LIMITED WARRANTY

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, Garmin will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you.

Garmin retains the exclusive right to repair or replace the unit or software, or to offer a full refund of the purchase price, at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, visit the Garmin Website at “http://www.garmin.com” or contact Garmin Customer Service at 800-800-1020.
WARNINGS, CAUTIONS, AND NOTES

**WARNING:** To reduce the risk of unsafe operation, carefully review and understand all aspects of the G1000 Pilot’s Guide documentation. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the G1000 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 Garmin G1000 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 G1000. 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, G1000 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 Garmin G1000 utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the G1000 can be misused or misinterpreted and, therefore, become unsafe.

**WARNING:** The altitude calculated by G1000 GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74A Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the G1000 PFD or other pressure altimeters in aircraft.

**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:** Navigation and terrain separation must NOT be predicated upon the use of the terrain function. The G1000 Terrain Proximity 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 Proximity feature is only to be used as an aid for terrain avoidance and is not certified for use in applications requiring a certified terrain awareness system. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.

**WARNING:** Do not use outdated database information. Databases used in the G1000 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.
WARNINGS, CAUTIONS, AND NOTES

**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 the G1000 Multi Function Display is provided as an aid in visually acquiring traffic. The aircraft should be maneuvered based only upon ATC guidance or positive visual acquisition of conflicting traffic.

**WARNING:** XM Weather should not be used for hazardous weather penetration. Weather information provided by the GDL 69/69A is approved only for weather avoidance, not penetration.

**WARNING:** NEXRAD weather data is to be used for long-range planning purposes only. Due to inherent delays in data transmission and the relative age of the data, NEXRAD weather data should not be used for short-range weather avoidance.

**WARNING:** Use of the Stormscope is not intended for hazardous weather penetration (thunderstorm penetration). Stormscope information, as displayed on the G1000 MFD, is to be used only for weather avoidance, not penetration.

**WARNING:** The illustrations in this guide are only examples. Never use the G1000 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:** Because of anomalies in the earth’s magnetic field, operating the G1000 within the following areas could result in loss of reliable attitude and heading indications. North of 70° North latitude and south of 70° South latitude. An area north of 65° North latitude between longitude 75° West and 120° West. An area south of 55° South latitude between longitude 120° East and 165° East.

**CAUTION:** The Garmin G1000 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.

**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.
NOTE: When using Stormscope, there are several atmospheric phenomena in addition to nearby thunderstorms that can cause isolated discharge points in the strike display mode. However, clusters of two or more discharge points in the strike display mode do indicate thunderstorm activity if these points reappear after the screen has been cleared.

NOTE: All visual depictions contained within this document, including screen images of the G1000 panel and displays, are for example only, are subject to change, and may not reflect the most current G1000 System. Depictions of equipment may differ slightly from the actual equipment.

NOTE: The GDU 1040/1042/1044 PFD/MFD may require a warm-up time of up to 30 minutes when exposed to -40°C for an extended period. A warm-up time of up to 15 minutes may be required when exposed to -30°C for an extended period.

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. For additional information, refer to the website 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 feet 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.
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<th>Revision</th>
<th>Date</th>
<th>Page Range</th>
<th>Description</th>
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</tr>
</tbody>
</table>
# TABLE OF CONTENTS

## SECTION 1 SYSTEM OVERVIEW

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>10</td>
</tr>
<tr>
<td>1.2</td>
<td>15</td>
</tr>
<tr>
<td>1.3</td>
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</tr>
<tr>
<td>1.4</td>
<td>17</td>
</tr>
<tr>
<td>1.5</td>
<td>26</td>
</tr>
<tr>
<td>1.6</td>
<td>35</td>
</tr>
<tr>
<td>1.7</td>
<td>49</td>
</tr>
</tbody>
</table>

## SECTION 2 FLIGHT INSTRUMENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>54</td>
</tr>
<tr>
<td>2.2</td>
<td>73</td>
</tr>
<tr>
<td>2.3</td>
<td>77</td>
</tr>
</tbody>
</table>

## SECTION 3 ENGINE INDICATION SYSTEM

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>86</td>
</tr>
<tr>
<td>3.2</td>
<td>88</td>
</tr>
<tr>
<td>3.3</td>
<td>91</td>
</tr>
<tr>
<td>3.4</td>
<td>92</td>
</tr>
</tbody>
</table>

## SECTION 4 AUDIO PANEL AND CNS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>99</td>
</tr>
<tr>
<td>4.2</td>
<td>104</td>
</tr>
<tr>
<td>4.3</td>
<td>113</td>
</tr>
<tr>
<td>4.4</td>
<td>126</td>
</tr>
<tr>
<td>4.5</td>
<td>132</td>
</tr>
</tbody>
</table>

## Additional Pages

- Abnormal Operations ........................................... 82
- Abnormal GPS Conditions ...................................... 82
- Unusual Attitudes .............................................. 83
- Low Altitude Annunciations ................................. 73
- Wind Data ......................................................... 75
- Vertical Navigation (VNV) Indications .................. 76
- System Alerting ................................................ 77
- Marker Beacon Annunciations ................................ 78
- Traffic Annunciation .......................................... 78
- TAWS Annunciations ........................................... 79
- Altitude Alerting .............................................. 80
- Low Altitude Annunciation .................................. 80
- Minimum Descent Altitude/Decision Height Alerting .... 81
- Course Deviation Indicator (CDI) ......................... 50
- Vertical Speed Indicator (VSI) ............................. 59
- Vertical Deviation ............................................. 60
- Horizontal Situation Indicator (HSI) ..................... 61
- MFD/PFD Controls and Frequency Display ............ 100
- Audio Panel Controls ........................................ 102
- System Display ................................................. 96
- Quick-Tuning and Activating 121.500 MHz ............... 106
- Auto-Tuning the COM Frequency ......................... 107
- Frequency Spacing ............................................ 111
- Automatic Squelch ........................................... 112
- NAV Operation .................................................. 113
- NAV Radio Selection and Activation .................... 113
- NAV Receiver Manual Tuning ............................... 114
- Auto-Tuning a NAV Frequency from the MFD .......... 116
- Marker Beacon Receiver ...................................... 121
- ADF/DME Tuning ............................................... 122
- Transponder Controls ........................................ 126
- Transponder Mode Selection ............................... 127
- Entering a Transponder Code .............................. 130
- IDENTITY Function ........................................... 131
- Power-Up ....................................................... 132
- Mono/Stereo Headsets ....................................... 132
- Speaker ......................................................... 132
- Intercom ........................................................ 133
- Passenger Address (PA) System ......................... 135
- Clearance Recorder and Player ............................ 135

---

Garmin G1000 Pilot’s Guide for the Diamond DA40/40F

190-00592-05 Rev. A
SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

7.1 AFCS Controls .................................................. 358
7.2 Flight Director Operation ........................................ 360
   Activating the Flight Director ................................... 360
   AFCS Status Box .................................................. 361
   Command Bars ..................................................... 362
   Flight Director Modes ............................................ 362
7.3 Vertical Modes .................................................. 363
   Pitch Hold Mode (PIT) ............................................ 364
   Selected Altitude Capture Mode (ALTS) ......................... 365
   Altitude Hold Mode (ALT) ....................................... 366
   Vertical Speed Mode (VS) ........................................ 367
   Flight Level Change Mode (FLC) ............................... 368
   Vertical Navigation Modes (VPTH, ALTV) ....................... 370
   Glidepath Mode (GP) (WAAS only) ............................. 375
   Glideslope Mode (GS) ............................................ 377
   Go Around Mode (GA) ......................................... 378
7.4 Lateral Modes .................................................... 379
   Roll Hold Mode (ROL) .......................................... 380
   Heading Select Mode (HDG) ..................................... 381
   Navigation Modes (GPS, VOR, LOC, BC) ...................... 382
   Approach Modes (GPS, VAPP, LOF) ............................ 384
7.5 Autopilot Operation ............................................. 386
   Engaging the Autopilot .......................................... 386
   Control Wheel Steering ......................................... 387
   Disengaging the Autopilot ....................................... 387
7.6 Example Flight Plan ............................................. 388
   Departure ......................................................... 389
   Intercepting a VOR Radial ...................................... 391
   Flying a Flight Plan/GPS Course ................................. 392
   Descent .......................................................... 393
   Approach ........................................................ 397
   Go Around/Missed Approach .................................... 399
7.7 AFCS Annunciations and Alerts ................................. 401
   AFCS Status Alerts .............................................. 401
   Overspeed Protection .......................................... 402
   Annunciations for KAP 140 Autopilot System .................. 402

SECTION 8 ADDITIONAL FEATURES

8.1 Synthetic Vision System (SVS) ............................. 404
   SVS Operation .................................................. 405
   SVS Features .................................................... 406
   Field of View .................................................... 411
   Reversionary Mode ............................................. 412
   Unusual Attitudes .............................................. 413

8.2 SafeTaxi ......................................................... 414
   SafeTaxi Cycle Number and Revision .......................... 417
8.3 ChartView ....................................................... 420
   ChartView Softkeys ............................................. 420
   Terminal Procedures Charts .................................... 421
   Chart Options .................................................... 431
   Day/Night View .................................................. 437
   ChartView Cycle Number and Expiration Date ............... 439
8.4 FliteCharts ...................................................... 443
   FliteCharts Softkeys ............................................ 443
   Terminal Procedures Charts .................................... 444
   Chart Options .................................................... 452
   Day/Night View .................................................. 456
   FliteCharts Cycle Number and Expiration Date ............... 458

8.5 XM Radio Entertainment (Optional) ......................... 462
   Activating XM Satellite Radio Services ........................ 462
   Using XM Radio ................................................. 464
   Automatic Audio Muting ....................................... 468

8.6 Scheduler ........................................................ 469
8.7 Electronic Checklists .......................................... 471
8.8 Abnormal Operation ............................................ 474
   SVS Troubleshooting ........................................... 475

APPENDICES

Annunciations and Alerts ........................................ 477
   SVS Terrain Alerts ............................................. 494
   SVS Terrain Status Annunciations ............................ 494
SD Card Use and Databases ....................................... 497
Glossary .......................................................... 501
Frequently Asked Questions ....................................... 507
General TIS Information .......................................... 511
Map Symbols ....................................................... 513

INDEX

Index ............................................................... I-1
SECTION 1  SYSTEM OVERVIEW

NOTE: Refer to the Automatic Flight Control System (AFCS) Section for details on the GFC 700 AFCS.

The G1000 Integrated Flight Deck System presents flight instrumentation, position, navigation, communication, and identification information using flat-panel color displays. The system is distributed across the following Line Replaceable Units (LRUs):

- **GDU 1040** Primary Flight Display (PFD)
- **GDU 1040/1042/1044** Multi Function Display (MFD)
- **GMA 1347** Audio Panel with Integrated Marker Beacon Receiver
- **GIA 63/63W** Integrated Avionics Units (IAU)
- **GDC 74A** Air Data Computer (ADC)
- **GEA 71** Engine/Airframe Unit
- **GTX 33** Mode S Transponder
- **GRS 77** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer
- **GDL 69/69A** Data Link Receiver
- **GSA 81** AFCS Servos
- **GSM 85** Servo Mounts

Figure 1-1 shows interactions between the LRUs. Additional/optional equipment are shown in Figure 1-2.

The Diamond DA40/40F may be optionally equipped with a GFC 700 Automated Flight Control System (AFCS), providing flight director (FD), autopilot (AP), and manual electric trim (MET) functions of the G1000 System.
1.1 LINE REPLACEABLE UNITS

- **GDU 1040/1042/1044** (2) – A GDU 1040 is configured as the Primary Flight Display (PFD) and a GDU 1040, 1042 or 1044 (1042/1044 for airframes equipped with the GFC 700) as a Multi Function Display (MFD). Both displays feature 10.4-inch LCD screens with 1024 x 768 resolution. The displays communicate with each other through a High-speed Data Bus (HSDB) Ethernet connection. Each display is also paired with an Ethernet connection to an IAU.

- **GMA 1347** – The Audio Panel integrates navigation/communication radio (NAV/COM) digital audio, intercom, and marker beacon controls, and is installed between the displays. This unit also provides manual control of display Reversionary Mode (red **DISPLAY BACKUP** button; see Section 1.4, System Operation) and communicates with both IAUs using an RS-232 digital interface.

- **GIA 63/63W** (2) – The Integrated Avionics Units (IAU) function as the main communications hub, linking all LRUs with the PFD. Each IAU contains a GPS receiver, a very high frequency (VHF) communication/navigation/glideslope (COM/NAV/GS) receiver, and system integration microprocessors, and is paired with the on-side display via an HSDB connection. The GIA 63W contains a GPS WAAS receiver. The IAUs are not paired together and do not communicate with each other directly.
**GDC 74A** – The Air Data Computer (ADC) processes data from the pitot/static system and outside air temperature (OAT) sensor. The ADC provides pressure altitude, airspeed, vertical speed, and OAT information to the G1000 System, and it communicates with the primary IAU, displays, and AHRS using an ARINC 429 digital interface.

![GDC 74A image]

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

![GEA 71 image]

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

![GTX 33 image]

- **GRS 77 (2)** – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 to both the PFD and the primary IAU. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, with the ADC to obtain air data, and with both IAUs to obtain GPS information. AHRS operation is discussed in Section 1.4, System Operation.
• **GMU 44** – The Magnetometer measures local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. This unit receives power directly from the AHRS and communicates with it via an RS-485 digital interface.

![GMU 44](image1)

• **GDL 69/69A** – The Data Link Satellite Radio Receiver provides real-time weather information to MFD maps and the PFD Inset Map. The GDL 69A model is also capable of providing digital audio entertainment. The Data Link Receiver communicates with the MFD via an HSDB connection. A subscription to XM Satellite Radio Service is required to enable Data Link Receiver capability.

![GDL 69/69A](image2)

• **GSA 81 and GSM 85** – The GSA 81 servos are used for automatic control of pitch, pitch trim, and roll. These units interface with each IAU. The GSM 85 servo mounts are responsible for transferring the output torque of the servo actuators to the mechanical flight-control surface linkages.

![GSA 81 and GSM 85](image3)
NOTE: The GDU 1044 is available in systems using the Garmin GFC 700 Automatic Flight Control System.
**NOTE:** The GDU 1040 is available in systems using the Honeywell KAP 140 Autopilot.

**NOTE:** For information on additional equipment shown in Figure 1-2, consult the applicable optional interface user’s guide. This document assumes that the reader is already familiar with the operation of this additional equipment.
1.2 SECURE DIGITAL (SD) CARDS

**NOTE:** Ensure the G1000 System is powered off before inserting an SD card.

**NOTE:** Refer to Appendix B for instructions on updating databases.

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

**Installing an SD card:**

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

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

![SD Card Slots](image)

*Figure 1-3 Display Bezel SD Card Slots*
1.3 SYSTEM POWER-UP

**NOTE:** See the Aircraft Flight Manual (AFM) for specific procedures concerning avionics power application and emergency power supply operation.

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

The G1000 System is integrated with the aircraft electrical system and receives power directly from electrical busses. The 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 1-4. All system annunciations should disappear typically within the first minute of power-up. Upon power-up, key annunciator lights also become momentarily illuminated on the Audio Panel 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 the first minute of power-up. The AHRS can align itself both while taxiing and during level flight.

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

- System version
- Copyright
- Land database name and version
- Obstacle database name and version
- Terrain database name and version
- Aviation database name, version, and effective dates

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

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

**NOTE:** Refer to Appendix A for detailed descriptions of all alerts and annunciations. Refer to the Aircraft Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.

The displays are connected together via a single Ethernet bus for high-speed communication. As shown in Figure 1-1, each IAU is connected to the on-side display. This allows the units to share information, enabling true system integration.

**DISPLAY 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.

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 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 1-6  G1000 Normal Operation](image)

In the event of a display failure, the G1000 System automatically switches to reversionary (backup) mode. In Reversionary Mode, all important flight information from the PFD is presented on the remaining display in the same format as in normal operating mode, with the addition of the EIS. EIS operation while in Reversionary Mode is discussed in the EIS Section. As when the PFD is operating normally, windows for flight planning, nearest airports, and procedures are available. The Inset Map is moved to the right side of the display.

If a display fails, the appropriate IAU-display Ethernet interface is cut off. Thus, the IAU can no longer communicate with the remaining display (refer to Figure 1-1), and the NAV and COM functions provided to the failed display by the IAU are flagged as invalid on the remaining display. The system reverts to backup paths for the AHRS, ADC, Engine/Airframe Unit, and Transponder, as required. The change to backup paths is completely automated for all LRUs and no pilot action is required.
If the system fails to detect a display problem, Reversionary Mode may be manually activated by pressing the Audio Panel’s red **DISPLAY BACKUP** Button. Pressing this button again deactivates Reversionary Mode.

---

**G1000 SYSTEM ANNUNCIATIONS**

When an LRU or an LRU function fails, a large red ‘X’ is typically displayed over the instrument experiencing failed data (Figure 1-8 displays all possible flags and responsible LRUs). The G1000 System alerts the pilot when backup paths are utilized by the LRUs. Upon G1000 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged, the G1000 should be serviced by a Garmin-authorized repair facility.

---

**Figure 1-7  G1000 Reversionary Mode (Failed PFD)**

**Figure 1-8  G1000 System Failure Annunciations**
SYSTEM STATUS

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

**Viewing LRU information:**

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

2) To place the cursor in the ‘LRU Info’ Box,
   
a) Press the **LRU** Softkey.
   
   Or:
   
a) Press the **MENU** Key.
   
b) With ‘Select LRU Window’ highlighted, press the **ENT** Key.

3) Use the **FMS** Knob to scroll through the box to view LRU status information.

![Figure 1-9 Example System Status Page](image_url)
Pertinent information on all system databases is also displayed on this page. Refer to the Appendices and Additional Features sections for more information about databases.

**Viewing database information:**

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

2) To place the cursor in the ‘Database’ Box,
   
   a) Press the DBASE Softkey.

   Or:

   a) Press the MENU Key.

   b) Highlight ‘Select Dbase Window’ and press the ENT Key.

3) Use the FMS Knob to scroll through the box to view database status information.

The G1000 uses aural tones to convey the priority of airframe-specific alerts. The alerting system’s annunciation tone may be tested from the System Status Page. Refer to the Appendices for airframe-specific alerts.

**Testing the system annunciation tone:**

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

2) Press the ANN TEST Softkey.

   Or:

   a) Press the MENU Key.

   b) Highlight ‘Enable Annunciator Test Mode’ and press the ENT Key.
AHRS OPERATION

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

The Attitude and Heading Reference System (AHRS) performs attitude, heading, and vertical acceleration calculations for the G1000 System, utilizing GPS, magnetometer, and air data in addition to information from its internal sensors. Attitude and heading information are updated on the PFD while the AHRS receives appropriate combinations of information from the external sensor inputs.

Loss of GPS, magnetometer, or air data inputs is communicated to the pilot by message advisory alerts (refer to Appendix A for specific AHRS alert information). Any failure of the internal AHRS inertial sensors results in loss of attitude and heading information (indicated by red ‘X’ flags over the corresponding flight instruments).

Two GPS inputs are provided to the AHRS. If GPS information from one of the inputs fails, the AHRS uses the remaining GPS input and an alert message is issued to inform the pilot. If both GPS inputs fail, the AHRS can continue to provide attitude and heading information to the PFD as long as magnetometer and airspeed data are available and valid.

If the magnetometer input fails, the AHRS continues to output valid attitude information; however, the heading output on the PFD is flagged as invalid with a red ‘X’.

Failure of the air data input has no effect on the AHRS output while AHRS is receiving valid GPS information. Invalid/unavailable airspeed data in addition to GPS failure results in loss of all attitude and heading information.
GPS RECEIVER OPERATION

Each Integrated Avionics Unit (IAU) contains a GPS receiver. Internal system checking is performed to ensure both GPS receivers are providing accurate data to the PFD. When both GPS receivers are providing accurate data, the GPS receiver producing the better solution is used by the system. 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.

Viewing GPS receiver status information:

1) Use the large FMS Knob on the MFD to select the Auxiliary Page Group (see Section 1.6 for information on navigating MFD page groups).

2) Use the small FMS Knob to select GPS Status Page (third page in the AUX Page Group).

3) To change the selected GPS receiver:

Press the desired GPS Softkey.

Or:

a) Press the MENU Key.

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

Figure 1-11  GPS Status Page
For WAAS-enabled systems, GPS sensor annunciations are most often seen after system power-up when one GPS receiver has acquired satellites before the other or one of the GPS receivers has not yet acquired a WAAS signal. While the aircraft is on the ground, the WAAS 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 WAAS signal. If no failure message exists, check the GPS Status Page and compare the information for GPS1 and GPS2. Discrepancies may indicate a problem.

**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. Satellite-Based Augmentation System (SBAS) status should be indicated as INACTIVE at this point. When acquisition is complete, the solution status changes to 3D DIFF NAV and SBAS becomes active.

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

**Disabling WAAS (for WAAS-enabled systems):**

1) Select the GPS Status Page.
2) Press the SBAS Softkey. The RAIM PREDICTION box is replaced by SBAS SELECTION.
3) Press the FMS Knob. ‘WAAS’ is highlighted.
4) Press the ENT Key to uncheck the box.
5) Press the FMS Knob to remove the cursor.

![Figure 1-12 Enable/Disable WAAS](image-url)
RAIM PREDICTION

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. In G1000 systems with WAAS enabled, performing RAIM prediction is not necessary in most cases. However, if the selected approach is outside the WAAS coverage area, it may be necessary to perform a RAIM prediction for the intended approach.

Because of the tighter protection limit on approaches, there may be times when RAIM is not available. The G1000 automatically monitors RAIM and warns with an alert message when it is not available. If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the messages “Approach is not active”. 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) 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 and press the ENT Key (refer to Section 1.6 for instructions on data 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) Enter an arrival time and press the ENT Key.
7) 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
SATELLITE INFORMATION

Satellites currently in view are shown at their respective positions on a satellite constellation diagram. This sky view is always oriented north-up, 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.

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 indicated by signal bar appearance:

• No signal strength bar—Receiver is looking for the indicated satellite.
• Hollow signal strength bar—Receiver has found the satellite and is collecting data. 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).
• Solid signal strength bar—Receiver has collected the necessary data and the satellite signal can be used.
• Checkered signal strength bar—Receiver has excluded the satellite (Fault Detection and Exclusion; FDE).
• “D” indication on signal strength bar—Satellite is being used for differential computations.
• Green signal strength bar—Satellites that are actually being used in the position calculation.
• Blue signal strength bar—Satellite is locked on but not yet being used in the position calculation.

Using the current satellite signal information, the system calculates the aircraft’s GPS position, time, altitude, ground speed, and track for the aircraft (displayed below the satellite signal accuracy measurements for reference). The following quantities denote the accuracy of the aircraft’s GPS fix:

• Estimated Position Uncertainty (EPU)—A statistical error indication; the radius of a circle centered on an estimated horizontal position in which actual position has 95% probability of lying
• Horizontal Dilution of Precision (HDOP)—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
• Horizontal and Vertical Figures of Merit (HFOM and VFOM)—Measures of horizontal and vertical position uncertainty; the current 95% confidence horizontal and vertical accuracy values reported by the GPS receiver
1.5 G1000 CONTROLS

The G1000 controls have been designed to simplify operation of the system and minimize workload and the
time required to access sophisticated functionality. Controls are located on the PFD and MFD bezels and Audio
Panel. PFD and MFD controls and softkeys are discussed in this section. See the Audio Panel and CNS Section
for more information about Audio Panel and NAV/COM controls. AFCS controls (on the bezel of the MFD) are
described in the AFCS section.

PFD/MFD CONTROLS

![Figure 1-13 PFD/MFD Controls](image)

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 1-14 Dual Concentric Knob](image)
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 Horizontal Situation Indicator (HSI) and synchronize the Selected Heading to the and current heading

5 Joystick  
   Turn to change map range  
   Press to activate Map Pointer and move in desired direction to pan map

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  
   The selected COM (green) is controlled with the COM MIC Key (Audio Panel).

8 COM Frequency Transfer Key (EMERG)  
   Transfers the standby and active COM frequencies  
   Press and hold 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 selection or data entry
FMS Knob (Flight Management System Knob)

Press to turn the selection cursor on/off

Data Entry: With cursor on, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location)

Scrolling: When a list of information is too long for the window/box, a scroll bar appears, indicating more items to view. With cursor on, turn large knob to scroll through the list.

Page Selection: Turn knob on MFD to select the page to view (large knob selects a page group; small knob selects a specific page from the group)

Softkey Selection Keys

Press to select softkey shown above the bezel key on the PFD/MFD display

ALT Knob

Sets the Selected Altitude, shown above the Altimeter (the large knob selects the thousands, the small knob selects the hundreds)

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. When a softkey function is disabled, the softkey label is subdued (dimmed).

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

In the following descriptions, top level softkeys are denoted with bullets.

PFD SOFTKEYS

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

The PFD softkeys provide control over flight management functions, including GPS, NAV, terrain, traffic, and lightning (optional). Each softkey sublevel has a BACK Softkey which can be selected to return to the previous level. The ALERTS Softkey is visible at all softkey levels (label changes if messages are issued).
• **INSET**  Displays Inset Map in PFD lower left corner
  - **OFF**  Removes Inset Map
  - **DCLTR (3)**  Selects desired amount of map detail; cycles through declutter levels:
    - DCLTR (No Declutter): All map features visible
    - DCLTR-1: Removes land data
    - DCLTR-2: Removes land and SUA data
    - DCLTR-3: Removes everything except active flight plan

  - **TRAFFIC (2)**  Displays/removes traffic information on Inset Map
    - TRFC-1: Displays traffic on Inset Map.
    - TRFC-2: Removes everything except traffic. Inset Map position HDG UP only.

  - **TOPO**  Displays/removes topographical data (e.g., coastlines, terrain, rivers, lakes) on Inset Map
  - **TERRAIN**  Displays/removes terrain information on Inset Map
  - **STRMSCP**  Displays/removes Stormscope weather information on Inset Map *(optional)*
  - **NEXRAD**  Displays/removes NEXRAD weather and coverage information on Inset Map *(optional)*
  - **XM LTNG**  Displays/removes XM lightning information on Inset Map *(optional)*

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**Figure 1-16 Top Level PFD Softkeys**

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Press the **CDI** Softkey to cycle through navigation sources:
- GPS
- NAV1 (VOR/LOC)
- NAV2 (VOR/LOC)

**Figure 1-17 INSET Softkeys**

---

Press the **OFF** or **BACK** Softkey to return to the top-level softkeys.
**PFD**  Displays second-level softkeys for additional PFD configuration

**SYN VIS**  Displays the softkeys for enabling or disabling Synthetic Vision features

**PATHWAY**  Displays rectangular boxes representing the horizontal and vertical flight path of the active flight plan

**SYN TERR**  Enables synthetic terrain depiction

**HRZN HDG**  Displays compass heading along the Zero-Pitch line

**APTSIGNS**  Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.

**DFLTS**  Resets PFD to default settings, including changing units to standard

**WIND**  Displays softkeys to select and configure wind data

**OPTN1**  Displays wind data in longitudinal and lateral components

**OPTN2**  Displays wind data total direction and speed

**OPTN3**  Displays wind data total direction with head and cross-wind speed components

**OFF**  Removes wind information from display

**DME**  Displays/removes DME Information Window (*optional*)

**BRG1**  Cycles the Bearing 1 Information Window through:
- NAV1: Waypoint frequency/identifier and DME information
- GPS: Waypoint identifier and GPS distance information
- ADF: Waypoint frequency
- Off: Removes window

**HSI FMT**  Displays softkeys to select the HSI format

**360 HSI**  Displays HSI as a 360° compass rose

**ARC HSI**  Displays HSI as a 140° viewable arc (Bearing Information windows unavailable)

**BRG2**  Cycles the Bearing 2 Information Window through:
- NAV2: Waypoint frequency/identifier and DME information
- GPS: Waypoint identifier and GPS distance information
- ADF: Waypoint frequency
- Off: Removes window

**ALT UNIT**  Displays softkeys for changing the Altimeter barometric setting and altitude displays to metric units

**METERS**  Displays the current and Selected altitudes in meters in addition to feet, when selected

**IN**  Displays the Altimeter barometric setting in inches of mercury (in Hg)

**HPA**  Displays the Altimeter barometric setting in hectopascals (hPa)

**STD BARO**  Sets barometric pressure to 29.92 in Hg (1013 hPa if metric display is selected)

**OBS**  Selects OBS Mode on the CDI when navigating by GPS (only available with active leg)

**CDI**  Cycles CDI through GPS, NAV1 (VOR/LOC), and NAV2 (VOR/LOC) navigation sources

**ADF/DME**  Displays/removes ADF/DME Radio Tuning Window (*optional*; may appear as ADF, DME, or ADF/DME depending on installation)
Press the STD BARO or BACK Softkey to return to the top-level softkeys.

Press the BRG1/BRG2 softkeys to display/remove the Bearing Information windows and cycle through bearing sources:
- NAV1/NAV2
- GPS
- ADF

Figure 1-18  PFD Configuration Softkeys
• 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  Manually selects Ground Mode (Transponder does not allow Mode A and Mode C replies, but does permit acquisition squitter and replies to discretely addressed Mode S interrogations)  
  VFR  Automatically enters the VFR code (1200 in U.S.A. only)  
  CODE  Displays transponder code selection softkeys 0-7  
  0 — 7  Use numbers to enter code  
  BKSP  Removes numbers entered, one at a time  
  • IDENT  Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen  
  • TMR/REF  Displays/removes Timer/References Window  
  • NRST  Displays/removes Nearest Airports Window  
  • ALERTS  Displays/removes Alerts Window

![XPDR Softkeys](image-url)
MFD SOFTKEYS

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

**Figure 1-20 EIS and MFD Softkeys**

- **ENGINE** Displays EIS - Engine Page and second-level engine softkeys; press again to exit page (see the EIS Section for more information)
- **LEAN** Accesses engine leaning assist mode
- **DEC FUEL** Decreases displayed fuel remaining in 1-gal increments
- **INC FUEL** Increases displayed fuel remaining in 1-gal increments
- **RST FUEL** Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero
SYSTEM OVERVIEW

- **MAP** Enables second-level Navigation Map Page softkeys
- **TRAFFIC** Displays/removes traffic information on Navigation Map Page
- **TOPO** Displays/removes topographical data (e.g., coastlines, terrain, rivers, lakes) on Navigation Map Page
- **TERRAIN** Displays/removes terrain information on Navigation Map Page
- **AIRWAYS** Selects the desired display of Airways; cycles through:
  - AIRWY ON: All Airways displayed
  - AIRWY LO: Low Altitude (Victor) Airways displayed
  - AIRWY HI: High Altitude Airways (Jet Routes) displayed
  - AIRWAYS: Airways are not displayed
- **STRMSCP** Displays/removes Stormscope weather information on Inset Map (optional)
- **NEXRAD** Displays/removes NEXRAD weather/coverage on Navigation Map Page (optional)
- **XM LTNG** Displays/removes XM lightning information on Navigation Map Page (optional)
- **BACK** Returns to top-level softkeys
- **DCLTR (3)** Selects desired amount of map detail; cycles through declutter levels:
  - DCLTR (No Declutter): All map features visible
  - DCLTR-1: Removes land data
  - DCLTR-2: Removes land and SUA data
  - DCLTR-3: Removes everything except the active flight plan
- **SHW CHRT** Displays optional Flite Charts or Chart View charts (optional)
- **CHKLIST** Displays the Checklist Page
- **DONE** Selects the highlighted checklist item
- **EXIT** Returns to the top-level softkeys
- **EMERGCY** Immediately accesses the emergency procedures
1.6 ACCESSING G1000 FUNCTIONALITY

MENUS

The G1000 has a dedicated MENU Key that when pressed displays a context-sensitive list of options. This options list allows the user to access additional features or make settings changes which specifically relate to the currently displayed window/page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display ‘No Options’ when there are no additional features or settings for the window/page selected.

Navigating a menu:

1) Press the MENU Key to display the menu.

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

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

4) Press the CLR Key or FMS Knob to remove the menu and cancel the operation.

DATA ENTRY

The FMS Knob can be used for directly entering alphanumeric data (e.g., Flight ID, waypoint identifiers, barometric minimum descent altitude) into the G1000. In some instances, such as when entering an identifier, the G1000 tries to predict the desired identifier based on the characters being entered. In this case, if the desired identifier appears, use the ENT Key to confirm the entry without entering the rest of the identifier manually. This can save the pilot from having to enter all the characters of the identifier.

Besides character-by-character data entry, the system also provides a shortcut for entering waypoint identifiers. When the cursor is on a field awaiting entry of a waypoint identifier, turning the small FMS Knob counterclockwise accesses three different lists of waypoint identifiers for quick selection: flight plan (FPL), nearest (NRST), and recently-entered (RECENT). The G1000 automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.
Using the FMS Knob to enter data:

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

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

3) Begin entering data.

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

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

   Or:

   a) Turn the small FMS Knob to select a character for the first placeholder.
      
       Turning the knob clockwise scrolls through the alphabet (where appropriate) toward the letter Z, starting at K, and the digits zero through nine. Afterwards, turning the knob counter-clockwise scrolls in the opposite direction.

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

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

   d) Press the ENT Key to confirm entry.

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

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

Information on the MFD is presented on pages which are grouped according to function. 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 current page group, number of pages available in the group, and placement of the current page within the group are indicated by icons. For some of these pages (Airport/Procedures/Weather Information, XM, Procedure Loading), the title of the page changes while the page icon remains the same.

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

**Selecting a page using the FMS Knob:**

1) Turn the large FMS Knob until the desired page group is selected.

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

There are also several pages (Airport/Procedures/Weather Information and XM pages) which are selected first from within a main page group with the FMS Knob, then with the appropriate softkey at the bottom of the page (or from the page menu). In this case, the page remains set to the selected page until a different page softkey is selected, even if a different page group is selected.
• **Map Page Group (MAP)**
  
  Navigation Map
  Traffic Map
  Stormscope (*optional*)
  Weather Data Link (*optional*)
  Terrain Proximity/TAWS (*TAWS optional*)

  ![Map Pages](Image)

• **Waypoint Page Group (WPT)**
  
  Airport/Procedures/Weather Information Pages
  - Airport Information (*INFO Softkey*)
  - Departure Information (*DP Softkey*)
  - Arrival Information (*STAR Softkey*)
  - Approach Information (*APR Softkey*)
  - Weather Information (*optional*) (*WX Softkey*)

  Intersection Information
  NDB Information
  VOR Information
  User Waypoint Information

  ![Waypoint Pages](Image)
• Auxiliary Page Group (AUX)
  Trip Planning
  Utility
  GPS Status
  System Setup
  XM Satellite screens (optional)
    - XM Information (INFO Softkey)
    - XM Radio (RADIO Softkey)
  System Status

Figure 1-25 Auxiliary Pages

• Nearest Page Group (NRST)
  Nearest Airports
  Nearest Intersections
  Nearest NDB
  Nearest VOR
  Nearest User Waypoints
  Nearest Frequencies
  Nearest Airspaces

Figure 1-26 Nearest Pages
In addition to the main page groups accessed exclusively using the **FMS** Knob, there are pages for flight planning (FPL) and loading procedures (PROC) which are accessed by key. In some instances, softkeys may be used to access the Procedure Loading pages.

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

- **Flight Plan Page Group (FPL)**
  - Active Flight Plan
  - Flight Plan Catalog
    - Stored Flight Plan
    - **NEW** Softkey

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

- **Procedure Loading Page Group (PROC)**
  - Departure Loading
  - Arrival Loading
  - Approach Loading

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

G1000 system settings are managed from the System Setup Page. The following settings can be changed:

- Date/time
- Display Units (see Flight Instruments Section)
- Airspace alerts (see Flight Management Section)
- Arrival alerts (see Flight Management Section)
- MFD Navigation Status Box fields (see Flight Management Section)
- CDI scaling for GPS navigation source (see Flight Instruments Section)
- COM channel spacing (see Audio Panel and CNS Section)
- Criteria for displaying nearest airports (see Flight Management Section)
- Audio Alerts

Restoring system setup defaults:

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

Or:

a) Press the MENU Key.

b) Highlight ‘Restore Defaults’ and press the ENT Key.

Figure 1-29 System Setup Page
DATE/TIME

The G1000 obtains the current Universal Coordinated Time (UTC) date and time directly from the GPS satellite signals (shown on the AUX - GPS Status Page, Figure 1-11). System time (displayed in the lower right corner of the PFD) can be displayed in three formats: local 12-hr, local 24-hr, or UTC. Local time is set by adding/subtracting an offset (hours:minutes) to/from UTC.

Configuring the system time:

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

Units in which various quantities are displayed on the G1000 screens are listed on the System Setup Page. The Navigation Angle reference can be set from here (refer to the Flight Instruments Section).

![Figure 1-32 Display Unit Settings (AUX - System Setup Page)](image)

<table>
<thead>
<tr>
<th>Category</th>
<th>Settings</th>
<th>Affected Quantities</th>
<th>Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation Angle</td>
<td>Magnetic (North)</td>
<td>Heading, Course, Bearing, Track, Desired Track, Wind direction (Trip Planning Page)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>True (North)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance and Speed</td>
<td>Nautical</td>
<td>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</td>
<td>Airspeed Indicator, True Airspeed (PFD), Wind speed vector, Map range (Traffic Page, Terrain Proximity/TAWS Page), CDI scaling (System Setup), Fuel range calculation (EIS)</td>
</tr>
<tr>
<td>Altitude and Vertical Speed</td>
<td>Feet</td>
<td>All altitudes on MFD, All elevations on MFD</td>
<td>Altimeter, Vertical Speed Indicator, VNV altitudes (Active Flight Plan)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Celsius</td>
<td>All temperatures on PFD, Total Air Temperature (Trip Planning Page)</td>
<td>Engine Indication System (EIS)</td>
</tr>
<tr>
<td></td>
<td>Fahrenheit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel and Fuel Flow</td>
<td>Gallons</td>
<td>Fuel parameters (Trip Planning Page)</td>
<td>Engine Indication System (EIS)</td>
</tr>
<tr>
<td>Weight</td>
<td>Pounds</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Position</td>
<td>HDDD°MM.MM‘ MM° SS.S”</td>
<td>All positions</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 1-1 Display Units Settings (AUX - System Setup Page)
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 Splash Screen (Figure 1-5). The G1000 can store up to 25 profiles; the currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the System Setup Page in the box labeled ‘Pilot Profile’. From here, pilot profiles may be created, selected, renamed, or deleted.

Creating a profile:

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

9) To cancel the process, select ‘CANCEL’ with the large FMS Knob and press the ENT Key.

Selecting an active profile:
1) Use the FMS Knob to select the AUX - System Setup Page.
2) Press the FMS Knob momentarily to activate the flashing cursor.
3) Turn the large FMS Knob to highlight the active profile field in the Pilot Profile Box.
4) Turn the small FMS Knob to display the pilot profile list and highlight the desired profile.
5) Press the ENT Key. The G1000 loads and displays the system settings for the selected profile.

Renaming a profile:
1) Use the FMS Knob to select the AUX - System Setup Page.
2) Press the FMS Knob momentarily to activate the flashing cursor.
3) Turn the large FMS Knob to highlight ‘RENAME’ in the Pilot Profile Box.
4) Press the ENT Key.
5) In the ‘Rename Profile’ window, turn the FMS Knob to select the profile to rename.
6) Press the ENT Key.
7) Use the FMS Knob to enter a new profile name up to 16 characters long and press the ENT Key.
8) With ‘RENAME’ highlighted, press the ENT Key.
9) To cancel the process, use the large FMS Knob to select ‘CANCEL’ and press the ENT Key.

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

The G1000 timers available include:
- Stopwatch-like generic timers (available from the PFD Timer/References Window and on the MFD AUX - Utility Page)
- Total-time-in-flight timer (MFD AUX - Utility Page)
- Time since departure (MFD AUX - Utility Page)

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 (PFD):

1) Press the TMR/REF Softkey.
2) Turn the large FMS Knob to select the timer field (hh/mm/ss).
3) Use the FMS Knob 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.
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 generic timer (MFD AUX - Utility Page):**

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 specific 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.

![Timer Configuration](image)

**Figure 1-35 Timers (AUX - Utility Page)**

**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 G1000 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.
1.7 DISPLAY BACKLIGHTING

The backlighting of the PFD and MFD displays and bezel and Audio Panel keys can be adjusted automatically or manually. The default setting (automatic backlighting adjustment) uses photocell technology to automatically adjust for ambient lighting conditions. Photocell calibration curves are pre-configured to optimize display appearance through a broad range of cockpit lighting conditions. Manual backlighting adjustment can be accomplished using the existing instrument panel dimmer bus or the following procedures. In normal operating mode, backlighting can only be adjusted from the PFD. In Reversionary Mode, it can be adjusted from the remaining display.

Adjusting display backlighting:

1) Press the PFD MENU Key to display the PFD Setup Menu. ‘AUTO’ is now highlighted next to ‘PFD DSPL’.
2) Turn the small FMS Knob to select ‘MANUAL’.
3) Press the ENT Key. The intensity value is now highlighted.
4) Use the FMS Knob to enter the desired backlighting then press the ENT Key.
5) Turn the large FMS Knob to highlight ‘AUTO’ next to ‘MFD DSPL’ and repeat steps 2-4.
6) To remove the menu, press the CLR or MENU Key.

Adjusting key backlighting:

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

Figure 1-36 PFD Setup Menu
SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

EIS

AUDIO PANEL & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

AFCS

ADDITIONAL FEATURES

APPENDICES

INDEX

BLANK PAGE
SECTION 2 FLIGHT INSTRUMENTS

**WARNING:** If the airspeed, attitude, altitude, or heading indications become unusable, refer to the backup instruments.

**NOTE:** The Automatic Flight Control System (AFCS) provides additional readouts and bugs on selected flight instruments. Refer to the AFCS Section for details on these bugs and readouts, as they appear on the display during certain AFCS modes.

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

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

- Airspeed Indicator, showing
  - Indicated airspeed
  - True airspeed
  - Airspeed awareness ranges
  - Vspeed reference flags
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Trend vector
  - Barometric setting
  - Selected altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) indications
- Outside air temperature (OAT)
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Bearing pointers and information windows
  - Navigation source
  - Course Deviation Indicator (CDI)
  - Bearing pointers and information windows
  - DME Information Window
- Transponder Mode, Code, and Ident/Reply
- Course Deviation Indicator (CDI)
- Timer/References Window, showing
  - Generic timer
  - Vspeed values
  - Barometric minimum descent altitude (MDA)
- Wind data

The PFD also displays various alerts and annunciations.
Figure 2-1 Primary Flight Display (Default)

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

- 1 Traffic Annunciation
- 2 Selected Heading
- 3 Vspeed Reference
- 4 Wind Data
- 5 Inset Map
- 6 DME Information Window
- 7 Bearing Information Windows
- 8 Minimum Descent Altitude/Decision Height
- 9 Flight Plan Window
- 10 Annunciation Window
- 11 Selected Course
- 12 Vertical Speed Required
- 13 Vertical Deviation Indicator
- 14 Current VNV Target Altitude
- 15 AFCS Status Annunciation
2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR

**NOTE: Refer to the Aircraft Flight Manual Supplement (AFMS) for airspeed criteria and Vspeed values.**

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The true airspeed 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 marked 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.

A color-coded (white, green, yellow, and red) speed range strip is located on the moving tape. The colors denote flaps operating range, normal operating range, caution range, and never-exceed speed ($V_{NE}$). Red and yellow ranges are also present for low speed awareness. For EASA-certified aircraft, the yellow low airspeed awareness band is not shown and the limits on the other lower speed ranges differ (refer to the AFMS for speed criteria).

The Airspeed Trend Vector is a vertical, magenta line, extending up or down on the airspeed scale, shown to the right of the color-coded speed range strip. The end of the trend vector corresponds to the predicted airspeed in 6 seconds if the current rate of acceleration is maintained. If the trend vector crosses $V_{NE}$, the text of the actual airspeed readout changes to yellow. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.
Vspeeds (Glide, \( V_g \), \( V_x \), and \( V_y \)) can be changed and their flags turned on/off from the Timer/References Window. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. By default, all Vspeed values are reset and all flags turned off when power is cycled.

**Changing Vspeeds and turning Vspeed flags on/off:**

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

**Turning all Vspeed flags on/off:**

1) Press the TMR/REF Softkey.
2) Press the MENU Key.
3) To activate all Vspeed flags, press the ENT Key with All References On highlighted.
4) To remove all Vspeed flags, turn the FMS Knob to highlight All References Off and press the ENT Key.

**Restoring all Vspeed defaults:**

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

Attitude information is displayed over a virtual blue sky and brown ground with a white horizon line. The Attitude Indicator displays the pitch, roll, and slip/skid information.

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°.

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

The Slip/Skid Indicator is the bar beneath the roll pointer. The indicator moves with the roll pointer and moves laterally away from the pointer to indicate lateral acceleration. Slip/skid is indicated by the location of the bar relative to the pointer. One bar displacement is equal to one ball displacement on a traditional Slip/Skid Indicator.

Figure 2-8  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 indicated altitude is displayed inside 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 upper or lower edge of the tape. When the metric value is selected it is displayed in a separate box above the Selected Altitude.

Setting the Selected Altitude:

Turn the **ALT** Knob to set the Selected Altitude (large knob for 1000-ft increments, small knob for 100-ft increments (increments reduce to 10 feet for approach).

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

![Figure 2-9 Altimeter Settings, In HG and Metric](image)
Altitudes can also be displayed in meters. Note that the altitude tape does not change scale.

**Displaying altitude in meters:**

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

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 six 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.

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 pressure setting creates discontinuities in VNV vertical navigation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

**Selecting the altimeter barometric pressure setting:**

Turn the BARO Knob to select the desired setting.

**Selecting standard barometric pressure (29.92 in Hg):**

1) Press the PFD Softkey to display the second-level softkeys.
2) Press the STD BARO Softkey.

**Changing altimeter barometric pressure setting units:**

1) Press the PFD Softkey to display the second-level softkeys.
2) Press the ALT UNIT Softkey.
3) Press the IN Softkey to display the barometric pressure setting in inches of mercury (in Hg).
   
   Or, press the HPA Softkey to display the barometric pressure setting in hectopascals (hPa).
4) Press 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.

**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 and minor tick marks every 500 fpm. 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 edge of the tape and the rate appears inside the pointer.
NOTE: The Glidepath Indicator is only shown for aircraft with GIA 63W Integrated Avionics Units when WAAS is available.

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

The Glideslope Indicator 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 heard.

The glideslope is analogous to the glideslope for GPS approaches supporting WAAS vertical guidance (LNAV+V, LVNAV, LPV). When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator appears as a magenta diamond during the approach. If the approach type downgrades past the final approach fix (FAF), “NO GP” is heard.

Full-scale deflection of two dots is 1000 feet.
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. 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.

![Figure 2-14 Horizontal Situation Indicator (HSI)](image-url)
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 2-15 Arc HSI](image)

The selected heading is shown to the upper left of the HSI for 3 seconds after being adjusted. The light blue heading 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.
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 2-17 Heading and Course Indications (True)](image)

**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 2-18 AUX - System Setup Page, Navigation Angle Settings](image)
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.

BEARING POINTERS AND INFORMATION WINDOWS

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

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

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

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

**Selecting bearing display and changing sources:**

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

**DME INFORMATION WINDOW**

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

**Displaying the DME Information Window:**

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

**NOTE:** 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.

The CDI can display two sources of navigation, GPS or VOR/LOC. The 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 navigating GPS. When navigating using a VOR or localizer (LOC), the CDI uses the same angular deviation 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 Course Deviation Indicator](image1)

![Figure 2-22 Navigation Sources](image2)
Changing navigation sources:

1) Press the **CDI** Softkey to change from GPS to VOR1 or LOC1. This places the light blue tuning box over the NAV1 standby frequency in the upper left corner of the PFD.

2) Press the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. This places the light blue tuning box over the NAV2 standby frequency.

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

***NOTE: KAP 140 equipped aircraft only***: Each time the **CDI** Softkey is pressed or the navigation source changes a message appears (“NAV Source Changed – Select Desired Autopilot Mode”) regardless of whether or not the autopilot is engaged.

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; see the Flight Management Section) 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 announcements appear on the HSI for the flight phase. Flight phase announcements 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 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 2-24 AUX - System Setup Page, GPS CDI Settings](image)

When set to Auto (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-25, Table 2-1).
• 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:
  - When navigating with an active arrival route, the flight phase and CDI scale does not change until the aircraft arrives at the first waypoint in the arrive route (if within 31 nm from the destination airport).

• During approach, the CDI scale ramps down even further (see Figures 2-26 and 2-27). 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 Automatic CDI Scaling**

[Diagram showing CDI scaling for different flight phases: Departure (0.3 nm), Terminal (1.0 nm), Enroute (2.0 nm), Approach (1.0 nm), Missed Approach (2.0 nm).]
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.

**Table 2-1 Automatic GPS CDI Scaling**

<table>
<thead>
<tr>
<th>Flight Phase</th>
<th>Annunciation</th>
<th>Automatic CDI Full-scale Deflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departure</td>
<td>DPRT</td>
<td>0.3 nm</td>
</tr>
<tr>
<td>Terminal</td>
<td>TERM</td>
<td>1.0 nm</td>
</tr>
<tr>
<td>Enroute</td>
<td>ENR</td>
<td>2.0 nm</td>
</tr>
<tr>
<td>Oceanic</td>
<td>OCN</td>
<td>2.0 nm</td>
</tr>
<tr>
<td>Approach (Non-precision)</td>
<td>LNAV</td>
<td>1.0 nm decreasing to 350 feet depending on variables (see Figure 2-26)</td>
</tr>
<tr>
<td>Approach (Non-precision with Vertical Guidance)</td>
<td>LNAV + V</td>
<td>1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-27)</td>
</tr>
<tr>
<td>Approach (LNAV/VNAV)</td>
<td>L/VNAV</td>
<td></td>
</tr>
<tr>
<td>Approach (LPV)</td>
<td>LPV</td>
<td></td>
</tr>
<tr>
<td>Missed Approach</td>
<td>MAPR</td>
<td>0.3 nm</td>
</tr>
</tbody>
</table>
**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 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 plan on the moving map retains the modified course line.

---

Figure 2-28 Omni-bearing Selector (OBS) Mode
Enabling/disabling OBS Mode while navigating a GPS flight plan:

1) Press the OBS Softkey to select OBS Mode.

2) Turn the CRS Knob to select the desired course to/from the waypoint. Press the CRS Knob to synchronize the Selected Course with the bearing to the next waypoint.

3) Press the OBS Softkey again to return to automatic waypoint sequencing.

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. SUSP appears on the HSI at the lower right of the aircraft symbol in place of OBS and the OBS Softkey label changes to SUSP. Pressing the SUSP Softkey resumes automatic sequencing of approach waypoints.
2.2 SUPPLEMENTAL FLIGHT DATA

**NOTE:** Pressing 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.

**OUTSIDE AIR TEMPERATURE**

The Outside Air Temperature (OAT) is displayed in degrees Celsius (°C) or Fahrenheit (°F) as selected by the pilot, in the lower left of the PFD under normal display conditions. Temperature is displayed below the true airspeed in reversionary mode.

![Figure 2-30  Outside Air Temperature](image)

**Normal Display**

**Reversionary Mode**

Figure 2-30  Outside Air Temperature
Changing temperature display units:

1) Select the AUX - System Setup Page on the MFD using the FMS Knob.
2) Press the FMS Knob to activate the cursor.
3) Turn the large FMS Knob to highlight the TEMP field in the Display Units box.
4) Turn the small FMS Knob to highlight either CELSIUS or FAHRENHEIT and press the ENT Key to confirm the selection.
5) To cancel the selection, press the FMS Knob or the CLR Key.

Figure 2-31 AUX - System Setup Page, Temperature Selection
**WIND DATA**

Wind direction and speed in knots can be displayed relative to the aircraft 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 displays NO WIND DATA. Wind data can be displayed in three different ways.

![Figure 2-32 Wind Data](image)

Displaying wind data:

1) Press the PFD Softkey.
2) Press the WIND Softkey to display wind data below the Selected Heading.
3) Press one of the OPTN softkeys to change how wind data is displayed:
   - **OPTN 1**: Headwind and crosswind components
   - **OPTN 2**: Total wind direction and speed
   - **OPTN 3**: Total wind direction with headwind and crosswind speed components
4) To remove the window, press the OFF Softkey.
VERTICAL NAVIGATION (VNV) INDICATIONS

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

![Figure 2-33 Vertical Navigation Indications (PFD)](image)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Required Vertical Speed (RVSI)</th>
<th>Vertical Deviation (VDI)</th>
<th>VNV Target Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft &gt; 1 min before the next TOD and not on a descent leg</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Aircraft &gt; 1 min before the next TOD due to flight plan change</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>VNV cancelled (CNCL VNV Softkey selected on MFD)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Distance to active waypoint cannot be computed due to unsupported flight plan leg type (see Flight Management Section)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Aircraft &gt; 250 feet below active VNV Target Altitude</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Current crosstrack or track angle error has exceeded limit</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Active altitude-constrained waypoint can not be reached within maximum allowed flight path angle and vertical speed</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last altitude-constrained waypoint in active flight plan reached</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2-2 VNV Indication Removal Criteria
2.3 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

SYSTEM ALERTING

Messages appear in the Alerts Window in the lower right corner of the PFD when a warning, caution, advisory alert, or G1000 message advisory occurs. System alert messages are provided for awareness of G1000 system problems or status and may or may not require pilot action. The Alerts Window allows system alerts to be displayed simultaneously. The FMS Knob is used to scroll through the alert messages. The Alerts Window is enabled/disabled by pressing the ALERTS Softkey. If the window is already open when a new message is generated, pressing the ALERTS Softkey to acknowledge the message turns the softkey gray.

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

Caution indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A flashing CAUTION Softkey annunciation and single aural tone (one chime) indicate the presence of a caution. The flashing CAUTION Softkey annunciation continues to flash until acknowledged by pressing the CAUTION Softkey.

Warnings are time-critical and require immediate attention. A flashing WARNING Softkey annunciation and aural tone (single chime every two seconds) indicate the presence of a warning. The aural tone and flashing WARNING Softkey annunciation continue until acknowledged by pressing the WARNING Softkey.

The Annunciation Window appears to the right of the Vertical Speed Indicator and displays abbreviated annunciation text for aircraft alerts. Warnings appear in red, cautions in yellow, advisory alerts in white, and safe operating annunciations in green. New alerts are displayed at the top of the Annunciation Window, regardless of priority. Once acknowledged, they are sequenced based on priority.

![G1000 Alerting System](image)
MARKER BEACON ANNUNCIATIONS

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

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 Appendix F 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 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 heard, unless an optional Traffic Advisory System (TAS) is installed. Refer to the applicable TAS documentation for alerts generated by TAS equipment.

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

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

Figure 2-37 Traffic and TAWS Annunciations
ALTITUDE ALERTING

Altitude Alerting provides the pilot with a visual alert when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The Altitude Alerter is independent of the GFC 700 AFCS, but alerting tones are heard only when the GFC 700 is installed. The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude an aural tone is heard. The Selected Altitude changes to black text on a light blue background and flashes for 5 seconds.
- 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 pilot flies outside the deviation band (±200 feet of the Selected Altitude) an aural tone is heard. The Selected Altitude changes to yellow text on a black background and flashes for 5 seconds.

LOW ALTITUDE ANNUNCIATION

**NOTE:** A Low Altitude Annunciation is available only when WAAS is available. This annunciation is not shown for systems with TAWS, unless TAWS is inhibited.

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

For altitude awareness, a barometric Minimum Descent Altitude (MDA) or Decision Height (DH) can be set in the Timer/References Window and is reset when the power is cycled. When active, the altitude setting is displayed to the bottom left of the Altimeter. Once the altitude is within the range of the tape, a bug appears at the reference altitude on the Altimeter. The following visual annunciations occur when approaching the MDA/DH:

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

![Barometric MDA/DH Alerting Visual Annunciations](image)

**Figure 2-40 Barometric MDA/DH Alerting Visual Annunciations**

Setting the barometric Minimum Descent Altitude/Decision Height and bug:

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

![Barometric MDA/DH](image)

**Figure 2-41 Barometric MDA/DH**

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the MDA. If the aircraft proceeds to climb after having reached the MDA, once it reaches 50 feet above the MDA, alerting is disabled.
2.4 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in the table can appear on the HSI when abnormal GPS conditions occur. Refer to the Flight Management Section for more information on Dead Reckoning Mode.

<table>
<thead>
<tr>
<th>Annunciation</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOI</td>
<td>Lower left of aircraft symbol</td>
<td>Loss of Integrity Monitoring—GPS integrity is insufficient for the current phase of flight</td>
</tr>
<tr>
<td>WARN</td>
<td>Lower left of aircraft symbol</td>
<td>Warning—RAIM function detects excessive GPS position errors</td>
</tr>
<tr>
<td>INTEG OK</td>
<td>Lower left of aircraft symbol</td>
<td>Integrity OK—GPS integrity has been restored to within normal limits (annunciation displayed for 5 seconds)</td>
</tr>
<tr>
<td>DR</td>
<td>Upper right of aircraft symbol</td>
<td>Dead Reckoning—System is using projected position rather than GPS position to compute navigation data and sequence active flight plan waypoints</td>
</tr>
</tbody>
</table>

Table 2-3 Abnormal GPS Conditions Annunciated on HSI

In Dead Reckoning Mode the CDI is removed from the display when GPS is the selected navigation source. The following items on the PFD are then shown in yellow:

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

These items should be verified when operating in Dead Reckoning Mode.
**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.

![Figure 2-43 Pitch Attitude Warnings](image)

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

- Traffic Annunciations
- AFCS Annunciations
- Flight director Command Bars
- Inset Map
- Outside air temperature (OAT)
- DME Information Window
- Wind data
- Transponder Status Box
- System Time
- PFD Setup Menu
- Windows displayed in the lower right corner of the PFD:
  - Timer/References
  - Nearest Airports
  - Flight Plan
  - Alerts
  - Procedures
  - ADF/DME Tuning
- Minimum Descent Altitude/Decision Height readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNV Target Altitude
FLIGHT INSTRUMENTS
SECTION 3 ENGINE INDICATION SYSTEM

The G1000 Engine Indication System (EIS) displays critical engine, electrical, fuel, and other system parameters on the left side of the Multi Function Display (MFD) during normal operations (Figure 3-1). EIS information can be fully expanded to an entire page (EIS - Engine Page) using the ENGINE Softkey. In Reversionary Mode, the displays are re-configured to present Primary Flight Display (PFD) symbology together with the EIS.

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. 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.
ENGINE INDICATION SYSTEM

3.1 EIS DISPLAY

1. Engine Manifold Pressure Gauge (MAN IN HG)
   - Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power (DA40 only)

2. Tachometer (RPM)
   - Displays propeller speed in revolutions per minute (rpm); the red band indicates propeller overspeed

3. Fuel Flow Indicator (FUEL FLOW GPH)
   - Displays current fuel flow in gallons per hour (gph)

4. Fuel Pressure Indicator (FUEL PRESS PSI)
   - Displays the fuel pressure in pounds per square inch (psi) (Option for EASA certified DA40 aircraft only)

5. Cylinder Head Temperature Indicator (CHT)
   - Displays the head temperature of the hottest cylinder (number is shown in pointer)

6. Oil Temperature Indicator (OIL TEMP)
   - Displays engine oil temperature

7. Oil Pressure Indicator (OIL PRES)
   - Displays pressure of oil supplied to the engine

8. Ammeter (AMPS)
   - Displays the alternator load in amperes

9. Voltmeter (VOLTS)
   - Displays the primary bus voltage

10. Fuel Quantity Indicator (FUEL QTY GAL)
    - Displays the quantity, in gallons (gal), of fuel in the tanks; pointers labeled L and R indicate the fuel quantity in each tank
      
      Standard Tanks: Indicator ranges from 0 to 20 gal with tick marks every 5 gal; only displays to 17 gal per side when full

      Long Range Tanks (optional): Indicator ranges from 0 to 25 gal with tick marks every 5 gal; only displays to 24 gal per side when full
Figure 3-2  EIS Display
### 3.2 ENGINE PAGE

Pressing the **ENGINE** Softkey accesses the EIS - Engine Page, which displays all engine, fuel, fuel calculation, electrical, and trim information.

![Figure 3-3 Engine Page Softkeys](image)

**ENGINE** Displays EIS - Engine Page and second-level engine softkeys; press again to exit page

**LEAN** Accesses Leaning Assist Mode

**DEC FUEL** Decreases displayed fuel remaining in 1-gal increments

**INC FUEL** Increases displayed fuel remaining in 1-gal increments

**RST FUEL** Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero

1. **Engine Manifold Pressure Gauge (MAN IN HG)**
   - Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power (DA40 only)

2. **Oil Temperature and Pressure Gauges (OIL °F PSI)**
   - Displays oil temperature in degrees Fahrenheit (°F) and pressure in pounds per square inch (psi)

3. **Fuel Quantity Gauges (L/R FUEL QTY GAL)**
   - Display the amount of fuel in gallons (gal) of fuel in the tanks.
     - **Standard Tanks**: Indicator ranges from 0 to 20 gal with tick marks every 5 gal; only displays to 17 gal per side when full
     - **Long Range Tanks (optional)**: Indicator ranges from 0 to 25 gal with tick marks every 5 gal; only displays to 24 gal per side when full

4. **Total Time in Service (TTL TIME IN SVC)**
   - Displays the total flight hours and is activated when the aircraft becomes airborne (note that time airborne does not necessarily correspond to tachometer time)

5. **Fuel Calculations Group (FUEL CALCULATOR)**
   - Displays calculated fuel used, endurance, and range (in nautical miles, RANGE NM) based on the displayed fuel remaining and the fuel flow totalizer

6. **Electrical Group (ELECTRICAL)**
   - Displays the alternator load in amperes and the primary bus voltage
7 **Engine Temperature Group (TEMPERATURE)**

Displays exhaust gas (EGT) and head (CHT) temperatures of all cylinders in °F

8 **Fuel Flow and Pressure Gauge (FUEL GPH PSI)**

Fuel pressure option EASA certified DA40 aircraft only

Displays fuel flow in gallons per hour (gph) and fuel pressure in pounds per square inch (psi)

9 **Tachometer (RPM)**

Displays propeller speed in revolutions per minute (rpm); the red band indicates propeller overspeed

![Figure 3-4  Engine Page (DA40)](image)
**FUEL CALCULATIONS**

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

Fuel used (GAL USED), endurance (ENDUR), and range (in nautical miles, RANGE NM) are calculated based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer. The calculated range also takes into account the aircraft’s heading and the wind direction and speed. See the Flight Management Section for information regarding the map feature related to the EIS Fuel Calculations.

**Adjusting the fuel totalizer quantity:**

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

**Resetting the fuel totalizer:**

On the Engine Page, press the **RST FUEL** Softkey; this also resets the fuel remaining (GAL REM) to zero.
3.3 LEANING ASSIST MODE

**NOTE:** The pilot should follow the engine manufacturer’s recommended leaning procedures in the Aircraft Flight Manual Supplement (AFMS).

A leaning assist function is available on the Engine Page to assist in the leaning process.

**Accessing Leaning Assist Mode:**

1) Press the ENGINE Softkey to open the Engine Page.
2) Press the LEAN Softkey to identify peaks.
3) Press the LEAN Softkey again to exit Leaning Assist Mode.

When the LEAN Softkey is pressed, the system initially highlights the number and EGT readout of the cylinder with the hottest EGT. The Δ Peak temperature is the difference between the peak temperature and the present temperature for the peaked cylinder. When the first peak is detected, “1st” is annunciated below that cylinder’s EGT bar and the temperature is marked in light blue on the graph.

The system continues to detect peak EGTs for each cylinder lean of peak as the fuel flow is decreased, and the peak of each cylinder’s EGT is indicated by a light blue marker on the graph. Once all cylinders are lean of peak, the last cylinder to peak is denoted by the “Last” annunciation below its bar on the graph.

![Figure 3-7 Leaning Assist Mode](image-url)
3.4 EIS DISPLAY IN REVERSIONARY MODE

In reversionary display mode, the remaining display is re-configured to present PFD symbology together with the EIS Display (refer to the System Overview for information about display Reversionary Mode).

When the G1000 displays enter reversionary mode, the EIS is separated into three displays: Engine (identical to the normal EIS Display on the MFD), Lean, and System. For a description of the Engine Display, refer to Section 3.1. The Lean Display presents temperature information and assistance for engine leaning. The System Display shows various system parameters and fuel calculations.

![EIS Display](image)

**Figure 3-8 Reversionary Mode (DA40)**
The Engine Display is shown by default. To return to the Engine Display from the Lean or System Display, press the ENGINE or BACK Softkey.

- **ENGINE** Displays second-level engine softkeys
- **LEAN** Displays the EIS Lean Display
- **CYL SLCT** Cycles through the cylinders to obtain information about a particular cylinder, shown in light blue on the bar graphs
- **ASSIST** Accesses Leaning Assist Mode
- **SYSTEM** Displays the EIS System Display
- **DEC FUEL** Decreases displayed fuel remaining in 1-gal increments
- **INC FUEL** Increases displayed fuel remaining in 1-gal increments
- **RST FUEL** Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero

![Figure 3-9 EIS Softkeys (Reversionary Mode)](image-url)
LEAN DISPLAY

NOTE: The pilot should follow the engine manufacturer’s recommended leaning procedures in the Aircraft Flight Manual Supplement (AFMS).

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

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

By default, the cylinder with the hottest temperature is selected (number highlighted in light blue) when the LEAN Softkey is pressed. Bars for cylinders with temperatures in the normal range are shown in white. On the CHT Bar Graph, caution and warning conditions are indicated in yellow and red, respectively.

Since only one cylinder’s EGT and CHT are displayed at a time, this information can be cycled through for each cylinder using the CYL SLCT Softkey; the selected cylinder’s number is highlighted in light blue on the bar graphs. This softkey is disabled when Leaning Assist Mode is selected.

Monitoring the desired cylinder’s temperatures:
From the Lean Display, press the CYL SLCT Softkey to cycle through each cylinder and view its temperature information. The selected cylinder number is highlighted in light blue.

While in Reversionary Mode, the leaning assist function is available when the ASSIST Softkey is pressed from the Lean Display to assist in the leaning process (refer to the section on Leaning Assist Mode for more information).

1. Engine Manifold Pressure Gauge (MAN IN HG)
   Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power (DA40 only)

2. Tachometer (RPM)
   Displays propeller speed in revolutions per minute (rpm); the red band indicates propeller overspeed

3. Fuel Flow (FFLOW GPH)
   Displays current fuel flow in gallons per hour (gph)

4. Exhaust Gas Temperature Bar Graph (EGT °F)
   Exhaust Gas Temperature (EGT) for each cylinder is represented as a bar; below the graph, the EGT readout is given for the selected cylinder (shown in light blue)
   A hollow block appears to represent the peak EGT for the selected cylinder when the ASSIST Softkey is pressed

5. EGT Deviation from Peak (∆ PEAK)
   Displays the current EGT deviation from peak for the selected cylinder in degrees Fahrenheit (°F) when the ASSIST Softkey is pressed

6. Cylinder Head Temperature Bar Graph (CHT °F)
   Head temperature for each cylinder is represented as a bar; below the graph, the CHT readout is given for the selected cylinder (shown in light blue)
Figure 3-10 Lean Display
ENGINE INDICATION SYSTEM

SYSTEM DISPLAY

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

**NOTE:** Refer to the Aircraft Flight Manual Supplement (AFMS) for limitations.

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

**Accessing the EIS System Display:**

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

**Adjusting the fuel totalizer quantity:**

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

**Resetting the fuel totalizer:**

From the System Display, press the RST FUEL Softkey. This also resets the fuel remaining (GAL REM) to zero.

1. **Engine Manifold Pressure Gauge (MAN IN HG)**  
   Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power (*DA40 only*)

2. **Tachometer (RPM)**  
   Shows propeller speed in revolutions per minute (rpm); the red band indicates propeller overspeed

3. **Oil Temperature (OIL °F)**  
   Engine oil temperature is shown in degrees Fahrenheit (°F)

4. **Oil Pressure (OIL PSI)**  
   Pressure of oil supplied to the engine is displayed in pounds per square inch (psi)

5. **Voltmeter (VOLTS)**  
   Shows the primary bus voltage

6. **Ammeter (AMPS)**  
   Shows the alternator load in amperes

7. **Fuel Flow (FFLOW GPH)**  
   Displays current fuel flow in gallons per hour (gph)

8. **Fuel Pressure (FPRESS PSI)**  
   Displays the fuel pressure in pounds per square inch (psi) (*Option for EASA certified DA40 aircraft only*)

9. **Fuel Remaining (GAL REM)**  
   Current fuel remaining in gallons as set by the pilot and adjusted for fuel burn since last set

10. **Fuel Used (GAL USED)**  
    Quantity of fuel used in gallons

11. **Endurance (ENDUR)**  
    Flight time remaining with fuel onboard (HH:MM when more than an hour remains)

12. **Range (RANGE NM)**  
    Aircraft range in nautical miles

13. **Total Time in Service (TTL TIME IN SVC)**  
    Displays the total flight hours and is activated when the aircraft becomes airborne (note that time airborne does not necessarily correspond to tachometer time)
**ENGINE INDICATION SYSTEM**

**SYSTEM OVERVIEW**

**FLIGHT INSTRUMENTS**

**EIS AUDIO PANEL & CNS**

**FLIGHT MANAGEMENT**

**HAZARD AVOIDANCE**

**AFCS**

**ADDITIONAL FEATURES**

**APPENDICES**

**INDEX**

Figure 3-11 System Display

**DA40**

1. **System Display**
2. **RPM 2310**
3. **OIL °F 230**
4. **Oil PSI 57.4**
5. **Volts 29.5**
6. **Amps +41**
7. **FFLOW GPH 8.0**
8. **FFRES PSI 20.0**
9. **FUEL CALC**
10. **GAL REM 50.0**
11. **GAL USED 0.0**
12. **ENDUR ___**
13. **RANGE NM ___**
14. **TTL TIME IN SVC 2.4 HRS**

**DA40F**

1. **System Display**
2. **RPM 2300**
3. **OIL °F 132**
4. **Oil PSI 58.4**
5. **Volts 29.5**
6. **Amps +41**
7. **FFLOW GPH 0.0**
8. **FUEL CALC**
9. **GAL REM 40.0**
10. **GAL USED 0.0**
11. **ENDUR ___**
12. **RANGE NM ___**
13. **TTL TIME IN SVC 0.0 HRS**
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SECTION 4  AUDIO PANEL AND CNS

4.1 OVERVIEW

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

CNS operation in Diamond DA40/40F aircraft is performed by the following Line Replaceable Units (LRUs):

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

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

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

The 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, COM/NAV Frequency Tuning Boxes, and ADF/DME Tuning Window (PFD Shown)
① **NAV VOL/ID Knob** – Controls NAV audio volume level. Press to turn the Morse code identifier audio on and off. Volume level is shown in the NAV frequency field as a percentage.

② **NAV Frequency Transfer Key** – Transfers the standby and active NAV frequencies.

③ **NAV Knob** – Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between NAV1 and NAV2.

④ **NAV Frequency Box** – Displays NAV standby and active frequency fields, volume, and station ID. The frequency of the NAV radio selected for navigation is displayed in green.

⑤ **COM Frequency Box** – Displays COM standby and active frequency fields and volume. The selected COM transceiver frequency is displayed in green.

⑥ **COM Knob** – Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between COM1 and COM2.

⑦ **COM Frequency Transfer Key** – Transfers the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.500 MHz) automatically into the active frequency field.

⑧ **COM VOL/SQ Knob** – Controls COM audio volume level. Press to turn the COM automatic squelch on and off. Volume level is shown in the COM frequency field as a percentage.

⑨ **ADF/DME Tuning Window** – Displays ADF frequencies, volume setting, and modes, and DME tuning selection. Display by pressing the ADF/DME Softkey.

⑩ **ENT Key** – Validates or confirms an ADF frequency or ADF/DME mode and Auto-tune selection.

⑪ **FMS Knob** – Flight Management System Knob, used to enter transponder codes, enter ADF frequencies, select ADF/DME modes, and Auto-tune entries when ADF/DME Tuning Window or NRST Window is present. Press the FMS Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.

⑫ **Transponder Data Box** – Indicates the selected transponder code, operating mode, reply, and ident status for the transponder.
NOTE: When a key is selected, a triangular annunciator above the key is illuminated.

1. **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receive can be added by pressing the **COM2** Key.

2. **COM1** – When selected, audio from the #1 COM receiver can be heard.

3. **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 receive can be added by pressing the **COM1** Key.

4. **COM2** – When selected, audio from the #2 COM receiver can be heard.

5. **COM3 MIC** – Not used in DA40/40F aircraft.
6 COM3 – Not used in DA40/40F aircraft.
7 COM 1/2 – Not used in DA40/40F aircraft.
8 TEL – Not used in DA40/40F aircraft.
9 PA – Selects the passenger address system. The selected COM transmitter is deselected when the PA Key is pressed.
10 SPKR – Selects and deselects the cabin speaker. COM and NAV receiver audio can be heard on the speaker.
11 MKR/MUTE – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received. Also, stops play of recorded COM audio.
12 HI SENS – Press to increase marker beacon receiver sensitivity. Press again to return to low sensitivity.
13 DME – Turns optional DME audio on or off.
14 NAV1 – When selected, audio from the #1 NAV receiver can be heard.
15 ADF – Turns optional ADF receiver audio on or off.
16 NAV2 – When selected, audio from the #2 NAV receiver can be heard.
17 AUX – Not used in DA40/40F aircraft.
18 MAN SQ – Enables manual squelch for the intercom. When the intercom is active, press the PILOT Knob to illuminate SQ. Turn the PILOT/PASS Knobs to adjust squelch.
19 PLAY – Press once to play the last recorded COM audio. Press again while audio is playing and the previous block of recorded audio is played. Each subsequent press plays each previously recorded block. Pressing the MKR/MUTE Key during play of a memory block stops play.
20 PILOT – Selects and deselects the pilot intercom isolation.
21 COPLT – Selects and deselects the copilot intercom isolation.
22 PILOT Knob – Press to switch between volume and squelch control as indicated by illumination of VOL or SQ. Turn to adjust intercom volume or squelch. The MAN SQ Key must be selected to allow squelch adjustment.
23 PASS Knob – Turn to adjust Copilot/Passenger intercom volume or squelch. The MAN SQ Key must be selected to allow squelch adjustment.
24 DISPLAY BACKUP Button – Manually selects Reversionary Mode.
4.2 COM OPERATION

COM TRANSCEIVER SELECTION AND ACTIVATION

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

**NOTE:** When turning on the G1000 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. The COM transceiver is selected for transmitting by pressing the COM MIC Keys on the Audio Panel. During reception of audio from the COM radio selected for transmission, audio from the other COM radio is muted.

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

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

![Figure 4-3 Selecting a COM Radio for Transmit](image)

[Image of Audio Panel and CNS system overview]
TRANSMIT/RECEIVE INDICATIONS

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

During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow. Entertainment audio, if selected, is muted during active COM radio reception. Refer to Additional Audio Panel Functions later in this section, and details on the Data Link Receiver in the Additional Features Section.

![Figure 4-4 COM Radio Transmit and Receive Indicators](image)

COM TRANSCIEVER 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 squelch on and off.

![Figure 4-5 COM Frequency Tuning](image)
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.

![Diagram](image)

Figure 4-6 Switching COM Tuning Boxes

QUICK-TUNING AND ACTIVATING 121.500 MHZ

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

![Diagram](image)

Figure 4-7 Quickly Tuning 121.500 MHz
AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

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

AUTO-TUNING FROM THE PFD

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.

Figure 4-8 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 4-9, 4-10, and 4-11).

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 4-11).
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.

Or:

1) 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 or the ENT Key.
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.
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.

![Figure 4-11 WPT – Airport Information Page](image)

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 Softkey** for AIRPORT, RUNWAYS, and FREQUENCIES Windows
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 4-12  NRST – Nearest Airspaces, NRST – Nearest Airports, and NRST – Nearest Frequencies Pages*
FREQUENCY SPACING

The G1000 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.

![Figure 4-13 COM Channel Spacing](image)

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 G1000 softkeys are blank.

![Figure 4-14 AUX – System Setup Page](image)
AUTOMATIC SQUELCH

Automatic Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. To disable Automatic Squelch, press the VOL/SQ Knob. When Automatic 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 Squelch.

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

![Figure 4-15 Overriding Automatic Squelch](image)

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.

![Figure 4-16 COM Volume Level](image)
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. The active NAV frequency selected for navigation is displayed in green. Pressing the CDI Softkey once selects NAV1 as the navigation radio. Pressing the CDI Softkey a second time selects NAV2 as the navigation radio. Pressing the CDI Softkey a third time activates GPS mode. Pressing the CDI Softkey again cycles back to NAV1.

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

The three navigation modes that can be cycled through are:

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

See the Flight Instruments Section for selecting the DME and Bearing Information windows and using VOR or ADF as the source for the bearing pointer.
NAV radios are selected for listening by pressing the corresponding keys on the Audio Panel. Pressing the NAV1, NAV2, ADF, or DME Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speaker (if selected). All radios can be selected individually or simultaneously.

![Figure 4-18 Selecting a NAV Radio Receiver](image1)

**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.

![Figure 4-19 NAV Frequency Tuning](image2)
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](image)

VOR/LOC ID

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

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

![Station Identifier](image)

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.
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 4-23, 4-24, and 4-25).

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 4-25).
4) Press the ENT Key to load the NAV frequency into the standby field of the selected NAV radio.
5) Press the Frequency Transfer Key to transfer the frequency to the NAV Active Frequency Field.

Figure 4-23  NAV Frequency Auto-Tuning from the MFD
Or:

1) When on the NRST pages, press the MENU Key to display the page menu.
2) Turn the large FMS Knob to scroll through the menu options.
3) Press the ENT Key to place the cursor in the desired window.
4) Scroll through the frequency selections with the FMS Knob or the ENT Key.
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.
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.

Figure 4-25  Loading the NAV Frequency from the NRST – Nearest VOR Page

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

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

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

![NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages](image)

Figure 4-26 NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages
AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION

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

**NOTE:** When an ILS/LOC approach has been activated 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.
MARKER BEACON RECEIVER

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

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

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

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

During marker beacon audio reception, pressing the MKR/MUTE Key mutes the audio but does not affect the marker annunciations (Figure 4-27). The marker tone is silenced, then waits for the next marker tone. The MKR/MUTE Key Annunciator is illuminated, indicating audio muting. The audio returns when the next marker beacon signal is received. If the MKR/MUTE Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the MKR/MUTE Key Annunciator is extinguished.

Pressing the HI SENS Key switches between high and low marker beacon receiver sensitivity. The HI SENS function (annunciator illuminated) is used to provide an earlier indication when nearing a marker during an approach. The LO SENS function (annunciator extinguished) results in a narrower marker dwell while over a station.
NOTE: When another auxiliary window is turned on, the ADF/DME Tuning Window is replaced on the PFD.

See the Flight Instruments Section for displaying the DME and bearing information windows (ADF) and using the ADF as the source for the bearing pointer.

The G1000 system tunes the ADF receiver (optional) and DME transceiver (optional). The ADF is tuned by entering the frequency in the ADF standby frequency field of the ADF/DME Tuning Window. (The softkey may be labeled ADF/DME, ADF, or DME, depending on installed equipment.)

The UHF DME frequency is tuned by pairing with a VHF NAV frequency. DME frequency pairing is automatic and only the VHF NAV frequency is shown.

The following ADF/DME information is displayed in the ADF/DME Tuning Window:

- Active and standby ADF frequencies
- ADF receiver mode
- ADF receiver volume
- DME tuning mode (DME transceiver pairing)

When the ADF/DME Tuning Window is displayed, the selection cursor is placed over the standby ADF frequency field.

Turning the large FMS Knob moves the selection cursor through the various fields (standby ADF frequency, ADF receiver mode, ADF radio volume, and DME tuning mode). Pressing the FMS Knob activates/deactivates the selection cursor in the ADF/DME Tuning Window. The ADF frequency is entered using the FMS Knob and the ENT Key.
ADF TUNING

ADF frequencies in the 190.0-kHz to 1799.5-kHz range are entered in the standby ADF frequency field of the ADF/DME Tuning Window. The G1000 System does not tune the ADF emergency frequency, 2182.0-kHz.

Tuning an ADF frequency:

1) Press the ADF/DME Softkey to display the ADF/DME Tuning Window.
2) Turn the large FMS Knob to place the selection cursor over the standby ADF frequency field.
3) Turn the small FMS Knob to begin data entry and change each digit.
4) Turn the large FMS Knob to move the cursor to the next digit position.
5) Press the ENT Key to complete data entry for the standby frequency.

Figure 4-30 Entering ADF Standby Frequencies

Pressing the CLR Key before completing frequency entry cancels the frequency change and reverts back to the previously entered frequency.

Pressing the CLR Key when the cursor is flashing, clears the frequency and replaces the standby field with 0000.0.

Transferring the active and standby ADF frequencies:

1) Turn the large FMS Knob to place the selection cursor over the standby ADF frequency field.
2) Press the ENT Key to complete the frequency transfer.

Figure 4-31 Transferring ADF Frequencies
SELECTING ADF RECEIVER MODE

The following modes can be selected: (In all modes NDB audio can be heard by selecting the ADF Key on the Audio Panel.)

- **ANT (Antenna)** – The ADF bearing pointer parks on the HSI at 90 degrees. Best mode for listening to NDB audio.
- **ADF (Automatic Direction Finder)** – The ADF pointer points to the relative bearing of the NDB station.
- **ADF/BFO (ADF/Beat Frequency Oscillator)** – The ADF pointer points to the relative bearing of the NDB station and an audible tone confirms signal reception. This mode allows identification of the interrupted carrier beacon stations used in various parts of the world.
- **ANT/BFO (Antenna/Beat Frequency Oscillator)** – The ADF bearing pointer parks on the HSI at 90 degrees while an audible tone is provided when a signal is received. This mode also allows identification of the interrupted carrier beacon stations and confirms signal reception.

**Selecting an ADF receiver mode:**

1) Turn the large FMS Knob to place the selection cursor over the ADF mode field.

2) Turn the small FMS Knob to select the desired ADF receiver mode.

ADF receiver volume level can be adjusted in the tuning window from 0 to 100%. The default volume level is set to 50%. The ADF volume level is the same for both Audio Panels.

**Adjusting ADF receiver volume:**

1) Turn the large FMS Knob to place the selection cursor over the ADF volume field.

2) Turn the small FMS Knob to adjust volume as desired.
NOTE: When turning on the G1000 for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.

The DME transceiver is tuned by selecting NAV1, NAV2, or HOLD in the ADF/DME Tuning Window.

The following DME transceiver pairing can be selected:

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

Selecting DME transceiver pairing:

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

Pressing the CLR Key or FMS Knob while in the process of DME pairing cancels the data entry and reverts back to the previously selected DME tuning state. Pressing the FMS Knob activates/deactivates the cursor in the ADF/DME Tuning Window.
4.4 GTX 33 MODE S TRANSPONDER

The GTX 33 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
- 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.

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, 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.
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.
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.

![Figure 4-37 Standby Mode](image)

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.

![Figure 4-38 ON Mode](image)
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.

![Figure 4-39 Altitude Mode](image)

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 4-40 Reply Indication](image)
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.

Entering a Code

Figure 4-41 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 4-42 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.

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.

Figure 4-43 VFR Code

Figure 4-44 IDENT Softkey and Indication
4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER-UP

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

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

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

SPEAKER

All of the radios can be heard over the cabin speaker. Pressing the SPKR Key selects and deselects the cabin speaker. Speaker audio is muted when the PTT is pressed. Certain aural alerts and warnings (autopilot, traffic, altitude) are always heard on the speaker, even when the speaker is not selected.

The speaker volume is adjustable within a nominal range. Contact a Garmin-authorized service center for volume adjustment.

Figure 4-45 Passenger Address and Speaker Keys
INTERCOM

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

![Intercom Controls](image)

**Figure 4-46 Intercom Controls**

<table>
<thead>
<tr>
<th>PILOT KEY Annunciator</th>
<th>COPLT KEY Annunciator</th>
<th>Pilot Hears</th>
<th>Copilot Hears</th>
<th>Passenger Hears</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>Selected radios, aural alerts, pilot, copilot, passengers, music</td>
<td>Selected radios, aural alerts, pilot, copilot, passengers, music</td>
<td>Selected radios, aural alerts, pilot, copilot, passengers, music</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Selected radios, aural alerts, pilot</td>
<td>Copilot, passengers, music</td>
<td>Copilot, passengers, music</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Selected radios, aural alerts, pilot; passengers, music</td>
<td>Copilot</td>
<td>Selected radios, aural alerts, pilot; passengers, music</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Selected radios, aural alerts, pilot, copilot</td>
<td>Selected radios, aural alerts, pilot, copilot</td>
<td>Passengers; music</td>
</tr>
</tbody>
</table>

Table 4-1 ICS Isolation Modes

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

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

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

When both the PILOT and COPLT Annunciators are extinguished, everyone hears the selected radios and is able to communicate with everyone else.
INTERCOM VOLUME AND SQUELCH

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

The **MAN SQ** Key allows either automatic or manual control of the squelch setting. When the MAN SQ Annunciator is extinguished (Automatic Squelch is on), the **PILOT/PASS** Knob controls only the volume (pressing the **PILOT/PASS** Knob has no effect on the VOL/SQ selection).

When the MAN SQ Annunciator is illuminated (Manual Squelch), the **PILOT/PASS** Knob controls both volume and squelch.

![Figure 4-47 Volume/Squelch Control](image)

**Manual Squelch Annunciator:** Off for Automatic Squelch, On for Manual Squelch

**Automatic/Manual Squelch**

**Pilot Volume or Manual Squelch:** Press to switch between VOL and SQ. Turn to adjust Squelch when SQ Annunciator is lit, Volume when VOL Annunciator is lit.

**Copilot/Passenger Volume or Manual Squelch**

**Volume Annunciation**

**Squelch Annunciation**
PASSENGER ADDRESS (PA) SYSTEM

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

CLEARANCE RECORDER AND PLAYER

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

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

Pressing the MKR/MUTE Key during play of a memory block stops play. If a COM input signal is detected during play of a recorded memory block, play is halted.

Pressing the PLAY Key while audio is playing begins playing the previously recorded memory block. Each subsequent press of the PLAY Key selects the previously recorded memory block.

Powering off the unit automatically clears all recorded blocks.
### ENTERTAINMENT INPUTS

**NOTE:** The entertainment MUSIC INPUT cannot be completely turned off. Audio level for MUSIC INPUT can be adjusted by a Garmin-authorized service center.

The Audio Panel provides a stereo entertainment input from the data link receiver or an MUSIC INPUT jack for the crew and passengers. The MUSIC INPUT jack input is compatible with popular portable entertainment devices such as MP3 and CD players through a 3.5-mm stereo phone jack, installed in a convenient location. The headphone outputs of the entertainment devices are plugged into the MUSIC INPUT jack.

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

### CREW MUSIC

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

**Music Muting**

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

**Music Muting Enable/Disable**

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

### PASSENGER MUSIC

Music can be heard only by the passengers and is never muted.

### XM RADIO ENTERTAINMENT (OPTIONAL)

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

Connecting a stereo input to the MUSIC INPUT jack removes the XM Radio Audio from that input.
4.6 AUDIO PANEL PREFLIGHT PROCEDURE

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

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

After powering up the G1000 System, the following steps aid in maximizing the use of the Audio Panel as well as prevent pilot and copilot induced issues. These preflight procedures should be performed each time a pilot boards the aircraft to insure awareness of all audio levels in the Audio Panel and radios.

Setting the Audio Panel during preflight:

1) Verify that the PILOT and COPLT Annunciators are extinguished.
2) Verify that the MAN SQ Annunciator is extinguished.
3) Turn the PILOT/PASS Knobs clockwise two full turns. This sets the headset intercom audio level to max volume (least amount of attenuation).
4) Adjust radio volume levels (COM, NAV, etc.) to a suitable level.
5) Adjust the PILOT/PASS Knob volume to the desired intercom level.

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

Abnormal operation of the G1000 includes equipment failures of the G1000 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.

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

STUCK MICROPHONE

<table>
<thead>
<tr>
<th>ALERTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 PTT - COM1 push-to-talk key is stuck.</td>
</tr>
</tbody>
</table>

![Figure 4-51 Stuck Microphone Alert](image)

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 4-52 COM Tuning Failure](image)

AUDIO PANEL FAIL-SAFE OPERATION

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

REVERSIONARY MODE

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

![Figure 4-53 Display Backup Button](image)
SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G1000 is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot’s Guide explains flight management using the G1000.

The most prominent part of the G1000 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, or LPV), or Missed Approach (MAPR)).

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

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by 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

- Direct To Window
- Flight Plan Window
- Procedures Window
- Nearest Airports Window

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

- Active Flight Plan Leg
- Map Orientation
- Map Range
- Aircraft Icon at Present Position
- Flight Plan Leg
- Aviation Data
- Geographic Data
- Topographic Data
- Hazard Data

Inset Map
NAVIGATION STATUS BOX

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

- **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:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Active Leg</td>
</tr>
<tr>
<td></td>
<td>Direct-to</td>
</tr>
<tr>
<td></td>
<td>Right Procedure Turn</td>
</tr>
<tr>
<td></td>
<td>Left Procedure Turn</td>
</tr>
<tr>
<td></td>
<td>Right Holding Pattern</td>
</tr>
<tr>
<td></td>
<td>Left Holding Pattern</td>
</tr>
<tr>
<td></td>
<td>Vector to Final</td>
</tr>
<tr>
<td></td>
<td>Right DME Arc</td>
</tr>
<tr>
<td></td>
<td>Left DME Arc</td>
</tr>
</tbody>
</table>

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)**
- **Enroute Safe Altitude (ESA)**
- **Estimated Time of Arrival (ETA)**
- **Estimated Time Enroute (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)**

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 any field to its default setting.

5.2 USING MAP DISPLAYS

Map displays are used extensively in the G1000 to provide situational awareness in flight. Most G1000 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

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)

- Icons for enabled map features
- Aircraft icon (representing present position)
- Nav range ring
- Flight plan legs
- User waypoints
- Track vector
- Topography scale
- Topography data
- 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.
- North up (NORTH UP) aligns the top of the map display to north (default setting).
- Track up (TRK UP) aligns the top of the map display to the current ground track.
- Desired track up (DTK UP) aligns the top of the map display to the desired course.
- Heading up (HDG UP) aligns the top of the map display to the current aircraft heading.

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

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

**Changing the Navigation Map orientation:**

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

![Figure 5-4 Navigation Map Page Menu Window](image)

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

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

![Figure 5-5 Map Setup Menu Window - Map Group](image)
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 G1000 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.

Figure 5-6  Map Range

AUTO ZOOM

Auto zoom allows the G1000 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 this 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](image-url)

**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.


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 ‘MAX LOOK FWD’ (zero to 999 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](image)

**NOTE:** The map is normally centered on the aircraft’s position. If the map has been panned and there has been no pointer movement for about 60 seconds, the map reverts back to centered on the aircraft position and the flashing pointer is removed.
When the Map Pointer is placed on an object, the name of the object is highlighted (even if the name was not originally displayed on the map). When any map feature or object is selected on the map display, pertinent information is displayed.

Figure 5-9  Navigation Map - Map Pointer on Point of Interest
When the Map Pointer crosses an airspace boundary, the boundary is highlighted and airspace information is shown at the top of the display. The information includes the name and class of airspace, the ceiling in feet above Mean Sea Level (MSL), and the floor in feet MSL.

**Information about 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](image)
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 Airspace?’ 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](image-url)
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.

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

1) Press the MAP Softkey (the INSET Softkey for the PFD Inset Map).
2) Press the TOPO Softkey.
3) Press the TOPO Softkey again to remove topographic data from the Navigation Map. When topographic data is removed from the page, all navigation data is presented on a black background.

Displaying/removing topographic data (TOPO DATA) using the Navigation Map Page Menu:

1) Press the MENU Key with the Navigation Map Page displayed. The cursor flashes on the ‘Map Setup’ option.
2) Press the ENT Key. The Map Setup Menu is displayed.
3) Select the ‘Map’ group.
4) Press the ENT Key.
5) Highlight the ‘TOPO DATA’ field.
6) Select ‘On’ or ‘Off’.
7) Press the FMS Knob to return to the Navigation Map Page.
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 as shown following.
Displaying/removing the topographic scale (TOPO SCALE):

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the ‘Map Setup’ option.

2) Press the **ENT** Key. The Map Setup Menu is displayed.

3) Select the ‘Map’ group and press the **ENT** Key.

4) Highlight the ‘TOPO SCALE’ field.

5) Select ‘On’ or ‘Off’.

6) Press the **FMS** Knob to return to the Navigation Map Page.
**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:

<table>
<thead>
<tr>
<th>Land Symbols</th>
<th>Symbol</th>
<th>Default Range (nm)</th>
<th>Maximum Range (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude/Longitude (LAT/LON)</td>
<td></td>
<td>Off</td>
<td>2000</td>
</tr>
<tr>
<td>Highways and Roads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interstate Highway (FREEWAY)</td>
<td></td>
<td>300</td>
<td>800</td>
</tr>
<tr>
<td>International Highway (FREEWAY)</td>
<td></td>
<td>300</td>
<td>800</td>
</tr>
<tr>
<td>US Highway (NATIONAL HWY)</td>
<td></td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>State Highway (LOCAL HWY)</td>
<td></td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Local Road (LOCAL ROAD)</td>
<td></td>
<td>N/A</td>
<td>8</td>
</tr>
<tr>
<td>Railroads (RAILROAD)</td>
<td></td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>LARGE CITY (&gt; 200,000)</td>
<td></td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>MEDIUM CITY (&gt; 50,000)</td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>SMALL CITY (&gt; 5,000)</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>States and Provinces (STATE/PROV)</td>
<td></td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>Rivers and Lakes (RIVER/LAKE)</td>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>USER WAYPOINT</td>
<td></td>
<td></td>
<td>150</td>
</tr>
</tbody>
</table>

Table 5-1  Land Symbol Information
AVIATION SYMBOLS

The following items are configured on the aviation menu:

<table>
<thead>
<tr>
<th>Aviation Symbols (Text label size can be None, Small, Medium (Med), or Large (Lrg))</th>
<th>Symbol</th>
<th>Default Range (nm)</th>
<th>Maximum Range (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Flight Plan Leg (ACTIVE FPL)</td>
<td>![Symbol]</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>Non-active Flight Plan Leg (ACTIVE FPL)</td>
<td>![Symbol]</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>Active Flight Plan Waypoint (ACTIVE FPL WPT)</td>
<td>![Symbol]</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>Large Airports (LARGE APT)</td>
<td>![Symbol]</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>Medium Airports (MEDIUM APT)</td>
<td>![Symbol]</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Small Airports (SMALL APT)</td>
<td>![Symbol]</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Taxiways (SAFETAXI)</td>
<td>![Symbol]</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Runway Extension (RWY EXTENSION)</td>
<td>![Symbol]</td>
<td>N/A</td>
<td>Off</td>
</tr>
<tr>
<td>Intersection (INT WAYPOINT)</td>
<td>![Symbol]</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Non-directional Beacon (NDB WAYPOINT)</td>
<td>![Symbol]</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>VOR (VOR WAYPOINT)</td>
<td>![Symbol]</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Class B Airspace/TMA (CLASS B/TMA)</td>
<td>![Symbol]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Class C Airspace/TCA (CLASS C/TCA)</td>
<td>![Symbol]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Class D Airspace (CLASS D)</td>
<td>![Symbol]</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Restricted Area (RESTRICTED)</td>
<td>![Symbol]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Military Operations Area [MOA(MILITARY)]</td>
<td>![Symbol]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Other/Air Defense Interdiction Zone (OTHER/ADIZ)</td>
<td>![Symbol]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>Temporary Flight Restriction (TFR)</td>
<td>![Symbol]</td>
<td>500</td>
<td>2000</td>
</tr>
</tbody>
</table>

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.

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.
7) Press the **ENT** Key to accept the selected range.
8) Press the **FMS** Knob to return to the Navigation Map Page.

**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.

Decluttering the map:

Press the DCLTR Softkey with the Navigation Map Page displayed. The current declutter level is shown. With each softkey selection, another level of map information is removed.

Or:

1) Press the MENU Key with the Navigation Map Page displayed.
2) Select ‘Declutter’. The current declutter level is shown.
3) Press the ENT Key.

Decluttering the PFD Inset Map:

1) Press the INSET Softkey.
2) Press the DCLTR Softkey. The current declutter level is shown. With each selection, another level of map information is removed.
Table 5-3 lists the items displayed at each declutter level. The ‘X’ represents map items displayed for the
various levels of declutter.

<table>
<thead>
<tr>
<th>Item</th>
<th>No Declutter</th>
<th>Declutter-1</th>
<th>Declutter-2</th>
<th>Declutter-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flight Plan Route Lines</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Flight Plan Route Waypoints</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Rivers/Lakes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Topography Data</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>International Borders</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Track Vector</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Navigation Range Ring</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fuel Range Ring</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Terrain Data</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Traffic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Airways</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>NEXRAD</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>XM Lightning Data</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Airports</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Runway Labels</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Restricted</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MOA (Military)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>User Waypoints</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Latitude/Longitude Grid</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>NAVAIDs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Class B Airspaces/TMA</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Class C Airspaces/TCA</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Class D Airspaces</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Airspaces/ADIZ</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TFRs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Obstacles</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Land/Country Text</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Roads</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Railroads</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>State/Province Boundaries</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>River/Lake Names</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 5-3 Navigation Map Items Displayed by Declutter 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.

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) Select the ‘Airway’ group.
4) Press the ENT Key.
5) Highlight the ‘LOW ALT AIRWAY’ or ‘HI ALT AIRWAY’ range field.
6) To change the 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.
The following range items are configurable on the airways menu:

<table>
<thead>
<tr>
<th>Airway Type</th>
<th>Symbol</th>
<th>Default Range (nm)</th>
<th>Maximum Range (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Altitude Airway (LOW ALT AIRWAY)</td>
<td>![U4]</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>High Altitude Airway (HI ALT AIRWAY)</td>
<td>![J24]</td>
<td>300</td>
<td>500</td>
</tr>
</tbody>
</table>

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.

![Track Vector](image)

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.
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.

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).

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.

![Figure 5-28 Navigation Map - Fuel Range Ring](image)

**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. This is only available if SVS is installed on the aircraft.

![Lateral Field of View Boundaries](image)

**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 **ENT** Key.

8) 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 CNS and Audio Panel 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 G1000. As a waypoint identifier, facility name, or location is entered, the G1000’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.

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.
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.
The following descriptions and abbreviations are used on the Airport Information Page:

- **Usage type:** Public, Military, or Private
- **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)

**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.
View 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:

<table>
<thead>
<tr>
<th>Communication Frequencies</th>
<th>Navigation Frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach *</td>
<td>Control</td>
</tr>
<tr>
<td>Arrival *</td>
<td>CTA *</td>
</tr>
<tr>
<td>ASOS</td>
<td>Departure *</td>
</tr>
<tr>
<td>ATIS</td>
<td>Gate</td>
</tr>
<tr>
<td>AWOS</td>
<td>Ground</td>
</tr>
<tr>
<td>Center</td>
<td>Helicopter</td>
</tr>
<tr>
<td>Class B *</td>
<td>Multicom</td>
</tr>
<tr>
<td>Class C *</td>
<td>Other</td>
</tr>
<tr>
<td>Clearance</td>
<td></td>
</tr>
<tr>
<td>* May include Additional Information</td>
<td></td>
</tr>
</tbody>
</table>

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 G1000 provides a **NRST** Softkey on the PFD, which gives the pilot quick access to nearest airport information (very useful if an immediate need to land is required). The Nearest Airports Window displays a list of 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.

**Figure 5-33 Nearest Airports Window on PFD**
Pressing the **ENT** Key displays the PFD Airport Information Window for the highlighted airport. Pressing the **ENT** Key again returns to the Nearest Airports Window with the cursor on the next airport in the list. Continued presses of the **ENT** Key sequences through the information pages for all airports in the Nearest Airports list.

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 5-34 Airport Information Window on PFD](image-url)
Viewing information for a nearest airport on the PFD:

1) Press the NRST Softkey to display the Nearest Airports Window.

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 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.

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.

Figure 5-36  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’.

Select an intersection:
1) With the Intersection Information Page displayed, enter an identifier in the Intersection Box.
2) Press the ENT Key.
3) Press the FMS Knob to remove the flashing cursor.
   Or:
   1) With the Nearest Intersections Page displayed, press the FMS Knob.
   2) Press the ENT Key or turn either FMS Knob to select an identifier in the Nearest Intersection Box.
   3) Press the FMS Knob to remove the flashing cursor.

The Nearest Intersections Page can be used to quickly find an intersection close to the flight path. In addition to displaying a map of the surrounding area, the page displays information for up to 25 nearest intersections in three boxes labeled ‘NEAREST INT’, ‘INFORMATION’, and ‘REFERENCE VOR’. 
The selected intersection is indicated by a white arrow. Up to eleven intersections are visible at a time. If there are more than can be shown, the list can be scrolled. If there are no items for display, text indicating that fact is displayed.

**NOTE:** The list only includes waypoints that are within 200 nm.

![Figure 5-38 Nearest Intersections Page](image-url)
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.’

NOTE: Compass locator (LOM): 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.

Select 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 5-40  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’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’.

The VOR classes used in the VOR information box are: LOW ALTITUDE, HIGH ALTITUDE, and TERMINAL.

Select 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.
USER WAYPOINTS

The G1000 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 or bearing from two existing waypoints. Once a waypoint has been created, it can be renamed, deleted, or moved.

Select 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 Waypoint 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.
CREATING USER WAYPOINTS

User waypoints can be created from the User Waypoint Information Page in the following ways:

Creating user waypoints from the User Waypoint Information Page:

1) Press the NEW Softkey, or press the MENU Key and select ‘Create New User Waypoint’.
2) Enter a user waypoint name (up to six characters).
3) Press the ENT Key. The current aircraft position is the default location of the new waypoint.
4) If desired, highlight the Information Box and enter the latitude and longitude for the waypoint or highlight the Reference Waypoints Box to enter a bearing and distance from another waypoint or the bearing from two other waypoints to define the new waypoint location.

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) Highlight the Information Box and enter the latitude and longitude for the waypoint or highlight the Reference Waypoints Box to enter a bearing and distance from another waypoint or the bearing from two other waypoints to define the new waypoint location.
6) Press the ENT Key to accept the new waypoint.
7) Press the FMS Knob to remove the flashing cursor.
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, highlight the Information Box and enter the latitude and longitude for the waypoint or highlight the Reference Waypoints Box to enter a bearing and distance from another waypoint or the bearing from two other waypoints to define the new waypoint location.
6) Press the FMS Knob to remove the flashing cursor.
7) Select 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) Move the cursor to the desired field.
3) Turn the small FMS Knob to make any changes.
4) Press the ENT Key to accept the changes.
5) 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.
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.

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 G1000 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).

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.

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’.

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 Airspace 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.

Figure 5-48 Nearest Airspaces Page
Pressing the PFD **ALERTS** Softkey displays the message window on the PFD. The following airspace alerts are displayed in the message window:

<table>
<thead>
<tr>
<th>Message</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSIDE ARSPC – Inside airspace.</td>
<td>The aircraft is inside the airspace.</td>
</tr>
<tr>
<td>ARSPC AHEAD – Airspace ahead – less than 10 minutes.</td>
<td>Special use airspace is ahead of aircraft. The aircraft penetrates the airspace within 10 minutes.</td>
</tr>
<tr>
<td>ARSPC NEAR – Airspace near and ahead.</td>
<td>Special use airspace is near and ahead of the aircraft position.</td>
</tr>
<tr>
<td>ARSPC NEAR – Airspace near – less than 2 nm.</td>
<td>Special use airspace is within 2 nm of the aircraft position.</td>
</tr>
</tbody>
</table>

**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 G1000 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 5-49 Direct-to Window - MFD](image)
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 waypoint 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.
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, or AIRWAY waypoint can be selected as a direct-to destination in the Direct-to Window.

Selecting a NRST, RECENT, 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 flight plan waypoints (the FPL list is populated only when navigating a flight plan).

3) Turn the small FMS Knob clockwise to display the NRST or RECENT waypoints.

4) Turn the large FMS Knob clockwise to select the desired waypoint.

5) Press the ENT Key. The cursor is now displayed on ‘ACTIVATE?’.

6) Press the ENT Key again to activate the direct-to.

The Direct-to Window can be displayed from any page and allows selection and activation of direct-to navigation. If the direct-to is initiated from any page except the WPT pages, the default waypoint is the active flight plan waypoint (if a flight plan is active) or a blank waypoint field. Direct-to requests on any WPT page defaults to the displayed waypoint.

Selecting any waypoint as a direct-to destination:

1) Select the page or window containing the desired waypoint type and select the desired waypoint.

2) Press the Direct-to Key to display the Direct-to Window with the selected waypoint as the direct-to destination.

3) Press the ENT Key. The cursor is now displayed on ‘ACTIVATE?’.

4) Press ENT again to activate the direct-to.
Selecting a nearby airport as a direct-to destination:
1) Press the NRST Softkey on the PFD; or turn the FMS Knob to display the Nearest Airports Page.
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 G1000 resumes navigating the flight plan along the closest leg.
When navigating a direct-to, the G1000 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 distance along-track before (-) or after (+) the offset waypoint.
8) Press the ENT Key. The ‘Activate?’ field is highlighted.
9) Press the ENT Key to activate.
Removing a VNV altitude constraint:

1) Press the **Direct-to** Key to display the Direct-to Window.

2) Press the **MENU** Key.

3) With ‘Clear Vertical Constraints’ highlighted, press the **ENT** Key.

Figure 5-53  Direct-to Window - Clearing Vertical Constraints
5.6 FLIGHT PLANNING

Flight planning on the G1000 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 G1000 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).

<table>
<thead>
<tr>
<th>Flight Plan Leg Type</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active non-heading Leg</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Active heading Leg</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Non-heading Leg in the current flight segment</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Heading Leg  not in the current flight segment</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Non-heading leg not in the active flight segment</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td>Turn Anticipation Arc</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
</tbody>
</table>

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 G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 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 System Messages) 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 re-loads 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 System Messages).
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)
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 G1000 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, or airway waypoints).
4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the ENT Key. The active flight plan is modified as each waypoint is entered.

5) Repeat step numbers 3 and 4 to enter each additional flight plan waypoint.

6) When all waypoints have been entered, press the FMS Knob to remove the cursor.

Creating a stored flight plan:

1) Press the FPL Key.

2) Turn the small FMS Knob clockwise to display the Flight Plan Catalog Page.

3) Press the NEW Softkey; or press the MENU Key, highlight ‘Create New Flight Plan’, and press the ENT Key to display a blank flight plan for the first empty storage location.

4) Turn the small FMS Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, 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.
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 5-57 Stored Flight Plan Page

Figure 5-58 Active Flight Plan Page - FPL Full
Adding a waypoint to a stored flight plan:

1) On the Flight Plan Catalog Page, press the FMS Knob to activate the cursor.
2) Highlight the desired flight plan.
3) Press the EDIT Softkey; or press the ENT Key, turn the large FMS Knob clockwise to select “EDIT” and press the ENT Key. The Stored Flight Plan Page is displayed.
4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
5) Enter the identifier, facility, or city of the new waypoint.
6) 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.

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 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.
Creating and adding user waypoints to the active flight plan:

1) Press the Joystick to activate the panning function on the Active Flight Plan Page and pan to the map location of the desired user waypoint.

2) Press the LD WPT Softkey; or press the MENU Key, select ‘Load Waypoint’, and press the ENT Key. The user waypoint is created with a name of USRxxx (using the next available in sequence) and is added to the end of the active flight plan.

ADDDING 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 G1000 also anticipates the desired airway and exit point based on loaded flight plan waypoints.

Adding an airway to a flight plan:

1) Press the FPL Key.

2) Press the FMS Knob to activate the cursor (not required on the PFD).

3) Turn the large FMS Knob to highlight the waypoint after the desired airway entry point. If this waypoint is not a valid airway entry point, a valid entry point should be entered at this time.

4) Turn the small FMS Knob one click clockwise and press the LD AIRWY Softkey, or press the MENU Key and select “Load Airway”. The Select Airway Page is displayed. The LD AIRWY Softkey or the “Load Airway” menu item is available only when a valid airway entry waypoint has been chosen (the waypoint ahead of the cursor position).

Figure 5-60  Select Airway Page - Selecting Airway
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.
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 G1000 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 G1000 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 5-63 Stored Flight Plan Page](image)

Softkeys:
- Load Departure -
- Load Arrival -
- Load Approach -
- Activate Flight Plan -
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.

![Departure Loading Page - Selecting the Departure](image)

**Loading a departure procedure into a stored flight plan:**

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

2) Press the **EDIT** Softkey; or press the **MENU** Key, select ‘EDIT FLIGHT PLAN’, and press the **ENT** Key. The Stored Flight Plan Page is displayed.

3) Press the **LD DP** Softkey; or press the **MENU** Key, select “Load Departure”, and press the **ENT** Key. The Departure Loading Page is displayed.

4) Select a departure. Press the **ENT** Key.

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

6) Select a runway served by the selected departure, if required. Press the **ENT** Key.

7) Press the **ENT** Key to load the selected departure procedure.
Figure 5-65  Departure Loading Page - Selecting Transition

Figure 5-66  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.

![Image of Arrival Loading Page]

**Figure 5-67 Arrival Loading Page - Selecting the Arrival**

**Loading an arrival procedure into a stored flight plan:**

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

2) Press the EDIT Softkey; or press the MENU Key, select ‘EDIT FLIGHT PLAN’, and press the ENT Key. The Stored Flight Plan Page is displayed.

3) Press the LD STAR Softkey; or press the MENU Key, select “Load Arrival”, and press the ENT Key. The Arrival Loading Page is displayed.

4) Select an arrival. Press the ENT Key.

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

6) Select a runway served by the selected arrival, if required. Press the ENT Key.

7) Press the ENT Key to load the selected arrival procedure.
Figure 5-68 Arrival Loading Page - Selecting the Transition

Figure 5-69 Stored Flight Plan Page - Arrival Inserted
APPRAOCH (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.

Loading an approach procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.
2) Press the EDIT Softkey; or press the MENU Key, select ‘EDIT FLIGHT PLAN’, and press the ENT Key. The Stored Flight Plan Page is displayed.
3) Press the LD APR Softkey; or press the MENU Key, select “Load Approach”, and press the ENT Key. The Approach Loading Page is displayed.
4) Select an approach. Press the ENT Key.
5) Select a transition for the selected arrival. Press the ENT Key.
6) Press the ENT Key to load the selected approval procedure.
Figure 5-71 Approach Loading Page - Selecting the Transition

Figure 5-72 Stored Flight Plan Page - Approach Inserted
FLIGHT PLAN STORAGE

The G1000 can store up to 99 flight plans, numbered 1 through 99. The active flight plan is erased when the G1000 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.

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.
**FLIGHT MANAGEMENT**

**SORT FLIGHT PLANS**

The stored flight plans can be sorted alphanumerically based on the flight plan name (comment) assigned to each flight plan.

**Sorting by comment (flight plan name):**

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 ‘Sort By Comment’ and press the ENT Key. A confirmation window is displayed.
4) With ‘OK’ highlighted, press the ENT Key to change flight plan ordering. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.

**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 and activates it.

**Activating a stored flight plan on the MFD:**

1) Press the FPL Key and turn the small FMS Knob to display the Flight Plan Catalog Page.
2) Press the FMS Knob to activate the cursor, and turn the FMS Knob to highlight the desired flight plan.
3) Press the ACTIVE Softkey; or press the MENU Key, highlight ‘Activate Flight Plan’, and press the ENT Key. The ‘Activate Stored Flight Plan?’ window is displayed.
4) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.

**Inverting and activating a stored flight plan on the MFD:**

1) Press the FPL Key and turn the small FMS Knob to display the Flight Plan Catalog Page.
2) Press the FMS Knob to activate the cursor, and turn the FMS Knob to highlight the desired flight plan.
3) Press the INVERT Softkey; or press the MENU Key, highlight ‘Invert & activate FPL?’, and press the ENT Key. The ‘Invert and activate stored flight plan?’ window is displayed.
4) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.

**COPY A FLIGHT PLAN**

The G1000 allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

**Copying a stored flight plan on the MFD:**

1) Press the FPL Key and turn the small FMS Knob to display the Flight Plan Catalog Page.
2) Press the FMS Knob to activate the cursor, and turn the FMS Knob to highlight the desired flight plan.
3) Press the COPY Softkey; or press the MENU Key, highlight ‘Copy Flight Plan’, and press the ENT Key. The ‘Copy to Flight Plan XX?’ window is displayed.

4) With ‘OK’ highlighted, press the ENT Key to copy the flight plan. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.

DELETE A STORED FLIGHT PLAN

Individual or all stored flight plans can be deleted from the G1000 memory.

Deleting a stored flight plan:

1) Press the FPL Key and turn the small FMS Knob to display the Flight Plan Catalog Page.
2) Press the FMS Knob to activate the cursor, and turn the FMS Knob to highlight the desired flight plan.
3) Press the DELETE Softkey; press the CLR Key; or press the MENU Key, highlight ‘Delete Flight Plan’, and press the ENT Key. The ‘Delete Flight Plan XX?’ window is displayed.
4) With ‘OK’ highlighted, press the ENT Key to delete the flight plan. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.

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 G1000 allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the G1000.

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.
5) Press the FMS Knob to remove the flashing cursor.
Deleting an individual waypoint from a stored flight plan:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Turn the small FMS Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the FMS Knob to activate the cursor and turn the FMS Knob to highlight the flight plan to be edited.
4) Press the EDIT Softkey; or press the MENU Key, select ‘Edit Flight Plan’ and press the ENT Key. The Stored Flight Plan Page is displayed.
5) Turn the large FMS Knob to highlight the waypoint to be deleted.
6) Press the CLR Key. The ‘Remove XXXXX?’ window is displayed.
7) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.
8) Press the FMS Knob to remove the flashing cursor.

Deleting an entire airway from a stored flight plan:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Turn the small FMS Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the FMS Knob to activate the cursor and turn the FMS Knob to highlight the flight plan to be edited.
4) Press the EDIT Softkey; or press the MENU Key, select ‘Edit Flight Plan’ and press the ENT Key. The Stored Flight Plan Page is displayed.
5) Turn the large FMS Knob to highlight the white header of the airway to be deleted.
6) Press the CLR Key. The ‘Remove <airway name>?’ window is displayed.
7) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.
8) Press the FMS Knob to remove the flashing cursor.

Deleting an entire procedure from a stored flight plan:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Turn the small FMS Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the FMS Knob to activate the cursor and turn the FMS Knob to highlight the flight plan to be edited.
4) Press the EDIT Softkey; or press the MENU Key, select ‘Edit Flight Plan’ and press the ENT Key. The Stored Flight Plan Page is displayed.
5) Turn the large FMS Knob to highlight the white header of the procedure to be deleted.
6) Press the CLR Key. The ‘Remove <procedure name> from flight plan?’ window is displayed.
7) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.
8) Press the FMS Knob to remove the flashing cursor.
Or:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Turn the small FMS Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the FMS Knob to activate the cursor and turn the FMS Knob to highlight the flight plan to be edited.
4) Press the EDIT Softkey; or press the MENU Key, select ‘Edit Flight Plan’ and press the ENT Key. The Stored Flight Plan Page is displayed.
5) Press the MENU Key to display the Page Menu and turn the FMS Knob to highlight ‘Remove <procedure>’.
6) Press the ENT Key. The ‘Remove <procedure name> from flight plan?’ window is displayed.
7) With ‘OK’ highlighted, press the ENT Key. To cancel the request, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.
8) Press the FMS Knob to remove the flashing cursor.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification and sorting.

Changing the active flight plan comment:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Press the FMS Knob to activate the cursor and turn the large FMS Knob to highlight the comment field.
3) Use the FMS Knobs to edit the comment.
4) Press the ENT Key to accept the changes.
5) Press the FMS Knob to remove the flashing cursor.

Changing a stored flight plan comment:
1) Press the FPL Key to display the Active Flight Plan Page.
2) Turn the small FMS Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the FMS Knob to activate the cursor and turn the FMS Knob to highlight the flight plan to be edited.
4) Press the EDIT Softkey; or press the MENU Key, select ‘Edit Flight Plan’ and press the ENT Key. The Stored Flight Plan Page is displayed.
5) Turn the large FMS Knob to highlight the comment field.
6) Use the FMS Knobs to edit the comment.
7) Press the ENT Key to accept the changes.
8) Press the FMS Knob to remove the flashing cursor.

ALONG TRACK OFFSETS

A waypoint having an “along track offset” distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be
entered from 1 to 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.

**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) 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.

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 5-76 Parallel Track Window

Figure 5-77 Parallel Track Active

Parallel Track Waypoints
- TIFTO-p
- TOP-p
- SLN-p
- HYS-p
- LAA-p

Activating Parallel Track affects the entire active flight segment (e.g., enroute)
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.

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.
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 G1000 allows selection of a highlighted leg as the “active leg” (the flight plan leg which is currently used for navigation guidance).

**Activating a flight plan leg:**

1) Press the FPL Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD)
2) Press the FMS Knob to activate the cursor (not required on the PFD) and turn the large FMS Knob to highlight the destination waypoint for the desired leg.
3) Press the ACT LEG Softkey (MFD only); or press the MENU Key, highlight ‘Activate Leg’, and press the ENT Key. A confirmation window is displayed with ‘ACTIVATE’ highlighted.
4) Press the ENT Key to activate the flight plan leg. To cancel, press the CLR Key, or highlight ‘CANCEL’ and press the ENT Key.
5) Press the FMS Knob to remove the flashing cursor.
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 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 flight plan to be inverted.
4) Press the INVERT Softkey; or press the MENU Key, select ‘Invert & Activate Flight Plan’ and press the ENT Key. An ‘Invert and activate stored flight plan?’ confirmation window is displayed.
5) Select ‘OK’.
6) Press the ENT Key to invert and activate the stored flight plan. To cancel, 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.

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.
COLLAPSING AIRWAYS

The G1000 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 reflects 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 the “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.
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 G1000 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.
5.7 VERTICAL NAVIGATION

**NOTE:** The G1000 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 G1000 system Vertical Navigation (VNV) feature provides vertical profile guidance during the enroute and terminal 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.

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 G1000 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.

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.
3) Select 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.

**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.
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 G1000 system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for “Cross at” altitudes. If the procedure states “Expect to cross at,” then the altitude is not in the database. In this case the altitude may be entered manually.

![Figure 5-87 Waypoint Altitude Constraints](image)
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 G1000 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.

<table>
<thead>
<tr>
<th>Large Text</th>
<th>White Text</th>
<th>Light Blue Text</th>
<th>Light Blue Subdued Text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
<td>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.</td>
<td>The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.</td>
</tr>
</tbody>
</table>

| 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 G1000 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 (6° down) or maximum vertical speed (-6000 fpm) 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 WAAS approach)
- The altitude constraint is added to a waypoint past the FAF

**Entering/modifying 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 G1000 displays the altitude restriction from the database provided no predicted altitude can be provided. The G1000 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 PROCEEDURES

The G1000 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) Select a departure from the list and press the ENT Key.
5) Select a runway (if required) and press the ENT Key.
6) Select a transition (if required) and press the ENT Key. ‘LOAD?’ is highlighted.
7) Press the ENT Key to load the departure procedure.
Figure 5-88  Departure Selection

Figure 5-89  Departure Loading
Viewing available departures at an airport:

1) From the Airport Information Page (first page in the WPT group), press the DP Softkey. The Departure Information Page is displayed, defaulting to the airport displayed on the Airport information Page.

2) To select another airport, press the FMS Knob to activate the cursor, enter an identifier/facility name/city, and press the ENT Key.

3) Press the FMS Knob, then 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. The departure is previewed on the map.

6) Turn the small FMS Knob to view the available transitions. Press the ENT Key to select the transition. The cursor moves to the Sequence box. The departure is previewed on the map.

7) Press the INFO 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.
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) Select an arrival from the list and press the ENT Key.
5) Select a transition (if required) and press the ENT Key.
6) Select a runway (if required) and press the ENT Key. ‘LOAD?’ is highlighted.
7) Press the ENT Key to load the arrival procedure.

![Figure 5-90 Arrival Selection](image-url)
Viewing available arrivals at an airport:

1) From the Airport Information Page (first page in the WPT group), press the STAR Softkey. The Arrival Information Page is displayed, defaulting to the airport displayed on the Airport Information Page.

2) To select another airport, press the FMS Knob to activate the cursor, enter an identifier/facility name/city, and press the ENT Key.

3) Press the FMS Knob, then turn the large FMS Knob to highlight the Arrival. The arrival is previewed on the map.

4) Turn the small FMS Knob to view the available arrivals. Press the ENT Key to select the arrival. The cursor moves to the Transition box. The arrival is previewed on the map.

5) Turn the small FMS Knob to view the available transitions. Press the ENT Key to select the transition. The cursor moves to the Runway box. The arrival is previewed on the map.

6) Turn the small FMS Knob to view the available runways. Press the ENT Key to select the runway. The cursor moves to the Sequence box. The arrival is previewed on the map.

7) Press the INFO 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.

APPROACHES

NOTE: If certain GPS parameters (WAAS, 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 G1000 WAAS GPS allows for flying LNAV, LNAV/VNAV, 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 G1000 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:

<table>
<thead>
<tr>
<th>HSI Annunciation</th>
<th>Description</th>
<th>Example on HSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNAV</td>
<td>GPS approach using published LNAV minima</td>
<td></td>
</tr>
<tr>
<td>LNAV+V</td>
<td>GPS approach using published LNAV minima. Advisory vertical guidance is provided</td>
<td></td>
</tr>
<tr>
<td>L/VNAV</td>
<td>GPS approach using published LNAV/VNAV minima</td>
<td></td>
</tr>
<tr>
<td>LPV</td>
<td>GPS approach using published LPV minima</td>
<td></td>
</tr>
</tbody>
</table>

Table 5-9 Approach Types

LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

Loading an approach into the active flight plan using the PROC Key:

1) Press the PROC Key. The Procedures Window is displayed.
2) Highlight ‘SELECT APPROACH’, and press the ENT Key. The Approach Loading Page is displayed.
3) Select an approach from the list and press the ENT Key.
4) Select a transition (if required) and press the ENT Key.
5) 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.
6) Press the ENT Key with ‘LOAD?’ highlighted to load the arrival procedure; or turn the large FMS Knob to highlight ‘ACTIVATE’ and press the ENT Key to load and activate the approach procedure.

NOTE: When GPS is not approved for the selected final approach course, the message ‘NOT APPROVED FOR GPS’ is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.
Figure 5-92  Approach Selection

Figure 5-93  Approach Loading
Viewing available approaches at an airport:

1) From the Airport Information Page (first page in the WPT group), press the APR Softkey. The 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) 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 Runway box. The approach 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. The approach 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 approach is previewed on the map.

7) Press the INFO 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.

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 arrival procedure; or turn the large FMS Knob to highlight ‘ACTIVATE’ and press the ENT Key to load and activate the approach procedure. The G1000 continues navigating the current flight plan until the approach is activated. When GPS is not approved for the selected final approach course, the message ‘NOT APPROVED FOR GPS’ is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.
ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Window.

Activating a previously loaded approach:

1) Press the PROC Key. The Procedures Window is displayed with ‘Activate Approach’ highlighted.
2) Press the ENT Key to activate the approach.

In many cases, it may be easiest to “load” the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, use the steps above to select ‘Activate Vector-To-Final’ — which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final:

1) Press the PROC Key to display the Procedures Window.
2) Highlight ‘ACTIVATE VECTOR-TO-FINAL’ and press the ENT Key.

Loading and activating an approach using the MENU Key:

1) From the Approach Loading Page, press the MENU Key. The page menu is displayed with ‘Load & Activate Approach’ highlighted.
2) Press the ENT Key. When GPS is not approved for the selected final approach course, the message ‘NOT APPROVED FOR GPS’ is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.

REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

Removing an approach from the active flight plan:

1) Press the FPL Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD)
2) Press the MENU Key, and highlight ‘Remove Approach’.
3) Press the ENT Key. A confirmation window is displayed listing the approach procedure.
4) With ‘OK’ highlighted, press the ENT Key. To cancel the removal, highlight ‘CANCEL’ and press the ENT Key.
   Or:
1) Press the FPL Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD)
2) Press the FMS Knob, and turn to highlight the approach header in the active flight plan.
3) Press the CLR Key. A confirmation window is displayed listing the approach procedure.
4) With ‘OK’ highlighted, press the ENT Key. To cancel the removal, highlight ‘CANCEL’ and press the ENT Key.
5) Press the FMS Knob to remove the flashing cursor.
MISSED APPROACH

Activating a missed approach in the active flight plan:

1) Press the PROC Key.
2) Turn the FMS Knob to highlight ‘ACTIVATE MISSED APPROACH’.
3) Press the ENT Key. The aircraft automatically sequences to the MAHP.

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 required altitude required to safely make the first turn toward the MAHP is exceeded. 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 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. The altitude constraint value defaults to 400 feet AGL when there is no Course to Altitude defined in the published procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would be labeled 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.
5.9 TRIP PLANNING

The G1000 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.

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 for trip.

• Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by subtracting the time of fuel endurance by the amount of time to go.

• Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.

• Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

• Density altitude (DENSITY ALT)

• True airspeed (TRUE AIRSPEED)

The pilot may select automatic (AUTO) or manual (MANUAL) page mode, and flight plan (FPL) or waypoint (WPTS) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTS selection).

Figure 5-6  Trip Planning Page - Flight Plan Mode
Selecting automatic or manual page mode:

Press the AUTO Softkey or the MANUAL Softkey; or press the MENU Key, highlight ‘Auto Mode’ or ‘Manual Mode’, and press the ENT Key.

Selecting flight plan or waypoint mode:

Press the FPL Softkey or the WPTS Softkey; or press the MENU Key, highlight ‘Flight Plan Mode’ or ‘Waypoints Mode’, and press the ENT Key.

Selecting a flight plan and leg for trip statistics:

1) Press the FMS Knob to activate the cursor in the flight plan number field.
2) Turn the small FMS Knob to select the desired flight plan number.
3) Turn the large FMS Knob to highlight ‘CUM’ or ‘REM’. The statistics for each leg can be viewed by turning the small FMS Knob to select the desired leg. The Inset Map also displays the selected data.

Selecting waypoints for waypoint mode:

1) Press the WPTS Softkey; or press the MENU Key, highlight ‘Waypoints Mode’, and press the ENT Key. The cursor is positioned in the waypoint field directly below the FPL field.
2) Turn the FMS knobs to select the desired waypoint (or select from the Page Menu ‘Set WPT to Present Position’ if that is what is desired), and press the ENT Key. The cursor moves to the second waypoint field.
3) Turn the FMS knobs to select the desired waypoint, and press the ENT Key. The statistics for the selected leg are displayed.

In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

1) Press the MANUAL Softkey or select ‘Manual Mode’ from the Page Menu, and press the ENT Key. The cursor may now be positioned in any field in the top right two boxes.
2) Turn the FMS Knobs to move the cursor onto the DEP TIME field and enter the desired value. Press the ENT Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.
5.10 **RAIM PREDICTION**

RAIM (Receiver Autonomous Integrity Monitoring) is a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nm for oceanic, 2.0 nm for enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). During oceanic, enroute, and terminal phases of flight, RAIM is available nearly 100% of the time. The RAIM prediction function also indicates whether RAIM is available at a specified date and time. RAIM computations predict satellite coverage within ±15 min of the specified arrival date and time. Because of the tighter protection limit on approaches, there may be times when RAIM is not available. RAIM prediction must be initiated manually if there is concern over WAAS 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.

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, 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.
Enabling/Disabling SBAS:

1) Select the AUX-GPS Status Page.
2) Press the FMS Knob. The SBAS SELECTION ‘WAAS’ field is highlighted.
3) Press the ENT Key to disable SBAS. Press the ENT Key again to enable SBAS.
Figure 5-100  SBAS Display - Disabled
5.11 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the WAAS capable GPS system while the G1000 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 5-101 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

2) Figure 5-101 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.
3) ATC now assigns routing to join V4. A heading of 290° is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-102.

![Figure 5-102 Assigned Heading of 290°](image)

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 5-103. When the V4 entry point (TOP) is inserted, it is placed immediately above the highlighted waypoint (SLN).

![Figure 5-103 Begin Adding V4 to the Flight Plan](image1)

Figure 5-103 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 5-104.

![Figure 5-104 Entering V4 Entry Point](image2)

Figure 5-104 Entering V4 Entry Point
d) Press the ENT Key. TOP is inserted into the flight plan as in Figure 5-105.

![Figure 5-105 TOP Inserted into the Flight Plan](image)

e) With SLN still highlighted as in Figure 5-104, turn the small FMS Knob clockwise. The Waypoint Information Page is displayed and the LD AIRWY Softkey is now available.

f) Press the LD AIRWY Softkey to display the list of available airways for TOP as seen in Figure 5-106.

![Figure 5-106 List of Available Airways for TOP](image)

g) Turn either FMS Knob to highlight V4 in the list as seen in Figure 5-106.
h) Press the **ENT** Key. The list of available exits for V4 is now displayed as in Figure 5-107.

![Figure 5-107 List of Available Exits for V4](image)

i) If necessary, turn either **FMS** Knob to select the desired exit. In this case Salina VOR (SLN) is selected as in Figure 5-107.

j) Press the **ENT** Key. The selected airway and exit are displayed, and the prompt “LOAD?” highlighted as in Figure 5-108.

![Figure 5-108 Ready to Load V4](image)

k) Press the **ENT** Key.
1) V4 is now loaded into the flight plan as shown in Figure 5-109.

Figure 5-109  V4 is Loaded in the Flight Plan

5) Making V4 the active leg of the flight plan.
   a) Press the FMS Knob to activate the cursor.
   b) Turn the large FMS Knob to highlight SLN. The TO waypoint of the leg is selected in order to activate the leg.
   c) Press the ACT LEG Softkey. The confirmation window is now displayed as in Figure 5-110. Note the TOP to SLN leg is actually part of V4.

Figure 5-110  Confirm Active Leg
d) Verify the displayed leg is the desired leg and press the ENT Key. Note in Figure 5-111, 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 5-111 V4 Now Active Leg](image)

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 5-112.

![Figure 5-112 Turn on to Active Leg](image)

8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-113.

![Figure 5-113 Turn to Intercept V244](image)
9) As seen in Figure 5-114, V244 is now the active flight plan leg.

Figure 5-114  V244 Now Active Leg
10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-115.

![Figure 5-115 HYS to LAA Leg Active](image)

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 Key. The Direct-to Window is now displayed as shown in Figure 5-116.

![Figure 5-116 Direct To OPSHN](image)
d) Turn the large FMS Knob to place the cursor in the VNV altitude field as shown in Figure 5-117.

![Figure 5-117 Enter VNV Altitude](image)

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 5-118.

![Figure 5-118 Enter VNV Offset Distance](image)

g) Enter the offset, or distance from the waypoint at which to reach the selected altitude. In this case, three miles prior to OPHSN is entered. In other words, the G1000 gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPHSN.
h) Press the **ENT** Key twice to activate the direct-to. Note, in Figure 5-119, 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.

---

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 5-120.

![Figure 5-120 Procedures Window](image)

**Figure 5-120 Procedures Window**

c) Press the **ENT** Key. A list of available approaches for the destination airport is displayed as in Figure 5-121.

![Figure 5-121 List of Available Approaches](image)

**Figure 5-121 List of Available Approaches**

d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-1201.
e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as in Figure 5-122.

![Figure 5-122 List of Available Transitions](image)

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.
With ‘LOAD?’ highlighted, again press the **ENT** Key. The selected approach is added to the flight plan as seen in Figure 5-124.

![Figure 5-124 Loaded Approach](image)
13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-125. These altitudes are loaded from the database and are displayed as light blue text, indicating these values are “designated” for use in computing vertical deviation guidance.

Note: To no longer use the displayed altitude for calculating vertical deviation guidance, perform the following:

a) Press the FMS Knob to activate the cursor.

b) Turn the small FMS Knob to highlight the desired altitude.

c) Press the CLR Key.

d) Press the FMS Knob to deactivate the cursor.

After making the altitude “non-designated”, it is displayed as white text.

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-125. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the WAAS GPS altitude source, therefore, the displayed altitude values are for reference only.

![Figure 5-125 Vertical Guidance is Active to the FAF](image-url)
14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -3.0 degrees and a required vertical speed is computed to maintain the -3.0 FPA. To change the vertical flight path, perform the following steps.

a) Press the VNV PROF Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-126.

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.

c) Press the ENT Key.
15) As seen in Figure 5-127, the aircraft is approaching TOD. Note the target vertical speed required to reached 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 5-128.

Figure 5-127  Approaching Top of Descent (TOD)

Figure 5-128  VDI & RVSI Upon Reaching Top of Descent (TOD)
16) Upon reaching TOD, a descent vertical speed is established which places the VSI pointer in line with the RVSI as shown in Figure 5-129.

![Figure 5-129 VDI & RVSI Showing Correctly Established Descent](image)

17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-130. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

![Figure 5-130 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint](image)
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 5-131. 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 5-131 Turn to intercept OPSHN to FSHER Leg
19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-132. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.

![Figure 5-132 Tracking the OPSHN to FSHER Leg](image)

20) The flight continues through the arrival procedure to PYNON (see Figure 5-133). 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 5-133  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 5-134).

![Figure 5-134 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 5-135.

c) Press the ENT Key to activate the approach.

![Figure 5-135 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 5-136  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 5-137) when the final approach course becomes active.

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 5-137.
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 5-138.

![Figure 5-138 Descending to the Missed Approach Point](image)

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 required altitude required to safely make the first turn toward the MAHP is exceeded. 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 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. The altitude constraint value defaults to 400 feet AGL when there is no Course to Altitude defined in the published procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, The altitude would be labeled 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.
Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. 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 5-139. The aircraft is climbing to 10,000 feet. The CDI flight phase now changes from LPV to MAPR as seen on the HSI.

Figure 5-139 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 5-140.

![Figure 5-140 Establishing the Holding Pattern](image)

27) The aircraft maintains 10,000 feet while following the magenta line through the hold as in Figure 5-141.

![Figure 5-141 Hold Established](image)
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 G1000 stops using GPS.

While in Enroute or Oceanic phase of flight, if the G1000 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 G1000 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 G1000 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 G1000 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/WAAS 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 G1000 by the appearance of the letters ‘DR’ superimposed in yellow over the ‘own aircraft’ symbol as shown in Figure 5-142. 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 5-142. Also, the CDI deviation bar is removed from the display. Lastly, but at the same time, a ‘GPS NAV LOST’ alert message appears on the PFD. Normal navigation using GPS/WAAS 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 5-142.

Also, while the G1000 is in DR Mode, the autopilot does not couple to GPS, and both TAWS and Terrain Proximity are disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.
Figure 5-142  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.
SECTION 6  HAZARD AVOIDANCE

Hazard avoidance features available for the G1000 are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather
- GDL 69A XM® Satellite Weather (Optional)
- L-3 STORMSCOPE® WX-500 Series II Weather Mapping Sensor (Optional)

Terrain Avoidance
- Terrain Proximity
- TERRAIN-SVS (Standard with SVS Option)
- Terrain Awareness and Warning System (TAWS) (Optional)

Traffic
- TIS (Traffic Information Service)
- Avidyne TAS600® Traffic Advisory System (Optional)

6.1 XM SATELLITE WEATHER

NOTE: XM Satellite Weather data provides information for avoiding hazardous weather. Do not utilize XM Weather information to penetrate hazardous weather.

NOTE: XM Lightning and optional L-3 STORMSCOPE® WX-500 Lightning are mutually exclusive.

XM Satellite Weather is provided through the GDL 69A, a remote-mounted data-link satellite receiver. Received graphical weather information and associated text is displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69A can also receive XM Satellite Radio® entertainment services. Both weather data and entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

XM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.xmradio.com.
ACTIVATING SERVICES

Before XM Satellite Weather can be used, the service must be activated. Service is activated by providing XM Satellite Radio with coded IDs unique to the installed GDL 69A. XM Satellite Radio and XM Satellite Weather services each have coded IDs. The Data and Audio Radio IDs must be provided to XM Satellite Radio to activate the weather service and entertainment subscriptions, respectively. These IDs are located on:

- The label on the back of the Data Link Receiver
- The XM Information Page on the MFD (Figure 6-1)
- The XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Audio and Data Radio IDs cannot be located.

XM Satellite Radio uses the coded IDs to send an activation signal that allows the G1000 to display weather data and/or entertainment programming provided through the GDL 69A.

Activating XM Satellite Weather and XM Satellite Radio services:

1) Contact XM Satellite Radio by email (address listed on their website, www.xmradio.com) or by the customer service phone number listed on the website. Follow the instructions provided by XM Satellite Radio services.

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

3) Press the INFO Softkey to display the XM Information Page.

4) Verify that the desired services are activated.

5) Press 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 XM SATELLITE WEATHER PRODUCTS

The primary map for viewing XM Weather data is the Weather Data Link Page in the Map Page Group. This is the only G1000 map display capable of showing information for all available XM weather products.

Viewing the Weather Data Link 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 Page.

When a weather product is active on the Weather Data Link Page or the Navigation Map Page, the age of the data is displayed on the screen (Figure 6-2). The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are refreshed at specific intervals (defined in the Refresh Rate column in Table 6-1).

If for any reason, a weather product is not refreshed within the 30-, 60-, or 90-minute Expiration Time intervals (see Table 6-1), the data is considered expired and is removed from the display. This ensures that the displayed data is consistent with what is currently being broadcast by XM Satellite Radio services. If more than half of the expiration time has elapsed, the color of the product age displayed changes to yellow.
Table 6-1 shows the weather product symbols, the expiration time and the refresh rate. The refresh rate represents the interval at which XM Satellite Radio broadcasts new signals that may or may not contain new weather data. It does not represent the rate at which weather data is updated or new content is received by the Data Link Receiver. Weather data is updated at intervals that are defined and controlled by XM Satellite Radio and its data vendors.

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<th>Weather Product</th>
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<th>Refresh Rate (Minutes)</th>
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<td>5</td>
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Table 6-1 Weather Product Symbols and Data Timing
Table 6-2 shows which XM products can be displayed (indicated with a ‘+’ symbol) on specific maps.

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Table 6-2  Weather Product Display Maps
Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-3 shows the weather product softkeys for the Weather Data Link Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product is enabled. Unavailable weather products have subdued softkey labels (softkeys are disabled from selection).

The setup menus for the Navigation Map Page and the Weather Data Link Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.
Setting up and customizing the Weather Data Link Page:

1) Select the Weather Data Link Page.
2) Press the **MENU** Key.
3) With ‘Weather Setup’ highlighted, press the **ENT** Key (Figure 6-4).
4) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-5).
5) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
6) Press the **ENT** Key to select an option.
7) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link Page with the changed settings.

![Figure 6-4 Weather Data Link Page Menu](image)

Restoring default Weather Data Link Page settings:

1) Select the Weather Data Link Page.
2) Press the **MENU** Key.
3) With ‘Weather Setup’ highlighted, press the **ENT** Key.
4) Press the **MENU** Key.
5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

![Figure 6-5 Weather Data Link Page Setup Menu](image)
Maps besides the Weather Data Link 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.
Each active weather product has an associated legend which can be displayed on the Weather Data Link Page.

**Viewing legends for displayed weather products**

1) Select the Weather Data Link Page.

2) Press the LEGEND Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the MENU Key.

   b) Select ‘Weather Legend’ and press the ENT Key.

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

4) To remove the Legend Window, press the LEGEND Softkey, the ENT or the CLR Key, or press the FMS Knob.

Additional information about the following can be displayed by panning over the display on the map:

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

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.

![Figure 6-9 Panning on the Weather Data Link Page](image)
NOTE: NEXRAD cannot be displayed at the same time as terrain.

WSR-88D, or NEXRAD (NExt-generation RADar), is a network of 158 high-resolution Doppler radar systems that are operated by the National Weather Service (NWS). NEXRAD data provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD radar 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.

NEXRAD data is not real-time. The lapsed time between collection, processing, and dissemination of NEXRAD images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only. Never use NEXRAD data or any radar data to penetrate hazardous weather. Rather, use it in an early-warning capacity of pre-departure and enroute evaluation.

NEXRAD data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages
Displaying NEXRAD weather information:

1) Press the MAP Softkey (for the PFD Inset Map, press the INSET Softkey). This step is not necessary on the Weather Data Link Page.

2) Press 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 Page. For the NEXRAD legend (Figure 6-11), press the LEGEND Softkey when NEXRAD is selected for display.

![NEXRAD Data with Legend](image)

The display of 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 grayish-purple. Radar capability exists in these areas, but it is not active or is off-line.

**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).

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 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed because it is unknown.

*No Coverage Above 55°N*

![Figure 6-13 NEXRAD Data - Canada](image)

- Precipitation Above 52°N
NOTE: Display of Echo Tops is mutually exclusive with Cloud Tops and NEXRAD.

Echo Tops data (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.

Displaying Echo Tops information:

1) Select the Weather Data Link Page.
2) Press the ECHO TOPS Softkey.

To display the Echo Tops legend (Figure 6-15), press the LEGEND Softkey when Echo Tops is selected for display. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is activated, NEXRAD and Cloud Tops data are removed.
The display of 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 grayish-purple. Radar capability exists in these areas, but it is not active or is off-line.

CLOUD TOPS

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

Cloud Tops data (Figure 6-16) depicts cloud top altitudes as determined from satellite imagery.

![Figure 6-16 Cloud Tops Data](image)

**Displaying Cloud Tops information:**

1) Select the Weather Data Link Page.

2) Press the **CLOUD TOPS** Softkey.

To display the Cloud Tops legend (Figure 6-17), press the **LEGEND** Softkey when Cloud Tops is selected for display. Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated, Echo Tops data is removed.

![Figure 6-17 Cloud Tops Legend](image)
XM LIGHTNING

Lightning data (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.

![Lightning Data](image)

**Figure 6-18 Lightning Data**

XM Lightning data displays on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

**Displaying XM Lightning information:**

1) Press the MAP Softkey (for the PFD Inset Map, press the INSET Softkey). This step is not necessary on the Weather Data Link Page.

2) Press the XM LTNG Softkey (LTNG Softkey on the Weather Data Link Page).

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

![Lightning Legend](image)

**Figure 6-19 Lightning Legend**
CELL MOVEMENT

Cell Movement data (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.

On most applicable maps, Cell Movement data is selected for display along with NEXRAD. On the Weather Data Link Page, Cell Movement data can be selected independently. Cell Movement data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

Displaying Cell Movement information:

1) Press the MAP Softkey (for the PFD Inset Map, press the INSET Softkey). This step is not necessary on the Weather Data Link Page.

2) Press the NEXRAD Softkey (CEL MOV Softkey on the Weather Data Link Page). For Cell Movement to be displayed on maps other than the Weather Data Link Page, Cell Movement must be turned on in the Navigation Map Setup Menu (see “Setting Up XM Satellite Weather”).

To display the Cell Movement legend on the Weather Data Link Page, (Figure 6-21), press the LEGEND Softkey when Cell Movement is selected for display.
SIGMETS AND AIRMETS

SIGMets (SIGnificant METeorological Information) and AIRMets (AIRmen’s METeorological Information) are broadcast for potentially hazardous weather considered of extreme importance to all aircraft. A Convective SIGMET is issued for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

Displaying SIGMets and AIRMets:

1) Select the Weather Data Link Page.
2) Press 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), press the LEGEND Softkey when SIGMets and AIRMets are selected for display.
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 aviation database service area.

METAR (METeorological Aerodrome Report) is the standard format for pre-flight weather briefings. METARs are updated hourly and are considered current. METARs typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure. They can also contain information on precipitation amounts, lightning, and other critical data. METARs are shown as colored flags at airports that provide them.

TAF (Terminal Aerodrome Report) is the standard format for 24-hour weather forecasts. TAFs may contain some METAR data, but generally cover a smaller area. It typically forecasts significant weather changes, temporary changes, probable changes, and expected changes in weather conditions.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, then as raw text. TAF information is displayed only in its raw form.

**Displaying METAR and TAF text:**

1) On the Weather Data Link Page, press 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) Use the FMS Knob or the ENT Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.

5) Press the FMS Knob or the CLR Key to return to the Weather Data Link Page.

Or:

1) Select the Weather Information Page.
   a) Turn the large FMS Knob to select the Waypoint Page Group.
   b) Press the WX Softkey to select the Weather Information Page.

2) Press the FMS Knob to display the cursor.

3) Use the FMS Knob to enter the desired airport and press the ENT Key.

4) Use the FMS Knob or the ENT Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

To display the METAR legend on the Weather Data Link Page (Figure 6-27), press the LEGEND Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.
SURFACE ANALYSIS AND CITY FORECAST

**NOTE:** Surface Analysis and City Forecast data are displayed only within the installed Aviation Database service area.

Surface Analysis and City Forecast information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

Figure 6-28  Current Surface Analysis Data

Displaying Surface Analysis and City Forecast information:

1) Select the Weather Data Link Page.
2) Press the **MORE WX** Softkey.
3) Press the **SFC** Softkey.
4) Select the desired forecast time: **CURRENT**, **12 HR**, **24 HR**, **36 HR**, or **48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

To display the Surface Analysis and City Forecast legend (Figure 2-29), press the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.

Figure 6-29  Surface Analysis Legend
FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-30). When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data appears at the next update.

Displaying Freezing Level information:

1) Select the Weather Data Link Page.
2) Press the MORE WX Softkey.
3) Press the FRZ LVL Softkey.

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

Winds Aloft data (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 up to 42,000 feet MSL.

Displaying Winds Aloft data:

1) Select the Weather Data Link Page.
2) Press the MORE WX Softkey.
3) Press the WIND Softkey.
4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Press the NEXT or PREV Softkey to cycle through the altitude softkeys. The WIND Softkey label changes to reflect the altitude selected.

![Figure 6-32 Winds Aloft Data at 27,000 Feet](image)

To display the Winds Aloft legend (Figure 6-33), press the LEGEND Softkey when Winds Aloft is selected for display.

![Figure 6-33 Winds Aloft Data with Legend](image)
COUNTY WARNINGS

County data (Figure 6-34) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on fires, tornadoes, severe thunderstorms, flood conditions, and other natural disasters.

Displaying County Warning information:

1) Select the Weather Data Link Page.
2) Press the MORE WX Softkey.
3) Press the COUNTY Softkey.

To display the County Warnings legend (Figure 6-35), press the LEGEND Softkey when County Warnings are selected to be displayed.
CYCLONE

The Cyclone weather product shows the current location of cyclones (hurricanes) and their projected tracks.

Displaying cyclone (hurricane) track information:

1) Select the Weather Data Link Page.
2) Press the MORE WX Softkey.
3) Press the CYCLONE Softkey.

To display the Cyclone legend (Figure 6-37), press the LEGEND Softkey when Cyclones are selected to be displayed.
6.2 WX-500 STORMSCOPE

**NOTE:** The Stormscope system is not intended for hazardous thunderstorm penetration. Weather information on the G1000 MFD is approved for weather avoidance only. Refer to the WX-500 User’s Guide for a detailed description of Stormscope operation.

**NOTE:** L-3 STORMSCOPE® WX-500 Lightning and GDL 69/69A XM® Satellite Weather Lightning are mutually exclusive.

The following pages can display Stormscope data:

- Stormscope Page
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

To display Stormscope data on the Navigation Map, AUX - Trip Planning Page, or any of the Nearest Pages, press the MAP Softkey, then press the STRMSCP Softkey. These pages can also display cell or strike data using the yellow lightning strike symbology shown in Table 6-3.

<table>
<thead>
<tr>
<th>Lightning Age</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strike is less than 6 seconds old</td>
<td><img src="symbol1.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Strike is between 6 and 60 seconds old</td>
<td><img src="symbol2.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Strike is between 1 and 2 minutes old</td>
<td><img src="symbol3.png" alt="Symbol" /></td>
</tr>
<tr>
<td>Strike is between 2 and 3 minutes old</td>
<td><img src="symbol4.png" alt="Symbol" /></td>
</tr>
</tbody>
</table>

Table 6-3 Lightning Age and Symbols

### SETTING UP STORMSCOPE ON THE NAVIGATION MAP

Setting up Stormscope options on the Navigation Map:

1) On the Navigation Map Page, press the MENU Key.
2) With ‘Map Setup’ selected (Figure 6-38), press the ENT Key.
3) Turn the small FMS Knob to display the group selection window. Turn the small FMS Knob to select ‘Weather’ (Figure 6-39), and press the ENT Key.
4) Turn the large FMS Knob to highlight and move between the product selections.
5) When an item is highlighted, turn the small FMS Knob to select the option.
6) Press the ENT Key.
7) Press the FMS Knob to return to the Navigation Map Page (Figure 6-40).
The following options are available (Figure 6-39):

- **STRMSCP LTNG** – Turns the display of Stormscope data on or off.
- **STRMSCP MODE** – Selects the CELL or STRIKE mode of lightning activity. Cell mode identifies clusters or cells of electrical activity. Strike mode indicates the approximate location of lightning strikes.
- **STRMSCP SMBL** – Selects the range at which Stormscope data displays. Stormscope data is removed when a map range greater than the STRMSCP SMBL value is selected.

**CELL AND STRIKE MODE ON THE NAVIGATION MAP**

On the Navigation Map, cell mode identifies cells of lightning activity (Figure 6-40). Stormscope identifies clusters of electrical activity that indicate cells. Strike mode indicates the approximate location of lightning strikes.
Selecting the 'cell' or 'strike' mode on the Navigation Map:

1) Press the **MENU** Key.
2) With 'Map Setup' selected, press the **ENT** Key.
3) Select the 'Weather' group.
4) Press the **ENT** Key. The cursor flashes on 'STRMSCP LTNG'.
5) Turn the **large FMS** Knob to select 'STRMSCP MODE'.
6) Turn the **small FMS** Knob to change between 'CELL' and 'STRIKE' options. When an item is selected, press the **ENT** Key.
7) Press the **FMS** knob to return to the Navigation Map Page.

![Navigation Map Page with Stormscope Lightning Data](image)

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn (Figure 6-41). This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

**Manually clearing Stormscope data on the Navigation Map:**

1) Press the **MENU** Key.
2) Select 'Clear Stormscope Lightning'.
3) Press the **ENT** Key.
HAZARD AVOIDANCE

ZOOM RANGE ON THE NAVIGATION MAP

Stormscope lightning data can be displayed up to 800 nm zoom range (in North up mode) on the Navigation Map Page. However, in the track up mode at the 500 nm range, a portion of Stormscope lightning data can be behind the aircraft and therefore not visible on the Navigation Map. Since the range for Stormscope data is 400 nm diameter total (200 nm in front and 200 nm behind), the 500 nm range in North up mode shows all the data.

At a map range of less than 25 nm, Stormscope lightning data is not displayed, but can still be present. The presence of Stormscope lightning data is indicated by the annunciation ‘LTNG < 25 nm’ in the upper right corner (Figure 6-42).

Selecting a Stormscope range on the Navigation Map:

1) Press the MENU Key.
2) Select ‘MAP SETUP’.
3) Select the ‘Weather’ group.
4) Press the ENT Key.
5) Turn the large FMS Knob to select 'STRMSCP SMBL'.
6) Turn the small FMS Knob to select the maximum display range.
7) Press the ENT Key.
8) Press the FMS Knob to return to the Navigation Map Page.

To change the display range on the Navigation Map Page, turn the RANGE Knob clockwise to zoom out or counter-clockwise to zoom in.
SELECTION THE STORMSCOPE PAGE

Stormscope lightning data can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm.

Adjusting the Stormscope Map Range:
1) Turn the large FMS Knob to select the Map Page Group.
2) Turn the small FMS Knob to select the Stormscope Page.
3) To change the map range, turn the RANGE Knob clockwise to zoom out or counter-clockwise to zoom in.

Changing between ‘cell’ and ‘strike’ mode on the Stormscope Page:
1) Select the Stormscope Page.
2) Press the MODE Softkey. The CELL and STRIKE softkeys are displayed.
3) Press the CELL Softkey to display ‘CELL’ data or press the STRIKE Softkey to display ‘STRIKE’ data. ‘CELL’ or ‘STRIKE’ is displayed in the mode box in the upper left corner of the Stormscope Page.
4) Press the BACK Softkey to return to the main Stormscope page.

Changing the viewing mode between 360˚ and 120˚ on the Stormscope Page:
1) Select the Stormscope Page.
2) Press the VIEW Softkey. The 360 and ARC softkeys are displayed. Press the 360 Softkey to display a 360˚ viewing area or press the ARC Softkey to display a 120˚ viewing area.
3) Press the BACK Softkey to return to the main Stormscope page.
6.3 TERRAIN PROXIMITY

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

**NOTE:** Terrain data is not displayed when the aircraft latitude is greater than 75° North or 60° South.

G1000 Terrain Proximity is a terrain awareness system that does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT). Do not confuse Terrain Proximity with Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Terrain Proximity does not provide warning annunciations or voice alerts. It only provides color indications on map displays when terrain and obstacles are within a certain altitude threshold from the aircraft. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

Terrain Proximity requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

Terrain Proximity displays altitudes of terrain and obstructions relative to the aircraft position and altitude with reference to a database that may contain inaccuracies. Terrain and obstructions are shown only if they are in the database. Terrain and obstacle information should be used as an aid to situational awareness. They should never be used to navigate or maneuver around terrain.

Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

The G1000 GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine terrain and obstacle proximity. GPS-MSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

Terrain and obstacle databases are referenced to MSL. Using the GPS position and altitude, the Terrain Proximity feature portrays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. GPS position and GPS-MSL altitude are used to calculate and predict the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.
DISPLAYING TERRAIN PROXIMITY DATA

The symbols and colors in Figure 6-44 and Table 6-4 are used to represent obstacles and aircraft altitude when the Terrain Proximity Page is selected for display. Terrain Proximity uses black, yellow, and red to represent terrain information relative to aircraft altitude. The color of each obstacle is associated with the altitude of the aircraft.

---

**Table 6-4  Terrain Proximity Terrain/Obstacle Colors and Symbology**

<table>
<thead>
<tr>
<th>Unlit Obstacle</th>
<th>Lit Obstacle</th>
<th>Obstacle Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1000’ AGL</td>
<td>&gt; 1000’ AGL</td>
<td>Red obstacle is above or within 100 ft below the aircraft altitude</td>
</tr>
<tr>
<td>&lt; 1000’ AGL</td>
<td>&gt; 1000’ AGL</td>
<td>Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude</td>
</tr>
</tbody>
</table>

Terrain and obstacle information can be displayed on the following pages:
- PFD Inset Map
- Navigation Map Page
- Terrain Proximity Page
- Trip Planning Page
- Flight Plan Page

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

1) Press the MAP Softkey (for the PFD Inset Map, select the INSET Softkey).

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

When Terrain Proximity is selected on maps other than the Terrain Proximity Page, an icon to indicate the feature is enabled for display and a legend for Terrain Proximity colors are shown (Figure 6-48).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map.
Terrain data can be selected for display independently of obstacle data; however, obstacles recognized by Terrain Proximity as yellow or red are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the Terrain Proximity Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the MENU Key.
3) With 'Map Setup' highlighted, press the ENT Key (Figure 6-45).
4) Turn the small FMS Knob to select the 'Map' Group and press the ENT Key (Figure 6-46).
5) Turn the large FMS Knob or press the ENT Key to scroll through product selections (Figure 6-47).
   • 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.
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.

**TERRAIN PROXIMITY PAGE**

The Terrain Proximity Page is specialized to show 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 Terrain Proximity Page:**

1) Turn the large FMS Knob to select the Map Page Group.
2) Turn the small FMS Knob to select the Terrain Proximity Page.
3) To change the view,
   a) Press the VIEW Softkey.
   b) Press the 360 or ARC Softkey to select the desired view.

Or:
   a) Press the MENU Key.
   b) Select ‘View 120°’ or ‘View 360°’ (choice dependent on current state) and press the ENT Key to change the view.
Showing/hiding aviation information on the Terrain Proximity Page:

1) Press the **MENU** Key.

2) Select ‘Show Aviation Data’ or ‘Hide Aviation Data’ (choice dependent on current state) and press the **ENT** Key.
6.4 TERRAIN-SVS

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

**NOTE:** Terrain data is not displayed when the aircraft latitude is greater than 75° North or 60° South.

**NOTE:** TERRAIN-SVS is standard when the Synthetic Vision System (SVS) option is installed. The TAWS option will take precedence over TERRAIN-SVS.

G1000 TERRAIN-SVS is a terrain awareness system available with the Synthetic Vision System (SVS). SVS functionality is offered as an optional enhancement. Optional Terrain Awareness and Warning System (TAWS) or standard TERRAIN-SVS is integrated within SVS to provide visual and auditory alerts to indicate the presence of threatening terrain relevant to the projected flight path. For detailed information regarding SVS, refer to the Synthetic Vision System (SVS) section of the G1000 Pilot’s Guide.

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

TERRAIN-SVS does not provide the following:

- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR)
- Negative Climb Rate (NCR)
- Descent to 500 Feet Callout (DFC)

TERRAIN-SVS requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

TERRAIN-SVS displays altitudes of terrain and obstructions relative to the aircraft position and altitude with reference to a database that may contain inaccuracies. Terrain and obstructions are shown only if they are in the database. Terrain and obstacle information should be used as an aid to situational awareness. They should never be used to navigate or maneuver around terrain.

Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

The G1000 GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine terrain and obstacle proximity. GPS-MSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.
Terrain and obstacle databases are referenced to MSL. Using the GPS position and altitude, the TERRAIN-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 GPS-MSL altitude are used to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.

**DISPLAYING TERRAIN-SVS DATA**

TERRAIN-SVS uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-51 and Table 6-5 are used to represent terrain, obstacles, and potential impact points.

**Figure 6-51 Terrain Altitude/Color Correlation for TERRAIN-SVS**

<table>
<thead>
<tr>
<th>Unlighted Obstacle</th>
<th>Lighted Obstacle</th>
<th>Potential Impact Points</th>
<th>Obstacle Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>WARNING</strong>: Red obstacle is above or within 100’ below current aircraft altitude</td>
</tr>
<tr>
<td>&lt; 1000’ AGL</td>
<td>&gt; 1000’ AGL</td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Unlighted Obstacle" /></td>
<td><img src="image" alt="Lighted Obstacle" /></td>
<td><img src="image" alt="Potential Impact Point" /></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Unlighted Obstacle" /></td>
<td><img src="image" alt="Lighted Obstacle" /></td>
<td><img src="image" alt="Potential Impact Point" /></td>
<td></td>
</tr>
</tbody>
</table>

**Table 6-5 TERRAIN-SVS Obstacle Colors and Symbology**

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

- PFD Inset Map
- Navigation Map Page
- TERRAIN-SVS Page
- Trip Planning Page
- Flight Plan Pages

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

1) Press the MAP Softkey (for the PFD Inset Map, select the INSET Softkey).
2) Press the TERRAIN Softkey to display terrain and obstacle data.
When TERRAIN-SVS is selected on maps other than the TERRAIN-SVS Page, an icon to indicate the feature is enabled for display and a legend for TERRAIN-SVS terrain colors are shown (Figure 6-58).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the TERRAIN-SVS Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the MENU Key.
3) With ‘Map Setup’ highlighted, press the ENT Key (Figure 6-52).
4) Turn the small FMS Knob to select the ‘Map’ Group and press the ENT Key (Figure 6-53).
5) Turn the large FMS Knob or press the ENT Key to scroll through product selections (Figure 6-54).
   - 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.
HAZARD AVOIDANCE

Figure 6-52 Navigation Map Page Menu

Figure 6-53 Navigation Map Page Setup Menu

Figure 6-54 Navigation Map Page Setup Menu, Map Group
HAZARD AVOIDANCE

TERRAIN-SVS PAGE

The TERRAIN-SVS 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. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TERRAIN-SVS Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the RANGE Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the TERRAIN-SVS Page:
1) Turn the large FMS Knob to select the Map Page Group.
2) Turn the small FMS Knob to select the TERRAIN-SVS Page.

Changing the TERRAIN-SVS Page view:
1) Press the VIEW Softkey.
2) Press the 360 or ARC Softkey to select the desired view.
   Or:
1) Press the MENU Key.
2) Select 'View 120°' or 'View 360°' (choice dependent on current state) and press the ENT Key to change the view.

Showing/hiding aviation information on the TERRAIN-SVS Page:
1) Press the MENU Key.
2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the ENT Key.
Figure 6-55 TERRAIN-SVS Page

Figure 6-56 TERRAIN-SVS Page (ARC View)
**TERRAIN-SVS ALERTS**

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

When an alert is issued, annunciations appear on the PFD and MFD. The TERRAIN-SVS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the TERRAIN-SVS Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the TERRAIN-SVS Page)

---

![Figure 6-57 TERRAIN-SVS Alert Annunciations](image1)

![Figure 6-58 Navigation Map Page](image2)

(After TERRAIN-SVS Pop-up Alert Acknowledgment)
### HAZARD AVOIDANCE

**Overview**

The Garmin G1000 includes several features to aid in hazard avoidance, including the TERRAIN-SVS Page and FLTA alerts. These features help pilots identify and avoid potential hazards such as terrain or obstacles.

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#### Flights Instrumentation & CNS

**Audio Panel & CNS**

- **Flight Management**
- **Hazards Avoidance**
- **Additional Features**
- **Appendices**
- **Index**

---

#### Table 6-6 TERRAIN-SVS Alerts Summary

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert</th>
<th>MFD Pop-Up Alert</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Required Terrain Clearance Warning (RTC)</td>
<td>TERRAIN</td>
<td>WARNING TERRAIN</td>
<td>“Warning; Terrain, Terrain”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Warning (ITI)</td>
<td>TERRAIN</td>
<td>WARNING TERRAIN</td>
<td>“Warning; Terrain, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Warning (ROC)</td>
<td>TERRAIN</td>
<td>WARNING OBSTACLE</td>
<td>“Warning; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Warning (IOI)</td>
<td>TERRAIN</td>
<td>WARNING OBSTACLE</td>
<td>“Warning; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Caution (RTC)</td>
<td>TERRAIN</td>
<td>CAUTION TERRAIN</td>
<td>“Caution; Terrain, Terrain”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Caution (ITI)</td>
<td>TERRAIN</td>
<td>CAUTION TERRAIN</td>
<td>“Caution; Terrain, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Caution (ROC)</td>
<td>TERRAIN</td>
<td>CAUTION OBSTACLE</td>
<td>“Caution; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Caution (IOI)</td>
<td>TERRAIN</td>
<td>CAUTION OBSTACLE</td>
<td>“Caution; Obstacle, Obstacle”</td>
</tr>
</tbody>
</table>

---

#### Forward Looking Terrain Avoidance

**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 Table 6-7. When an RTC alert is issued, a potential impact point is displayed on the TERRAIN-SVS 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 cell in the aircraft’s projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TERRAIN-SVS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Table 6-7.

#### Table 6-7 FLTA Alert Minimum Terrain and Obstacle Clearance Values

<table>
<thead>
<tr>
<th>Flight Phase</th>
<th>Minimum Clearance Altitude (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level Flight</td>
</tr>
<tr>
<td>Enroute</td>
<td>700</td>
</tr>
<tr>
<td>Terminal</td>
<td>350</td>
</tr>
<tr>
<td>Approach</td>
<td>150</td>
</tr>
<tr>
<td>Departure</td>
<td>100</td>
</tr>
</tbody>
</table>

---

During final approach, FLTA alerts are automatically inhibited when the aircraft is below 200 feet AGL while within 0.5 nm of the approach runway or below 125 feet AGL while within 1.0 nm of the runway threshold.
PDA and FLTA aural and visual alerts can be manually inhibited. Discretion should be used when inhibiting TERRAIN-SVS and the system should be enabled when appropriate. When TERRAIN-SVS is inhibited, the alert annunciation ‘TER INHB’ is shown on the PFD and MFD (Figure 6-59).

**TER INHB**

Figure 6-59 TERRAIN-SVS Alerting Disabled
(TERRAIN-SVS Inhibited) Annunciation

*Inhibiting/enabling TERRAIN-SVS alerting:*

1) Select the TERRAIN-SVS Page.

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

   Or:

   a) Press the **MENU** Key.

   b) Select ‘Inhibit TERRAIN-SVS’ or ‘Enable TERRAIN-SVS’ (choice dependent on current state) and press the **ENT** Key.

If TERRAIN-SVS alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS WAAS 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.

**SYSTEM STATUS**

During power-up, TERRAIN-SVS conducts a self-test of its aural and visual annunciations. An aural alert is issued at test completion.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert Annunciation</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Test in Progress</td>
<td><strong>TER TEST</strong></td>
<td>None</td>
</tr>
<tr>
<td>System Test Pass</td>
<td>None</td>
<td>“Terrain System Test OK”</td>
</tr>
<tr>
<td>Terrain System Test Fail</td>
<td><strong>TER FAIL</strong></td>
<td>“Terrain System Failure”</td>
</tr>
</tbody>
</table>

Table 6-8 TERRAIN-SVS System Test Status Annunciations
TERRAIN-SVS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the aural message “Terrain System Failure” is generated along with the ‘TER FAIL’ alert annunciation.

TERRAIN-SVS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation ‘TER N/A’ is generated in the annunciation window and on the TERRAIN-SVS Page. The aural message “Terrain System Not Available” is generated. When the GPS signal is re-established and the aircraft is within the database coverage area, the aural message “Terrain System Available” is generated.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert Annunciation</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>No GPS position</td>
<td>TER N/A</td>
<td>“Terrain System Not Available”</td>
</tr>
<tr>
<td>Excessively degraded GPS signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS signal re-established</td>
<td>None</td>
<td>“Terrain System Available”</td>
</tr>
</tbody>
</table>

Table 6-9 TERRAIN-SVS Status Annunciations
6.5 TERRAIN AWARENESS & WARNING SYSTEM (TAWS)

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

**NOTE:** The data contained in the TAWS databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.

TAWS (Terrain Awareness and Warning System) is an optional feature to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS provides visual and aural annunciations when terrain and obstacles are within the given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only.

TAWS satisfies TSO-C151b Class B requirements for certification. Class B TAWS is required for all Part 91 aircraft operations with six or more passenger seats and for Part 135 turbine aircraft operations with six to nine passenger seats (FAR Parts 91.223, 135.154).

TAWS requires the following to operate properly:

- A valid terrain/obstacle/airport terrain database
- A valid 3-D GPS position solution

TAWS uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. The data undergoes verification by Garmin to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

TAWS uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine TAWS alerts. GPS-MSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GPS altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS are referenced to mean sea level (MSL). Using the GPS position and GPS-MSL altitude, TAWS displays a 2-D (or 3-D with SVS) picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the GPS position and GPS-MSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS can provide advanced alerts of predicted dangerous terrain conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmosphere 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 GPS-MSL altitude. This variation results in the aircraft’s true altitude differing from the baro-corrected altitude.
DISPLAYING TAWS DATA

TAWS uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-60 and Table 6-10 are used to represent terrain, obstacles, and potential impact points.

<table>
<thead>
<tr>
<th>Unlighted Obstacle</th>
<th>Lighted Obstacle</th>
<th>Potential Impact Points</th>
<th>Obstacle Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1000’ AGL</td>
<td>&gt; 1000’ AGL</td>
<td>&lt; 1000’ AGL</td>
<td>&gt; 1000’ AGL</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>![Symbol]</td>
<td>![Symbol]</td>
<td>![Symbol]</td>
</tr>
</tbody>
</table>

WARNING: Red obstacle is above or within 100’ below current aircraft altitude

CAUTION: Yellow obstacle is between 100’ and 1000’ below current aircraft altitude

Table 6-10  TAWS Obstacle Colors and Symbology

TAWS information can be displayed on the following maps:
- PFD Inset Map
- Navigation Map Page
- TAWS Page
- Trip Planning Page
- Flight Plan Pages

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

1) Press the MAP Softkey (for the PFD Inset Map, select the INSET Softkey).
2) Press the TERRAIN Softkey to display terrain and obstacle data.

When TAWS is selected on maps other than the TAWS Page, an icon to indicate the feature is enabled for display and a legend for TAWS terrain colors are shown (Figure 6-67).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map.
Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the TAWS Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

**Customizing terrain and obstacle display on the Navigation Map Page:**

1) Select the Navigation Map Page.

2) Press the MENU Key.

3) With ‘Map Setup’ highlighted, press the ENT Key (Figure 6-61).

4) Turn the small FMS Knob to select the ‘Map’ Group and press the ENT Key (Figure 6-62).

5) Turn the large FMS Knob or press the ENT Key to scroll through product selections (Figure 6-63).
   - 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.
TAWS PAGE

The TAWS 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. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TAWS 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 TAWS Page:
1) Turn the large FMS Knob to select the Map Page Group.
2) Turn the small FMS Knob to select the TAWS Page.

Changing the TAWS 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 120°’ or ‘View 360°’ (choice dependent on current state) and press the ENT Key to change the view.

Showing/hiding aviation information on the TAWS 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.
HAZARD AVOIDANCE

Figure 6-64 TAWS Page

Figure 6-65 TAWS Page (ARC View)
TAWS ALERTS

Alerts are issued when flight conditions meet parameters that are set within TAWS software algorithms. TAWS 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 6-11 shows TAWS alert types with corresponding annunciations and aural messages.

When an alert is issued, annunciations appear on the PFD and MFD. The TAWS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the TAWS Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the CLR Key (returns to the currently viewed page), or
- Press the ENT Key (accesses the TAWS Page)

![Figure 6-66 TAWS Alert Annunciations](image)

![Figure 6-67 Navigation Map Page](image)

(After TAWS Pop-up Alert Acknowledgment)
### Table 6-11 TAWS Alerts Summary

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert Annunciation</th>
<th>MFD Pop-Up Alert</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Descent Rate Warning (EDR)</td>
<td>PULL UP</td>
<td>PULL UP</td>
<td>“Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Warning (RTC)</td>
<td>PULL UP</td>
<td>TERRAIN AHEAD - PULL-UP</td>
<td>“Terrain Ahead, Pull Up; Terrain Ahead, Pull Up”* or “Terrain, Terrain; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Warning (ITI)</td>
<td>PULL UP</td>
<td>TERRAIN AHEAD - PULL-UP</td>
<td>Terrain Ahead, Pull Up; Terrain Ahead, Pull Up** or “Terrain, Terrain; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Warning (ROC)</td>
<td>PULL UP</td>
<td>OBSTACLE AHEAD - PULL-UP</td>
<td>“Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up** or “Obstacle, Obstacle; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Warning (IOI)</td>
<td>PULL UP</td>
<td>OBSTACLE AHEAD - PULL-UP</td>
<td>“Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up** or “Obstacle, Obstacle; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Caution (RTC)</td>
<td>TERRAIN</td>
<td>TERRAIN AHEAD</td>
<td>“Terrain Ahead; Terrain Ahead** or “Caution, Terrain; Caution, Terrain”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Caution (ITI)</td>
<td>TERRAIN</td>
<td>TERRAIN AHEAD</td>
<td>“Terrain Ahead; Terrain Ahead** or “Caution, Terrain; Caution, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Caution (ROC)</td>
<td>TERRAIN</td>
<td>OBSTACLE AHEAD</td>
<td>“Obstacle Ahead; Obstacle Ahead** or “Caution, Obstacle; Caution, Obstacle”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Caution (IOI)</td>
<td>TERRAIN</td>
<td>OBSTACLE AHEAD</td>
<td>“Obstacle Ahead; Obstacle Ahead** or “Caution, Obstacle; Caution, Obstacle”</td>
</tr>
<tr>
<td>Premature Descent Alert Caution (PDA)</td>
<td>TERRAIN</td>
<td>TOO LOW - TERRAIN</td>
<td>“Too Low, Terrain”</td>
</tr>
<tr>
<td>Altitude Callout “500”</td>
<td>None</td>
<td>None</td>
<td>“Five-Hundred”</td>
</tr>
<tr>
<td>Excessive Descent Rate Caution (EDR)</td>
<td>TERRAIN</td>
<td>SINK RATE</td>
<td>“Sink Rate”</td>
</tr>
<tr>
<td>Negative Climb Rate Caution (NCR)</td>
<td>TERRAIN</td>
<td>DON’T SINK</td>
<td>“Don’t Sink”** or “Too Low, Terrain”</td>
</tr>
</tbody>
</table>

* Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration are indicated with asterisks.
EXCESSIVE DESCENT RATE ALERT

The purpose of the Excessive Descent Rate (EDR) alert is to provide suitable notification when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 6-68 shows the parameters for the alert as defined by TSO-C151b.

![Excessive Descent Rate Alert Criteria](image)

Figure 6-68  Excessive Descent Rate Alert Criteria
FORWARD LOOKING TERRAIN AVOIDANCE

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 Table 6-12. When an RTC alert is issued, a potential impact point is displayed on the TAWS 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 cell in the aircraft’s projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Table 6-12.

<table>
<thead>
<tr>
<th>Flight Phase</th>
<th>Minimum Clearance Altitude (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level Flight</td>
</tr>
<tr>
<td>Enroute</td>
<td>700</td>
</tr>
<tr>
<td>Terminal</td>
<td>350</td>
</tr>
<tr>
<td>Approach</td>
<td>150</td>
</tr>
<tr>
<td>Departure</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6-12  FLTA Alert Minimum Terrain and Obstacle Clearance Values

During final approach, FLTA alerts are automatically inhibited when the aircraft is below 200 feet AGL while within 0.5 nm of the approach runway or below 125 feet AGL while within 1.0 nm of the runway threshold.
PREMATURE DESCENT ALERTING

A Premature Descent Alert (PDA) is issued when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-69).

PDA alerting begins when the aircraft is within 15 nm of the destination airport and ends when the aircraft is either 0.5 nm from the runway threshold or is at an altitude of 125 feet AGL while within 1.0 nm of the threshold. During the final descent, algorithms set a threshold for alerting based on speed, distance, and other parameters.

PDA and FLTA aural and visual alerts can be manually inhibited. Discretion should be used when inhibiting TAWS and the system should be enabled when appropriate. When TAWS is inhibited, the alert annunciation ‘TAWS INHB’ is shown on the PFD and MFD (Figure 6-70).

Inhibiting/enabling TAWS alerting:

1) Select the TAWS Page.

2) Press the INHIBIT Softkey to inhibit or enable TAWS (choice dependent on current state).

Or:

a) Press the MENU Key.

b) Select ‘Inhibit TAWS’ or ‘Enable TAWS’ (choice dependent on current state) and press the ENT Key.

If TAWS alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS WAAS 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.
HAZARD AVOIDANCE

FIVE-HUNDRED AURAL ALERT

The purpose of the aural alert message “Five-hundred” is to provide an advisory alert that the aircraft is 500 feet above terrain. When the aircraft descends within 500 feet of terrain, the aural message “Five-hundred” is generated. There are no display annunciations or pop-up alerts that accompany the aural message.

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT (NCR)

The Negative Climb Rate (NCR) After Takeoff alert (also referred to as “Altitude Loss After Takeoff”) provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. The aural message “Don’t Sink” is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the display. NCR alerting is only active when departing from an airport and when the following conditions are met:

- Height above the terrain is less than 700 feet
- Distance from the departure airport is 2 nm or less
- Heading change from the departure heading is less than 110 degrees

Figure 6-71 shows the NCR alerting parameters as defined by TSO-C151b.
SYSTEM STATUS

During power-up, TAWS conducts a self-test of its aural and visual annunciations. The system test can also be manually initiated. An aural alert is issued at test completion. TAWS System Testing is disabled when ground speed exceeds 30 knots.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert Annunciation</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Test in Progress</td>
<td>TAWS TEST</td>
<td>None</td>
</tr>
<tr>
<td>System Test Pass</td>
<td>None</td>
<td>“TAWS System Test OK”</td>
</tr>
<tr>
<td>TAWS System Test Fail</td>
<td>TAWS FAIL</td>
<td>“TAWS System Failure”</td>
</tr>
</tbody>
</table>

Table 6-13 TAWS System Test Status Annunciations

Manually testing the TAWS System:

1) Select the TAWS Page.
2) Press the MENU Key (Figure 6-72).
3) Select ‘Test TAWS’ and press the ENT Key to confirm the selection.

TAWS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the aural message “TAWS System Failure” is generated along with the ‘TAWS FAIL’ alert annunciation.

TAWS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation ‘TAWS N/A’ is generated in the annunciation window and on the TAWS Page. The aural message “TAWS Not Available” is generated. When the GPS signal is re-established and the aircraft is within the database coverage area, the aural message “TAWS Available” is generated.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD Alert Annunciation</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>No GPS position</td>
<td>TAWS N/A</td>
<td>“TAWS Not Available”</td>
</tr>
<tr>
<td>Excessively degraded GPS signal</td>
<td>TAWS N/A</td>
<td>“TAWS Not Available”</td>
</tr>
<tr>
<td>GPS signal re-established</td>
<td>None</td>
<td>“TAWS Available”</td>
</tr>
</tbody>
</table>

Table 6-14 TAWS Status Annunciations
6.6 TRAFFIC INFORMATION SERVICE (TIS)

**WARNING**: The Traffic Information Service (TIS) is intended for advisory use only. TIS is intended to help the pilot locate traffic visually. It is the responsibility of the pilot to see and maneuver to avoid traffic.

**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 G1000 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 according to TCAS symbology using four different symbols (Table 6-15).

<table>
<thead>
<tr>
<th>TIS Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Threat Traffic</td>
</tr>
<tr>
<td></td>
<td>Proximity Advisory (PA)</td>
</tr>
<tr>
<td></td>
<td>Traffic Advisory (TA)</td>
</tr>
<tr>
<td></td>
<td>Traffic Advisory Off Scale</td>
</tr>
</tbody>
</table>

Table 6-15 TIS Traffic Symbols

Proximity Advisories (PAs) are defined as traffic within the 5.0-nm range, within ±1200 feet of altitude separation. They are not Traffic Advisories (TA), which alert the crew to intruding aircraft. 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 range of the map on which traffic is displayed are indicated with a message in the lower left corner of the map.

TIS also provides a vector line showing the direction in which the traffic is moving, to the nearest 45°. Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the Traffic Map Page (Figure 6-77) or in a banner at the lower left corner of maps other than the Traffic Map Page on which traffic can be displayed.

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) Press the MAP Softkey.
2) Press the TRAFFIC Softkey to display traffic data.

When traffic is selected on maps other than the Traffic Map Page, an icon is shown to indicate the feature is enabled for display.

![Figure 6-73 TIS Traffic on the Navigation Map Page](image-url)
Displaying traffic information (PFD Inset Map):

1) Press the INSET Softkey.
2) Press the TRAFFIC Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Customizing traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the MENU Key.
3) With 'Map Setup' highlighted, press the ENT Key (Figure 6-74).
4) Turn the small FMS Knob to select the ‘Traffic’ Group and press the ENT Key (Figure 6-75).
5) Turn the large FMS Knob or press the ENT Key to scroll through product selections (Figure 6-76).
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Alerts and Proximity Advisories
     - TA ONLY - Displays Traffic Alerts only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown (with the option to turn off)
6) Turn the small FMS Knob to scroll through options 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.
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. 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 G1000 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:
   Press 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.
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.
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) Press 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 G1000 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.

<table>
<thead>
<tr>
<th>Traffic Map Page Annunciation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DATA</td>
<td>Data is not being received from the transponder*</td>
</tr>
<tr>
<td>DATA FAILED</td>
<td>Data is being received from the transponder, but a failure is detected in the data stream*</td>
</tr>
<tr>
<td>FAILED</td>
<td>The transponder has failed*</td>
</tr>
<tr>
<td>UNAVAILABLE</td>
<td>TIS is unavailable or out of range</td>
</tr>
</tbody>
</table>

* Contact a service center or Garmin dealer for corrective action

Table 6-16 TIS Failure Annunciations

Figure 6-79 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.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Traffic Mode Annunciation (Traffic Map Page)</th>
<th>Traffic Display Enabled Icon (Other Maps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIS Operating</td>
<td>OPERATING</td>
<td></td>
</tr>
<tr>
<td>TIS Standby</td>
<td>STANDBY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(also shown in white in center of page)</td>
<td></td>
</tr>
<tr>
<td>TIS Failed*</td>
<td>FAIL</td>
<td></td>
</tr>
</tbody>
</table>

* See Table 6-16 for additional failure annunciations

Table 6-17 TIS Modes

**Switching between TIS modes:**

1) Select the Traffic Map Page.

2) Press 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 6-18).

<table>
<thead>
<tr>
<th>Traffic Status Banner Annunciation</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 6-18  TIS Traffic Status Annunciations
6.7 TRAFFIC ADVISORY SYSTEM

NOTE: TIS is disabled when Traffic Advisory System (TAS) is installed.

Refer to the Avidyne TAS600 Series Pilot’s Guide for a detailed discussion of the Avidyne TAS600.

TAS SYMBOLOGY

Traffic Advisory System (TAS) is designed to help in detection and avoidance of other aircraft. TAS uses an on-board interrogator-processor and the Mode S transponder for the air-to-air traffic data link. Traffic is displayed according to TCAS symbology using four different symbols.

<table>
<thead>
<tr>
<th>TAS Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Non-Threat Traffic</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Proximity Advisory (PA)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Traffic Advisory (TA)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Traffic Advisory Off Scale</td>
</tr>
</tbody>
</table>

Table 6-19 TAS Symbol Description

A Non-threat Advisory, shown as an open white diamond, indicates that an intruding aircraft is at greater than ±1200 feet relative altitude or the distance is beyond 5 nm.

A Proximity Advisory indicates that the intruding aircraft is within ±1200 feet and is within 5 nm range, but is still not considered a threat.

A Traffic Advisory (TA) alerts the crew to a potentially hazardous intruding aircraft. Closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.
DISPLAYING TRAFFIC DATA

Traffic information is displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

Displaying traffic on the Traffic Map Page:

1) Turn the large FMS Knob to select the Map Page Group.
2) Turn the small FMS Knob to select the Traffic Map Page.
3) Turn the RANGE Knob clockwise to display a larger area or counter-clockwise to display a smaller area.

Displaying traffic information (maps other than the Traffic Map Page):

1) Press the MAP Softkey.
2) Press the TRAFFIC Softkey to display traffic data.

The Traffic Map Page shows surrounding TAS traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the RANGE Knob from 2 to 24 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner.
When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate TAS is enabled for display.

Displaying traffic information (PFD Inset Map):
1) Press the INSET Softkey.
2) Press the TRAFFIC Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

ALTITUDE DISPLAY

Changing the altitude display mode:
1) On the Traffic Page, press the ALT MODE Softkey.
2) Press one of the following Softkeys:
   - BELOW
   - NORMAL
   - ABOVE
   - UNREST (unrestricted)
3) To return to the Traffic Page, press the BACK Softkey.
Or:

1) Press the MENU Key.
2) Turn the small FMS Knob to select one of the following:
   • BELOW
   • NORMAL
   • ABOVE
   • UNREST (unrestricted)
3) Press the ENT Softkey.

**TRAFFIC MAP PAGE DISPLAY RANGE**

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the RANGE Knob from 2 to 24 nm, as indicated by the map range rings.

### Changing the display range on the Traffic Page:

1) Turn the RANGE Knob.
2) The following range options are available:
   • 2 nm
   • 2 and 6 nm
   • 6 and 12 nm
   • 12 and 24 nm

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.
Customizing the traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-82).
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-83).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-84).
   - **TRAFFIC** – Turns the display of traffic data on or off
   - **TRAFFIC MODE** – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Alerts and Proximity Advisories
     - TA ONLY - Displays Traffic Alerts only
   - **TRAFFIC SMBL** – Selects the maximum range at which traffic symbols are shown
   - **TRAFFIC LBL** – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

Figure 6-82  Navigation Map Page Menu

Figure 6-83  Navigation Map Page Setup Menu

Figure 6-84  Navigation Map Page Setup Menu, Traffic Group
TAS ALERTS

**NOTE:** Refer to the TAS600 documentation for information on alerts generated by the TAS equipment.

When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:

- A “Traffic” voice alert is generated followed by the clock position, relative altitude and range of the TA.
- A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with TA traffic.

![Figure 6-85 Traffic Annunciation (PFD)]

**TAS VOICE ALERTS**

To listen to an update of Traffic Advisories press the MUTE Softkey twice. If no Traffic Advisories (TAs) are in effect, a “No Advisories” statement is heard.

**Muting the TAS voice alert in progress:**

1) Select the Traffic Map Page.

2) Select the MUTE Softkey while the voice alert is playing. Subsequent voice alerts will be heard.
NOTE: Refer to the TAS600 documentation for information on the operating mode.

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Traffic Mode Annunciation (Traffic Map Page)</th>
<th>Traffic Display Enabled Icon (Other Maps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAS Operating</td>
<td>OPERATING</td>
<td></td>
</tr>
<tr>
<td>TAS Failed*</td>
<td>FAIL</td>
<td></td>
</tr>
</tbody>
</table>

* See Table 6-21 for additional failure annunciations

Table 6-20 TAS Modes

If the unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page.

<table>
<thead>
<tr>
<th>Traffic Map Page Annunciation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DATA</td>
<td>Data is not being received from the TAS unit</td>
</tr>
<tr>
<td>DATA FAILED</td>
<td>Data is being received from the TAS unit, but the unit is self-reporting a failure</td>
</tr>
<tr>
<td>FAILED</td>
<td>Incorrect data format received from the TAS unit</td>
</tr>
</tbody>
</table>

Table 6-21 TAS Failure Annunciations
The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

<table>
<thead>
<tr>
<th>Traffic Status Banner Annunciation</th>
<th>Description</th>
</tr>
</thead>
</table>
| TA OFF SCALE                      | A Traffic Advisory is outside the selected display range*  
Annunciation is removed when traffic comes within the selected display range |
| TA X.X ± XX ‡                    | System cannot determine bearing of Traffic Advisory**  
Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending) |
| TRFC FAIL                         | TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data) |
| NO TRFC DATA                      | Data is not being received from the TAS unit |

*Shown as symbol on Traffic Map Page  
**Shown in center of Traffic Map Page

| Table 6-22 TAS Traffic Status Annunciations |
SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

NOTE: The approved Aircraft Flight Manual Supplement (AFMS) always supersedes the information in this Pilot’s Guide.

NOTE: A failure of the primary (#1) Integrated Avionics Unit (IAU) results in loss of the flight director. Any IAU failure results in loss of the autopilot and manual electric trim.

The GFC 700 is a digital Automatic Flight Control System (AFCS), fully integrated within the G1000 System avionics architecture. The System Overview section provides a block diagram (Figure 1-1) to support this system description. GFC 700 AFCS functionality in Diamond DA40/40F aircraft is distributed across the following Line Replaceable Units (LRUs):

- GDU 1040 Primary Flight Display (PFD)
- GDU 1042/1044 Multi-Function Display (MFD)
- GIA 63/63W Integrated Avionics Units (2)
- GSA 81 AFCS Servo (3)
- GSM 85 Servo Mounts (3)

The GFC 700 AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — Flight director operation takes place within the primary (#1) IAU. Flight director commands are displayed on the PFD. The flight director provides:
  - Command Bars showing pitch/roll guidance
  - Pitch/roll mode selection and processing
  - Autopilot communication

- **Autopilot (AP)** — Autopilot operation occurs within the pitch, roll, and pitch trim servo and provides servo monitoring and automatic flight control in response to flight director steering commands, AHRS attitude and rate information, and airspeed.

- **Manual Electric Trim (MET)** — The pitch trim servo provides manual electric trim capability when the autopilot is not engaged.
7.1 AFCS CONTROLS

The following dedicated AFCS keys are located on the bezel of the MFD:

1. **AP Key**  
   Engages/disengages the autopilot

2. **FD Key**  
   Activates/deactivates the flight director only  
   Pressing once turns on the flight director in the default pitch and roll modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.

3. **NAV Key**  
   Selects/deselects Navigation Mode

4. **ALT Key**  
   Selects/deselects Altitude Hold Mode

5. **VS Key**  
   Selects/deselects Vertical Speed Mode

6. **FLC Key**  
   Selects/deselects Flight Level Change Mode

7. **HDG Key**  
   Selects/deselects Heading Select Mode

8. **APR Key**  
   Selects/deselects Approach Mode

9. **VNV Key**  
   (GDU 1044 only)  
   Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control

10. **NOSE UP/NOSE DN Keys**  
    Control the mode reference in Pitch Hold, Vertical Speed, and Flight Level Change modes

![Figure 7-1 Dedicated MFD AFCS Controls (GDU 1044)]
The following AFCS controls are located in the cockpit separately from the MFD:

**AP DISC Switch**  
(Autopilot Disconnect)  
Disengages the autopilot and interrupts pitch trim operation  
This switch may be used to mute the aural autopilot disconnect alert.  
The **AP DISC Switch** is located on each control stick.

**CWS Button**  
(Control Wheel Steering)  
While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope Mode) and roll (if in Roll Hold Mode)  
Upon release of the **CWS Button**, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section.  
The **CWS Button** is located on the top of the left control stick.

**GA Switch**  
(Go Around)  
Disengages the autopilot and selects flight director Go Around Mode  
If an approach procedure is loaded this switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.  
The **GA Switch** is located on the throttle handle.

**AP TRIM Switch**  
(Autopilot Trim)  
Used to command manual electric trim  
This composite switch is split into left and right sides. The left switch is the ARM contact and the right switch controls the DN (forward) and UP (rearward) contacts. The **AP TRIM ARM switch** can be used to disengage the autopilot and to acknowledge an autopilot disconnect alert and mute the associated aural tone.  
Manual trim commands are generated only when both sides of the switch are operated simultaneously. If either side of the switch is active separately for more than three seconds, MET function is disabled and ‘PTRM’ is displayed as the AFCS Status Annunciation on the PFD. The function remains disabled until both sides of the switch are inactivated.  
The **AP TRIM Switch** is located on the left control stick.
7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFD. With the flight director activated, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch (-15°/+20°) and roll (22°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in Table 7-1 (when the flight director is not active) activates the flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the display by pressing the FD Key again. The FD Key is disabled when the autopilot is engaged.

<table>
<thead>
<tr>
<th>Control Pressed</th>
<th>Modes Selected</th>
<th>Lateral</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD Key</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Pitch Hold (default)</td>
</tr>
<tr>
<td>AP Key</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Pitch Hold (default)</td>
</tr>
<tr>
<td>CWS Button</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Pitch Hold (default)</td>
</tr>
<tr>
<td>GA Switch</td>
<td>Takeoff (on ground)</td>
<td>TO</td>
<td>Takeoff (on ground)</td>
</tr>
<tr>
<td></td>
<td>Go Around (in air)</td>
<td>GA</td>
<td>Go Around (in air)</td>
</tr>
<tr>
<td>ALT Key</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Altitude Hold</td>
</tr>
<tr>
<td>VS Key</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Vertical Speed</td>
</tr>
<tr>
<td>VNV Key</td>
<td>Roll Hold (default)</td>
<td>ROL</td>
<td>Vertical Path Tracking*</td>
</tr>
<tr>
<td>NAV Key</td>
<td>Navigation**</td>
<td>GPS VOR LOC BC</td>
<td>Pitch Hold (default)</td>
</tr>
<tr>
<td>APR Key</td>
<td>Approach**</td>
<td>GPS VOR LOC</td>
<td>Pitch Hold (default)</td>
</tr>
<tr>
<td>HDG Key</td>
<td>Heading Select</td>
<td>HDG</td>
<td>Pitch Hold (default)</td>
</tr>
</tbody>
</table>

*Valid VNV flight plan must be entered before VNV Key press activates flight director.

**The selected navigation receiver must have a valid VOR or LOC signal or active GPS course before NAV or APR Key press activates flight director.

***The selected navigation receiver must have a valid LOC signal before BC Key press activates flight director.

Table 7-1 Flight Director Activation
AFCS STATUS BOX

Flight director mode annunciations are displayed on the PFD when the flight director is active. Autopilot status is displayed in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical on the right. Armed modes are annunciated in white and active in green.

![AFCS Status Box Diagram](image)

Figure 7-2 PFD AFCS Display
COMMAND BARS

Upon activation of the flight director, Command Bars are displayed on the PFD as a single magenta cue. The Command Bars move together vertically to indicate pitch commands and bank left or right to indicate roll commands. The Command Bars do not override the aircraft symbol.

If the attitude information sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if the pitch exceeds +30°/-20° or bank exceeds 65°.

---

FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll mode(s).

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, GPS, VNV, WAAS) required to compute commands. When such a loss occurs, the system automatically begins to roll the wings level (enters Roll Hold Mode) or maintain the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.
7.3 VERTICAL MODES

Table 7-2 lists the vertical modes with their corresponding controls and annunciations. The mode reference is displayed next to the active mode annunciation for Altitude Hold, Vertical Speed, and Flight Level Change modes. The **NOSE UP/NOSE DN** Keys can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **NOSE UP/NOSE DN** Keys are also listed in the table.

<table>
<thead>
<tr>
<th>Vertical Mode</th>
<th>Description</th>
<th>Control</th>
<th>Annunciation</th>
<th>Reference Range</th>
<th>Reference Change Increment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch Hold</td>
<td>Holds aircraft pitch attitude; may be used to climb/descend to the Selected Altitude</td>
<td>(default)</td>
<td>PIT</td>
<td>-15° to +20°</td>
<td>0.5°</td>
</tr>
<tr>
<td>Selected Altitude Capture</td>
<td>Captures the Selected Altitude</td>
<td>*</td>
<td>ALTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altitude Hold</td>
<td>Holds current Altitude Reference</td>
<td>ALT Key</td>
<td>ALT</td>
<td>nnnnn FT</td>
<td></td>
</tr>
<tr>
<td>Vertical Speed</td>
<td>Holds aircraft vertical speed; may be used to climb/descend to the Selected Altitude</td>
<td>VS Key</td>
<td>VS</td>
<td>-3000 to +1500 fpm</td>
<td>100 fpm</td>
</tr>
<tr>
<td>Flight Level Change</td>
<td>Holds aircraft airspeed while aircraft is climbing/descending to the Selected Altitude</td>
<td>FLC Key</td>
<td>FLC</td>
<td>70 to 165 kt</td>
<td>1 kt</td>
</tr>
<tr>
<td>Vertical Path Tracking</td>
<td>Captures and tracks descent legs of an active vertical profile</td>
<td>VNV Key</td>
<td>VPTH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VNV Target Altitude Capture</td>
<td>Captures the Vertical Navigation (VNV) Target Altitude</td>
<td>**</td>
<td>ALTV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glidepath***</td>
<td>Captures and tracks the WAAS glidespath on approach</td>
<td>APR Key</td>
<td>GP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glideslope</td>
<td>Captures and tracks the ILS glidespath on approach</td>
<td></td>
<td>GS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go Around</td>
<td>Disengages the autopilot and commands a constant pitch angle and wings level</td>
<td>GA Switch</td>
<td>GA</td>
<td>7°</td>
<td></td>
</tr>
</tbody>
</table>

* ALTS is armed automatically when PIT, VS, FLC, or GA is active, and under VPTH when the Selected Altitude is to be captured instead of the VNV Target Altitude.

** ALTV is armed automatically under VPTH when the VNV Target Altitude is to be captured instead of the Selected Altitude.

***GP is available in installations with GIA 63W IAs when WAAS is available.

Table 7-2 Flight Director Vertical Modes
PITCH HOLD MODE (PIT)

When the flight director is activated (the FD Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active pitch mode by the green annunciation ‘PIT’. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

CHANGING THE PITCH REFERENCE

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the NOSE UP/NOSE DN Keys
- Pressing the CWS Button, hand-flying the aircraft to establish a new pitch reference, then releasing the CWS Button

Figure 7-5 Pitch Hold Mode
SELECTED ALTITUDE CAPTURE MODE (ALTS)

Selected Altitude Capture Mode is automatically armed with activation of the following modes:

- Pitch Hold
- Vertical Speed
- Flight Level Change
- Go Around
- Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNV Target Altitude)

The white ‘ALTS’ annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-5 for example). The ALT Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed (Figure 7-6). This automatic transition is indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The Selected Altitude is shown as the Altitude Reference beside the ‘ALTS’ annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude (shown as the Altitude Reference). As Altitude Hold Mode becomes active, the white ‘ALT’ annunciation moves to the active pitch mode field and flashes green for 10 seconds to indicate the automatic transition.

CHANGING THE SELECTED ALTITUDE

NOTE: Pressing the CWS Button while in Selected Altitude Capture Mode does not cancel the mode.

Use of the ALT Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.
ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director’s Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green ‘ALT’ annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-6). Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director’s Altitude Reference.

CHANGING THE ALTITUDE REFERENCE

**NOTE:** Turning the **ALT** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director’s Altitude Reference, and does not cancel the mode.

With the **CWS** Button depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

Figure 7-7 Altitude Hold Mode
VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the VS Key, ‘VS’ is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

CHANGING THE VERTICAL SPEED REFERENCE

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by:

• Using the NOSE UP/NOSE DN Keys
• Pressing the CWS Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the CWS Button

NOTE: If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the CWS Button must be pressed again after the Selected Altitude is reached.
FLIGHT LEVEL CHANGE MODE (FLC)

**NOTE:** The Selected Altitude should be set before selecting Flight Level Change Mode.

Flight Level Change Mode is selected by pressing the FLC Key. This mode acquires and maintains the Airspeed Reference while climbing or descending to the Selected Altitude (shown above the Altimeter). When Flight Level Change Mode is active, the flight director continuously monitors Selected Altitude, airspeed, and altitude.

The Airspeed Reference is set to the current airspeed upon mode activation. Flight Level Change Mode is indicated by a green 'FLC' annunciation beside the Airspeed Reference in the AFCS Status Box. The Airspeed Reference is also displayed directly above the Airspeed Indicator, along with a bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

CHANGING THE AIRSPEED REFERENCE

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the NOSE UP/NOSE DN Keys
- Pressing the CWS Button, hand-flying the aircraft to a new airspeed, then releasing the CWS Button to establish the new Airspeed Reference

**NOTE:** If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the CWS Button must be pressed again after the Selected Altitude is reached.
Figure 7-9 Flight Level Change Mode

Command Bars Indicate Climb to Attain Selected Altitude

Selected Altitude Capture Mode Armed

Airspeed Reference

Flight Level Change Mode Active

Airspeed Reference

Airspeed Reference Bug

Command Bars Indicate Climb to Attain Selected Altitude

Figure 7-9 Flight Level Change Mode
VERTICAL NAVIGATION MODES (VPTH, ALTV)

**NOTE:** VNV is disabled when parallel track or dead reckoning mode is active.

**NOTE:** The Selected Altitude takes precedence over any other vertical constraints.

Vertical Navigation (VNV) flight control is available for enroute/terminal cruise and descent operations any time that VNV flight planning is available. Refer to the Flight Management Section for more information on VNV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (VNV ENBL Softkey pressed on the MFD).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNV modes.

VERTICAL PATH TRACKING MODE (VPTH)

**NOTE:** If another pitch mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.

**NOTE:** Pressing the CWS Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the CWS Button.

When a vertical profile (VNV flight plan) is active and the VNV Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. ‘VPTH’ (or ‘V’ when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.

![Figure 7-10  Vertical Path Tracking Armed Annunciations](image-url)
Prior to descent path interception, the Selected Altitude must be set below the current aircraft altitude by at least 75 feet. For the flight director to transition from Altitude Hold to Vertical Path Tracking Mode, acknowledgment is required within 5 minutes of descent path interception by:

- Pressing the VNV Key
- Adjusting the Selected Altitude

If acknowledgment is not received within 1 minute of descent path interception, the white 'VPTH' annunciation starts to flash. Flashing continues until acknowledged or the descent path is intercepted. If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

In conjunction with the “TOD [top of descent] within 1 minute” annunciation in the Navigation Status Box and the “Vertical track” voice message, VNV indications (VNV Target Altitude, vertical deviation, and vertical speed required) appear on the PFD in magenta (Figure 7-11).
When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile. An altitude capture mode (‘ALTS’ or ‘ALTV’) is armed as appropriate.

If the Altimeter’s barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.
AUTOMATIC REVERSION TO PITCH HOLD MODE

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

NON-PATH DESCENTS

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNV flight control is selected. If the VS or FLC Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the VNV Key twice re-arms Vertical Path Tracking for immediate profile re-capture.
VNV TARGET ALTITUDE CAPTURE MODE (ALTV)

NOTE: Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the VNV Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation ‘ALTV’ indicates that the VNV Target Altitude is to be captured. VNV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the Flight Management Section for details). At the same time as “TOD within 1 minute” is annunciated in the Navigation Status Box, the active VNV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-11).

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The VNV Target Altitude is shown as the Altitude Reference beside the ‘ALTV’ annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RWSI) is removed once VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white ‘ALT’ annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.

CHANGING THE VNV TARGET ALTITUDE

NOTE: Pressing the CWS Button while in VNV Target Altitude Capture Mode does not cancel the mode.

Changing the current VNV Target Altitude while VNV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNV target altitudes can be changed while editing the active flight plan (see the Flight Management Section for details).
GLIDEPATH MODE (GP) (WAAS ONLY)

**NOTE:** Pressing the CWS Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the CWS Button.

Glidepath Mode is available only in installations with GIA 63W IAU's when WAAS is available. Glidepath Mode is used to track the WAAS-based glidepath. When Glidepath Mode is armed, ‘GP’ is annunciatiated in white in the AFCS Status Box.

Selecting Glidepath Mode:

1) Ensure a GPS approach with vertical guidance or vertical descent angle (LPV, LNAV/VNAV, LNAV+V) is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan.

2) Ensure that GPS is the selected navigation source (use the CDI Softkey to cycle through navigation sources).

3) Press the APR Key.

**NOTE:** Some RNAV (GPS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are NOT considered Approaches with Vertical Guidance (APV). Approaches that are annunciatiated on the HSI as LNAV or LNAV+V are considered Nonprecision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided.

**WARNING:** When flying an LNAV approach (with vertical descent angle) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

![Figure 7-15 Glidepath Mode Armed](image)

Once the following conditions have been met, the glidepath can be captured:

- The active waypoint is at or after the final approach fix (FAF)
- Vertical deviation is valid
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no ‘SUSP’ annunciation on the HSI)
Figure 7-16 Glidepath Mode

- **GPS Approach Mode Active**
- **Glidepath Mode Active**

**Keznu Faf → RW18 Map**

<table>
<thead>
<tr>
<th>GPS</th>
<th>GP</th>
</tr>
</thead>
</table>

**GPS is Selected Navigation Source**

**LNAV Approach Active**

**Command Bars Indicate Descent on Glidepath**

**Glidepath Indicator**
GLIDESLOPE MODE (GS)

**NOTE:** Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as ‘GS’ in white), LOC Approach Mode is armed as the lateral flight director mode.

**Selecting Glideslope Mode:**

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
3) Press the **APR** Key.

Or:

1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
2) Ensure a LOC/ILS approach is loaded into the active flight plan.
3) Ensure the corresponding LOC frequency is tuned.
4) Press the **APR** Key.

![Figure 7-17 Glideslope Mode Armed](image)

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to capture and track the glideslope.

![Active ILS Frequency Tuned](image)

![Approach Mode Active](image)

![Glideslope Mode Active](image)

![NAV2 (localizer) is Selected Navigation Source](image)

![Command Bars Indicate Descent on Localizer/Glideslope Path](image)

![Glideslope Indicator](image)

![Figure 7-18 Glideslope Mode](image)
GO AROUND MODE (GA)

Pushing the GA Switch engages the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around. This mode is a coupled pitch and roll mode and is annunciated as ‘GA’ in both the active pitch and roll mode fields. Go Around Mode disengages the autopilot and arms Selected Altitude Capture Mode automatically. Subsequent autopilot engagement is allowed. Attempts to modify the aircraft attitude (i.e., with the CWS Button or NOSE UP/NOSE DN Keys) result in reversion to Pitch and Roll Hold modes.

![Go Around Mode Active](image)

Autopilot Disconnect Annunciation
Flashes Yellow 5 sec

Figure 7-19  Go Around Mode
### 7.4 LATERAL MODES

The GFC 700 offers the lateral modes listed in Table 7-3. Refer to the vertical modes section for information regarding Go Around Mode.

<table>
<thead>
<tr>
<th>Lateral Mode</th>
<th>Description</th>
<th>Control</th>
<th>Annunciation</th>
<th>Maximum Roll Command Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll Hold</td>
<td>Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle</td>
<td>(default)</td>
<td>ROL</td>
<td>22°</td>
</tr>
<tr>
<td>Heading Select</td>
<td>Captures and tracks the Selected Heading</td>
<td>HDG</td>
<td>HDG</td>
<td>22°</td>
</tr>
<tr>
<td>Navigation, GPS</td>
<td>Captures and tracks the selected navigation source (GPS, VOR, LOC)</td>
<td>GPS</td>
<td>22°</td>
<td></td>
</tr>
<tr>
<td>Navigation, VOR Enroute Capture/Track</td>
<td>Captures and tracks the selected navigation source (GPS, VOR, LOC)</td>
<td>VOR</td>
<td>22° Capture 10° Track</td>
<td></td>
</tr>
<tr>
<td>Navigation, LOC Capture/Track (No Glideslope)</td>
<td>Captures and tracks a localizer signal for backcourse approaches</td>
<td>LOC</td>
<td>22° Capture 10° Track</td>
<td></td>
</tr>
<tr>
<td>Navigation Backcourse Capture/Track</td>
<td>Captures and tracks a localizer signal for backcourse approaches</td>
<td>BC</td>
<td>22° Capture 10° Track</td>
<td></td>
</tr>
<tr>
<td>Approach, GPS</td>
<td>Captures and tracks the selected navigation source (GPS, VOR, LOC)</td>
<td>GPS</td>
<td>22°</td>
<td></td>
</tr>
<tr>
<td>Approach, VOR Capture/Track</td>
<td>Captures and tracks the selected navigation source (GPS, VOR, LOC)</td>
<td>VAPP</td>
<td>22° Capture 10° Track</td>
<td></td>
</tr>
<tr>
<td>Approach, LOC Capture/Track (Glideslope Mode automatically armed)</td>
<td>Captures and tracks the selected navigation source (GPS, VOR, LOC)</td>
<td>LOC</td>
<td>22° Capture 10° Track</td>
<td></td>
</tr>
<tr>
<td>Go Around</td>
<td>Disengages the autopilot and commands a constant pitch angle and wings level</td>
<td>GA</td>
<td>GA</td>
<td>Wings Level</td>
</tr>
</tbody>
</table>

The GFC 700 limits turn rate to 3 degrees per second (standard rate turn).

Table 7-3 Flight Director Lateral Modes

The CWS Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach modes. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the CWS Button.
ROLL HOLD MODE (ROL)

**NOTE:** If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as ‘ROL’ in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle conditions listed in Table 7-4.

<table>
<thead>
<tr>
<th>Bank Angle</th>
<th>Flight Director Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6°</td>
<td>Rolls wings level</td>
</tr>
<tr>
<td>6 to 22°</td>
<td>Maintains current aircraft roll attitude</td>
</tr>
<tr>
<td>&gt; 22°</td>
<td>Limits bank to 22°</td>
</tr>
</tbody>
</table>

Table 7-4 Roll Hold Mode Responses

CHANGING THE ROLL REFERENCE

The roll reference can be changed by pressing the CWS Button, establishing the desired bank angle, then releasing the CWS Button.
HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the HDG Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a light blue bug on the HSI and in the box to the upper left of the HSI.

CHANGING THE SELECTED HEADING

**NOTE:** Pressing the HDG Knob synchronizes the Selected Heading to the current heading.

The Selected Heading is adjusted using the HDG Knob. Pressing the CWS Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the CWS Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 340° at a time result in turn reversals.

---

**Figure 7-21  Heading Select Mode**

---
NAVIGATION MODES (GPS, VOR, LOC, BC)

**NOTE:** The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Navigation Mode.

**NOTE:** When intercepting a flight plan leg, the flight director gives commands to capture the active leg at approximately a 45° angle to the track between the waypoints defining the active leg. The flight director does not give commands fly to the starting waypoint of the active leg.

**NOTE:** When making a backcourse approach, set the Selected Course to the localizer front course.

Pressing the NAV Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (GPS, VOR, LOC). The flight director follows GPS roll steering commands when GPS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision GPS and LOC approaches where glideslope capture is not required.

Backcourse Navigation Mode is selected when the localizer front course is greater than 105° from the aircraft heading. Backcourse Navigation Mode captures and tracks a localizer signal in the backcourse direction. The annunciation ‘BC’ in the AFCS Status Box indicates Backcourse Navigation Mode.

If the Course Deviation Indicator (CDI) shows greater than one dot when the NAV Key is pressed, the selected mode is armed. If the CDI is less than one dot, Navigation Mode is automatically captured when the NAV Key is pressed. The armed annunciation appears in white to the left of the active roll mode.

![Figure 7-22 GPS Navigation Mode Armed](image-url)

When the CDI has automatically switched from GPS to LOC during a LOC/ILS approach, GPS Navigation Mode remains active, providing GPS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed automatically when the navigation source switch takes place if the APR Key is not pressed prior to the automatic source switch.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the CDI Softkey)
- During a LOC/ILS approach the FAF is crossed while in GPS Navigation Mode after the automatic navigation source switch from GPS to LOC
CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

![Image](image_url)

**Figure 7-23** Navigation Mode

- **GPS** Navigation Mode Active
- **Pitch Mode** Active
- **Selected Altitude Capture Mode Armed**

**Figure 7-24** Backcourse Mode

- **LOC2** is Selected Navigation Source
- **Command Bars Hold Pitch Attitude**
APPRAIS MODES (GPS, VAPP, LOC)

**NOTE:** The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Approach Mode.

Approach Mode is activated when the APR Key is pressed. Approach Mode acquires and tracks the selected navigation source (GPS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the APR Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less than one dot, the LOC is automatically captured when the APR Key is pressed.

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode.

**Selecting VOR Approach Mode:**

1) Ensure a valid VOR frequency is tuned
2) Ensure that VOR is the selected navigation source (use the CDI Softkey to cycle through navigation sources if necessary).
3) Press the APR Key.

When GPS Approach Mode is armed, Glidepath Mode is also armed.

**Selecting GPS Approach Mode:**

1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
2) Ensure that GPS is the selected navigation source (use the CDI Softkey to cycle through navigation sources if necessary).
3) Press the APR Key.
LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

Selecting LOC Approach Mode:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the CDI Softkey to cycle through navigation sources if necessary).
3) Press the APR Key.
   Or:
   1) Ensure that GPS is the selected navigation source (use the CDI Softkey to cycle through navigation sources if necessary).
   2) Ensure a LOC/ILS approach is loaded into the active flight plan.
   3) Ensure the corresponding LOC frequency is tuned.
   4) Press the APR Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

• Approach Mode is active and a Vectors-To-Final is activated
• Approach Mode is active and Navigation source is manually switched
• During a LOC/ILS approach, GPS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from GPS to LOC

CHANGING THE SELECTED COURSE

The Selected Course is controlled using the CRS Knob (while in VOR, LOC, or OBS Mode). Pressing the CWS Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the CWS Button is released.
7.5 AUTOPILOT OPERATION

**NOTE:** Refer to the AFM for specific instructions regarding emergency procedures.

The autopilot operates flight control surface servos to provide automatic flight control. Pitch and roll commands are provided to the servos, based on the active flight director modes. The autopilot uses pitch and roll rates to stabilize the aircraft attitude during upsets and flight director maneuvers. Flight director commands are rate- and attitude-limited, combined with pitch and roll damper control, and sent to the pitch and roll servo motors.

Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric trim (MET). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated only when both halves of the **AP TRIM** Switch are operated simultaneously. Trim speeds are scheduled with airspeed to provide more consistent response.

Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

**ENGAGING THE AUTOPILOT**

**NOTE:** Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the **CWS** Button to disengage the pitch and roll servos while the autopilot remains active.

When the **AP** Key is pressed, the autopilot and flight director (if not already engaged) are activated. Engagement is indicated by a green ‘AP’ annunciation in the center of the AFCS Status Box. The flight director engages in Pitch and Roll Hold modes when initially activated.

![Autopilot Engaged](image-url)
CONTROL WHEEL STEERING

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the CWS Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. The ‘AP’ annunciation is temporarily replaced by ‘CWS’ in white for the duration of CWS maneuvers.

In most scenarios, releasing the CWS Button reengages the autopilot with a new reference. Refer to the flight director modes section for specific CWS behavior in each mode.

DISENGAGING THE AUTOPILOT

The autopilot is manually disengaged by pushing the AP DISC Switch, GA Switch, AP TRIM ARM Switch, or the AP Key on the MFD. Manual disengagement is indicated by a five-second flashing yellow ‘AP’ annunciation and a two-second autopilot disconnect aural alert. After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the AP TRIM ARM or AP DISC Switch (AP DISC Switch also cancels the flashing ‘AP’ annunciation).

Automatic autopilot disengagement is indicated by a flashing red ‘AP’ annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the AP DISC or AP TRIM ARM Switch. Automatic disengagement occurs due to:

- System failure
- Inability to compute default flight director modes (FD also disengages automatically)
7.6 EXAMPLE FLIGHT PLAN

NOTE: The following example flight plan and diagrams (not to be used for navigation) in this section are for instructional purposes only and should be considered not current. Numbered portions of accompanying diagrams correspond to numbered procedure steps.

This scenario-based set of procedures (based on the example flight plan found in the Flight Management Section) shows various GFC 700 AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using GPS navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

Figure 7-30 Flight Plan Overview
DEPARTURE

Climbing to the Selected Altitude and flying an assigned heading:

1) Before takeoff, set the Selected Altitude to 12,000 feet using the ALT Knob.

2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).
   a) Press the VS Key to activate Vertical Speed Mode.

   ROL | VS ↑ 500 fpm ALTS

   The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the NOSE UP/NOSE DN Keys or pushing the CWS Button while hand-flying the aircraft to establish a new Vertical Speed Reference.

   b) Press the AP Key to engage the autopilot in a climb using Vertical Speed Mode.

   ROL | AP | VS ↑ 500 fpm ALTS

3) Use the HDG Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4.
   Press the HDG Key to activate Heading Select Mode while the autopilot is engaged in the climb. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.

   HDG | AP | VS ↑ 500 fpm ALTS

4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds.

   HDG | AP | ALTS 12000FT

   At 50 feet from the Selected Altitude, the green ‘ALT’ annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

   HDG | AP | ALT 12000FT
Figure 7-31  Departure

Selected Altitude of 12,000 MSL

HDG Mode

VS Mode

ALT Mode

KMKC

1

2

3

4

Figure 7-31  Departure
INTERCEPTING A VOR RADIAL

During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or GPS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

1) Arm VOR Navigation Mode:
   a) Tune the VOR frequency.
   b) Press the **CDI** Softkey to set the navigation source to VOR.
   c) Use the **CRS** Knob to set the Selected Course to 255°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly 290°.
   d) Press the **NAV** Key. This arms VOR Navigation Mode and the white ‘VOR’ annunciation appears to the left of the active lateral mode.

2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the ‘VOR’ annunciation flashes green. The autopilot begins turning to intercept the Selected Course.

3) The autopilot continues the turn until the aircraft is established on the Selected Course.

![Diagram of Intercepting a VOR Radial](image)

**Figure 7-32** Intercepting a VOR Radial
FLYING A FLIGHT PLAN/GPS COURSE

NOTE: Changing the navigation source cancels Navigation Mode and causes the flight director to revert back to Roll Hold Mode (wings rolled level).

As the aircraft closes on Salina VOR, GPS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying a GPS flight plan:

1) Transition from VOR to GPS Navigation Mode:
   a) Press the CDI Softkey until GPS is the selected navigation source.
   b) Press the NAV Key to activate GPS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.

2) Following the flight plan, the autopilot continues to steer the aircraft under GPS guidance. Note that in GPS Navigation Mode, course changes defined by the flight plan are automatically made without pilot action required.

![Figure 7-33 Transition to GPS Flight Plan](image)
DESCENT

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for the descent:

• Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.

• Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the GPS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNV flight control can provide vertical profile guidance, a VNV flight plan must be entered and enabled.

• Non-path descent in a VNV scenario – A VNV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Flight Level Change descent:

1) Select Flight Level Change Mode:
   a) Using the ALT Knob, set the Selected Altitude to 10,000 feet.
   b) Press the FLC Key to activate Flight Level Change Mode. The annunciation ‘FLC’ appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.

2) Use the NOSE UP/NOSE DN Keys or push the CWS Button while hand-flying the aircraft to adjust the commanded airspeed while maintaining the same power, or reduce power to allow descent in Flight Level Change Mode while the autopilot maintains the current airspeed.

3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds.

The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.
Vertical Path Tracking descent to VNV Target Altitude:

1) Select VNV flight control:
   a) Press the VNV Key to arm Vertical Path Tracking Mode. The white annunciation ‘VPTH’ appears.

   | GPS | AP | ALT 12000FT | VPTH |

   b) Using the ALT Knob, set the Selected Altitude below the flight plan’s VNV Target Altitude of 10,000 feet.

   If the Selected Altitude is not at least 75 ft below the VNV Target Altitude, the flight director captures the
   Selected Altitude rather than the VNV Target Altitude once Vertical Path Tracking Mode becomes active (ALTS is
   armed rather than ALTV).

   c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is
   required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with
   descent path capture if the white ‘VPTH’ annunciation begins flashing, do one of the following
   • Press the VNV Key
   • Turn the ALT Knob to adjust the Selected Altitude

   If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the
   descent is not captured.

2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and
   begins the descent to the VNV Target Altitude. Intention to capture the VNV Target Altitude is indicated by the
   white ‘ALTV’ annunciation.

   | GPS | AP | VPTH | ALTV |

3) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode,
   indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds.

   | GPS | AP | ALTV10000FT | ALT |

   The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the
   autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

   | GPS | AP | ALT 10000FT |

   Figure 7-35  VPTH Descent
Non-path descent using Flight Level Change Mode:

1) Using Flight Level Change Mode, command a non-path descent to an intermediate altitude above the next VNV flight plan altitude:
   a) Using the **ALT** Knob, set the Selected Altitude below the current aircraft altitude to an altitude (in this case 9,400 feet) at which to level off between VNV flight plan altitudes.
   b) Press the **FLC** Key before the planned TOD during an altitude hold while VPTH is armed. The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode are armed automatically.

   | GPS | AP | FLC | 130KT ALTS VPTH |

2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.

3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds.

   | GPS | AP | ALT | 9400FT ALTS ALT VPTH |

   The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off, reset Selected Altitude at or below 9,000 ft.

   | GPS | AP | ALT | 9400FT VPTH |

4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).

   | GPS | AP | VPTH ALTV |

5) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds.

   | GPS | AP | ALTV 9000FT ALT |

   The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

   | GPS | AP | ALT | 9000FT |

Figure 7-36 Non-path Descent
Approach

Flying an ILS approach:

1) Transition from GPS Navigation Mode to Heading Select Mode.
   a) Select the Runway 35L ILS approach for KCOS and select ‘VECTORS’ for the transition. Load and activate the approach into the flight plan.
   b) Use the HDG Knob to set the Selected Heading after getting vectors from ATC.
   c) Press the HDG Key. The autopilot turns the aircraft to the desired heading.
   d) Use Heading Select Mode to comply with ATC vectors as requested.

     | HDG | AP | ALT 9000FT |
     |-----|----|-------------|

2) Arm LOC Approach and Glideslope modes.
   a) Ensure the appropriate localizer frequency is tuned.
   b) Press the APR Key when cleared for approach to arm Approach and Glideslope modes. ‘LOC’ and ‘GS’ appear in white as armed mode annunciations.

<table>
<thead>
<tr>
<th>LOC</th>
<th>HDG</th>
<th>AP</th>
<th>ALT 9000FT</th>
<th>GS</th>
</tr>
</thead>
</table>

   c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determines when to begin the turn to intercept the final approach course. The flight director now provides guidance to the missed approach point.

3) There are two options available at this point, as the autopilot flies the ILS approach:

   - Push the AP DISC Switch at the decision height and land the aircraft.
   - Use the GA Switch to execute a missed approach.

Figure 7-37  ILS Approach to KCOS
**NOTE:** Support for WAAS precision approaches is available only in installations with GIA 63W IAUs when WAAS is available.

Flying a RNAV GPS approach with vertical guidance:

1) Arm flight director modes for a RNAV GPS approach with vertical guidance:
   a) Make sure the navigation source is set to GPS (use CDI Softkey to change navigation source).
   b) Select the Runway 35R LPV approach for KCOS. Load and activate the approach into the flight plan.

2) Press the APR Key once clearance for approach has been received. GPS Approach Mode is activated and Glidepath Mode is armed.

3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.

4) There are two options available at this point, as the autopilot flies the approach:
   - Push the AP DISC Switch at the Decision height and land the aircraft.
   - Use the GA Switch to execute a missed approach.

![Figure 7-38 LPV Approach to KCOS](image-url)
GO AROUND/MISSED APPROACH

**NOTE:** As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern as depicted on the PFD and MFD.

Flying a missed approach:

1) Push the **GA** Switch at the Decision Height and apply go around power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow. If flying an ILS or LOC approach the CDI also switches to GPS as the navigation source.

   Note that when the **GA** Switch is pushed, the missed approach is activated and the autopilot disconnects, indicated by the ‘AP’ annunciation flashing yellow for 5 seconds.

2) Start the climb to the prescribed altitude in the published Missed Approach Procedure (in this case, 10,000 ft).
   a) Press the **AP** Key to re-engage the autopilot.
   b) Press the **NAV** Key to have the autopilot fly to the hold.

3) Use the **ALT** Knob to set a Selected Altitude to hold.

   To hold the current airspeed during the climb, press the **FLC** Key.

   As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds.

   The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box, above the AFCS Status Box.
Figure 7-39  Go Around/Missed Approach
7.7 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

The annunciations in Table 7-5 (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.

<table>
<thead>
<tr>
<th>Alert Condition</th>
<th>Annunciation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aileron Mistrim Right</td>
<td>![AIL→]</td>
<td>Roll servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Aileron Mistrim Left</td>
<td>![AIL←]</td>
<td>Roll servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Elevator Mistrim Down</td>
<td>![ELE▼]</td>
<td>Pitch servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Elevator Mistrim Up</td>
<td>![ELE↑]</td>
<td>Pitch servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Pitch Trim Failure</td>
<td>![PTRM]</td>
<td>If AP engaged, take control of the aircraft and disengage AP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If AP disengaged, move AP TRIM switches separately to unstick</td>
</tr>
<tr>
<td>Roll Failure</td>
<td>![ROLL]</td>
<td>Roll axis control failure; AP inoperative</td>
</tr>
<tr>
<td>Pitch Failure</td>
<td>![PITCH]</td>
<td>Pitch axis control failure; AP inoperative</td>
</tr>
<tr>
<td>System Failure</td>
<td>![AFCS]</td>
<td>AP and MET are unavailable; FD may still be available</td>
</tr>
<tr>
<td>Preflight Test</td>
<td>![PFT]</td>
<td>Performing preflight system test; aural alert sounds at completion</td>
</tr>
<tr>
<td></td>
<td>![PFT]</td>
<td>Do not press the AP DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preflight system test failed; aural alert sounds at failure</td>
</tr>
</tbody>
</table>

Table 7-5  AFCS Status Field Alerts
OVERSPEED PROTECTION

**NOTE:** Overspeed protection is not active in Altitude Hold, Glideslope or Glidepath Modes.

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director and pitch commands are limited for overspeed protection. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow ‘MAXSPD’ annunciation. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.

![Figure 7-41 Overspeed Annunciation](image)

ANNUNCIATIONS FOR KAP 140 AUTOPILOT SYSTEM

**NOTE:** Refer to the autopilot manufacturer’s Pilot’s Guide for more information.

When GPS approach mode becomes active and the necessary approach criteria are met, a message appears in the AFCS Status Box alerting the pilot to a change in autopilot NAV source (“NAV Source Changed – Select Desired Autopilot Mode”). The annunciation shall blink for five seconds and remain in the AFCS Status Box for 30 seconds.

![Figure 7-42 KAP 140 Annunciation (Informative)](image)

**NOTE:** KAP 140 equipped aircraft only: Each time the CDI Softkey is pressed or the navigation source changes (i.e. missed approach) a message appears (“NAV Source Changed – Select Desired Autopilot Mode”) regardless of whether or not the autopilot is engaged.
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.

NOTE: SVS requires a terrain database that has a resolution of 9 arc-seconds.

Additional features of the G1000 include the following:

- Synthetic Vision System (SVS)
- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- XM Radio entertainment
- Scheduler

The optional Synthetic Vision System (SVS) provides a three-dimensional forward view of terrain features on the PFD. SVS imagery shows the pilot’s view of relevant features in relation to the aircraft attitude.

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 optional XM Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. XM Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as Switch fuel tanks, Change oil, or Altimeter-Transponder Check in the Alerts Window on the PFD.
8.1 SYNTHETIC VISION SYSTEM (SVS)

The optional Synthetic Vision System (SVS) is a visual enhancement to the G1000 Integrated Flight Deck System. This option is available upon installation into the PFD by the installer. SVS is displayed as a forward-looking attitude display of the topography immediately in front of the aircraft. SVS information is shown on the primary flight display (PFD) and on the Multifunction Display (MFD) in reversionary mode (Figure 8-10). The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a database of terrain, obstacles, and other relevant features.

The following SVS enhancements appear on the PFD:

- Pathways
- Flight Path Marker
- Horizon Heading Marks
- Traffic Display
- Airport Signs
- Runway Display
- Terrain Alerting
- Obstacle Alerting

Optional Terrain Awareness and Warning System (TAWS) or standard Terrain - SVS is integrated within SVS to provide visual and audible alerts to indicate the presence of terrain threats relative to the projected flight path. In addition to the standard TAWS or Terrain - SVS alerts, SVS offers a three-dimensional view of terrain and obstacles. Terrain and/or obstacles that pose a threat to the aircraft in flight are shaded yellow or red.

While SVS is enabled the pitch ladder displays less pitch range.
SVS OPERATION

SVS is activated from the PFD using the softkeys located along the bottom edge of the display. Pressing the softkeys turn the related function on or off.

SVS 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 enables synthetic vision and displays the PATHWAY, SYN TERR, HRZN HDG, and APT SIGNS, Softkeys. The BACK Softkey returns to the previous level of softkeys.

HRZN HDG, APT SIGNS, and PATHWAY Softkeys are all dependent upon the state of the SYN TERR Softkey. When Synthetic Terrain is deactivated, the SYN TERR Softkey appears illuminated while the remaining SVS Softkeys are unavailable for selection and subdued (black with dark-grey characters). If Synthetic Terrain is deactivated, all other SVS features are also deactivated. With Synthetic Terrain activated, all other SVS features may be turned on or off at the pilot’s discretion.

- 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.
- APT SIGNS Softkey enables airport signposts.

Figure 8-2  SVS Softkeys

Activating and Deactivating SVS:

1) Press the PFD Softkey.
2) Press the SYN VIS Softkey.
3) Press the SYN TERR Softkey to view the SVS display.

To deactivate SVS, select each softkey a second time, or repeat the whole procedure.
Activating and Deactivating Pathways:

1) Press the PFD Softkey.
2) Press the SYN VIS Softkey.
2) Press the PATHWAY Softkey.

To deactivate Pathways, press the PATHWAYS Softkey a second time, or repeat the whole procedure.

SVS FEATURES

Pathways provide a three-dimensional perspective view of the selected route of flight at a selected altitude. They are 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 size is proportional to full scale deviation on the HSI.

The color of the rectangular boxes may be magenta, green, or white depending on the route of flight and navigation source selected. The active leg is represented by magenta boxes. A localizer course is represented by green boxes, associated with a corresponding green CDI. An inactive leg of an active flight plan is represented by white boxes.

NOTE: Pathways and terrain features are not a substitute for standard course and altitude deviation information using the CDI, VSI, and VDI presentations.
Pathways is not intended for primary guidance. Pathways provide supplemental glidepath information on an active ILS, LPV, LNAV/VNAV, or LNAV approach. Pathways are intended as a secondary source of navigation information and should not be used independently of the CDI and VDI primary navigation information. Pathways are removed when the primary navigation information is not available. Pathways are not displayed beyond the active leg when leg sequencing is suspended.

**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 Synthetic Terrain is in operation. The FPM represents the direction of the flight path as it relates to the terrain on the display, while the airplane symbol represents the aircraft heading.

The FPM works in conjunction with Pathways to enable the crew to maintain desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the Pathways rectangles.

In the figure below, the aircraft is on the localizer and glide path during an ILS approach.

![Figure 8-4 Flight Path Marker and Pathways](image-url)
**Zero Pitch Line** is drawn completely across the display and represents the aircraft attitude with respect to the horizon. It is not necessarily aligned with the terrain horizon, particularly when the terrain is sloped or mountainous.

**Horizon Heading** is synchronized with the HSI and shows a field of view of 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 when they are behind either the airspeed or altitude display. Horizon Heading is activated and deactivated by pressing the HRZN HDG Softkey.

**Traffic** symbols are displayed in their approximate respective location as determined by the related traffic systems, either TIS or TAS. Traffic is displayed in three dimensions, appearing larger as they are getting closer, and smaller when they are further away. Traffic symbol coloring and shaping is the same as that used for traffic displayed in the inset moving map or MFD traffic page.

**Airport Signs** (Figure 8-5) 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 9 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 APT SIGNS Softkey.

![Figure 8-5 Airport Signs](image)
Terrain - SVS and TAWS Alerting render red or yellow shading on the PFD synthetic terrain during terrain alerts. Terrain alerting on the synthetic terrain display is triggered by the Forward-looking Terrain Avoidance (FLTA), and corresponds to the red and yellow X symbols on the MFD and Inset moving map displays. For more detailed information regarding Terrain - SVS and TAWS, refer to the Hazard Avoidance Section.
Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the inset and MFD maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the inset and MFD moving map display, obstacles on the synthetic terrain display do not change colors to warn of potential conflict with the aircraft’s flight path until the obstacle is associated with an actual FLTA alert. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

Figure 8-7 Obstacles
FIELD OF VIEW

The PFD field of view can be represented on the MFD Navigation Map Page lateral image. 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.
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 figure compares the PFD forward looking depiction with the MFD plan view and FIELD OF VIEW turned on.

![SVS View on the PFD](image1)

![Field of View on the MFD](image2)

**Figure 8-9 MFD and PFD Field of View Comparison**

### REVERSIONARY MODE

SVS can be displayed on the Multifunction Display (MFD) in reversionary mode.

![SVS Reversionary Mode](image3)

**Figure 8-10 SVS Reversionary Mode**
UNUSUAL ATTITUDES

Unusual attitudes are displayed with red chevrons overlaid on the display, pointing to the direction to fly to correct the unusual attitude condition. The display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.

The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display.

Two conditions that inhibit SVS and generate alerts on the PFD:
- The position of the aircraft exceeds the range of the terrain database.
- The terrain database is out of date using a 30AS instead of 9AS terrain database card.
8.2 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the aircraft location is within the screen boundary, including within SafeTaxi ranges, an airplane symbol is shown on any of the navigation map views for 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.
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.

![Navigation Map PAGE MENU, Map Setup Option](image1)

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.

![MAP SETUP Menu, Aviation Group, SAFETAXI Range Options](image2)
SAFETAXI CYCLE NUMBER AND REVISION

The SafeTaxi database is revised every 56 days. SafeTaxi is always available for use after the expiration date. When turning on the G1000, the Power-up Page indicates whether the databases are current, out of date, or not available. The Power-up Page shows the SafeTaxi database is current when the SafeTaxi Expires date is shown in white. When the SafeTaxi cycle has expired, the SafeTaxi Expires date appears in yellow. The message SafeTaxi: N/A appears in white if no SafeTaxi data is available on the database card.

Figure 8-16 Power-up Page, SafeTaxi Database
The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page. SafeTaxi information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Figures 8-17 and 8-18). SafeTaxi REGION NOT AVAILABLE appears in blue if SafeTaxi data is not available on the database card (Figure 8-18). Expired SafeTaxi data is never disabled.

Press the DBASE Softkey for scrolling through the database information. Scroll through the database with the FMS knob or ENT Key.

The SafeTaxi database cycle number shown in the figure, 07S6, is deciphered as follows:

07 – Indicates the year 2007
S – Indicates the data is for SafeTaxi
6 – Indicates the sixth issue of the SafeTaxi database for the year

The SafeTaxi EFFECTIVE date 25–OCT–07 is the beginning date for the current database cycle. SafeTaxi EXPIRES date 20–DEC–07 is the revision date for the next database cycle.

The SafeTaxi database is provided by Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the SafeTaxi 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. NOT AVAILABLE indicates that SafeTaxi is not available on the database card or no database card is inserted.

Figure 8-18  AUX – System Status Page, SafeTaxi Expired, SafeTaxi Not Available
8.3 CHARTVIEW

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the plan view of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

CHARTVIEW SOFTKEYS

ChartView functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys shown below appear on the Airport Information Page.

Pressing the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Pressing the **CHRT OPT** Softkey advances to the next level of softkeys: **ALL**, **HEADER**, **PLAN**, **PROFILE**, **MINIMUMS**, **FIT WDTH**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

Figure 8-19 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the SHW CHRT Softkey.

Or:

1) Press the MENU Key to display the PAGE MENU.
2) Turn the large FMS Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the ENT Key to display the chart.

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.
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.

![UNABLE TO DISPLAY CHART Banner](image)

Figure 8-22 Unable To Display Chart Banner

When a chart is not available by pressing the SHW CHRT Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the SHW CHRT Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.
Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the SHW CHRT Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.

2) Press the FMS Knob to activate the cursor.

3) Turn the large FMS Knob to select either the Airport Identifier Box or the Approach Box. (Press the APR Softkey if the Approach Box is not currently shown).

4) Turn the small and large FMS Knob to enter the desired airport identifier.

5) Press the ENT Key to complete the airport selection.

6) Turn the large FMS Knob to select the Approach Box.

7) Turn the small FMS Knob to show the approach chart selection choices.

8) Turn either FMS Knob to scroll through the available charts.

9) Press the ENT Key to complete the chart selection.

While the APPROACH Box is selected using the FMS Knob, the G1000 softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the Joystick. Pressing the Joystick centers the chart on the screen.

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears (Figure 8-27). If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.
Pressing the CHRT Softkey switches between the ChartView diagram and the associated map in the WPT page group. In the example shown, the CHRT Softkey switches between the Colorado Springs, CO (KCOS) Airport Diagram and the navigation map on the WPT – Airport Information page.

Figure 8-24  CHRT Softkey, Airport Information Page
Pressing the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey has no effect.

The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries. In the example shown, the aircraft is turning onto Taxiway Romeo 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** Softkey. When the INFO Box is selected using the **FMS** Knob, the G1000 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.)
In the example shown in Figure 8-25, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 8-26).

**Figure 8-26  Airport Information Page, Class B Chart Selected from INFO View**

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

**Figure 8-27  Departure Information Page**
Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

![Figure 8-28 Arrival Information Page](image)

Pressing the **APR** Softkey displays the approach chart for the airport if available.

![Figure 8-29 Approach Information Page](image)
Pressing the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the XM Data Link Receiver, when available. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.
NOTE: A subdued softkey label indicates the function is disabled.

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Pressing the NOTAM Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the NOTAM Softkey label appears subdued and is disabled as shown in Figure 8-30. The NOTAM Softkey may appear on the Airport Information Page and all of the chart page selections.

![Figure 8-31 NOTAM Softkey Highlighted](image)
Pressing the NOTAM Softkey again removes the NOTAMS information.

Pressing the GO BACK Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).
CHART OPTIONS

Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-19). Pressing the **ALL** Softkey shows the entire approach chart on the screen.

Figure 8-33 Approach Information Page, ALL View
Pressing the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.

![Figure 8-34 Approach Information Page, Header View](image)

Pressing the **PLAN** Softkey shows the approach chart two dimensional plan view.

![Figure 8-35 Approach Information Page, Plan View](image)
Pressing the **PROFILE** Softkey displays the approach chart descent profile strip.

Figure 8-36  Approach Information Page, Profile View, Full Screen Width

Pressing the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.

Figure 8-37  Approach Information Page, Minimums View, Full Screen Width
If the chart scale has been adjusted to view a small area of the chart, pressing the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.
Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

**Selecting Additional Information:**

1) While viewing the Airport Taxi Diagram, press the **FULL SCN** Softkey to display the information windows (AIRPORT, INFO).

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

3) Turn the large **FMS** Knob to highlight the AIRPORT, INFO, RUNWAYS, or FREQUENCIES Box (INFO Box shown).

4) Turn the small **FMS** Knob to select the INFO Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.

5) Press the **FMS** Knob again to deactivate the cursor.

---

**Figure 8-39 Airport Information Page, Full Screen and Info Window**

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.
The full screen view can also be selected by using the page menu option.

**Selecting full screen On or Off:**

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu **OPTIONS**.

2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.

4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.
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 G1000 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.

3) Turn the large FMS Knob to move to the COLOR SCHEME Option (Figure 8-42).

4) Turn the small FMS Knob to choose between Day, Auto, and Night Options.

5) If Auto Mode is selected, turn the large FMS Knob to select the percentage field. Use the small FMS Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

6) Press the FMS Knob when finished to remove the Chart Setup Menu.
Figure 8-42  Arrival Information Page, Day View

Figure 8-43  Arrival Information Page, Night View
CHARTVIEW CYCLE NUMBER AND EXPIRATION DATE

The ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disabled date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing upon reaching the disabled date. When turning on the G1000, the Power-up Page indicates any of nine different possible criteria for ChartView availability. See the table below for the various ChartView Power-up Page displays and the definition of each.

<table>
<thead>
<tr>
<th>Power-up Page Display</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank Line. G1000 system is not configured for ChartView. Contact a Garmin-authorized service center for configuration.</td>
<td></td>
</tr>
<tr>
<td>System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.</td>
<td></td>
</tr>
<tr>
<td>Normal operation. ChartView database is valid and within current cycle.</td>
<td></td>
</tr>
<tr>
<td>ChartView database is within 1 week after expiration date. A new cycle is available for update.</td>
<td></td>
</tr>
<tr>
<td>ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.</td>
<td></td>
</tr>
<tr>
<td>ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.</td>
<td></td>
</tr>
<tr>
<td>System time is not available. GPS satellite data is unknown or G1000 has not yet locked onto satellites. Check database cycle number for effectivity.</td>
<td></td>
</tr>
<tr>
<td>System is verifying chart database when new cycle is installed for the first time.</td>
<td></td>
</tr>
<tr>
<td>After verifying, chart database is found to be corrupt. ChartView is not available.</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-1 ChartView Power-up Page Annunciations and Definitions
Examples of four possible Power-up Page conditions are shown here. ChartView Disables plus a date in white, indicates chart data is current. This indication for normal operation shows how long the charts may be viewed. Chart data update available, in white, indicates the chart data cycle has expired within the past week and the next chart cycle is available. Chart data is out of date! in yellow, indicates charts are still viewable, but approaching the disable date. Chart data is disabled. in yellow, indicates the chart cycle has been disabled and is no longer viewable.

Figure 8-44 Examples of Power-up Page, ChartView Database
NOTE: A subdued softkey label indicates the function is disabled.

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.

Press the DBASE Softkey for scrolling through the database information. Scroll through the database with the FMS knob or ENT Key.

The ChartView database cycle number shown in the figure, 0722, is deciphered as follows:

07 – Indicates the year 2007
22 – Indicates the 22nd issue of the ChartView database for the year

The EXPIRES date 15–NOV–07 is the date that this database should be replaced with the next issue.

The DISABLES date 24–JAN–08 is the date that this database becomes inoperative.

The ChartView database is provided directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.
The other three possible AUX - System Status page conditions are shown here. The EXPIRES date, in yellow, is the revision date for the next database cycle. The DISABLES date, in yellow, is the date that this database cycle is no longer viewable. REGION and CYCLE NOT AVAILABLE in blue, indicate that no ChartView data is available on the database card or no database card is inserted.

![ChartView Database has Expired, but is not Disabled](chartview_expired.png)

![ChartView Database is Disabled](chartview_disabled.png)

![ChartView Database is Not Available](chartview_notavailable.png)

Figure 8-46  AUX – System Status Page, ChartView Expired, ChartView Disabled, ChartView Not Available
8.4 FLITECHARTS

FliteCharts resemble the paper version of National Aeronautical Charting Office (NACO) terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts. FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the SHW CHRT Softkey displays the available terminal chart and advances to the chart selection level of softkeys: CHRT OPT, CHRT, INFO, DP, STAR, APR, WX, and GO BACK. The chart selection softkeys appear on the Airport Information Page.

Pressing the GO BACK Softkey reverts to the top level softkeys and previous page.

Pressing the CHRT OPT Softkey displays the available terminal chart and advances to the next level of softkeys: ALL, FIT WDTH, FULL SCN, and BACK.

While viewing the CHRT OPT Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

Figure 8-47 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

Or:

1) Press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the **ENT** Key to display the chart.

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.
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.

**UNABLE TO DISPLAY CHART**

Figure 8-50  Unable To Display Chart Banner

When a chart is not available by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.
Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.

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

3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).

4) Turn the small and large **FMS** Knob to enter the desired airport identifier.

5) Press the **ENT** Key to complete the airport selection.

6) Turn the large **FMS** Knob to select the Approach Box.

7) Turn the small **FMS** Knob to show the approach chart selection choices.

8) Turn either **FMS** Knob to scroll through the available charts.

9) Press the **ENT** Key to complete the chart selection.

While the APPROACH Box is selected using the **FMS** Knob, the G1000 softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.
Pressing the **CHRT** Softkey alternates between the FliteCharts diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the Charlotte, NC (KCLT) Airport Diagram and the navigation map on the WPT – Airport Information page.

![Figure 8-52  CHRT Softkey, Airport Information Page](image-url)
Pressing the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey has no effect.

Another source for additional airport information is from the **INFO** Box above the chart (Figure 8-52) or to the right of the chart (Figure 8-53) for certain airports. This information source is not related to the **INFO** Softkey. When the **INFO** Box is selected using the **FMS** Knob, the G1000 softkeys are blank. The Charlotte, NC airport has three additional charts offering information; the Airport Diagram, Alternate Minimums, and Take-off Minimums.
In the example shown in Figure 8-53, TAKE OFF MINIMUMS is selected. Pressing the **ENT** Key displays the Take-off Minimums and Departure Procedures Chart (Figure 8-54).

![Figure 8-54 Airport Information Page, TAKE OFF MINIMUMS Selected from INFO View](image)

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

![Figure 8-55 Departure Information Page](image)
Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

![Figure 8-56 Arrival Information Page](image1)

Pressing the **APR** Softkey displays the approach chart for the airport if available.

![Figure 8-57 Approach Information Page](image2)
Pressing the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data such as METAR and TAF from the XM Data Link Receiver. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.

**Selecting Additional Information:**

1) While viewing the Airport Taxi Diagram, press the **WX** Softkey to display the information windows (AIRPORT, INFO).

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

3) Turn the large **FMS** Knob to highlight the INFO Box.

4) Turn the small **FMS** Knob to select the INFO Box choices. When the INFO Box is selected the G1000 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.

Pressing the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).
CHART OPTIONS

Pressing the CHRT OPT Softkey displays the next level of softkeys, the chart options level (Figure 8-47). Pressing the ALL Softkey shows the entire chart on the screen.

Figure 8-59  Airport Information Page, ALL View Selected
Pressing the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.
Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

![Diagram showing Full Screen and Info Window](image)

Press **FULL SCN** Softkey to Switch Between Chart on Full Screen and Chart with Info Window

**Figure 8-61  Airport Information Page, Full Screen and Info Window**

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.
The full screen view can also be selected by using the page menu option.

**Selecting full screen On or Off:**

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu **OPTIONS**.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

![Chart Setup Option](chart_setup_option.png) ![Full Screen On/Off Selection](full_screen_selection.png)

*Figure 8-62  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 G1000 softkeys are blank.

**Selecting Day, Night, or Automatic View:**

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.

2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

![Figure 8-63  Waypoint Information Page, OPTIONS Menu](image)

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-64).

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.
ADDITIONAL FEATURES

Figure 8-64  Approach Information Page, Day View

Figure 8-65  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 disabled date. FliteCharts is disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disabled date. When turning on the G1000, the Power-up Page indicates any of five different possible criteria for chart availability. These indications are whether the databases are not configured, not available, current, out of date, or disabled. See the table below for the various FliteCharts Power-up Page displays and the definition of each.

<table>
<thead>
<tr>
<th>Power-up Page Display</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank Line</td>
<td>Blank Line. G1000 system is not configured for FliteCharts. Contact Garmin-authorized service center for configuration.</td>
</tr>
<tr>
<td><img src="Image" alt="Chart Data: N/A" /></td>
<td>System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database</td>
</tr>
<tr>
<td><img src="Image" alt="FliteCharts Expires 2-AUG-2007" /></td>
<td>Normal operation. FliteCharts database is valid and within current cycle.</td>
</tr>
<tr>
<td><img src="Image" alt="Chart data is out of date!" /></td>
<td>FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.</td>
</tr>
<tr>
<td><img src="Image" alt="Chart data is disabled." /></td>
<td>FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.</td>
</tr>
</tbody>
</table>

Table 8-2 FliteCharts Power-up Page Annunciations and Definitions
Examples of four possible Power-up Page messages are shown here. 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.

Figure 8-66  FliteCharts Power-up Page Messages
NOTE: A subdued softkey label indicates the function is disabled.

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.

Press the DBASE Softkey for scrolling through the database information. Scroll through the database with the FMS knob or ENT Key.

The FliteCharts database cycle number shown in the figure, 0707, is deciphered as follows:

07 – The first 07 indicates the year 2007
07 – The second 07 indicates the seventh issue of the FliteCharts database for the year
The FliteCharts EFFECTIVE date 05–JUL–07 is the first date that this database is current.
The FliteCharts EXPIRES date 02–AUG–07 is the last date that this database is current.
The DISABLES date 29–JAN–08 is the date that this database becomes inoperative.

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 EXPIRES date, in yellow, is the revision date for the next database cycle. The DISABLES date, in yellow, is the date that this database cycle is no longer viewable. REGION and CYCLE NOT AVAILABLE in blue, indicate that FliteCharts database is not available on the database card or no database card is inserted.

<table>
<thead>
<tr>
<th>DATABASE</th>
<th>DATABASE</th>
<th>DATABASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION</td>
<td>VERSION</td>
<td>VERSION</td>
</tr>
<tr>
<td>CYCLE</td>
<td>CYCLE</td>
<td>CYCLE</td>
</tr>
<tr>
<td>EFFECTIVE</td>
<td>EFFECTIVE</td>
<td>EFFECTIVE</td>
</tr>
<tr>
<td>EXPIRES</td>
<td>EXPIRES</td>
<td>EXPIRES</td>
</tr>
<tr>
<td>DISABLES</td>
<td>DISABLES</td>
<td>DISABLES</td>
</tr>
</tbody>
</table>

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FliteCharts Database has Expired, but is not Disabled
FliteCharts Database is Disabled
FliteCharts Database is Not Available

Figure 8-68  AUX – System Status Page, FliteCharts Expired, FliteCharts Disabled, FliteCharts Not Available
8.5 XM RADIO ENTERTAINMENT (OPTIONAL)

NOTE: Refer to the Hazard Avoidance Section for information about XM Weather products.

The optional XM Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot’s and passengers’ enjoyment. The GDL 69A can receive XM Satellite Radio® entertainment services at any altitude throughout the Continental U.S. Entertainment audio is not available on the GDL 69 Data Link Receiver.

XM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. XM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.xmradio.com.

ACTIVATING XM SATELLITE RADIO SERVICES

The service is activated by providing XM Satellite Radio with either one or two coded IDs, depending on the equipment. Either the Audio Radio ID or the Data Radio ID, or both, must be provided to XM Satellite Radio to activate the entertainment subscription.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. Either or both services can be activated. XM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the XM Information Page on the MFD (Figure 8-69)
- On the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.
NOTE: The LOCK Softkey on the XM Information Page (Auxiliary Page Group) is used to save GDL 69A activation data when the XM services are initially set up. It is not used during normal XM Radio operation, but there should be no adverse effects if inadvertently pressed during flight. Refer to the GDL 69/69A XM Satellite Radio Activation Instructions (190-00355-04, Rev F or later) for further information.

Activating the XM Satellite Radio services:

1) Contact XM Satellite Radio through the email address listed on their website (www.xmradio.com) or by the customer service phone number listed on the website. Follow the instructions provided by XM Satellite Radio services.
2) Select the Auxiliary Page Group.
3) Select the next to last page in the AUX Page Group.
4) Press the INFO Softkey to display the XM Information Page.
5) Verify that the desired services are activated.
6) Press the LOCK Softkey.
7) Turn the large FMS Knob to highlight YES.
8) To complete activation, press the ENT Key.

If XM weather services have not been activated, all the weather product boxes are blank on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.
USING XM RADIO

The XM Radio Page provides information and control of the audio entertainment features of the XM Satellite Radio.

Selecting the XM Radio Page:

1) Turn the large FMS Knob to select the Auxiliary Page Group.
2) Turn the small FMS Knob to select the displayed AUX - XM Information Page.
3) Press the RADIO Softkey to show the XM Radio Page where audio entertainment is controlled.
ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel that the XM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

Selecting a channel from the channel list:

1) While on the XM Radio Page, press the CHNL Softkey.
2) Press the CH + Softkey to go up through the list in the Channel Box, or move down the list with the CH – Softkey.
   Or:
   1) Press the FMS Knob to highlight the channel list and turn the large FMS Knob to scroll through the channels.
   2) Press the ENT Key to activate the selected channel.

Selecting a channel directly:

1) While on the XM Radio Page, press the CHNL Softkey.
2) Press the DIR CH Softkey. The channel number in the Active Channel Box is highlighted.
3) Press the numbered softkeys located on the bottom of the display to directly select the desired channel number.
4) Press the ENT Key to activate the selected channel.
CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is PRESETS to view channels that have been programmed.

Selecting a category:

1) Press the CATGRY Softkey on the XM Radio Page.
2) Press the CAT + and CAT - Softkeys to cycle through the categories.

Or:

Turn the small FMS Knob to display the Categories list. Highlight the desired category with the small FMS Knob and press the ENT Key. Selecting All Categories places all channels in the list.

![Categories List](image)

Figure 8-71 Categories List
PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by pressing the PRESETS and MORE Softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

Setting a preset channel number:

1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, press the PRESETS Softkey to access the first five preset channels (PS1 - PS5).

2) Press the MORE Softkey to access the next five channels (PS6 – PS10), and again to access the last five channels (PS11 – PS15). Pressing the MORE Softkey repeatedly cycles through the preset channels.

3) Press any one of the (PS1 - PS15) softkeys to assign a number to the active channel.

4) Press the SET Softkey on the desired channel number to save the channel as a preset.

Pressing the BACK Softkey, or waiting during 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUME

Radio volume is shown as a percentage. Volume level is controlled by pressing the VOL Softkey, which brings up the MUTE Softkey and the volume increase and decrease softkeys.

Adjusting the volume:

1) With the XM Radio Page displayed, press the VOL Softkey.

2) Press the VOL – Softkey to reduce volume or press the VOL + Softkey to increase volume. (Once the VOL Softkey is pressed, the volume can also be adjusted using the small FMS Knob.)

3) Press the MUTE Softkey to mute the audio. Press the MUTE Softkey again to unmute the audio.
AUTOMATIC AUDIO MUTING

XM Radio audio is muted automatically when the aircraft groundspeed exceeds approximately 30 knots and the airspeed is less than approximately 80 knots. The audio is not unmuted automatically. The audio must be manually unmuted once the aircraft is airborne and outside the applicable speed range. Automatic Audio Muting has been implemented to meet regulatory requirements that the aural stall warning be heard.

When the aircraft is operating within the automute airspeed range, the MUTE Softkey and the volume softkeys are subdued, and the Unmute selection of the Page Menu is unavailable, preventing the audio from being unmuted at this time.

Audio availability conforms to the following three states:

- Audio is available on the ground until the aircraft exceeds 30 knots
- Audio is automatically muted (not available) from Airborne Status up to 80 knots airspeed
- Audio is available when airspeed is over 80 knots

**Unmuting XM audio:**

1) With the XM Radio Page displayed, press the VOL Softkey.
2) Press the MUTE Softkey to restore (unmute) XM Audio.

**Or:**

1) While on either the XM – Radio Page or the XM – Information Page, press the MENU Key to display the PAGE MENU.
2) Turn the large FMS Knob to select the Unmute option.
3) Press the ENT Key to restore (unmute) XM Audio.
8.6 SCHEDULER

The Scheduler feature can be used to enter and display reminder messages (e.g., Change oil, 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 8-76 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 Alerts Window and press the ENT Key.
5) Press the ENT Key again or use the large FMS Knob to move the cursor to the field next to Type.
6) Turn the small FMS Knob to select 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 Messages Window on the PFD. When a scheduler message is waiting, the ALERTS Softkey label changes to ADVISORY. Pressing the ADVISORY Softkey opens the Messages Window and acknowledges the scheduler message. The softkey label reverts to ALERTS when pressed. Pressing the ALERTS Softkey again removes the Messages Window from the display, and the scheduler message is deleted from the message queue.
8.7 ELECTRONIC CHECKLISTS

**NOTE:** The checklists presented here are for example only and may not reflect checklists actually available for the Diamond DA40. This material is not intended to replace the checklist information presented in the AFM or the Pilot Safety and Warning Supplements document.

**NOTE:** Garmin is not responsible for the content of checklists. Diamond DA40 checklists are created, modified, and updated by the aircraft manufacturer.

**NOTE:** Checklists cannot be edited from within the G1000 system. Refer to the Garmin Aviation Checklist Editor (ACE) User’s Guide for information on creating and editing checklists.

The optional checklist functions are displayed on two levels of softkeys that are available on any MFD page.

The MFD is able to display optional electronic checklists which allow a pilot to quickly find the proper procedure on the ground and during each phase of flight. The G1000 accesses the checklists from an SD card inserted into the bezel slot. If the SD card contains an invalid checklist file or no checklist, the Power-up Page messages display Invalid Checklist File or Checklist File Not Present and the CHKLIST Softkey is not available.

**Accessing and navigating checklists:**

1) From any page on the MFD, press the CHKLIST Softkey.

2) Turn the large FMS Knob to select the GROUP field.

3) Turn the small FMS Knob to select the desired procedure and press the ENT Key.

4) Turn the large FMS Knob to select the Checklist field.

5) Turn the FMS Knob to select the desired checklist and press the ENT Key.

6) Turn the FMS Knob to scroll through the checklist and highlight the desired checklist item. A hollow white box is used for the checkmark.

The following colors are used for checklist items:
### GROUP

**NORMAL OPERATING PROCEDURES**

**CHECKLIST**

**CHECK BEFORE ENGINE START**

<table>
<thead>
<tr>
<th>Item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric master</td>
<td>ON</td>
</tr>
<tr>
<td>Rudder pedals</td>
<td>ADJUSTED</td>
</tr>
<tr>
<td>Flight controls</td>
<td>CHECKED</td>
</tr>
<tr>
<td>Trims</td>
<td>CHECKED</td>
</tr>
<tr>
<td>Gear warning, fire detector</td>
<td>TEST</td>
</tr>
<tr>
<td>* Device ANNUNTEST</td>
<td>ON</td>
</tr>
<tr>
<td>* DEICE LVL LO caution</td>
<td>CHECKED ON</td>
</tr>
<tr>
<td>* Windshield deicing</td>
<td>PUMP 1 + 2</td>
</tr>
<tr>
<td>Flaps</td>
<td>LDG</td>
</tr>
<tr>
<td>Variable elevator backstop</td>
<td>CHECK</td>
</tr>
<tr>
<td>Flaps</td>
<td>UP</td>
</tr>
<tr>
<td>Passengers</td>
<td>INSTRUCTED</td>
</tr>
<tr>
<td>Seat belts</td>
<td>FASTENED</td>
</tr>
<tr>
<td>Rear door</td>
<td>CLOSED and LATCHED</td>
</tr>
<tr>
<td>Front canopy</td>
<td>POS. 1 or 2</td>
</tr>
<tr>
<td>MFD</td>
<td>ENGINE - FUEL</td>
</tr>
<tr>
<td>Fuel quantity</td>
<td>CHECKED, RESET, SET if required</td>
</tr>
<tr>
<td>Fuel temperature</td>
<td>CHECKED</td>
</tr>
<tr>
<td>Total time in service</td>
<td>NOTED</td>
</tr>
<tr>
<td>MFD</td>
<td>ENGINE - SYSTEM</td>
</tr>
<tr>
<td>* DEIC PRESS LO caution</td>
<td>CHECKED ON</td>
</tr>
<tr>
<td>* Device ANNUNTEST</td>
<td>OFF</td>
</tr>
<tr>
<td>Power levers (CL)</td>
<td>IDLE</td>
</tr>
<tr>
<td>ACL (strobe)</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Figure 8-79 Sample Checklist**
Immediately accessing emergency procedures:

1) From any page, press the CHKLIST Softkey.

2) Press the EMERG CY Softkey.

---

<table>
<thead>
<tr>
<th>GROUP</th>
<th>EMERGENCY Procedures ENGINE CHECKLIST ENGINE FAILURE DURING TAKE-OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rejected Take-off or emergency landing</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td></td>
</tr>
<tr>
<td>Brakes</td>
<td></td>
</tr>
<tr>
<td>ATC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If necessary</td>
</tr>
<tr>
<td>Engine masters (2)</td>
<td>OFF</td>
</tr>
<tr>
<td>Fuel selectors (2)</td>
<td>OFF</td>
</tr>
<tr>
<td>Electric master</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Figure 8-80  Emergency Checklist Page Example
8.8 ABNORMAL OPERATION

GDL 69/69A DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to XM
- Ensure the XM subscription has been activated
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver
- Ensure that nothing is plugged into the MUSIC INPUT jack because that would prevent XM radio from being heard

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69/69A) status, serial number, and software version number. If a failure has been detected in the GDL 69/69A the status is marked with a red X.

**Selecting the System Status Page:**

1) Turn the large FMS Knob to select the AUX Page Group.
2) Turn the small FMS Knob to select the System Status Page (the last page in the AUX Page Group).

![LRU Information Window on System Status Page](image-url)
If a failure still exists, the following messages may provide insight as to the possible problem:

<table>
<thead>
<tr>
<th>Message</th>
<th>Message Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHECK ANTENNA</td>
<td>XM Radio Page - active channel field</td>
<td>Data Link Receiver antenna error; service required</td>
</tr>
<tr>
<td>UPDATING</td>
<td>XM Radio Page - active channel field</td>
<td>Data Link Receiver updating encryption code</td>
</tr>
<tr>
<td>NO SIGNAL</td>
<td>XM Radio Page - active channel field</td>
<td>Loss of signal; signal strength too low for receiver</td>
</tr>
<tr>
<td>LOADING</td>
<td>Weather Datalink Page - center of page</td>
<td>Acquiring channel audio or information</td>
</tr>
<tr>
<td>OFF AIR</td>
<td>XM Radio Page - active channel field</td>
<td>Channel not in service</td>
</tr>
<tr>
<td>---</td>
<td>XM Radio Page - active channel field</td>
<td>Missing channel information</td>
</tr>
<tr>
<td>WEATHER DATA LINK FAILURE</td>
<td>Weather Datalink Page - center of page</td>
<td>No communication from Data Link Receiver within last 5 minutes</td>
</tr>
<tr>
<td>ACTIVATION REQUIRED</td>
<td>Weather Datalink Page - center of page</td>
<td>XM subscription is not activated</td>
</tr>
</tbody>
</table>

Table 8-3  GDL 69/69A Data Link Receiver Error Messages

SVS TROUBLESHOOTING

SVS is intended to be used with traditional attitude, heading, obstacle, terrain, and traffic inputs. SVS is disabled when valid attitude or heading data is not available for the display. In case of invalid SVS data, the PFD display reverts to the standard blue-over brown attitude display.

SVS becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data
- 9 Arc-second Terrain data
- Obstacle data
- TAWS function is not available, in test mode, or failed
- The position of the aircraft exceeds the range of the terrain database.
ANNUNCIATIONS AND ALERTS

NOTE: The Aircraft Flight Manual (AFM) supersedes information found in this document.

The G1000 Alerting System conveys alerts using the following:

• **Annunciation Window:** The Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described in the following section. The Annunciation Window is located to the right of the Altimeter and Vertical Speed Indicator. All aircraft annunciations can be displayed simultaneously in the Annunciation Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window.

• **Alerts Window:** The Alerts Window displays text messages for up to 64 prioritized alert messages. Pressing the ALERTS Softkey displays the Alerts Window. Pressing the ALERTS Softkey a second time removes the Alerts Window from the display. When the Alerts Window is displayed, the FMS Knob can be used to scroll through the alert message list.

• **Softkey Annunciation:** During certain alerts, the ALERTS Softkey may appear as a flashing annunciation to accompany an alert. The ALERTS Softkey assumes a new label consistent with the alert level (WARNING, CAUTION, or ADVISORY). By selecting the softkey when flashing an annunciation, the alert is acknowledged. The softkey label then returns to ALERTS. If alerts are still present, the ALERTS label is displayed in white with black text. Selecting the ALERTS Softkey a second time views the alert text messages.

• **System Annunciation:** Typically, a large red ‘X’ appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the G1000 System Annunciations Section for more information.

![Figure A-1  G1000 Alerting System](image-url)
• **Audio Alerting System:** The G1000 System issues audio alert tones when specific system conditions are met. See the Alert Level Definitions Section for more information. The annunciation tone may be tested from the AUX - System Status Page.

**Testing the system annunciation tone:**

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

Or:

a) Press the **MENU** Key.

b) Highlight ‘Enable Annunciator Test Mode’ and press the **ENT** Key.

![Figure A-2 Annunciation Tone Testing (AUX-System Status Page)](image)

**ALERT LEVEL DEFINITIONS**

The G1000 Alerting System, as installed in Diamond DA40/40F aircraft, uses three alert levels.

• **WARNING:** This level of alert requires immediate attention.

  Warning alert text is shown in red in the Annunciation Window and is accompanied by a continuous chime and a flashing ‘WARNING’ Softkey annunciation. Pressing the **WARNING** Softkey acknowledges the presence of the warning alert and stops the aural chime.

• **CAUTION:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require intervention.
Caution alert text is shown in yellow in the Annunciation Window and is accompanied by a single chime and a flashing ‘CAUTION’ Softkey annunciation. Pressing the CAUTION Softkey acknowledges the presence of the caution alert.

- **ANNUNCIATION OR MESSAGE ADVISORY:** This level of alert provides general information.

  Annunciation alert text is shown in white in the Annunciation Window; no aural tone is generated. An annunciation alert is accompanied by a flashing ADVISORY Softkey annunciation. Pressing the ADVISORY Softkey acknowledges the presence of the annunciation alert.

  Message advisory alerts do not issue annunciations in the Annunciation Window. Instead, message advisory alerts only issue a flashing ‘ADVISORY’ Softkey annunciation. Selecting the ADVISORY Softkey acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts Window.

![Figure A-3 Softkey Annunciation (ALERTS Softkey Labels)](image)

**AIRCRAFT ALERTS**

The following alerts are configured specifically for the Diamond DA40/40F. Red annunciation window text signifies warnings and yellow, cautions. See the Aircraft Flight Manual Supplement (AFMS) for recommended pilot actions.

<table>
<thead>
<tr>
<th>Annunciation Window Text</th>
<th>Alerts Window Message</th>
<th>Audio Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL PRES LO</td>
<td>Oil pressure is below 25 psi.</td>
<td>Continuous Aural Tone</td>
</tr>
<tr>
<td>FUEL PRES LO*</td>
<td>Fuel pressure is below 14 psi. (1.0 psi on DA40F)</td>
<td></td>
</tr>
<tr>
<td>FUEL PRES HI*</td>
<td>Fuel pressure is greater than 35 psi. (8 psi on DA40F)</td>
<td></td>
</tr>
<tr>
<td>ALTERNATOR</td>
<td>Alternator failed. Battery is only elec source.</td>
<td></td>
</tr>
<tr>
<td>STARTER ENGD</td>
<td>Starter is engaged.</td>
<td></td>
</tr>
<tr>
<td>DOOR OPEN</td>
<td>Canopy and/or rear door is not closed and locked.</td>
<td></td>
</tr>
<tr>
<td>TRIM FAIL**</td>
<td>Autopilot automatic trim has failed.</td>
<td>None</td>
</tr>
<tr>
<td>L FUEL LOW</td>
<td>Left fuel quantity is less than 3 gallons.</td>
<td>Single Aural Tone</td>
</tr>
<tr>
<td>R FUEL LOW</td>
<td>Right fuel quantity is less than 3 gallons</td>
<td></td>
</tr>
<tr>
<td>LOW VOLTS</td>
<td>On-board voltage is below 24 V.</td>
<td></td>
</tr>
<tr>
<td>PITOT FAIL</td>
<td>Pitot heat is inoperative.</td>
<td></td>
</tr>
<tr>
<td>PITOT OFF</td>
<td>Pitot heat is off.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>PFD FAN FAIL – The cooling fan for the PFD is inoperative.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>MFD FAN FAIL – The cooling fan for the MFD is inoperative.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GIA FAN FAIL – The cooling fan for the GIAS is inoperative.</td>
<td></td>
</tr>
</tbody>
</table>

* Values differ for the DA40F; refer to the Aircraft Flight Manual Supplement (AFMS) for more information.
** KAP 140 installations only.
**VOICE ALERTS**

The following audio alerts are announced by the system using a voice of male or female gender. If the optional Terrain Awareness and Warning System is installed, voice alerts are also generated (refer to the TAWS Alerts section).

<table>
<thead>
<tr>
<th>Voice Alert</th>
<th>Alert Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Minimums, Minimums”</td>
<td>Issued when the aircraft transitions through the minimum descent altitude/decision height (MDA/DH)</td>
</tr>
<tr>
<td>“Vertical Track”</td>
<td>Aircraft is one minute from Top of Descent - issued only when vertical navigation is enabled</td>
</tr>
<tr>
<td>“Traffic”</td>
<td>TIS voice alert - issued when a Traffic Advisory (TA) is issued</td>
</tr>
<tr>
<td>“Traffic Not Available”</td>
<td>TIS voice alert - issued when the TIS traffic system fails or cannot communicate</td>
</tr>
<tr>
<td>“Traffic, Traffic”</td>
<td>TAS voice alert - issued when a Traffic Advisory (TA) is issued</td>
</tr>
<tr>
<td>“Traffic Advisory System Test Passed”</td>
<td>TAS voice alert - issued when the TAS passes a pilot-initiated self test</td>
</tr>
<tr>
<td>“Traffic Advisory System Test Failed”</td>
<td>TAS voice alert - issued when the TAS fails a pilot-initiated self test</td>
</tr>
</tbody>
</table>

**Selecting the audio alert voice:**

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the voice in the Audio Alert Box.
4) Turn the small **FMS** Knob to select the desired voice, press the ENT Key.
G1000 SYSTEM ANNUNCIATIONS

**NOTE:** Upon power-up, certain windows remain invalid as G1000 equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the G1000 System should be serviced by a Garmin-authorized repair facility.

When an LRU or an LRU function fails, a large red ‘X’ is typically displayed on windows associated with the failed data (refer to Figure B-1 for all possible flags and the responsible LRUs). Refer to the Aircraft Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.

The status of detected LRUs can be checked on the AUX - System Status Page (Figure A-2). Active LRUs are indicated by green check marks; failed, by red ‘Xs. Failed LRUs should be noted and a service center or Garmin-authorized dealer informed.

**Viewing LRU information:**

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

2) To place the cursor in the ‘LRU Info’ Box,
   a) Select the LRU Softkey.
   Or:
   a) Press the MENU Key.
   b) With ‘Select LRU Window’ highlighted, press the ENT Key.

3) Use the FMS Knob to scroll through the box to view LRU status information.
<table>
<thead>
<tr>
<th>System Annunciation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Attitude and Heading Reference System is aligning." /></td>
<td>Display system is not receiving attitude information from the AHRS.</td>
</tr>
<tr>
<td><img src="image" alt="AHRS calibration incomplete or configuration module failure." /></td>
<td>Display system is not receiving vertical speed input from the air data computer.</td>
</tr>
<tr>
<td><img src="image" alt="This annunciation is seen only when the autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a red “X” soon appears over the Attitude Indicator." /></td>
<td>Display system is not receiving valid heading input from AHRS.</td>
</tr>
<tr>
<td><img src="image" alt="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 AFM)." /></td>
<td>Display system is not receiving valid true airspeed information from air data computer.</td>
</tr>
<tr>
<td><img src="image" alt="Other Various Red X Indications" /></td>
<td>Display system is not receiving valid OAT information from air data computer.</td>
</tr>
<tr>
<td><img src="image" alt="Display system is not receiving valid transponder information." /></td>
<td>Display system is not receiving valid transponder information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Annunciation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Display system is not receiving altitude input from the air data computer." /></td>
<td>Different versions of GDU software are installed in the PFD and MFD. This can also indicate different versions of the navigation database installed in the PFD and MFD. In some circumstances, a cross-talk error between the PFD and MFD can cause this annunciation.</td>
</tr>
<tr>
<td><img src="image" alt="A red ‘X’ through any other display field (such as engine instrumentation fields) indicates that the field is not receiving valid data." /></td>
<td>Other Various Red X Indications</td>
</tr>
</tbody>
</table>

*Comment:
- Attitude and Heading Reference System is aligning.
- Display system is not receiving attitude information from the AHRS.
- AHRS calibration incomplete or configuration module failure.
- This annunciation is seen only when the autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a red “X” soon appears over the Attitude Indicator.
- 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 AFM).
- Display system is not receiving airspeed input from air data computer.
## G1000 SYSTEM MESSAGE ADVISORIES

### NOTE: This section provides information regarding G1000 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.

This section describes various G1000 System message advisories. Certain messages are issued due to an LRU or LRU function failure. Such messages are normally accompanied by a corresponding red ‘X’ annunciation as shown previously in the G1000 System Annunciations section.

### PRIMARY FLIGHT DISPLAY & MULTI FUNCTION DISPLAY

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA LOST – Pilot stored data was lost. Recheck settings.</td>
<td>The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD &amp; PFD with preferred settings, if desired.</td>
</tr>
<tr>
<td>XTALK ERROR – A flight display crosstalk error has occurred.</td>
<td>The MFD and PFD are not communicating with each other. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 SERVICE – PFD1 needs service. Return unit for repair.</td>
<td>The PFD and/or MFD self-test has detected a problem. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MFD1 SERVICE – MFD1 needs service. Return unit for repair.</td>
<td>The PFD and/or MFD self-test has detected a problem. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST – PFD1 software mismatch, communication halted.</td>
<td>The PFD and/or MFD has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST – MFD1 software mismatch, communication halted.</td>
<td>The PFD and/or MFD has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 CONFIG – PFD1 config error. Config service req’d.</td>
<td>The PFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MFD1 CONFIG – MFD1 config error. Config service req’d.</td>
<td>The MFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>SW MISMATCH – GDU software version mismatch. Xtalk is off.</td>
<td>The MFD and PFD have different software versions installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.</td>
<td>The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td>MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.</td>
<td>The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 KEYSTK – PFD1 [key name] is stuck.</td>
<td>A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.</td>
</tr>
<tr>
<td>MFD1 KEYSTK – MFD1 [key name] is stuck.</td>
<td>A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.</td>
</tr>
<tr>
<td>CNFG MODULE – PFD1 configuration module is inoperative.</td>
<td>The PFD1 configuration module backup memory has failed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage</td>
<td>The PFD1 voltage is low. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage</td>
<td>The MFD voltage is low. The G1000 system should be serviced.</td>
</tr>
</tbody>
</table>
# DATABASES

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFD1 DB ERR – MFD1 aviation database error exists.</td>
<td>The MFD and/or PFD detected a failure in the aviation database. Attempt to reload the aviation database. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 aviation database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 basemap database error exists.</td>
<td>The MFD and/or PFD detected a failure in the basemap database.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 basemap database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 terrain database error exists.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 terrain database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 terrain database missing.</td>
<td>The terrain database is present on another LRU, but is missing on the specified LRU.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 terrain database missing.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 obstacle database error exists.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 obstacle database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 obstacle database missing.</td>
<td>The obstacle database is present on another LRU, but is missing on the specified LRU.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 obstacle database missing.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 airport terrain database error exists.</td>
<td>The MFD and/or PFD detected a failure in the airport terrain database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 airport terrain database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 airport terrain database missing.</td>
<td>The airport terrain database is present on another LRU, but is missing on the specified LRU.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 airport terrain database missing.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 Safe Taxi database error exists.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>PFD1 DB ERR – PFD1 Safe Taxi database error exists.</td>
<td></td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 Chartview database error exists.</td>
<td>The MFD and/or PFD detected a failure in the ChartView database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td>MFD1 DB ERR – MFD1 FliteCharts database error exists.</td>
<td>The MFD and/or PFD detected a failure in the FliteCharts database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.</td>
</tr>
</tbody>
</table>
## DATABASES (CONT.)

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB MISMATCH – Aviation database version mismatch. Xtalk is off.</td>
<td>The PFD and MFD have different aviation database versions installed. Crossfill is off. Install correct aviation database version in both displays.</td>
</tr>
<tr>
<td>DB MISMATCH – Aviation database type mismatch. Xtalk is off.</td>
<td>The PFD and MFD have different aviation database types installed (Americas, European, etc.). Crossfill is off. Install correct aviation database type in both displays.</td>
</tr>
<tr>
<td>DB MISMATCH – Terrain database version mismatch.</td>
<td>The PFD and MFD have different terrain database versions installed. Install correct terrain database version in both displays.</td>
</tr>
<tr>
<td>DB MISMATCH – Terrain database type mismatch.</td>
<td>The PFD and MFD have different terrain database types installed. Install correct terrain database type in both displays.</td>
</tr>
<tr>
<td>DB MISMATCH – Obstacle database version mismatch.</td>
<td>The PFD and MFD have different obstacle database versions installed. Install correct obstacle database version in both displays.</td>
</tr>
<tr>
<td>DB MISMATCH – Airport Terrain database mismatch.</td>
<td>The PFD and MFD have different airport terrain databases installed. Install correct airport terrain database in both displays.</td>
</tr>
</tbody>
</table>

### GMA 1347 AUDIO PANEL

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMA1 FAIL – GMA1 is inoperative.</td>
<td>The audio panel self-test has detected a failure. The audio panel is unavailable. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>GMA1 CONFIG – GMA1 config error. Config service req’d.</td>
<td>The audio panel configuration settings do not match backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST – GMA1 software mismatch, communication halted.</td>
<td>The audio panel has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>GMA1 SERVICE – GMA1 needs service. Return unit for repair.</td>
<td>The audio panel self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio panel may still be usable. The G1000 system should be serviced when possible.</td>
</tr>
</tbody>
</table>

### GEA 71 ENGINE/AIRFRAME UNIT

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEA1 CONFIG – GEA1 config error. Config service req’d.</td>
<td>The GEA1 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST – GEA1 software mismatch, communication halted.</td>
<td>The #1 GEA 71 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
</tbody>
</table>

### GDC 74A AIR DATA COMPUTER

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANIFEST – GDC1 software mismatch, communication halted.</td>
<td>The GDC 74A has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>ADC1 ALT EC – ADC1 altitude error correction is unavailable.</td>
<td>GDC1 is reporting that the altitude error correction is unavailable.</td>
</tr>
<tr>
<td>ADC1 AS EC – ADC1 airspeed error correction is unavailable.</td>
<td>GDC1 is reporting that the airspeed error correction is unavailable.</td>
</tr>
</tbody>
</table>
### APPENDIX A

#### GIA 63 INTEGRATED AVIONICS UNIT

<table>
<thead>
<tr>
<th>Message</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GIA1 CONFIG</strong> – GIA1 config error. Config service req’d.</td>
<td>The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 CONFIG</strong> – GIA2 config error. Config service req’d.</td>
<td>The GIA1 and/or GIA2 have an error in the audio configuration. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA1 COOLING</strong> – GIA1 temperature too low.</td>
<td>The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.</td>
</tr>
<tr>
<td><strong>GIA2 COOLING</strong> – GIA2 temperature too low.</td>
<td>The GIA1 and/or GIA2 temperature is too high. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA1 SERVICE</strong> – GIA1 needs service. Return the unit for repair.</td>
<td>The GIA1 and/or GIA2 self-test has detected a problem in the unit. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 SERVICE</strong> – GIA2 needs service. Return the unit for repair.</td>
<td>The GIA1 and/or GIA2 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>MANIFEST</strong> – GIA1 software mismatch, communication halted.</td>
<td>The GIA1 and/or GIA2 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>MANIFEST</strong> – GIA2 software mismatch, communication halted.</td>
<td>The GIA1 and/or GIA2 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM1 TEMP</strong> – COM1 over temp. Reducing transmitter power.</td>
<td>The system has detected an over temperature condition in COM1 and/or COM2. The transmitter will operate at reduced power. If the problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM2 TEMP</strong> – COM2 over temp. Reducing transmitter power.</td>
<td>The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td><strong>COM1 SERVICE</strong> – COM1 needs service. Return unit for repair.</td>
<td>The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td><strong>COM2 SERVICE</strong> – COM2 needs service. Return unit for repair.</td>
<td>The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td><strong>COM1 PTT</strong> – COM1 push-to-talk key is stuck.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM2 PTT</strong> – COM2 push-to-talk key is stuck.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM1 RMT XFR</strong> – COM1 remote transfer key is stuck.</td>
<td>The COM1 and/or COM2 remote transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM2 RMT XFR</strong> – COM2 remote transfer key is stuck.</td>
<td>The COM1 and/or COM2 remote transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.</td>
</tr>
</tbody>
</table>
## APPENDIX A

### GIA 63 (CONT.)

<table>
<thead>
<tr>
<th>Message</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RAIM UNAVAIL</strong></td>
<td>RAIM is not available from FAF to MAP waypoints.</td>
</tr>
<tr>
<td><strong>LOI</strong></td>
<td>GPS integrity lost. Crosscheck with other NAVS.</td>
</tr>
<tr>
<td><strong>GPS NAV LOST</strong></td>
<td>Loss of GPS navigation. Insufficient satellites.</td>
</tr>
<tr>
<td><strong>GPS NAV LOST</strong></td>
<td>Loss of GPS navigation. Position error.</td>
</tr>
<tr>
<td><strong>GPS NAV LOST</strong></td>
<td>Loss of GPS navigation. GPS fail.</td>
</tr>
<tr>
<td><strong>ABORT APR</strong></td>
<td>Abort approach due to loss of GPS navigation.</td>
</tr>
<tr>
<td><strong>TRUE APR</strong></td>
<td>Displayed after passing the first waypoint of a true north approach when the nav angle is set to ‘AUTO’.</td>
</tr>
<tr>
<td><strong>GPS1 FAIL</strong></td>
<td>A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver is unavailable.</td>
</tr>
<tr>
<td><strong>GPS2 FAIL</strong></td>
<td>A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available.</td>
</tr>
<tr>
<td><strong>GPS1 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in the GPS1 and/or GPS2 receiver.</td>
</tr>
<tr>
<td><strong>GPS2 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in the GPS1 and/or GPS2 receiver.</td>
</tr>
<tr>
<td><strong>NAV1 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in the NAV1 and/or NAV2 receiver.</td>
</tr>
<tr>
<td><strong>NAV2 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in the NAV1 and/or NAV2 receiver.</td>
</tr>
<tr>
<td><strong>NAV1 RMT XFR</strong></td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>NAV2 RMT XFR</strong></td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>G/S1 FAIL</strong></td>
<td>A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>G/S2 FAIL</strong></td>
<td>A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td><strong>G/S1 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>G/S2 SERVICE</strong></td>
<td>Return unit for repair. A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 system should be serviced when possible.</td>
</tr>
</tbody>
</table>
# APPENDIX A

## GIA 63W INTEGRATED AVIONICS UNIT

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GIA1 CONFIG</strong> – GIA1 config error. Config service req’d.</td>
<td>The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 CONFIG</strong> – GIA2 config error. Config service req’d.</td>
<td></td>
</tr>
<tr>
<td><strong>GIA1 CONFIG</strong> – GIA1 audio config error. Config service req’d.</td>
<td>The GIA1 and/or GIA2 have an error in the audio configuration. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 CONFIG</strong> – GIA2 audio config error. Config service req’d.</td>
<td></td>
</tr>
<tr>
<td><strong>GIA1 COOLING</strong> – GIA1 temperature too low.</td>
<td>The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.</td>
</tr>
<tr>
<td><strong>GIA2 COOLING</strong> – GIA2 temperature too low.</td>
<td></td>
</tr>
<tr>
<td><strong>GIA1 COOLING</strong> – GIA1 over temperature.</td>
<td>The GIA1 and/or GIA2 temperature is too high. If problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 COOLING</strong> – GIA2 over temperature.</td>
<td></td>
</tr>
<tr>
<td><strong>GIA1 SERVICE</strong> – GIA1 needs service. Return the unit for repair.</td>
<td>The GIA1 and/or GIA2 self-test has detected a problem in the unit. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>GIA2 SERVICE</strong> – GIA2 needs service. Return the unit for repair.</td>
<td></td>
</tr>
<tr>
<td><strong>HW MISMATCH</strong> – GIA hardware mismatch. GIA1 communication halted.</td>
<td>A GIA mismatch has been detected, where only one is WAAS capable.</td>
</tr>
<tr>
<td><strong>HW MISMATCH</strong> – GIA hardware mismatch. GIA2 communication halted.</td>
<td></td>
</tr>
<tr>
<td><strong>MANIFEST</strong> – GIA1 software mismatch, communication halted.</td>
<td>The GIA1 and/or GIA 2 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>MANIFEST</strong> – GIA2 software mismatch, communication halted.</td>
<td></td>
</tr>
<tr>
<td><strong>COM1 TEMP</strong> – COM1 over temp. Reducing transmitter power.</td>
<td>The system has detected an over temperature condition in COM1 and/or COM2. The transmitter operates at reduced power. If the problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM2 TEMP</strong> – COM2 over temp. Reducing transmitter power.</td>
<td></td>
</tr>
<tr>
<td><strong>COM1 SERVICE</strong> – COM1 needs service. Return unit for repair.</td>
<td>The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td><strong>COM2 SERVICE</strong> – COM2 needs service. Return unit for repair.</td>
<td></td>
</tr>
<tr>
<td><strong>COM1 PTT</strong> – COM1 push-to-talk key is stuck.</td>
<td>The COM1 and/or COM2 external push-to-talk switch is stuck in the enable (or &quot;pressed&quot;) position. Press the PTT switch again to cycle its operation. If the problem persists, the G1000 system should be serviced.</td>
</tr>
<tr>
<td><strong>COM2 PTT</strong> – COM2 push-to-talk key is stuck.</td>
<td></td>
</tr>
</tbody>
</table>
## GIA 63W (CONT.)

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1 RMT XFR – COM1 remote transfer key is stuck.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>COM2 RMT XFR – COM2 remote transfer key is stuck.</td>
<td></td>
</tr>
<tr>
<td>LOI – GPS integrity lost. Crosscheck with other NAVS.</td>
<td>GPS integrity is insufficient for the current phase of flight.</td>
</tr>
<tr>
<td>ABORT APR – Loss of GPS navigation. Abort approach.</td>
<td>Abort approach due to loss of GPS navigation.</td>
</tr>
<tr>
<td>APR DWNGRADE – Approach downgraded.</td>
<td>Use LNAV minima when approach is downgraded.</td>
</tr>
<tr>
<td>TRUE APR – True north approach. Change HDG reference to TRUE.</td>
<td>Displayed after passing the first waypoint of a true north approach when the nav angle is set to ‘MAGNETIC’.</td>
</tr>
<tr>
<td>GPS1 SERVICE – GPS1 needs service. Return unit for repair.</td>
<td>A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>GPS2 SERVICE – GPS2 needs service. Return unit for repair.</td>
<td></td>
</tr>
<tr>
<td>NAV1 SERVICE – NAV1 needs service. Return unit for repair.</td>
<td>A failure has been detected in the NAV1 and/or NAV2 receiver. The receiver may still be available. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>NAV2 SERVICE – NAV2 needs service. Return unit for repair.</td>
<td></td>
</tr>
<tr>
<td>NAV1 RMT XFR – NAV1 remote transfer key is stuck.</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>NAV2 RMT XFR – NAV2 remote transfer key is stuck.</td>
<td></td>
</tr>
<tr>
<td>G/S1 FAIL – G/S1 is inoperative.</td>
<td>A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>G/S2 FAIL – G/S2 is inoperative.</td>
<td></td>
</tr>
<tr>
<td>G/S1 SERVICE – G/S1 needs service. Return unit for repair.</td>
<td>A failure has been detected in glideslope receiver 1 and/or receiver 2. The receiver may still be available. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td>G/S2 SERVICE – G/S2 needs service. Return unit for repair.</td>
<td></td>
</tr>
</tbody>
</table>
### GTX 33 TRANSPONDER

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPDR1 CONFIG</td>
<td>The transponder configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST</td>
<td>The transponder has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>XPDR1 SRVC</td>
<td>The #1 transponder should be serviced when possible.</td>
</tr>
<tr>
<td>XPDR1 FAIL</td>
<td>There is no communication with the #1 transponder.</td>
</tr>
</tbody>
</table>

### GRS 77 ATTITUDE AND HEADING REFERENCE SYSTEM

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHR1 TAS</td>
<td>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 G1000 system should be serviced.</td>
</tr>
<tr>
<td>AHR1 GPS</td>
<td>The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The G1000 system should be serviced when possible.</td>
</tr>
<tr>
<td>AHR1 GPS</td>
<td>The #1 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>AHR1 GPS</td>
<td>The #1 AHRS is not receiving backup GPS information. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>AHR1 GPS</td>
<td>The #1 AHRS is operating exclusively in no-GPS mode. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>AHR1 MAG DB</td>
<td>The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.</td>
</tr>
<tr>
<td>AHR1 SRVC</td>
<td>The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.</td>
</tr>
<tr>
<td>GEO LIMITS</td>
<td>The aircraft is outside geographical limits for approved AHRS operation. Heading is flagged as invalid.</td>
</tr>
<tr>
<td>MANIFEST</td>
<td>The #1 AHRS has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
</tbody>
</table>

### GDL 69/69A SATELLITE DATALINK RECEIVER

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDL69 CONFIG</td>
<td>GDL 69 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>GDL69 FAIL</td>
<td>A failure has been detected in the GDL 69. The receiver is unavailable. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST</td>
<td>The GDL 69 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
</tbody>
</table>
## GMU 44 Magnetometer

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDG FAULT – AHRS1 magnetometer</td>
<td>A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for</td>
</tr>
<tr>
<td>fault has occurred.</td>
<td>backup mode operation. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>MANIFEST – GMU1 software</td>
<td>The GMU 44 has incorrect software installed. The G1000 system should be serviced.</td>
</tr>
<tr>
<td>mismatch, communication halted.</td>
<td></td>
</tr>
</tbody>
</table>

## Miscellaneous

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPL WPT LOCK – Flight plan</td>
<td>Upon power-up, the G1000 system detects that a stored flight plan waypoint is locked. This occurs when an aviation 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.</td>
</tr>
<tr>
<td>is locked.</td>
<td></td>
</tr>
<tr>
<td>FPL WPT MOVE – Flight plan</td>
<td>The system has detected that a waypoint coordinate has changed due to a new aviation database update. Verify that stored flight plans contain correct waypoint locations.</td>
</tr>
<tr>
<td>waypoint moved.</td>
<td></td>
</tr>
<tr>
<td>TIMER EXPIRD – Timer has expired.</td>
<td>The system notifies the pilot that the timer has expired.</td>
</tr>
<tr>
<td>DB CHANGE – Database changed.</td>
<td>This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after an aviation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.</td>
</tr>
<tr>
<td>Verify user modified procedures.</td>
<td></td>
</tr>
<tr>
<td>DB CHANGE – Database changed.</td>
<td>This occurs when a stored flight plan contains an airway that is no longer consistent with the aviation database. This alert is issued only after an aviation database update. Verify use of airways in stored flight plans and reload airways as needed.</td>
</tr>
<tr>
<td>Verify stored airways.</td>
<td></td>
</tr>
<tr>
<td>FPL TRUNC – Flight plan has</td>
<td>This occurs when a newly installed aviation 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.</td>
</tr>
<tr>
<td>been truncated.</td>
<td></td>
</tr>
<tr>
<td>LOCKED FPL – Cannot navigate</td>
<td>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.</td>
</tr>
<tr>
<td>locked flight plan.</td>
<td></td>
</tr>
<tr>
<td>WPT ARRIVAL – Arriving at waypoint</td>
<td>Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.</td>
</tr>
<tr>
<td>[xxxx]</td>
<td></td>
</tr>
<tr>
<td>STEEP TURN – Steep turn ahead.</td>
<td>A steep turn is 15 seconds ahead. Prepare to turn.</td>
</tr>
<tr>
<td>INSIDE ARSPC – Inside airspace.</td>
<td>The aircraft is inside the airspace.</td>
</tr>
<tr>
<td>ARSPC AHEAD – Airspace ahead less</td>
<td>Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.</td>
</tr>
<tr>
<td>than 10 minutes.</td>
<td></td>
</tr>
<tr>
<td>ARSPC NEAR – Airspace near and</td>
<td>Special use airspace is near and ahead of the aircraft position.</td>
</tr>
<tr>
<td>ahead.</td>
<td></td>
</tr>
<tr>
<td>ARSPC NEAR – Airspace near – less</td>
<td>Special use airspace is within 2 nm of the aircraft position.</td>
</tr>
<tr>
<td>than 2 nm.</td>
<td></td>
</tr>
<tr>
<td>APR INACTV – Approach is not active.</td>
<td>The system notifies the pilot that the loaded approach is not active. Activate approach when required.</td>
</tr>
</tbody>
</table>
## MISCELLANEOUS (CONT.)

<table>
<thead>
<tr>
<th>Message Advisory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLCT FREQ — Select appropriate frequency for approach.</td>
<td>The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.</td>
</tr>
<tr>
<td>SLCT NAV — Select NAV on CDI for approach.</td>
<td>The system notifies the pilot to set the CDI to the correct NAV receiver. Set the CDI to the correct NAV receiver.</td>
</tr>
<tr>
<td>PTK FAIL — Parallel track unavailable: bad geometry.</td>
<td>Bad parallel track geometry.</td>
</tr>
<tr>
<td>PTK FAIL — Parallel track unavailable: invalid leg type.</td>
<td>Invalid leg type for parallel offset.</td>
</tr>
<tr>
<td>PTK FAIL — Parallel track unavailable: past IAF.</td>
<td>IAF waypoint for parallel offset has been passed.</td>
</tr>
<tr>
<td>UNABLE V WPT — Can’t reach current vertical waypoint.</td>
<td>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.</td>
</tr>
<tr>
<td>VNV — Unavailable. Unsupported leg type in flight plan.</td>
<td>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.</td>
</tr>
<tr>
<td>VNV — Unavailable. Excessive crosstrack error.</td>
<td>The current crosstrack exceeds the limit, causing vertical deviation to go invalid.</td>
</tr>
<tr>
<td>VNV — Unavailable. Excessive track angle error.</td>
<td>The current track angle error exceeds the limit, causing the vertical deviation to go invalid.</td>
</tr>
<tr>
<td>VNV — Unavailable. Parallel course selected.</td>
<td>A parallel course has been selected, causing the vertical deviation to go invalid.</td>
</tr>
<tr>
<td>NO WGS84 WPT — Non WGS 84 waypoint for navigation - [xxxx]</td>
<td>The selected waypoint [xxxx] does not use the WGS 84 datum. Cross-check position with alternate navigation sources.</td>
</tr>
<tr>
<td>TRAFFIC FAIL — Traffic device has failed.</td>
<td>The G1000 is no longer receiving data from the traffic system. The traffic device should be serviced.</td>
</tr>
<tr>
<td>STRMSCP FAIL — Stormscope has failed.</td>
<td>Stormscope has failed. The G1000 System should be serviced.</td>
</tr>
<tr>
<td>FAILED PATH — A data path has failed.</td>
<td>A data path connected to the GDU or the GIA 63/63W has failed.</td>
</tr>
<tr>
<td>MAG VAR WARN — Large magnetic variance. Verify all course angles.</td>
<td>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°.</td>
</tr>
<tr>
<td>SCHEDULER [#] — &lt;message&gt;.</td>
<td>Message criteria entered by the user.</td>
</tr>
<tr>
<td>SVS — SVS DISABLED: Out of available terrain region.</td>
<td>Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.</td>
</tr>
<tr>
<td>SVS — SVS DISABLED: Terrain DB resolution too low.</td>
<td>Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.</td>
</tr>
</tbody>
</table>
AFCS STATUS ANNUNCIATIONS

The following annunciations (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.

**Figure A-5  AFCS Status Annunciation**

<table>
<thead>
<tr>
<th>Alert Condition</th>
<th>Annunciation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aileron Mistrim Right</td>
<td>AIL</td>
<td>Roll servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Aileron Mistrim Left</td>
<td>←AIL</td>
<td></td>
</tr>
<tr>
<td>Elevator Mistrim Down</td>
<td>ELE</td>
<td>Pitch servo providing sustained force in the indicated direction</td>
</tr>
<tr>
<td>Elevator Mistrim Up</td>
<td>↑ELE</td>
<td></td>
</tr>
<tr>
<td>Pitch Trim Failure (or stuck AP TRIM Switch)</td>
<td>PTRM</td>
<td>If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move AP TRIM switches separately to unstick</td>
</tr>
<tr>
<td>Roll Failure</td>
<td>ROLL</td>
<td>Roll axis control failure; AP inoperative</td>
</tr>
<tr>
<td>Pitch Failure</td>
<td>PITCH</td>
<td>Pitch axis control failure; AP inoperative</td>
</tr>
<tr>
<td>System Failure</td>
<td>AFCS</td>
<td>AP and MET are unavailable; FD may still be available</td>
</tr>
<tr>
<td>Preflight Test</td>
<td>PFT</td>
<td>Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preflight system test failed; aural alert sounds at failure</td>
</tr>
</tbody>
</table>
SVS TERRAIN ALERTS

Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD. For more information on SVS Terrain, refer to the Hazard Avoidance Section.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD TERRAIN-SVS Page Annunciation</th>
<th>Pop-Up Alert (MFD Navigation Map Page)</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Required Terrain Clearance Warning (RTC)</td>
<td>TERRAIN</td>
<td>WARNING TERRAIN</td>
<td>“Warning; Terrain, Terrain”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Warning (ITI)</td>
<td>TERRAIN</td>
<td>WARNING TERRAIN</td>
<td>“Warning; Terrain, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Warning (ROC)</td>
<td>TERRAIN</td>
<td>WARNING OBSTACLE</td>
<td>“Warning; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Warning (IOI)</td>
<td>TERRAIN</td>
<td>WARNING OBSTACLE</td>
<td>“Warning; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Caution (RTC)</td>
<td>TERRAIN</td>
<td>CAUTION TERRAIN</td>
<td>“Caution; Terrain, Terrain”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Caution (ITI)</td>
<td>TERRAIN</td>
<td>CAUTION TERRAIN</td>
<td>“Caution; Terrain, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Caution (ROC)</td>
<td>TERRAIN</td>
<td>CAUTION OBSTACLE</td>
<td>“Caution; Obstacle, Obstacle”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Caution (IOI)</td>
<td>TERRAIN</td>
<td>CAUTION OBSTACLE</td>
<td>“Caution; Obstacle, Obstacle”</td>
</tr>
</tbody>
</table>

SVS TERRAIN STATUS ANNUNCIATIONS

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>PFD/MFD TERRAIN-SVS Page Annunciation</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Test Fail</td>
<td>TER FAIL</td>
<td>“Terrain System Failure”</td>
</tr>
<tr>
<td>Terrain Alerting is disabled</td>
<td>TER INHB</td>
<td>None</td>
</tr>
<tr>
<td>No GPS position or excessively degraded GPS signal</td>
<td>TER N/A</td>
<td>“Terrain System Not Available”</td>
</tr>
<tr>
<td>System Test in progress</td>
<td>TER TEST</td>
<td>None</td>
</tr>
<tr>
<td>System Test pass</td>
<td>None</td>
<td>“Terrain System Test OK”</td>
</tr>
<tr>
<td>GPS signal is re-established</td>
<td>None</td>
<td>“Terrain System Available”</td>
</tr>
</tbody>
</table>
**APPENDIX A**

**TERRAIN AWARENESS AND WARNING SYSTEM (TAWS) ALERTS**

Annunciations appear on the PFD and MFD. Pop-up alerts appear only on the MFD. For more information on TAWS, refer to the Hazard Avoidance Section.

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>Annunciation (PFD/MFD TAWS Page)</th>
<th>Pop-Up Alert (MFD Navigation Map Page)</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Descent Rate Warning (EDR)</td>
<td>PULL UP</td>
<td>PULL-UP</td>
<td>“Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Warning (RTC)</td>
<td>PULL UP or TERRAIN - PULL-UP</td>
<td>TERRAIN AHEAD - PULL-UP or TERRAIN - PULL-UP</td>
<td>“Terrain, Terrain; Pull Up, Pull Up” or “Terrain Ahead, Pull Up; Terrain Ahead, Pull Up”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Warning (ITI)</td>
<td>TERRAIN AHEAD - PULL-UP</td>
<td>or TERRAIN - PULL-UP</td>
<td>“Terrain Ahead, Pull Up; Terrain Ahead, Pull Up” or “Terrain, Terrain; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Warning (ROC)</td>
<td>PULL UP or OBSTACLE - PULL-UP</td>
<td>OBSTACLE AHEAD - PULL-UP or OBSTACLE - PULL-UP</td>
<td>“Obstacle, Obstacle; Pull Up, Pull Up” or “Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Warning (IOI)</td>
<td>OBSTACLE AHEAD - PULL-UP</td>
<td>or OBSTACLE - PULL-UP</td>
<td>“Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up” or “Obstacle, Obstacle; Pull Up, Pull Up”</td>
</tr>
<tr>
<td>Reduced Required Terrain Clearance Caution (RTC)</td>
<td>CAUTION - TERRAIN or TERRAIN AHEAD</td>
<td>TERRAIN - OBSTACLE or OBSTACLE AHEAD</td>
<td>“Caution, Terrain; Caution, Terrain” or “Terrain Ahead; Terrain Ahead”</td>
</tr>
<tr>
<td>Imminent Terrain Impact Caution (ITI)</td>
<td>TERRAIN AHEAD</td>
<td>or CAUTION - TERRAIN</td>
<td>“Terrain Ahead; Terrain Ahead” or “Caution, Terrain; Caution, Terrain”</td>
</tr>
<tr>
<td>Reduced Required Obstacle Clearance Caution (ROC)</td>
<td>CAUTION - OBSTACLE or OBSTACLE AHEAD</td>
<td>TERRAIN - OBSTACLE or OBSTACLE AHEAD</td>
<td>“Caution, Obstacle; Caution, Obstacle” or “Obstacle Ahead; Obstacle Ahead”</td>
</tr>
<tr>
<td>Imminent Obstacle Impact Caution (IOI)</td>
<td>OBSTACLE AHEAD or CAUTION - OBSTACLE</td>
<td>TERRAIN - OBSTACLE or OBSTACLE AHEAD</td>
<td>“Obstacle Ahead; Obstacle Ahead” or “Caution, Obstacle; Caution, Obstacle”</td>
</tr>
<tr>
<td>Premature Descent Alert Caution (PDA)</td>
<td>TERRAIN</td>
<td>TOO LOW - TERRAIN</td>
<td>“Too Low, Terrain”</td>
</tr>
<tr>
<td>Altitude Callout “500”</td>
<td>None</td>
<td>None</td>
<td>“Five-Hundred”</td>
</tr>
<tr>
<td>Excessive Descent Rate Caution (EDR)</td>
<td>TERRAIN</td>
<td>SINK RATE</td>
<td>“Sink Rate”</td>
</tr>
<tr>
<td>Negative Climb Rate Caution (NCR)</td>
<td>TERRAIN</td>
<td>DON’T SINK or TOO LOW - TERRAIN</td>
<td>“Don’t Sink” or “Too Low, Terrain”</td>
</tr>
</tbody>
</table>
APPENDIX A

TAWS SYSTEM STATUS ANNUNCIATIONS

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>Annunciation (PFD/MFD TAWS Page)</th>
<th>Pop-Up Alert (MFD Navigation Map Page)</th>
<th>Aural Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAWS System Test Fail</td>
<td>TAWS FAIL</td>
<td>None</td>
<td>“TAWS System Failure”</td>
</tr>
<tr>
<td>TAWS Alerting is disabled</td>
<td>TAWS INHB</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>No GPS position or excessively degraded GPS signal</td>
<td>TAWS N/A</td>
<td>None</td>
<td>“TAWS Not Available”</td>
</tr>
<tr>
<td>System Test in progress</td>
<td>TAWS TEST</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>System Test pass</td>
<td>None</td>
<td>None</td>
<td>“TAWS System Test OK”</td>
</tr>
<tr>
<td>GPS signal is re-established</td>
<td>None</td>
<td>None</td>
<td>“TAWS Available”</td>
</tr>
</tbody>
</table>

Figure A-6  TAWS Annunciation Locations
APPENDIX B

SD CARD USE AND DATABASES

The G1000 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 aviation and ChartView database updates.

⚠️ **CAUTION:** Do not load Jeppesen navigation data (except ChartView) onto Garmin Supplemental Data Cards.

JEPPESSEN DATABASES

The Jeppesen aviation database is updated on a 28-day cycle. The optional ChartView database is updated on a 14-day cycle. If the ChartView database is not updated within 70 days of the expiration date, ChartView no longer functions.

Both these databases are provided directly from Jeppesen. The ChartView database should be copied to the Garmin supplied Supplemental Data Card which resides in the bottom card slot on the MFD. The aviation 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 aviation database is installed, the card may be removed.

Updating the Jeppesen aviation database:

1) With the G1000 System OFF, insert the SD card containing the aviation database update into the top card slot of the PFD to be updated (label of SD card should face left).

2) Turn the G1000 System ON. A prompt similar to the following is displayed in the upper left corner of the PFD:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
FROM: WORLDWIDE
TO: WORLDWIDE
CYCLE: 0604 0605
EFFECTIVE: 13-APR-2006 11-MAY-2006
EXPIRES: 11-MAY-2006 08-JUN-2006

NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-1 Database Update Prompt

3) Press the **ENT** Key to start the database update. A prompt similar to the following is displayed:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
FROM: WORLDWIDE
TO: WORLDWIDE
CYCLE: 0604 0605
EFFECTIVE: 13-APR-2006 11-MAY-2006
EXPIRES: 11-MAY-2006 08-JUN-2006

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING AVIATION DATABASE, PLEASE WAIT.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation
4) After the update completes, the PFD continues to power-up normally.
5) Turn the G1000 System OFF and remove the SD card.
6) Repeat steps 1 through 4 for the MFD. The MFD and PFD databases are now updated. Remove the SD card when finished.
7) Verify the correct update cycle is loaded during MFD power-up.

GARMIN DATABASES

**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 following G1000 databases are stored on Supplemental Data Cards provided by Garmin:

- **Expanded basemap** – 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.

- **Terrain** – The terrain database contains terrain mapping data. It is updated periodically and has no expiration date.

- **Airport terrain** – The airport terrain database contains airport diagram data. It is updated periodically and has no expiration date.

- **Obstacle** – The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.

- **SafeTaxi** – 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.

- **FliteCharts** – 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 no longer functions.

Since these databases are not stored internally in the PFD or MFD, a Supplemental Data Card containing identical database versions must be kept in each display unit. After subscribing to the desired databases product, these database products will be downloaded to two Supplemental Data Cards (with the exception of FliteCharts, which is loaded on only one card). Insert each Supplemental Data Card into the correct location shown in Figure B-3. If one of the Supplemental Data Cards contains the ChartView database, or the FliteCharts database, this card must be inserted into the bottom card slot on the MFD. These cards must not be removed except to update the databases stored on each card.
The Garmin database updates can be obtained by following the instructions detailed in the ‘Aviation Databases’ section of the Garmin website (www.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 the existing Supplemental Data Cards. The following equipment is required to perform the update:

- Windows-compatible PC computer (Windows 2000 or XP recommended)
- SanDisk SD Card Reader, P/Ns SDDR-93 or SDDR-99 or equivalent card reader
- Updated database obtained from the Garmin website
- Existing 010-00330-42 Supplemental Database SD Cards from both 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.

**Updating Garmin databases:**

1) Copy the data to the appropriate data cards.

2) Insert one SD card in the bottom card slot of the MFD and one in the bottom card slot of each PFD. The SD card containing the ChartView or FliteCharts database must be inserted into the bottom slot on the MFD.
3) Apply power to the G1000 System. View the MFD power-up splash screen. Check that the databases are initialized and displayed on the splash screen. When updating the terrain and FliteCharts databases, an ‘in progress’ message may be seen. If this message is present, wait for the system to finish loading before verifying the correct databases are initialized, then proceed to step 3.

![DATABASE](image)

Figure B-4 Database Information on the Splash Screen

4) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.

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

6) Select the **DBASE** Softkey to place the cursor in the ‘DATABASE’ box.

7) Turn the **FMS** Knob to scroll through the list and check that all databases are current and there are no errors.

8) Power down the G1000.
GLOSSARY

ACC accuracy
ACT, ACTV active, activate
ADC air data computer
ADF Automatic Direction Finder
ADI Attitude Direction Indicator
AF Arc to fix
AFCS Automatic Flight Control System
AFM Airplane Flight Manual
AFMS Airplane Flight Manual Supplement
AFRM airframe
AGL Above Ground Level
AHRS Attitude and Heading Reference System
AIM Airman’s Information Manual
AIRMET Airman’s Meteorological Information alert
ALRT alert
ALT altitude
ALT, ALTN alternator
AMPS amperes
ANNUNC announcement
ANT antenna
AP autopilot
AP DISC autopilot disconnect
APR approach
APT airport, aerodrome
ARINC Aeronautical Radio Incorporated airspace
ARTCC Air Route Traffic Control Center
ARV arrival
AS airspeed
ASB Aviation Support Branch
ASOS Automated Surface Observing System
ATC Air Traffic Control
ATCRBS ATC Radar Beacon System
ATIS Automatic Terminal Information Service
ATK along-track automatic sequence
AUTOSEQ auxiliary
AUX Automated Weather Observing System
B ALT barometric altitude
BARO barometric setting
BATT battery
BC backcourse
Bearing The compass direction from the present position to a destination waypoint
BFO beat frequency oscillator
BKSP backspace
BRG bearing
c C center runway
°C degrees Celsius
CA Course to Altitude calculator
CALC Calibrated Airspeed
Indicated airspeed corrected for installation and instrument errors.
CD Course to DME distance
CDI Course Deviation Indicator
CDU Control Display Unit
CF Course to Fix
CHT Cylinder Head Temperature
CHKLIST checklist
CHNL channel
CI Course to Intercept
c cloud
clear
cm centimeter
CNS Communication, Navigation, & Surveillance
carbon monoxide
COM communication radio
CONFIG configuration
COOL coolant
COPLT co-pilot
Course Course to Steer
The line between two points to be followed by the aircraft
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
CR Course to Radial
CROSS Course to Radial
CRG Cockpit Reference Guide
c current
CRNT Cursor
Crosstrack Error The distance the aircraft is off a desired course in either direction, left or right
course
CRS Course to Steer
cursor
CTRL Control Area
control
APPENDIX C

Cumulative The total of all legs in a flight plan.
CVR Cockpit Voice Recorder
CVRG coverage
CWS control wheel steering
CYL cylinder

D ALT density altitude
DB, DBASE database
dBZ decibels ‘Z’ (radar return)
DCLTR, DECLTR declutter
DEC FUEL decrease fuel
deg degree
DEIC, DEICE de-icing
DEP departure
Desired Track The desired course between the active “from” and “to” waypoints

DEST destination
DF Direct to Fix
DFLT default
DGRD degrade
DH decision height

Dilution of Precision A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry)

DIR direction
DIS distance

Distance The ‘great circle’ distance from the present position to a destination waypoint

DME Distance Measuring Equipment
DOP Dilution of Precision
DP Departure Procedure
DPRT departure
DR dead reckoning
DSBL disabled
DTK Desired Track

E empty, east
ECU Engine Control Unit

Efficiency A measure of fuel consumption, expressed in distance per unit of fuel

EGT Exhaust Gas Temperature
EIS Engine Indication System
ELEV elevation
ELEV elevator

EMERGCY emergency
EMI Electromagnetic Interference
ENDUR endurance

Endurance Flight endurance, or total possible flight time based on available fuel on board

ENG engine
ENGD engaged
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

ENT enter
EPE Estimated Position Error
EPU Estimated Position Uncertainty
ERR error
ESA Enroute Safe Altitude

Estimated Position Error A measure of horizontal GPS position error derived by satellite geometry conditions and other factors

Estimated Time of Arrival The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track

ETA Estimated Time of Arrival
ETE Estimated Time Enroute
EXPIRD expired

°F degrees Fahrenheit
FA Course From Fix to Altitude
FAA Federal Aviation Administration
FADEC Full Authority Digital Engine Control
FAF Final Approach Fix
FAIL failure

FC Course From Fix to Distance
FCC Federal Communication Commission
FCST forecast

FD Course From Fix to Manual Termination
FFLOW fuel flow
FDE Fault Detection and Exclusion
FIS-B Flight Information Services-Broadcast

FISDL Flight Information Service Data Link
FL flight level
FLC Flight Level Change
FM Course From Fix to Manual Termination

Endurance Flight endurance, or total possible flight time based on available fuel on board

ENG engine
ENGD engaged
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

ENT enter
EPE Estimated Position Error
EPU Estimated Position Uncertainty
ERR error
ESA Enroute Safe Altitude

Estimated Position Error A measure of horizontal GPS position error derived by satellite geometry conditions and other factors

Estimated Time of Arrival The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track

ETA Estimated Time of Arrival
ETE Estimated Time Enroute
EXPIRD expired

°F degrees Fahrenheit
FA Course From Fix to Altitude
FAA Federal Aviation Administration
FADEC Full Authority Digital Engine Control
FAF Final Approach Fix
FAIL failure

FC Course From Fix to Distance
FCC Federal Communication Commission
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FD Course From Fix to Manual Termination
FFLOW fuel flow
FDE Fault Detection and Exclusion
FIS-B Flight Information Services-Broadcast

FISDL Flight Information Service Data Link
FL flight level
FLC Flight Level Change
FM Course From Fix to Manual Termination
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>FMS</td>
<td>Flight Management System</td>
</tr>
<tr>
<td>FOB</td>
<td>Fuel On Board</td>
</tr>
<tr>
<td>FPL</td>
<td>flight plan</td>
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<tr>
<td>fpm</td>
<td>feet per minute</td>
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<tr>
<td>FREQ</td>
<td>frequency</td>
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<tr>
<td>FRZ</td>
<td>freezing</td>
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<tr>
<td>FSS</td>
<td>Flight Service Station</td>
</tr>
<tr>
<td>ft</td>
<td>foot/feet</td>
</tr>
<tr>
<td>Fuel Flow</td>
<td>The fuel flow rate, expressed in units of fuel per hour</td>
</tr>
<tr>
<td>Fuel On Board</td>
<td>The total amount of usable fuel on board the aircraft</td>
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<tr>
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<td>glideslope</td>
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<tr>
<td>GA</td>
<td>go-around</td>
</tr>
<tr>
<td>gal, gl</td>
<td>gallon(s)</td>
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<td>GBOX</td>
<td>gearbox</td>
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<tr>
<td>GDC</td>
<td>Garmin Air Data Computer</td>
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<tr>
<td>GDL</td>
<td>Garmin Satellite Data Link</td>
</tr>
<tr>
<td>GDU</td>
<td>Garmin Display Unit</td>
</tr>
<tr>
<td>GEA</td>
<td>Garmin Engine/Airframe Unit</td>
</tr>
<tr>
<td>GEO</td>
<td>geographic</td>
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<tr>
<td>GFC</td>
<td>Garmin Flight Control</td>
</tr>
<tr>
<td>GIA</td>
<td>Garmin Integrated Avionics Unit</td>
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<tr>
<td>GLS</td>
<td>Global Navigation Satellite Landing System</td>
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<td>GMA</td>
<td>Garmin Audio Panel System</td>
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<tr>
<td>GMT</td>
<td>Greenwich Mean Time</td>
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<tr>
<td>GMU</td>
<td>Garmin Magnetometer Unit</td>
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<tr>
<td>GND</td>
<td>ground</td>
</tr>
<tr>
<td>gph</td>
<td>gallons per hour</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>Grid MORA</td>
<td>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</td>
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<tr>
<td>Groundspeed</td>
<td>The velocity that the aircraft is travelling relative to a ground position</td>
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<td>Ground speed</td>
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<tr>
<td>GTX</td>
<td>Garmin Transponder</td>
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<td>HA</td>
<td>Hold Terminating at Altitude heading</td>
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<tr>
<td>HDG</td>
<td>heading</td>
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<tr>
<td>Heading</td>
<td>The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro</td>
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<td>hectopascal</td>
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<td>hour</td>
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<td>HSDB</td>
<td>High-Speed Data Bus</td>
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<td>Initial Approach Fix</td>
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<td>International Civil Aviation Organization</td>
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<td>Intercom System</td>
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<td>Identification/Morse Code Identifier</td>
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<td>IDENT, IDNT</td>
<td>identification</td>
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<td>Initial Fix</td>
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<td>Imperial gallon</td>
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<td>Instrument Landing System</td>
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<td>Instrument Meteorological Conditions</td>
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<td>inch</td>
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<td>INACTV</td>
<td>inactive</td>
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<td>INC FUEL</td>
<td>increase fuel</td>
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<tr>
<td>IND</td>
<td>indicated</td>
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<td>Information provided by properly calibrated and set instrumentation on the aircraft panel information</td>
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<td>in HG</td>
<td>inches of mercury</td>
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<td>INT</td>
<td>intersection(s)</td>
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<td>INTEG</td>
<td>integrity (RAIM unavailable)</td>
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<td>IrDA, IRDA</td>
<td>Infrared Data Association</td>
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<td>key stuck</td>
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<td>kg</td>
<td>kilogram</td>
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<td>Abbreviation</td>
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<td>kt</td>
<td>knot</td>
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<td>left, left runway</td>
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<td>latitude</td>
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<td>label</td>
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<td>Light Emitting Diode</td>
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<td>longitude</td>
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<td>Localizer Performance with Vertical guidance</td>
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<td>Magnetic Variation</td>
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<td>MAHP</td>
<td>Missed Approach Hold Point</td>
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<tr>
<td>MAN IN</td>
<td>manifold pressure (inches Hg)</td>
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<td>MAN SQ</td>
<td>Manual Squelch</td>
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<td>MAP</td>
<td>Missed Approach Point</td>
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<tr>
<td>MASQ</td>
<td>Master Avionics Squelch</td>
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<td>MAX</td>
<td>maximum</td>
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<tr>
<td>MAXSPEED</td>
<td>maximum speed (overspeed)</td>
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<td>MDA</td>
<td>barometric minimum descent altitude</td>
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<tr>
<td>MET</td>
<td>manual electric trim</td>
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<tr>
<td>METAR</td>
<td>Meteorological Aviation Routine</td>
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<td>MEPT</td>
<td>manual electric pitch trim</td>
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<td>MFD</td>
<td>Multi Function Display</td>
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<td>MGRS</td>
<td>Military Grid Reference System</td>
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<tr>
<td>MHz</td>
<td>megahertz</td>
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<td>MIC</td>
<td>microphone</td>
</tr>
<tr>
<td>MIN</td>
<td>minimum</td>
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<tr>
<td>Minimum Safe Altitude</td>
<td>Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position</td>
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<tr>
<td>MSA</td>
<td>Minimum Safe Altitude</td>
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<tr>
<td>MSG</td>
<td>message</td>
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<td>MSL</td>
<td>Mean Sea Level</td>
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<tr>
<td>mV</td>
<td>millivolt(s)</td>
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<td>MVFR</td>
<td>Marginal Visual Flight Rules</td>
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<tr>
<td>N</td>
<td>north</td>
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<tr>
<td>NAV</td>
<td>navigation</td>
</tr>
<tr>
<td>NAVAID</td>
<td>NAVigation AID</td>
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<tr>
<td>NDB</td>
<td>Non-directional Beacon</td>
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<td>NEXRAD</td>
<td>Next Generation Radar</td>
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<tr>
<td>nm</td>
<td>nautical mile(s)</td>
</tr>
<tr>
<td>NRST</td>
<td>nearest</td>
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<td>O</td>
<td>Outer Marker</td>
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<tr>
<td>OAT</td>
<td>Outside Air Temperature</td>
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<tr>
<td>OBS</td>
<td>Omni Bearing Selector</td>
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<td>OFST</td>
<td>offset</td>
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<tr>
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<td>oxygen</td>
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<tr>
<td>P ALT</td>
<td>pressure altitude</td>
</tr>
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<td>PA</td>
<td>Passenger Address</td>
</tr>
<tr>
<td>PA</td>
<td>Proximity Advisory</td>
</tr>
<tr>
<td>PASS</td>
<td>passenger(s)</td>
</tr>
<tr>
<td>PC</td>
<td>personal computer</td>
</tr>
<tr>
<td>PFD</td>
<td>Primary Flight Display</td>
</tr>
<tr>
<td>PI</td>
<td>Procedure Turn to Course Intercept</td>
</tr>
<tr>
<td>PIT, PTCH</td>
<td>pitch</td>
</tr>
<tr>
<td>POSN</td>
<td>position</td>
</tr>
<tr>
<td>PPM</td>
<td>parts per million</td>
</tr>
<tr>
<td>P, POS</td>
<td>Present Position</td>
</tr>
<tr>
<td>PRES, PRESS</td>
<td>pressure</td>
</tr>
<tr>
<td>PROC</td>
<td>procedure(s), procedure turn</td>
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<tr>
<td>psi</td>
<td>pounds per square inch</td>
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<tr>
<td>PT</td>
<td>Procedure Turn</td>
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### APPENDIX C

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>PTK</td>
<td>parallel track</td>
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<tr>
<td>PTT</td>
<td>Push-to-Talk</td>
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<tr>
<td>PWR</td>
<td>power</td>
</tr>
<tr>
<td>QTY</td>
<td>quantity</td>
</tr>
<tr>
<td>R</td>
<td>right, right runway</td>
</tr>
<tr>
<td>RAD</td>
<td>radial</td>
</tr>
<tr>
<td>RAIM</td>
<td>Receiver Autonomous Integrity Monitoring</td>
</tr>
<tr>
<td>RAM</td>
<td>random access memory</td>
</tr>
<tr>
<td>REF</td>
<td>reference</td>
</tr>
<tr>
<td>REM</td>
<td>remaining (fuel remaining)</td>
</tr>
<tr>
<td>REQ</td>
<td>required</td>
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<tr>
<td>RES</td>
<td>reserve (fuel reserve entered by pilot)</td>
</tr>
<tr>
<td>REV</td>
<td>reverse, revision, revise</td>
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<tr>
<td>RF</td>
<td>Constant Radius Turn to Fix</td>
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<td>RMI</td>
<td>Radio Magnetic Indicator</td>
</tr>
<tr>
<td>RMT</td>
<td>remote</td>
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<td>range</td>
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<td>RNWY</td>
<td>runway</td>
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<td>ROL</td>
<td>roll</td>
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<td>ROM</td>
<td>read only memory</td>
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<tr>
<td>rpm</td>
<td>revolutions per minute</td>
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<tr>
<td>RST FUEL</td>
<td>reset fuel</td>
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<tr>
<td>RSV</td>
<td>reserve (fuel reserve entered by pilot)</td>
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<td>right</td>
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<td>RVRSNRY</td>
<td>reversionary</td>
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<td>RX</td>
<td>receive</td>
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<td>S</td>
<td>south</td>
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<td>Selective Availability</td>
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<td>Static Air Temperature</td>
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<td>SBAS</td>
<td>Satellite-Based Augmentation System</td>
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<td>SCIT</td>
<td>Storm Cell Identification and Tracking</td>
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<tr>
<td>SD</td>
<td>Secure Digital</td>
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<td>sec</td>
<td>second(s)</td>
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<td>SEL, SLCT</td>
<td>select</td>
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<td>surface</td>
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<td>SIAP</td>
<td>Standard Instrument Approach Procedures</td>
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<td>SID</td>
<td>Standard Instrument Departure</td>
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<tr>
<td>SIGMET</td>
<td>Significant Meteorological Information</td>
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<td>Sim</td>
<td>simulator</td>
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<td>slip/skid</td>
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<td>Special Position Identification</td>
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<td>squelch</td>
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<td>standby</td>
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<td>standard</td>
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<td>Special Use Airspace</td>
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<td>system</td>
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<td>true</td>
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<td>Traffic Advisory</td>
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<td>TACAN</td>
<td>Terminal Air Navigation System</td>
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<td>TAF</td>
<td>Terminal Aerodrome Forecast</td>
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<td>Traffic Advisory System</td>
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<td>Terrain Awareness and Warning System</td>
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<td>terminal</td>
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<td>TFR</td>
<td>Track Between Two Fixes</td>
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<td>T HDG</td>
<td>Temporary Flight Restriction</td>
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<td>TIS</td>
<td>True Heading</td>
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<td>TIT</td>
<td>Traffic Information System</td>
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<td>TKE</td>
<td>Turbine Inlet Temperature</td>
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<td>TMA</td>
<td>Track Angle Error</td>
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<td>TMR/REF</td>
<td>Terminal Maneuvering Area</td>
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<td>Timer/Reference</td>
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<td>topographic</td>
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<td>Track Angle Error</td>
<td>Direction of aircraft movement relative to a ground position; also ‘Ground Track’</td>
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<td>TRG</td>
<td>The angle difference between the desired track and the current track target</td>
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<td>Abbreviation</td>
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<td>TURN</td>
<td>procedure turn</td>
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<td>UTC</td>
<td>Coordinated Universal Time</td>
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<tr>
<td>UTM/UPS</td>
<td>Universal Transverse Mercator/Universal Polar Stereographic Grid</td>
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<tr>
<td>V, Vspeed</td>
<td>velocity (airspeed)</td>
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<td>Heading Vector to Altitude</td>
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<td>VOR approach</td>
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<td>VAR</td>
<td>variation</td>
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<td>VD</td>
<td>Heading Vector to DME Distance</td>
</tr>
<tr>
<td>Vdc</td>
<td>volts, direct current</td>
</tr>
<tr>
<td>VERT</td>
<td>vertical</td>
</tr>
<tr>
<td>Vertical Figure of Merit</td>
<td>A measure of the uncertainty in the aircraft's vertical position</td>
</tr>
<tr>
<td>Vertical Speed Required</td>
<td>The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed</td>
</tr>
<tr>
<td>VFLM</td>
<td>Vertical Figure of Merit</td>
</tr>
<tr>
<td>VFR</td>
<td>Visual Flight Rules</td>
</tr>
<tr>
<td>VHF</td>
<td>Very High Frequency</td>
</tr>
<tr>
<td>VI</td>
<td>Heading Vector to Intercept</td>
</tr>
<tr>
<td>VLOC</td>
<td>VOR/Localizer Receiver</td>
</tr>
<tr>
<td>VM</td>
<td>Heading Vector to Manual Termination</td>
</tr>
<tr>
<td>VMC</td>
<td>Visual Meteorological Conditions</td>
</tr>
<tr>
<td>VNAV, VNV</td>
<td>vertical navigation</td>
</tr>
<tr>
<td>VOL</td>
<td>volume</td>
</tr>
<tr>
<td>VOR</td>
<td>VHF Omni-directional Range</td>
</tr>
<tr>
<td>VORTAC</td>
<td>very high frequency omnidirectional range station and tactical air navigation</td>
</tr>
<tr>
<td>VPL</td>
<td>Vertical Protection Level</td>
</tr>
<tr>
<td>VPROF</td>
<td>VNV profile, vertical profile</td>
</tr>
<tr>
<td>VPTH</td>
<td>VNV path, vertical path</td>
</tr>
<tr>
<td>VR</td>
<td>Heading Vector to Radial</td>
</tr>
<tr>
<td>VS</td>
<td>vertical speed</td>
</tr>
<tr>
<td>VSI</td>
<td>Vertical Speed Indicator</td>
</tr>
<tr>
<td>VSR</td>
<td>Vertical Speed Required</td>
</tr>
<tr>
<td>VTF</td>
<td>vector to final</td>
</tr>
<tr>
<td>W</td>
<td>watt(s), west</td>
</tr>
<tr>
<td>WAAS</td>
<td>Wide Area Augmentation System</td>
</tr>
<tr>
<td>WARN</td>
<td>warning (GPS position error)</td>
</tr>
<tr>
<td>WGS-84</td>
<td>World Geodetic System - 1984</td>
</tr>
<tr>
<td>WPT</td>
<td>waypoint(s)</td>
</tr>
<tr>
<td>WW</td>
<td>world wide</td>
</tr>
<tr>
<td>WX</td>
<td>weather</td>
</tr>
<tr>
<td>XFER, XFR</td>
<td>transfer</td>
</tr>
<tr>
<td>XPDR</td>
<td>transponder</td>
</tr>
<tr>
<td>XTALK</td>
<td>cross-talk</td>
</tr>
<tr>
<td>XTK</td>
<td>cross-track</td>
</tr>
</tbody>
</table>
FREQUENTLY ASKED QUESTIONS

If a particular aspect of G1000 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 WAAS?

The Wide Area Augmentation System (WAAS) 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 one of two geostationary satellites. This correction information can then be received by any WAAS-enabled GPS receiver.

WAAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight. WAAS is currently available in the United States, including Alaska and Hawaii.

HOW DOES WAAS AFFECT APPROACH OPERATIONS?

Both LNAV/VNAV and LPV approaches use the accuracy of WAAS 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 WAAS. 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.

If WAAS is not available for the final approach course, the approach downgrades, as indicated by the “Approach downgraded. Use LNAV minima.” message.

WHAT IS RAIM AND HOW DOES IT AFFECT APPROACH OPERATIONS?

When WAAS is unavailable, the GPS receivers use Receiver Autonomous Integrity Monitoring (RAIM) to perform the following functions:

• Monitor and verify integrity and geometry of tracked GPS satellites
• Notify pilot when satellite conditions do not provide necessary coverage to support a certain phase of flight
• Predict satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements (refer to the System Overview Section for instructions on RAIM prediction)
• Detect and exclude bad satellites from the navigation solution (Fault Detection and Exclusion, FDE)

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (4.0 nm for oceanic, 2.0 nm for enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). Without WAAS or RAIM, GPS position accuracy integrity cannot be monitored.
WHY MIGHT THERE BE NO 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 G1000 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 enroute 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 G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 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 G1000?

“/G” may be filed for a flight plan. The G1000 System meets the requirements of TSO-C129a with GIA 63 and TSO-C146a with GIA 63W Class A1 or A2 installation. GPS approaches are not to be flown with an expired database. See the approved Airplane Flight Manual (AFM) 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 G1000 automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

<table>
<thead>
<tr>
<th>Normal (OBS not activated)</th>
<th>OBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Automatic sequencing of waypoints</td>
<td>• Manual sequencing - ‘holds’ on selected waypoint</td>
</tr>
<tr>
<td>• Manual course change on HSI not possible</td>
<td>• Manually select course to waypoint from HSI</td>
</tr>
<tr>
<td>• Always navigates ‘TO’ the active waypoint</td>
<td>• Indicates ‘TO’ or ‘FROM’ waypoint</td>
</tr>
<tr>
<td>• Must be in this mode for final approach course</td>
<td>• Cannot be set for final approach course or published holding patterns</td>
</tr>
</tbody>
</table>
When OBS mode is active, the G1000 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 G1000 suspends automatic waypoint sequencing (indicated by a ‘SUSP’ annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000 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 might the G1000 not automatically sequence to the next waypoint?**

The G1000 only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no ‘OBS’ or ‘SUSP’ annunciation on the HSI). For automatic sequencing to occur, the aircraft must also cross the bisector of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

**How can a waypoint be skipped in an approach, a departure, or an arrival?**

The G1000 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 G1000 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 G1000 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.
APPENDIX D

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 G1000 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 G1000 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 G1000 provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by pressing the PROC Key. Choose ‘SELECT APPROACH’, select the desired approach from the list shown, and press the ENT Key. Select the desired transition, then activate the approach using the ENT Key.

To activate a new approach to a different airport, press the Direct-to Key and select the desired airport using the FMS Knobs. Press the ENT Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.
GENERAL TIS INFORMATION

NOTE: Aircraft without an operating transponder are invisible to TIS.

NOTE: TIS is not intended to be used as a collision avoidance system and does not relieve the pilot of the responsibility to “see and avoid” other aircraft. TIS should not be used for avoidance maneuvers during instrument meteorological conditions (IMC) or when there is no visual contact with the intruder aircraft.

The Traffic Information Service (TIS) provides traffic advisory information to non-TAS/TCAS-equipped aircraft. TIS is a ground-based service providing the relative locations of all ATCRBS Mode-A and Mode-C transponder equipped aircraft within a specified service volume. The TIS ground sensor uses real-time track reports to generate traffic notification. The G1000 System displays TIS traffic information on the Traffic Map Page of the MFD. TIS information may also be displayed for overlay on the MFD Navigation Map Page, as well as on the PFD Inset Map. Surveillance data includes all transponder-equipped aircraft within the coverage volume. The G1000 System displays up to eight traffic targets within a 7.5-nm radius, from 3,000 feet below, to 3,500 feet above the requesting aircraft.

The main difference between the Traffic Information System (TIS) and Traffic Advisory (TAS) or Traffic Collision Avoidance Systems (TCAS) is the source of surveillance data. TAS/TCAS uses an airborne interrogator with a half-second update rate, while TIS utilizes the terminal Mode-S ground interrogator and accompanying data link to provide a five-second update rate. TIS and TAS/TCAS have similar ranges.

TIS relies on surveillance of the Mode-S radar system, which is a “secondary surveillance” radar system similar to that used by ATCRBS. Many limitations are inherent in secondary radar surveillance. Information provided by TIS is neither better nor more accurate than the information used by ATC. TIS is intended only to assist in visual acquisition of other aircraft in visual meteorological conditions (VMC). While TIS is a useful aid for visual traffic avoidance, system limitations must be considered to ensure proper use. No recommended avoidance maneuvers are given, nor authorized, as a direct result of a TIS intruder display or TIS advisory.

• TIS operation may be intermittent during turns or other maneuvering.

• TIS is dependent on two-way, line-of-sight communications between the aircraft and the Mode-S radar antenna. Whenever the structure of the aircraft comes between the transponder antenna and the ground-based radar antenna, the signal may be temporarily interrupted.

NOTE: Refer to the TIS Limitations section of the Aeronautical Information Manual (AIM) for a more comprehensive explanation of limitations and anomalies associated with TIS.

NOTE: TIS is unavailable at low altitudes in many areas of the United States. This is often the case in mountainous regions.
WARNING: Garmin is not responsible for Mode S geographical coverage. Operation of the ground stations is the responsibility of the FAA. Refer to the AIM for a Terminal Mode S radar site map.

TIS information is collected during a single radar sweep. Collected information is then sent through the Mode S uplink on the next radar sweep. Because of this, the surveillance information is approximately five seconds old. TIS ground station tracking software uses prediction algorithms to compensate for this delay. These algorithms use track history data to calculate expected intruder positions consistent with the time of display. Occasionally, aircraft maneuvering may cause variations in this calculation and create slight errors on the Traffic Map Page which affect relative bearing information and the target track vector and may delay display of the intruder information. However, intruder distance and altitude typically remain relatively accurate and may be used to assist in spotting traffic. The following errors are common examples:

- When the client or intruder aircraft maneuvers excessively or abruptly, the tracking algorithm may report incorrect horizontal position until the maneuvering aircraft stabilizes.
- When a rapidly closing intruder is on a course that intercepts the client aircraft course at a shallow angle (either overtaking or head-on) and either aircraft abruptly changes course within 0.25 nm, TIS may display the intruder aircraft on the incorrect side of the client aircraft.

These are rare occurrences and are typically resolved within a few radar sweeps once the client/intruder aircraft course stabilizes.

Pilots using TIS can provide valuable assistance in the correction of malfunctions by reporting observations of undesirable performance. Reports should identify the time of observation, location, type and identity of the aircraft, and describe the condition observed. Reports should also include the type of transponder and transponder software version. Since TIS performance is monitored by maintenance personnel, not ATC, malfunctions should be reported in the following ways:

- By telephone to the nearest Flight Service Station (FSS) facility
- By FAA Form 8000-7, Safety Improvement Report (postage-paid card can be obtained at FAA FSSs, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operators)
### MAP SYMBOLS

#### AIRPORTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
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</thead>
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<tr>
<td>Unknown Airport</td>
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</tr>
<tr>
<td>Non-towered, Non-serviced Airport</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Towered, Non-serviced Airport</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Non-towered, Serviced Airport</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Towered, Serviced Airport</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Restricted (Private) Airport</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Heliport</td>
<td>![symbol]</td>
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#### NAVAIDS

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<tbody>
<tr>
<td>Intersection</td>
<td>![symbol]</td>
</tr>
<tr>
<td>LOM (compass locator at outer marker)</td>
<td>![symbol]</td>
</tr>
<tr>
<td>NDB (non-directional radio beacon)</td>
<td>![symbol]</td>
</tr>
<tr>
<td>VOR</td>
<td>![symbol]</td>
</tr>
<tr>
<td>VOR/DME</td>
<td>![symbol]</td>
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<tr>
<td>VOR/ILS</td>
<td>![symbol]</td>
</tr>
<tr>
<td>VORTAC</td>
<td>![symbol]</td>
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<tr>
<td>TACAN</td>
<td>![symbol]</td>
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#### BASEMAP

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<tr>
<td>State Highway</td>
<td>![symbol]</td>
</tr>
<tr>
<td>US Highway</td>
<td>![symbol]</td>
</tr>
<tr>
<td>National Highway</td>
<td>![symbol]</td>
</tr>
<tr>
<td>City</td>
<td>![symbol]</td>
</tr>
<tr>
<td>State/Province Border</td>
<td>![symbol]</td>
</tr>
<tr>
<td>International Border</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Road</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Railroad</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Latitude/Longitude</td>
<td>![symbol]</td>
</tr>
</tbody>
</table>

#### AIRSPACE BOUNDARIES

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<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAO Control Area</td>
<td>![symbol]</td>
</tr>
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<td>Class B Airspace</td>
<td>![symbol]</td>
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<tr>
<td>Mode C Tower Area</td>
<td>![symbol]</td>
</tr>
<tr>
<td>Warning Area</td>
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</tr>
<tr>
<td>Alert Area</td>
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<tr>
<td>Caution Area</td>
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<tr>
<td>Danger Area</td>
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<td>Class C</td>
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<td>Terminal Radar Service Area</td>
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<td>Mode C Area</td>
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<tr>
<td>Military Operations Area (MOA)</td>
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</table>
## APPENDIX F

### HAZARD AVOIDANCE FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Symbol</th>
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</thead>
<tbody>
<tr>
<td>Terrain Proximity/TAWS display enabled</td>
<td><img src="symbol.png" alt="Terrain Proximity/TAWS" /></td>
</tr>
<tr>
<td>Traffic display enabled</td>
<td><img src="symbol.png" alt="Traffic" /></td>
</tr>
<tr>
<td>NEXRAD display enabled</td>
<td><img src="symbol.png" alt="NEXRAD" /></td>
</tr>
<tr>
<td>Cloud Top display enabled</td>
<td><img src="symbol.png" alt="Cloud Top" /></td>
</tr>
<tr>
<td>Echo Top display enabled</td>
<td><img src="symbol.png" alt="Echo Top" /></td>
</tr>
<tr>
<td>XM Lightning display enabled</td>
<td><img src="symbol.png" alt="XM Lightning" /></td>
</tr>
<tr>
<td>Cell Movement display enabled</td>
<td><img src="symbol.png" alt="Cell Movement" /></td>
</tr>
<tr>
<td>SIGMETs/AIRMETs display enabled</td>
<td><img src="symbol.png" alt="SIGMETs/AIRMETs" /></td>
</tr>
<tr>
<td>METARs display enabled</td>
<td><img src="symbol.png" alt="METARs" /></td>
</tr>
<tr>
<td>City Forecast display enabled</td>
<td><img src="symbol.png" alt="City Forecast" /></td>
</tr>
<tr>
<td>Surface Analysis display enabled</td>
<td><img src="symbol.png" alt="Surface Analysis" /></td>
</tr>
<tr>
<td>Freezing Levels display enabled</td>
<td><img src="symbol.png" alt="Freezing Levels" /></td>
</tr>
<tr>
<td>Winds Aloft display enabled</td>
<td><img src="symbol.png" alt="Winds Aloft" /></td>
</tr>
<tr>
<td>County Warnings display enabled</td>
<td><img src="symbol.png" alt="County Warnings" /></td>
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<tr>
<td>Cyclone Warnings display enabled</td>
<td><img src="symbol.png" alt="Cyclone Warnings" /></td>
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<tr>
<td>Loss of hazard avoidance feature (loss of GPS position)</td>
<td><img src="symbol.png" alt="Loss of GPS position" /></td>
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### TRAFFIC

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<td>Proximity Advisory</td>
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</tr>
<tr>
<td>Traffic Advisory, Out of Range</td>
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<tr>
<td>Traffic Advisory</td>
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### MISCELLANEOUS

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<th>Item</th>
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</thead>
<tbody>
<tr>
<td>ARTCC Frequency or FSS Frequency</td>
<td><img src="symbol.png" alt="ARTCC Frequency or FSS Frequency" /></td>
</tr>
<tr>
<td>Map Pointer (when panning)</td>
<td><img src="symbol.png" alt="Map Pointer" /></td>
</tr>
<tr>
<td>Elevation Pointer (on Topography Scale when panning)</td>
<td><img src="symbol.png" alt="Elevation Pointer" /></td>
</tr>
<tr>
<td>Measuring Pointer</td>
<td><img src="symbol.png" alt="Measuring Pointer" /></td>
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<tr>
<td>Wind Vector</td>
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<tr>
<td>Overzoom Indicator</td>
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<td>User Waypoint</td>
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<tr>
<td>Vertical Navigation Along Track Waypoint</td>
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<td>Parallel Track Waypoint</td>
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<td>Unanchored Flight Path Waypoint</td>
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<td>Top of Descent (TOD)</td>
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<tr>
<td>Bottom of Descent (BOD)</td>
<td><img src="symbol.png" alt="Bottom of Descent (BOD)" /></td>
</tr>
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<td>Navigating using Dead Reckoning</td>
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OBSTACLE DATABASE

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<tr>
<td>&lt; 1000' AGL</td>
<td>&lt; 1000' AGL</td>
<td>Red obstacle is above or within 100 ft below the aircraft altitude</td>
</tr>
<tr>
<td>&gt; 1000' AGL</td>
<td>&gt; 1000' AGL</td>
<td>Red terrain is above or within 100 ft below the aircraft altitude</td>
</tr>
</tbody>
</table>

Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude

Gray obstacle is more than 1000 ft below aircraft altitude

Table F-1 Obstacle Colors

TERRAIN AVOIDANCE COLORS AND SYMBOLS

Figure F-1 Terrain Altitude/Color Correlation

Figure F-2 TAWS Potential Impact Points
## INDEX

### A

- Activate a Flight Plan ........................................ 214
- Active channel ........................................ 465
- Active frequency ........................................ 104, 113
  - ADF ........................................ 122
  - ADF mode ........................................ 122, 124
  - ANT mode ........................................ 124
  - Volume ........................................ 122
  - ADF/BFO ........................................ 124
  - ADF/DME tuning ...................................... 125
  - ADF volume ...................................... 124
  - AHR ........................................ 490, 491
  - AIRMETs ......................................... 300
- Airport
  - Information .......................................... 174
  - Airspace Alerts ...................................... 188, 189, 281
  - Airspeed indicator .................................. 52, 54
  - Airspeed Reference ................................ 368
  - Airspeed Trend Vector .............................. 54
- Airways
  - Collapsed .......................................... 227
  - Expanded ......................................... 227
  - Air Data Computer (ADC) ........................... 11
  - Alerting system ..................................... 477
  - Alerts ........................................... 477
  - Aircraft .......................................... 479
  - Audio voice ........................................ 480
  - Alerts window ...................................... 77
  - Alert levels ......................................... 478
  - Along Track Offset .................................. 218, 219
  - ALT ............................................... 277
  - Altimeter .......................................... 52, 57
  - Altitude
    - Constraints ....................................... 230, 264
    - Altitude alerting ................................ 80
    - Altitude capture .................................. 365, 374
    - Altitude Hold Mode (ALT) ....................... 366
    - Altitude Reference ................................. 365, 366, 374
  - Ammeter ........................................... 96
- Annunciations
  - AFCS Status ......................................... 493
  - G1000 System ........................................ 18, 481–482
  - TAWS Status ........................................ 496
- Test tone ............................................. 20, 478
- Annunciation Window .................................... 53
- Annunciator lights ..................................... 132
- ANT/BFO ............................................ 124
- Approach
  - Activating .......................................... 508
  - ILS ............................................... 243
  - Loading ........................................... 211, 240, 242
  - Missed ............................................ 399
  - Removing ........................................... 243
- Approach box ........................................... 446
- Approach Mode, AFCS ................................ 384, 397, 398
- APR softkey ........................................... 242, 248
- Arrival procedure .................................... 197, 209, 237, 239, 240, 242, 262, 264, 273
- Assist, engine leaning ................................ 91–93
- Attitude and Heading Reference System (AHRS) ........................................ 11, 16, 21–22
- Attitude indicator ...................................... 52
- Audio alerting system ................................ 478
- Audio Panel .......................................... 10, 18
- Audio panel controls
  - SPKR ............................................... 132
  - Audio panel fail-safe operation .................. 138
- Auto-tuning .......................................... 120
- Auto-tuning, COM .................................... 107
- Auto-tuning, NAV ..................................... 116
- Automatic audio muting .............................. 468
- Automatic Flight Control System (AFCS) ............ 9, 357–402
  - Controls .......................................... 358–359
  - Example procedures ................................ 388–395
  - Status Annunciations ............................... 401
  - Status Box ......................................... 361
- Automatic squelch .................................... 112
- Autopilot ............................................. 357, 386–387
- Disconnect ........................................... 359, 378, 387
- Auto Zoom ............................................ 144
- Auxiliary Pages (AUX) ................................ 39
- AUX - system status page ............................ 418, 419, 441, 442, 460, 461
  - Aviation Symbols .................................. 156, 197

### B

- Backlighting .......................................... 49
- Barometric altimeter setting ......................... 52, 58
- Bearing/distance, measuring ......................... 151
- Bearing information .................................. 65
- Bearing Information Windows ....................... 53
- Bearing pointer ....................................... 64
- Bearing source ...................................... 65
- Bus voltage .......................................... 96

### C

- Calibrated Airspeed ................................... 245
- CDI .............................................. 239, 253, 264, 272, 279
- CELL MOV Softkey .................................. 299
- ChartView .......................................... 403, 441
- ChartView database .................................. 439, 441, 442
- ChartView functions ................................ 420
- ChartView plan view ................................ 432
- ChartView profile view ................................ 433
- ChartView softkeys ................................... 420
- ChartView subscription ............................. 441
- Chart Not Available ................................ 421, 444
- Chart options ...................................... 431, 452
INDEX

Databases.................................................................................................................. 15, 16, 20, 497
Datalink receiver troubleshooting................................................................. 474
Data entry.................................................................................................................. 35–36
Data Link Receiver.............................................................................................. 12
Date and time.......................................................................................................... 42
Day/Night views....................................................................................................... 437, 456
Day view.................................................................................................................... 437, 438, 456, 457
Dead Reckoning...................................................................................................... 82
Decision Height (DH)............................................................................................... 53, 81
Declutter, display.................................................................................................... 83
Declutter maps.......................................................................................................... 29, 34
DEC FUEL softkey................................................................................................. 90
Delete Flight Plans.................................................................................................. 215
Deleting
An entire airway....................................................................................................... 216, 217
An entire procedure............................................................................................... 216, 217
An individual waypoint.......................................................................................... 216, 217
Flight Plan Items...................................................................................................... 216
Density Altitude........................................................................................................ 247
Departure
Procedure................................................................................................................. 207, 222, 234, 236
Select......................................................................................................................... 234, 237, 240, 243
Time............................................................................................................................ 245
Timer........................................................................................................................... 48
Departure procedure chart.................................................................................... 426, 449
Dilution of Precision (DOP).................................................................................... 25
Direct-to: 168, 190, 191, 192, 193, 194, 228, 229, 262, 264, 279
Display backup......................................................................................................... 18, 103
Display controls....................................................................................................... 26–33
DME............................................................................................................................. 86
DME information...................................................................................................... 64, 65

E
ECHO TOP Softkey................................................................................................... 296
Electronic checklists.............................................................................................. 471, 472
Emergency checklist.............................................................................................. 473
Emergency frequency............................................................................................. 138
Endurance, calculated (ENDUR)......................................................................... 88, 90
Engine Airframe Unit............................................................................................. 11
Engine Indication System (EIS)............................................................................ 85–98
Engine Manifold Pressure (MAN IN HG)......................................................... 86, 88, 94, 96
Entertainment inputs............................................................................................. 136
Estimated Position Error (EPE)............................................................................ 25
Exhaust Gas Temperature (EGT)........................................................................ 91–92

F
Fail-safe operation................................................................................................. 138
Field of View (SVS)............................................................................................... 167
Flight director.......................................................................................................... 357, 360–361
Pitch modes............................................................................................................ 363–369
Roll modes............................................................................................................... 379
Flight Level Change Mode (FLC).......................................................................... 368, 393
Flight plan
Closest point to reference..................................................................................... 227
Storing....................................................................................................................... 508
Flight timer............................................................................................................... 47
FliteCharts................................................................................................................ 403, 443, 458, 498
FliteCharts database.............................................................................................. 443, 460
FliteCharts functions.............................................................................................. 443
FliteCharts softkeys................................................................................................ 443
FPA.............................................................................................................................. 230, 269
Freezing Levels....................................................................................................... 304
Frequency
Nearest.................................................................................................................... 186
Frequency spacing................................................................................................. 111
Frequency transfer arrow...................................................................................... 105
Frequently asked questions................................................................................... 507
Fuel
Calculations.............................................................................................................. 90
Efficiency.................................................................................................................. 247
Endurance............................................................................................................... 247
Flow............................................................................................................................ 89
Quantity..................................................................................................................... 88
Remaining............................................................................................................... 247
Required................................................................................................................... 247
Statistics................................................................................................................... 247
Fuel calculations..................................................................................................... 96
Fuel Flow (FFLOW GPH)....................................................................................... 86, 94, 96
Fuel on Board.......................................................................................................... 247
Fuel Quantity (FUEL QTY GAL)........................................................................... 86
Fuel remaining (GAL REM) ......................................... 96
Fuel used (GAL USED)............................................. 96

G
GDL 69/69A ................................................................. 283
GFC 700 AFCS .......................................................... 357–402
Glidepath ............................................................... 277
Glidepath indicator .................................................. 60
Glidepath Mode (GP) ................................................. 375, 384, 398
Glideslope ............................................................... 277
Glideslope indicator .................................................. 60
Glideslope Mode (GS) ................................................. 377, 397

Global Positioning System (GPS)
  Navigation ................................................................ 190–282
  Go Around Mode (GA) ............................................. 359, 378, 399–400
  GTX 33 Transponder .............................................. 126

H
Heading ................................................................. 52
Heading bug ............................................................ 52
Heading Select Mode (HDG) ....................................... 381, 389
HI SENS .................................................................. 121
Horizontal situation indicator .................................... 52, 61
HSI double green arrow ........................................... 113
HSI magenta arrow ................................................ 113
HSI single green arrow ........................................... 113

I
ID indicator ............................................................. 115
ILS approach ............................................................ 397
Indicated airspeed ................................................... 54
Indicated Altitude ...................................................... 245
Info box .................................................................. 448
Inset Map, PFD ........................................................ 53
Integrated Avionics Unit (IAU) .................................... 10
Intercom system (ICS) .............................................. 136
Intersection
  Information ............................................................. 175–176
  Inverting a flight plan .......................................... 214
  IOI .................................................................. 325, 334

J
Jeppesen aviation database ........................................ 497

L
Land Symbols .......................................................... 155
Line Replaceable Units (LRU) ..................................... 10–13, 19
LNAV ..................................................................... 253
Low Altitude Annunciation ...................................... 80
LO SENS .................................................................. 121
LPV ..................................................................... 253, 279
LPV approach .......................................................... 388

M
Manual Electric Trim (MET) ........................................ 357, 386
Map
  Panning ................................................................ 146
Map Pages (MAP) ..................................................... 38
Map symbols .......................................................... 513
Marker beacon ....................................................... 121
Marker beacon annunciations .................................. 78
MASQ processing .................................................... 99
Measurement units, changing displayed ...................... 43
Menus ..................................................................... 35
Message advisories - 479, 483, 484, 485, 489, 490, 491, 492
METARs ................................................................. 301
Minimum Descent Altitude (MDA) ............................ 53, 81
Missed Approach .................................................... 197, 244, 249, 253, 279, 399
Mode S .................................................................... 126, 127
Morse code identifier .............................................. 115
Multi Function Display (MFD) .................................. 10
Controls ................................................................. 26–27
Softkeys .................................................................. 33

N
National Weather Service .......................................... 306
Navigation
  Database .............................................................. 230, 231
Map ................................................................. 193
Navigation (NAV) frequency box .................................. 52
Navigation Mode, AFCS ......................................... 382–383, 391–392
Navigation mode selection ...................................... 113
Navigation source ................................................ 66–67
Navigation status box ........................................... 52
NAV frequency box ............................................... 101
NAV radio selection .............................................. 113
NAV tuning knob .................................................. 115
Nearest
  Airport ................................................................. 171, 172, 173, 174, 186–189, 242
  Airports Page ....................................................... 172, 173, 174
  Airport Minimum Runway Length ......................... 174
  Airport Surface Matching .................................... 174
  VOR .................................................................. 186–187
Nearest Pages (NRST) ............................................. 39
NEXRAD Softkey ...................................................... 292
Night view .............................................................. 437, 438, 456, 457
Non-path descent .................................................. 373, 395–396
Normal display operation ...................................... 17
NOTAMs ................................................................. 429

O
Obstacles ............................................................... 485, 488
OBS Mode .............................................................. 71, 71–72
Oil Pressure (OIL PSI) ............................................ 86, 88
Oil Temperature (OIL °F) ......................................... 86
<table>
<thead>
<tr>
<th>INDEX</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P</strong></td>
<td><strong>Q</strong></td>
</tr>
<tr>
<td>Page groups</td>
<td>Page groups</td>
</tr>
<tr>
<td>Page menus</td>
<td>Page menus</td>
</tr>
<tr>
<td>Parallel Track</td>
<td>Parallel Track</td>
</tr>
<tr>
<td>PA system</td>
<td>PA system</td>
</tr>
<tr>
<td>Pilot profiles</td>
<td>Pilot profiles</td>
</tr>
<tr>
<td>Pitch Hold Mode (PIT)</td>
<td>Pitch Hold Mode (PIT)</td>
</tr>
<tr>
<td>Pitch modes, flight director</td>
<td>Pitch modes, flight director</td>
</tr>
<tr>
<td>Pitch Reference</td>
<td>Pitch Reference</td>
</tr>
<tr>
<td>Power-up, system</td>
<td>Power-up, system</td>
</tr>
<tr>
<td>Power-up page</td>
<td>Power-up page</td>
</tr>
<tr>
<td>Primary Flight Display (PFD)</td>
<td>Primary Flight Display (PFD)</td>
</tr>
<tr>
<td>Controls</td>
<td>Controls</td>
</tr>
<tr>
<td>Softkeys</td>
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</tr>
<tr>
<td>Procedure examples, AFCS</td>
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</tr>
<tr>
<td>Procedure Loading Pages (PROC)</td>
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</tr>
<tr>
<td><strong>R</strong></td>
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<tr>
<td>RAIM</td>
<td>RAIM</td>
</tr>
<tr>
<td>Range</td>
<td>Range</td>
</tr>
<tr>
<td>Receiver Autonomous Integrity Monitoring</td>
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</tr>
<tr>
<td>Required Vertical Speed</td>
<td>Required Vertical Speed</td>
</tr>
<tr>
<td>Reversionary Mode</td>
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</tr>
<tr>
<td>ROC</td>
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<td>Roll Hold Mode (ROL)</td>
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<td>Roll modes, flight director</td>
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<td>Roll Reference</td>
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<tr>
<td>RVS</td>
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<td>RX indicator</td>
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<tr>
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<td><strong>S</strong></td>
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<tr>
<td>Tachometer (RPM)</td>
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</tr>
<tr>
<td>TAFs</td>
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<tr>
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<td>Terminal procedures charts</td>
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<td>Terrain</td>
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<td>Terrain Awareness and Warning System (TAWS)</td>
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<td>Track Vector</td>
<td>Track Vector</td>
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<td>Traffic Annunciation</td>
</tr>
<tr>
<td>Traffic Information Service (TIS)</td>
<td>Traffic Information Service (TIS)</td>
</tr>
<tr>
<td>Voice alerts</td>
<td>Voice alerts</td>
</tr>
</tbody>
</table>
INDEX

Transponder ........................................ 11
Transponder code entry .......................... 130
Transponder data box .............................. 99, 101
Transponder ground mode ......................... 127
Transponder mode field ............................ 127, 128, 129
Transponder softkeys ................................ 127
Transponder standby mode ....................... 128
Transponder status box ............................ 52
Trend Vector
   Turn Rate ........................................ 64
Trend Vector, Airspeed ............................ 54
Trim, Manual Electric .............................. 357, 359, 386
Trip Planning ....................................... 245, 246, 247
Trip statistics ....................................... 246, 247
True Airspeed ...................................... 52, 54, 247
Tuning ADF frequencies ........................... 123
Turn anticipation ................................... 509
Turn Rate Indicator ................................ 52, 64
TX indicator ......................................... 105

U
Unable to display chart ............................ 422, 445
Updating Garmin databases ....................... 418, 460
Updating Jeppesen databases ..................... 441

V
VDI .................................................. 270, 271
Vertical Descent Indicator ......................... 270
Vertical deviation .................................. 372
Vertical deviation guidance ....................... 231
Vertical Deviation Indicator (VDI) ............. 60
Vertical navigation ................................ 230
   Direct-to ....................................... 229
Vertical Navigation (VNV)
   Flight control ................................... 370–374
   Vertical Path Tracking Mode (VPTH) .......... 370–371, 394
Vertical speed guidance ......................... 231
Vertical speed indicator ......................... 52, 59
Vertical Speed Mode (VS) ....................... 367
Vertical Speed Reference ......................... 367
VFR code ........................................... 131
VNAV .............................................. 195
VNV ................................................. 269, 492, 506
VNV guidance
   Disabling ....................................... 228
   Enabling ....................................... 228
VNV indications ................................... 76
VNV Target Altitude ................................ 60, 370–373
VNV Target Altitude Capture Mode (ALTv) ... 374
Voice alerts, TIS ................................... 78
Voice alerts, TIS Traffic ......................... 344, 480
Voltmeter ........................................... 96
Volume level
   ADF ............................................ 122, 124
   VOL annunciation ............................. 134
VOR
   Nearest ....................................... 186–187
   VOR selection .................................. 113
   VSI ............................................. 271
Vspeed references .................................. 53, 55
VS TGT ............................................ 230, 269

W
WAAS ............................................. 253, 388, 488
Warranty .......................................... i
Waypoint
   Automatic sequencing ........................ 508, 509
   Skipping ...................................... 509
   Waypoint Pages (WPT) ....................... 38
   Waypoint Selection Submenu ............. 191, 199, 200, 202, 249
Wind ................................................ 142, 164
   Winds Aloft ................................... 305
   Wind data .................................... 53
   WIND Softkey .................................. 305

X
XM
   Radio ......................................... 283, 462
   Receiver troubleshooting .................... 474
   Satellite Weather ............................. 283
   Activating .................................... 284
   XM channel list ................................ 464
   XM radio entertainment ..................... 136
   XM radio volume ............................. 467
   XM Satellite Radio ......................... 12, 462, 464, 465, 467

Z
Zoom
   Auto ......................................... 144