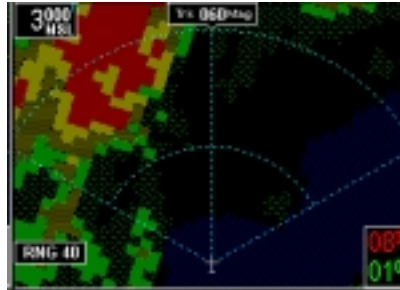


FlightMax™

Flight Situation Display



FlightMax GroundProx

Part Number 600-0064 Revision 00

Revision History

Date	Revision	Description
Sep. 7, 2000	00	Production Release

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FlightMax GroundProx

Introduction

This part of the Pilot's Guide explains Flightmax GroundProx. Flightmax GroundProx is a control and display interface for airborne Terrain Awareness and Warning System (TAWS) equipment. Topics include:



**Figure 1: GroundProx
Icon**

- *GroundProx Overview* - presents an overview of the GroundProx function.
- *GroundProx Pages and Menus* - explains every page and menu used in GroundProx
- *How to Use GroundProx* - explains how to perform specific tasks using GroundProx.
- *Messages and Error Indications* - provides the meanings of GroundProx messages and error indications.
- *Menu Organization* - graphically shows the path to any menu in GroundProx.
- *Honeywell Software Levels* - explains the different software levels used on Honeywell EGPWS and how they interface with the FlightMax FSD.

Flightmax GroundProx is verified by the presence of its icon and text label in the Main Menu. If the GroundProx icon and label, shown in Figure 1, are not present in the Main Menu, contact your installer for assistance.

GroundProx Overview

FlightMax GroundProx displays data from an external, Enhanced Ground Proximity Warning System (EGPWS), to provide pilots with a color visual display of the terrain along and below the airplane's flight path.

The terrain display is color-coded so as to indicate the varying relative altitudes and threat levels of the adjacent terrain. Visually, the GroundProx display is similar to a radar display. Terrain data is continuously updated by a radar like sweep across the screen. The data is overlaid with range rings, allowing pilots to estimate relative distance to terrain features. The display range is adjustable, as defined by the EGPWS. An adjustable bearing line can also be displayed.

The EGPWS is powered separately from the MFC, and is always "on", whether or not the MFC or GroundProx Display is functioning. All non display functions, including aural alerts, operate independently from the GroundProx display.

Terrain Caution and Terrain Warning conditions are visually annunciated on the display. Urgent and immediate terrain situations are indicated in the message bar, even if another function is currently displayed. Exceptional conditions, such as loss of communication or other fault conditions as reported by the EGPWS are also annunciated on the display.

Peaks Mode

During normal operation, the EGPWS displays terrain topography that is above or within 2000 feet below the aircraft. The EGPWS can be configured to an optional mode of operation called "Peaks Mode". This configuration requires a hardware change on the EGPWS.

When the Peaks Mode option is engaged additional features are displayed, including terrain display independent of the aircraft's altitude, digital elevations for the highest and lowest displayed terrain, and a distinctive presentation of 0 MSL elevation water (sea level and corresponding shoreline).

GroundProx Pages and Menus

Data Page Layout

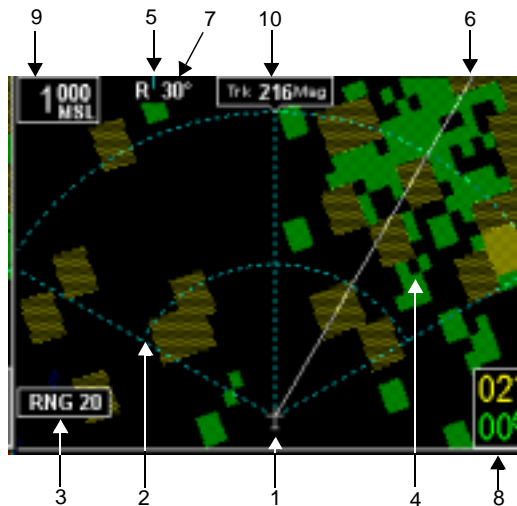


Figure 2: GroundProx Data Page

1. **Aircraft Symbol** - White symbol that is always in a “heading up” orientation.
2. **Range Rings** - Range rings are shown as dotted cyan lines. Radius to outer ring is shown in Range annunciation. Inner ring is one half the outer ring. Range rings can be displayed in the forward (arc) view or centered (ring) view. Figure 2 is shown in forward view.
3. **Range**- The range number indicates the currently selected range scale. The supported ranges are 2.5, 5, 10, 20, 40, 80, 160, 240, and 320 nm, with 80nm as the default scale.
4. **Terrain Data** - Terrain data is depicted as color areas representing various altitude levels and potential hazard situations (see Table 1 for color definitions).
5. **Scan Marker** - The marker is a short vertical, cyan colored line that moves across the top of the display area. It indicates the current position of the scan.

6. **Bearing Line** - The bearing line is a white line that provides the relative bearing to any feature displayed on the screen. The bearing line is activated and controlled by the outer knob. It disappears from the screen after 15 seconds of non use. The bearing line can be used in forward or centered view.
7. **Bearing** - Presents the relative bearing, in degrees, of the bearing line, relative to the top of the screen. L for left, R for right .
8. **Peaks Mode Elevations** - This annunciation is displayed if the EGPWS is configured for peaks mode operation. The two numerical values correspond to the highest terrain/obstacle elevation displayed and the bottom elevation of the lowest color band displayed. Elevations are expressed in feet above sea level, with the hundreds digit displayed half size, i.e. 10⁸ is equal to 10,800 feet and 01⁰ is equal to 1000 feet. If there is no appreciable difference in elevation (flat terrain) only the highest value is displayed. The color of each elevation value is the same as the color of the terrain display containing that elevation (green, yellow or red).
9. **MSL Altitude**¹ - This annunciation indicates the mean sea level altitude of the aircraft. The current altitude is displayed with each scan, rounded down to the nearest 100ft. The altitude value is expressed in feet. If the EGPWS ceases to supply valid MSL altitude data, the annunciation will display 3 dashes.
10. **Heading**¹ - This display presents the type of heading reference being used by the EGPWS. There are five possible annunciations: Magnetic Heading, True Heading, Magnetic Track, True Track, and North. If valid data is not available, the annunciation is replaced by three dashes.

Color Coding

GroundProx displays terrain data using the following basic colors: black, green, yellow, red, and magenta. In addition, if the Peaks mode is enabled, blue will be used.

Table 1 lists all the colors generated by the EGPWS and their meaning. Some colors are listed as percentages.

¹.These annunciations are not supported with earlier versions of Honeywell software. See "Honeywell Software Levels" on page 17.

These percentages indicate the amount of color dots alternating with black dots to produce a more subdued color. Generally speaking the more subdued the color, the farther away the terrain/obstacle is from the aircraft.

NOTE: Yellow shading in the table indicates values that only apply to Peaks mode configuration.

Table 1: Color Definitions

Color	Meaning
Solid Red	Terrain/Obstacle threat area, a WARNING is generated.
Solid Yellow	Terrain/Obstacle threat area, a CAUTION is generated.
50% Red Dots	Terrain/Obstacle that is more than 2000 feet above aircraft.
50% Yellow Dots	Terrain/Obstacle that is between 1000 and 2000 feet above aircraft.
25% Yellow Dots	Terrain/Obstacle that is 500 (250 with gear down) feet below to 1000 feet above aircraft altitude.
Solid Green (Peaks only)	Shown only when no Red or Yellow terrain/Obstacle areas are within range on the display. Highest terrain/Obstacle not within 500 (250 with gear down) feet of aircraft altitude.
50% Green Dots	Terrain/Obstacle that is 500 (250 with gear down) feet below to 1000 feet below aircraft altitude.
50% Green Dots (Peaks only)	Terrain/Obstacle that is the middle elevation band when there is no Red or Yellow terrain areas within range on the display.
16% Green Dots	Terrain/Obstacle that is 1000 to 2000 feet below aircraft altitude.
16% Green Dots (Peaks only)	Terrain/Obstacle that is the lower elevation band when there is no Red or Yellow terrain areas within range on the display.

Table 1: Color Definitions

Color	Meaning
Black	No significant terrain/obstacle
16% Blue (Peaks only)	Water at sea level elevation (0 feet MSL).
Magenta Dots	Unknown terrain. No terrain data in the data base for the magenta area shown.

GroundProx Main Menu²

The GroundProx main menu (Figure 3) provides access to all the operating functions used to control the GroundProx system and display.

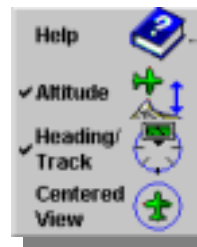


Figure 3: GroundProx Main Menu

Altitude

The Altitude menu item is a toggle function that activates the MSL Altitude Annunciation. The annunciation is located at the top left of the display area. When the MSL Altitude Annunciation is active a check mark is displayed to the left of this menu item.

The EGPWS provides altitude data to the GroundProx display. The altitude value is expressed in feet above sea level. The hundreds, tens, and units digits are displayed half the size of the higher order digits. The lower order digits are rounded down to the next to the next lower multiple of 100 feet for display.

If the MSL Altitude annunciation is active at system shutdown it will be active when GroundProx is started again.

Heading/Track

The Heading/Track menu item is a toggle function that activates the Heading/Track Annunciation. The

²The Main Menu does not support Altitude, Heading/Track, and Centered View selections for earlier versions of Honeywell Software. See "Honeywell Software Levels" on page 17.

annunciation is located at the top center of the display area. When the Heading Annunciation is active a check mark is displayed to the left of this menu item.

There are five possible Display References: Magnetic Heading, True Heading, Magnetic Track, True Track, and North. If the EGPWS has reliable heading data, it will send that to the GroundProx display. If reliable heading data is not available, but reliable ground track data is, the EGPWS will supply terrain display data in a “Track Up” configuration, and the ground track angle will be presented in the Heading annunciation. If neither reliable heading or ground track data is available, the EGPWS supplies terrain display data in a “North Up” configuration. North Up is also used whenever heading is not available and ground speed drops below about 40 knots. The annunciation becomes “North”.

NOTE: The type of heading reference being used is not selectable. This data is provided by the EGPWS and is dependent on the model of EGPWS being used and it's level of software.

If the Heading annunciation is active at system shutdown it will be active when GroundProx is started again.

Centered View

The Centered View menu item is a toggle function that switches the display presentation between Forward View and Centered View. When Centered View is active a check mark is displayed to the left of this menu item. Forward View is always active when GroundProx starts up, so there's no check mark.

In centered view the airplane symbol is located in the center of the display area with terrain data displayed 360° around the aircraft (see Figure 5).

In Forward view the airplane symbol is located at the bottom center of the display area. Terrain data is displayed forward of the aircraft, similar to a radar display.

When switching between forward and centered views, there is a slight delay between the request and the receipt of terrain data in the new format. During the transition period a small dashed rectangle appears above the range annunciation. This enclosed rectangle contains the letters FWD or CTR depending on whether the operator has requested a Forward or Centered view. When GroundProx begins receiving data in the new view format, this annunciation is removed from the screen. The rectangle is drawn dashed to indicate the transient nature of the annunciation.



Figure 4: View Change

The default view is always forward view. When the GroundProx is shutdown, the next time GroundProx is started, the view will be forward.

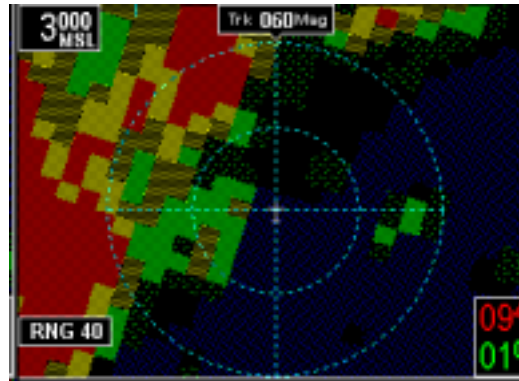


Figure 5: Centered View

How to Use GroundProx

GroundProx Startup

FlightMax GroundProx starts automatically as part of the normal initialization sequence of the FSD. To use GROUNDPROX do the following:

1. Select GROUNDPROX from the Main Menu.
At startup, GroundProx restores the Heading and Altitude settings that were active when it was last used
2. When GroundProx first comes up it will display an annunciation "Display Initializing". This screen will remain active while communications is established between the EGPWS and the FSD.
3. GroundProx then displays its data page and main menu.

AutoRange

"AutoRange" is an EGPWS installation option. If AutoRange is enabled in the EGPWS, whenever a terrain alert takes place the display range is automatically set to 10nm, overriding the operator's current range selection. Upon receipt of an auto-range occurrence, FlightMax GroundProx updates the Range Rings and Range Annunciation to 10nm. Manual range control is not disabled by an Auto-Range event. The pilot may manually reset the range to any desired value, starting from the range value set by AutoRange.

Control Knob Functions

Bearing

The outer knob is used to activate and orient the bearing line. Turning the outer knob in either direction will cause the bearing line to appear on the screen. Initially the line will appear at 0°, followed by movement in the direction indicated by the knob. Turning the outer knob counter clockwise will move the bearing line to the left. Turning the knob clockwise will move the line toward the right.

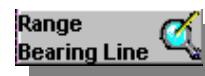


Figure 6: Knob Functions

The bearing line functions in both center and forward view.

If the outer knob is not turned within 15 seconds after the bearing line is displayed or used, the bearing line will deactivate.

Range

The inner knob is used to select the range (scale) for the Data page display. The available ranges are 2.5, 5, 10, 20, 40, 80, 160, 240, and 320nm. At startup the Range is preset to 80nm. Ranges 240 and 320 are not available in Centered View.

Turning the knob counter clockwise will decrease the viewing range (down to 2.5nm). Once the display range is at minimum, further counter-clockwise turns will have no effect.

Turning the knob clockwise will increase the viewing scale. Once the display range is at the highest scale, further clockwise turns will have no effect.

If the EGPWS is sending terrain data when the range is changed the FSD clears the screen to a magenta color, then begins painting the new terrain display data on the screen. The range value annunciated on the screen is not changed until data at the new range is received.

When changing ranges there may be a slight delay between the request and the receipt of terrain data at the new range, particularly if the pilot piles up several requests by rapidly turning the knob. During the transition period a small dashed rectangle appears above the range annunciation. Except for the dashed line, this rectangle looks identical to the range annunciation. The range value it contains is the last range the pilot requested. When GroundProx begins receiving terrain display data at the new range, the dashed rectangle is removed from the screen.

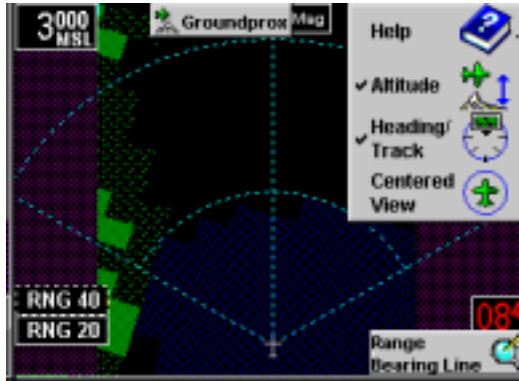


Figure 7: Changing Range

Changing the View Orientation³

To change the display orientation:

1. Bring up the GroundProx main menu.
2. Select Center View.

A check mark indicates the display is in center view, no check mark indicates the display is forward view. The default is always forward view.

To Add/Remove Altitude Annunciation³

1. Bring up the GroundProx main menu.
2. Select Altitude from the menu.

A check mark indicates the altitude annunciation is displayed.

To Add/Remove Heading Annunciation³

1. Bring up the GroundProx main menu.
2. Select Heading from the menu.

A check mark indicates the heading annunciation is displayed.

³This annunciation is not available with earlier versions of Honeywell software. See "Honeywell Software Levels" on page 17.

Messages and Error Indications

Status Annunciations

The system status annunciation describes the operating state of the system. The status is displayed in amber letters across the main Data page.

Table 2: GroundProx Status Messages

Message	Meaning
SENSOR OFF	Indicates that the EGPWS sensor is powered down or incorrectly attached to the FSD. The terrain display becomes a dark magenta.
DISPLAY INITIALIZING	During its startup phase, GroundProx detects the EGPWS equipment configuration and informs the EGPWS equipment of various parameters regarding the Avidyne GroundProx Display configuration. During this initialization phase the GroundProx displays the text DISPLAY INITIALIZING in yellow block letters.
SENSOR UNAVAILABLE	If the EGPWS declares its display capability inoperative at any time during its communication with the GroundProx it displays the text SENSOR UNAVAILABLE in yellow block letters. The EGPWS may still be able to issue aural alerts.
SENSOR FAILED	If the GroundProx detects errors in the data transmission from the EGPWS equipment, or if the EGPWS fails to transmit certain expected data to the FSD in a timely manner, this error message is displayed.
DISPLAY FAILED	If the GroundProx application determines through its own means of self-verification that it is not operating properly, it displays this message.

Table 2: GroundProx Status Messages

Message	Meaning
SENSOR SELF-TEST	When the EGPWS is performing a Self-Test it indicates this to GroundProx by transmitting a distinctive terrain test pattern for display. The words "Self-Test" are displayed over the test pattern. The text will remain until the self test is finished.
WARNINGS INHIBITED	The pilot may inhibit the functioning of the EGPWS equipment. (This capability is required by TSO-C151a.). The EGPWS will indicate to the Avidyne GroundProx Display that it is in the inhibited state.
IMPROPER CONFIGURATION	Under certain circumstances GroundProx may determine that the MFC is improperly configured with respect to the GroundProx function and there is no point in attempting to communicate with the EGPWS. Contact your installer or Avidyne for assistance.

Check Altitude⁴

If the EGPWS receives an anomalous altitude reading it will indicate this situation to the GroundProx. Avidyne GroundProx presents a Check Altitude Annunciation on the screen.

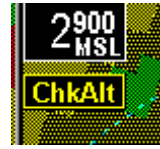


Figure 8: ChkAlt Message

The Check Altitude Annunciation consists of the text “ChkAlt” enclosed in a rectangle. (see Figure 8).

GroundProx removes the Check Altitude Annunciation from the display when the EGPWS receive a correct altitude value.

Message Bar

The GroundProx Advisory message is shown in Figure 9. This message will appear whenever a Terrain/Obstacle caution or alert is issued by the EGPWS. A GroundProx message bar alert can appear while viewing another function or while in GroundProx. The message bar will appear in yellow or red across the bottom of the screen with information about the type of message (caution or warning) and whether there is terrain or an obstacle ahead. Pressing the **Enter** key will immediately take you to the GroundProx page (if you’re not already there).

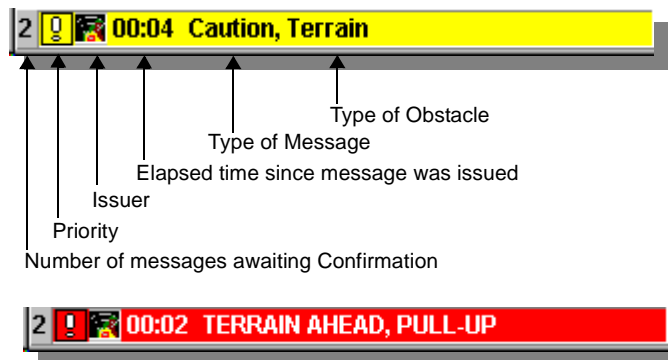


Figure 9: GroundProx Advisory Message Bar

⁴.Not available with earlier versions of Honeywell software. See “Honeywell Software Levels” on page 17.

Terrain and Obstacle Alerts

Terrain and obstacle alerts are the most critical situations displayed by the GroundProx. There are two types of alerts: caution and warning.

When a terrain or obstacle caution occurs, the display area that caused the alert is changed to a solid (100%) yellow. If auto-ranging is enabled, the display range is set to 10 nm.

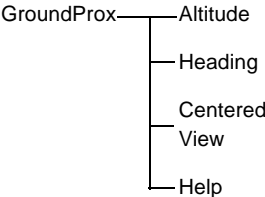
When a terrain or obstacle warning occurs, the display area that caused the alert is changed to a solid (100%) red. If auto-ranging is enabled, the display range is set to 10 nm.

There are four possible messages that are generated by the EGPWS during an alert: CAUTION, TERRAIN (for a Caution alert) or TERRAIN AHEAD, PULL-UP (for a Warning alert). If the alert is due to an obstacle, the message will be changed to CAUTION, OBSTACLE or OBSTACLE AHEAD, PULL-UP depending on whether it's a caution or a warning. The EGPWS is able to distinguish between objects and terrain data and will issue the appropriate message.

Because of the critical nature of alerts the caution or warning always appears in the message bar. When the message bar appears the pilot can view the GroundProx display (if viewing another function) by pressing the Enter key. In order not to obscure terrain display data, the menu is not displayed when the pilot transitions to the GroundProx display. As usual, the pilot may restore the menu to the display by pressing the Menu key.

Menu Organization

The following Menu Tree graphically depicts the paths to all GroundProx menu functions



Honeywell Software Levels

Honeywell supports different levels of software for their EGPWS models. Groundprox supports most recent levels of Honeywell software but earlier versions of the software will *not* contain the following features:

- the MSL altitude display.
- the Heading/Track display
- Center view display.

Table 3: Software Levels

MODEL	SOFTWARE LEVEL	
	Minimum Features	All Features
MK V	210	212
MK VI	001	003
MK VII	210	212
MK VIII	001	003
MK XXI	N/A	001
MK XXII	N/A	001
GA	N/A	001