7.5 TERRAIN AWARENESS & WARNING SYSTEM (TAWS) DISPLAY (OPTIONAL)

NOTE: *Terrain data is not displayed when the aircraft latitude is greater than 75 degrees north or 60 degrees south.*

NOTE: *TAWS operation is only available when the G1000 is configured for a TAWS-B installation.*

DISPLAYING TERRAIN ON 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, whichever is configured.
3. If desired, press the **VIEW** softkey to access the **ARC** and **360** softkeys. When the **ARC** softkey is pressed, a radar-like 120° view is displayed. Press the **360** softkey to return to the 360° default display.
4. Rotate the **JOYSTICK** clockwise to display a larger area or rotate counter-clockwise to display a smaller area.

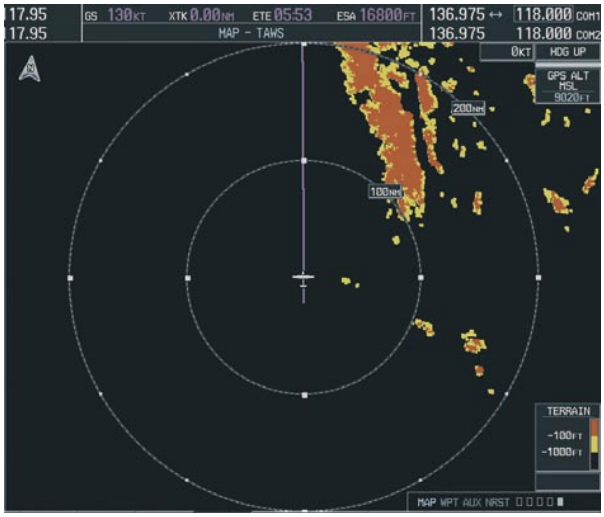

Figure 7-21 TAWS Page (360˚ View)

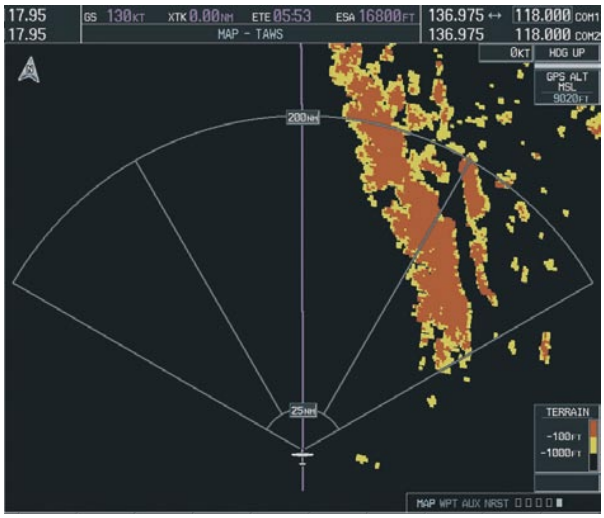

Figure 7-22 TAWS Page (ARC View)

Enable/Disable Aviation Data

1. While the TAWS Page is displayed, press the **MENU** key.
2. Turn the **small FMS** knob to select "Show (or Hide) Aviation Data".
3 Press the **ENT** key.

Figure 7-23 TAWS Page Menu

Color	Terrain/Obstacle Location	Alert Level	Suggested Pilot Response
Red	Terrain/Obstacle is within 100' or above aircraft altitude.	WARNING	Initiate climb and/or turn away from terrain/obstacle.
Yellow	Terrain/Obstacle is within 1000' of aircraft altitude.	CAUTION	Be aware of surroundings. Be prepared to take action.
Black	Terrain/Obstacle is more than 1000' below aircraft altitude.	NO DANGER	No action required.

Table 7-2 TAWS Color Definitions

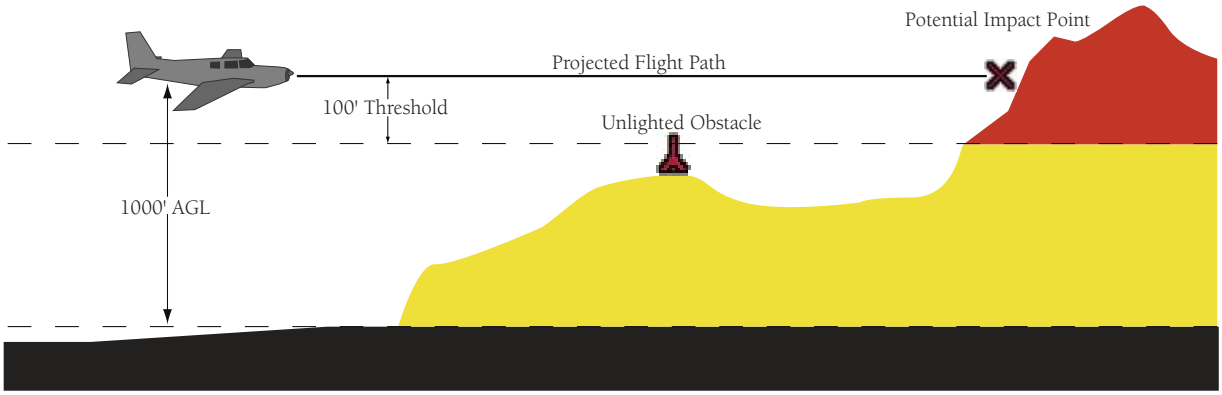

Figure 7-24 TAWS Terrain/Obstacle Locations

TAWS Inhibit

Flying VFR into an area where unique terrain exists could cause the system to annunciate a nuisance alert. When TAWS is inhibited, only FLTA and PDA alerts are disabled.

To Inhibit TAWS:

1. While the TAWS Page is displayed, press the **MENU** key.
2. Turn the **small FMS** knob to select'Inhibit TAWS'.
3. Press the **ENT** key.

To Enable TAWS:

1. While the TAWS Page is displayed, press the **MENU** key.
2. Turn the **small FMS** knob to select 'Enable TAWS'.
3. Press the **ENT** key.

Manual System Test

A system test is automatically performed at power-up. After sucessful completion of the test, "***TAWS System Test, OK***" will be heard.

The system test may also be initiated manually, but only when the aircraft is on the ground. To manually verify proper operation of the aural and visual annunciations of the system, perform the following steps.

1. While the TAWS Page is displayed, press the **MENU** key.
2. Turn the **small FMS** knob to select 'Test TAWS'.
3 Press the **ENT** key. During the test 'TAWS TEST' is displayed in the center of the TAWS Page.

   When all is in working order, "TAWS System Test, OK" will be heard.

Forward Looking Terrain Avoidance (FLTA)

The Forward Looking Terrain Avoidance alert is composed of two sub-functions:

Reduced Required Terrain Clearance (RTC) and Reduced Required Obstacle Clearance (ROC)

This provides alerts when the aircraft flight path is above terrain and/or obstacles, yet is projected to come within minimum clearance values outlined in the following table. When an RTC or ROC alert is issued, a potential impact point is displayed on the TAWS Page as a yellow or red 'X'.

Imminent Terrain Impact (ITI) and Imminent Obstacle Impact (IOI)

This provides alerts when the current aircraft altitude is below the elevation of terrain in the aircraft's projected path and the vertical flight path is calculated to come within minimum clearence values outlined in the following table. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS Page as a yellow or red 'X'.

Phase of Flight	Level Flight	Descending
Enroute	700 ft.	500 ft.
Terminal	350 ft.	300 ft.
Approach	150 ft.	100 ft.
Departure	100 ft.	100 ft.

During the final approach phase of flight, RTC/ROC/ ITI/IOI alerts are automatically inhibited when the aircraft is below 200 feet AGL while within 0.5 nm of the approach runway or is below 125 feet AGL while within 1 nm of the runway.

Premature Descent Alert (PDA)

A Premature Descent Alert is issued when the system detects that the aircraft is significantly below the normal approach path to a runway. The PDA alert mode functions only during descent to land. There are three different scenarios to consider with PDA:

- No Approach Loaded - 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 nm of the threshold. During the final descent, algorithms will set a threshold for alerting based on speed, distance, and other parameters.
- Non-Precision Approach Loaded - PDA alerting begins when the FAF is the active waypoint AND the aircraft is within 15 nm of the destination airport. Again, algorithms are used to set a threshold for alerting based upon various parameters. PDA alerting ends at 0.5 nm from the runway threshold OR at an altitude of 125 feet AGL while within 1 nm of the threshold.
- ILS Approach Loaded—PDA alerting begins when the FAF is the active waypoint AND the aircraft is within 15 nm of the destination airport. Prior to reaching the FAF, a PDA alert will be issued if the aircraft descends 200 feet below the FAF altitude. Once the aircraft intercepts the glideslope, PDA will alert the pilot if the aircraft descends 0.7 degrees below the glideslope. PDA alerting ends 0.5 nm from the runway threshold OR at an altitude of 125 feet AGL while within 1 nm of the threshold.

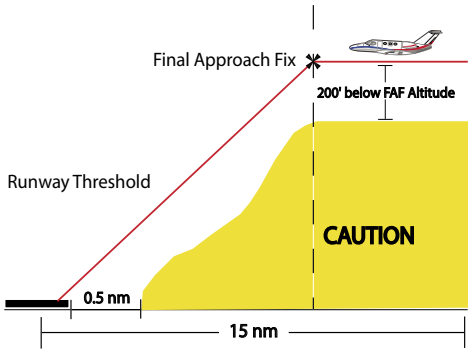

Figure 7-25 Non-Precision Approach PDA Alert Threshold

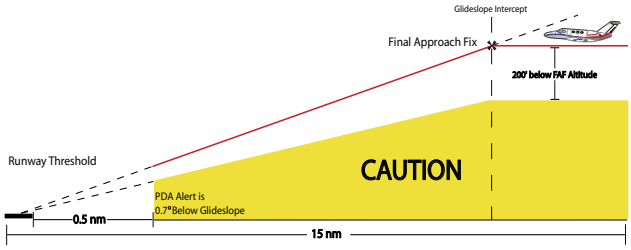

Figure 7-26 ILS Approach PDA Alert Threshold

Excessive Descent Rate Alert (EDR)

The purpose of the Excessive Descent Rate alert is to provide suitable alerts when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 7-27 displays the correlation between height above terrain and descent rate, resulting in the two EDR alerts. EDR alerts have two levels of severity, caution (sink rate) and warning (pull-up).

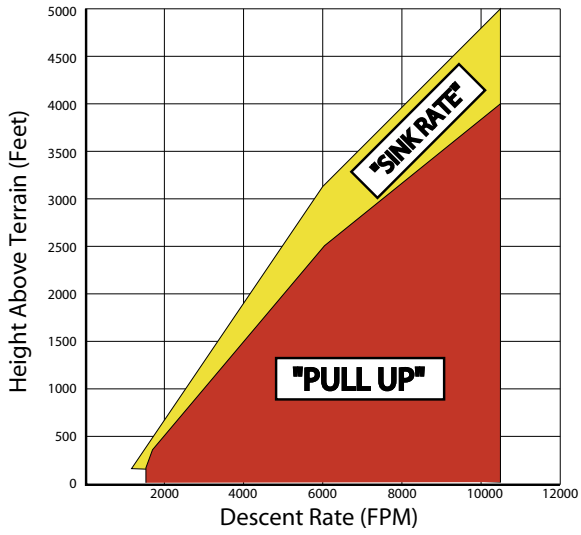

Figure 7-27 Excessive Descent Rate

Negative Climb Rate After Takeoff Alert (NCR)

The purpose of the Negative Climb Rate After Takeoff alert is to provide suitable alerts to the pilot when the system determines that 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 is only activated during the departure phase of flight under the following conditions:

A) height above the terrain is less than 700 feet
B) the aircraft is less than 2 nm from the departure airport
C) heading change from the departure heading is less than 110 degrees.

"Five-Hundred" Aural Alert

The purpose of the aural alert message "Five-hundred" is to provide an advisory alert to the aircrew that the aircraft is five-hundred feet above terrain. When the aircraft descends within 500 feet of terrain, the aural message "***Five-hundred***" is heard. There are no display annunciations or pop-up alerts that accompany the aural message.

This function is enabled when the aircraft's height above the terrain is more than 675 feet. It is disabled when the aircraft's height above the terrain becomes less than 500 feet.

Displaying Terrain and Obstacles on the Navigation Map

1. With the Navigation Map displayed, press the **MAP** softkey.
2. Press the **TERRAIN** softkey. Terrain and obstacle proximity will now be displayed on the map.

Unlighted Obstacle (Height is less than 1000' AGL)	Lighted Obstacle (Height is less than 1000' AGL)	Unlighted Obstacle (Height is greater than 1000' AGL)	Lighted Obstacle (Height is greater than 1000' AGL)	Potential Impact Points
				

Figure 7-28 TAWS Symbols

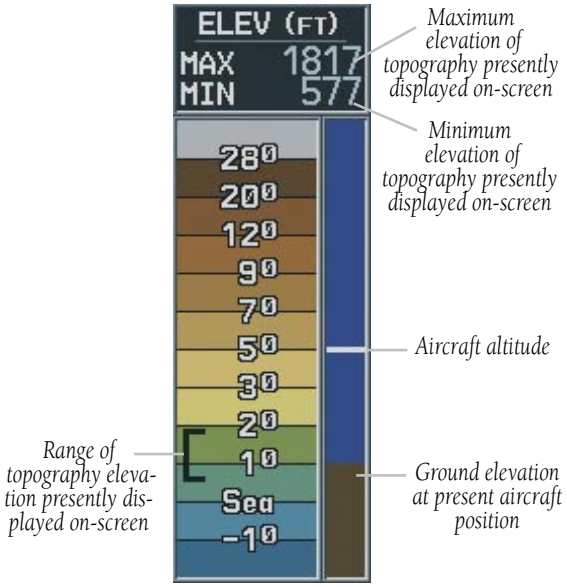

Figure 7-29 Topography Scale

Pop-up Alerts

When a terrain or obstacle alert is issued, a pop-up window is displayed on the MFD with the appropriate alert.

Figure 7-30 Alert Pop-Up

Press the **ENT** key to display the TAWS Page, or press the **CLR** key to remain on the existing page.

TAWS Alerts Summary

Table 7-3 shows the possible TAWS alert types with corresponding annunciations and aural messages.

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Map Page Pop-Up Alert	Aural Message
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD - PULL-UP or TERRAIN - PULL-UP	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" or "Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE AHEAD - PULL-UP or OBSTACLE - PULL-UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" or "Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD or CAUTION - TERRAIN	"Terrain Ahead; Terrain Ahead" or "Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD or CAUTION - OBSTACLE	"Obstacle Ahead; Obstacle Ahead" or "Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK or TOO LOW - TERRAIN	"Don't Sink" or "Too Low, Terrain"

Table 7-3 TAWS Alert Summary

The following system status annunciations may also be issued.

Alert Type	PFD/MFD TAWS Page Annunciation	MFD Pop-Up Alert	Aural Message
TAWS System Test Fail	TAWS FAIL	None	"TAWS System Failure"
TAWS Alerting is disabled	TAWS INHB	None	None
No GPS position or excessively degraded GPS signal	TAWS N/A	None	"TAWS Not Available"
System Test in progress	TAWS TEST	None	None
System Test pass	None	None	"TAWS System Test OK"

Table 7-4 TAWS Status Summary