No. 2778

Certification of Terrain Awareness and Warning System (TAWS) Installations

NOTE: Revision A to this Service Letter adds new ground and flight test procedures based on the availability of TAWS SCN 10.5. It also updates the TAWS Terminal Monitor program information in Appendix 1.

Introduction

Upon installation of a Universal Avionics Terrain Awareness and Warning System (TAWS) in your aircraft, certification of the installation is required. This Service Letter provides procedures for certifying your TAWS installation.

Application

Universal Terrain Awareness and Warning Systems, P/N 3010-00-00.

Description

Supporting documents for the initial TAWS certification are on file at Universal Avionics Product Support. Documents include the STC letter, TSO letter and sample Flight Manual Supplement.

Refer to FAA Advisory Circular 25-23 (or 23-18), *Airworthiness Criteria for the Installation of a Terrain Awareness and Warning System (TAWS)*, for TAWS certification guidance. Procedures in the circular should be used in conjunction with Universal's TAWS Installation Manual, Report No. 34-40-01, dated 29 June 2000 or later released version.

NOTE: In a typical installation a Universal Avionics Flight Management System (FMS) is also installed. The FMS must be properly configured for TAWS before proceeding with the instructions in this letter. Refer to the applicable FMS Technical Manual for FMS configuration procedures.

This Service Letter provides sample procedures for ground and flight testing of the TAWS. All TAWS installations must be certified to meet FAA airworthiness approval standards. The sample procedures are intended as a guide for follow-on STC certification efforts. They may also be used as guidance for obtaining FAA Form 337 approval. The responsible FAA offices should be consulted prior to accomplishing a TAWS installation.

Appendix 1 to this Service Letter contains information for using the TAWS Terminal Monitor program. This program assists the installer in configuring TAWS and accomplishing the ground and flight tests.

NOTE: Advisory Circular 23-18 should be consulted for any Part 23 aircraft TAWS installation. Part 25 aircraft are covered in Advisory Circular 25-23. Key subjects addressed in these circulars are:

1.   Different class installation requirements - There are two installation classes determined by such distinctions as aircraft operating category, number of seats, equipage, etc.

2.   Guidance for communicating with the FAA and document submittal.

3.   A flight test matrix describing installation examples and flight test requirements.

4.   Guidance on developing Aircraft Flight Manual supplements.

These advisory circulars are available for download from the FAA web site:

http://www.faa.gov/avr/air/acs/achome.htm

NOTE: Universal Avionics received STC and TSO approval from the Los Angeles FAA office.

Requests for documentation should be directed to Universal Avionics Systems Corporation Product Support. A questionnaire to request a documentation package is included in this Service Letter

QUESTIONNAIRE

(To be filled out by requestor of documentation package)

NAME _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____ FAX _____

E-MAIL _____

AIRCRAFT MAKE _____ MODEL _____

S/N _____ REG. NO. _____

FMS/GPS MAKE & MODEL _____

RADIO ALTIMETER MAKE & MODEL _____

AIR DATA COMPUTER MAKE & MODEL _____

VOR/ILS NAV RECEIVER MAKE & MODEL _____

FLIGHT INSTRUMENT SYSTEMS MAKE & MODEL _____

PLANNED TAWS TERRAIN DISPLAY(S)_____

Completed questionnaires should be submitted to Universal Product Support.

Facsimile No.:   (520) 295-2384

1. Ground Test

NOTE: The scope and range of testing should include all aspects of the particular class of installation as well as interfaces and functions. The following Sample Test Plan is designed around an aircraft equipped with dual FMSs, Collins ALT 55B, Collins ADC 85 and Collins VIR 32. Since the TAWS Computer may be interfaced with equipment other than stated here, tests must be conducted based on your specific interfaces. **Use of necessary and appropriate equipment and procedures will be required and is the responsibility of the installation agency.**

A. Aircraft Configuration

Date _____

Aircraft S/N _____   TAWS P/N _____

Aircraft Make & Model _____   TAWS S/N _____

Aircraft Registration _____   TAWS SCN _____

TAWS Mods _____

Flight Test Personnel _____

_____   Display Device _____

_____   _____

Ground Test Personnel _____   _____

_____   GPS Device _____

_____   _____

B. Test Preparations

CAUTION: **ONLY QUALIFIED PERSONNEL SHOULD PERFORM THESE TEST PROCEDURES.**

1. Required test equipment:
   a. Approved ILS test set. Use of a "GO NO-GO type test is not advised since precise control of deviations cannot be achieved.
   b. Approved pitot static test set and materials.
   c. Radio altimeter test set.
   d. An IBM-compatible portable computer with the UASC Terminal Monitor (SCN 3.X, P/N A12015) program installed for real time monitoring of the TAWS computer. See Appendix 1 for information regarding this program.
2. **Verify that the Universal FMS (if used) or Multi-Function Display (MFD) has been configured according to installation data contained in the appropriate Technical Manual.**
3. Set all necessary circuit breakers and ensure that the following systems are operational:
   a. Terrain Awareness and Warning System (TAWS)
   b. Radio Altimeter source (Set altimeter to field elevation)
   c. Air Data Computer source
   d. VHF NAV Receiver source
   e. FMS #1 and #2 (with SCN 604.3/704.3 or later installed) and/or GPS sensor
      NOTE: Display Processor Software SCN 10.1 or higher must be installed to display TAWS information on the FMS.
   f. Gear and Flaps indicating systems
   g. Audio distribution system
   h. Attitude source (if interfaced)

C.   Test Procedures

NOTE: Meet all approved maintenance and safety conditions. Use of appropriate ground power for the aircraft is required.

NOTE: TAWS video, if installed, may be displayed on a Universal FMS CDU, Universal MFD-640 or other compatible display devices. Control for selecting TAWS video display will vary depending on the display device and installation.

NOTE: Aircraft must be in view of satellites for valid GPS position.

1.   Power up the PC and start the TAWS Terminal Monitor program. The Terminal Monitor program is Windows-based and is started the same as any other Windows application. See Appendix 1 of this Service Letter for detailed information on the TAWS Terminal Monitor program.

2.   Verify that TAWS is configured according to the aircraft-specific installation data. Using the UASC Terminal Monitor program, perform the following steps as required:

Test Condition	Expected Result	Actual Result	Pass/Fail
Power On and SELF TEST			
Pull TAWS circuit breaker. Apply power to the aircraft and avionics systems. Power on the TAWS system by engaging the circuit breaker. Leave FMS(s)/GPS off at this time.	While observing the Terminal Monitor Program, verify normal power-on sequence and self tests (approx. 1½ to 3 minutes). At end of test sequence verify TERR INOP annunciator is illuminated and GPWS INOP annunciator is extinguished.		

For installations with Dual UASC Flight Management Systems installed:

Power on (but do not initialize) FMS 2. *Do not power on FMS 1 at this time.*	Verify TERR INOP annunciator is illuminated. Verify GPWS INOP annunciator is extinguished.		

Test Condition	Expected Result	Actual Result	Pass/Fail
Power On and SELF TEST			
Initialize FMS 2 to current GPS position. Verify that FMS "Q" or ANP on NAV page 2 is < 0.50 nm. Do not enter a flight plan at this time.	Verify normal TAWS video display on TAWS display device and TERR INOP annunciator is extinguished. **NOTE:** Normal display is MAP view of local area on FMS 2 with 'red/green" display (Yellow color band is inhibited while on ground).		

For installations with single UASC Flight Management Systems or other compatible GPS source installed:

Power on and initialize the FMS/GPS to current GPS position. Verify that FMS "Q" or ANP on NAV page 2 is < 0.50 nm. Do not enter a flight plan at this time.	Verify normal TAWS video display on TAWS display device, and TERR INOP annunciator is extinguished.		

For installations with UNS-1M/UNS-1M*sp* or other than Universal Avionics FMS or GPS:

Power on and initialize the FMS/GPS. Verify that position quality is less than 0.6 nm.	Verify normal TAWS video display on TAWS display device, and TERR INOP annunciator is extinguished. (No flight plan information will be displayed on UNS-1M/UNS-1M*sp* or non-Universal Avionics FMS installations.)		

TAWS Self Test

Test Condition	Expected Result	Actual Result	Pass/Fail
Power On and SELF TEST (cont'd)			
Ensure that the TERR INHIB switch is NOT activated.			
Press the TAWS Test switch (PULL UP Annunciator/switch) momentarily and note the following indications:			
TAWS Display	Pop-up (when available)		
PULL UP Annunciator	Illuminates		
TERR Annunciator	Illuminates		
TERR INOP Annunciator	Illuminates		
GPWS INOP Annunciator	Illuminates		
BELOW G/S Annunciator	Illuminates		
FLAP OVRD Annunciator	Illuminates		
G/S INHIBIT. Annunciator	Illuminates		
TERR INHIB. Annunciator QFE Annunciator (Note 1)	Illuminates Illuminates		
Test Image (If display is installed, configured and selected to display TAWS).	TAWS TEST DISPLAY COLOR BARS		
Aural Speaker/Headsets:	"TERRAIN, TERRAIN" (Note 2)		
	"PULL UP, PULL UP"		
	"CAUTION TERRAIN"		
	"TOO LOW TERRAIN"		
	"500"		
	"TOO LOW GEAR"		
	"TOO LOW FLAPS"		
	"SINK RATE"		
	"DON'T SINK"		
	"GLIDESLOPE"		
	"BANK ANGLE"		

NOTE 1: QFE functions are available on TAWS installations using SCN 10.5 and later. QFE functions are NOT available on aircraft operating in the United States. QFE operations are confined to specified foreign air space.

NOTE 2: "TERRAIN AHEAD" will be announced if TAWS is configured for European syntax.

NOTE 3: Aural annunciations will concur with functions configured for system. "500" will be the only altitude callout.

Test Condition	Expected Result	Actual Result	Pass/Fail
Power On and SELF TEST (cont'd)			
Completion of Self Test	At end of test verify that PULL UP, TERR, BELOW G/S, G/S INHIBIT and FLAP OVRD annunciators extinguish, but TERR INOP and GPWS INOP remain illuminated for approximately one minute as TAWS system reboots. Verify FMS displays TAWS FAIL message during reboot cycle. At end of reboot verify that TERR INOP and GPWS INOP annunciators extinguish and the FMS clears the TAWS FAIL message.		
Press aircraft annunciator press-to-test button.	All annunciators illuminate.		

Test Condition	Expected Result	Actual Result	Pass/Fail
Sensor Input Failure Tests			
Fail the radio altimeter by pulling the RADIO ALTIMETER circuit breaker.	Verify TERR INOP and GPWS INOP annunciators illuminate.		
Reset circuit breaker	Annunciators extinguish.		
Fail the air data computer by pulling the AIR DATA circuit breaker.	Verify TERR INOP and GPWS INOP annunciators illuminate.		
Reset circuit breaker	Annunciators extinguish. TAWS CDU display returns.		

The following steps apply to all TSO-151a installations. The following steps assume a dual UASC FMS interface with the TAWS displayed on the #2 Control Display Unit. These steps test the communication bus between the FMS and the TAWS, as well as the display of TAWS information. A separate display / FMS interface must be tested accordingly. No flight plan data will be available when interfaced to a non-UASC FMS/GPS.

Test Condition	Expected Result	Actual Result	Pass/Fail
FMS Input Tests (Refer to TAWS Terminal Monitor Program Pages 8 through 12)			
Enter flight plan with several waypoints within 40 NM of present position on FMS 2. Perform Direct-To waypoint within 10 NM of the aircraft. Slew the aircraft heading as required.	If installed with terrain display, select and verify Map View, 10 nm scale showing FMS 2 as source data. Verify flight plan with magenta TO leg.		
	Select and verify Map view 'red/green' display (Yellow color band is inhibited while on ground).		
	Select and verify Profile view.		
	Select and verify 3D View .		
Power on and initialize FMS 1 and crossfill flight plan. Perform DTO second waypoint in flight plan.	Verify TAWS display, if installed, now shows FMS 1 as source data.		
Deselect both GPS's from FMS 1.	Verify TAWS display, if installed, lacks flight plan data, and no FMS source annunciation will be displayed. **NOTE:** Display orientation will 'search' around aircraft location while stationary.		
Power off FMS 1.	Verify TAWS video display, if installed, switches to FMS 2 and display shows valid flight plan and orientation.		

Test Condition	Expected Result	Actual Result	Pass/Fail
FMS Input Tests (cont'd)			
Power on and initialize FMS 1 and crossfill flight plan. Perform DTO second waypoint. Verify Q or FMS 1 ANP is < 0.5 nm.	Verify TAWS automatically switches back to FMS 1 for source data.		
Make careful note of original FMS configuration settings, then de-configure GPS in both FMS 1 and 2. Re-initialize FMS 1 and 2.	Normal initialization on both FMS 1 and 2.		
Select TAWS terrain display.	Verify gray screen for all TAWS video views and TERR INOP annunciator illuminates. (See Note 1)		
Using the applicable FMS Technical Manual, reconfigure FMS 1 and 2 for GPS installed. Reinitialize both FMS systems.	Verify FMS initialization.		

NOTE 1:   A gray screen will not occur if both FMS and GPS are configured.

Discrete Inputs

Discrete inputs may be tested during the course of the flight tests. In the event no flight test is required, actual demonstration of the discrete inputs must be tested. The status of discrete inputs can be monitored using the UASC TAWS Terminal Monitor Program.

Test Condition	Expected Result	Actual Result	Pass/Fail
Discrete Inputs and Outputs (Refer to TAWS Terminal Monitor Program Pages 15 and 16)			
Cycle flaps through all settings.	Verify landing flap discrete active only when landing flaps selected.		
Landing gear discrete.	Verify gear down discrete is DOWN when gear is down.		
Weight on wheels discrete.	Verify weight on wheels discrete confirms ON GROUND condition.		
Activate the FLAP OVRD switch to override.	Verify FLAP OVERIDE discrete and "ON" indication.		
Activate the TERRAIN SEL switch if installed.	Verify TERRAIN SELECT discrete while depressed, and that FMS displays last TAWS view selected.		
Activate the TERR INHIBIT switch.	Verify TERRAIN INHIBIT discrete and "TERR INOP" indication.		
Activate the GLIDESLOPE INHIBIT switch.	Verify GLIDE SLOPE INHIBIT discrete active while active. Also verify G/S INHIBIT annunciator illuminates.		
Activate the GLIDESLOPE INHIBIT switch.	Also verify G/S INHIBIT annunciator extinguishes.		
Select GO AROUND (TOGA) on Power Levers (if provisioned).	Verify TOGA Discrete valid.		

Test Condition	Expected Result	Actual Result	Pass/Fail
For QFE Operations			
Activate QFE select switch (See Note 1)	Verify momentary TRUE state.		
Toggle the QFE discrete.	TAWS display shows "QFE Armed". After 15 seconds verify TAWS display shows "QFE ----" (where ---- equals the appropriate airport designator).		
With QFE active, reset altimeter more than 100 ft.	Verify TAWS displays message "TAWS QFE MODE NOT ACTIVE BARO COMPENSATION CHANGED".		
Deselect and reselect QFE to active. Pull the ADC circuit breaker.	Verify TAWS displays message "TAWS QFE MODE NOT ACTIVE TERR INOP".		
Reset ADC circuit breaker and deselect QFE. Reselect QFE.	Verify display shows "QFE Armed".		
Within 15 seconds of selecting QFE make a baro compensation change on the altimeter.	Verify display shows "QFE ----" within 3 seconds after completing altimeter reset (where ---- equals the appropriate airport designator).		
Deselect QFE. Set TAWS for Terrain Inhibit. Reselect QFE.	Verify TAWS displays message "TAWS QFE MODE NOT ACTIVE TERR INHIBIT".		

NOTE 1:   QFE functions are available on TAWS installations using SCN 10.5 and later. QFE functions are NOT available on aircraft operating in the United States. QFE operations are confined to specified foreign air space.

Localizer, Glideslope and Backcourse Input Tests

This is a required test for all installations. The following is based around a 429 EFIS / CSDB Nav interface. Aircraft equipage and installation engineering may require modifications to the specific test procedures. Tuned To LOC, LOC Val, G/S Val and lat/vert deviations are minimum requirements to meet TSO.

Test Condition	Expected Result	Actual Result	Pass/Fail
Localizer, Glideslope and Backcourse Input Tests (Refer to TAWS Terminal Monitor Program Pages 5, 6 and 15)			
Tune the #1 NAV to valid LOC frequency generated by test set.	Verify valid localizer input.		
Select LOC 1 as active source on pilot's HSI and set CRS pointer under lubber line.	Verify BACKCOURSE discrete is not active. Verify presence of valid LOC and G/S indications on HSI.		
If backcourse discrete input is provided to TAWS, rotate CRS pointer away from lubber line.	Verify at approximately 115 degrees from lubber line that backcourse discrete becomes active.		
Return CRS pointer to lubber line.	Verify BACKCOURSE discrete returns to inactive state		
GLIDESLOPE DEVIATION: Set test set to G/S deviations as indicated.	Verify GLIDESLOPE DEVIATION within $\pm$ 0.2 dots. **NOTE:** "-" = UP (below beam) "+" = DOWN (above beam)	2 dots UP _____ 1 dot UP _____ 1 dot DN _____ 2 dots DN _____	
GLIDESLOPE FLAG: Set G/S invalid on test set.	Verify flagged condition for G/S data.		
LOCALIZER DEVIATION: Set test set to LOC deviations as indicated.	Verify LOCALIZER DEVIATION within $\pm$ 0.2 dots. **NOTE:** "-" = Fly left "+" = Fly right	2 dots RT _____ 1 dot RT _____ 1 dot LT _____ 2 dots LT _____	
LOCALIZER FLAG: Set LOC invalid on test set.	Verify flagged condition for LOC Data.		

Air Data Input Tests (field elevation and zero airspeed)
> This is a required test for all installations. Follow the Aircraft manufacturers' procedures and provide pitot static pressures to the air data system. Monitor the TAWS via the portable computer for input verification.

Test Condition	Expected Results	Actual Results	Pass/Fail
Air Data Input Tests (Refer to TAWS Terminal Monitor Program Pages 2 and 3)			
Using appropriate air data system tester, increase altitude in 1000-foot steps to 5,000 feet above field elevation.	Verify correlation of altitudes between pilot's altimeter and TAWS to within ± 50 feet.	Record data:	
Simulate a climb at 1000, 2500 and 4000 feet per minute.	Verify correlation of vertical speed between pilot's VSI and TAWS to within ± 200 fpm.	Record data:	
Simulate a descent at 1000, 2500 and 4000 feet per minute.	Verify correlation of vertical speed between pilot's VSI and TAWS to within ± 200 fpm.	Record data:	
Set test altitude to approximately 5000 ft. or field elevation, whichever is greater.			
Increase indicated airspeed to 140, 170 and 200 knots.	Verify correlation of *TRUE* airspeed between FMS #1 ADC and TAWS to within ±10 knots. (Record data from FMS 1 ADC sensor page)	Record TAS data.	
Return air data test set to ambient pitot and static pressures. Disconnect test set.	Verify correct TAWS indications of altitude, vertical speed and airspeed.		

Radio Altimeter Input Tests

> The following is a required test for all TSO C92c and C151a (class A) installations. Class B installations by definition do not require a radio altimeter interface.

Test Condition	Expected Results	Actual Results	Pass/Fail
Radio Altimeter Input Tests (Refer to TAWS Terminal Monitor Program Page 4)			
Increase radio altitude to 2500 feet at points shown and record data. Range altitude and check accuracy of any other altitude callouts which may be configured.	Verify accuracy of radio altitudes within tolerances given.	0 ± 3:___ 100 ± 3:_____ 200 ± 6:_____ 300 ± 9:_____ 400 ± 12:_____ 500 ± 15:_____ 750 ± 30:_____ 1000 ± 40:_____ 1500 ± 60:_____ 2000 ± 80:_____ 2500 ± 100:____	

Night Lighting Tests

> Configure the aircraft for night lighting conditions either by adequately darkening the cockpit and cabin or by performing this test at night.
> All TAWS installations must provide easily visible and readable annunciations and display (if display is required). Access to the TAWS controls and circuit breaker must be demonstrated.

Test Condition	Expected Results	Actual Results	Pass/Fail
Night Lighting Tests			
Initiate TAWS self test and monitor annunciators during test. Use FMS CDU controls to vary display brightness. Use cockpit dimmer to vary annunciator brightness.	Verify that the TAWS display and annunciators are legible and readable under night lighting conditions.		
Installation Evaluation Tests			
From the Pilot position, evaluate location and legibility of glareshield annunciators- PULL UP, TERR, BELOW G/S, G/S INHIBIT. Use main annunciator push to test as required to illuminate annunciators.	Verify appropriate placement and appearance.		

Test Condition	Expected Results	Actual Results	Pass/Fail
Installation Evaluation Tests (cont'd)			
From the pilot position, evaluate location and legibility of instrument panel annunciators - TERRAIN SELECT, TERR INOP, TERR INHIB, GPWS INOP, ON, FLAP OVRD. Use main annunciator push to test as required to illuminate annunciators	Verify appropriate placement and appearance. Also verify operation of guard over FLAP OVRD switch if installed.		
Select TAWS display on the display system. From the pilot position, evaluate display presentation.	Verify acceptable access and presentation.		
From the pilot position, evaluate the accessibility of the TAWS circuit breaker.	Verify acceptable pilot access.		

DTU-100 Operations (for aircraft with ARINC 739 interface)

Test Condition	Expected Results	Actual Results	Pass/Fail
DTU-100 Operations			
Update the TAWS airport data base via the DTU-100.	Verify update progresses normally.		
From the TAWS Disk Menu page or from Page 30 of the Terminal Monitor program (Page 528 of this manual), download the TAWS data configuration, alert logs and fault logs files to disk.	Verify via PC that the files are downloaded to the disk.		

B. Preflight Test

Instructions for accomplishing a flight test of TAWS is presented in the next section. Before performing the flight test, a TAWS preflight check should be completed. The following table presents scheduled TAWS preflight test items.

Test Aural (Annunciated on both Headsets and Speakers)	Digital Signal Description	Test Lamp (Note 3)	Test Image	Test Image Message (Annunciated on all displays as shown in the Pre-Flight Test images)
TERRAIN TERRAIN (US) OR TERRAIN AHEAD (European)	Terrain Warning	PULL UP	ON	TAWS PRE-FLIGHT TEST
PULL UP PULL UP	GPWS Warning	PULL UP	ON	TAWS PRE-FLIGHT TEST
MINIMUMS (Note 1)	None	None	ON	TAWS PRE-FLIGHT TEST
CAUTION TERRAIN	Terrain Caution	TERR	ON	TAWS PRE-FLIGHT TEST
TOO LOW TERRAIN	Terrain Caution	TERR	ON	TAWS PRE-FLIGHT TEST
500	None	None	ON	TAWS PRE-FLIGHT TEST
TOO LOW GEAR	GPWS Caution	TERR	ON	TAWS PRE-FLIGHT TEST
TOO LOW FLAPS	GPWS Caution	TERR	ON	TAWS PRE-FLIGHT TEST
SINK RATE	GPWS Caution	TERR	ON	TAWS PRE-FLIGHT TEST
DON'T SINK	GPWS Caution	TERR	ON	TAWS PRE-FLIGHT TEST
GLIDE SLOPE	GPWS Caution	BELOW G/S (Note 1) or TERR	ON	TAWS PRE-FLIGHT TEST
APPROACHING MINIMUMS (Note 1)	None	None	ON	TAWS PRE-FLIGHT TEST
RADIO ALTIMETER (Note 1)	None	None	ON	TAWS PRE-FLIGHT TEST
BANK ANGLE (Note 1)	None	None	ON	TAWS PRE-FLIGHT TEST
NONE (Note 2)	GPWS Inoperative	GPWS INOP	ON	TAWS PRE-FLIGHT TEST
NONE (Note 2)	Terrain Inoperative	TERR INOP	ON	TAWS PRE-FLIGHT TEST
NONE (Note 2)	G/S Cancel Terrain Inhibit Terrain Inoperative	FLAP INHIB (Note 1), G/S INHIB (Note 1), TERR INHIB (Note 1) OR TERR INOP	ON	TAWS PRE-FLIGHT TEST

NOTE 1:   If configured.
NOTE 2:   A one-second quiet period is inserted here since no aural annunciation corresponds to the current visual annunciation.
NOTE 3:   The QFE Mode light (if configured) and the TCAS Audio Inhibit (if configured) will remain ON during the entire preflight test.
NOTE 4:   SCN 10.4 and previous, the TAWS display must be manually selected to view the TAWS preflight test pattern. On installation using SCN 10.5 and later with pop-up configured, the pattern will pop up.

2.   Sample Flight Test

> **NOTE:** The purpose of the following Sample Test Plan is to demonstrate the proper operation of the TAWS Basic Mode 1-5 and Altitude callout functions in addition to TAWS Alerting and Terrain Display. The tests are also intended to demonstrate that the system does not produce nuisance alerts for normal aircraft operations. This Sample Test Plan is not intended for use as a complete or final test document. Since the TAWS Computer may be interfaced with equipment other than stated, tests must be conducted based on your specific interfaces., type of aircraft, avionics suite and other variables. Use of necessary and appropriate equipment and procedures will be required and is the responsibility of the installation agency. The degree and extent of Flight Testing is the responsibility of the installation agency as directed by the certifying authority. Representative flight tests from this document should be selected in accordance with FAA Advisory Circular (AC) 25-23, Paragraph 20, or AC 23-18, Paragraph 7.o.

> **NOTE:** To obtain valid results, careful attention must be paid to maintaining stabilized flight per the parameters defined for the test being performed, and accurately observing the applicable flight instruments, displays and annunciations when the alerts and warnings occur. Adequate data must be recorded for each test while it is performed to be useful in documenting the certification test flights.

> **NOTE:** Flight test should only be performed in visual meteorological conditions.

> **NOTE:** All new equipment installed in conjunction with your TAWS installation should be thoroughly tested before performing this flight test.

A.   Ground Proximity Warning Functions

> **NOTE:** Airspeed values identified in this section are True Airspeed (TAS) values. Use of the FMS ADC Sensor page data can ensure adequate Indicated Airspeed (IAS) corrections are made (SCN 10.4 and later will have airspeed values identified as Indicated Airspeed). Altitude values are approximate for envelope and terrain features, therefore some variance can be expected. Alert altitudes should be consistent with the alert envelopes depicted in the TAWS Operator's Manual (Report No. 34-40-01.01). This can be determined by reviewing the alert log captures correlated to time marks made throughout.

> **NOTE:** Current local Baro altimeter setting is required for proper TAWS operation. Altimeter settings from local tower ATIS or approved weather source should be used. For test at remote locations, altimeters should be calibrated against the local terrain feature.

The Universal Avionics TAWS computer provides the following six Ground Proximity warning modes as defined in RTCA Document DO-161A and TSO C151a:

- ➤ Excessive Rates of Descent (DO-161A Warning Mode 1).

- ➤ Excessive Closure Rate to Terrain (DO-161A Warning Mode 2).

- ➤ Negative Climb Rate or Altitude Loss After Take-Off (DO-161A Warning Mode 3).

- ➤ Flight Into Terrain When Not in Landing Configuration (DO-161A Warning Mode 4).

- ➤ Excessive Downward Deviation From an ILS Glideslope (DO-161A Warning Mode 5).

- ➤ Descent of airplane to 500 feet above the terrain or the nearest runway elevation.

These warning modes should be tested using the maneuvers defined and may be accomplished in any sequence. During the test the aircraft should be stabilized on the airspeed, altitude, heading and/or flight path angle as defined for the test being conducted. Accurate and timely observation of the applicable flight instruments is essential to determine if the installation meets specifications.

1.   Gear and WOW Inputs (Airborne)

Using a portable computer (PC) with the TAWS Terminal Monitor program installed, after takeoff and with gear up, verify gear down discrete indicates gear is up and WOW indicates "airborne" on TAWS Monitor page 15.

2.   Vertical Speed Check

Compare the vertical speed from the aircraft VSI with the TAWS computed vertical speed, which is displayed on TAWS Monitor page 3, at several rates for reasonableness and record readings. Verify that the two values agree (±200 fpm).

AIRCRAFT VSI	TAWS VSI

3.   Excessive Rates of Descent (DO-161A Warning Mode 1)
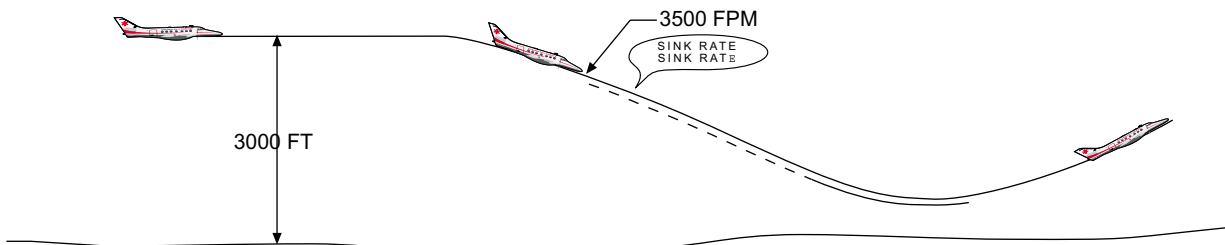
NOTE: This test should be conducted over level terrain. Conduct this test in the following sequence:
(a)   Test Conditions
(1)   Start from an altitude of approximately 3000 feet AGL with Landing Gear and Flaps - UP.
(2)   Verify GPWS INOP light is off.
(3)   Select/Verify TERR INHIB – ON.
(4)   Select/Verify FLAP OVRD - OFF.
(6)   Establish a descent at a constant rate of approximately 3500 FPM.

(7) Verify the following indications:

Mode 1 Sink Rate Alert   TIME

Voice Alert:	"SINK RATE, SINK RATE"	☐ PASS	☐ FAIL
Lamp Alert Caution	TERR	☐ PASS	☐ FAIL
Pop-up	No	☐ PASS	☐ FAIL

(8) After continued descent, verify the following indications:

Mode 1 Pull Up Warning   TIME

Voice Alert:	"PULL UP, PULL UP"	☐ PASS	☐ FAIL
Lamp Alert Warn	PULL UP	☐ PASS	☐ FAIL
Pop-up	No	☐ PASS	☐ FAIL

(9) Upon getting the "PULL UP" warnings, initiate a climb at approximately 1000 FPM.

(10) By the time a positive rate of climb has been established all warnings shall terminate/turn off.

NOTE: Excessive airspeeds may trigger Mode 4 "Too Low Terrain" alerts that will mask the "Sink Rate" aural alert. The aircraft may be configured with gear and/or flaps down as necessary.

4. Excessive Closure Rate to Terrain (DO-161A Warning Mode 2)

NOTE: Mode 2 testing requires establishing a uniformly decreasing rate of change of height above terrain (Radar Altitude) starting from 2450 feet AGL. This requires approaching a target terrain feature at a constant airspeed and on an established course over the ground. Any mountain with enough local relief to allow initiating the maneuver at a radar altitude of greater than 2450 ft and with a uniform slope of from .21 to .3 is suitable. Radar altitudes specified for warnings are approximate and intended as guide. Actual RA values should be verified from the alert logs. Verify and set local altimeter prior to this test.

"TERRAIN TERRAIN,
PULL UP PULL UP"
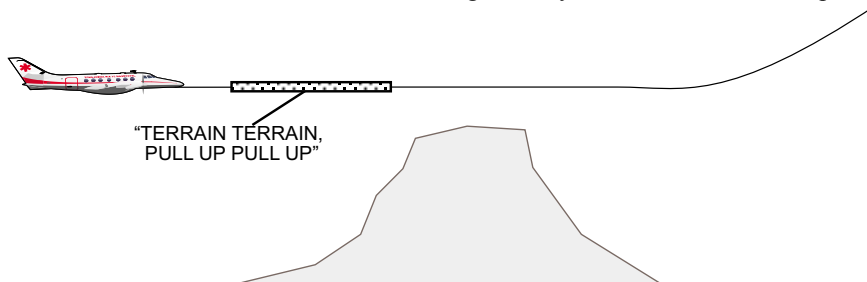
(a) Mode 2A Flaps NOT in Landing Configuration

Test Conditions

(1) Ensure ILS is not tuned.

(2) Select/Verify TERR INHIB – ON.

(3) Select/Verify Flaps NOT in landing configuration.

(4) Select/Verify FLAP OVRD – OFF.

(5) Select/Verify Landing Gear - UP.

(6) Fly across the specified mountain from the no warning area on a constant heading at an even altitude of 500 feet above the selected target terrain feature and at a stabilized 210 ± 10 KTS Ground Speed.

(7)   At a radar altitude 1100 to 1450 Ft AGL, verify the following indications:

TIME

Voice Alert:	"TERRAIN, TERRAIN" "PULL UP, PULL UP"	_____	☐ PASS	☐ FAIL
Lamp Alert Warn:	TERR Annunciator at "TERRAIN, TERRAIN"		☐ PASS	☐ FAIL
Lamp Alert Warn:	PULL UP annunciator at "PULL UP"		☐ PASS	☐ FAIL
Pop-up:	Yes		☐ PASS	☐ FAIL

(8)   After overflying the peak, initiate a 500 to 1000 FPM climb. The PULL UP annunciator should turn off after 300 feet of altitude is gained.

5.   Altitude Loss after Take-off (DO-161A Warning Mode 3)
        NOTE: These alerts occur when the aircraft loses altitude shortly after take-off or go-around.
        NOTE: This test should be conducted over fairly level ground or water. Carefully monitor the Radio Altimeter Indicator to determine the TURN ON and TURN OFF points of the warnings.

(a)   Mode 3 after Take-off
        Test Conditions
    (1)   Select/Verify TERR INHIB – ON
    (2)   Conduct a normal takeoff.
    (3)   Accelerate and retract the flaps to *other than* landing flaps.
    (4)   IMMEDIATELY start climbing at approximately 600 FPM. Level out at 1000 feet AGL and IMMEDIATELY start a slow descent (rate of at least 110 FPM) to approximately 800 feet AGL.
    (5)   When a barometric altitude loss of 5 to 200 feet has been attained observe the following:

TIME

Voice Alert:	"DON'T SINK"	_____	☐ PASS	☐ FAIL
Lamp Alert:	TERR		☐ PASS	☐ FAIL
Pop-up:	No		☐ PASS	☐ FAIL

(6)   Smoothly pull up into a 100 FPM climb. The "DON'T SINK" warning will terminate and the TERR annunciator will extinguish after a positive rate of climb is established.

6.   Flight into Terrain When Not in Landing Configuration (DO-161A Warning Mode 4)

TAWS generates Mode 4 alerts when the aircraft is too close to the ground. An alert occurs when the aircraft is operated too close to the ground with the landing gear retracted or when he TAWS computer determines that aircraft is a landing configuration with less than landing flaps. This test should be conducted near an airport or over flat terrain.

190 KNOTS or faster TAS (SCN 10.3 and earlier; SCN 10.4 and later expresses airspeed as IAS)

500 FPM

TOO LOW TERRAIN
TOO LOW TERRAIN

150 KNOTS TAS (SCN 10.3 and earlier; SCN 10.4 and later expresses airspeed as IAS)

HIGH SPEED TERRAIN CLEARANCE TEST PROFILE
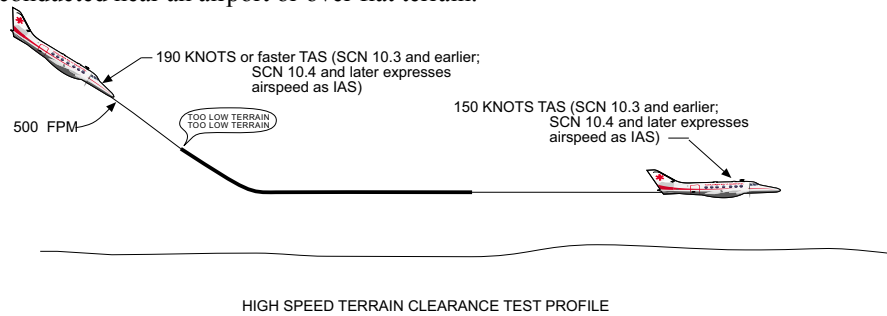
Test Conditions

(a)   Select/Verify Gear – UP and TERR INHIB - ON.
(b)   Select/Verify Flaps NOT in landing configuration.
(c)   At a stabilized airspeed of greater than 190 kts IAS descend to an altitude of 500 Feet AGL or less.
       NOTE: Airspeed is expressed as IAS (Indicated Airspeed) in TAWS installations with SCN 10.4 and later. Earlier software versions express airspeed as TAS (True Airspeed).
(d)   Between 1000 and 500 feet AGL, observe the following:

TIME

Voice Alert:	"TOO LOW TERRAIN"		☐ PASS	☐ FAIL
Lamp Alert:	TERR		☐ PASS	☐ FAIL
Pop-up:	Yes		☐ PASS	☐ FAIL

Test Conditions

(a)   Commence a stabilized visual approach from an altitude of approximately 1000 feet AGL, descend at approximately 500 FPM, less than 150 kts IAS.
       NOTE: Airspeed is expressed as IAS (Indicated Airspeed) in TAWS installations with SCN 10.4 and later. Earlier software versions express airspeed as TAS (True Airspeed).
(b)   Between 600 and 400 feet AGL, observe the following:

TIME

Voice Alert: "TOO LOW GEAR, TOO LOW GEAR"		☐ PASS	☐ FAIL
Lamp Alert:	TERR	☐ PASS	☐ FAIL
Pop-up:	No	☐ PASS	☐ FAIL

(c)   Extend the Landing Gear. The TERR annunciator will extinguish and the "TOO LOW GEAR" warning will turn OFF.
(d)   Continue the approach.
(e)   Between 300 and 200 feet AGL, observe the following:

TIME

Voice Alert: "TOO LOW FLAPS, TOO LOW FLAPS"		☐ PASS	☐ FAIL
Lamp Alert:	TERR	☐ PASS	☐ FAIL
Pop-up:	No	☐ PASS	☐ FAIL

(f)   Extend the flaps to landing configuration and hold the altitude at 100 to 150 feet AGL. The TERR annunciator will extinguish and the "TOO LOW FLAPS" warning will turn OFF.

(g)　　Initiate a Go-Around procedure. Raise the landing gear and climb at 600 FPM to an altitude of 1500 feet AGL.

7.　　Excessive Downward Deviation from an ILS Glideslope (DO-161A Warning Mode 5)

TAWS generates Mode 5 alerts when the aircraft deviates excessively below the glideslope with the gear down.

MODE 5 TEST PROFILE
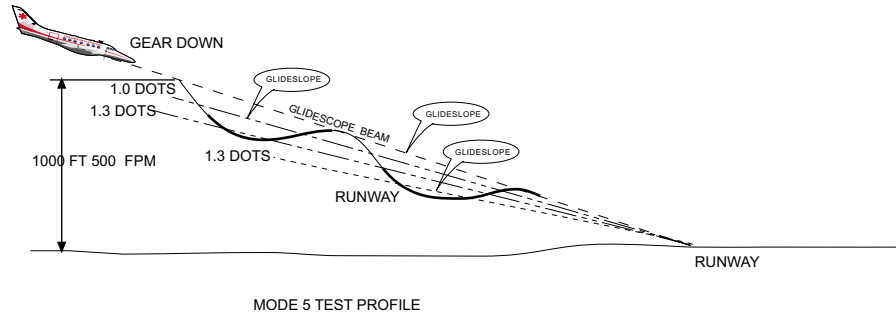
NOTE:　The following conditions must be present to allow this warning function to operate.

Test Conditions
(a)　　Select/Verify TERR INHIB – ON.
(b)　　Initiate a normal ILS approach. (#1 NAV radio tuned to ILS)
(c)　　Landing gear – Down
(d)　　At 1000 feet AGL, start to descend below the Glideslope at a descent rate of at least 500 FPM. Between 1.0 and 1.6 dots (nominal value 1.3 dots) "Fly Up" indication, observe the following:

		TIME		
Voice Alert: "GLIDESLOPE" (soft alert)			☐ PASS	☐ FAIL
Lamp Alert:	BELOW G/S		☐ PASS	☐ FAIL
Pop-up:	No		☐ PASS	☐ FAIL

(e)　　Level out airplane. When the G/S indication decreases to between 1.3 and 0.7 Dots "Fly Up", the "GLIDESLOPE" warning and BELOW G/S lamp(s) will turn OFF.
(f)　　Descend again to more than 2.0 dots fly up indication.
(g)　　Maintain the descent at this deviation. At 250 TO 300 feet AGL the following indication will occur:

		TIME		
Voice Alert: "GLIDESLOPE" (loud alert)			☐ PASS	☐ FAIL
Lamp Alert:	BELOW G/S		☐ PASS	☐ FAIL
Pop-up:	No		☐ PASS	☐ FAIL

(h)　　At 200 ft. AGL press G/S INHIBIT and observe:

	TIME		
Glideslope alert cancels		☐ PASS	☐ FAIL

For Analog with backcourse discrete configured:
Test Conditions
(a)　　Select/Verify TERR INHIB – ON.
(b)　　Initiate FMS ILS Back course approach
(c)　　Verify G/S INHIBIT light illuminates.
(d)　　Recover aircraft to glidepath condition or resume flight test.

8. Altitude Callouts:

The altitude callout function generates aural altitude annunciations each time the aircraft's radio altimeter altitude descends through one of the configured altitude with no ILS frequency tuned.

Test Conditions

(a)   Conduct non-precision approach to an airport.

(b)   Verify no ILS frequency tuned.

(c)   Observe the following aural callout at 500ft AGL:

TIME

Voice alert	"FIVE HUNDRED"	☐ PASS	☐ FAIL

(d)   Continue approach or resume flight.

9. Bank Angle Callouts (if so equipped and configured):

The TAWS will monitor the aircraft bank angle and issue a voice alert upon reaching the Configured Bank Angle limit. If the Aircraft continues past the limit and reaches a bank angle value equal to 20% greater than the configuration setting, a second voice alert will be issued. It is possible for the aircraft to maintain a bank angle in excess of the configuration setting after the warnings have been issued with no further warnings issued. Decreasing the aircraft bank angle to a value less than 20% of the configuration setting will reset the alert and any further incursions past the configuration setting will generate a new voice alert.

(a)   Climb to a safe altitude for banking turn maneuvers.

(b)   Gradually establish a bank angle that approaches and exceeds the configured bank angle limit. Observe the following:

TIME

Voice Alert: "BANK ANGLE"		☐ PASS	☐ FAIL
Lamp Alert:	No	☐ PASS	☐ FAIL
Pop-up:	No	☐ PASS	☐ FAIL

(c)   Return the aircraft to wings level flight flight.

B.   Terrain Alerting Functions

NOTE: TERRAIN INHIBIT must be **OFF** for all terrain alerting functions tests.

NOTE: These alerts use *GROUNDSPEED* from the FMS and *not TAS*. Refer to the #1 FMS CDU Nav page 1 for ground speed reference data.

1. Premature Descent Alerts (PDA)

NOTE: This sample test will evaluate the TAWS alerts generated when the aircraft violates the protection floor around an airport. This function can be tested within 10nm of the destination airport runway.

(a)   On the FMS or visually establish an inbound course to a runway at a selected airport.

(b)   Position the aircraft at *10nm* from the end of the runway.

(c)   Landing gear down or flap override active.

(d)   Flaps in landing configuration.

(e)   Descend below 400 Feet AGL *more* than *5nm* before the runway.

TIME

Voice Alert: "TOO LOW TERRAIN"		☐ PASS	☐ FAIL
Lamp Alert caution:	TERR	☐ PASS	☐ FAIL
Pop-up:	Yes	☐ PASS	☐ FAIL

(f)   Pull up to a safe altitude and resume normal flight.

2. Forward Looking Terrain Avoidance Alerts

The alerts associated with the Forward Looking Terrain Avoidance Alerts are validated by flying flight profiles toward steep terrain.

Along track and along arc lateral vertical envelopes are generated based on the aircraft's current position and ground speed. Vertical envelopes are generated in Climb, Level and Descent Regions. Terrain Warnings or Cautions occur when the terrain in the terrain data base lateral envelope violates the vertical envelopes.

Potential terrain conflicts are depicted by the Terrain Threat Symbol. Both Warnings and Cautions are alerted with this symbol. Terrain Warnings display a flashing red symbol while Terrain Cautions are depicted by a flashing yellow symbol. Terrain threats along the flight plan display at the predicted first point of contact of terrain with the terrain envelopes.

NOTE: Ensure flaps are not in landing configuration and Flap Override is not engaged for these tests.

(a) Reduced Obstacle Clearance Alerts

> **NOTE:** ROC changes with phase of flight. For best test results remain at least 15 nm from any airport to keep TAWS in enroute phase.

This sample test will evaluate the TAWS alert generated when terrain ahead penetrates the Level Flight Region or the Descent Region of the vertical envelope and the terrain elevation is *less* than airplane altitude. Terrain Caution will be generated approximately 60 seconds from the point over the ground where the Reduced Obstacle Clearance is less than the vertical clearance required for the Flight Phase. At approximately 30 seconds from the same point a Terrain Warning will occur.

(1) Reduced Obstacle Clearance – Level Flight Test Conditions
a. Fly toward the selected mountain an altitude approximately 300 feet above the terrain feature while maintaining a constant heading.
b. Maintain 220 kts *GROUND SPEED*.
c. When the conditions for this warning are met, the following indications indicate proper function of this alert:

Reduced Obstacle Clearance Caution:

		TIME		
Voice Alert: "CAUTION TERRAIN, CAUTION TERRAIN"		_____	☐ PASS	☐ FAIL
Lamp Alert: TERR			☐ PASS	☐ FAIL
Pop-up: Yes (yellow terrain threat symbol)			☐ PASS	☐ FAIL

d. Approximately 30 seconds after Caution:

Reduced Obstacle Clearance Warning:

		TIME		
Voice Alert: "TERRAIN TERRAIN, PULL UP PULL UP"		_____	☐ PASS	☐ FAIL
Lamp Alert: PULL UP			☐ PASS	☐ FAIL
Pop-up: Yes (red terrain threat symbol)			☐ PASS	☐ FAIL

e. Exit ROC alert envelope and climb to a safe altitude.

2. QFE Operations Mode
   NOTE: QFE operations are NOT conducted in the United States.
   A. Departure Operations
   This test will evaluate the optional configuration QFE mode function. The departure logic selects the departure airport on the FMS flight plan if one exists. If no flight plan is present on the FMS, TAWS selects its own destination airport based on position.

   (1) Verify that TAWS is operational and in the non-QFE mode
   (2) Press the QFE request switch and verify QFE armed.

   TIME

   _____ ☐ PASS ☐ FAIL

   (3) Within fifteen seconds set pilot's altimeter to local QFE setting. If no local QFE setting is available set altimeter to zero (0). Verify QFE active.

   TIME

   _____ ☐ PASS ☐ FAIL

   (4) Execute a normal takeoff and verify that no nuisance alerts occur.

   TIME

   _____ ☐ PASS ☐ FAIL

   (5) At 30 nm from the airport, verify that QFE mode automatically cancels. A "NOT IN DEPART TERM AREA" message will be displayed.

   TIME

   _____ ☐ PASS ☐ FAIL

   (6) Press the QFE request switch to cancel QFE.
   B. Arrival Operations
   This test will evaluate the configurable QFE mode function during approach and landing operations. TAWS will check the FMS for a destination airport in the flight plan. If no destination airport is present QFE will not activate.

   (1) Verify that TAWS is operational in the non-QFE mode and link approach.
   (2) Press the QFE request switch and verify QFE armed.

   TIME

   _____ ☐ PASS ☐ FAIL

   (3) Within fifteen seconds set pilot's altimeter to local QFE setting. If no local QFE setting as available, estimate the setting based on the current altimeter setting. Set altimeter to zero (0). Verify that QFE is active.

   TIME

   _____ ☐ PASS ☐ FAIL

   (4) Make a normal approach and landing. Verify that no nuisance terrain alerts occur.

   TIME

   _____ ☐ PASS ☐ FAIL

4.   "Flight Plan Look Ahead" Terrain Alerting

TAWS generates both static and dynamic terrain envelopes along and down the flight path. Static lateral and vertical envelopes are used for Terrain on Flight Plan Advisory feature. Terrain on Flight Plan Advisory feature uses the vertical and horizontal flight plan information to look down plan for terrain threats. For Dynamic Terrain Caution and Advisories, TAWS uses Estimated Position Error and current ground speed. The topographical features of the terrain used for the test should be suitable for proper operation of this warning mode.

(a)   Terrain On Flight Plan Alerting and Warning

This Sample Test Plan will evaluate the TAWS Advisory generated when the terrain in the Static Lateral envelope penetrates the Vertical Flight Plan Look Ahead Envelope.

Test Conditions

(1)   Create a flight plan with a waypoint within 5.6 nm (2 times the Terrain Required Position Accuracy of 2.8 for Enroute Flight Phase) of a terrain feature.

(2)   On the VNAV Flight plan enter an altitude that is at or below the terrain elevation at a flight plan waypoint.

(3)   The following should be observed:

TIME

Voice Alert:	None	☐ PASS ☐ FAIL
EFIS Message:	None	☐ PASS ☐ FAIL
TAWS Display Alert:	White Threat Symbol (See Note 1)	☐ PASS ☐ FAIL
Lamp Alert:	FMS Message Light	☐ PASS ☐ FAIL
Pop-up:	No	☐ PASS ☐ FAIL

NOTE 1:   When operating TAWS with SCN 10.5 or later, an "FPL CONFLICT" message will appear with the white threat symbol. Closest waypoint and range will also be displayed.

(4)   Remove VNAV altitude from flight plan.

--END OF TEST--

NOTE: The following pages show the various screens of the TAWS Terminal Monitor program. Use the information as a guide when performing TAWS post-installation checkout.

APPENDIX 1

This appendix to Service Letter 2778 contains information regarding Universal's TAWS Terminal Monitor program. The following will assist in configuring TAWS and checking out your installation. Refer to this appendix while accomplishing the preceding ground and flight tests.

```
┌──────────────────────────────MAIN MENU─────────────────────────── Page 1 ─┐
│    1) Main Menu                      23) Command Options                   │
│    2) Air Data Input Monitor 1/2     24) Fault Log                         │
│    3) Air Data Input Monitor 2/2     25) Alert Log                         │
│    4) Radio Altimeter Input Monitor  26) Misc. Data (SCNs, RCs)            │
│    5) ILS Input Monitor 1/2          27) Configuration Data 1/3            │
│    6) ILS Input Monitor 2/2          28) Configuration Data 2/3            │
│    7) Attitude Input Monitor         29) Configuration Data 3/3            │
│    8) FMS Input Monitor 1/4          30)DTU Options                        │
│    9) FMS Input Monitor 2/4          31) True Heading Monitor              │
│   10) FMS Input Monitor 3/4                                                │
│   11) FMS Input Monitor 4/4                                                │
│   12) GPS Input Monitor                                                    │
│   13) UMFD Input Monitor                                                   │
│   14) WXR Input Monitor                                                    │
│   15) Input Discretes Monitor                                             │
│   16) Output Discretes Monitor                                            │
│   17) 429 Outputs - Alert Parameters                                      │
│   18) 429 Outputs – Image Control Bus                                     │
│   19) 429 Output Bus Monitor 3/6     99) Print messages                   │
│   20) 429 Output Bus Monitor 4/6                                          │
│   21) 429 Output Bus Monitor 5/6     Press F1 for help at any time.       │
│   22) 429 Output Bus Monitor 6/6                                          │
└─ 20:11:49 ──────────────────────────────────────────────── 10.5 ─────────┘
```

NOTES:

1. The TAWS boot up sequence can be monitored. Start the Terminal Monitor program then apply power to the TAWS unit. The Monitor program will display the progress of the TAWS boot.

2. Upon successful boot, the above screen will be displayed. The laptop Page Up / Page Down keys can be used to navigate between screens. The number of the desired screen can also be entered manually. The TAB key will navigate the available fields on a given page.

3. The contents of the Terminal Monitor displays can be captured to a .txt file. Press F8 and the contents of the display screen will be "dumped". Any Alert information will also be captured. This can be useful for flight testing. Only one .txt file will be created during a session. Every press of the F8 key will update the displays and add whatever screen is currently displayed. In the case of the alert logs, the displays accumulate rather than refresh. For more details on alert logs, refer to page 25 of the TAWS Terminal Monitor Program.

4. Some items in this program use the terms "Captain" and "First Officer". "Captain" is interchangeable with "Pilot" and "First Officer" is interchangeable with "Co-pilot".

```
┌──────────────── AIR DATA INPUT MONITOR 1/2 DATA ──────────── Page  2 ──┐
│                           Source                                        │
│  Parameter        Source    Selected  Validity    Port    Value         │
│                                                                         │
│  Baro Altitude    A429 LS      (1)      (2)        (3)     (4)   ft      │
│                   A429 HS      Not Configured                    ft      │
│                   A575         Not Configured                    ft      │
│                   Syncro       Not Configured                    ft      │
│                   Sperry       Not Configured                    ft      │
│                                                                         │
│  True Airspeed    A429 LS      (X)    Valid          6      245   kts    │
│                   A429 HS      Not Configured                    kts     │
│                   A575         Not Configured                    kts     │
│                   A565 DC      Not Configured                    kts     │
│                   A565 AC T1   Not Configured                    kts     │
│                   A565 AC T2   Not Configured                    kts     │
│                                                                         │
│  Ind Airspeed     A429 LS       X     INVALID        3       0    kts    │
│                   A429 HS      Not Configured                    kts     │
│                   A575         Not Configured                    kts     │
│                                                                         │
│ ── 20:17:44 ─────────────────────────────────────────────── 10.5 ──    │
└─────────────────────────────────────────────────────────────────────────┘
```

NOTES:

1. When a valid signal is present, an "X" will appear in this field. If more than one source is available, the "X" will correspond with the source selected by the TAWS computer.
2. This field will indicate "Not Configured", "Valid" or "Invalid as appropriate.
3. This field reflects the TAWS input port Configuration setting.
4. This field indicates the respective value for a source.
5. Sample data is shown in the True Airspeed field.

Parameter	Source	Source Selected	Validity	Port	Value
Vertical Speed	A429 LS	X	VALID	3	ft/min
	A429 HS		Not Configured		ft/min
	A575		Not Configured		ft/min
	A565 AD		Not Configured		ft/min
	A595 DC		Not Configured		ft/min
Pressure Alt	A429 LS	X	VALID	3	ft
	A429 HS		Not Configured		ft
	A575		Not Configured		ft

20:17:51   10.5

```
                          Source
Parameter        Source   Selected  Validity      Port    Value

Radio Alt 1      A429 LS      X         VALID        7    -114 ft
                 A552A            Not Configured             ft
                 CALT 55          Not Configured             ft
                 PB-5M            Not Configured             ft




Radio Alt 2      A429 LS          Not Configured             ft
                 A552A            Not Configured             ft
                 CALT 55          Not Configured             ft
                 PB-5M            Not Configured             ft




 20:17:56 ─────────────────────────────────────────── 10.5 ──
```

```
                       Source
Parameter       Source  Selected  Validity      Port   Value

NAV Freq 1      A429 LS           Not Configured                   MHz
                CSDB              Not Configured                   MHz
NAV Freq 2      A429 LS           Not Configured                   MHz
                CSDB              Not Configured                   MHz

Loc Dev 1       A429 LS           Not Configured                   dot
                CSDB              Not Configured                   dot
                A547              Not Configured                   dot
                A578 HS           Not Configured                   dot
                A578 LS           Not Configured                   dot
                COLLINS VIR30         INVALID              0.03    dot
Loc Dev 2       A429 LS           Not Configured                   dot
                CSDB              Not Configured                   dot
                A547              Not Configured                   dot
                A578 HS           Not Configured                   dot
                A578 LS           Not Configured                   dot
                COLLINS VIR30     Not Configured                   dot

  20:17:59 ───────────────────────────────────────────── 10.5
```

```
                    Source
Parameter       Source       Selected  Validity    Port   Value

GS Dev 1        A429 LS                Not Configured                    dot
                CSDB                   Not Configured                    dot
                A547                   Not Configured                    dot
                A578 HS                Not Configured                    dot
                A578 LS                Not Configured                    dot
                COLLINS VIR30              INVALID             -0.13 dot
GS Dev 2        A429 LS                Not Configured                    dot
                CSDB                   Not Configured                    dot
                A547                   Not Configured                    dot
                A578 HS                                                  dot
                A578 LS                                                  dot
                COLLINS VIR30                                            dot




```
```
 ── 22:10:57 ──────────────────────────────────────── 10.5 ──
```

```
┌──────────────── ATTITUDE INPUT MONITOR ─────────────── Page  7 ─┐
│                       Source                                    │
│ Parameter        Source      Selected  Validity   Port    Value │
│                                                                 │
│ AHRS Status      AHRS A429 HS   Not Configured                  │
│                                                                 │
│                                                                 │
│                                                                 │
│                                                                 │
│                                                                 │
│ Roll Angle       AHRS A429 HS   Not Configured            deg   │
│                  IRS  A429 HS   X      INVALID    4     +0 deg   │
│                  SYNCHRO        Not Configured            deg   │
│                                                                 │
│                                                                 │
│                                                                 │
│                                                                 │
│                                                                 │
│                                                                 │
│ ──── 20:18:11 ────────────────────────────────── 10.5 ────│
└─────────────────────────────────────────────────────────────────┘
```

NOTE: When an AHRS is interfaced, TAWS input information will be displayed here.

```
 PRIMARY                      SECONDARY              TERTIARY
                                 Source
 Parameter              Source  Selected  Validity  Port   Value
 PRIM  PPOS Latitude    A429 HS    X        VALID     1          deg
 SEC   PPOS Latitude    A429 HS       Not Configured             deg
 TERT  PPOS Latitude    A429 HS       Not Configured             deg

 PRIM  PPOS Longitude   A429 HS    X        VALID     1          deg
 SEC   PPOS Longitude   A429 HS       Not Configured             deg
 TERT  PPOS Longitude   A429 HS       Not Configured             deg

 PRIM  Baro Altitude    A429 HS    X        VALID     1          ft
 SEC   Baro Altitude    A429 HS       Not Configured             ft
 TERT  Baro Altitude    A429 HS       Not Configured             ft

 PRIM  Press Altitude   A429 HS    X        VALID     1          ft
 SEC   Press Altitude   A429 HS       Not Configured             ft
 TERT  Press Altitude   A429 HS       Not Configured             ft

 PRIM  Vertical Speed   A429 HS    X        VALID     1          ft/m
 SEC   Vertical Speed   A429 HS       Not Configured             ft/m
 TERT  Vertical Speed   A429 HS       Not Configured             ft/m
    22:24:06                                              10.5
```

```
 PRIMARY                          SECONDARY                 TERTIARY
                                    Source
 Parameter              Source   Selected   Validity    Port    Value
 PRIM   Ground Speed    A429 HS     X          VALID      1              kts
 SEC    Ground Speed    A429 HS            Not Configured                kts
 TERT   Ground Speed    A429 HS            Not Configured                kts

 PRIM   True Airspeed   A429 HS     X          VALID                     kts
 SEC    True Airspeed   A429 HS            Not Configured                kts
 TERT   True Airspeed   A429 HS            Not Configured                kts

 PRIM   Desired Track   A429 HS     X          VALID                     deg
 SEC    Desired Track   A429 HS            Not Configured                deg
 TERT   Desired Track   A429 HS            Not Configured                deg

 PRIM   Track Angle     A429 HS     X          VALID                     deg
 SEC    Track Angle     A429 HS            Not Configured                deg
 TERT   Track Angle     A429 HS            Not Configured                deg

 PRIM   Track Angle Err A429 HS     X          VALID                     deg
 SEC    Track Angle Err A429 HS            Not Configured                deg
 TERT   Track Angle Err A429 HS            Not Configured                deg
      18:25:00                                                           10.5
```

```
┌──────────────────── FMS INPUT MONITOR 3/4 ──────────────── Page 10 ──┐
│ PRIMARY                      SECONDARY            TERTIARY           │
│                               Source                                │
│ Parameter          Source   Selected  Validity   Port   Value       │
│ PRIM  RNP          A429 HS     X         VALID      1     2.80 nm    │
│ SEC   RNP          A429 HS         Not Configured             nm     │
│ TERT  RNP          A429 HS         Not Configured             nm     │
│                                                                     │
│ PRIM  EPU          A429 HS               VALID      1     0.22 nm    │
│ SEC   EPU          A429 HS         Not Configured             nm     │
│ TERT  EPU          A429 HS         Not Configured             nm     │
│                                                                     │
│ PRIM  Roll Angle   A429 HS             INVALID      1       +0 deg   │
│ SEC   Roll Angle   A429 HS         Not Configured            deg     │
│ TERT  Roll Angle   A429 HS         Not Configured            deg     │
│                                                                     │
│ PRIM  True Heading A429 HS             INVALID      1        0 deg   │
│ SEC   True Heading A429 HS         Not Configured            deg     │
│ TERT  True Heading A429 HS         Not Configured            deg     │
│                                                                     │
│ PRIM  MAG Heading  A429 HS             INVALID      1          deg   │
│ SEC   MAG Heading  A429 HS         Not Configured            deg     │
│ TERT  MAG Heading  A429 HS         Not Configured            deg     │
│____ 20:01:34 _____ 10.5 __│
```

```
 ┌─────────────────── FMS INPUT MONITOR 4/4 ─────────────────── Page 11 ──┐
 │ PRIMARY  1                SECONDARY              TERTIARY                │
 │                             Source                                      │
 │ Parameter            Source  Selected  Validity   Port  Value           │
 │ PRIM  XtrackDist     A429 HS    X        VALID      1            nm      │
 │ SEC   XtrackDist     A429 HS       Not Configured               nm      │
 │ TERT  XtrackDist     A429 HS       Not Configured               nm      │
 │                                                                         │
 │ PRIM  Date           A429 HS    X        VALID      1    01/15/02        │
 │ SEC   Date           A429 HS       Not Configured                       │
 │ TERT  Date           A429 HS       Not Configured                       │
 │                                                                         │
 │ PRIM  Time           A429 HS    X        VALID      1    22:07:54 GMT    │
 │ SEC   Time           A429 HS       Not Configured               GMT     │
 │ TERT  Time           A429 HS       Not Configured               GMT     │
 │                                                                         │
 │                                                                         │
 │                                                                         │
 │                                                                         │
 │                                                                         │
 │                                                                         │
 └──── 22:12:44 ───────────────────────────────────────────── 10.5 ──────┘
```

```
                          Source
Parameter           Source   Selected  Validity     Port    Value

Date                A429 HS          Not Configured
                    A429 LS              VALID        5    01/15/02
Time                A429 HS          Not Configured                GMT
                    A429 LS             INVALID          00:00:00 GMT
Ground Speed        A429 HS          Not Configured                kts
                    A429 LS              VALID                  14 kts
True Track Angle    A429 HS          Not Configured                deg
                    A429 LS              VALID                 132 deg
PPOS Latitude       A429 HS          Not Configured                deg
                    A429 LS              VALID               32.08 deg
PPOS Longitude      A429 HS          Not Configured                deg
                    A429 LS              VALID              110.90 deg
VDOP                A429 HS          Not Configured
                    A429 LS              VALID                2.81


     22:15:23                                                   10.5
```

```
┌─────────────── UMFD INPUT MONITOR ─────────────── Page 13 ──┐
│                                                              │
│   Source: A429 HS        Port:  6  Validity:    VALID        │
│                                                              │
│   View             PLAN                                      │
│   Range                                                      │
│    Horizontal        10 nm                                   │
│    Vertical        2000 ft                                   │
│   AntiClutter        ALL                                     │
│   Orientation   NOSE UP                                      │
│   Image Status     TAWS                                      │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│   20:18:26 ───────────────────────────────────────── 10.5   │
└──────────────────────────────────────────────────────────────┘
```

NOTE: When a Universal Avionics MFD is interfaced, real time MFD data will be displayed on this page.

```
┌────────────────────── WXR INPUT MONITOR ──────────────────── Page 14 ─┐
│                   WXR 1:  Not Configured    Port:                       │
│                                                                         │
│ Control Word 1:  0x                    Control Word 2:  0x              │
│   Mode:                                     Range:      nm              │
│                                                                         │
│                   WXR 2:  Not Configured                                │
│                                                                         │
│ Control Word 1:  0x                    Control Word 2:  0x              │
│   Mode:                                     Range:      nm              │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│   20:18:28 ──────────────────────────────────────────────── 10.5 ──┘
```

NOTE: This page is reserved for Radar interface when it becomes available.

```
┌──────────────────── INPUT DISCRETES MONITOR ───────────────── Page 15 ──┐
│Parameter                       Discrete State            Value          │
│ Gear UP/DOWN                     GROUND                      DOWN        │
│ Flaps In Landing                 OPEN (NOTE 1)      NOT FLAPS (NOTE 2)   │
│ Glide Slope Inhibit              OPEN               NOT INHIBIT          │
│ Flap Inhibit                     OPEN               NOT INHIBIT          │
│ Gear Inhibit                   Not Configured                           │
│ Terrain Inhibit                  OPEN               NOT INHIBIT          │
│ Air/Ground                       GROUND                   GROUND        │
│ Inhibit All Modes                OPEN               NOT INHIBIT          │
│ Master Audio Cancel              OPEN                NOT CANCEL          │
│ ILS 1 Mode                       OPEN                     FALSE          │
│ ILS 2 Mode                     Not Configured                           │
│ Back Course 1 Selected           OPEN                     FALSE         │
│ Back Course 2 Selected         Not Configured                           │
│ Captain Terrain Select           OPEN                     FALSE         │
│ First Officer Terrain Select   Not Configured                           │
│ Minimums                       Not Configured                           │
│ QFE                              OPEN                     FALSE          │
│ RWS WARNING                    Not Configured                           │
│ FMS/CDU Video Sw 1             Not Configured                           │
│ FMS/CDU Video Sw 2             Not Configured                           │
│ TOGA                             OPEN                NOT TOGA            │
│ ──── 23:12:17 ──────────────────────────────────────────────── 10.5 ───│
└─────────────────────────────────────────────────────────────────────────┘
```

NOTES:

1. The state of the corresponding discrete will be displayed in this field. The information is relative to the function; i.e.: OPEN / GROUND, OPEN / 28 VDC, ETC.

2. The value is also relative to the function; i.e.: GND - AIR, LANDING FLAPS - NOT LANDING FLAPS, etc.

```
┌──────────────── OUTPUT DISCRETES MONITOR ────────────────── Page 16 ──┐
│                                                                        │
│ Parameter                        Discrete State      Value            │
│                                                                        │
│ TAWS Warning Light                  OPEN (NOTE 1)        OFF (NOTE 2)  │
│ TAWS Caution Light                  OPEN                 OFF           │
│ GPWS Fail Light                     OPEN                 OFF           │
│ Terrain Fail Light                  OPEN                 OFF           │
│ Wind Shear Fail Light            Not Configured                        │
│ TCAS Audio Inhibit                  OPEN         NOT INHIBIT           │
│ Glide Slope Manual Inhibit          OPEN         NOT INHIBIT           │
│ Flap Manual Inhibit                 OPEN         NOT INHIBIT           │
│ Wind Shear Warning Light         Not Configured                       │
│ Wind Shear Caution Light         Not Configured                       │
│ Glide Slope Caution Light           OPEN                 OFF           │
│ Captain Terrain Relay Driver     GROUND                 TRUE          │
│ First Officer Terrain Relay Driver  Not Configured                    │
│ Obstacle Fail Light              Not Configured                       │
│ QFE Mode Light                      OPEN                 OFF           │
│ Terrain Inhibit Light            Not Configured                       │
│                                                                        │
│                                                                        │
│                                                                        │
│   18:44:00                                                    10.5     │
└────────────────────────────────────────────────────────────────────┘
```

NOTES:

1. The state of the corresponding discrete will be displayed in this field. The information is relative to the function; i.e.: OPEN / GROUND, OPEN / 28 VDC, ETC.

2. The value is also relative to the function; i.e.: ON - OFF, INHIBIT - NOT INHIBIT, etc.

```
                            Alert Parameters

Terrain Threat Elevation          0 ft  No_Flight_Plan              ACTIVE
Terrain Threat Latitude       0.00 deg  Airplane_In_Turn          INACTIVE
Terrain Threat Longitude      0.00 deg  Obstacle Caution          INACTIVE
Mode 6  Bank Angle            INACTIVE     Terrain Threat Active   INACTIVE
Mode 6  Altitude Callouts     INACTIVE     Check Baro Correction   INACTIVE
Mode 5  Loud Glide Slope      INACTIVE     MSA Advisory            INACTIVE
Mode 5  Soft Glide Slope      INACTIVE     MGCB Advisory           INACTIVE
Mode 4B Flaps                 INACTIVE     High Terrain Impact Warning   INACTIVE
Mode 4A Gear                  INACTIVE     High Terrain Impact Caution   INACTIVE
Mode 4  Terrain               INACTIVE     Imminent Terr Impact Warning  INACTIVE
Mode 3  Don't Sink            INACTIVE     Imminent Terr Impact Caution  INACTIVE
Mode 2B Terrain               INACTIVE     Reduced Obstacle Clr Warning  INACTIVE
Mode 2A Pull Up               INACTIVE     Reduced Obstacle Clr Caution  INACTIVE
Mode 2A Terrain Warning       INACTIVE     Terrain On Flt Plan Advisory  INACTIVE
Mode 2A Terrain Caution       INACTIVE
Mode 1  Pull Up               INACTIVE
Mode 1  Sink Rate             INACTIVE




   18:44:00                                                    10.5
```

```
                            Image Control Bus

Captain:                                 First Officer:
upper elevation                    0 ft  upper elevation               ft
upper elev display       BLANKED SOLID    upper elev display
upper elevation color           GREEN    upper elevation color
lower elevation                    0 ft  lower elevation               ft
lower elev display       BLANKED SOLID    lower elev display
lower elevation color           GREEN    lower elevation color












   18:44:00                                                    10.5
```

NOT AVAILABLE AT THIS TIME

20:18:38   10.5

NOT AVAILABLE AT THIS TIME

20:18:44   10.5

NOT AVAILABLE AT THIS TIME

20:28:39   10.5

NOT AVAILABLE AT THIS TIME

20:18:49   10.5

```
┌──────────────── COMMAND OPTIONS ───────────────────────── Page 23──┐
│ Page                                                                │
│                                                                     │
│ Pre-Flight Test    ----    Off      Verbose Debug      00000000 (hex)│
│                                                                     │
│             CPU Resets              Toggle Pop Up      On           │
│ CLEAR COUNT                                                         │
│   Count   82                        Toggle Halving RA              │
│   Time                               Inputs to GPWS    Off         │
│     Prev  00:00:00  00/00/00                                        │
│     Last  00:00:00  00/00/00                                        │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│   20:18:49                                              10.5        │
└─────────────────────────────────────────────────────────────────┘
```

```
──────────────────────────── FAULT LOG ──────────────────────── Page 24 ──
│Fault                 Occurrences  Initial Date/Time  Latest Date/Time   SCN#│
│GEAR RC FAIL              1         01/07/02 20:10:31  01/07/02 20:10:31  10.5│
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│                                                                             │
│   Prev 10 Faults              Records  1 - 10              Next 10 Faults│
│   ── 20:28:50                                             10.5 ──         │
```

NOTE: This page displays faults detected by the various self tests in the TAWS computer. Details of the faults can be accessed by using the TAB key to highlight the desired fault, then pressing the space bar. The fault details will appear superimposed over the main page.

```
──────────────────────────── FAULT LOG ──────────────────────── Page 24 ──
│Fault                 Occurrences  Initial Date/Time  Latest Date/Time   SCN#│
│   ┌──────────────────────────────────────────────────────────────┐        │
│   │          FAULT LOG                                             │        │
│   │                                                                │        │
│   │                                                                │        │
│   │                                                                │        │
│   │   Fault                 GPWS MODE 6 NOT AVAIL                  │        │
│   │   Date/Time (Initial)   08/23/00 15:51:05                      │        │
│   │   Date/Time (Last)      08/23/00 18:55:42                      │        │
│   │   Occurrences            2                                     │        │
│   │   SCN#                  10.10                                  │        │
│   │   Additional Data 1     0            0x00000000                │        │
│   │   Additional Data 2     0            0x00000000                │        │
│   │                                                                │        │
│   └──────────────────────────────────────────────────────────────┘        │
│                                                                             │
│                            Records  1 - 10                                  │
│   20:28:50                                                    10.5 ──       │
```

NOTE: Each space bar press will advance the superimposed screen to the next available fault.

```
┌───────────────────── Alert LOG ───────────────────── Page 25 ─┐
│ Alert                  Date      Time      SCN#                 │
│ WARNING: Terrain Ter  08/04/00  23:35:44  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:11:59  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:11:06  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:09:54  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:08:26  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:07:03  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:06:43  10.10                 │
│                                                                 │
│ CAUTION: Bank Angle   08/04/00  22:04:57  10.10                 │
│                                                                 │
│ Takeoff               08/04/00  22:04:56  10.10                 │
│                                                                 │
│ WARNING: Terrain (RO  08/04/00  00:11:21  10.10                 │
│                                                                 │
│  Prev 10 Alerts            Records  1 - 10       Next 10 Alerts │
│   20:19:23 ─────────────────────────────────────────── 10.5 ───┘
```

NOTE: This page displays alerts generated by the TAWS computer. Details of the alerts can be accessed by using the TAB key to highlight the desired alert, then pressing the space bar. The alert details will appear superimposed over the main page.

```
┌───────────────────── Alert LOG ───────────────────── Page 25 ─┐
│ Alert                  Date      Time      SCN#                 │
│   WARNING: Terrain Terrain (Preface)            08/04/00 23:35:44│
│   Scn#:10.10    Alert Var: 0x00000008   Inhibit Input Var: 0xFE7FFFFF│
│   Tail#: N10UN          Active ROC:   700 ft   Flt Phase:ENROUTE│
│   Org Airport:KSEA      Dest Airport: none     From Leg:    ??? │
│   Org Runway: none      Dest Runway:  none     To Leg:         │
│   Baro Alt:  14999 ft   Ppos Lat:    51.81     Ppos Lon: -129.69│
│   Plane Alt: 14999 ft   Radio Alt:    1378     Sel Alt:   14999 ft│
│   G/S Dev:    0.00 dot  Close Rate:  -5005 fpm  Sink Rate:    0 fpm│
│   Rnp:        0.00 nm   Epu:          0.13 nm  Trpa:       2.80 nm│
│   Gnd Speed:   279 kt   Air Speed:     279 kt  All Modes Inh:NO INHIBIT│
│   Flaps:NO FLAPS        Air/Gnd:  AIR          G/S Inh:    NO INHIBIT│
│   Gear: UP              Flap Inh: NO INHIBIT   Terrain Inh:  NO INHIBIT│
│   Master Audio Cancel:NO CANCEL      Toga:       NO TOGA      │
│   BackCourse Approach:INACTIVE       FP Adherence: FALSE      │
│   Mnvr Dist:              0.0 ft   Plt Reac Dist:       0.0 ft│
│   True Track Angle:     -50.6 deg   True Track Rate:    0.00 deg/sec│
│   Cross Track Dist:      0.00 nm   ILS 1/2 Mode:     FALSE/FALSE│
│   Terr Conflict LAT:     0.00      Terr Conflict LON:  0.00   │
│   Terr Conflict Elev:     0        Roll Angle:        0.02 deg│
│   WARNING: Terrain (RO  08/04/00  00:11:21  10.10              │
│  Prev 10 Alerts            Records  1 - 10       Next 10 Alerts│
│   20:19:23 ──────────────────────────────────────── 10.5 ─────┘
```

NOTE: Each space bar press will advance the superimposed screen to the next available alert.

```
S/W            SCN
 CPU Main      10.5    Jan  2 2002
 CPU Boot      10.50   Sep 19 2001
 ARINC Board   020.20
 Analog Board  1.140
 Config Module 10.5
 Terrain DB    0005 efc 05-May-2000
                    bld
 Airport DB    0107 efc 12-Jun-2001
                    bld 29-Jun-2001
 GFX Filesytm  0012     14-Dec-2001
     TAWS with Wxr that includes pe
 CRC
  CPU Main    0x732419D7
  CPU Boot    0x1E96BA70
  Terrain DB 0x
  Airport DB 0x

 MAC Address   00.90.95.00.0C.54
 IP Address    192.168.55.06
```

```
  20:25:55                                                    10.5
```

```
────────────────── CONFIGURATION DATA 1/3 ────────────── Page 27 ──
ARINC Rcvr  Config          Version   Date   Comment        Length 856
       1 PRIMARY FMS HS  V10.5  1/15/2002 Test Bench
       2 no device
       3 ADC LS           Analog In      Config      Aircraft Param
       4 IRS HS            Airspeed  no device       Type
       5 GPS LS            BaroAlt   no device       Best Climb        fpm
       6 no device         AltRate   no device       MaxRA             ft
       7 no device         LocDev1   ILS CVIR30      TailID
       8 no device         GlideDev1 ILS CVIR30
       9 no device         LocDev2   no device
      10 no device         GlideDev2 no device
      11 no device         RadAlt1   CALT 55
      12 no device         RadAlt2   no device
 CSDB  1 no device         Roll      no device
 CSDB  2 no device                               Data Rates
 WXPD  1 no device      Video Output Type         Baro Alt          Hz
 WXPD  2 no device       Type                     True Track        Hz
ARINC Xmtr  Config        Device                  Radio Alt         Hz
       1 FMS HS
       2 no device      PopUpDisplay              FMS Page
       3 IMAGE CNTL HS   Type                     Ethernet 10T
       4                 Device

    20:26:10                                                 10.5
```

```
┌──────────────────── CONFIGURATION DATA 2/3 ──────────────── Page 28 ──┐
│Display Colors          Audio                    Feature       Enabled│
│ Aircraft Symbol BLACK    Spkr   Lo   0.5 w        Wind Shear Alert  - │
│ Flight Leg      WHITE           Hi   1.0 w        Obstacle Alert    - │
│ Active Leg      MAGENTA         Noisy 0.0 db      Pop Up            - │
│ Trend Line      MAGENTA  Headset Lo   10 mw       FMS MSG Lamp      - │
│                                 Hi   35 mw                            │
│                                 Noisy 0.0 db      Overlay Display  ----│
│                                                                        │
│Alert Callouts                   Alert Syntax  US     Display          │
│ Alt   Enabled   Alt Enabled     Repeat Enable Y      Type  UFMS  UMFD UEEI│
│ 2500    N       200   N                              Dimen            │
│ 2000    N       100   N         Alerts  Enabled Config   Hz   480  480  480│
│ 1500    N        90   N          BaroAlt    N   2000 ft  Vt   320  640  640│
│ 1000    N        80   N          RAActive   N   2500 ft  Origin       │
│  900    N        70   N          MinAlt     N    500 ft   X   240  240  240│
│  800    N        60   N          ApproachMin N   600 ft   Y    20   40   40│
│  700    N        50   N          MaxBank    Y     25 deg Range 260  520  520│
│  600    N        40   N                              Arc            │
│  500    Y        30   N                                              │
│  400    N        20   N                                              │
│  300    N        10   N                                              │
│                                                                        │
│── 20:26:24 ──────────────────────────────────────────── 10.5 ──      │
└────────────────────────────────────────────────────────────────────────┘

┌──────────────────── CONFIGURATION DATA 3/3 ──────────────── Page 29 ──┐
│WXR Param                                                             │
│ Cntl   no evice                                                      │
│ Output no device                                                     │
│ Interleave   No                                                      │
│ Orientation TRACK UP                                                 │
│ User Defined Params                                                  │
│   Base A708-6                                                        │
│   Mode Box                                                           │
│     Enable    No (d)                                                 │
│     X Pos     +0 (d)                                                 │
│     Y Pos     +0 (d)                                                 │
│   Alt Box                                                            │
│     Enable    No (d)                                                 │
│     X Pos     +0 (d)                                                 │
│     Y Pos     +0 (d)                                                 │
│   Colors      5 (d)                                                  │
│  Sweep       180 (d)                                                 │
│  Int Angle    45 (d)                                                 │
│                                                                      │
│ (d) indicate default                                                 │
│                                                                      │
│── 20:26:24 ──────────────────────────────────────────── 10.5 ──     │
└────────────────────────────────────────────────────────────────────────┘
```

```
 LOAD DB                      Complete:   0%
  Version:
  Effectivity:
  CRC:             0X00000000
  Loading Disk:    0 of 0      CONTINUE        ABORT
  DTU File:
  Flash File:
 CLEAR Load Errors ( forces reset )

 Flight Data Recording  off
    Status:    Normal
    File:
    DTU Bytes:  0
      Enable    No (d)
 DUMP LOGS
    Status:
```

Revision A   Page 53 of 54
22 February 2002

```
                                    Source
Parameter             Source      Selected   Validity    Value

True Heading          WXR1                   INVALID         0 deg
                      WXR2                   INVALID         0 deg
                      ATT           X          VALID       132 deg
                      FMS                      VALID       132 deg
MAG Heading           WXR1                   INVALID         0 deg
                      WXR2                   INVALID         0 deg
                      ATT                      VALID       120 deg
                      FMS                      VALID       120 deg
MAG Var               WXR1                   INVALID        +0 deg
                      WXR2                   INVALID        +0 deg
                      ATT                    INVALID        +0 deg
                      FMS                      VALID       +11 deg
Drift Angle           WXR1                   INVALID        +0 deg
                      WXR2                   INVALID        +0 deg
                      ATT                    INVALID      +120 deg
                      FMS                    INVALID      +120 deg


Computed True Heading                          VALID       132 deg
```

—— 20:26:24 ——————————————————————————————————————— 10.5 ——