Section - III
SYSTEMS DESCRIPTION

Sub-section 17
AVIONICS

Table of Contents

Page

GENERAL

The Hawker 800XP Collins Pro Line 21 avionics system is an intricate network of subsystems interconnected and managed by the Integrated Avionics Processor System (IAPS).

This Sub-section provides general information of the systems with expanded information on the Enhanced Ground Proximity Warning System (EGPWS). For expanded information on other avionics systems components and operating procedures, refer to the Hawker 800XP Collins Pro Line 21 Avionics System Pilot's Guide, P/N 523-0780409-001117.

SYSTEMS and CONTROLS

The majority of the avionics displays and controls are located on the main instrument panels, glareshield panels and side consoles. A push-to-test panel is located in the flight compartment at the top of the overhead roof panel and provides test functions for certain systems.

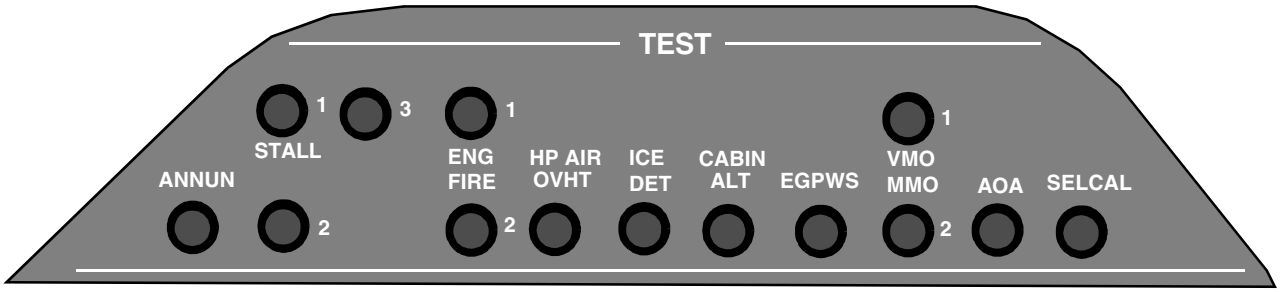


Figure 1
Push-To-Test Panel

ELECTRONIC FLIGHT INSTRUMENT SYSTEM (EFIS) Figure 2

The system consists of four 8" X 10" color composite Adaptive Flight Displays (AFD). These AFDs are provided as two Primary Flight Displays (PFD) and two Multifunction Displays (MFD).

Each PFD displays airplane attitude, heading, airspeed, altitude, vertical speed, flight guidance system annunciations and navigation data on a single integrated display. The PFD also provides engine or fuel and flaps display information when selected in reversionary mode.

The upper region of the PFD is used to present the basic "T" instruments, an Attitude Director Indicator (ADI), altitude scale, airspeed scale and vertical speed scale. Flight guidance system mode information displays in the area above the ADI.

The lower region of the PFD is used to present a Horizontal Situation Indicator (HSI) with a full compass rose or partial compass arc, as selected by the pilot. Map format is available in revisionary mode. Weather radar or EGPWS information can be overlaid on the partial arc format or map format. The space to either side of the HSI format is used to present a lateral navigation data field, a weather radar mode field, EGPWS mode field, system messages and selected menus.

The area along the bottom of the PFD is used to present radio tuning, time and temperature displays. Normal control, reversion and warning annunciations are also presented. In the case of a failed AFD, either the PFD or the MFD can be manually reverted to a composite MFD/PFD format. This format presentation includes Engine Indicating System (EIS) displays across the top of the format and the basic "T" information presented below.

Each MFD can be used to present a variety of information, including: Present Position Map; TCAS; FMS based textual data; Navigation Data; Weather Radar and EGPWS. Engine data is typically presented on the Pilot's MFD. The Copilot's MFD can present fuel gauging data, the flap display and the electronic checklist.

Line select keys are provided on each side of the displays and are used to control the basic display formats. The bezel mounted line select keys along with the Display Control Panel (DCP) and Flight Guidance Panel (FGP) provide primary pilot interface to control the PFD and MFD. Control of the radar, NAV sources and bearing pointers is through the DCP and the PFD line select keys. Control of the course, preselect heading, altitude and speed references is through the Flight Guidance Panel (FGP).

DISPLAY CONTROL PANELS (DCP) Figure 3

Each PFD/MFD display pair has a dedicated DCP to control the display and menu functions on their respective PFD/MFDs.

The DCPs are located on the glareshield panels directly above the respective PFD/MFDs they normally control. The DCP, when combined with the line select keys on the PFD, provides control of the Weather Radar, NAV source, bearing pointers, V speeds, BARO Minimums (Barometric Altitude-based Minimum Descent Altitude) and RA Minimums (Radio Altitude-based Decision Height Minimums).

FLIGHT GUIDANCE PANEL (FGP) Figure 3

The FGP is used to control the Flight Guidance System and is located in the center of the glareshield panel.

Command of the Flight Guidance System is accomplished by using the lateral and vertical mode select switches, VS/pitch wheel, autopilot switches, FD switches and various control knobs of the FGP along with the yoke mounted synchronization (SYNC), autopilot disconnect (AP DISC), and go-around (GA) switches.

Attitude reference, heading reference, airspeed reference, vertical speed reference and VS pitch reference are also controlled from the FGP.

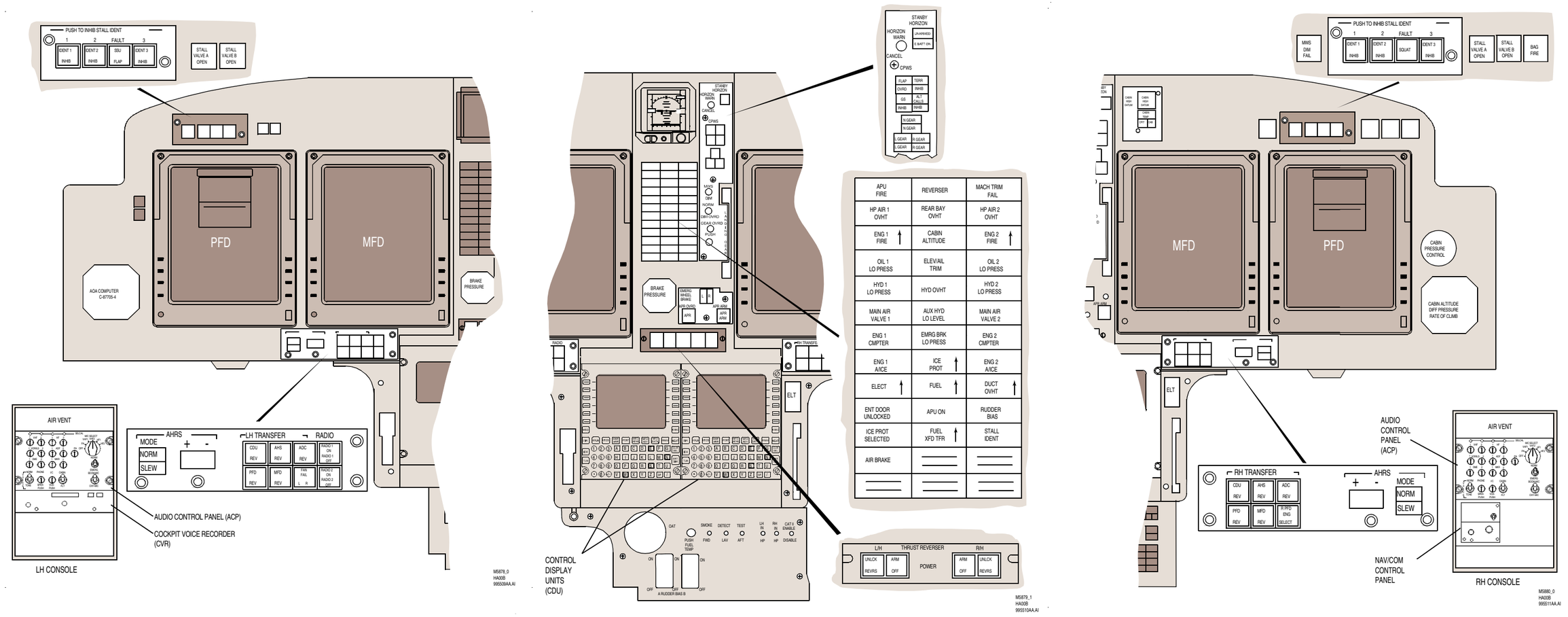
CONTROL DISPLAY UNITS (CDU) Figure 2

Two CDUs are installed side by side in the lower section of the center instrument panel. Each CDU is a color LCD-based display unit with an integrated keyboard having 16 keys and a full alphanumeric keypad. In addition to the integrated keyboard, each CDU has six line select keys located in the bezel on each side of the color LCD display.

The CDUs are used to control the Radio Sensor System (RSS) and provide integrated control of several combinations of airplane communications (including a normal means of radio tuning) and navigation radio subsystems.

The CDUs can also provide the following functions:

- Control display for the Flight Management System (FMS).
- Stand-alone control for radios.
- Back-up display for engine data.
- Back-up display for Global Positioning System (GPS) data.
- MFD menus



Pilot Instrument Panel

Center Instrument Panel

Copilot Instrument Panel

Figure 2
Main Instrument Panels

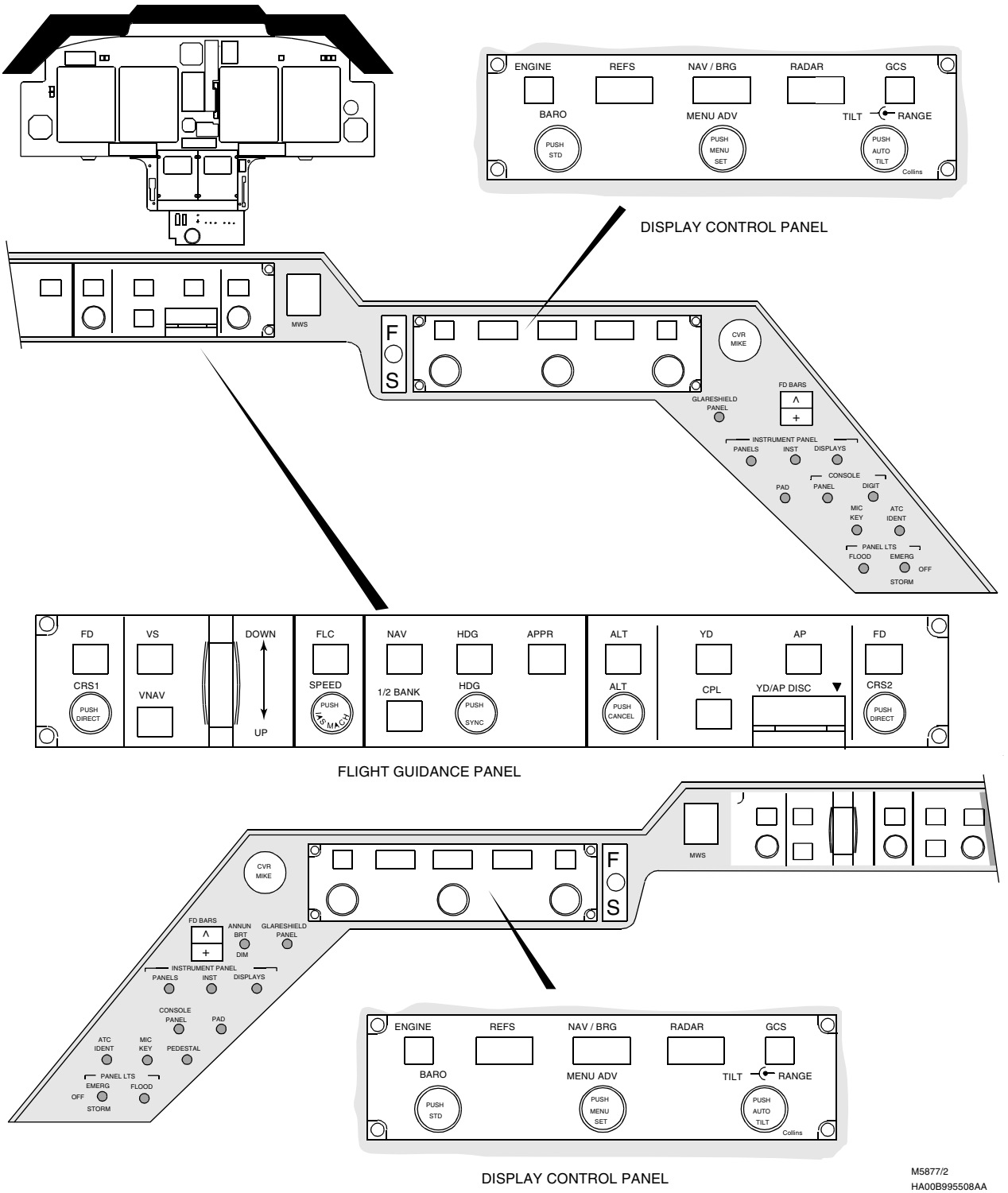


Figure 3
Glareshield Control Panels

FLIGHT GUIDANCE SYSTEM (FGS)

The FGS provides autopilot and dual flight guidance functions by utilizing two identical computers, three primary servos, a pitch trim servo and a flight guidance panel.

The Flight Guidance Computers (FGC) receive Attitude Heading System (AHS) data directly from the Attitude Heading Computer (AHC) to provide independent flight guidance computation while operating together to provide 3-axis autopilot, pitch trim, Mach trim and yaw damper functions.

The two FGCs apply differential autopilot command drive to each primary servo to move the airplane elevator, aileron and rudder control surfaces.

ATTITUDE HEADING SYSTEM (AHS)

The AHS is a dual reference system consisting of two AHC-3000 Attitude Heading Computers (AHC), two FDU-3000 Flux Detector Units (FDU) and two External Compensation Units (ECU).

The AHS supplies attitude, stabilized magnetic or free gyro heading and linear acceleration data to the Flight Guidance System, Electronic Flight Instrument System, Integrated Avionics Processor System and Weather Radar System.

The AHCs are functionally and physically isolated from each other and replace the conventional vertical gyro, directional gyro, three rate gyros, and three linear accelerometers. The AHS has two operational modes, slaved and Directional Gyro (DG) mode.

FLIGHT MANAGEMENT SYSTEM (FMS)

The Flight Management System provides flight plan management, multisensor navigation, and radio tuning. The FMS consists of two Flight Management Computers (FMC), two Control Display Units (CDU) used to control the FMS and a Data Base Unit.

The FMC is a lateral and vertical navigator used by the autopilot to fly a programmed flight plan and provides coupled VNAV, NAV-to-NAV capture, navaid data base storage and several control/planning functions.

The Data Base Unit is a data loader used primarily to load monthly data base updates to the FMC and to load and download maintenance data from the MDC maintenance computer.

AIR DATA SYSTEM (ADS)

Dual ADSs sense and process data obtained from the air mass around the airplane. The two Air Data Computers (ADC) connect to the pitot/static air input ports and to a temperature sensor. The ADCs process air data and provide output parameters to the AFDs, AHCs and the IAPS concentrators.

ENGINE INDICATING SYSTEM (EIS)

The EIS digitizes airplane engine data for input to the avionics system while converting avionics digital data into outputs that drive airplane annunciators and aural horns.

The EIS consists of four Data Concentration Units (DCUs). Two units are wired as DCUs and two units are wired as Engine Data Concentrators (EDCs).

The DCUs transfer airplane sensor information (analog fuel flow, strut status, etc.) to the IAPS concentrators while transferring caution/warning advisory information from the Flight Control Computers to the annunciators. The EDUs also provide redundant engine data to the displays.

WEATHER RADAR SYSTEM

The Weather Radar System is a fully integrated system that detects precipitation, moisture-based turbulence and ground feature returns in front of the airplane which can be displayed on the Primary Flight Displays (PFDs) or the Multifunction Flight Displays (MFDs) and features the following operating modes:

Mode	*Description*
WX (Weather) Mode	The basic weather detection mode. Depicts areas of precipitation with four different colors, determined by reflectivity strength.
MAP Mode	Used to depict the display colors on the MFD/PFD as accentuated ground features.
WX+T (Weather Plus Turbulence) Mode	Contains WX mode features and includes detection of precipitation related turbulence targets, including wind shifts that contain precipitation.
TURB (Turbulence) Mode	Shows areas of precipitation-related turbulence within 50 nautical miles.
TARGET (Target/Turbulence Alert) Mode	Used as an alert for precipitation and/or precipitation related turbulence.

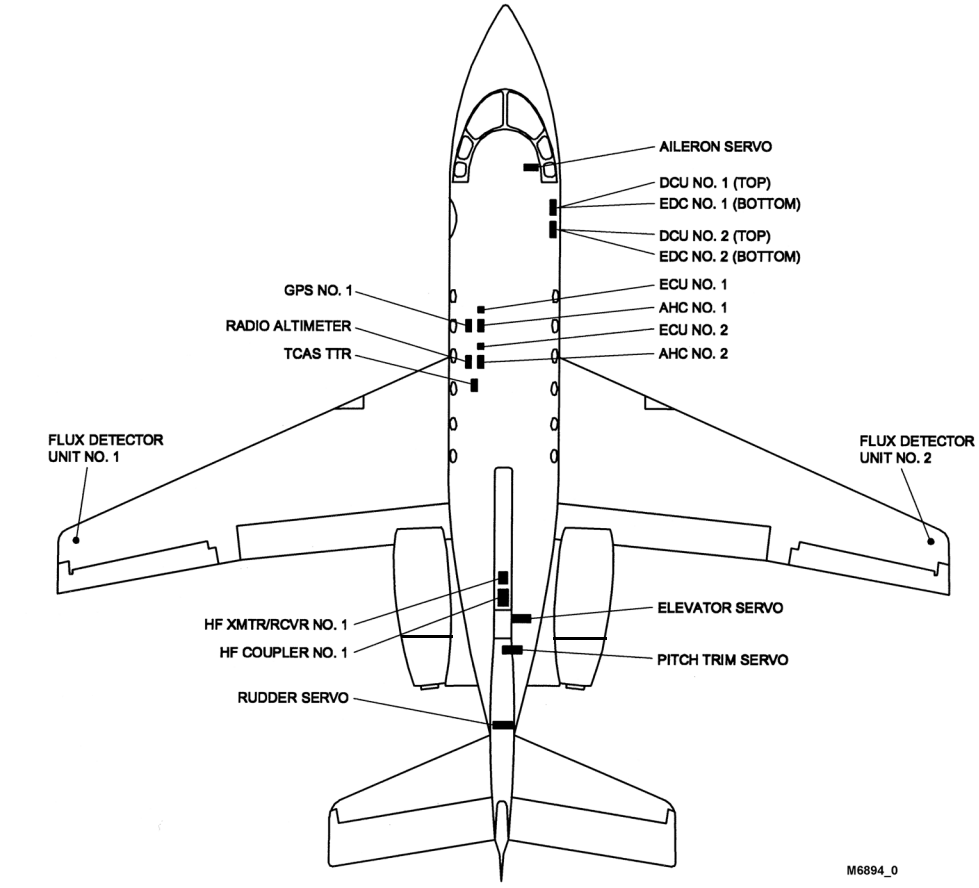
TRAFFIC ALERT and COLLISION AVOIDANCE SYSTEM (TCAS II)

The TCAS II system protects a volume of airspace around the airplane by warning pilots of the presence of other transponder equipped aircraft.

The system interrogates Mode C and Mode S transponders in nearby aircraft and a computer analyzes their replies to identify potential and predicted collision threats. The system advises the pilot when to climb, descend or maintain altitude to avoid passing too close to the threat aircraft.

Resolution maneuvers between aircraft equipped with TCAS II are automatically co-ordinated by the use of Mode S data link communication. The system provides two types of flight compartment displays to the EFIS and aural alerts to the airplane audio system.

COMPONENT LOCATIONS



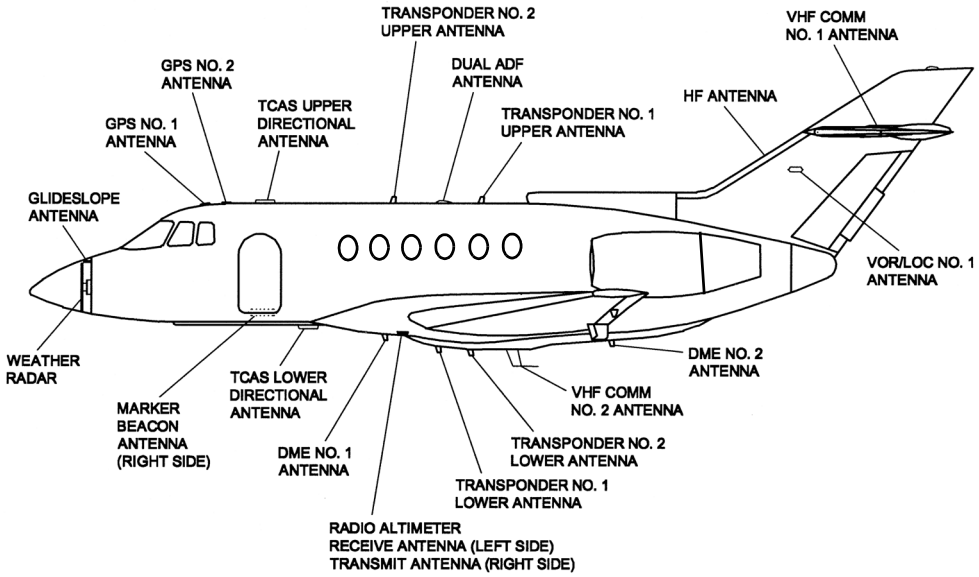


Figure 4
Component Locations

TEMPORARY CHANGE

P/N 140-590032-0007TC3

PUBLICATION AFFECTED:	Pilot's Operating Manual P/N 140-590032-0007, at the latest revision, for Hawker 800XP airplanes equipped with Pro Line 21 avionics.
AIRPLANE SERIAL NUMBERS AFFECTED:	Hawker 800XP 258541, 258556, 258567 and After.
DESCRIPTION OF CHANGE:	Clarification of acceptable fluxuations which normally occur during HF radio transmissions.
FILING INSTRUCTIONS:	Insert this Page 1 of 2 to face Page 17-10 in Section III - SYSTEMS DESCRIPTION, Sub-section 17 - AVIONICS.

SECTION III - SYSTEMS DESCRIPTION

Sub-section 17 - AVIONICS

SYSTEMS and CONTROLS

AUDIO INTEGRATING SYSTEM

Read the following information in place of the existing *HF Radio Transmissions*:

HF Radio Transmissions

Raytheon Aircraft Company (RAC) considers the following indication fluxuations to be normal and acceptable providing that the indications return to a normal reading when the HF radio transmission ceases, (the interference should be noted by the Flight Crew but it is not considered to be detrimental to flight safety).

- Fuel quantity indications may increase, depending on frequency set and amount of fuel in the tanks.
- Flight deck or cabin indications/indicators (i.e. oil temperature, oil pressure, flap position, cabin/duct temperature and OAT etc).
- N_1 indications
- N_2 indications
- ITT indications
- Erroneous ELT annunciations, without ELT activation.
- No fluxuations are permitted in navigational indications (i.e. VOR, LOC, GPS, Glide Slope, etc) except as permitted in the Airplane Flight Manual Section 2 - LIMITATIONS.

RADIO SENSOR SYSTEM (RSS)

The Radio Sensor System consists of the radios and controls used for voice communication, navigation and operation in the Air Traffic Control (ATC) environment.

AUDIO INTEGRATING SYSTEM

The audio integrating system controls the output of the communications and navigation receivers to the flight crew and airplane speakers.

The system consists of two Audio Control Panels (ACP) which command two digital audio control amplifiers and an audio interphone amplifier for signal processing. The ACPs also command a passenger speaker amplifier which provides the Seat Belt and No Smoking sign chime tones and also allows the flight crew to address the passengers. An aural warning generator is installed which provides aural warnings to both digital audio control amplifiers.

Audio Control Panel (ACP) Figures 2 and 5

An ACP is installed on the forward area of the pilot and copilot side consoles.

An optional ACP installation is provided, reference Figure 5 on the following page.

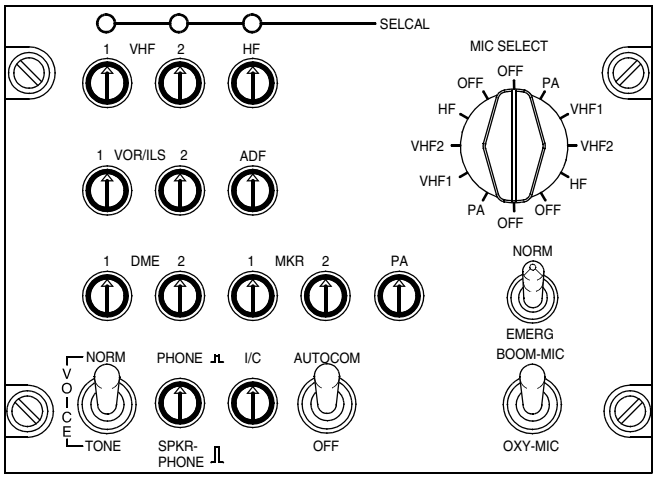
The power supply for No. 1 ACP is provided by the PE busbar through the AUDIO 1 CTL circuit breaker. The power supply for No. 2 ACP is provided by the PS2 busbar through the AUDIO 2 CTL circuit breaker.

For aircraft with KIT 149-3410 installed, the power supply for No. 1 and No. 2 ACPs are provided by the PE busbar through the AUDIO 1 CTL and AUDIO 2 CTL circuit breakers.

HF Radio Transmissions

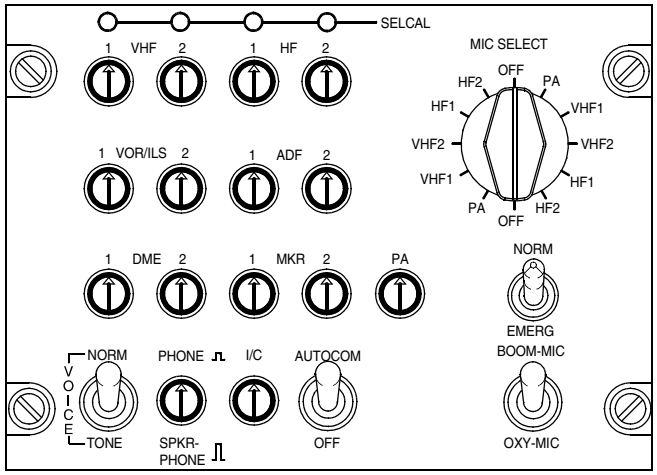
The following anomalies may occur during HF radio transmissions:

- Fuel quantity indications may increase 10 to 220 lbs, depending on frequency set and amount of fuel in the tanks.
- The DUCT TEMP indication, located on the Flight Compartment Overhead Roof panel, may fluctuate up to 10°.
- The CABIN TEMP indication, located adjacent to the DUCT TEMP indication, may fluctuate up to 5°.
- The OAT indication, located below the pilot's CDU keypad , may fluctuate 5°.
- Erroneous ELT annunciations, without ELT activation.



M8504_0.AI

Standard ACP Installation



M8503_0.AI

Optional ACP installation based on requested Optional Customer Equipment

(ACP shown with HF 2 and ADF 2 Customer Options installed)

Figure 5
Audio Control Panel (ACP)

Control	*Function*
SELCAL indicator lamps	A SELCAL lamp is located above each respective transceiver and illuminates when a ground to air SELCAL signal is received or SELCAL is tested.
TRANSCEIVER switches/volumes	VHF 1, VHF 2, HF 1, and HF 2 (if option installed) receiver switch functions and volume controls. The OUT position enables receiver audio.
MIC SELECT switch	6 or 12 position rotary switch (dependent on ACP installation) Refer to Figure 5. Selects transmission source.
RECEIVER switches/volumes	VOR/ILS 1 and 2, ADF 1, and ADF 2 (if option installed), DME 1 and 2, MKR 1 and 2 receiver switch functions and volume controls. The OUT position enables receiver audio.
PA Volume	PA volume is only connected to the output at the ACP when the Transmit Select Switch is in the PA position and the Transmit PTT is pushed.
NORM/EMERG switch	When switched to EMERG, this feature is designed to allow the operator to switch transmit and interphone functions to the cross-side audio control panel. This feature allows the operator to retain most of the station's normal function even in the event of failure of that station.
NORM/VOICE/TONE switch	NORM position - Voice and Ident enabled. VOICE position - Voice only enabled. TONE position - Ident only enabled.
PHONE volume SPKR-PHONE	Headphone and loudspeaker volume control and SPKR ON/OFF switching. The OUT position turns loudspeaker ON.
I/C (Interphone) switch/volume	Interphone volume control. The IN position turns microphone ON continuously.
AUTOCOM switch	When the AUTOCOM switch is in the AUTOCOM position the channel selected by the rotary MIC SELECT switch shall auto enable (automatically on) even if the receiver function and volume control knob is not enabled (out position). The receiver function and volume control knob can still be used to adjust volume for that channel selected by the MIC SELECT switch. The receiver function and volume control knob will not illuminate while disabled.

Control	*Function*
BOOM-MIC/OXY-MIC switch	BOOM-MIC position - Sets the BOOM mic input as the microphone input to the audio control panel. OXY-MIC position - Sets the OXY mic input as the microphone input to the ACP. Also turns ON the following digital amplifier functions: INPH Hot switch, INPH to SPKR switch and Speaker switch.

Microphone Jacks

There are two identical microphone jack assemblies which are mounted by the left and right side consoles. They are used to interface the pilot's headset and microphones with the airplane communication and navigation systems. A stowage boot and microphone jack are also provided on each pilot's control yoke for operation and stowage of the hand mic.

Flight Compartment Speakers

Some audio outputs cannot be muted and are, therefore, always heard over both speakers regardless of the speaker selection on the audio panels. The flight compartment unmuted audio system has an emergency bypass circuit between the ACP and VHF COMM NAV which will produce aural warning tones through the speakers.

Oxygen Mask Assemblies

There are two identical oxygen mask assemblies located above the left and right side consoles. The assemblies contain microphone connectors which provide the flight crew with an additional method of voice communication.

ENHANCED GROUND PROXIMITY WARNING SYSTEM (EGPWS) with WINDSHEAR

The EGPWS provides voice and visual predictive warnings to the flight crew alerting them to the proximity of possible terrain hazards by presenting PULL UP and GND PROX annunciations on the PFD, graphical representations of terrain and peaks elevation value on the PFD/MFD. The EGPWS also provides Windshear Caution and Warning alerts. Alerts appear on the PFD, when commanded by the EGPWS system, in addition to Mode and Fault annunciations when appropriate.

The Enhanced Ground Proximity Warning Computer (EGPWC) combines data input from the Integrated Avionics Processor System (IAPS) and the Global Positioning System (GPS) into a flight profile which is analyzed with regard to radio altitude. Depending on the flight mode, airspeed and absolute altitude, the computer generates voice and visual cautions and warnings based on pre-programmed values and airplane performance specifications.

The EGPWC receives inputs from the Angle of Attack (AOA) and Stick Shaker Margin with other discrete inputs to calculate the minimum safe altitude. The EGPWC also has Envelope Modulation and Aural Declutter. The Envelope Modulation is an automatic feature which tailors the operation of the EGPWS at certain locations to reduce nuisance warnings and/or give added protection. The Aural Declutter feature reduces the repetition of the warning messages.

EGPWS Features

The EGPWS system has 7 operating modes, all of which are controlled by switching logic based upon radio altitude, airspeed, vertical speed, landing gear, flap position and terrain closure.

The EGPWC can detect and warn of both increasing and decreasing performance windshears and also compute the Terrain Clearance Floor (TCF) when the airplane is on approach, using high resolution terrain database grids.

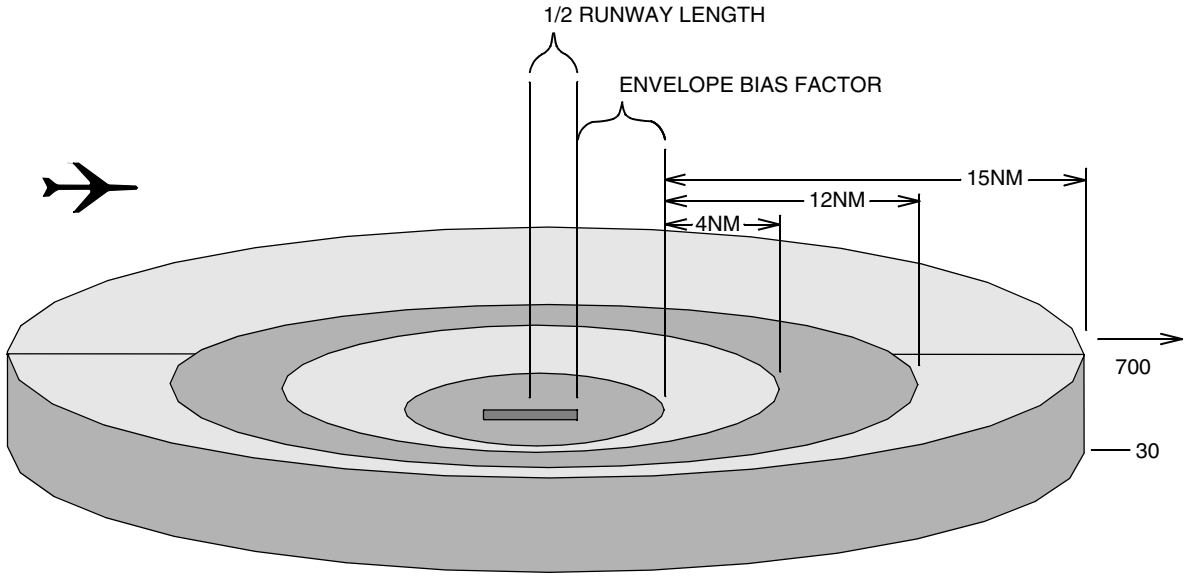
The TCF is usually computed at 700 ft Above Ground Level (AGL) until the airplane is within 15 nautical miles (nm) from the airport. The TCF then slopes over the next 3 nm from 700 ft AGL to 400 ft AGL. This level extends from 12 nm to 4 nm from the airport. The TCF then slopes from 400 ft AGL to 0 ft to let the airplane land. Adjacent to the runway the TCF alert envelope is limited to a minimum of 245 ft AGL.

Reference Figures 6 and 7 for depictions of Terrain Clearance.

The Terrain Awareness Display (TAD) gives an image of the surrounding terrain on the Weather Radar screen using green, yellow and red dots in differing densities. This display is generated by the EGPWC which compares the terrain data to the position and altitude of the airplane, if no terrain data is available the area is colored magenta.

When a "CAUTION TERRAIN" alert is generated, approximately 60 seconds before a potential conflict, areas within ± 90° of the airplane track which enter the terrain caution envelope are shown as solid yellow areas.

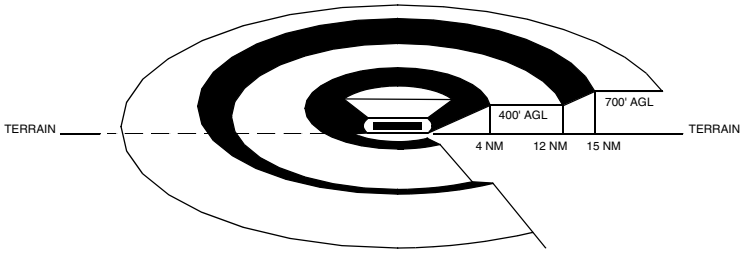
When a "TERRAIN TERRAIN PULL UP" warning is generated, approximately 30 seconds before a potential conflict, areas of terrain within ± 90° of the airplane track which enter the terrain warning envelope are shown as solid red areas.



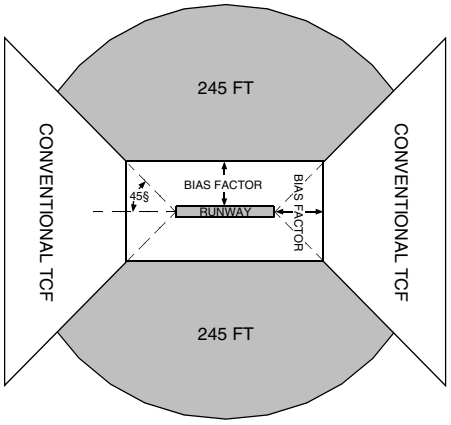
TCF ALERT ENVELOPE

M6914_0
HA00C
016398AA

Figure 6
Terrain Clearance Floor Alert Envelope



IMPROVED TCF ENVELOPE



IMPROVED TCF ENVELOPE PLAN VIEW

M6915_0
HA00C
016399AA.AI

Figure 7
Improved Terrain Clearance Floor Envelope

The EGPWS Terrain video is inhibited by pushing the TERR INHIB switch. If the EGPWS terrain video is showing, pushing the TERR INHIB switch makes the video stop and TERR is shown in amber.

NOTE: The basic EGPWS modes 1-6 and windshear mode 7 remain active when the Terrain Awareness Alerting is manually inhibited.

Peaks and obstacles are two supplemental features of TAD. Peaks provides additional terrain display features for enhanced situational awareness, independent of the airplane's altitude. This includes digital elevations for the highest and lowest displayed terrain and additional elevation (color) bands.

The obstacles feature utilizes an obstacle database for obstacle conflict alerting and display. EGPWS caution and warning visual and audio alerts are provided when a conflict is detected. Also, when TAD is enabled, obstacles are graphically displayed similar to terrain.

A Runway Field Clearance Floor (RFCF) feature is also included. This is similar to the TCF feature except that RFCF is based on the current airplane position and height above the destination runway using Geometric Altitude (in lieu of Radio Altitude) and provides improved protection at locations where the surrounding terrain is significantly lower than the runway. Reference Figure 8 for a depiction of the Runway Field Clearance Floor Envelope.

Geometric Altitude is a computed pseudo-barometric altitude, based on the GPS altitude, which is designed to reduce or eliminate altitude errors resulting from temperature extremes, non-standard pressure altitude conditions and altimeter miss-sets.

Self Test

The EGPWS performs a self test each time power is applied to the computer and when manually selected. Any failures during the self test are annunciated to the pilots both visually and aurally.

Switches/Annunciators

Annunciators and switches (external to the EGPWS) control and annunciate the status of the various modes of the EGPWS. There are four switches/annunciators located on the Center Instrument Panel between the pilot's and copilot's MFD. Refer to Figure 2. Located in the overhead control panel is the EGPWS TEST pushbutton. Refer to Figure 1.

The functions of the various switches/annunciators are as follows:

1. EGPWS TEST — Not a light. Momentary push button to initiate system self-test.
2. FLAP OVRD — Background illuminates white when flap warnings disabled. Alternate action button to override or restore mode 2 and mode 4 flap warnings.
3. GS INHIB — Background illuminates white when glideslope is inhibited. Momentary push switch to inhibit or restore glideslope mode 5 warning.
4. TERR INHIB — Background illuminates white when terrain display is inhibited. Pressing the TERR INHIB switch inhibits TAD and TCF alerting and display, including Obstacles and Peaks when enabled. This is used when position accuracy is inadequate or when operating at airports not in the database. Neither loss nor inhibiting TAD/TCF effects the basic GPWS functions (modes 1-7).
5. ALT CALLS INHIB — Background illuminates white when altitude call outs inhibited. Momentary push switch to inhibit mode 6 altitude callouts.

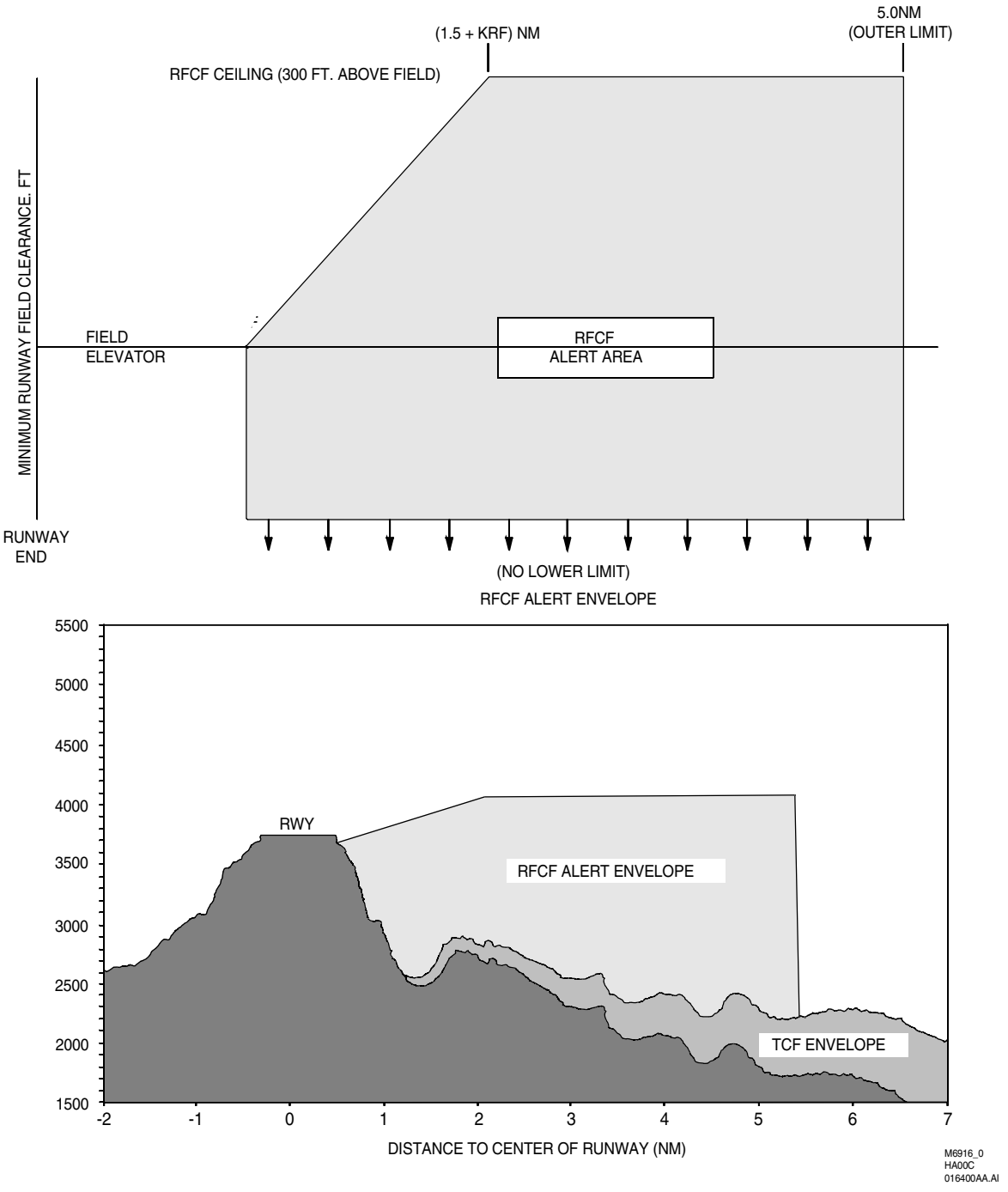


Figure 8
Runway Field Clearance Floor Envelope

EGPWS Operating Modes

There are 7 modes of operations*:*

Mode	*Operational Envelope*
MODE 1 Excessive Descent Rate Alert/Warning	This mode is active for all phases of flight when the radio altimeter indicates between 10 and 2450 ft AGL. The mode envelope identifies the minimum radio altitude permitted based on a given descent rate. If the airplane flight profile goes into the alert envelope, the EGPWS PULL UP annunciator illuminates and the "SINKRATE" voice warning is heard. If the airplane flight profile goes into the warning envelope, the PULL UP annunciator stays on and the voice warning changes to a continuous "PULL UP". Upon going out of the Mode 1 envelope, the voice message stops and the PULL UP annunciator extinguishes.
MODE 2 Terrain Closure Rate Warning	This mode is active for all phases of flight and airplane configurations. The Mode 2 warning envelope changes with airplane speed and configuration and has two sub-modes: • Mode 2A is active when the flaps are in any position other than landing and the airplane is not on the glideslope centerline. • Mode 2B is active when the flaps are in the landing position or when ILS is in use and the airplane is on the glideslope with less than 2 dots deviation. When the airplane flight profile goes into either the Mode 2A or 2B envelope, the PULL UP annunciator illuminates and the "TERRAIN TERRAIN" voice warning sounds. After the "TERRAIN TERRAIN" warning, one of three results will occur: 1. If the airplane flight profile goes out of the warning envelope, no additional warnings are generated and the PULL UP annunciator extinguishes. 2. If the flight profile stays in the warning envelope and the flaps or gear are not in the landing configuration, a continuous "WHOOP WHOOP" tone and "PULL UP" message is heard until the airplane goes out of the Mode 2 warning envelope. 3. If the flight profile stays in the warning envelope and the flaps and gear are in the landing configuration, the "TERRAIN TERRAIN" message continues until the airplane goes out of the Mode 2 warning envelope. Upon going out of the Mode 2 warning envelope, the voice messages stop and the PULL UP annunciator extinguishes.

Mode	*Operational Envelope*
MODE 3 Alert To Descent After Takeoff	This mode is active when the radio altimeter indicates between 30 and 1500 ft AGL, either the landing gear or flaps are UP, and the EGPWS is in the takeoff mode (enabled by a successful landing previous to the current takeoff). The Mode 3 warning envelope changes with airspeed, radio altitude and vertical speed. Mode 3 is enabled when vertical speed becomes negative, and stays active until the altitude loss is fully recovered. When the altitude loss is recovered, Mode 3 resets and continues to scan for negative vertical speed. If the airplane flight profile goes into the Mode 3 warning envelope, the PULL UP annunciator illuminates and the "DON'T SINK" voice warning sounds. The PULL UP annunciator stays on and the "DON'T SINK" message continues until the airplane gets a positive rate of climb. Upon going out of the Mode 3 warning envelope, the voice messages stop and the PULL UP annunciator extinguishes.
MODE 4 Alert To Insufficient Terrain Clearance	This mode is active when the radio altimeter indicates 30 ft AGL or more. Modes 4A and 4B alert the flight crew to insufficient terrain clearance during cruise and approach. Mode 4C alerts the flight crew to insufficient terrain clearance during takeoff or go-around. • Mode 4A is active when the landing gear is UP, and the EGPWS is in the approach mode. If the airplane flight profile goes into the Mode 4A warning envelope at less than 190 kts, the PULL UP annunciator illuminates and the continuous "TOO LOW GEAR" warning sounds. If the flight profile goes into the Mode 4A warning envelope at more than 190 kts, the "TOO LOW TERRAIN" warning sounds and the PULL UP annunciator illuminates. • Mode 4B is active when the landing gear is DOWN, and the EGPWS is in the approach mode. If the flight profile goes into the Mode 4B warning envelope at less than 159 kts, the PULL UP annunciator illuminates and the "TOO LOW FLAPS" warning sounds. The message will continue until the flaps are lowered or the airplane goes out of the Mode 4B warning envelope. If the flight profile goes into the Mode 4B warning envelope at more than 159 kts, the PULL UP annunciator illuminates and the "TOO LOW TERRAIN" warning sounds. • Mode 4C is active when the radio altimeter indicates 245 ft AGL or above, or above 100 ft AGL with landing gear or flaps not in the landing configuration. If the flight profile goes into the Mode 4C warning envelope, the PULL UP annunciator illuminates and the "TOO LOW TERRAIN" warning sounds. Upon going out of the warning envelopes, the voice warnings stop and the PULL UP annunciator extinguishes.

Mode	*Operational Envelope*
MODE 5 Alert To Descent Below Glideslope	This mode is active when the following conditions are present: • A valid glideslope signal is present. • The EGPWS is in the approach mode or the flaps are in the landing configuration. • GS INHIB button has not been used to cancel glideslope. • The landing gear is in the DOWN position. • Radio altimeter indicates more than 30 ft AGL. • Mode 5 is not inhibited by back course select or other inhibit signal. Pushing the illuminated GS INHIB switch momentarily cancels the glideslope alerts until the cancel logic is reset. Pushing the illuminated GS INHIB switch resets the cancel logic. The cancel logic resets automatically when the radio altimeter indicates more than 1500 ft AGL or less than 30 ft AGL or a non-ILS frequency is selected. The Mode 5 alert envelope is enabled by glideslope deviations over 1.3 dots and radio altitudes between 300 and 1000 ft AGL (typical). The Mode 5 warning envelope is enabled by glideslope deviations over 2 dots and radio altitudes below 300 ft AGL. If the airplane flight profile goes into the alert envelope, the soft "GLIDESLOPE" warning sounds and the GLIDESLOPE annunciator illuminates. If the airplane flight profile goes into the warning envelope, the loud "GLIDESLOPE" warning sounds and the GLIDESLOPE annunciator illuminates. Upon going out of the Mode 5 alert or warning envelope, the voice messages stop and the GLIDESLOPE annunciator extinguishes. *NOTE: To permit maneuvering on final approach with an unreliable glideslope, the GLIDESLOPE message can be inhibited by pushing the GS INHIB switchlight when the airplane is below 2000 ft AGL. The GLIDESLOPE messages are automatically inhibited during Back Course approaches.*

Mode	*Operational Envelope*
MODE 6 Altitude Callouts/Bank Angle	This mode is active for all phases of flight and airplane configurations. Mode 6 gives voice altitude callouts and indications. The standard callouts will be Menu 76 with smart callout: • TWO THOUSAND FIVE HUNDRED (at 2500 ft AGL) • ONE THOUSAND (at 1000 ft AGL) • FIVE HUNDRED (at 500 ft AGL) • FOUR HUNDRED (at 400 ft AGL) • THREE HUNDRED (at 300 ft AGL) • TWO HUNDRED (at 200 ft AGL) • ONE HUNDRED (at 100 ft AGL) • FIFTY (at 50 ft AGL) • FORTY (at 40 ft AGL) • THIRTY (at 30 ft AGL) • TWENTY (at 20 ft AGL) • TEN (at 10 ft AGL) • MINIMUMS (based on the Decision Height) Some airplanes will have menu 14: • ONE THOUSAND (at 1000 ft AGL) • FIVE HUNDRED (at 500 ft AGL) • MINIMUMS (based on the Decision Height) • BANK ANGLE Mode 6 excessive bank angle warnings are divided into two types based on radio altitude. • Below 150 ft AGL, maximum allowable bank angle is computed as a function of the radio altitude (e.g. less bank angle is allowed as altitude decreases). Below 30 ft AGL the maximum allowable bank angle is 10° and is inhibited below 5 ft AGL. • Above 150 ft AGL, the maximum allowable bank angle is 40°. If the airplane bank angle exceeds the maximum allowable bank angle above 150 ft AGL, the "BANK ANGLE BANK ANGLE" voice warning sounds with a ¾ second pause between the warnings. Upon rolling back below the maximum allowable bank angle the voice messages stop.

Mode	*Operational Envelope*
MODE 6 Altitude Callouts/Bank Angle (continued)	If the airplane bank angle exceeds the maximum allowable bank angle below 150 ft AGL, the "BANK ANGLE BANK ANGLE" voice warning sounds with no pause between the warnings. On rolling back below the maximum allowable bank angle, the voice messages stop. "BANK ANGLE BANK ANGLE" will sound again if the roll attitude increases by 20%. When the roll attitude increases to 40% above the first callout angle "BANK ANGLE" sounds continuously. The "SMART" 500 ft warning helps the pilots when on a non-precision approach and stays silent when on a precision approach with vertical guidance. The warning "FIVE HUNDRED" sounds at 500 ft AGL if the pilot's instruments are not selected to an in-use ILS signal, a deviation from the ILS glideslope of greater than 2 dots or if the glideslope is cancelled.
MODE 7 Windshear Detection	This mode is active for windshear detection during takeoff mode from rotation to 1500 ft AGL or if the airplane is reconfigured for landing. The mode is also active for windshear detection during approach or go-around modes when the radio altitude is between 1500 ft and 10 ft AGL. The EGPWS can detect both increasing performance windshears (e.g. increasing headwind, decreasing tailwind, updraft), as well as decreasing performance windshears (e.g. decreasing headwind, increasing tailwind, downdraft). If the airplane flight profile indicates an increasing performance windshear, the WNDSHR CAUTION annunciator illuminates and the "CAUTION WINDHEAR" warning sounds. Upon going out of the windshear caution conditions, the voice messages stop and the WNDSHR CAUTION annunciator extinguishes. If the airplane flight profile indicates a decreasing performance windshear, the WNDSHR WARN annunciator illuminates and the siren and "WINDSHEAR WINDSHEAR WINDSHEAR" audible warnings sound. Upon going out of the windshear warning conditions, the voice message and siren stop and the WNDSHR WARN annunciator extinguishes.