ELECTRONIC FLIGHT INSTRUMENT SYSTEM

General

The aircraft is equipped with two independent Electronic Flight Instrument Systems (EFIS), one on the captain side and one on the first officer’s side. The purpose is to display the attitude and relative position of the aircraft. Each system consists of one Symbol Generator (SG), two Display Units (DU) and one EFIS control panel. Additionally, other controls are provided at the AVIONICS panel and at the Flight Mode Panel (FMP).

Symbol generator

Amongst other systems each SG receives data from AHRS, ADC, FMS, TAWS, AFCS, VOR, ILS, DME, ADF, RA, marker beacon, and weather radar. It processes these data for presentation at the DU’s. Input data are compared by the SG’s; any difference detected will be displayed at the DU’s. Normally SG 1 drives the captain DU’s and SG 2 the first officer’s DU’s. In case of an SG failure the operative SG is capable to drive all four DU’s. Alerts are presented in the event of an SG failure.

Display units

The DU’s are installed one above the other. The DU’s are full-color screens. The upper DU is normally the Primary Flight Display (PFD) and the lower one is the Navigation Display (ND).

Type I

In case of a DU failure or for convenience a composite mode at the PFD or ND can be selected at the onside EFIS control panel.

Type II

In case of a DU failure or for convenience the PFD and the ND can be transferred using the DU XFR pushbutton on the avionics panel.

Primary flight displays

The PFD presents aircraft attitude, flight director commands, localizer deviation, Flight Mode Annunciation (FMA), Radio Altitude (RA), marker beacon, decision height, comparator warnings, rising runway, air data commands and FMS information. Attitude data is not available before alignment of AHRS.

Navigation display

The ND presents heading, desired track, selected course, course deviation, VOR to/from station, DME distance, glide slope deviation, VOR and/or ADF bearing, ground speed, time-to-go, wind direction and velocity, primary navigation source, range rings, weather radar, cross track deviation, map data, and FMS information.

Heading information supplied by AHRS is not available before alignment of AHRS.
The navigation display modes presented are FULL, ARC and MAP.

In the FULL mode a 360 degrees compass rose and ILS or VOR information are displayed.

In the ARC mode a forward segment of 90 degrees out of the compass rose and the same information as in the FULL mode are displayed.

In the MAP mode VOR (navaids) and FMS information (waypoints) are displayed at the 90 degrees compass rose segment. Weather radar system data can be superimposed in the ARC or MAP mode.

**EFIS control panel**

The EFIS control panel enables selection of navigation display modes, ground speed or time-to-go, NAV sources, bearings, radio altimeter decision heights, and an onside EFIS test.

Additionally, the DU brightness and the weather radar display brightness can be manually adjusted. When the light intensity in the flight deck changes the DU brightness is automatically adapted.

**Type I**

Bearing needle one can be selected at OFF, VOR 1, ADF 1 and FMS. Bearing needle two can be selected at OFF, VOR 2 and ADF 2.

**Type II**

Bearing needle one can be selected at OFF, VOR 1 and ADF 1. Bearing needle two can be selected at OFF, VOR 2, ADF 2 and FMS.

**Avionics panel**

**Type I**

Enables all four DU’s to be driven by one SG in case of an SG failure. In addition, a white COOLING FAN INOP light is installed on the avionics panel, which will indicate a DU cooling failure or an AHRS cooling failure.

**Type II**

Enables all four DU’s to be driven by one SG in case of an SG failure and transfer of the PFD and the ND in case of failure or for own convenience. In addition, a white COOLING FAN INOP light is installed on the avionics panel, which will indicate a DU cooling failure or an AHRS cooling failure.

**Flight mode panel**

The flight mode panel enables selection of course and heading.
EFIS test

An onside EFIS test may be performed by depressing the inner knob of the PFD/DH selector located at the onside EFIS control panel. If an EFIS test is initiated the following must be observed:

• A double chime is produced.
• MCL’s are flashing.
• SG FAULT light on the AVIONICS panel illuminated.
• COMPARE ATT light on the CAP illuminates.
• Onside PFD and ND will show a test pattern.
• All selected FD modes are cancelled.
Controls and indicators

A AVIONICS PANEL

AVIONICS

SG

FAULT

ALTN

EFIS

SG

FAULT

ALTN

COOL FAN INOP

COOLING FAN INOPERATIVE LIGHT

COOL FAN INOP (white)
- Cooling for DU's fails, or
- Cooling for AHRS fails.

SYMBOL GENERATOR P/B
Normal (blank)
- SG operating normally.
Fault (amber)
- SG failure, or
- EFIS test.
ALTN (white)
- Offside SG feeds all four DU's.

NOTE: ALTN selection disables offside ALTN selection and cancels onside FD modes.

Controls and indicators - Type I
**DISPLAY UNIT TRANSFER P/B**

- Normal (blank)
- Normal DU configuration.
- ON (white)
- Primary flight information is displayed at the lower DU.
- Navigation information is displayed at the upper DU.

**SYMBOL GENERATOR P/B**

- Normal (blank)
- SG operating normally.
- Fault (amber)
- SG failure, or
- EFIS test.
- ALTN (white)
- Offside SG feeds all four DU’s.

**AVIONICS**

```
+----------------+-----------------+----------------+
|                |                  |                  |
| SG             | DU-XFR           | SG               |
|                |                  |                  |
| FAULT          | ON               | FAULT            |
| ALTN           |                  | ALTN             |
```

**COOLING FAN INOPERATIVE LIGHT**

- COOL FAN INOP (white)
- Cooling for DU’s failure, or
- Cooling for AHRS failure.
Flight mode panel

**COURSE 1 SELECTOR**

Rotate to set the NAV 1 course pointer or course line to the desired course.

**NOTE:** Selection is inhibited when FMS is selected as primary navigation source.

**COURSE 2 SELECTOR**

Rotate to set the NAV 2 course pointer or course line to the desired course.

**NOTE:** Selection is inhibited when FMS is selected as primary navigation source.

**FLIGHT MODE PANEL**

**HEADING SELECTOR**

Rotate to set the heading bug at both ND's to the desired heading.
EFIS control panel

**EFIS control panel**

- **FULL/ARC P/B**
  - Depress momentarily to exchange the FULL mode at the ND for the ARC mode or vice versa.

- **FD COMMAND P/B**
  - Depress momentarily to display or to remove the FD command bar at the PFD.

- **MAP P/B**
  - Depress momentarily to select or de-select the MAP mode at the ND.

- **GSPD/TTG P/B**
  - Depress momentarily to exchange to ground speed display for time-to-go display and vice versa.

- **PFD/DH SELECTOR**
  - Rotate outer knob to adjust PFD brightness.
  - OFF
    - PFD blank.
  - Rotate inner knob to select decision height.
  - Full CCW
    - Decision height display removed.
  - Push inner knob to test the onside EFIS. The EFIS test is inhibited after GS capture.

- **BEARING SELECTOR 1**
  - OFF
    - No bearing pointer and bearing source display at the ND.
  - VOR 1
    - Bearing pointer displays VOR 1 bearing.
    - Bearing source is displayed.
  - ADF 1
    - Bearing pointer displays ADF 1 bearing.
    - Bearing source is displayed.
  - TYPE I

- **BEARING SELECTOR 2**
  - OFF
    - Bearing pointer and bearing source display at the ND.
  - VOR 2
    - Bearing pointer displays VOR 2 bearing.
    - Bearing source is displayed.
  - ADF 2
    - Bearing pointer displays ADF 2 bearing.
    - Bearing source is displayed.
  - TYPE II (NOT DISPLAYED IN DRAWING)

- **ND/WX SELECTOR**
  - Rotate outer knob to adjust ND brightness.
  - OFF
    - ND blank.
  - Rotate inner knob to adjust the brightness of the weather radar display.
  - OFF
    - No weather radar display

- **NAV SOURCE BUTTONS**
  - Depress either button momentarily to select FMS, VHF NAV 1 or VHF NAV 2 as primary navigation source.
Primary flight display

**FLIGHT DIRECTOR COMMAND BARS**
Bars (magenta)
- Display pitch and/or roll.

**NOTE:**
1. Bars disappear when the required signal inputs are unreliable.
2. Display is dependent on FD COMMAND switching and active FD mode(s).

**AIRCRAFT SYMBOL**

**PITCH DISPLAY**

**RISING RUNWAY**
Runway (yellow)
- Appears at 200 ft AGL.
- Indicates absolute altitude reference above the terrain.
- Contacts the aircraft symbol at touchdown.

**DECISION HEIGHT DISPLAY**
Displays selected decision height.

**LOCALIZER DEVIATION DISPLAY**
Pointer (green)
- Displays localizer position at deviation scale.

**NOTE:**
- Full scale sensitivity greater than course deviation bar:
  - 7.5 times in LOC and BC modes.
  - 3.75 when BC approach is flown without FD.

**ROLL SCALE**

**ROLL POINTER**

**GLIDE SLOPE DEVIATION DISPLAY**
Pointer and G (green)
- Displays glide slope position at deviation scale.

**LOC**

**GS**

**200 DH**

**140 RA**

**SLIP INDICATOR**

**RADIO ALTITUDE DISPLAY**
Displays radio altitudes in steps of 10 ft when below 2500 ft AGL.
Below 200 ft RA in steps of 5 ft.

**NOTE:**
1. Box (white)
   - Radio altitude less than 100 ft above DH.
2. DH (amber)
   - Radio altitude at or below DH.

**MARKER BEACON DISPLAY**
Box (white)
- A localizer is tuned.
O (blue)
- Outer Marker.
M (amber)
- Middle Marker.
I (white)
- Inner or fan Marker.
FLIGHT MODE ANNUNCIATIONS

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<th>ROLL MODES</th>
<th>PITCH MODES</th>
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<tr>
<td>Armed (white)</td>
<td>Captured (green)</td>
</tr>
<tr>
<td>- LOC</td>
<td>- LOC</td>
</tr>
<tr>
<td>- NAV</td>
<td>- NAV</td>
</tr>
<tr>
<td>- BC</td>
<td>- HDG</td>
</tr>
<tr>
<td>- VAPP</td>
<td>- BC</td>
</tr>
<tr>
<td></td>
<td>- VAPP</td>
</tr>
<tr>
<td></td>
<td>- LNAV</td>
</tr>
<tr>
<td>Armed (white)</td>
<td>Captured (green)</td>
</tr>
<tr>
<td>- GS</td>
<td>- GS</td>
</tr>
<tr>
<td></td>
<td>- ASEL</td>
</tr>
</tbody>
</table>

Box (white) for 5 seconds
- Automatic mode transition from armed to captured.

AIR DATA COMMAND DISPLAY
Displays hold reference for:
- Indicated airspeed in KTS when IAS mode is selected at FMP.
- Vertical speed in FMP when VS mode is selected at FMP.

FMS REMINDER DISPLAY
FMS MSG (amber)
- Message displayed at the FMS CDU.
<table>
<thead>
<tr>
<th>COMPARATOR DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIT (amber)</td>
</tr>
<tr>
<td>Pitch disagreement.</td>
</tr>
<tr>
<td>ROL (amber)</td>
</tr>
<tr>
<td>Roll disagreement.</td>
</tr>
<tr>
<td>ATT (amber)</td>
</tr>
<tr>
<td>Pitch and roll disagreement.</td>
</tr>
</tbody>
</table>

**NOTE:** Display LOC, GS and ILS only, provided both NAV receivers are tuned to the same ILS frequency, and the FD has captured localizer and glide slope.

<table>
<thead>
<tr>
<th>FLIGHT DIRECTOR FAILURE DISPLAY</th>
</tr>
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<tbody>
<tr>
<td>FD FAIL (amber)</td>
</tr>
<tr>
<td>Flight director failure.</td>
</tr>
</tbody>
</table>

**NOTE:** Command bars and flight mode announcements are removed.

<table>
<thead>
<tr>
<th>COMMON SYMBOL GENERATOR DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>When ALTN SG selected:</td>
</tr>
<tr>
<td>SG1 or SG 2 (amber)</td>
</tr>
<tr>
<td>One symbol generator used for all DU's.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AIR DATA COMMAND DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dashes (amber)</td>
</tr>
<tr>
<td>ADC information not available and IAS mode selected at FMP.</td>
</tr>
<tr>
<td>Blank</td>
</tr>
<tr>
<td>TSC operation.</td>
</tr>
<tr>
<td>ADC information not available and VS mode selected at FMP.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RADIO ALTITUDE DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dashes (amber)</td>
</tr>
<tr>
<td>Radio altimeter system failure.</td>
</tr>
</tbody>
</table>

**NOTE:** If present, the rising runway disappears.
EXCESSIVE DEVIATION DISPLAY

Pointer and scale (amber)
- Localizer and/or glide slope excessive deviation threshold is exceeded.

NOTE: Display only, provided radio altitude is between 500 ft and 100 ft and the FD has captured the glide slope.
**ATTITUDE FAILURE DISPLAY**
- Att FAIL (red)
  - Onside AHRS pitch and roll failure.

**GLIDE SLOPE FLAG**
- Flag (red)
  - Glide slope information not available.

**LOCALIZER FLAG**
- Flag (red)
  - Localizer information not available.

**INTERNAL FAILURES**
- Blank
  - DU or SG failure.
- SG FAIL (red)
  - SG fault.
Navigation display

**COURSE/DESIRED TRACK DISPLAY**
- CRS (white) - Displays selected VOR or LOC course.
- DTRK (white) - Displays FMS desired track.

**HEADING SYNC DISPLAY**
- Bar centered: AHIRS synchronized.
- Bar out of center: + (green) - Slaved magnetic heading decreased.
- O (green) - Slaved magnetic heading increased.

**NOTE:** Display only when slaved magnetic heading is selected at onside COMPASS panel.

**COURSE/DESIRED TRACK POINTER**
- Pointer (yellow) - Indicates selected VOR or LOC course, or FMS desired track.

**BEARING SOURCE DISPLAY**
- ADF1, VOR1, or FMS (white) - Indicates bearing pointer navigation source.
- ADF2 or VOR2 (white) - Indicates bearing pointer navigation source.

**HEADING DISPLAY**
- Displays selected heading.

**● BEARING POINTER**
- Pointer (blue) - Indicates either VOR1 or ADF1 bearing, or FMS bearing to next waypoint.

**HEADING SOURCE DISPLAY**
- DG (white) - Directional gyro heading selected at onside COMPASS panel.

**NAVIGATION DISPLAY FULL MODE**

**A**

**HEADING BUG**
- Bug (blue) - Indicates selected heading.

**● BEARING POINTER**
- Pointer (green) - Indicates either VOR2 or ADF2 bearing.

**PRIMARY NAVIGATION SOURCE DISPLAY**
- ILS1 (2) or VOR1 (2) (white), or FMS (blue) - Onside primary navigation source selected.

**DISTANCE DISPLAY**
- Displays DME distance.

**TO-FROM POINTER**
- Pointer (white) - Indicates direction of VOR or next waypoint.

**GLIDE SLOPE DEVIATION DISPLAY**
- Pointer and G (green) - Displays glide slope position at deviation scale.

**AIRCRAFT SYMBOL**

**GROUND SPEED/TIME-TO-GO DISPLAY**
- Displays ground speed in KTS when GSPD is selected at FMP.
- Time-to-go in MIN when TTG is selected at FMP.

**COMPASS ROSE**
HEADING ARROW
Arrow (blue)
- Heading bug is selected out of arc range.
- Indicates shortest direction to selected heading.

HEADING DISPLAY
Displays actual heading.

INNER RANGE RING

RANGE DISPLAY
50 (white)
- Distance to inner range ring in nautical miles.

NOTE: For range selection see FLIGHT/NAVIGATION DATA SYSTEMS.
Fokker 50 - Flight Navigation Instruments

**FMS CROSSTRACK MESSAGE DISPLAY**

- XTK (blue)
  - Offset path selected at FMS CDU.

**TRACK POINTER**

- Pointer (green)
  - Indicates actual aircraft track.

**NOTE:** Segment between lubber line and track pointer is drift angle.

**DEAD RECKONING/WAYPOINT ALERT DISPLAY**

- DR (amber)
  - Navigation mode is degraded to dead reckoning.

**NOTE:** DR is present for maximum 5 min and has priority over waypoint alert display.

- WPT (amber)
  - A waypoint will be passed.

**NOTE:** If an automatic track change is to occur, WPT is present ≥15 sec before reaching that waypoint. If no automatic track change is to occur, WPT is present ≥90 sec before reaching that waypoint.

**WIND DISPLAY**

- Numerals (green)
  - Displays wind velocity.

- Arrow (green)
  - Displays wind direction.

**ARC MODE**

- DTRK 315, XTK 130, DG 320, DR 50, GSPD 160 KTS

- HDG 319
**TO-FROM DISPLAY**

TO or FR (white)
- Indicates direction of VOR information.

**NOTE:** Display not present during ILS operation.

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**NAVAID DISPLAY**

△ VOR1 (blue)
- Displays position of a tuned VOR1 station.

△ VOR2 (green)
- Displays position of a tuned VOR2 station.

**NOTE:** The source of the navaid can be seen from the bearing source display.

---

**COURSE LINE DISPLAY**

Inbound course line (magenta)
- Desired course to VOR2 station.

Outbound course line (dashed magenta)
- Desired course from VOR2 station.

**NOTE:** When the navaid is out of display an inbound or outbound course line is displayed with an arrow at the inner range ring which indicates the direction of the navaid.

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**NAVAID DISPLAY**

△ VOR2 (magenta)
- Displays position of the active VOR2 station.

**NOTE:** The source of the navaid can be seen from the primary navigation source display.

---

**COURSE DEVIATION POINTER**

Pointer (yellow)
- Indicates VOR course deviation.

---

**MAP MODE**

CRS 315 TO

HDG 319

VOR2 30.0 NM

VOR1

320

50

GSPD 130 KTS
Fokker 50 - Flight Navigation Instruments

**FLIGHT PLAN**
- (white) - Indicates active flight plan.

**WAYPOINT DISPLAY**
- + letters (white) - Displays position and identification of a waypoint in the active flight plan.
- + letters (magenta) - Displays position and identification of next waypoint in the active flight plan.

**CROSSTRAK DEVIAOTN DISPLAY**
- Numerals + L or R (white) - Displays crosstrack deviation in NM left or right of FMS desired track.
- Dashes (amber) - NAV information not available.
COURSE/DESIR ED TRACK DISPLAY
CRS (white) + dashes (amber)
- Selected course failure.
DTRK (white) + dashes (amber)
- FMS desired track failure.

PRIMARY NAVIGATION SOURCE DISPLAY
ILS 1 (2) or VOR 1 (2) (amber)
- Same primary navigation source selected.
- Primary navigation sources cross selected.
FMS (amber)
- Same primary navigation source selected.

DISTANCE DISPLAY
Dashes (amber)
- Distance (DME) information not available.
H + dashes (amber)
- DME HOLD selected at DME panel.

EXCESSIVE DEVIATION DISPLAY
Pointer and scale (amber)
- Glide slope excessive deviation threshold is exceeded.

NOTE: Display only, provided radio altitude is between 500 ft and 100 ft and the FD has captured the glide slope.

GROUND SPEED/ TIME-TO-GO DISPLAY
Dashes (amber)
- Ground speed information not available when GS PD is selected at FMP.
- Time-to-go information not available when TTG is selected at FMP.
- DME HOLD selected at DME panel.
**Fokker 50 - Flight Navigation Instruments**

---

**HEADING FAILURE DISPLAY**
- HDG FAIL and Flag (red)
- Onside AHRS heading failure.

*NOTE:* Course/desired track and heading display are dashed (amber) also.

---

**GLIDE SLOPE FLAG**
- Flag (red)
- Glide slope information not available.

---

**COURSE DEVIATION FLAG**
- Flag (red)
- NAV information not available.

*NOTE:* Neither scale nor flag will be displayed in the event of an onside AHRS heading failure.

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**INTERNAL FAILURES**
- Blank
- DU or SG failure
- Flag and SG FAIL (red)
- SG fault.
Fokker 50 - Flight Navigation Instruments

TEST PATTERN
**WXR STATUS DISPLAY 1**

- WX (amber)  
  - System OFF.
- WAIT (green)  
  - System warm up.
- Weather radar display selected ON.
- TX (magenta)  
  - System on.
  - Weather radar display selected OFF.
- STBY (green)  
  - System standby.
- WX (green)  
  - Weather detection mode.
- RCT (green)  
  - Weather detection mode.
  - REACT enabled.
- GMAP (green)  
  - Ground mapping mode.
- FPLN (green)  
  - Flight plan mode.
  - System standby.
- TEST (green)  
  - System test.
- FAIL (amber)  
  - System fault.

**WXR STATUS DISPLAY 2**

- TGT (green)  
  - Target alert selected.
- TGT (amber)  
  - Red precipitation level detected.
- VAR (amber)  
  - Variable gain selected.

**WXR RETURN DISPLAY**

- Green, yellow, red, magenta  
  - Precipitation levels in weather detection mode.
- Cyan, yellow, magenta  
  - Reflective levels in ground mapping mode.

**ANTENNA TILT DISPLAY**

- or + (green)  
  - Antenna tilt direction.
- Numerals (green)  
  - Antenna tilt angle in degrees.

**MAP MODE – WEATHER RADAR SYSTEM ON**

**WXR RANGE DISPLAY**

- 2.5/5/12.5/25/50/100/150  
  - Range display in nautical miles.

**NOTE:** Range display at inner range ring is half the actual WXRR range.
For aircraft equipped with composite mode.

**Primary Flight Display (Composite Mode)**

- **Roll Pointer**
- **Pitch Display**
- **To-From Display**
- **Course Display**
- **Flight Director Command Bars**
- **Lubber Line**
- **Heading Scale**
- **Heading Display**
  - Displays selected heading.
- **Heading Source Display**
  - Display not present when IAS or VS mode is selected at FMP.
- **Air Data Command Display**
- **Decision Height Display**
- **Roll Scale**
- **Primary Navigation Source Display**
- **Distance Display**
- **Comparator Display**
- **Aircraft Symbol**
- **Glide Slope Deviation Display**
- **Heading Display**
  - Displays actual heading.
- **Heading Bug**
- **Marker Beacon Display**
- **COURSE POINTER**
- **Radio Altitude Display**
- **COURSE DEVIATION BAR**
- **Slip Indicator**

**NOTE:**
1. Composite mode at ND is similar.
2. Failure displays and flags are similar to the normal display mode.
3. Test pattern in the composite mode shows the results as PFD and ND.
### Alerts

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<th>CONDITION(S)/LEVEL</th>
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<th>MWL/MCL</th>
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<td>COMPARE</td>
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<tr>
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<td>DISAGREEMENT</td>
<td>CAUTION</td>
<td></td>
<td>ATT</td>
<td></td>
</tr>
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</table>

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SECONDARY INSTRUMENTS

Airspeed indicator

Two airspeed indicators are installed; one at each pilot’s instrument panel. Each indicator shows indicated airspeed (IAS) and maximum operating limit speed (V_{MO}) in knots.

For aircraft equipped with air data system type I, II and III

IAS and V_{MO} information are derived from the pitot-static system. Signals from both airspeed indicators are inputs for the integrated alerting system for the following purposes:

• Take-off inhabitation (80kt signal).
• Landing gear NOT down alert (140kt).

An aircraft overspeed is detected by the ADC and the relevant alert is presented. This alert occurs any time V_{MO} is exceeded and can be silenced only by reducing airspeed below V_{MO}. A speed limit placard is located below each ND.

For aircraft equipped with air data system type IV, V and VI

Two airspeed indicators are installed; one at each pilot’s instrument panel. Each indicator shows indicated airspeed (IAS) and maximum operating limit speed (V_{MO}) in knots. IAS and V_{MO} information are derived from the Air Data Computer (ADC).

An aircraft overspeed is detected by the ADC’s and the relevant alert is presented. This alert occurs any time V_{MO} is exceeded and can be silenced only by reducing airspeed below V_{MO}. A speed limit placard is located below each ND.

Radio magnetic indicator

Two Radio Magnetic Indicators (RMI) are installed; one at each pilot’s instrument panel. Each RMI shows aircraft’s magnetic heading, relative bearing to VOR and/or ADF selected ground stations.

Magnetic heading is supplied by the offside AHRS and is indicated by the lubber line against a rotating compass rose.

A heading system failure is indicated by a heading flag.

Bearing is indicated at the azimuth card by two pointers; a single pointer and a double pointer. Each pointer has two source select buttons, which are located next to the RMI. The single pointer is connected to either VOR 1 or ADF 1. The double pointer is connected to either VOR 2 or ADF 2. The selected source is indicated by a green pointer symbol at the relevant button. After power-up, the pointers are connected to the VOR’s.
Altimeter

For aircraft equipped with air data system type I, II and III
Two altimeters are installed; one at each pilot’s instrument panel. Each altimeter shows altitude in feet. Altitude information is derived from the pitot static system.

The captain’s altimeter is a servo driven instrument. The static pressure is converted in the instrument into an electric signal. This signal drives the altitude pointer. The indication is also used for altitude pre-select, altitude alerting, ATC 1 transponder and TCAS.

The first officer’s altimeter is a barometric altimeter. This altimeter contains a vibrator to optimize accuracy of the indication.

For aircraft equipped with air data system type IV, V and VI
Two altimeters are installed; one at each pilot’s instrument panel. Each altimeter shows altitude in feet. Standard altitude information is derived from the ADC.

Data from the captain or first officer’s altimeter is used for altitude pre-select and altitude alerting. Data from the captain altimeter only is used by the Flight Management System (FMS).

Vertical speed indicator

Two vertical speed indicators are installed; one at each pilot’s instrument panel. Each indicator shows instantaneous vertical speed, surrounding traffic, and TCAS Traffic Advisory/Resolution Advisory information on a full color Liquid Crystal Display (LCD).

For aircraft equipped with air data system type I, II and III
A pointer and a vertical speed scale are displayed on the LCD and indicate present aircraft vertical speed in feet per minute. Vertical speed information is derived from the pitot static system.

For aircraft equipped with air data system type IV, V and VI
A pointer and a vertical speed scale are displayed on the LCD and indicate present aircraft vertical speed in feet per minute. Vertical speed information is derived from the onside ADC.
All

Resolution Advisory
Resolution Advisories are displayed as red and green bands around the periphery of the vertical speed scale. Corrective and preventive RA maneuvering guidance is accomplished by keeping the vertical speed pointer within the green band and/or out of the red band(s).

Traffic Advisory
The center area of the TA/VSI display is a horizontal situation presentation of the traffic around the aircraft, including their relative position and altitude. Symbols and colors are used to identify the relative threat of the other traffic.

NOTE: For maximum brightness of the LCD, the ‘Main Instrument Brightness Control Knob’ should be rotated fully left. (Integral instrument lights off).

Total air temperature system
TAT comprises of Outside Air Temperature (OAT) plus ram rise. On the ground TAT will approximately OAT.

For aircraft equipped with air data system type I, II, III, IV and V
A Total Air Temperature (TAT) indicator is installed at the main instrument panel. TAT is derived from a probe installed at the LH wing/fuselage fairing.

For aircraft equipped with air data system type VI
A Total Air Temperature (TAT) indicator is installed at the engine rating panel. TAT is derived from the ADC’s.

Clock

Type I
Two electronic clocks are installed; one at each pilot’s instrument panel. There are two displays with separate controls at each clock. Greenwich Mean Time (GMT) is set at the upper display. The lower display is either for Elapsed Time (ET) or for the chronometer (CHR). Additionally, a chronometer button is provided on each control wheel. The clock installed at the captain side provides a GMT output to the flight data recording system.

Type II
Two electronic clocks are installed; one at each pilot’s instrument panel. There are two displays with separate controls at each clock. Greenwich Mean Time (GMT) and date is set at the upper display. The lower display is either for Elapsed Time (ET) or for the chronometer (CHR). Additionally, a chronometer button is provided on each control wheel. The clock installed at the captain side provides a GMT output to the flight data recording system.
Controls and indicators - For aircraft equipped with air data system type I, II and III
Controls and indicators - For aircraft equipped with air data system type IV, V and VI
Controls and indicators - All

**SINGLE POINTER SOURCE SELECT BUTTONS**

**DOUBLE POINTER SOURCE SELECT BUTTONS**

**B SOURCE SELECT BUTTONS**

**A RADIO MAGNETIC INDICATOR**

**LUBBER LINE**
Indicates aircraft heading.

**HEADING FLAG**
Flag (amber)
- Offside AHRS heading failure.
- Power failure.
- Indicator failure.

*NOTE:* Pointer flags are presented simultaneously.

**DOUBLE POINTER**
Indicates either VOR 2 or ADF 2 bearing.

*NOTE:* In case of an input or indicator failure, the pointer remains in the last valid position.

**DOUBLE POINTER FLAG**
Flag (amber)
- VOR 2 or ADF 2 failure.
- Power failure.
- Indicator failure.

**SINGLE POINTER**
Indicates either VOR 1 or ADF 1 bearing.

*NOTE:* In case of an input or indicator failure, the pointer remains in the last valid position.

Flag (amber)
- VOR 1 or ADF 1 failure.
- Power failure.
- Indicator failure.
CAPTAIN'S ALTIMETER
LOCATION: LH MAIN INSTRUMENT PANEL

<table>
<thead>
<tr>
<th>ALTIMETER DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displays altitude in increments of one hundred feet. Flag indication:</td>
</tr>
<tr>
<td>Flag (black/red)</td>
</tr>
<tr>
<td>— Power or indicator failure.</td>
</tr>
<tr>
<td>Flag (black/white)</td>
</tr>
<tr>
<td>— 0 - 9999 ft.</td>
</tr>
<tr>
<td>Flag (red/white)</td>
</tr>
<tr>
<td>— Below sea level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTITUDE POINTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pointer (white)</td>
</tr>
<tr>
<td>— Makes one revolution each one thousand feet.</td>
</tr>
</tbody>
</table>

| BAROMETRIC REFERENCE PRESSURE SELECTOR |

<table>
<thead>
<tr>
<th>TOTAL AIR TEMPERATURE INDICATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION: CENTER MAIN INSTRUMENT PANEL</td>
</tr>
</tbody>
</table>

Controls and indicators - For aircraft equipped with air data system type I, II and III
Controls and indicators - For aircraft equipped with air data system type I, II and III
Controls and indicators - For aircraft equipped with air data system type IV, V and VI
Controls and indicators - For aircraft equipped with air data system type I, II, III, IV and V

TOTAL AIR TEMPERATURE INDICATOR
LOCATION: CENTER MAIN INSTRUMENT PANEL

Controls and indicators - For aircraft equipped with air data system type I, II, III, IV and V

ENGINE RATING PANEL

Controls and indicators - For aircraft equipped with air data system type I, II, III, IV and V
Controls and indicators - For aircraft equipped with air data system types I, II and III

TRAFFIC ADVISORY/RESOLUTION ADVISORY VERTICAL SPEED INDICATOR

LOCATION: LH AND RH MAIN INSTRUMENT PANEL

**TRAFFIC ADVISORY SYMBOL**

- **(yellow)**
  - Displays position of traffic that is projected to get too close within approx 30 to 45 seconds.
  - Numerals (yellow)
    - Displays relative altitude of traffic in hundreds of feet.

**NOTE 1:** Traffic above:
- Numerals above TA symbol.
- Plus sign added.
- Traffic below:
- Numerals below TA symbol.
- Minus sign added.
- Traffic at same level:
- Numerals below TA symbol.
- Traffic at same level (coming in from below):
- Numerals below TA symbol.
- Traffic at same level (coming in from above):
- Numerals above TA symbol.
- ARROW (yellow)
  - Indicates traffic is climbing or descending at 800 feet or more.

**NOTE 2:** In case of a TA the alert “TRAFFIC TRAFFIC” is generated.

**OTHER TRAFFIC SYMBOL**

- **(white)**
  - Displays position of traffic that is outside the proximity traffic range.
- Numerals (white)
  - Displays relative altitude of traffic in hundreds of feet.
**NOTE:** See NOTE 1 TRAFFIC ADVISORY SYMBOL.

**ARROW (white)**
- Indicates traffic is climbing or descending at 800 feet or more.

**OFF SCALE TRAFFIC SYMBOL**

- **(white)**
  - Displays position of TA (yellow) or RA (red) symbol.
  - Displays position of TA or RA traffic that is outside the selected display range.
- Numerals (yellow or red)
  - Displays relative altitude of traffic in hundreds of feet.
**NOTE:** See NOTE 1 TRAFFIC ADVISORY SYMBOL.

**ARROW (yellow or red)**
- Indicates traffic is climbing or descending at 800 feet or more.

**PROXIMATE TRAFFIC SYMBOL**

- **(white)**
  - Displays position of traffic that is within 6 nautical miles and a 1,000 ft vertically.
- Numerals (white)
  - Displays relative altitude of traffic in hundreds of feet.
**NOTE:** See NOTE 1 TRAFFIC ADVISORY SYMBOL.

**ARROW (white)**
- Indicates traffic is climbing or descending at 800 feet or more.

**RESOLUTION ADVISORY SYMBOL**

- **(red)**
  - Displays position of traffic that is projected to get too close within approx 15 to 30 seconds.
- Numerals (red)
  - Displays relative altitude of traffic in hundreds of feet.
**NOTE:** See NOTE 1 TRAFFIC ADVISORY SYMBOL.

**ARROW (red)**
- Indicates traffic is climbing or descending at 800 feet or more.
**NOTE:** In case of an RA the appropriate alert is generated.
Controls and indicators - For aircraft equipped with air data system type I, II and III (cont'd)
TRAFFIC ADVISORY/RESOLUTION ADVISORY VERTICAL SPEED INDICATOR (cont)

<table>
<thead>
<tr>
<th>TCAS STATUS DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST (yellow)</td>
</tr>
<tr>
<td>– System test</td>
</tr>
<tr>
<td>TCAS STBY (blue)</td>
</tr>
<tr>
<td>– System standby</td>
</tr>
<tr>
<td>TCAS (yellow)</td>
</tr>
<tr>
<td>– System failure</td>
</tr>
<tr>
<td>TA ONLY (blue)</td>
</tr>
<tr>
<td>– TA mode only</td>
</tr>
</tbody>
</table>

TEST PATTERN

VSI STATUS DISPLAY

VSI (yellow)
– Failure or loss of vertical speed data will prevent display of resolution advisory information, provided TCAS is on.

VSI FAILURE

Controls and indicators - For aircraft equipped with air data system type I, II and III (cont’d)
Controls and indicators - For aircraft equipped with air data system type IV, V and VI
Controls and indicators - For aircraft equipped with air data system type IV, V and VI (cont’d)
Controls and indicators - For aircraft equipped with air data system type IV, V and VI (cont'd)

TCAS STATUS DISPLAY

- TCAS TEST (white)
  - System test.
- TA ONLY (white)
  - TA mode only.
- RA FAIL (yellow)
  - Failure to display RA's.

TCAS STATUS DISPLAY

- TCAS OFF (white)
  - System standby.
- TCAS FAIL (yellow)
  - TCAS system failure.
- TD FAIL (yellow)
  - Failure to display TA's and RA's.
VSI STATUS DISPLAY
VSI FAIL (yellow)
- Failure or loss of vertical speed data will prevent display of resolution advisory information, provided TCAS is on.

A TRAFFIC ADVISORY/VERTICAL SPEED INDICATOR

Controls and indicators - For aircraft equipped with air data system type IV, V and VI (cont'd)
**Controls and indicators - Type I**

**CHRONOMETER BUTTON**
- Controls start, stop, and reset of CHR display and second hand with successive push operations.
- Overrides existing ET display.

**NOTE:** Chronometer buttons are also installed at the Captain's control wheel (RH) and at the F/O's control wheel (LH).

**GMT DISPLAY**
- Displays time up to 24 hours, zero minutes.

**SECOND HAND**
- Indicates chronometer seconds.

**ET/CHR DISPLAY**
- Displays elapsed time or chronometer time.
- ET displays time in hours and in minutes.
- CHR displays time in minutes.

**GMT SELECTOR**

**RUN**
- Starts GMT display counting in hours and minutes.
- HLD (hold)
  - Stops GMT display time and sets seconds to zero.
- SS (Slow Slew)
  - Sets GMT display seconds to zero and advances minutes but not the hours.
- FS (Fast Slew)
  - Sets GMT display seconds to zero and advances hours but not minutes.
Controls and indicators - Type II

**Controls and Indicators - Type II**

**Chronometer Button**
- Depress momentarily to start, stop, and reset the chronometer.
- **Note 1:** When reset the elapsed time is shown.
- **Note 2:** Chronometer buttons are also available at each control wheel.

**G.M.T./Date Display**
- Depress momentarily to exchange the G.M.T. at the G.M.T./date display for the date and vice versa.
- Shows G.M.T.
- Displays elapsed time in:
  - Hours (max 99 hours).
  - Minutes (max 99 minutes).

**Second Hand**
- Indicates chronometer seconds.

**E.T./Chr Display**
- Displays chronometer time in:
  - Minutes (max 99 minutes).
  - Displays elapsed time in:
    - Hours (max 99 hours).
    - Minutes (max 99 minutes).

**G.M.T. Selector**
- **Run**
  - Normal operating position.
  - G.M.T. is shown.
  - H.L.D.
    - No counting of time.
  - S.S.M.
    - Set time slowly (1 min/sec).
  - F.S.D.
    - Set time rapidly (1 hr/sec).
- When the date button is depressed momentarily function of G.M.T. selector changes:
- **Run**
  - Date is shown.
  - H.L.D.
    - Set years (1 year/sec)
  - S.S.M.
    - Set months (1 month/sec).
  - F.S.D.
    - Set days (1 day/sec).

**E.T. Selector**
- **Reset** (spring loaded to H.L.D. position):
  - E.T./Chr display blank and remains blank in H.L.D.
- **Run**
  - Elapsed time is reset to zero and starts.
- **H.L.D.** (from Run)
  - Elapsed time stops.
- **Note:** E.T. counting continues, even when CHR function is active.
Alerts

<table>
<thead>
<tr>
<th>CONDITION(S)/LEVEL</th>
<th>AURAL</th>
<th>MWL/MCL</th>
<th>CAP</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIRCRAFT OVERSPEED</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CLACKER
STANDBY INSTRUMENTS

Standby horizon

A standby horizon is installed at the main instrument panel. The horizon provides an indication of aircraft attitude that is independent of AHRS. The horizon is powered when the BATTERIES switch at the ELECTRIC panel is ON or when either FUEL lever is open. The gyro reaches operational speed approximately one minute after power has been applied.

Standby compass

A magnetic standby compass is installed at the lower end of the overhead panel. The compass provides aircraft magnetic heading at all times. Deviation correction cards are fitted at the ceiling just above the sliding windows. A compass light switch is provided for integral lighting of the standby compass.

Standby altimeter

For aircraft equipped with air data system type I, II, IV, V and VI

A standby altimeter is installed at the captain instrument panel. The altimeter shows altitude in feet. Altitude information is derived from the pitot-static system.

Standby airspeed indicator

For aircraft equipped with air data system type I, IV, V and VI

A standby airspeed indicator is installed at the captain instrument panel. The indicator shows indicated airspeed (IAS) in knots. Airspeed information is derived from the pitot-static system.
Controls and indicators

A  STANDBY HORIZON

B  STANDBY COMPASS

ROLL POINTER AND SCALE

WARNING FLAG
Flag (red)
- Power or indicator failure.

AIRCRAFT SYMBOL

HORIZONTAL LINE AND PITCH SCALE

GYRO CAGING KNOB
Pull to level horizon line with aircraft symbol.
NOTE: Type II, the standby altimeter is installed at the RH main instrument panel.

Controls and indicators - For aircraft equipped with air data system type I, II, IV, V and VI
Controls and indicators - For aircraft equipped with air data system type I, IV, V and VI

AIRSPEED POINTER
Pointer (white)
- Indicates airspeed in knots.
TERRAIN AWARENESS AND WARNING SYSTEM (TYPE I)

Introduction

The Universal Avionics systems corporation Terrain Awareness and Warning System uses inputs from:

- ILS receiver.
- Air Data Computer.
- AHRS.
- Radio Altimeter.
- Air/GND Switch.
- Landing Gear Position.
- GPS based Position Sensor system.
- Internal terrain database to provide basic Ground Proximity Warning system (GPWS) alerts and Terrain alerts.

Both the GPWS alerts and the Terrain alerts provide the crew with aural and visual indications of possible inadvertent flight into terrain.

GPWS alerts are generated when the airplanes path/configuration is unsafe given the aircrafts radar altitude, phase of flight combined with the following:

- Vertical speed.
- Rate of closure to terrain.
- Accumulated altitude loss.
- Airspeed.
- Flap and/or gear configuration.
- Glide slope deviation

Terrain alerts are generated by comparing aircraft position and altitude to the TAWS terrain database. The system has the capability to provide "Flight Plan Look Ahead" Terrain Alerts and Warnings by comparing the FMS flight plan to the terrain database. (GPS Sensor Software Dependant)

The system provides a terrain display image to each ND. Control of the TAWS display is by Switch-Light selection on either pilot's instrument panel, or automatic. ("Popup Display") See The Explanation and location of the switches in Normal Operations.
TAWS display

TAWS display information

TAWS provides a map view, which is presented on the ND. Horizontal range selection is controlled through the weather radar control panel.

The following illustrations identify the color banding on the ND.

**NOTE:** The yellow (ROC) band is not displayed on the ground or within one-tenth nautical mile of the airport during the approach.

- Red indicates terrain above the aircraft.
- Yellow indicates terrain below the aircraft and penetrating the ROC.
- Green indicates terrain below aircraft altitude minus ROC. The texture of the green changes to show height contouring over a range of up to four ROC bands. When the airplane is more than ROC band height above all terrain, terrain will be shown with the highest terrain in green and lower terrain contoured up to three additional bands. (See the following illustrations.)
- Black indicates terrain or water that is more than five ROC bands below the airplane altitude. Water that is below the airplane altitude and within the ROC band height is shaded yellow.
- Blue indicates areas of water, although water may be displayed as yellow depending on the ROC of the aircraft.
- Magenta indicates areas where terrain database is not available.

![Depiction of color banding within ROC band height](image)
TAWS will display a text overlay to assist in the identification of the displayed information. The Map View has a Terrain Elevation text field on the left side of the map. The figures indicate the highest terrain in their respective colors as depicted by the terrain displayed on the map.

The top altitude shown represents the highest elevation in the red terrain. The bottom altitude represents the highest elevation in the green terrain. The bottom indication will be blank if the top indication is green.

The resolution of the elevations is in hundreds of feet, for example, 5,100 feet MSL will be displayed as 051.

The WXR indicator displays a TERR mode annunciation on the right side of the map display. The color of the TERR annunciation indicates the following status of TAWS:

• TERR in red indicates a TAWS warning level alert.
• TERR in yellow indicates a TAWS caution alert level.
• TERR in green indicates normal operation and no active alerts.
• TERR in magenta indicates a TAWS terrain fail condition.

The altitude and mode annunciation boxes can be displayed at different points on the TAWS display to allow an unobstructed view of non-TAWS data on the indicator.
The Required Obstacle Clearance (ROC) is used to determine the color bands on the TAWS display. The Required Terrain Clearance (RTC) is used to determine alerts.

The color band display criteria vary with phase of flight.

Destination airports and runways are chosen by TAWS with respect to the aircraft position unless the FMS contains a flight plan with a destination airport and the aircraft is within 15 NM of this airport.

In this case, the FMS destination is selected. The following table identifies the Flight Phase for specific flight conditions and the associated ROCs and RTCs for alerts and displays.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Aircraft Position/Configuration</th>
<th>Alert RTC (feet)</th>
<th>Display ROC (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>En-route</td>
<td>All other flight positions.</td>
<td>700 - Level Flight</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 - Descent</td>
<td></td>
</tr>
<tr>
<td>Terminal</td>
<td>Less than 15 NM from airport and ≤6500' above airport elevation.</td>
<td>350 - Level Flight</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300 - Descent</td>
<td></td>
</tr>
<tr>
<td>Approach</td>
<td>Flaps in landing position or flap override active or Localizer tuned and localizer deviation &lt; 2 dots and glide slope deviation &lt; 2 dots or Less than 5 NM from airport and ≤3000' above airport elevation.</td>
<td>150 – Level Flight</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 – Descent</td>
<td></td>
</tr>
<tr>
<td>Departure</td>
<td>Aircraft has transitioned from Ground to Flight or TOGA Discrete and Aircraft position ≤20 NM and distance increasing from the departure airport and ≤4000’ above airport elevation.</td>
<td>40 feet per NM from Airport</td>
<td>250</td>
</tr>
</tbody>
</table>
TAWS graphical symbols

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrain Threat Warning</td>
<td>Two-dimensional hollow, seven pointed star. Red with bold black border.</td>
<td></td>
</tr>
<tr>
<td>Terrain Threat Caution</td>
<td>Two-dimensional hollow, seven pointed star. Yellow with bold black border.</td>
<td></td>
</tr>
<tr>
<td>Waypoint IDENT</td>
<td>Text – Same color as associated waypoint. White for down path legs, gray for way points hidden behind terrain.</td>
<td></td>
</tr>
<tr>
<td>Waypoint Post</td>
<td>Pole drawn from Waypoint elevation to terrain elevation. Top 1000 feet is black with remainder white.</td>
<td></td>
</tr>
<tr>
<td>Airplane Symbol</td>
<td>Map View</td>
<td></td>
</tr>
</tbody>
</table>

Terrain threat

A terrain threat is depicted by a Terrain Threat Symbol. The characteristics of the symbol are consistent with the alert level. When the FMS flight plan criteria has been met and the TAWS computer calculates a predicted terrain threat along the flight plan, one of the two threat symbols is displayed. If the alert level is CAUTION, the terrain alert symbol indication will be a yellow star. This yellow star is issued approximately 60 seconds prior to the terrain threat. If the alert level is WARNING, the terrain alert symbol indication will be a red star. This red symbol is issued approximately 30 seconds prior to the terrain threat.

**WARNING:** During high rates of descent or while turning near terrain caution and warnings can occur in significantly less time than the normal 60 and 30 seconds prior to the threat.

Flight plan

When selected the FMS flight plan is overlaid on the navigation display(s). The overlay graphically indicates current aircraft position as well as waypoint locations and idents for the TO leg and beyond legs as selected. The legs follow standard map display concepts.

Connecting waypoints is done with a white line between waypoints. The TO leg is the color magenta and subsequent legs are white. A valid flight plan must have more than 1 waypoint to be displayed on TAWS.

The user can select which waypoint names to display using one of the following options selectable through the FMS CDU:
- TO – display to waypoint only.
- ALL – display all waypoints.
- NONE – display no waypoints.
To reduce clutter on the ND, TAWS inhibits the display of waypoints when it has been determined that a missed approach has occurred. The waypoints will be re-displayed when they become part of the active flight plan when the crew activates a missed approach. If the crew re-links the flight plan or performs a DTO such that the approach legs are again being flown by FMS, TAWS will display them.

**Waypoint idents**

The textual Ident of waypoints appears to the right and below each waypoint.

**NOTE:** During holding patterns, flight-plan data is suppressed.

**Pop-up terrain display**

When the situation warrants, the TAWS display will “Pop-Up” automatically, on both ND’s. The display can be de-selected by pressing the Terrain Select Switch. For TAWS to display in ANY mode, the weather radar must be on and have the intensity set so the display can be observed.

Potential terrain conflicts are depicted by a star shaped Terrain Threat Symbol. Both Warnings and Cautions are alerted with this symbol. A Terrain Warning displays a red star, while a yellow star depicts a Terrain Caution.

**MAP view**

In Map view, the aircraft’s position and altitude are represented by the apex of the aircraft position triangle. This view shows the terrain under the aircraft as seen from above.

This view also displays the FMS flight plan superimposed over the terrain if the aircraft is on or within the display range of the flight plan.

“GAPs” or “NO LINKS” in flight plans are depicted as no connection between waypoints on either side of the GAP. Selected heading legs and curved paths such as holding patterns, procedure turns and DME arcs are not drawn by TAWS and will appear as flight plan GAPs.

In the upper left corner is the FMS source displayed along with distance to the current TO waypoint. The current FMS Navigation leg is displayed in magenta. Subsequent legs are white. Waypoint identifiers are selectable through the FMS CDU.

**Terrain conflict and OFF-Flight plan maneuvering**

In the Map View, the aircraft’s flight path trend will be shown. A dashed magenta line from the aircraft symbol represents the projected path based on current track and velocities.

If the predicted path encounters terrain that does not provide the Required Terrain Clearance, a Terrain Caution (yellow star) or Terrain Warning (red star) threat symbol will be displayed at the closest threat location.
TAWS can detect terrain conflicts with the Flight Plan Intent function. If the conflict is within the displayed range, Waypoint (XXX) and distance information (-X.X nm) is displayed as “FPL CONFLICT (XXX X.X nm)” and may be a negative or positive indication indicating the closest waypoint to the conflict. A positive value indicates the conflict occurs beyond the indicated waypoint and a negative value indicates the conflict occurs before the indicated waypoint. The FROM waypoint in the FMS flight plan cannot be the indicated waypoint in the FPL Conflict message.

**Terrain envelope off-set**

Published Routes and Procedures/ATC Clearances are designed to assure proper terrain clearance. This is not assured for pilot defined routes or procedures. Use care and caution when creating and navigating on pilot defined routes or procedures.

**WARNING:** When the aircraft is not flying a FMS flight plan centerline but is flying parallel within a 10° track angle to the flight plan, an offset of the TAWS terrain alerting envelope can occur. When this condition exists, the forward looking terrain alert (FLTA) envelope is shifted parallel to the present track position of the aircraft by the distance of the cross track error from the flight plan centerline. This introduces the possibility of missed alerts or nuisance alerts.

This condition does not occur during FMS Selected Cross Track (SXTK) operations or when operating off the FMS flight plan beyond normal flight plan path limits of +/-2.8nm en-route, +/-1.0nm terminal or +/- 0.5nm approach phases of flight.

The shift of TAWS protection is limited to FLTA function only and only for the conditions noted. Basic Ground Proximity functions, Mode 1 thru 6 and Premature Descent Alert (PDA) functions operate normally. The TAWS terrain display is unaffected.

Conduct flight plan operations with LNAV coupled whenever possible. This will ensure flight plan centerline path following and correct TAWS FLTA operations.

Enter a FMS SXTK whenever intentionally navigating parallel to the flight plan.

**WARNING:** Use of the FMS VNAV top of descent (TOD) calculation will result in a forward along track offset of the terrain-alerting envelope from PPOS to the TOD waypoint position when TOD is within 80nm of the aircraft position. TOD waypoints beyond 80nm from PPOS will cause a TERRAIN INOP condition and annunciations.

This condition does not occur during FMS Selected Cross Track (SXTK) operations or when operating off a FMS flight plan beyond normal flight plan path limits of +/-2.8nm en-route, +/-1.0nm terminal or +/-0.5nm approach phases of flight.

At altitudes below FL 180, do not enter target vertical speeds on the FMS VNAV page to calculate a Top of Descent. When below FL 180, use only Vertical Direct To.
System alerts

Forward looking terrain alerts

Flight phases of En-route, Terminal, Approach and Departure are determined by the aircraft’s position and inputs from the FMS, landing gear position, flap position and glide slope. TAWS utilizes flight phase to generate values for RTC alerting.

Along track and along arc lateral/vertical envelopes are generated based on the aircraft’s current position, track, turn rate and ground speed. Vertical envelopes are generated in climb, level and descent regions.

Required terrain clearance alerts

Required Terrain Clearance alerts are generated when the aircraft is above terrain ahead on the flight path, but the projected clearance is considered unsafe for the phase of flight. Terrain Caution is generated approximately 60 seconds from the point over the ground where the required terrain clearance is less than the vertical clearance required for the flight phase. At approximately 30 seconds a Terrain Warning will occur.

Since RTC is reduced in terminal, approach and departure, the system favors en-route whenever the information available to the TAWS computer is ambiguous.

Imminent terrain impact alerts

Imminent Terrain Impact Alerts are generated when the aircraft is currently below the elevation of terrain ahead at or above the projected vertical flight path. Terrain Caution is generated approximately 60 seconds prior to predicted terrain conflict. At approximately 30 seconds prior, a Terrain Warning will occur.

High terrain impact alerts

High Terrain Impact Alerts are generated when the terrain ahead along the flight path is higher than 1500 feet above the projected vertical path. The high terrain warning will occur earlier based on the configured climb rate for the aircraft. This adds additional response time for terrain significantly higher than the aircraft.

Flight plan look ahead alerts

TAWS generates static and dynamic terrain envelopes along and down the flight path. Static lateral and vertical envelopes are used for the terrain on the flight plan advisory feature. The terrain on the flight plan advisory feature uses the vertical and horizontal flight plan information to look down the flight plan for terrain threats. For dynamic terrain caution and warning alerts, TAWS uses estimated position error, and current ground speed.

Circle to land and VFR approach operations

When TAWS is operated in the visual portion of circle to land approaches at airports where sharp terrain contours exist in the circling environment, it may be necessary to activate the Terrain Inhibit function to eliminate nuisance alerts from TAWS. This is not a fault with TAWS, but a result of violating the Required Terrain Clearance.
The same situation exist for visual approaches that are conducted using descent paths below a normal 3 degree approach slope.

**Altimeter setting alert**

The aural alert “ALTIMETER SETTING, ALTIMETER SETTING” is issued to provide an informational alert to the crew making them aware of an altimeter problem or failure.

The alert occurs under the following conditions:

- Barometric altitude from the ADC is significantly higher than terrain elevation plus radio altitude.
- Barometric altitude from the ADC is significantly higher than GPS altitude.
- ADC errors or failure.

This annunciation can occur when the difference is as little as 200 feet depending on terrain database resolution and GPS geometry.

**NOTE:** This aural alert is an advisory. Crew should check barometric altimeter for proper setting.

The alert is inhibited when the indicated altitude is greater than 18,000 feet or when the altimeter setting is 1013 mbar.
Premature Descent Alerts (PDA)

TAWS generates alerts when the aircraft violates the Minimum Ground Clearance Boundary (MGCB) protection floor around an airport. The MGCB is generated from the runway end or airport reference point.

The system generates a "TOO LOW TERRAIN" alert when the aircraft is hazardously below the normal approach path angle of three degrees. The chart below describes this alert region.

![Diagram of TOO LOW TERRAIN alert region]

TAWS utilize either a valid radio altitude or a height above the terrain value obtained by comparing the barometric altitude to the terrain elevation from the TAWS system. This permits the Premature Descent Alerts to function and permits the FLTA alerts to be available.

Premature Descent Alerts are available when the aircraft is below the runway elevation. This occurs when the airport is on a mesa or hilltop and the minimum radio altitude for the alert is not obtained due to the runway location.
Basic ground proximity alert functions

MODE 1: Excessive rates of descent

Excessive rates of descent is active for all phases of flight and provides alerts and warnings for excessive rates of descent as determined by the vertical speed.

When the aircraft enters an excessive rate of descent within 2450 feet of the ground, an aural “SINK RATE, SINK RATE” will occur and the TERR annunciator will illuminate. Penetrating the inner warning area of the envelope will result in an aural “PULL UP” and the PULL UP annunciator illuminated. These alerts will continue until a positive rate of climb is achieved.
MODE 2: Excessive closure rate to terrain

Operations to plateau airports

Some airports are located on plateaus or in areas with sharp terrain contours along final approach segments that may cause Mode 2 closure rate alerts due to radio altimeter excursions.

This required GPWS function is not affected by the Terrain Inhibit function.

Excessive closure rate to terrain

Excessive Closure Rate to Terrain is active during all phases of flight. It uses radio altitude, airspeed, flap and gear inputs to produce warnings. Excessive radio altitude closure rate trigger warnings. There are two sub modes to this alert, Mode 2A is active during departure, en-route and terminal operations (flaps not in landing configuration and not on glide slope). If the aircraft penetrates the caution area the “TERRAIN TERRAIN” aural alert is generated and TERR annunciator is illuminated. If the aircraft penetrates the PULL UP envelope from the No Alert area, the “TERRAIN TERRAIN” warning and PULL UP annunciator warning are generated followed by a continuous “PULL UP” and PULL UP annunciator warning until the condition no longer exists.

![Diagram of MODE 2A ENVELOPE]
Mode 2B is active when the flaps are in landing configuration (or FLAP OVRD enabled), or when on an ILS approach with less than a 2 dot localizer and glide slope deviation. When the alert envelope is penetrated and the landing gear is in the down position, “TERRAIN TERRAIN” aural alert is generated, and the TERR caution annunciator is illuminated and repeated until the envelope is exited.

When the alert envelope is penetrated and the landing gear is in the up position, “PULL-UP, PULL-UP” aural warning is generated and the PULL-UP annunciator is illuminated. The aural warning will be repeated and the annunciator will remain illuminated until the envelope is exited.
MODE 3: Negative climb rate or altitude loss after take-off

Negative Climb Rate or Altitude Loss After Take-Off is active for take-off and go-around below 1347 feet AGL when flaps are in other than landing position.

NOTE: Mode 3 and Mode 4 cannot be active at the same time.

TAWS uses radio and barometric altitude loss to provide this warning. The “DON’T SINK” aural alert is generated and the TERR caution annunciator is illuminated if sufficient altitude is lost after take-off or go-around to enter the DON’T SINK envelope. The alert is reset when a positive rate of climb is greater than 500 FPM or if the initial decent altitude is reached with a positive rate of climb less than 500 FPM.

Should it be necessary to land while Mode 3 is active (just after take-off or a go-around and the aircraft has not reached 1347 feet AGL), the Mode 3 aural alert “DON’T SINK” will occur until flaps are selected to landing position. This does not activate Mode 4, but it cancels the aural alert.

There are four ways to set the envelope:
- Transition WOW from ground to air.
- While radio altimeter is less than 1347 feet AGL
- Cycle landing gear from down to up.
- Have a climb rate of greater than 300 fpm when radio altimeter is less than 245 feet AGL.
MODE 4: Flight into terrain when not in landing configuration

Flight Into Terrain When Not in Landing Configuration is active in cruise and descent phases of flight when below 1000 feet AGL and not in landing configuration. Mode 4 is active whenever mode 3 is inactive.

NOTE: Mode 3 and Mode 4 cannot be active at the same time.

An alert occurs when the aircraft is operated too close to the ground with the landing gear retracted or when the TAWS computer determines that the aircraft is in landing configuration with less than landing flaps. These alerts are derived from radio altitude and airspeed and are independent of closure rate. The “TOO LOW TERRAIN”, “TOO LOW GEAR” and “TOO LOW FLAPS” aural alerts are generated and the TERR caution annunciator is illuminated when the appropriate envelopes are penetrated.

Mode 4A envelope is active during cruise and approach when the landing gear is up. Mode 4B is active during cruise and approach when landing gear is in landing mode and flaps are not in landing configuration. If landing with flaps not in landing position, the FLAP OVRD can be enabled to disable the MODE 4B callout.
MODE 5: Excessive downward deviation from an ILS glide slope

Excessive downward deviation from an ILS glide slope is active while below 1000 feet radio altitude and an ILS glide slope is tuned on the navigation receiver. The soft “GLIDE SLOPE” aural alert is generated and the TERR caution or BELOW G/S annunciator (configuration dependent) is illuminated when the flight path deviation exceeds 1.3 dots below glide slope.

If the deviation continues to increase, the loud “GLIDE SLOPE” aural alert is generated, and the TERR caution or BELOW G/S annunciator is illuminated when the aircraft is below 300 feet radio altitude and more than 2 dots below glide slope. These alerts will continue until the aircraft exits the envelope.

Glide slope inhibit

Pressing the Glide Slope inhibit push button below 2000 feet of radio altitude cancels or inhibits mode 5 alerts. If no glide slope alert is active when the Glide Slope inhibit switch is pressed below 2000 feet of radio altitude, the glide slope alert will be inhibited, and the alert will not be re-armed until either of the following conditions exist:

• The airplane altitude exceeds 2100 feet of Radio Altitude or
• Air to Ground transitions from Ground to Air.

Pressing the Glide Slope inhibit push button when Mode 5 alerts are already inhibited re-enables the Mode 5 alert.

Back course approaches

The Glide Slope Inhibit function should be activated when executing localizer back course approaches to prevent nuisance alerts that may be encountered due to false glide slope alerts. This function is automatic in some aircraft installations, in this case the Glide Slope Inhibit annunciator will annunciate.
MODE 6: Altitude callouts

The advisory “FIVE HUNDRED” and “FIFTY” will be generated at that radio altitude above the terrain.

Bank angle callouts

TAWS will monitor the aircraft bank angle and issue a “BANK ANGLE” aural alert when the 35° bank angle limit is reached. If the aircraft continues past the limit and reaches a bank angle equal to 20 percent greater than the configured setting, a second aural alert will be issued. Decreasing the bank angle to 20 percent less than the configured setting will reset the alert.

Minimums & approaching minimums

TAWS receives an input from EFIS control panel and the radio altimeter when the minimum altitude set at the EFIS control panel is reached. This input to TAWS generates the aural annunciation “APPROACHING MINIMUMS” and “MINIMUMS”. This feature only occurs during approach and may only occur once per approach.

Aural and visual alert messages

TAWS alerts are listed in the table below. All TAWS alerts should be considered valid and the crew will react to all aural alerts, associated annunciators and TAWS display pop-ups. Any annunciation or aural alert requires appropriate action. Loss of any one or two aural or visual caution alert indications does not decrease the validity of the alert. The amber TERR and BELOW G/S annunciators indicate cautions and require immediate attention if the condition continues. The red PULL UP annunciator constitutes a TAWS warning and requires immediate aggressive action by the pilot.

Perceived nuisance alerts shall be brought to the attention of maintenance for analysis. Noting location, barometric altitude, aircraft configuration and alert announcements (aural and visual) would prove helpful in the analysis.

If a forward looking terrain alert is previously determined to be erroneous and is repetitive at a specific location, the terrain alerting function can be inhibited by activating the TERRAIN INHIBIT switch.

NOTE: Aural messages associated with alerts are prioritized to avoid the confusion of multiple and simultaneous alerts occurring.
## Aural and visual alert messages

<table>
<thead>
<tr>
<th>AURAL ALERT</th>
<th>ANNUNCIATOR</th>
<th>PILOT ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Pull Up, Pull Up&quot;</td>
<td>PULL UP</td>
<td>Disengage autopilot and immediately level wings. Apply full power, establish a climb attitude and climb out of the alert envelope. Continue maneuver until alert ceases or terrain clearance is assured. <strong>NOTE:</strong> Reconfigure the aircraft as necessary to establish climb. During daytime visual conditions, take immediate action as necessary until alert ceases.</td>
</tr>
<tr>
<td>&quot;Sink Rate, Sink Rate&quot;</td>
<td>TERR</td>
<td>Arrest sink rate and fly out of alert envelope.</td>
</tr>
<tr>
<td>&quot;Terrain, Terrain&quot;</td>
<td>TERR</td>
<td>Apply power, level wings, establish a climb attitude and climb out of the alert envelope.</td>
</tr>
<tr>
<td>Terrain Ahead, Pull Up, Terrain Ahead, Pull Up</td>
<td>PULL UP (30 second Terrain Warning Alert)</td>
<td>Disengage autopilot and immediately level wings. Apply full power, establish a climb attitude and climb out of the alert envelope. Continue maneuver until alert ceases or terrain clearance is assured. <strong>NOTE:</strong> Reconfigure the aircraft as necessary to establish climb. During daytime visual conditions, take immediate action as necessary until alert ceases.</td>
</tr>
<tr>
<td>&quot;Terrain Ahead, Terrain Ahead&quot;</td>
<td>TERR (60 second Terrain Caution Alert)</td>
<td>Caution alert. Followed by &quot;Terrain, Terrain&quot;, &quot;Pull Up, Pull Up&quot; if condition continues. a. If level, apply power, establish a climb attitude and climb out of the alert, check position on TAWS display. b. If descending, apply power and level off. If caution continues, apply power, establish a climb attitude and climb out of the alert, check position on TAWS display.</td>
</tr>
<tr>
<td>&quot;Too Low Terrain, Too Low Terrain&quot;</td>
<td>TERR</td>
<td>Immediately arrest sink rate and fly out of alert envelope.</td>
</tr>
<tr>
<td>&quot;Too Low Gear, Too Low Gear&quot;</td>
<td>TERR</td>
<td>If conditions permit, extend the landing gear; otherwise, execute go-around.</td>
</tr>
<tr>
<td>&quot;Too Low Flaps, Too Low Flaps&quot;</td>
<td>TERR</td>
<td>Select landing full flaps or cancel with the FLAP OVRD switch.</td>
</tr>
</tbody>
</table>
## Aural and visual alert messages (cont’d)

<table>
<thead>
<tr>
<th>AURAL ALERT</th>
<th>ANNUNCIATOR</th>
<th>PILOT ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Glide Slope”</td>
<td>BELOW G/S</td>
<td>Arrest descent rate and rejoin the glide slope.</td>
</tr>
<tr>
<td>(Soft Alert)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Glide Slope”</td>
<td>BELOW G/S</td>
<td>Arrest descent rate and rejoin the glide slope, consider missed approach.</td>
</tr>
<tr>
<td>(Loud Alert)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Don’t Sink”</td>
<td>TERR</td>
<td>Immediately level wings. Apply full power, establish a climb attitude and climb out of the alert envelope.</td>
</tr>
<tr>
<td>“Five Hundred”</td>
<td>None</td>
<td>Advisory callout only.</td>
</tr>
<tr>
<td>“Fifty”</td>
<td>None</td>
<td>Advisory callout only.</td>
</tr>
</tbody>
</table>

## Alert priorities

TAWS warnings are prioritized and interactive with other systems. The table below lists the various TAWS alerts with other possible aural alerts. A higher priority alert takes precedence over a lower alert.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Description</th>
<th>Alert Level</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sink Rate Pull Up Warning</td>
<td>Warning</td>
<td>Continuous</td>
</tr>
<tr>
<td>2</td>
<td>Terrain Pull Up Warning</td>
<td>Warning</td>
<td>Continuous</td>
</tr>
<tr>
<td>3</td>
<td>Terrain Warning</td>
<td>Warning</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Terrain Ahead Pull Up Warning</td>
<td>Warning</td>
<td>Continuous</td>
</tr>
<tr>
<td>5</td>
<td>Terrain Ahead Pull Up Warning</td>
<td>Warning</td>
<td>Continuous</td>
</tr>
<tr>
<td>6</td>
<td>Terrain Caution</td>
<td>Caution</td>
<td>Continuous</td>
</tr>
<tr>
<td>7</td>
<td>Minimums</td>
<td>Informational</td>
<td>7 Seconds</td>
</tr>
<tr>
<td>8</td>
<td>Caution Terrain Ahead</td>
<td>Caution</td>
<td>7 Seconds</td>
</tr>
<tr>
<td>9</td>
<td>Caution Terrain Ahead (ROC Caution)</td>
<td>Caution</td>
<td>7 Seconds</td>
</tr>
<tr>
<td>10</td>
<td>Too Low Terrain</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>PDA (Too Low Terrain)</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Altitude Callout 500 Feet</td>
<td>Informational</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Altitude Callouts – Others</td>
<td>Informational</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Too Low Gear</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Too Low Flaps</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Sink Rate</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Don’t Sink</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Glideslope (Loud)</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Glideslope (Soft)</td>
<td>Caution</td>
<td></td>
</tr>
<tr>
<td>201</td>
<td>Bank Angle</td>
<td>Caution</td>
<td></td>
</tr>
</tbody>
</table>
### System annunciators and switches

<table>
<thead>
<tr>
<th>Annunciator/ Switch</th>
<th>Switch Action</th>
<th>Annunciator Function</th>
<th>Switch Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPWS GS</td>
<td>Amber None</td>
<td>GPWS (amber): GPWS warning modes 1, 2, 3, 4. GS (amber): GPWS warning mode 5</td>
<td>None</td>
</tr>
<tr>
<td>TERR</td>
<td>Amber None</td>
<td>“TERRAIN”: Aural and visual alert to required terrain clearance.</td>
<td>None</td>
</tr>
<tr>
<td>TERR INHIB</td>
<td>Amber Visible white Alternate Action</td>
<td>TERR INOP is illuminated when: • TERRAIN function is inhibited by TERRAIN INHIBIT switch. • Terrain Database is invalid or failed. • Display Inhibited Annunciations are displayed • Flaps reasonableness check fail. • Terrain alert function is inoperative due to hardware failure or lack of required input such as GPS position or altitude.</td>
<td>Provides manual inhibit of TAWS terrain caution function. When TERR INHIB is selected, the message TERRAIN INHIB SELECTED is displayed.</td>
</tr>
</tbody>
</table>
Display inhibit functions

If the TAWS computer determines that a view is unavailable, when selected the navigation displays will be blank, making the loss of display self-annunciating. An appropriate message will also be displayed. Gray areas on the terrain display will also be presented when the terrain database lacks data for that area or region of the world.

<table>
<thead>
<tr>
<th>Displayed Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERRAIN HEADING UNAVAILABLE</td>
<td>No valid heading input.</td>
</tr>
<tr>
<td>TERRAIN TRACK UNAVAILABLE</td>
<td>No valid track angle input.</td>
</tr>
<tr>
<td>TERRAIN POSITION UNAVAILABLE</td>
<td>No valid position input.</td>
</tr>
<tr>
<td>TERRAIN ALTITUDE UNAVAILABLE</td>
<td>No valid altitude input.</td>
</tr>
<tr>
<td>DISABLE RENDER TASK</td>
<td>TAWS discontinues providing a display during a database load through the DTU or a configuration through the RS-232 port or the DTU.</td>
</tr>
<tr>
<td>RENDERING DISABLED NEAR POLES</td>
<td>TAWS discontinues providing a display while navigating above 85 degrees latitude, North or South.</td>
</tr>
<tr>
<td>TERRAIN DATABASE CORRUPTED</td>
<td>The CRC for the terrain database has failed. This includes failures that occur during the terrain database load process.</td>
</tr>
<tr>
<td>TERRAIN INHIBIT SELECTED</td>
<td>The flight crew has selected the TAWS TERR INHIB switch.</td>
</tr>
<tr>
<td>MODE DATA UNAVAILABLE</td>
<td>No valid mode data.</td>
</tr>
<tr>
<td>RANGE DATA UNAVAILABLE</td>
<td>No valid range data.</td>
</tr>
<tr>
<td>INVALID MODE SELECTED</td>
<td>Current mode does not support display of terrain data.</td>
</tr>
<tr>
<td>INVALID RANGE SELECTED</td>
<td>Current range does not support display of terrain data.</td>
</tr>
</tbody>
</table>
Operation

All interface with TAWS is conducted through the FMS, the weather radar control panel, the EFIS control panel and ND.

The FMS can display TAWS pages allowing the operator the ability to change TAWS displays and operation settings.

The TAWS pages provides four pages on which the following can be displayed:
- View perspective.
- Vertical and horizontal range.
- The number of waypoints.
- TAWS displays and Self-Test.
- TAWS software.
- Terrain and airport databases.

Cold temperature correction

TAWS is corrected for cold temperatures.

Barometric altimeter

**CAUTION:**
- TAWS relies on accurate barometric altitude data for proper operation.
- Correction of altimeter settings for the area of operation is required.

Emergency procedures

In the event that the Airplane Flight Manual requires a flap setting not normally required for landing, press the FLAP OVRD push button to simulate flaps in landing position.

When an off airport landing or ditching is required the Forward-Looking Terrain-Avoidance (FLTA) and Premature Descent Alert (PDA) functions should be inhibited by activation of the TERRAIN INHIBIT switch.

The GPWS circuit breaker may be pulled to deactivate the TAWS when an emergency procedure in the emergency checklist specifies landing with the gear up.
### Abnormal procedures

In the event of TAWS system or component failure, the appropriate annunciators will indicate which function or component has failed.

<table>
<thead>
<tr>
<th>Failure condition</th>
<th>Effect on aircraft and crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Radio Altimeter</td>
<td>Loss of basic GPWS modes. No loss of Terrain advisory alerts.</td>
</tr>
<tr>
<td>Loss of air data computer</td>
<td>Loss of basic GPWS modes.</td>
</tr>
<tr>
<td>Loss of No. 1 ILS Receiver</td>
<td>Loss of basic GPWS Mode 5. (Glideslope Alerting)</td>
</tr>
<tr>
<td>Loss of Aural Alerts</td>
<td>Crew will still have visual alerts.</td>
</tr>
<tr>
<td>Loss of visual alerts</td>
<td>Crew will still have aural alerts</td>
</tr>
</tbody>
</table>
| Failure of Terrain Inhibit Switch | a. If failed to the inhibit state, all Terrain Alerts will be inhibited.  
b. If failed to perform function, crew cannot inhibit Terrain Alerts |
| Failure of G/S Inhibit Switch     | a. If failed to the inhibit state, all GPWS mode 5 alerts will be inhibited.  
b. If failed to perform function, crew cannot inhibit GPWS mode 5 alerts. |
| Failure of Flap Override Switch   | a. If failed to perform function, the “Too Low Flaps” caution will be inhibited.  
b. If failed to the “Normal State”, the crew cannot inhibit flap related alerts, if flaps are not in the landing position. |
Build in test

The TAWS system should be tested with the push button located at the LH main instrument panel and the weather radar control panel first flight of the day.

Ensure the Terrain Inhibit Switch is not engaged, and Radar is in Test Mode. TAWS Display on both HSIs: Pops Up with TAWS color test pattern

<table>
<thead>
<tr>
<th>TEST PROCEDURE</th>
<th>EXPECTED RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANNUNCIATOR</td>
<td>AUDIO-SPEAKER &amp; HEADSETS</td>
</tr>
<tr>
<td>GPWS – Both Instrument Panels</td>
<td>“TERRAIN AHEAD, TERRAIN AHEAD”</td>
</tr>
<tr>
<td>GPWS INOP ANNUNCIATOR</td>
<td></td>
</tr>
<tr>
<td>TERRAIN INOP ANNUNCIATOR</td>
<td></td>
</tr>
<tr>
<td>TERRAIN INHIBIT ANNUNCIATOR</td>
<td></td>
</tr>
<tr>
<td>COMPLETION OF SELF-TEST</td>
<td>At the end of the test, verify that GPWS, TERR, BELOW G/S, G/S INHIBIT, and FLAP OVRD annunciators extinguish.</td>
</tr>
<tr>
<td>TERRAIN INOP and GPWS INOP</td>
<td>remain lit for approximately 1 minute as TAWS re-boots</td>
</tr>
</tbody>
</table>

- Red
- Yellow
- Green
- Blue (light)
- Black
- White
- Magenta
Controls and indicators

- TERR INOP (amber):
  - Terrain function is inhibited by the terrain inhibit switch.
  - Terrain database is invalid or failed.
  - Terrain alert function is inoperative due to failure or lack of required input.

- TERR INHIB (white):
  When manual selected, terrain inhibit is active.

- TERRAIN (Amber):
  Aural and visual alert to required terrain clearance

- GPWS (amber):
  GPWS warning modes 1, 2, 3, 4.

- GS (amber):
  GPWS warning mode 5.

- GPS INTEG (amber):
  GPS is outside allowable limits applicable flight phase.

- HDG (white):
  Selected HDG mode in FMS active.

- APR (white):
  An approach has been activated.

- MSG (amber):
  When a system message becomes active.

- WPT (amber):
  Arrival of the way point.

- SXT (white):
  Selected X track is active

- LRN (white):
  FMS is the selected navigation source on respective EFIS

- TERR INOP SWITCH
  Provides manual selection of the TAWS display.

- TERR INHIB SWITCH

- TERR SELECTION

- PLCARD
- **TEST BUTTON**: Depress to test the ground proximity warning system.

- **GLIDE SLOPE WARNING INHIBIT BUTTON**: Depress to cancel/inhibit warning mode 5.

- **FLAP OVERRIDE SWITCH (guarded)**:
  - **Normal**
  - **ON** — Inhibits warning mode 4.
GPWS P/B (guarded and sealed)

- Normal (blank)
- GPWS armed to operate.
- FAULT (amber)
- GPWS failure.
- OFF (white)
- GPWS manually switched off.
Alerts

<table>
<thead>
<tr>
<th>CONDITION(S)/LEVEL</th>
<th>AURAL</th>
<th>MWL/MCL</th>
<th>CAP</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPWS FAILURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ENHANCED GROUND PROXIMITY WARNING SYSTEM (TYPE II)

General

The Honeywell EGPWS is a Terrain Awareness and Warning System (TAWS) providing basic GPWS functions plus additional enhanced terrain alerting and display features. The system operates independent of the Integrated Alerting Unit.

The EGPWS/TAWS system receives inputs from:
- ADC (1)
- Radio Altimeter
- AHRS 1
- TAWS Temperature probe (OAT)
- ILS
- EFIS
- Internal GPS
- Internal terrain-, airport- and obstacle databases.

The system continuously monitors the aircraft flight path / position with regard to terrain. If the projected flight path should lead to inadvertent proximity to terrain, the system generates visual and aural warnings. These warnings persist for as long as the aircraft has a dangerous proximity or closure rate to terrain.

NOTE: Position information for TAWS alerting is calculated from GPS data and is independent of FMS position. Consequently, FMS position errors do not affect TAWS functionality.

The EGPWS/TAWS provides the following warnings and/or alerts:
- **Mode 1**: Excessive descent rate.
- **Mode 2**: Excessive closure to terrain.
- **Mode 3**: Altitude loss after take-off or go-around.
- **Mode 4**: Inadvertent proximity to terrain.
- **Mode 5**: Excessive deviation below the ILS glide slope.
- **Mode 6**: Call-outs during approach for selected DH and a pre-determined Radio Altitude. Excessive Bank Angle alert.

- Terrain Clearance Floor (TCF).
- Runway Field Clearance Floor (RFCF)
- Terrain Ahead Alerting.

NOTE: The TAWS will also provide a warning/alert display of slow descents into unprepared terrain while in the landing configuration.
An audio declutter feature is active in the TAWS. It reduces the repetition of warning messages.

The TAWS modulates the warning and alert envelope to avoid nuisance warnings or alerts at airports with unique terrain conditions. The airport database provides detailed data of all airports with a hard runway surface length greater than 620 m.

**WARNING:** To avoid unwanted alerts, TAWS must be Inhibited by the TAWS INHIB p/b within 15 NM of take-off, approach or landing at an airport which is not included in the airport database. This will deselect all TAWS functions but will not effect the basic GPWS operation.

- **Inhibit modes**
  All aural ground proximity warnings are inhibited when the pre-stall warning is active. A guarded FLAP OVERRIDE p/b at the captain's MAIN INSTRUMENT PANEL is provided to inhibit warnings in mode 4 caused by flap position; for example when a landing has to be performed with less than normal flaps.

  The glide slope warning can be inhibited when the aircraft is deliberately flown below the glide slope during the final approach below 2000 ft RA. The mode automatically rearms when 2000 ft RA is passed during a climb or 30 ft RA in a descent. The GS WARNING INHIB button is located at the captain's MAIN INSTRUMENT PANEL.

- **Steep approach**
  The Sleep Approach capability can be (de)activated manually via the STEEP APPROACH p/b at the captain's MAIN INSTRUMENT PANEL. The P/B will only function in flight, and will be automatically reset in case of a landing or go-around. Activation of this capability adapts GPWS warning mode 1 to allow for higher sink rates during approaches on a steep ILS glideslope (4.0-5.5 degrees).

**Mode description**

The EGPWS comprises the basic GPWS plus TAWS functions.

**BASIC GPWS functions**

The basic GPWS is active between 50 feet and 2450 feet Radio Altitude and comprises six warning modes:

- **Mode 1:** Excessive descent rate.
- **Mode 2:** Excessive closure to terrain.
- **Mode 3:** Altitude loss after take-aft or go-around.
- **Mode 4:** Inadvertent proximity to terrain.
- **Mode 5:** Excessive deviation below the ILS glide slope.
- **Mode 6:** Call-outs during approach for selected DH, a pre-determined Radio Altitude and bank angle.

A detailed table concerning all warnings/alerts is presented at the end of this paragraph.
• **Annunciation**
  For warning modes 1, 2, 3, and 4, the visual warnings, at the captain’s and first officer’s MAIN INSTRUMENT PANEL, are two red (GPWS) lights. Warning mode 5 is enunciated by two amber Glide Slope (GIS) lights. For warning mode 6, no visual warnings are provided. The aural warnings are generated by a dedicated loudspeaker in the flight deck and via the audio system.

• **Excessive Bank Angle alert**
  The callout ‘BANK ANGLE, BANK ANGLE’ warns for penetration of the bank angle envelope. The GPWS generates the bank angle alert. Bank angle alerts are inhibited below 10ft.

**TAWS functions**

• **Terrain Clearance Floor**
  The Terrain Clearance Floor (TCF) function enhances the basic GPWS Modes by alerting the pilot of descending below a defined ‘Terrain Clearance Floor’ regardless of the aircraft configuration. The TCF alert is a function of the aircraft’s Radio Altitude and distance relative to the center of the nearest runway in the database. The TCF envelope is defined for all runways and extends to infinity, or until it encounters the envelope of another runway.

  When penetrating the TCF/RFCF envelope, the GPWS warning lights will illuminate and the aural warning ‘TOO LOW TERRAIN’ will be given. The audio message is provided once when initial envelope penetration occurs and again only for additional 20% decreases in Radio Altitude or Geometric Altitude. The EGPWS alert lights remain illuminated until the TCF/RFCF envelope is exited.

• **Runway Field Clearance Floor**
  The Runway Field Clearance Floor (RFCF) is similar to the TCF feature except that RFCF is based on the current aircraft position and height above the destination runway, using Geometric Altitude (in lieu of Radio Altitude). This provides improved protection at locations where the runway is located significantly higher than the surrounding terrain.

• **Terrain Ahead Alerting**
  This function, provided by the Internal Terrain Database, gives the ability to ‘look’ ahead of the aircraft and defect terrain or obstacle conflicts with greater alerting time. This ability is based on aircraft position, flight path angle, track, and speed relative to the terrain profile (terrain database image) ahead of the aircraft. Through sophisticated look ahead algorithms, both caution and warning alerts are generated if terrain or an obstacle conflict is expected ahead of the aircraft. The caution alert is given typically 40 to 60 seconds ahead of the terrain/obstacle conflict and is repeated every seven seconds as long as the conflict remains within the caution area. The caution alert is given by an aural warning ‘CAUTION TERRAIN, CAUTION TERRAIN’ or ‘CAUTION OBSTACLE, CAUTION OBSTACLE’ and illuminating GPWS warning lights. When the warning area is intruded, typically 30 seconds prior to the terrain/obstacle conflict, GPWS warning lights illuminate and the aural message ‘TERRAIN, TERRAIN, PULL UP’ is annunciated with repeated ‘PULL UPs’ until the warning area is exited.
NOTE: The Obstacle Database provides only limited obstacle information, i.e. data that is declassified by the authorities.

NOTE: The TAWS Terrain Database, Terrain Ahead Alerting and the TAWS display do not account for man made obstacles.

- **Geometric Altitude**
  Based on GPS Altitude, Geometric Altitude is a computed pseudobarometric altitude Above Sea Level (ASL) designed to reduce or eliminate errors potentially induced in Corrected Barometric Altitude by temperature extremes, nonstandard pressure altitude conditions, and altimeter miss-sets. This ensures an optimal terrain display and alerting capability.

- **EGPWS/TAWS Alerts and Anuciations**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Boundary</th>
<th>Aural alert</th>
<th>Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Excessive Descent Rate</td>
<td>High barometric sinkrate</td>
<td>‘SINK RATE, SINK RATE’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>Severe barmetric sinkrate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A. Excessive closure to terrain</td>
<td>Excessive RA descent</td>
<td>‘TERRAIN, TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>or ‘PULL UP’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B. Excessive closure to terrain in landing</td>
<td>RA descent in landing configuration</td>
<td>‘TERRAIN, TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td>configuration</td>
<td>or ‘PULL UP’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Altitude loss after take-off or go-around</td>
<td>Excessive inertial altitude loss</td>
<td>‘DON’T SINK, DON’T SINK’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td>4A. Inadvertent proximity to terrain with landing gear not down</td>
<td>Airspeed &lt; 178 kts and RA below 500 ft</td>
<td>‘TOO LOW GEAR’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>Airspeed &lt; 178 kts and RA below 1000 ft</td>
<td>‘TOO LOW TERRAIN’</td>
<td></td>
</tr>
<tr>
<td>4B. Inadvertent proximity to terrain with flaps not in landing configuration</td>
<td>Airspeed &lt; 148 kts and RA below 200 ft</td>
<td>‘TOO LOW FLAPS’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>Airspeed &lt; 148 kts and RA below 1000 ft</td>
<td>‘TOO LOW TERRAIN’</td>
<td></td>
</tr>
<tr>
<td>4C. Inadvertent proximity to terrain</td>
<td>RA decrease during take-off</td>
<td>‘TOO LOW TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td>5. Excessive deviation from the ILS glide slope (BELOW)</td>
<td>Below 1000 ft RA and deviation in excess of 1.3 dots.</td>
<td>‘GLIDE SLOPE’ Soft alert</td>
<td>GS Warning Light</td>
</tr>
<tr>
<td></td>
<td>Below 150 ft RA deviation threshold increases to 2 dots.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below 300 ft RA and deviation in excess of 2 dots.</td>
<td>‘GLIDE SLOPE’ Hard alert</td>
<td>GS Warning Light</td>
</tr>
<tr>
<td>6. Call-out during approach for selected DH</td>
<td>Descent below DH and RA between 1000ft and 30 ft and gear down.</td>
<td>‘MINIMUMS, MINIMUMS’</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>Boundary</td>
<td>Aural alert</td>
<td>Visual</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Altitude Call-out</td>
<td>At 500 feet RA</td>
<td>‘FIVE HUNDRED’</td>
<td></td>
</tr>
<tr>
<td>Bank angle</td>
<td>Bank angle without AP engaged: 15 – 50 between 10 ft and 210 ft RA ≥ 50 above 210 ft RA, Bank angle with AP engaged: 15 - 33 between 10 ft and 156 ft RA ≥ 33 above 156 ft RA</td>
<td>‘BANK ANGLE, BANK ANGLE’</td>
<td></td>
</tr>
<tr>
<td>Terrain Clearance Floor</td>
<td>Insufficient terrain clearance independent of aircraft configuration</td>
<td>‘TOO LOW TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td>Runway Field Clearance Floor</td>
<td>Insufficient terrain clearance dependent of the aircraft configuration</td>
<td>‘TOO LOW TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td>Terrain Ahead Alerting</td>
<td>40 to 60 seconds from impact in terrain shown on TAWS Display Unit</td>
<td>‘CAUTION TERRAIN, CAUTION TERRAIN’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>30 seconds from impact in terrain shown on TAWS Display Unit</td>
<td>‘TERRAIN, TERRAIN, PULL UP, PULL UP’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>40 to 60 seconds from impact in obstacle shown on TAWS Display Unit</td>
<td>‘CAUTION OBSTACLE, CAUTION OBSTACLE’</td>
<td>GPWS Warning Light</td>
</tr>
<tr>
<td></td>
<td>30 seconds from impact in obstacle shown on TAWS Display Unit</td>
<td>OBSTACLE, OBSTACLE PULL UP, PULL UP’</td>
<td>GPWS Warning Light</td>
</tr>
</tbody>
</table>
Taws display unit

The TAWS Display Unit is installed in the central pedestal. It provides controls for ON/OFF selection, display brightness, display range, and view selection. The TAWS Display Unit initializes in MAP display upon power up and ‘NO EXTERNAL POSITION DATA’ is displayed. Terrain can be selected by pressing the TERR function key. In case of a terrain awareness caution or warning the terrain display will automatically pop-up, and a range of 1ONM is displayed provided the display is selected ON.

The TAWS Display Unit displays terrain and obstacles in the vicinity of the aircraft within the selected range. The display provides a graphical plan-view image of the surrounding terrain as varying density patterns of green, yellow, and red.

Two display modes are available:
- Conventional Display Mode; terrain will be presented relative to aircraft altitude.
- Peaks Display Mode; terrain will be presented relative to MSL.

The conventional mode is displayed whenever there is terrain within 500 ft below (250 ft with gear down) the aircraft. Whenever there is no terrain within 500 ft (250 ft with gear down) the peaks mode is displayed.

Conventional mode display

<table>
<thead>
<tr>
<th>Color</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>Terrain/Obstacle threat area - Warning</td>
</tr>
<tr>
<td>Solid Yellow</td>
<td>Terrain/Obstacle threat area - Caution</td>
</tr>
<tr>
<td>50% Red Fill</td>
<td>Terrain/Obstacle that is more than 2000 ft above aircraft altitude</td>
</tr>
<tr>
<td>50% Yellow Fill</td>
<td>Terrain/Obstacle that is between 1000 and 2000 ft above aircraft altitude</td>
</tr>
<tr>
<td>25% Yellow Fill</td>
<td>Terrain/Obstacle that is 500 ft below to 1000 ft above aircraft altitude</td>
</tr>
<tr>
<td>50% Green Fill</td>
<td>Terrain/Obstacle that is 500 ft below to 1000 ft below aircraft altitude</td>
</tr>
<tr>
<td>16% Green</td>
<td>Terrain/Obstacle that is 1000 to 2000 ft below aircraft altitude</td>
</tr>
<tr>
<td>Black</td>
<td>No significant terrain/obstacle</td>
</tr>
<tr>
<td>16% Cyan Fill</td>
<td>Water at MSL</td>
</tr>
<tr>
<td>Magenta Fill</td>
<td>Unknown terrain. No terrain data in the database for the magenta area shown</td>
</tr>
</tbody>
</table>
Peaks mode display

<table>
<thead>
<tr>
<th>Color</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Green</td>
<td>Highest terrain/obstacle not within 500 ft of aircraft altitude</td>
</tr>
<tr>
<td>50% Green Fill</td>
<td>Terrain/Obstacle that is the middle elevation band</td>
</tr>
<tr>
<td>16% Green</td>
<td>Terrain/Obstacle that is the lower elevation band</td>
</tr>
<tr>
<td>Black</td>
<td>No significant terrain/obstacle</td>
</tr>
<tr>
<td>16% Cyan Fill</td>
<td>Water at MSL</td>
</tr>
<tr>
<td>Magenta Fill</td>
<td>Unknown terrain. No terrain data in the database for the magenta area shown</td>
</tr>
</tbody>
</table>

System test

A system self test may be performed on the ground by pressing the TEST button located at the captain's MAIN INSTRUMENT PANEL.

NOTE: The TAWS Display Unit must be switched ON when performing a self test.

During the self test, the TAWS Display Unit self test pattern is displayed for approximately 10 seconds and the call outs 'PULL UP', 'TEBRAIN, TERRAIN -PULL UP', and if tuned to an active ILS frequency 'GLIDESLOPE' are generated. During the self test the following lights illuminate and/or extinguish:

- The FAULT light in the GPWS p/b at the OVERHEAD PANEL.
- The amber TAWS light in the TAWS p/b at the MAIN INSTRUMENT PANEL.
- The FLAP OVRD light in the FLAP OVERRIDE p/b at the captain's MAIN INSTRUMENT PANEL.
- The STEEP APPR light in the STEEP APPROACH p/b at the captain's MAIN INSTRUMENT PANEL.
- The GPWS/GS lights in the GPWS/GS p/b at the MAIN INSTRUMENT PANEL.

When the GPWS TEST button is depressed on the ground for seven seconds or longer, all the voice warnings are generated.
System failure

Failure of the basic GPWS is detected by the Integrated Alerting Unit and the relevant alert is presented.

NOTE: The GPWS fault light is delayed for 60 seconds by the Integrated Alerting Unit.

Failure of the TAWS Display Unit is indicated by a small @ indicator located between the range buttons on the Display Unit. When illuminated the information displayed should not be used. Failure of the display unit does not affect the EGPWS/TAWS system.

A TAWS p/b is installed at each pilot's MAIN INSTRUMENT PANEL. The amber TAWS light in the TAWS p/b indicates a failure of the TAWS. The INHIBIT light will illuminate to indicate that the system is manually inhibited.

NOTE:
- Switching OFF the GPWS p/b will cancel all aural warnings generated by EGPWS, visual alerts are however still generated.
- Basic GPWS mode 1 thru 6 will remain functional when switching off TAWS.
Controls and indicators

A  TAWS CONTROL PANEL

TAWS P/B
Normal (blank)
- TAWS operating normally.
TAWS (amber)
- TAWS failure.
INHIBIT (white)
- TAWS manually inhibited.

NOTE: Basic GPWS modes remain available with TAWS Inhibited

Inoperative

GROUND PROXIMITY WARNING SYSTEM LIGHTS
GPWS (red)
- Warning: Modes: 1, 2, 3 or 4 = Enhanced functions.
GS (amber)
- Warning mode 5.

B  GPWS CONTROL PANEL

TEST BUTTON
Depress to test the ground proximity warning system.

GLIDE SLOPE WARNING INHIBIT SWITCH
Depress to cancel/inhibit warning mode 5.

FLAP OVERRIDE P/B (guarded)
Normal (blank)
- Normal operation.
ON (blue)
- Inhibits warning mode 4.
Fokker 50 - Flight Navigation Instruments

GPWS P/B (guarded and sealed)
  Normal (blank)
  = GPWS armed to operate.
  FAULT (amber)
  = GPWS failure.
  OFF (white)
  = Basic GPWS and TAWS manually switched OFF.

A. GENERAL SWITCHING PANEL Type 1
BRIGHTNESS CONTROL KNOB
Rotate to adjust brightness of display and switch legends.

DISPLAY

DATA CARD

POWER KNOB
ON
- Display initializes in MAP mode.
OFF
- In flight: TAWS available.

FUNCTION INDICATORS
- Illuminated when corresponding function key is pressed.

JOY STICK
For maintenance purposes only.

FAULT INDICATOR
- Display unit failure.
NORMAL (blank)
- System operates normally.

CONTROL KNOB
Not used.
Not available

FUNCTION KEYS
Press momentarily to display the following display modes:
MAP
- Not available.
NOTE: “NO EXTERNAL POSITION DATA” is displayed
WX
- Not available.
TRFC
- Not available.
TERR
- Displays terrain.
AUX
- For maintenance purposes only.
ALTIMETER ALTITUDE ALERT

General

If the altitude is 1000 feet below or above the selected altitude, an altitude entry alert is presented. If the altitude deviates from the selected altitude by more than 250 feet, an altitude exit alert is presented. The ALT ALERT light at the CAP remains on until the aircraft returns within 250 feet of the selected altitude.

Operation

For the altitude pre-select and alert functions the alert controller obtains barometrically corrected altitude information from the captain or first officer’s altimeter. AP COMMAND buttons at the FMP determine which altimeter will supply the alert controller. The selected altitude can be set at the flight mode panel installed in the glare shield. Selection is possible between zero and 50,000 feet in increments of 100 feet. Before initial selection, a dashed line is shown. Initial selection shows the actual aircraft altitude to proceed from. When the alert controller fails, the display will be blank.

Inhibit phases

In addition to the inhibit phases as controlled by the integrated alerting system, no alert is presented when the selected altitude is being changed, or when the glide slope capture mode is supplied by the coupled flight director.
Controls and indicators

**AP COMMAND BUTTONS**

**L (white)**
- Alert controller obtains altitude information from captain's altimeter.

**R (white)**
- Alert controller obtains altitude information from first officer's altimeter.

**SELECTED ALTITUDE DISPLAY**

**ALTITUDE SELECT KNOB**
Rotate to set the desired altitude in steps of hundred ft.
## Alerts

<table>
<thead>
<tr>
<th>CONDITION(S)/LEVEL</th>
<th>AURAL</th>
<th>MWL/MCL</th>
<th>CAP</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECTED ALTITUDE ENTRY</td>
<td></td>
<td></td>
<td>C-CHORD</td>
<td></td>
</tr>
<tr>
<td>SELECTED ALTITUDE DEVIATION</td>
<td>2</td>
<td></td>
<td>CAUTION</td>
<td>ALT ALERT</td>
</tr>
</tbody>
</table>

- ENTRY ALERT
- EXIT ALERT

+1000 ft
+250 ft
SELECTED ALTITUDE
-250 ft
-1000 ft