Honeywell

KTA870/ KMH880

Pilot's Guide

BENDIX/KING®

Traffic Advisory System/ Multi-Hazard Awareness System

Rev. 3

006-18265-0000

SYSTEM COMPONENTS

TRAFFIC DISPLAYS:

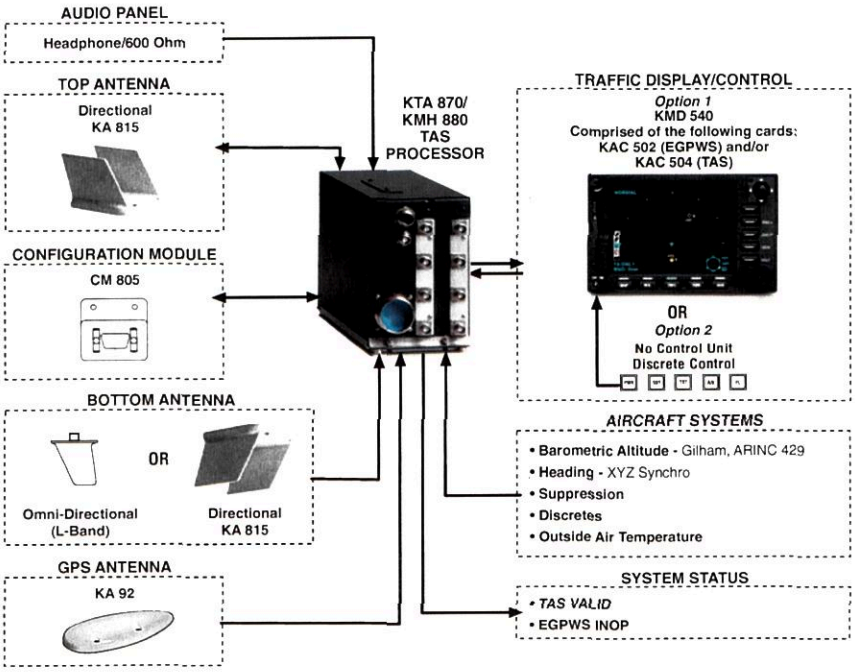
KMD 850
Compatible Radar Indicators via GC 362A
Compatible EFIS
TA/VSI

TAS CONTROLS:

KMD 850
CP 66B TCAS I Controller
Discretes

OPTIONAL EGPWS CONTROLS & DISPLAYS:

KMD 850
Compatible Radar Indicators
Discretes



KTA 870/KMH 880 Block Diagram

INTRODUCTION

The Bendix/King General Aviation Enhanced Ground Proximity Warning System (GA-EGPWS) brings state-of-the-art technology in Terrain Display, Situational Awareness, Terrain Alerting and Warning, and Obstacle Alerting and Warning to the General Aviation pilot. The GA-EGPWS is an affordable, extremely lightweight, compact and rugged computer that is easily installed in single- and multi-engine piston aircraft as well as small turbo-props and other aircraft. The terrain function can be provided entirely by the KMH 880, or can be provided by a combination of a KTA 870 in combination with a KGP 560.

Based on 30 years experience in the development and advancement of Ground Proximity Warning Systems for Air Transport, Regional and Commuter Airlines, Military aircraft and Corporate aviation, Honeywell brings this vital safety technology to all segments of General Aviation. Using our proprietary world-wide terrain database, obstacle database, runway database, state-of-the-art GPS technology, and proven Terrain Display with Alerting and Warning functions, the system provides the General Aviation pilot with superior situational awareness with respect to terrain and known obstacles. In addition, the system contains the most advanced alerting and warning functionality to warn the pilot of danger with respect to terrain, man-made obstacles and other primary scenarios associated with the dangers of Controlled Flight Into Terrain (CFIT).

Use of a terrain display is optional, but recommended in order to enhance full situational awareness. If a terrain display is not installed in the system, all alerts and warnings are still present.

This Pilot's Guide outlines the basic requirements for system operation and recommended procedures for use of the GA-EGPWS by the General Aviation pilot. This Guide does NOT supersede FAA Approved Data or FAA Flight Manual Supplements, or FAA Required Procedures. Each pilot should be thoroughly familiar with his or her aircraft, its systems, and FAA and/or company requirements for that aircraft as equipped with the General Aviation Enhanced Ground Proximity Warning System.

WHAT IS THE GA-ENHANCED GROUND PROXIMITY WARNING SYSTEM?

The Bendix/King GA-EGPWS is a small lightweight computer that can be installed in most single- and multi-engine piston aircraft, small turboprop aircraft and other aircraft in which a Terrain Avoidance & Warning System is applicable.

The system uses information from an existing GPS (already in the aircraft) or internal GPS receiver contained in the GA-EGPWS computer. The only other required input is uncorrected barometric pressure from the aircraft's transponder or altitude reporting/encoding device. An additional input of Outside Air Temperature (OAT) is optional and recommended. See section on Aircraft Altitude.

The system can also accept inputs from various digital air data computers, when such equipment is available on an aircraft. The terrain database, obstacle database, runway database and alerting / warning functionality are contained in the GA-EGPWS computer, and require no pilot *action for system operation.*

Outputs generated by the system are:

* Terrain / Obstacle Display
* Voice alerts / Warnings / Callouts
* Visual alerts / Warnings

During normal flight operations, the system remains essentially silent, using GPS, altitude and temperature (optional) data in combination with its various database information to provide the pilot with a display of the aircraft position relative to surrounding terrain and known obstacles, thereby providing unprecedented situational awareness for the pilot. Pilot workload in interacting with the system during normal flight is minimal.

Should the aircraft fly into danger where a conflict with terrain or a known obstacle is imminent, the system will provide both visual and aural alerts and warnings to the pilot. The system also provides alerts and warnings for excessive rates of descent and inadvertent descents or altitude loss after take-off.

The system provides an aural altitude callout when 500 feet above runway elevation during a landing approach, and also monitors altimeter systems in the aircraft to provide alerts for possible altimeter malfunctions or errors.

Pilot reactions to alerts and warnings differ according to weather conditions, visibility, type of warning, phase of flight and aircraft performance considerations. Pilots should be thoroughly familiar with FAA, company, or other approved operational procedures as required by their aircraft and type of operation. Pilots should train to react properly to GA-EGPWS alerts and warnings just as one would train to react to an aircraft stall, engine failure or any other emergency situation.

REGULATORY STANDARDS

The GA-EGPWS satisfies the requirements for Terrain Avoidance & Warning Systems (TAWS) as defined by FAA TSO C151b, Class B and C, when installed in aircraft in accordance with approved procedures. (See System Installation Manual).

GA-EGPWS FUNCTIONS AND FEATURES

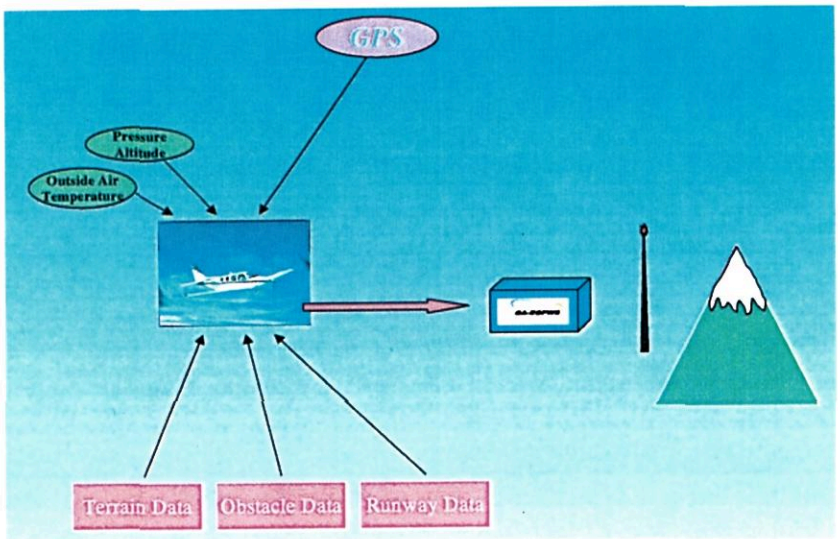
AIRCRAFT POSITION

The GA-EGPWS uses Global Positioning System (GPS) information from either an aircraft-installed GPS receiver, or an internal GPS receiver contained in the GA-EGPWS computer itself. It is good for the pilot to be aware of the actual position source being used by the system, as the internal GPS is not used for navigation of the aircraft.

GPS signals arrive at an antenna on the aircraft and are then processed by the GA-EGPWS computer to provide both horizontal (lateral) and vertical position (altitude) information. This position in space is then compared to the terrain, obstacle and runway database information contained in the GA-EGPWS computer to produce a "virtual" picture which can then be displayed to provide Situational Awareness for the pilot.

Other GPS information such as true track, groundspeed, vertical velocity, N/S and E/W velocity, and signal accuracy measurements are also processed by the GA-EGPWS computer to provide a complete picture of not only the aircraft position in three dimensions, but also an excellent picture of the aircraft's flight path.

This total package of information is then used to provide the Terrain Display for the pilot, and to provide alerting and warning functionality to protect the pilot and passengers from possible conflicts with terrain, known obstacles, and other scenarios associated with the dangers of Controlled Flight Into Terrain (CFIT).



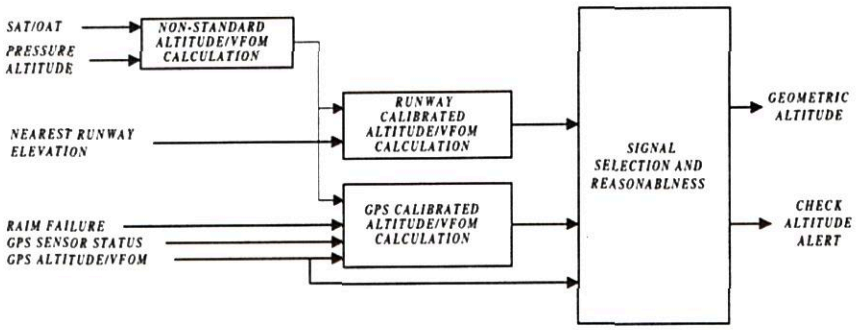
AIRCRAFT ALTITUDE

In addition to the altitude information provided by the GPS, the GA-EGPWS uses uncorrected barometric pressure altitude information from the aircraft's encoding altimeter, blind altitude encoder or transponder. This altitude information allows the system to do two main tasks.

First, by using a special "derived-altitude" developed by Honeywell called "Geometric Altitude", the GPS and uncorrected pressure altitude information is blended together by the system to provide accurate altitude information, which is using the same Mean Sea Level (MSL) reference as the terrain, obstacle and runway databases in the system. The blending functionality of "Geometric Altitude" means it is much less susceptible to errors or malfunctions in the use of normal altimeter systems. (The pilot is NOT required to enter an altimeter setting specifically for the GA-EGPWS system).

Where aircraft are routinely operated in extreme weather conditions (either hot or cold), Honeywell strongly recommends the optional temperature input be used with the GA-EGPWS. This additional factor in the blending formula of "Geometric Altitude" provides an even more accurate vertical position to the system, and prevents serious discrepancies between actual altitude and "Geometric Altitude" under extreme temperature conditions, especially during rapid climbing or descending flight profiles.

The second benefit of using "Geometric Altitude" in the system is that the pilot will now have an independent monitor of altitude. The system can detect an abnormal difference between "Geometric Altitude" and the uncorrected pressure altitude. Optionally, the system can provide a voice callout and display a message to the pilot should such an abnormal difference occur.



Geometric Altitude

On some terrain displays, an indication of MSL or GSL altitude will appear. This altitude is the reference altitude for the display and the terrain awareness algorithm. This reference altitude is based on internally calculated Geometric Altitude and NOT corrected barometric altitude that must be used when navigating within the National Airspace System. Geometric Altitude is the height above mean sea level (MSL) derived from the GPS receiver, filtered by the vertical figure of merits from the same GPS and complemented by short term variations in barometric altitude. It represents the aircraft's calculated true height above MSL and serves as the reference altitude for color-coding of the terrain display and the altitude input to the look-ahead algorithm. On some displays the Geometric Altitude number may be labeled 'MSL', 'GSL' (Geodetic Sea Level) or have no label. Exact location and display definition of this altitude is detailed in the Operating Guide and/or Flight Manual Supplements of the display system.

Because Geometric Altitude is primarily comprised of GPS altitude, this reference altitude will often differ from cockpit displayed corrected barometric altitude. **The geometric altitude is not to be used for navigation.** It is presented to provide the crew with additional situational awareness of true height above sea level upon which terrain alerting and display is based. GPS altitude is an altitude above mean-sea-level and it is the geodetic height above the WGS-84 ellipsoid corrected by the geoid height in the GPS receiver itself. With Selective Availability turned off as currently, the accuracy is usually better than 75 feet and with Selective Availability turned on, short term accuracy is in the order of 400 feet, but the geometric altitude should be within 100 feet.

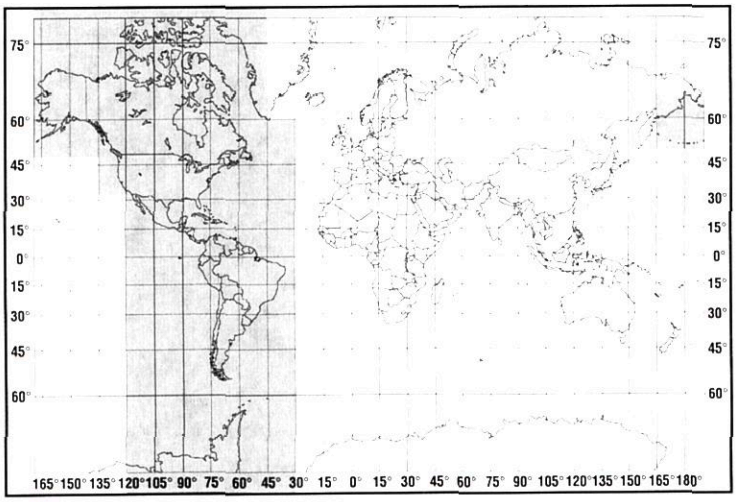
TERRAIN, OBSTACLES & RUNWAY DATABASE

The GA-EGPWS contains a removable database card, which is inserted into the unit through a slot in the top surface of the computer. This card contains all the terrain data, known obstacles data (where available), and runway data used by the system. This card must be installed in the computer for proper operation. Instructions for update procedures and installation of the database card are discussed later in this guide.

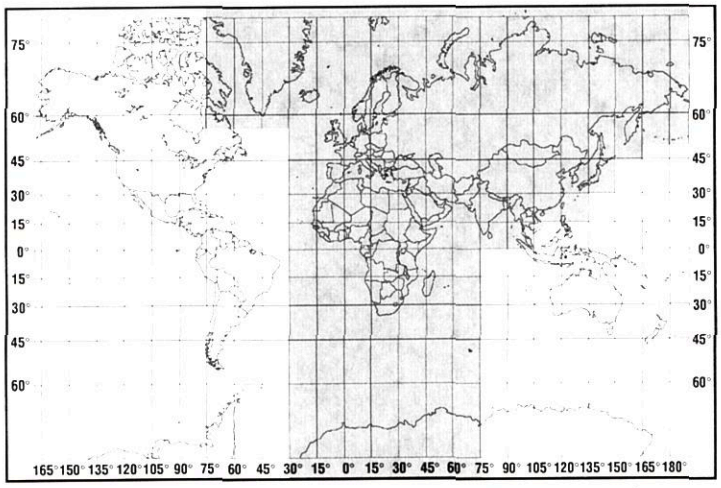
Terrain data is supplied from the same proprietary database used by other Honeywell EGPWS products, and is divided into three regions worldwide. (See pictures following). The terrain data is divided into grid patterns of various sizes, from areas about 1/4 nm square resolution to areas of about 5 nm square. This allows a large area of data to be stored in the unit, and allows high-resolution data near airports, with lower resolution data where terrain is not a factor and airports are sparse.

Data for known obstacles such as towers, buildings, antennas, etc. is contained on the same data card as the terrain and airport data. Presently, there are some 70,000-plus obstacles in the database, but they are all in the area of North America. As more reliable information becomes available, Honeywell will expand the capability to provide alerting and warning for obstacles in other areas of the world.

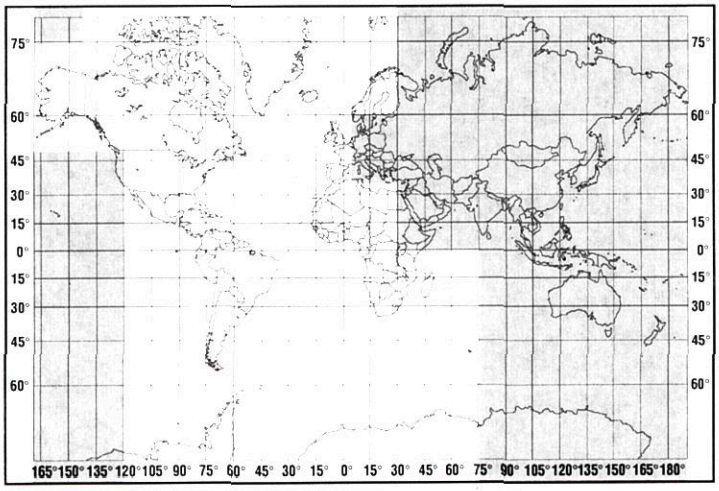
Obstacles in the database are those known obstacles more than 100 feet AGL, so obstacles of lower height will not produce GA-EGPWS "Obstacle" alerts or warnings. However, terrain elevations are "rounded" up to the next 100 feet, so alerting and warning protection is generally available for known obstacles that are less than 100 feet AGL.



Regional Database: Americas (shaded areas)



Regional Database: Atlantic (shaded areas)



Regional Database: Pacific (shaded areas)

Runway database information in the GA-EGPWS computer contains all known public runways that are 2000 feet in length or longer. This runway data is used to adjust the alerting and warning functions of the system so as to provide a dynamic system that is essentially free of nuisance or unwanted warnings. A list of runways in the database can be accessed at the Internet website: http:\\ www.egpws.com. A list of the most recent database versions available for the GA-EGPWS can also be found there.

TERRAIN INHIBIT SWITCH

The GA-EGPWS requires the installation of a "Terrain Inhibit" switch as part of the system installation. When engaged by the pilot, this switch will inhibit all visual and aural alerts and warnings associated with the GA-EGPWS. Also, an external annunciator lamp is illuminated and a message will be displayed indicating "Warnings Inhibited". The terrain display, if installed, remains operational.

The purpose of the "Terrain Inhibit" switch is to allow aircraft to operate without nuisance or unwanted warnings at airports that are not in the system database. Examples might be private airports or those with runways shorter than 2000 feet. Additionally, there may be some "VFR-only" airports where unique terrain features are in close proximity to the runway, and the "Terrain Inhibit" may be used when operating in good VFR conditions. The "Terrain Inhibit" switch should be NOT engaged for normal operations.

NORMAL PROCEDURES

GA-EGPWS SYSTEM SELF-TEST

Prior to flight, the system should be tested for proper operation. Normally, this is done by the pilot during the BEFORE TAKE-OFF check. All aircraft power and systems should be up and running, and the GA-EGPWS "Not Available" annunciator lamp should be off.

NOTE: Because the system requires GPS information to operate, it may be several minutes after power-up before the aircraft GPS system supplies accurate information to the GA-EGPWS. If the internal GPS card is used to supply position information, it may take additional time for satellite acquisition depending upon the frequency of use of the system. The internal GPS card requires a current almanac to locate GPS satellite positions. This almanac can take several minutes to load. When an accurate GPS position is acquired and the rest of the GA-EGPWS system is available, the "NOT AVAILABLE" lamp will extinguish.

To perform a normal GA-EGPWS Self-Test:

- Press the Self-Test switch. When a Self-Test is initiated, the GA-EGPWS first checks for any configuration (installation or database) errors. If any are detected, it is audibly enunciated and the test is terminated. If none are detected, the test continues through a sequence resulting in turning on and off all system annunciators, enunciating specific audio messages, and if enabled, displaying a video test pattern on the terrain display. Any functions determined inoperative are also enunciated. The Self-Test terminates automatically at its conclusion.

  The following is a description of the expected results of a typical level 1 Self-Test. Actual annunciation nomenclature and sequence may differ depending on the installation.

- Observe that the amber "Not Available" and red "Warning" annunciator lamps associated with the system illuminate.
- Observe that the voice callout "EGPWS SYSTEM, OK" is heard.
- Observe that the red "Warning" annunciator lamp extinguishes, and the amber "Caution" annunciator lamp illuminates.
- Observe that the GA-EGPWS Terrain Display shows the Test Pattern.
- Observe that the Terrain Display Test Pattern is removed.
- Observe that the amber "Caution" and amber "Not Available" annunciator lamps associated with the system extinguish.

Pressing the Self-Test switch as the Level One Self-Test is completed will initiate Level Two of the internal test capability. Level Two provides information about any faults the system may be detecting. Normally, this will not be necessary. If a normal Self-Test is unsuccessful, a Level Two test is automatically initiated by the system.

Further Self-Test levels may be accessed after Level Two by following instructions to "Press to Continue" at the end of Level Two and so on. These further levels provide information about the installation configuration, part number, and software / database versions, etc. All levels of Self-Test may be performed on the ground, but only Self-Test Level One and Two are accessible during flight. If the "Not Available" annunciator lamp illuminates during flight, a Self-Test will indicate the reason.

GA-EGPWS Status Message	*GA-EGPWS Condition*
"EGPWS System OK"	EGPWS is operational and ready for flight.
"Terrain Inhibited"	Terrain Inhibit switch is engaged.
"EGPWS Computer Fault"	A fault in the EGPWS computer is detected. Level 2 Self-Test will follow automatically.
"EGPWS Not Available"	EGPWS is not operational for some reason. Level 2 Self-Test will follow automatically.

GA-EGPWS Self-Test: Level 1 Messages

GA-EGPWS Status Message	*GA-EGPWS Condition*
"Internal Faults. Internal GPS Failed"	The EGPWS internal GPS has failed.
"Internal Faults. Terrain Database Failed"	The EGPWS Terrain Database is not present, corrupted, or cannot be accessed.
"No Faults. EGPWS Computer OK. Internal GPS Not Navigating."	GPS inputs to the EGPWS are present, but are not yet satisfactory for normal operation.
"No Faults. EGPWS Computer OK. GPS Inputs Not Valid"	External GPS inputs to the EGPWS are not present, or are not valid for use.
"No Faults. EGPWS Computer OK. Outside Regional Terrain Database."	GPS position shows aircraft outside the area covered by the database installed in the EGPWS.
"EGPWS Computer OK. External Faults. Encoder Altitude Fault."	Pressure altitude source is not present, not valid for use or a wiring fault exists.
"EGPWS Computer OK. External Faults. GPS Bus Inactive."	There is no External GPS information available or a wiring fault exists.
"EGPWS Computer OK. External Faults. Display Configuration Fault. Internal GPS Not Navigating.	EGPWS Display is either not ON, is inoperative, or is not properly configured.
"EGPWS Computer OK. External Faults. Configuration Module Read Error."	EGPWS Configuration Module has a hardware fault. (i.e. wiring or connector problem)
"EGPWS Computer OK. External Faults. Air Data Bus Inactive."	External Air Data source inoperative or a wiring fault exists.
"EGPWS Computer OK. External Faults. Display Bus Inactive."	EGPWS Display is not ON, or a wiring fault exists.
"EGPWS Computer OK. External Faults. Static Air Temperature Wiring Fault."	Outside Air Temperature source wiring fault.
"Press to Continue"	Press the Self-Test switch to proceed to the next Self-Test Level.

GA-EGPWS Self-Test: Level 2 Messages

NOTE: This Level 2 list contains the most commonly heard messages. Other messages may be given, depending upon installation / equipment types. Messages may be heard in various combinations.