MGL Avionics

Odyssey/Voyager G2
and iEFIS

Navigation

This document applies to G2 version 1.1.0.1 or later, iEFIS 1.0.0.3 or later.

Note:
This document is based on the G2. The iEFIS system provides identical functionality, augmented by the touch screen.

Table of Contents

Introduction

The G2 EFIS and iEFIS systems provide a comprehensive navigation system. This documents describes the following related topics:

Navigation sources

This section describes the various internal and external navigation sources that can be used as horizontal (lateral) and vertical navigation sources.

Navigation databases

Navigation databases contain information on waypoints, navigation aids, airports and many other items. This section describes the databases available and how to use them.

Navigation setup

The EFIS allows you to customize the way you would like the navigation system to work to a very large degree. Customization may be done based on available navigation sources or on personal preferences.

Using the navigation system

This section describes how to use the various navigation modes and features.

Navigation sources

The EFIS provides the following available navigation sources. Some of these are based on internal sources, some require external sources.

The internal GPS

The internal GPS receiver is uses as source for several navigation sources. These are:

Direct to GPS navigation

This is the simplest form of GPS navigation. It directs you to a chosen geographic point, referred to as a "waypoint". There are many different types of waypoints.

Route (Flight Plan) navigation

This is somewhat related to the "direct to" GPS navigation but you follow a string of waypoints that are contained in a route file. Such routes can be followed in forward or reverse direction and you can select the next active waypoint in the route.
Routes can be created in applications such as "MGL Central", several third party flight planning tools such as "PocketFMS" or "Easyplan" and you can also create routes directly on the EFIS itself using the "Interactive flight plan tool" (Please view manual "G1 and G2 Interactive map and flight plan tool" for details on this).

GVOR navigation

Normal VOR stations are radio beacons that allow an aircraft to determine on which radial relative to the beacon it is currently (effectively an approach or departure bearing). Some VOR stations also have DME facilities and this can be used by suitable on-board equipment to measure the distance to that station.

GVOR is a GPS based simulation of a VOR/DME station. This is based on known locations and magnetic variations of VOR stations included in the navigation database(s).

The EFIS simulates all indicators such as the HSI (horizontal situation indicator) as if you would have tuned your navigation receiver to that station.

GLS Navigation

This is a GPS based implementation of a simulated ILS and glideslope system. It can be used to guide an aircraft to the threshold of a runway at the correct approach angle.

This system is based on known runway threshold locations including elevation contained in the database(s). Visual highway in the sky (HITS) guidance can be provided in addition to traditional HSI and glideslope indicators. Unlike a normal ILS system, it is not required to select an OBS bearing as the system knows what that bearing should be,

The external GPS

The system can be configured to use an external GPS feed either via NMEA on RS232 port 2 or it can use GPS guidance from either one of the three available ARINC 429 receive ports.

Please note that typically, the internal GPS is a better performer to external GPS systems due to faster update rates and higher resolution. You may be forced to use an external, certified GPS for legal IFR procedures. We recommend that you use the internal GPS whenever possible.

All navigation sources available for the internal GPS are available for the external GPS.

Analog NAV inputs

The EFIS system provides several analog inputs. These are typically coupled to older navigation systems that provide a standard +/-150 mV signal.
The EFIS uses two of these, one as horizontal and the other for vertical guidance (plus validity flags).
These signals can be switched to the HSI and GSI for navigation. These signals are not dedicated to any form of navigation type but depend on the external equipment that is supplying these signals.

Typical sources are VOR/ILS radios and GPS systems.

ARINC inputs

The EFIS provides three ARINC 429 receiver inputs, one high speed and two low speed. Each of these inputs can react to VOR, ILS and GPS navigation with or without vertical guidance.

Each of these inputs can be switched as source to the HSI and GSI for navigation.

A special mode is also provided where two inputs are combined into a GPS/VOR/ILS system using some non-standard methods employed by the Garmin 430W range of NAV/COM systems.
Please view manual "Stratomaster EFIS to Garmin 400/500W series ARINC Integration and Operation" for details.

RS232 based navigation radios

The EFIS system makes provision for navigation radios that use a serial RS232 communications line. This can be connected to RS232 port 1 or to any of the ports on a MGL COM extender module.

Currently the only such navigation radio supported is the Garmin SL30 NAV/COM radio. This device provides VOR and ILS/Glideslope information.

Navigation databases

Navigation databases and their installation are described in the manual "MGL EFIS Files" in detail.

This is an overview:

The EFIS has up to three navigation databases active at any one time. It is possible to install many more databases, each assigned a "region" code. While this is intended to allow installation of databases that each cover a different geographical region, this is not dictated in any fixed way – any database for any region code can contain any data. It is thus also possible to use different databases for the same region.

The active databases are organized into:

Primary database

This is a navidata file (Navidata.ewd), created by the MGL Central application or from a third party source. This database can be subscription product.

The database is identified by region by the last letter of the file name, example:

Navidata.ewd, Navidatb.ewd, Navidatc.ewd up to Navidatz.ewd.

The primary database can contain items such as:

1) All types of waypoints including navaids
2) Airport information (frequencies, runways etc)
3) Airspaces
4) Obstacle database
5) Airways
6) Approaches
7) Standard arrivals
8) Standard departures

Secondary database

This is a navidata file (SNavia.ewd), created by the MGL Central application or from a third party source. This database cannot be an encypted subscription product and must be in open format (such as produced by MGL Central).

The main purpose of this database is to allow you to use a subscription product but still allow you simultaneous use of your own database that you can maintain yourself if so desired.

The database is identified by region by the last letter of the file name, example:

SNavia.ewd, SNavib.ewd, SNavic.ewd up to SNaviz.ewd.

The secondary database can contain items such as:

1) All types of waypoints including navaids
2) Airport information (frequencies, runways etc)

Other items may be included in this database but at time of writing are not utilized in the system.

Supplementary waypoint database

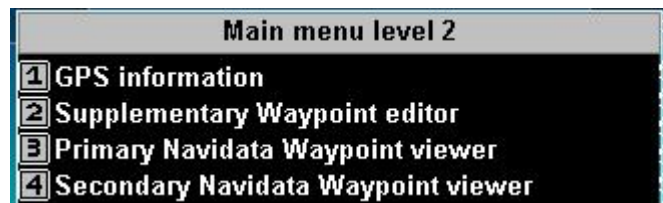This database is created automatically in your system if it does not exist.

The filename is "Waypoint.ewd". This is a list of waypoints you can create and edit directly on the EFIS.

The primary and secondary databases are not editable so this database allows you to create new waypoints whenever you need them.

Viewing or editing the databases

The three databases have viewers and the supplementary database has a viewer/editor.

These are accessed from Menu level 2

The primary and secondary databases can only be viewed, they cannot be changed on the system:

Basic information is shown in the viewer, distance to the waypoint from current location (or last known GPS location) as well as the relative direction of the waypoint from where the aircraft is pointing. In the above viewer, Cape Town International is to the left of us while Ysterplaat is behind us.

Pressing any of the buttons 1 to 0 brings up more information on the selected waypoint:

Waypoint editor

Editing the supplementary waypoint database

You can create new waypoints, edit (change) existing waypoints or delete waypoints.

New waypoints can be created from scratch or picked from an existing route.
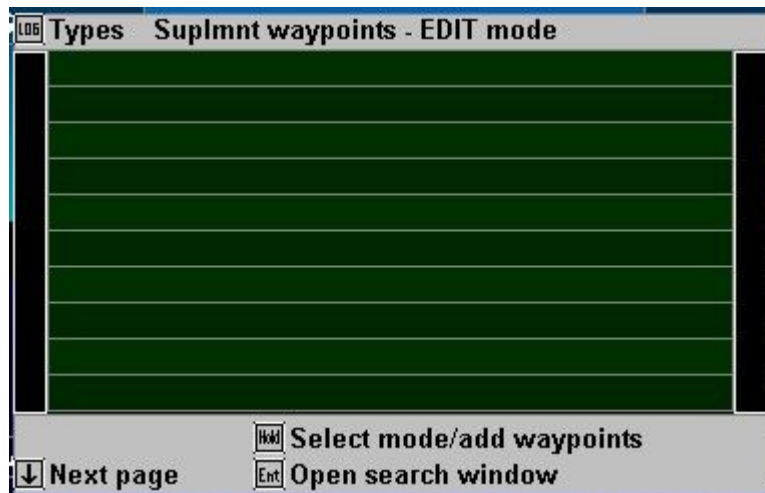
The above image shows an empty waypoint database. Note that it is also possible for the above image to show if the "Types" selected exclude any of the waypoint types you have in your database. Press "LOG" to get the "Types" selection:

 The above selection will allow any airport type and normal "untyped" waypoints to show but all other types will be suppressed from the viewer.

Creating a new waypoint

To create a new waypoint, Press "HOLD" (Select mode, add waypoints).
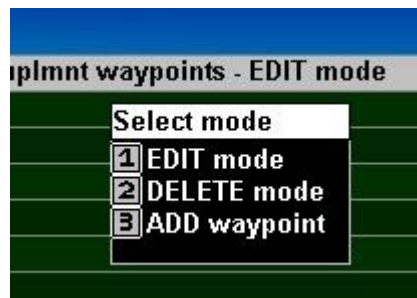
Press [3] to ADD a waypoint.
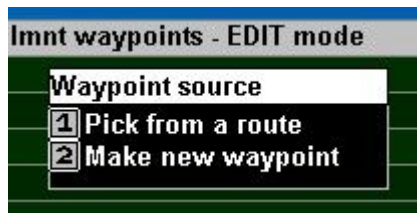
You can pick a waypoint from any route (Flight Plan) in the system or you can make a new waypoint.

Please note that there is a special route file in the system called "MARKERS.ERT" this file is created when you use the [ENTER] key from any normal screen to create an "ad hock" waypoint at your current location.

Let's create a new waypoint. Press [2].

A new waypoint is created at your current location (or last known GPS location).

You can edit all the parameters of the new waypoint and if you are happy, press [ENTER] or [MENU] to cancel.

Tip: Use the up/down arrow keys to change the latitude and longitude hemisphere.

The new waypoint has been created and is ready for use.

Picking a new waypoint from a route

If you are picking a new waypoint from a route, the EFIS will request that you select the route file name (The route file must be stored on your internal RAM drive).
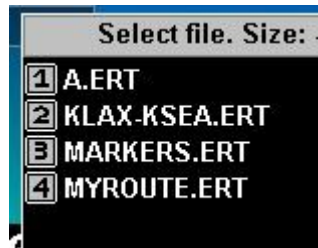
Here we selected the route "A.ERT".

Here we selected [3], Cape Town International.

At this point we can edit the details if required for our new waypoint. Perhaps we want to change the position slightly or change the name. Press [ENTER] when you are done.

We are done, the waypoint has been added to the supplementary waypoint database and is ready to use.

Edit and delete modes

Using the [HOLD] button you can change the editor mode between "EDIT" and "DELETE". If in EDIT mode, selecting a waypoint will show the waypoint editor for this waypoint. If in "DELETE" mode, selecting a waypoint will delete it from the supplementary waypoint database.

Copy the supplementary database to and from the EFIS

You can copy the supplementary database to and from the EFIS using the SD card and the file manager. The location of the supplementary database is the "Navdata" folder and you can use the file manager of the EFIS to perform the copy in both directions (log onto the source drive to copy onto another drive). The filename is "Waypoints.ewd". You can edit this file in the MGL Central application.

Tip: The file Waypoint.ewd is in the same format as any route file in *.ERT format. This means that you can easily rename an existing route file to become a new supplementary waypoint file or you could turn an existing route file into a supplementary database. The renaming would need to be performed on an external computer, there is no file renaming facility on the EFIS.

Navigation setup

Navigation setup is accessible via the System setup menu. Here you find setups that are usually done once for your system.
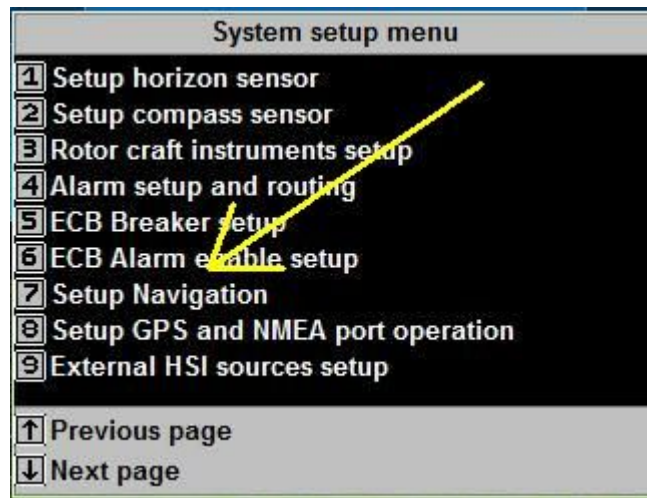
Functions in the navigation menu are:
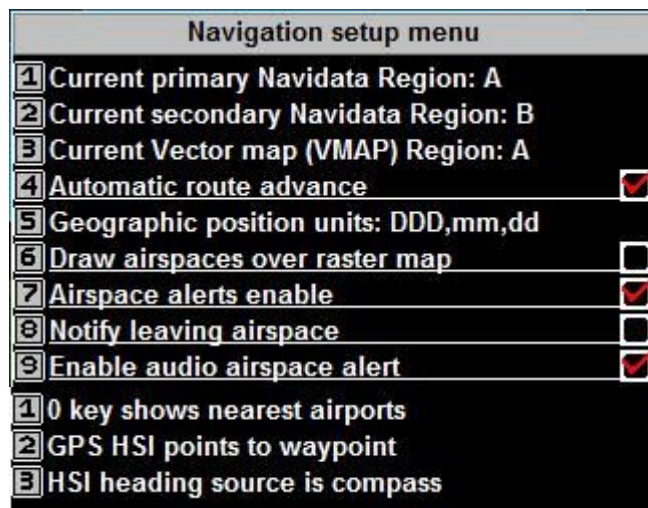
Current primary/secondary Navidata region / Current Vector map region

Please refer to the document "MGL EFIS Files" for a detailed description of the region system. Basically, the region system allows you to install up to 26 files identified by region codes A to Z. Region codes can be used for Navidata files as well as vector map files.

Note: This setup is a duplication. You can change the region codes as part of the navigation functions and map functions.

Automatic route advance

If you have a route active, this setting specifies if the EFIS should advance to the next waypoint in the route automatically if a waypoint has been reached.

Note that you can advance the active route waypoint in any direction using the left and right arrow keys on the G2. With iEFIS use the appropriate route+ and route- touch screen buttons. On either system you can also perform the same operations using the route menu.

It is recommended to enable the automatic route advance.

"0" key function select (G2 function only)

This function selects how you would like the "0" key to work.

If a route is active, pressing the "0" key brings up the "Live flightplan".

If a route is not active, you can select the functionality of the zero key as follows:

The most likely use is to select it as "nearest airports". If this is selected, pressing the "0" key brings up the nearest airports to your current location.

If the function is selected to show airport info (active goto) then the zero key will select information on that airport (frequencies, runways and also GLS activation). If no goto is active or the active waypoint is not an airport then the nearest airport list is shown.

Note: You can select "nearest airports" from the airport information screen if the active waypoint is an airport so you do not loose this function.

GPS HSI...

This setting selects which way the HSI needle points if you are using GPS OBS. GPS OBS allows you to change the approach angle to an active waypoint.

Recommendation: Select "GPS HSI points to waypoint". This way the HSI arrow will show you the direction to turn and by how much in order to reach the waypoint.

GPS HSI points to waypoint

This setting will cause the CDI to show deviation from the current selected OBS track and the HSI arrow will point towards the waypoint. This is the recommended setting.

GPS HSI is locked to GPS OBS

In this mode the CDI will show deviation from the current selected OBS track and the HSI arrow will point parallel to the selected GPS OBS track.
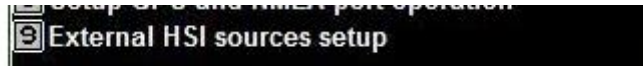
Other navigation setup items

Other navigation setup menu items are self explanatory and not listed here.
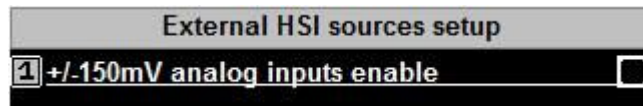
HSI Heading source

You may select the HSI heading source to be either the magnetic compass or the GPS ground track (if available). Recommendation: Select the GPS track.

External HSI Sources setup

This setup menu currently contains a single item:

The EFIS systems provide analog navigation inputs intended for use with analog (needle based) instruments.

Four inputs are provided and they are used as:

Input 1   Lateral CDI

Input 2   Lateral CDI validity flag

Input 3   Vertical GSI

Input 4   Vertical GSI validity flag

If these inputs are not used it cannot be determined with certainty if they are not be be used by the system. For this reason you can disable them.

Please do not enable the analog inputs if you are not using them.

Note: Analog inputs must be "zero'd" before they can be used (System initialization menu). Ensure connections to the balanced inputs are correct polarity to ensure correct left/right and up/down indication.

Navigation source groups

Navigation sources are grouped into priority lists. Only one navigation source per group is considered based on priority:

GPS Lateral	VOR Lateral	ILS	Vectors
ARINC CDI	ARINC CDI/Radial	ARINC CDI/GS	
	RS232 CDI/Radial	RS232 CDI/GS	
Internal GPS	Internal GVOR	Internal GLS	Heading bug
	Analog CDI	Analog CDI/GS	

ARINC has the highest priority and will override lower priority navigation sources.

ARINC sources are devices such as the Garmin 400/500 series and compatible instruments.

RS232 sources currently refer only to the SL30 NAV receiver and compatible devices.

"Internal" refers to sources internal to the EFIS system.

The Analog navigation inputs have the lowest priority>

Note on Analog sources: The same CDI input is used for VOR and ILS. The ultimate use depends on the navigation source selected by the pilot in the EFIS: If VOR is selected then the CDI is assumed to be VOR. If ILS is selected then the CDI is assumed to be ILS.

Selecting a navigation source

Selecting navigation sources is done partly automatically for internal sources such as GPS navigation as you select a destination. Regardless of this, you can select from one of the four navigation source groups at any time.

On the G2 and iEFIS you can select the navigation source group from the NAV menu. On the iEFIS you can also select the navigation source group by tapping on the HSI display.
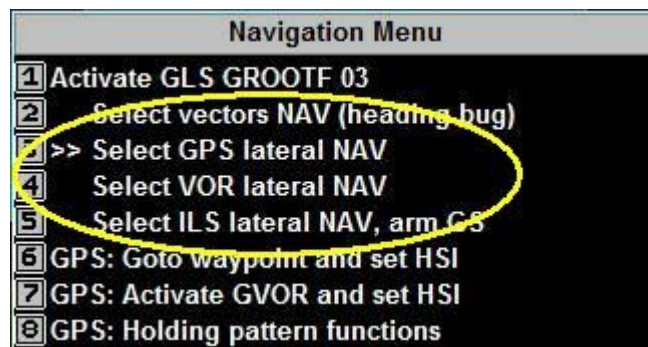
Navigation source selection by tapping on the HSI display on iEFIS.
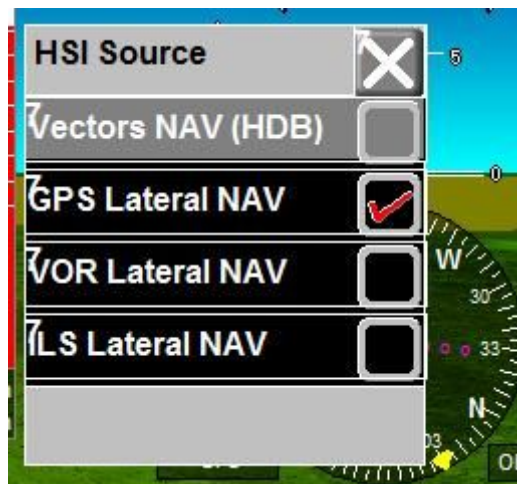
Selecting a GPS waypoint, activating a route (flightplan), selecting GVOR primary or activating a GLS selects the navigation source automatically.

Please note, this is still subject to higher priority navigation sources within the group. If, for example you have a VOR station selected on your NAV radio and that station has a valid radial (in range and receiving) – the EFIS will NOT use the GVOR solution but will be forced to use only the external VOR source. Should you wish to use the GVOR in this case, simply deselect the station on your NAV radio or switch it off.

Special case: The ILS

The system is designed in such a way that any active ILS source will be shown on the HSI and other available ILS indicators automatically regardless of any other selected navigation source. Existing navigation will not be affected, the ILS information is shown passively.

This allows you to, for example, use GPS RNAV to fly to the FAF (Final approach fix) – at that point the ILS and glide slope should be active and will be shown.

You may now proceed on the ILS without any further action required or if you prefer, you can select the ILS as navigation source which will suppress other lateral sources.

You will also do this if you are flying your approach on autopilot as the autopilot follows the selected navigation source. This means the autopilot will not follow the ILS unless the pilot demands this.

This display shows the ILS CDI with the OBS selected to the runway heading 030M. We are to the right of the runway centerline. ILS is shown in light blue.
We have the GPS lateral navigation active to the FAF which is dead ahead and we are on track. GPS lateral navigation is shown in maroon.

If the autopilot is engaged, it will follow the GPS lateral navigation until we switch navigation sources to "ILS lateral NAV".

Vertical navigation

Vertical navigation has one of two sources:

Altimeter bug	Glide slope
The altimeter bug can be set be the pilot to the desired altitude. It can also be set by a flight plan containing altitude change waypoints.	Glide slope can be dictated by an external NAV radio or it can originate from a GLS approach which uses runway geographic information contained in the database to calculate the glide slope.

Regardless of origin, the glide slope has a "validity flag" which tells the system when valid glide slope information is available.

Irrespective of any selected navigation source, when a glide slope is valid, any related display will be activated.

Typical glide slope display. This is the "modified" glide slope display usually used with MGL "default" screens. Other types of glide slope display may be available depending on your screen design.

The "modified" glide slope here shows that the aircraft is slightly below the glide slope.

Glide slopes and the autopilot

If you have the autopilot engaged you will select the ILS lateral navigation source while still below the glide slope. You will be using the altitude bug to select the desired glide slope intercept altitude.

When you select (or reselect) the ILS lateral navigation source you will arm the autopilot to intercept the glide slope. The autopilot will not attempt to climb towards the glide slope but will remain on altitude bug.

As the glide slope indicator approaches ½ way to the intercept the autopilot will command a 1.5 degree decent, increasing to 2.2 degrees shortly before intercept. As the glide slope is intercepted the AP will then attempt to match the glide slope and track it to the touch down point.

Please take note that the pilot is still in control of engine power and possibly the rudder of the aircraft. The autopilot should be disengaged when minimums are reached and the touch down is to be performed by the pilot.

Note: The EFIS does not have auto-land capability. The touch down has to be performed by the pilot.

Note: Should the ILS be armed with autopilot engaged and you are already above the glide slope, the autopilot will attempt a three degree slope immediately, steepening it to up to 6 degrees in an attempt to intercept the glide slope. The pilot needs to decide whether to disengage the autopilot and perform a manual approach or to activate a "missed approach".

The missed approach

Missed approaches may be initiated on the EFIS under autopilot or manual control.

In either case, the HSI will be set to vectors (Heading bug) – autopilot will be selected to VSI hold with the autopilot VSI selected to the maximum rate of climb selected as part of your autopilot pitch control setup.

If the missed approach is done from a GLS approach the heading bug is set to the runway heading. If the missed approach is done from an ILS approach the heading bug is selected from the current OBS setting (The assumption is that the OBS would have been set to the runway heading).
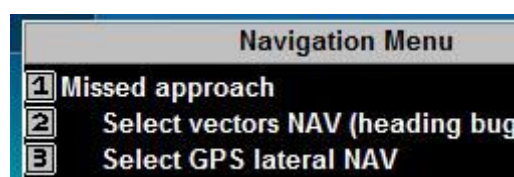
The missed approach procedure is available if the navigation source is selected to "ILS Lateral NAV" and the ILS is valid.

Recovery from the missed approach on autopilot:

Activation of the missed approach causes the autopilot to attempt a maximum vertical speed climb. The climb vertical speed is selected in your autopilot pitch setup menu.

When you have reached a save altitude you can select any vertical speed as needed – the autopilot has been set to heading bug and VSI mode.

Select altitude hold when you have reached your desired altitude using the autopilot menu and activate the new selection when you are ready.

Automatic approach guidance

The EFIS has automatic approach guidance for any runway included in the navigation database that has geographic information.

Guidance takes two forms: Approach guidance and approach information

3D Approach guidance

The EFIS will display approach guidance onto the closest runway provided you are within a +/-20 degree lateral cone of the centreline. This functionality is continuous and automatic.

This image shows approach guidance onto runway 03 at GROOTF. Approach guidance is shown with blue crosses on a white background. The glide slope angle is based on the angle selected in your GLS setup (typically 3.0 degrees).

You can view the approach guidance as GPS based ILS. Line up the crosses so you see a single cross on the screen – then you are exactly on the runway centreline and on the glide slope.

Note: Approach guidance has no effect on any current navigation solution or on the autopilot.

Approach information

Textual and graphical approach guidance is available. Shown here is an ILS approach.

Take off guidance

As the approach guidance latches onto the nearest runway it can be used during take off

as a means to see if you are drifting off the center line. You will see a row of crosses extending into the sky ahead of you. Simply keep the crosses lined up for a perfect take off.

Textual information shows that we are 3.5 nm from GROOTF and need 3 minutes, 22 seconds to touch down at current speed. The HSI shows we are to the right of the runway.

This is confirmed by the light blue ILS needles in the screen center which show the glide slope above us to our left.

The GLS approach

The GLS approach is a GPS based implementation of an ILS system and relies on geographic runway information.

There are three ways of initiating a GLS approach:

From "nearest airports" direct	From "nearest airports" via intercept	Convert approach guidance into a GLS "direct"approach
Select the desired airport, then the runway and finally the direction to activate a "direct" approach.	Select the desired airport, then the runway and finally the direction "via intercept".	If you see a suitable 3D approach guidance display on the screen you can convert it to a GLS approach via the NAV menu.

Approach via intercept

A temporary waypoint is created some distance along the runway centreline. A normal lateral GPS navigation is initiated to that point (also referred as FAF or Final Approach Fix). Once this point is reached, the GLS approach is activated.
You setup the FAF distance in the GLS setup menu.

Converting Approach guidance to a GLS approach

If you have the desired approach visible as guidance on the screen, you can select it as GLS approach using the NAV menu. The information shown gives you the short airport name and the runway.

GLS approach features

GLS adds simulations of both outer and middle marker. If you have the EFIS sound output routed to your intercom system you will hear the standard marker tones if you overfly the virtual markers.

GLS and the Autopilot

The autopilot can follow a GLS approach using the same methods described for a normal ILS approach.

The GLS approach uses white crosses on a green background to distinguish from the similar approach guidance. GLS, like ILS is a navigation source and can be used as source for the HSI and thus, the autopilot if engaged.

Like other internal GLS sources, it is selected as navigation source automatically. Note that it subject to override of higher priority ILS sources are connected and valid. In particular an external ILS source from a connected ARINC or RS232 NAV radio.

Middle and outer markers

For GLS approaches, outer and middle marker tones are emulated. If you have your EFIS connected to your intercom system you will hear the standard marker tones as you overfly the virtual marker distances from the threshold.

The distances are fixed to the minimum distances usually found at large airports.

The distances are 4.0 and 0.5 Nautical miles for outer and middle marker respectively.

ILS/GLS and GVOR setup menu
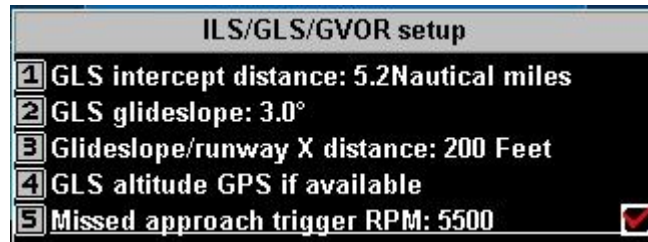
GLS Intercept distance

Distance from the touch down point to the final approach fix (FAF). The FAF is along the extended center line of the runway.

GLS Glide slope

Glide slope angle. Typically 3.0 degrees.

Glideslope/runway X distance

Runway coordinates in the database typically define points close to the runways outer boundaries (threshold). Here you can define the distance the touch down point should have from the threshold. Typical distances would be 300 feet for smaller aircraft.

Altitude source for GLS

You can choose to work GLS based on pressure altitude (subject to local pressure settings) or GPS altitude which requires a good GPS satellite constellation to be accurate.

Recommendation: Use pressure altitude if local barometric pressure correction is available.
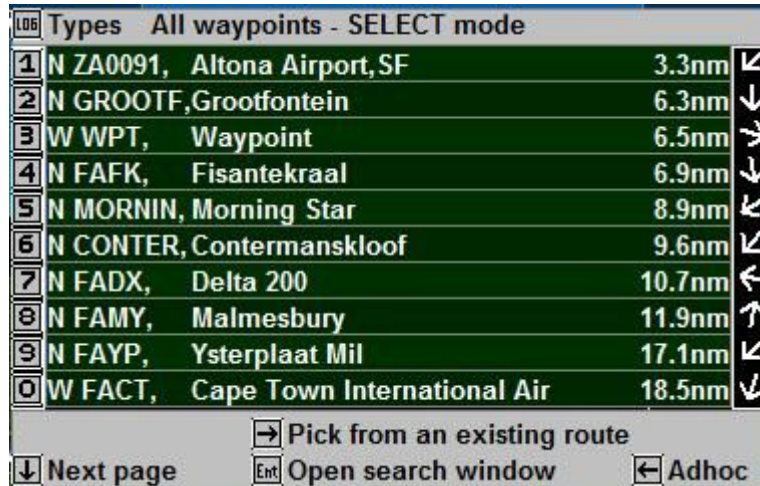
Missed approach trigger RPM

If your navigation source is selected to ILS you can activate a missed approach either via NAV menu selection or automatically by applying full engine power. For this you can select a trigger RPM value that must be reached and you must enable the function in order to use it.

Please note that missed approaches for ILS sources require that your OBS is selected to the runway heading so the autopilot can maintain correct heading during the missed approach. Heading is selected on the heading bug and the navigation source is selected to vectors so you can change the heading at any time.

GVOR Range

Simulated range of a GVOR virtual transmitter.

Direct-to GPS Navigation


```
LOG  Types   All waypoints - SELECT mode
1  N ZA0091,  Altona Airport,SF            3.3nm  ↙
2  N GROOTF,Grootfontein                   6.3nm  ↓
3  W WPT,     Waypoint                     6.5nm  →
4  N FAFK,    Fisantekraal                 6.9nm  ↓
5  N MORNIN, Morning Star                  8.9nm  ↙
6  N CONTER,Contermanskloof                9.6nm  ↙
7  N FADX,    Delta 200                   10.7nm  ←
8  N FAMY,    Malmesbury                  11.9nm  ↑
9  N FAYP,    Ysterplaat Mil              17.1nm  ↙
0  W FACT,    Cape Town International Air  18.5nm  ↓
          → Pick from an existing route
↓ Next page    Ent Open search window       ← Adhoc
```

Direct-to GPS navigation is one of the most common forms of navigation. Typically you select from a list of waypoints, airports or navigation beacons.
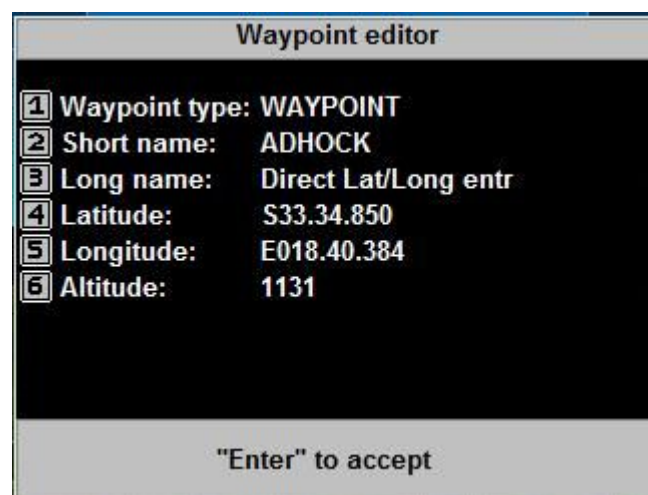
You can filter the types of waypoints shown (Types button). For example you may want to show only airports.

All waypoints are shown in order of distance from your current location (GPS position required). You may search for a waypoint if it is far away and you know the name. You can search either the short or the long names. On iEFIS systems you can also search for partial text contained anywhere in the name.

Distances to the waypoints are shown as well as direction to fly relative to the current ground track.

You may also pick a waypoint that may be contained in any of your route (Flightplans).

Finally, you may enter an "AdHock" waypoint. This is used if you know the coordinates for a particular waypoint but do not want to create a permanent waypoint in the supplementary database.


```
                    Waypoint editor
1  Waypoint type: WAYPOINT
2  Short name:     ADHOCK
3  Long name:      Direct Lat/Long entr
4  Latitude:       S33.34.850
5  Longitude:      E018.40.384
6  Altitude:       1131

              "Enter" to accept
```

The altitude is not relevant in this case so you can ignore it (it is shown as the standard waypoint editor is used). You may change the default names – these will be shown as the active waypoint but you may choose to keep the defaults.

The Adhoc waypoint is not stored in any database and the information is lost when you select a new waypoint.

GVOR navigation

From the NAV menu, select "Activate GVOR and set HSI".

Select the desired NAV source. The frequency associated to this source will be sent to the NAV radio is it can accept remote frequency control. In addition the GVOR will be activated and you will have an immediate, virtual radial if you are within the simulated GVOR range (see GVOR setup) . Should the connected NAV radio receive a valid VOR signal it will override the simulated signal as the connected VOR source has a higher priority.

The EFIS supports selection of a primary and a secondary VOR station. Only the primary station can contribute a CDI for navigation.

HSI showing a single GVOR primary source. The green (A) paddle shows the direction of the location of the VOR station.

HSI showing both primary and secondary GVOR stations. The red (S) paddle shows the

direction of the location of the secondary VOR station.

Note: Primary GVOR and VOR navigation can be used as a source for the autopilot: Enter the desired radial to fly using the OBS knob.

Holding patterns

The EFIS includes a comprehensive list of all possible types of holding patterns.

The holding patterns are selected using the NAV menu.

Holding patterns can be located at a navaid (such as a VOR), any fix (Waypoints etc) or at the current position.

Legs can be selected by standard 1 minute distance, fixed distance or a variable time.

Holds are either right hand or left hand turns.

When a hold is activated, the current magnetic track or heading is used to orientate the direction of the hold. You can change the direction of the hold using the OBS knob.

If your autopilot is engaged, activating a hold will cause the autopilot to fly the hold. The correct way to exit the hold when you are flying on autopilot is to select a new navigation source or perform a direct-to or route navigation.

For example, you may be flying a hold close to an airport waiting for ATC to vector you to the runway (or another hold or navaid). When ATC gives you the vector, first enter the vector using the heading bug knob and then select "Vectors" as navigation source using the NAV menu. This action will cancel the hold and the autopilot will now fly your vector.

Image showing an active holding pattern on the moving map. With the holding pattern active, map background (terrain and cultural data) is suppressed.

The triangle shows the hold fix location and hold direction.

Note: The size of the holding pattern is determined to a large extent by your aircraft's ground speed and dynamically sized as needed.

For proper autopilot operation, ensure that your autopilot bank rate of turn setup allows sufficient authority to the autopilot system to enable it to achieve the required turns to fly the hold correctly.

You should use 3.0 degrees/second for most aircraft, faster aircraft may need to reduce the rate of turn to avoid overly steep turns.