



Los Angeles

GPS Gauge

Version 1.7



Documentation

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GPS Gauge

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INSTALLATION

If you are reading this you have already unzipped the ZIP file.

This gauge is intended as a replacement in FSX for the Garmin GPS 500 standard gauge which was originally designed for earlier versions of Flight Simulator. This gauge can be installed on pretty much any aircraft but only in FSX. There are high resolution maps and displays which are not compatible with FS9.

To share it between several aircraft **copy the GPSNEW.CAB to the FSX \Gauges folder**. If it is only for one aircraft the GPSNEW.CAB can be copied to that aircraft's \panel sub-directory.

Different Colour Background (optional)

This gauge is a “see-through” gauge that allows you to choose any background colour you wish. A dark colour is recommended.

To set a background colour then set the **Background_color=0,0,10** parameter in the panel.cfg to be **Background_color=aaa,bbb,ccc** where aaa, bbb, and ccc are the decimal RGB values for the desired background colour. These numbers can be found from MS-Paint by selecting the colour wanted and noting the decimal RGB values. Some examples are shown below.

Note that any selected background colour does not apply to any of the maps.

Blue Background (Background_color=17,20,64)



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Red Background (Background_color=92,7,12)



Green Background (Background_color=10,50,21)



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POSITIONING AND SIZING

For those already familiar with positioning and sizing gauges in FSX (or FS9) this section is redundant. It is intended as a simple explanation for those not familiar with how to reposition or resize a gauge. It is not intended to be exhaustive.

Standard Positioning

In FSX there are a number of standard positions that can easily be changed. These positions are defined by the **position=** parameter in the panel.cfg file.

The standard position is 7. Altogether there are 9 standard positions in FSX. These are:

- 0 = top left corner
- 1 = top side middle
- 2 = top right corner
- 3 = middle left side
- 4 = middle of screen
- 5 = middle right side
- 6 = bottom left corner
- 7 = bottom side middle
- 8 = bottom right corner

So to easily reposition the gauge the parameter **position=** can be made equal to any of the above numbers.

Custom Positioning

Positioning the gauge to any point on the screen is a little more complex and should really only be done by those with a good understanding of how it works. Positioning a popup panel is different to positioning on a main panel. It is assumed that anyone inserting this gauge into a main panel will be familiar with how to position on the panel. This section only deals with positioning of a window.

In all versions of Flight Simulator positions are defined as x and y coordinates starting from the top left corner of the screen and pointing to the top left corner of the object being positioned. Units are effectively pixels so on a 1920X1080 screen the coordinate 1920,1080 points to the extreme bottom right corner of the screen. This is a vertical inversion of the typical mathematical x,y coordinate graph.

The position of a window on a screen is defined by using the parameter **window_pos=**. Use of this parameter overrides the standard **position=** parameter. The format is:

Window_pos= x.xxxx, y.yyyy

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In this case `x.xxxx` and `y.yyyy` do not represent a number of pixels. They represent a proportion of the side of the screen. So if the screen is 1920 pixels wide and `x.xxxx` is 0.5 then it points to a point halfway across the screen – i.e. position 960 in this case. Similarly if `y.yyyy` is equal to 0.5 and the screen height is 1080 then it points to a position half way down the screen – i.e. position 540. So if **Window_pos=0.5, 0.5** then the window will be positioned with its top left corner exactly in the middle of any screen.

To position the window precisely usually needs some experimentation. It can be positioned to the nearest pixel using a number to 4 decimal places.

Simple Sizing

Simple sizing is done by defining a proportion of the original size of the window. It is done using the parameter:

Window_size_ratio=n.nn

In the installation instructions a ratio of 0.76 has been recommended on a screen size of 1920X1080. This yields a screen size larger than the Garmin GPS 500 although the overall gauge size is significantly smaller. You may prefer a smaller or larger size depending on your screen size and the panel you are using however you must ensure the gauge is always wider than it is high. The size can easily be changed simply by changing the `Window_size_ratio` to whatever fraction of 1 preferred. The parameter can be set greater than 1 if desired but this is not recommended for this gauge.

Custom Sizing

Custom sizing of a window is done using the parameter:

Window_size=xx.xxxx, yy.yyyy.

Window_size= overrides any **Window_size_ratio=** setting.

`xx.xxxx` and `yy.yyyy` are similar to the positioning parameters in that they represent a proportion of the side of the screen. In this case however the proportion is of the side of the object. If you want an object to appear as 500 pixels wide on a 1920X1080 pixel screen then the parameter `xx.xxxx` would be 0.2604 (500/1920). Similarly if you wanted the same object to be 500 pixels tall on the same screen `yy.yyyy` would be 0.4630 (500/1080). From this it can be seen that a square object does not have equal parameters for the two sides. Note that the original size of the object does not matter – the object can be stretched or squeezed in either direction. For this gauge it is important for formatting that the width should be greater than the height but other than that any size can be used that is suitable.

For a detailed explanation of the parameters in the `panel.cfg` including the positioning and sizing please refer to the Microsoft website:

<https://msdn.microsoft.com/en-us/library/cc526956.aspx>.

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INSTRUCTIONS

Introduction

This gauge was developed as a replacement for the standard Garmin GPS 500 / 295 gauge which is found in many panels. The GPS 500 was developed for earlier versions of Flight Simulator and has a fairly low resolution as well as difficult to operate for both novice and experienced users.

This new gauge carries out pretty much all the functions of the GPS 500 with many additional features added. Some of the new features are:

- Tuning of ILS frequencies (no more map lookups)
- Auto Tuning to VORs and NDBs
- Selectable tuning to VORs and NDBs
- Nearest Airports, VORs, NDBs, and Intersections can be searched to any number
- High resolution terrain Maps with terrain shadowing
- Other aircraft display (TCAS)
- TAWS Map
- Flight Plan Map
- Uncluttered Maps with selectable overlays
- Detailed Flight Plan
- Easy navigation between pages
- Approach selected and activated with two mouse clicks
- Localiser and Glideslope Nav aids
- Direct-to feature
- Background colour
- Runway lists
- Movable map
- Approach Transition selection

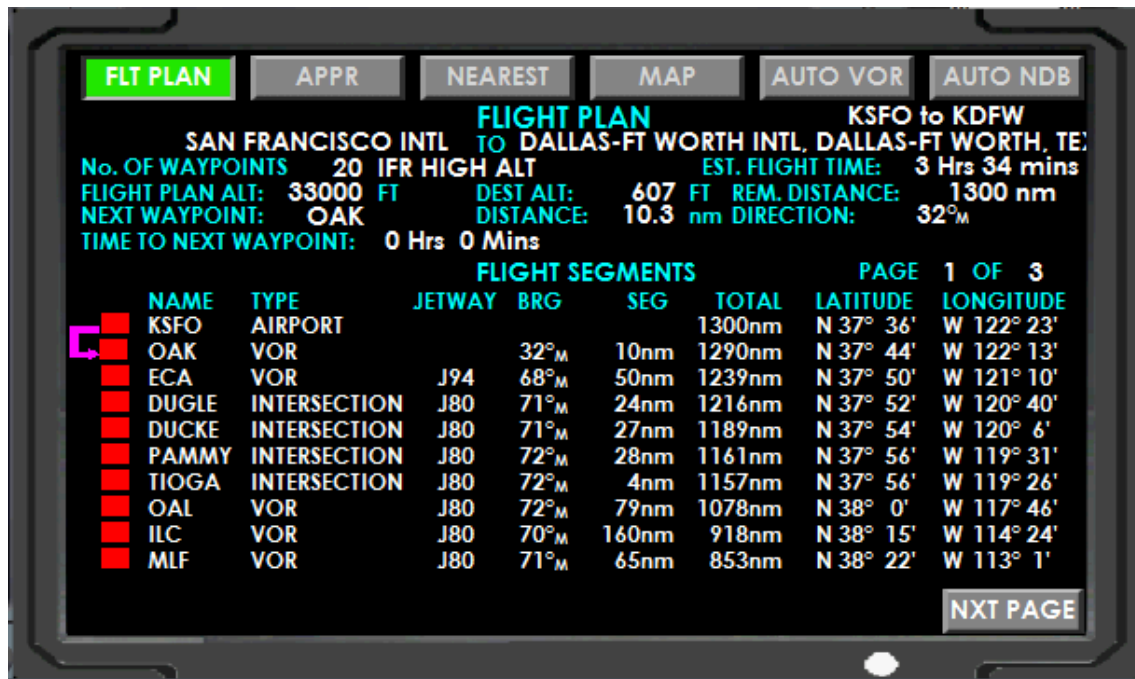
Although this gauge is not based on any real gauge it is meant to have a similar look and feel to the interactive synoptic displays on the Boeing 787.

This gauge is for FSX. It does not work on earlier versions of Flight Simulator. It can work on pretty much any aircraft. It will work on any screen size although reasonably high resolution is recommended. It is unlikely to look good on a 640X480 screen.

This gauge must always be wider than it is high. If you are having any formatting difficulties with this gauge the advice is always the same: MAKE THE GAUGE WIDER or REDUCE THE HEIGHT.

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Flight Plan



If no Flight Plan is loaded the message “No Flight Plan Active” will display on a blank screen. Although both Flight Plan and Approach do not work if there is no Flight Plan, the Maps, Nearest, and VOR tuning functions still work.

The Flight Plan screen displays a list of all the flight segments to however many pages are needed. Clicking on the red box next to a Waypoint will open an information box about that Waypoint. Although this gauge has no limit on the number of flight segments the FSX Flight Planner has a limit of somewhere around 45 segments.

An arrow on the left indicates the current flight segment being travelled.

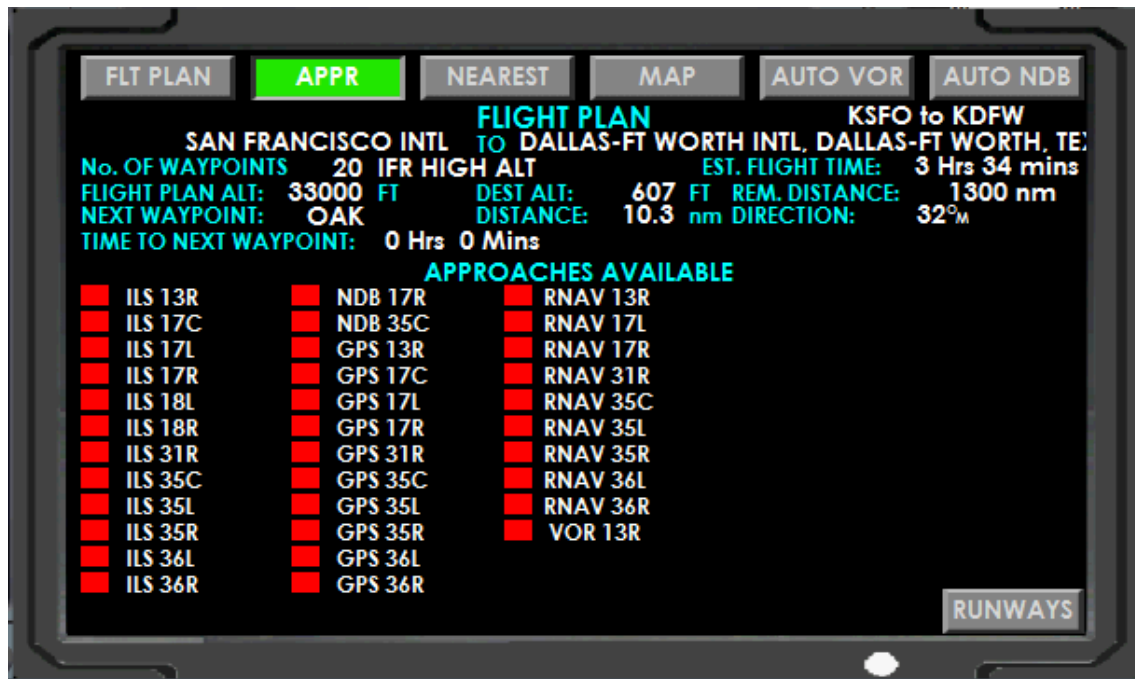
The **Estimated flight time** is calculated in one of two ways:

1. When the aircraft is on the ground it is calculated using the defined aircraft cruising speed and flight plan distance to the destination plus 30 minutes contingency.
2. When the aircraft is airborne it is calculated using the FSX estimated flight time which is based on the actual ground speed without contingency.

The calculation can not be as accurate as is done in real airline operation but it gives a reasonable indication.

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Approach

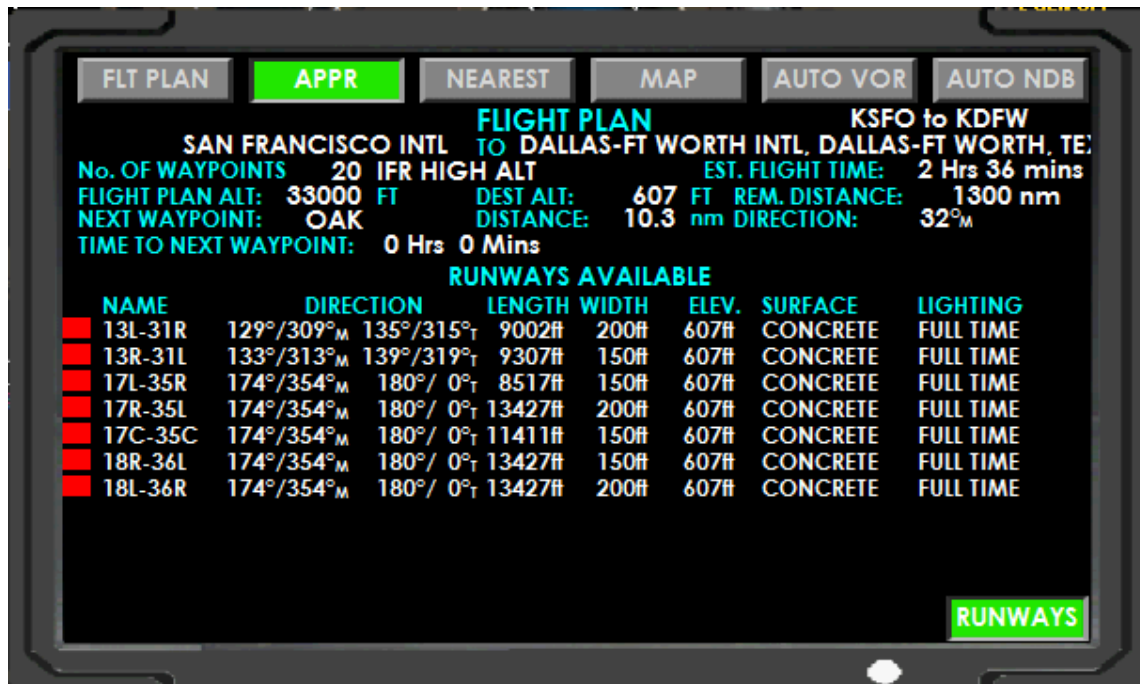


The Approach screen is the first screen that displays at startup. It contains the basic flight plan information at the top and displays a list of all approaches at the destination airport. Provision is made for up to 48 approaches to display. The highest number of approaches found has been 34 at Dallas-Fort Worth Airport. If anybody can find an airport with more than 48 approaches then I will rewrite this section.

Where an airport has no approaches – as in many small airports – a list of runways will appear. This list is for information only and no selection can be made from it.

For the Approaches list clicking on a red box selects that approach then clicking the "Confirm" box goes to the next screen. Alternatively clicking on the "Runways" box at the bottom right will give a full list of runways for that airport including runways that have no approach. Clicking the "Runways" box again will return to the Approaches list.

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After confirmation all available information about the selected approach then displays. At this point the Approach is not activated.



Zurich Transition EKRIT

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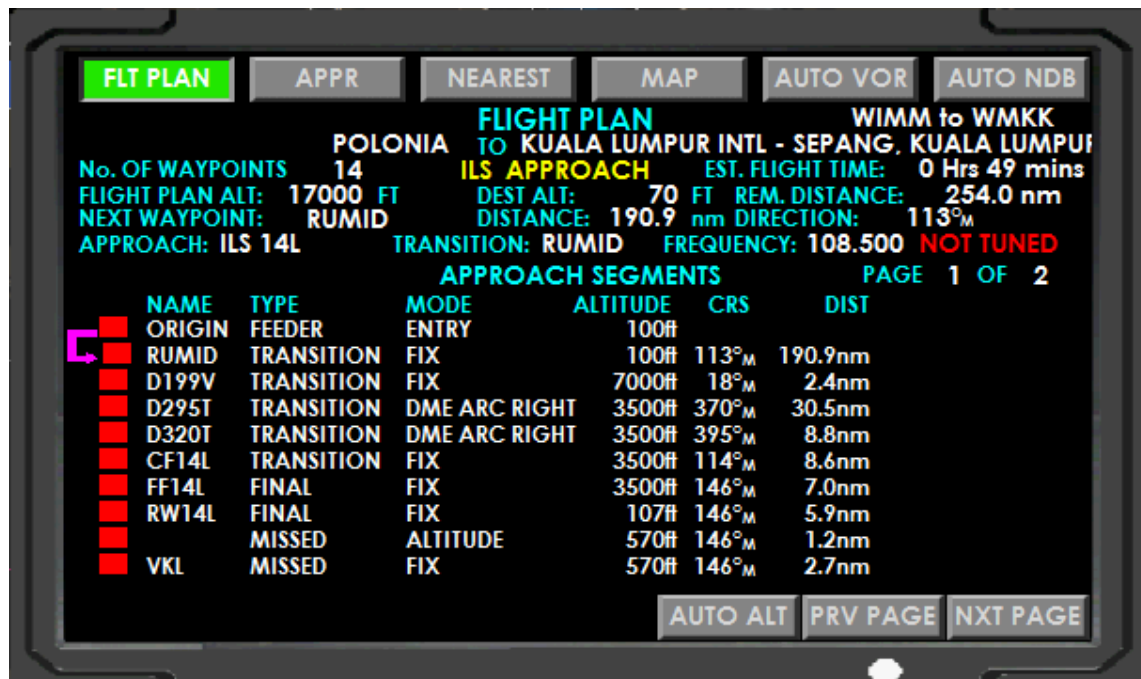
By default the VECTORS Approach map displays initially. Selection of another transition will display the map for that transition. The map always remains visible after activation but can not be changed unless the Approach is cancelled. The map can be adjusted using the same icons as on the main map but note that Terrain and TAWS are not displayed. Adjustment to line width will apply only to the Approach line width – it does not affect the Flight Plan line width. The map is always oriented North.

The Transitions box displays a maximum of 8 transitions. If there are more transitions a magenta down arrow will appear on the right hand side of the box. To scroll down press the “**Tab**” key. To scroll up press “**Backspace**”.

To activate the Approach click on the “Activate” button. After activation a track from the aircraft current position to the Approach entry point is added to the flight plan and the Approach Flight Plan is displayed. For an ILS approach, to tune the NAV1 radio to the ILS frequency, click on the ILS Tuned box. The screen will indicate when the radio is tuned and whether or not there is a signal.

An Approach can be cancelled at any time by clicking on the “Cancel” button even if it has been activated. On cancellation the screen will revert to the Approach select screen and the Flight Plan screen will revert to the original Flight Plan. Note that if the ILS has already been tuned the NAV1 radio frequency will not revert.

After activating the Transition the Approach Flight Plan will appear in the Flight Plan panel. In the FSX database the altitude of the first Transition leg is always zero so this gauge shows the current altitude of the aircraft for the Feeder and the first Transitional leg.



ILS Transition RUMID at Kuala Lumpur

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The AUTO ALT Button

The “AUTO ALT” button shown on the previous page, when switched on, will automatically alter the autopilot selected altitude to the specified altitude of the transition segment. This results in the aircraft automatically descending along the transition if the autopilot is switched on. It will have no effect if the autopilot is not switched on or if there is no autopilot. The rate of change of altitude will be the default vertical speed defined in the aircraft.cfg but can be manually altered during the altitude change.

Note that as the rate of descent is the standard rate of descent the aircraft may not necessarily reach the correct altitude by the next waypoint or may reach the new altitude earlier than expected.

Transition Turn Anticipation

Robert McElrath in his excellent “FS9GPS MODULE GUIDEBOOK” makes some observations about turn anticipation. His results however differ from my observations which are as follows:

When flying enroute on autopilot, a turn at the end of a flight segment invariably commences precisely 3 nm short of the end of the segment. There appears to be no variation for speed or angle of turn. This anticipation seems to work satisfactorily most of the time.

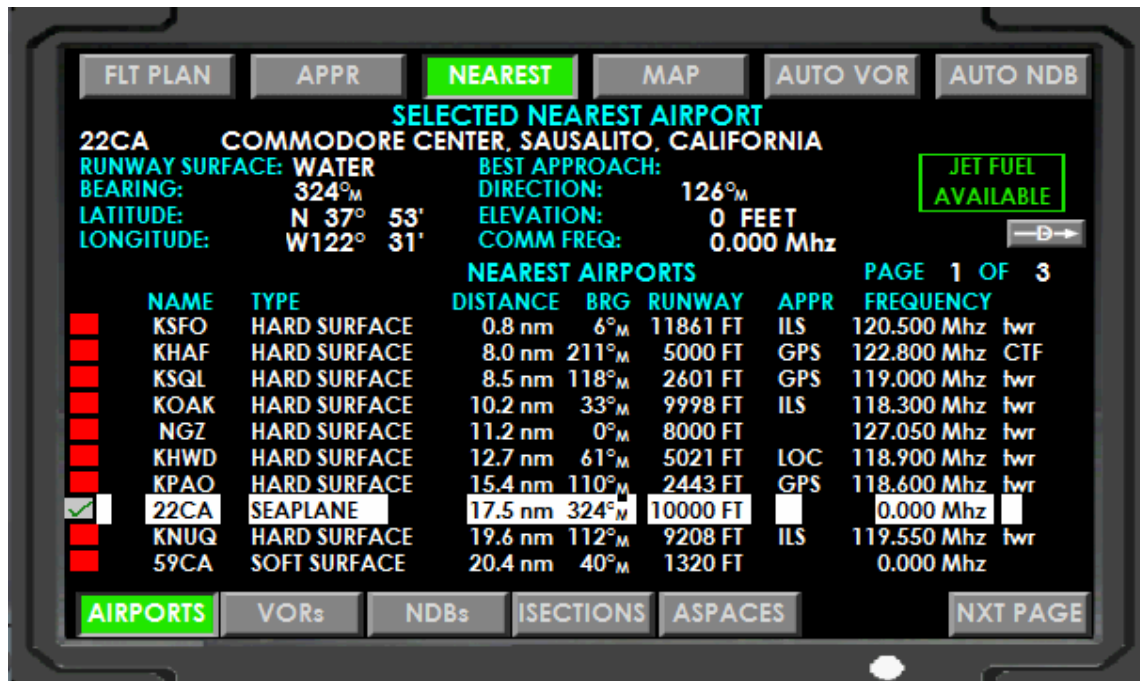
During approach however, the turn commences 1 nm before the end of the segment, regardless of angle or speed, which is often insufficient space to make a turn. This can result in the aircraft not following the transition accurately during a transition involving turns. This problem can be mitigated by reducing speed but it is often impossible to automatically follow a transition at a speed above stalling speed – especially for jet aircraft.

At the same time there are transitions in the FSX database which simply do not work. For example at Geneva all the transitions lead into the approach at 6000 feet leaving insufficient distance to descend to the runway unless done manually with a high rate of descent. Even at Heathrow, several curved transitions end directly over the runway making it impossible to do an automatic landing in a large jet transport aircraft.

This gauge does not attempt to fix these problems and simply displays data which is in the FSX database.

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Nearest



Clicking on the nearest button initially goes to a list of nearest Airports. As this gauge can be used on large or small aircraft there is no filtering on this list and all airports are shown. On entry details of the nearest airport are always shown in the upper section.

Clicking on VORs, NDBs, or Isections boxes produces a similar list of the nearest ones to the aircraft.

The Airspaces box is slightly different – it will give a list of nearest airspaces but if the aircraft is already in an airspace it will only display those airspaces covering the aircraft position – i.e. those at different altitudes at the present position.

Clicking on the red box next to the item will display details of that item in the header part of the screen.

On the VOR and NDB screen an item can be selected and either NAV1, NAV2 or ADF1 can be tuned automatically by clicking on the appropriate “TUNE” box.

On the Airport display screen a green box will appear if fuel is available at a selected airport. Note that it will only display if there is appropriate fuel available – e.g. if you are in a jet aircraft it will only display if jet fuel is available: for a piston engine it will display only if Avgas is available. The messages are very dubious as, according to FSX, there is no fuel available at many large airports including Singapore Changi and Jakarta International and in the example shown it believes there is Jet fuel at a Seaplane base.

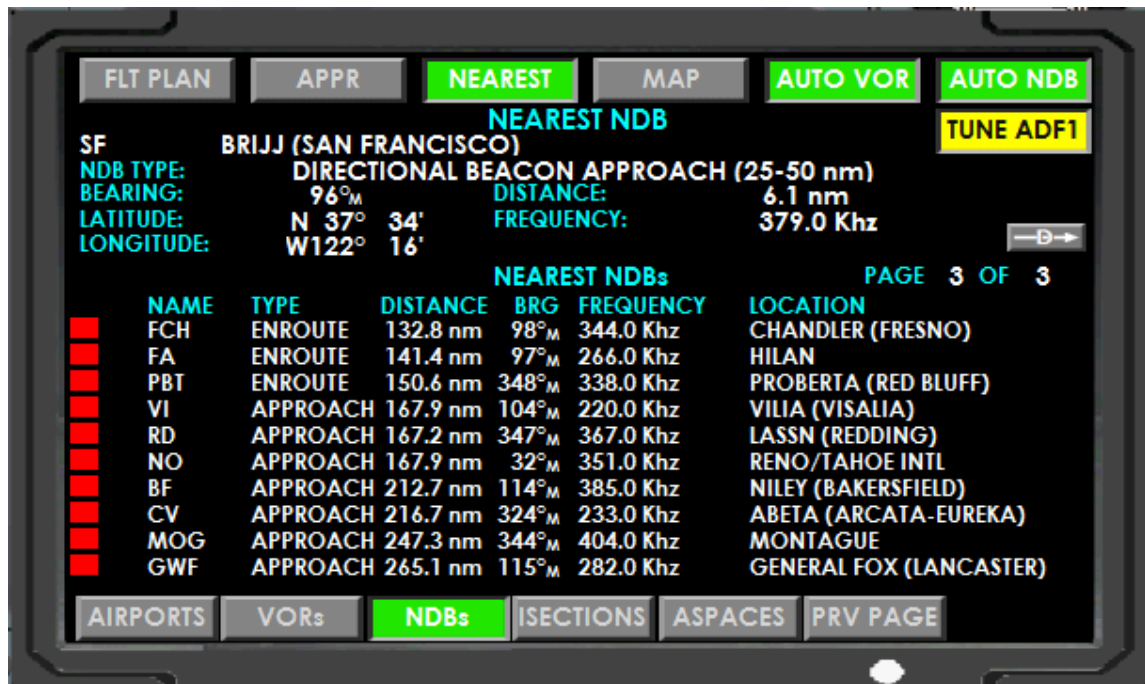
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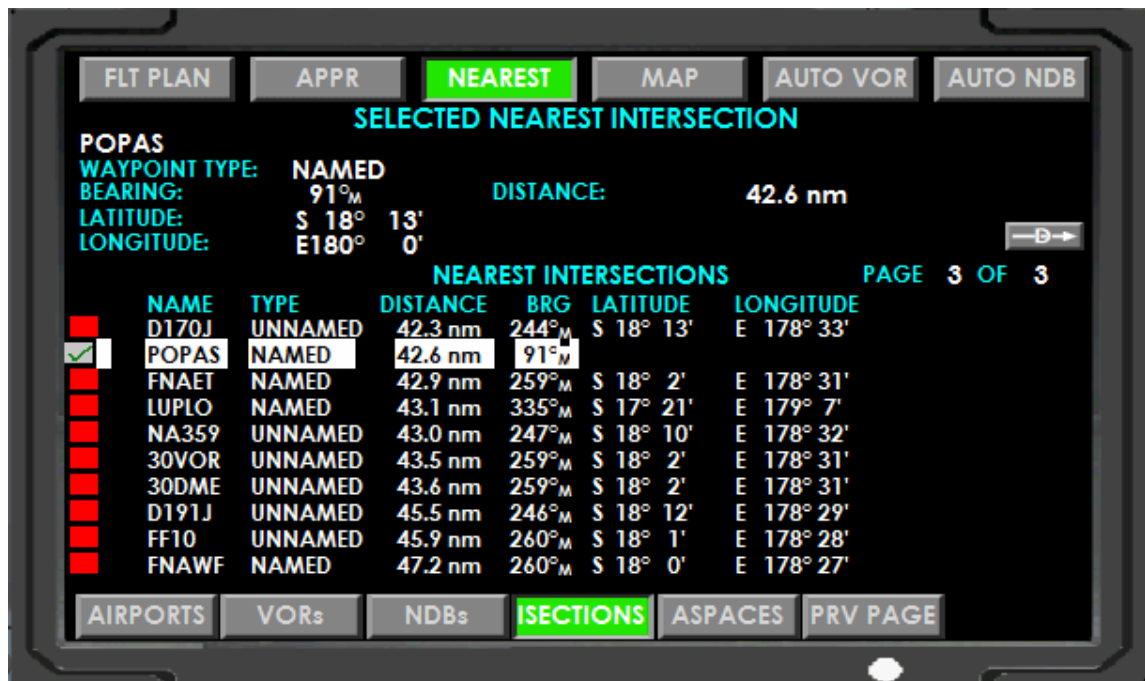
Clicking on “AUTO VOR” will automatically tune NAV1 to the nearest VOR and NAV2 to the 2nd nearest. This will happen continuously as the aircraft moves until the Auto VOR is switched off. It is essential to switch off Auto VOR before the ILS is tuned on the Approach screen otherwise NAV1 will revert to the nearest VOR. Similarly Auto NDB will automatically tune ADF1 to the nearest NDB throughout the flight.

Obviously these automatic functions are not always desirable and might only be switched on at certain times in-flight. Note that while these auto functions are on, a NAV radio or ADF can not be manually tuned using any other gauge. To manually tune a VOR or NDB using this or any gauge the corresponding Auto function must first be switched off.

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On the VORs and NDBs screen a green box appears against a station that is tuned. The box is yellow if the station is tuned but there is no signal.



Example of POPAS waypoint on 180 degree meridian (See Version 1.6 bug fix)

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On the Airspaces screen the status of the Airspace will display both in the header and in then detail section. The one in the Header is colour coded. This status is the equivalent of the Messages in the GPS 500.


Changing Number of Pages

By default 3 pages of Nearest items will appear. This limit can be increased up to 99 pages at any time by right clicking on the total pages but each increase will slow the response time. Each time an increase is done the increase will not be completed until the contents of the page change. This can take a long time on trans-oceanic flights so the default limit of 3 pages is designed to decrease the need for this function.

The number of pages can also be decreased by left clicking on the number of pages. Reducing the maximum pages to 1 will ensure the fastest loading speed.

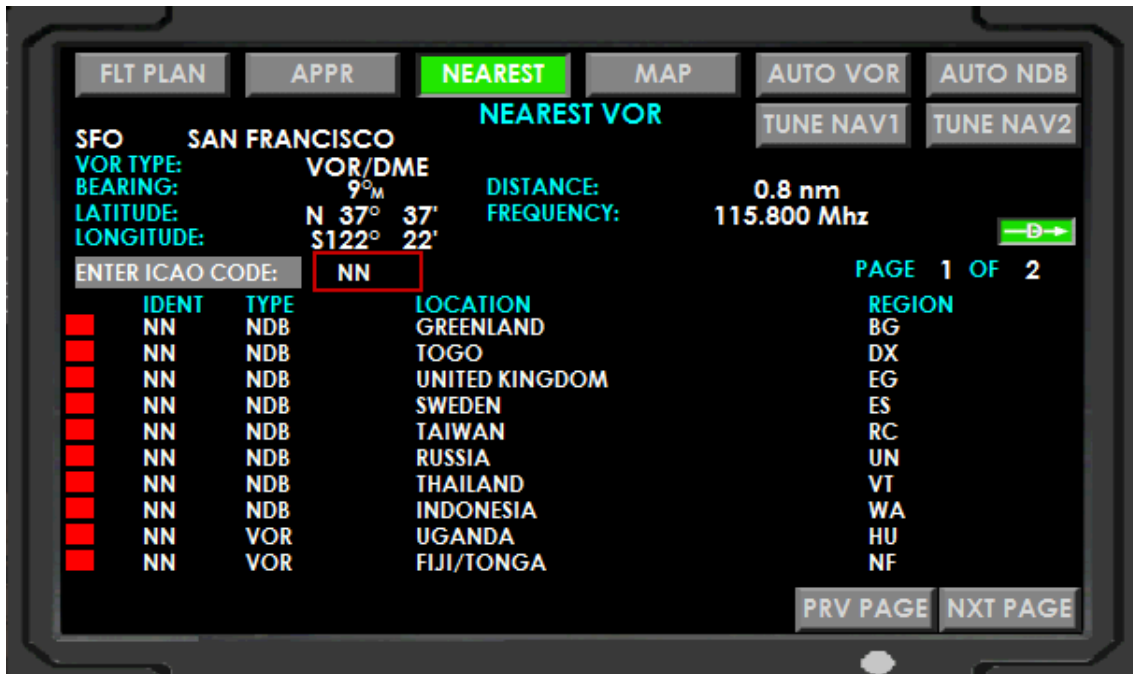
The Direct-to Function

On the Nearest Screens

On the Nearest Screens (Airports, VORs, NDBs, Isections, but not Aspaces) a Direct-to icon  appears on the right side. If this icon is clicked without selecting an item from the list the screen will go to an entry screen where you can enter an ICAO code of an Airport, VOR, NDB, or Intersection that you want to fly to. Note that on the Airport screen only Airports can be selected and the list will never be more than one item. On the other screens any facility including airports will appear on the list.

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To enter an ICAO code a red box will appear on the screen and the ICAO code can be entered from the keyboard. The initial code that appears is the existing destination. As you enter characters on the screen the list will display all facilities that have the name that you have entered. This list can be several pages on screens other than the Airports screen.



On the Airport screen there is the option to enter an Airport name instead of an ICAO code. To enter an Airport name press the “Tab” on your keyboard and the red box will move to the name. You may then start typing the airport name to as many characters need to identify the airport. Only one airport will appear on the list at any time. Pressing the “Tab” key again reverts to ICAO entry.

Once entry of the code is complete then the facility is selected by clicking on the red box against the item and then clicking on “Confirm” to create the direct-to flight plan.


If you have selected an item from the Nearest list then clicking on the Direct-to icon will create a flight plan to fly directly to that point replacing the pre-existing flight plan (if any). If the point is an Airport then a list of Approaches will be available for that airport but if not the aircraft will just fly in circles when it arrives at that point. The new flight plan will also display on the map.

After clicking the  icon it will turn green  to indicate that a Direct-to flight plan is in effect. The new flight plan can be seen on the Flight Plan screen with the start location being the location where the Direct-to was selected. Note that the full name of the destination will not display on the Flight Plan – this name can only be seen on the Nearest screen where it was selected. This is due to a limitation in FSX.

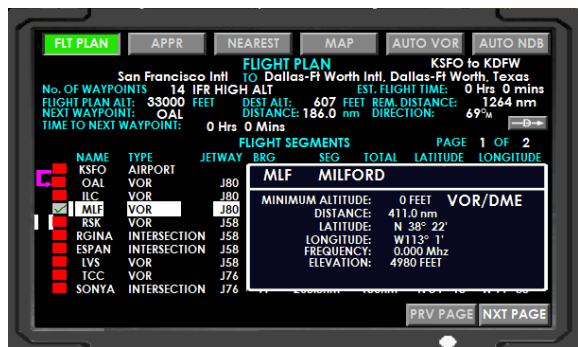
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To reinstate the original flight plan click on the green Direct-to icon. Note that if there was no original flight plan it will NOT revert to no flight plan. To change to another Direct-to destination first click on the green icon to de-deselect the old Direct-to destination then select the new destination and click on the Direct-to icon again.

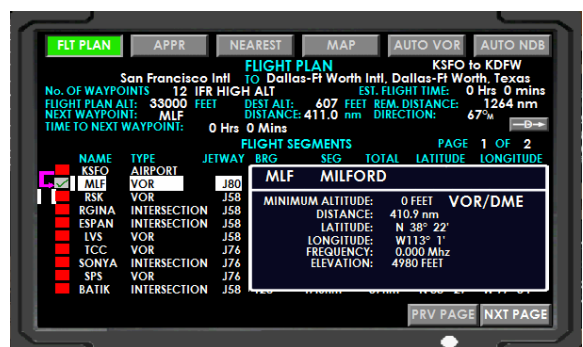
On the Flight Plan Screen

On the Flight Plan screen the  icon will only appear if a Waypoint is selected and if Approach is not active. The function however is slightly different – clicking on the icon will delete all waypoints prior to the selected waypoint and the aircraft will fly directly to the selected waypoint. All waypoints after the selected waypoint remain unchanged so the aircraft will still continue to its original destination.

THIS FUNCTION CAN NOT BE REVERSED.



Before



After

N.B. The use of the Direct-to function has a small risk of system failure. The risk is low but if a system failure does occur when using Direct-to this is due to FSX not due to the gauge.

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MAP



Clicking on the MAP button will initially display a monochrome map centred on the aircraft with a range of 10 nm and with the heading of the aircraft towards the top. Icons appear at the top which are the same as the icons that appear on the FSX Map and perform the same functions. Some are missing as this map does not support weather display. At the bottom are other icons for functions additional to the FSX Map.

Positioning the mouse on any icon will bring up a message describing its function (provided “Show cockpit ToolTips” is ticked in Settings-Aircraft).

The Radio Height displays at the bottom right of the screen only when the aircraft is less than 2500 feet above the ground. The radio height in FSX is the height of the antenna above the ground which when on the ground shows a variable height depending on the aircraft. This gauge corrects the radio height for any aircraft to the altitude from the base of the wheels – so giving a zero height when landing.

It will also be noticed that sometimes the aircraft does not align with the airport symbol on the map. This has been investigated and it has been found that many airport symbols are not precisely positioned on the map – so it is the airport symbols that are inaccurate. The ILS feathers are more accurately located and the aircraft will invariably correctly align with those.

The functions of the Icons are as follows:

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Upper Icons



Airports Icon

This icon is on by default, clicking it will switch off the Airports display



VORs Icon

This icon switches on display of VORs on the map.



NDBs Icon

This icon switches on display of NDBs on the map.



Intersections Icon

This icon switches on display of Intersections on the map.



Victor Airways Icon

This icon switches on display of Victor Airways on the map.



Jet Airways Icon

This icon switches on display of Jet Airways on the map.



Airspaces Icon

This icon switches on display of Airspaces on the map.



Flight Plan Icon

This icon is on by default, clicking it will switch off the Flight Plan display

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Details Icon

This icon switches on display of more textual detail on the map. This can result in a very cluttered display and should be used with care.



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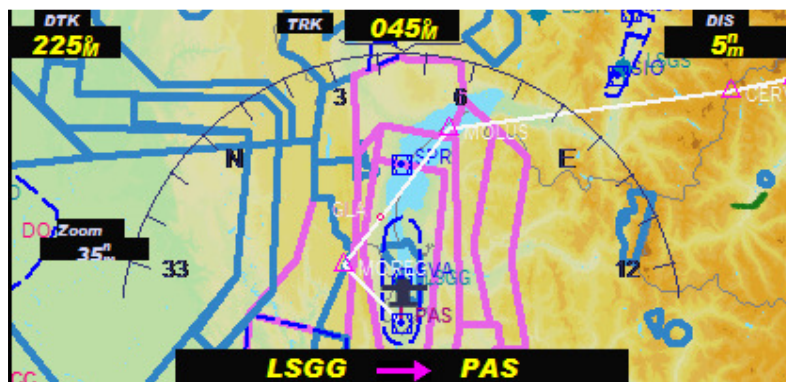


Terrain Icon

This icon switches on display of a high resolution terrain map as shown below. Terrain elevation colours are based on the Garmin system and have terrain shadowing to enhance the effect.



Terrain at Geneva



GPS 500 Map of the same Terrain

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Lower Icons

OFF OFF Icon

Clicking this icon switches the map off and returns to the last screen displayed.

N/W Compass Icon

Clicking this icon displays a Compass rose on the map as shown below



 **TCAS Icon**

Clicking on this icon displays other aircraft on the map as shown below. Note that this function works only in FSX Acceleration edition. TCAS does not work in other versions of FSX.



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Waypoints Panel Icon

Clicking on this icon displays the Waypoints panel on the left of the map as shown below.



TAWS Icon

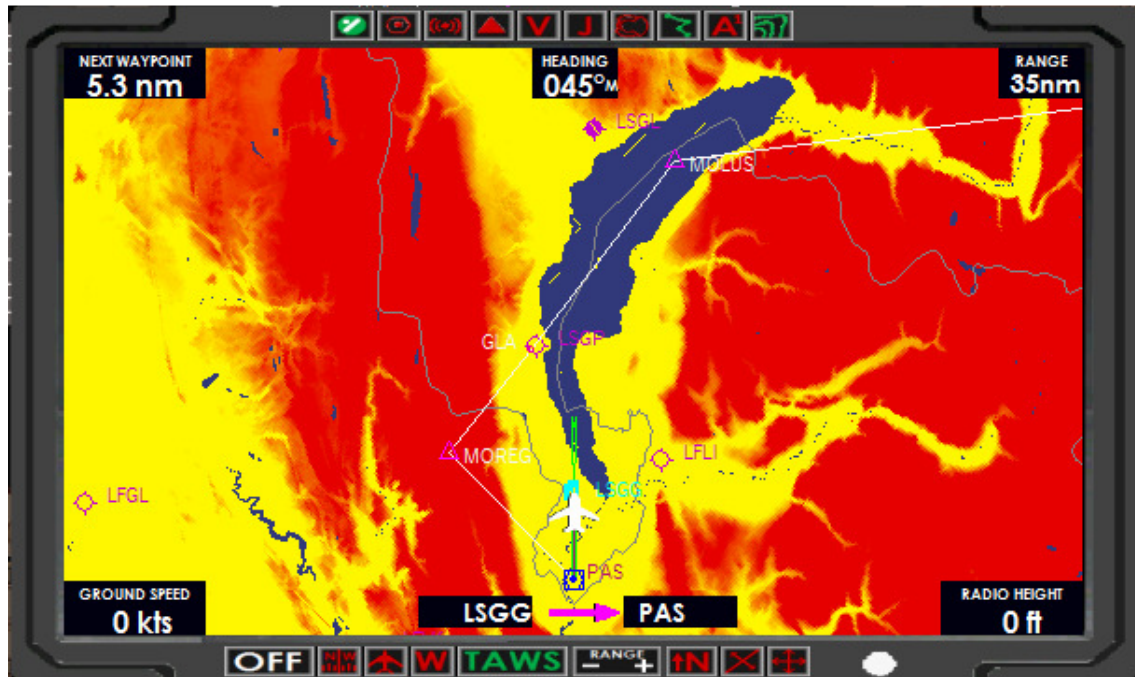
The Terrain Awareness (TAWS) Map shown on the next page is a map which measures terrain altitudes from the height of the aircraft rather than from sea level. The system used on this aircraft follows the colour scheme specified for a Boeing 737-800 however does not have the same accuracy as colours can only be defined in FSX per 1000 feet instead of 250 feet as needed by the specification.

This TAWS map shows terrain from 2000 feet below the aircraft to 1000 feet below the aircraft in Green, from 1000 feet below to 2000 feet above the aircraft is Yellow, and Terrain more than 2000 feet above the aircraft as Red. If the aircraft is more than 2000 feet above terrain the display is the same as the monochrome map. The specification states that the Green should only extend to 500 feet below the aircraft (or 250 feet if gear extended) and the Yellow above that.

The TAWS icon can only be clicked on after first clicking the TERR icon. The map will reload with every 500 foot change in aircraft altitude and the screen will go blank during the reload. It can be slow to load and temperamental. When flying at high altitude the map will have the same appearance as the standard monochrome map but will still go blank from time to time when reloading.

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The example map shown is with the aircraft on the ground.



RANGE **Range Icon**

Clicking on the Range icon will increase or decrease the range by:

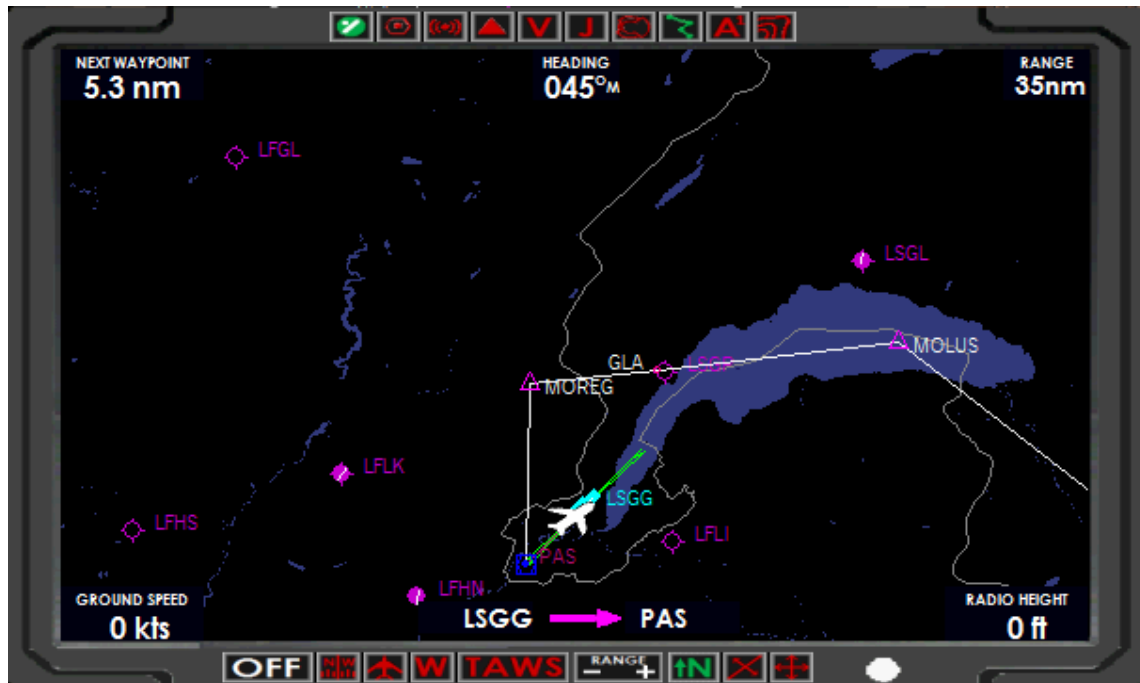
- 1 nm if the current range is 10 nm or less
- 5 nm if the current range is more than 10 nm and 50 nm or less
- 10 nm if the current range is more than 50 nm and 90 nm or less
- 50 nm if the current range is 100 nm or more

The map will go down to 5 nm and up to 2650 nm. The range is precisely the distance from the centre of the aircraft symbol to the top of the map.

N.B. Range is increased by right clicking on the icon or left clicking to decrease.



Clicking on this icon will orient the map to face north. The aircraft symbol is oriented to its current heading.

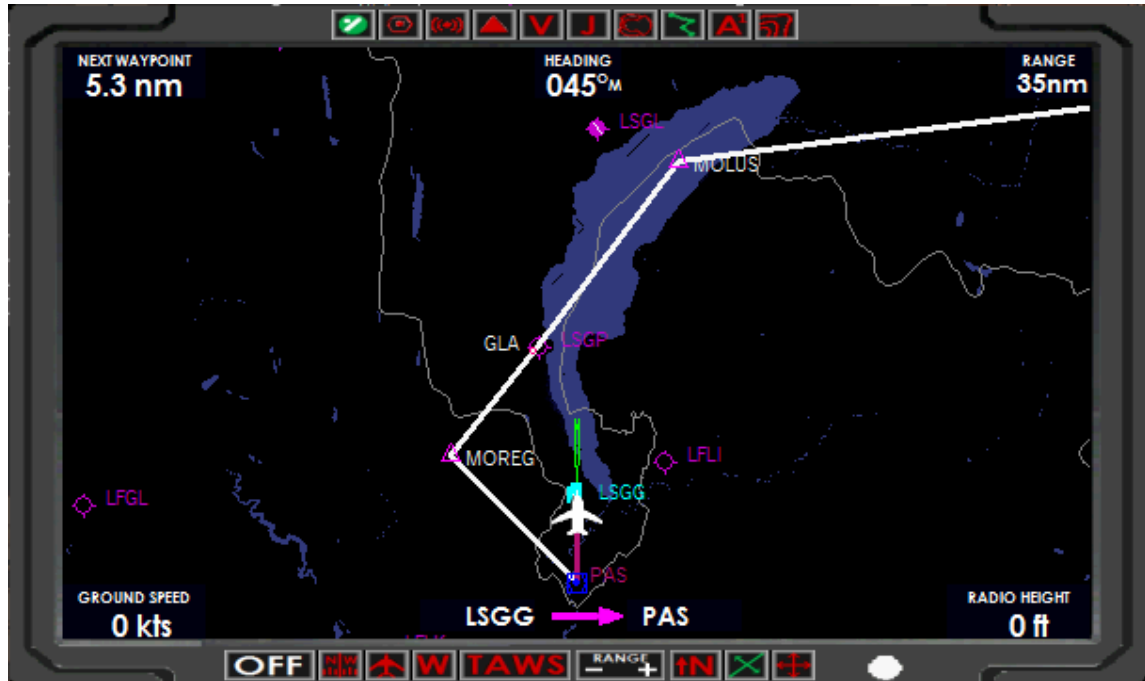


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Line Width Icon

Right click on this icon to increase the width of the Flight Plan line on the map or left click to decrease. The icon will become green when any change is made and will turn yellow when the minimum width has been reached. The number of clicks to change the line width depends on the size of monitor used. On a 1920X1080 monitor two clicks will change the thickness by one increment



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Move Map Icon

This icon will move the centre of the map in any direction and by any distance by multiple clicks. It is operated as follows:

- Left Click:** Move map to the left
- Right Click:** Move map to the right
- Mouse Wheel:** Move map up and down
- Centre Click:** Return map to centring on the aircraft

The left and right click buttons can be held down for repeated moves but a smoother and more controllable action can be achieved by rapid single clicking.

When the centre of the map is moved away from the aircraft the icon will turn yellow.



Aircraft moved off-centre

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