Aussie Star Flight Simulation

Basic GPS Operation

by
Greg Whiley

Another practical publication from Flight Simulation Australia

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www.flightsimaus.com.au
info@flightsimaus.com.au

Introduction

This short tutorial is intended for those who are new to flight simulation and have little or no experience of the use of the Garmin *GPS 500* and GPSMAP 295 navigation receivers. It will cover the following aspects of the GPS:

- How to access the GPS receiver within flight simulator
- An explanation of the fundamental operational buttons, knobs and windows
- How to activate a 'GPS direct' flight.

A significantly more detailed tutorial document on the full capabilities and operation of the Garmin GPS 500 and the Garmin 295 GPS can be found in the Aussie Star Flight Simulation (ASFS) publication, *Flying with the GPS*, available on the ASFS website. That publication is adapted from the article *Using the GPS* found in the FSX Learning Centre which itself is based on the article *Garmin GPS 500 Pilot's Guide and Reference Manual*, published by Garmin Corporation, and adapted with permission for use with Flight Simulator. This manual provides a comprehensive explanation of the Garmin GPS 500 and GPSMAP 295 GPS receivers and explains the function and operation of each GPS screen or 'page'. The illustrative graphics have been amended to provide an Australian context.

Fully utilised, the GPS can pretty much perform all the horizontal navigational features of a flight management computer (FMC) and can considerably enhance the realism of flying. There is a move by authorities to progressively replace VOR navigation with the GPS. The debate on this seems to be a hot topic on many a forum. But the fact remains that in the foreseeable future both VOR and GPS navigation will have its place in aviation navigation:

- GPS is best for high altitude, long range and over water navigation
- VOR is best for low altitude, medium to short range (over land) navigation
- VOR routes are more standardised to enhance the awareness of users of high density traffic.
- Finding an airport if you are lost.

Displaying the GPS receiver

Flight Simulator displays the GPS receiver in a pop-up window on top of the main instrument panel. You can access it using either the mouse or the keyboard.

To display and hide the GPS while flying any aircraft equipped with the receiver:

Click the **GPS** icon on the main panel

OR
Press **Shift+3** on the keyboard

OR
On the **Views** menu, point to **Instrument panel** and select **GPS**

Moving and resizing the GPS window

You can move the GPS window anywhere on screen and resize it. Just click and drag. By doing this you can effectively integrate the GPS window into the main panel as shown opposite.

If operating two screens, you may elect to have the GPS unit on the second screen. To move the GPS window across, right click on the window, click 'Undock Window' on the popup window, and click and drag to the other screen.

Operating the GPS

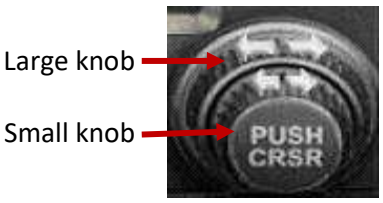
The GPS unit is operated by the use of knobs and buttons. To manipulate the knobs and buttons on the GPS units, use your mouse just like you'd use your hand in a real cockpit.

Two GPS Units, same functionality

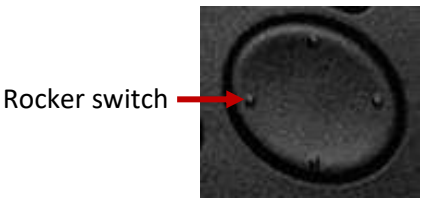
Flight Simulator includes two GPS units, a "panel-mounted" version and a "portable" version. Both Flight Simulator GPS units have nearly the same functionality, modelled after the real-world Garmin GPS 500 receiver, although the portable version looks like a Garmin GPSMAP 295. The two units have buttons in different places, but they do the same things.

Using the GPSMAP 295

The GPS 500 has a large inner knob and a small outer knob. The GPSMAP 295 has a rocker switch that performs the same functions as the knobs on the GPS 500. Whenever the procedures in this document mention a knob on the GPS 500, use the rocker switch if you're flying with the GPSMAP 295.



GPS 500 knobs



GPSMAP 295 rocker switch

When the instructions say to "turn" the small knob on the GPS 500, click the left or right side of the rocker switch on the GPSMAP 295. To "turn" the large knob, click the top or bottom of the rocker switch. Whereas the GPS 500 has a **CRSR** button integrated into the small knob, the GPSMAP 295 has a separate **CRSR** button.

Button and Knob Functions

Like any computer, the GPS units in Flight Simulator are equipped with both a display and an input device. The GPS receiver's buttons and knobs are used to switch among pages and page groups, and to access and enter information. Both the GPS 500 and the GPSMAP 295 units in Flight Simulator offer nearly the same

functionality, as illustrated on the figures below. The following diagrams and table show the function of each of the buttons in both the Garmin 500 and the GPSMAP 295.

Knobs

The GPS 500 includes two adjustment knobs: an **inner small knob** and an **outer large knob**. When the instructions say to "turn" a knob, move the mouse over the arrows on the knob. A hand with either a **-** (minus sign) or a **+** (plus sign) will appear.

- The hand with the **-** appears, turns the knob to the left.
- The hand with the **+** appears, turns the knob to the right.

Remember: On the GPSMAP 295, use the rocker switch instead of the knob

Buttons

Press buttons to activate them. When the instructions say to "press" a button, move the mouse pointer over the button and click it.

1		The **Range** button (or the **IN** and **OUT** buttons on the GPSMAP 295) allows you to select the desired map scale. Use the up arrow side of the button to zoom out to a larger area, or the down arrow side to zoom in to a smaller area.
2		The **Direct-to** button provides access to the direct-to function, which allows you to enter a destination waypoint and establishes a direct course to the selected destination.
3		The **Menu** button is used to activate a specific leg in an active flight plan (not available on the GPSMAP 295).
4		The **Clear** button (or the **QUIT** button on the GPSMAP 295) is used to erase information or cancel an entry. Press and hold this button to immediately display the **Default NAV** (navigation) page, regardless of which page is currently displayed.
5		The **Enter** button is used to approve an operation or to complete data entry.
6		The **large knob** (top and bottom of the rocker switch on the GPSMAP 295) is used to select between the various page groups: **NAV**, **WPT**, **FPL**, or **NRST**. With the on-screen cursor enabled, the large knob allows you to move the cursor about the page.
7		The **small knob** (left and right of the rocker switch on the GPSMAP 295) is used to select between the various pages within one of the groups listed above.
8		The **cursor button** displays the on-screen cursor. The cursor allows you to enter data and/or make a selection from a list of options.
9		The **Procedures** button allows you to add instrument approaches to your flight plan. When using a flight plan, available procedures for your arrival airport are offered automatically. Otherwise, you may select the desired airport, then the desired procedure.
10		The **Terrain** button allows you to add a graphical depiction of the terrain to the **Default NAV** page and to the **Map** page.
11		The **Flight Plan** button (**ROUTE** button on the GPSMAP 295) allows you to see and follow a flight plan you've created using the Flight Planner, and to access instrument approaches.
12		The **Message** button (not available on the GPSMAP 295) is used to view Airspace Alerts.
13		The **Omnibearing Selector** button is used to select manual or automatic sequencing of waypoints. Pressing this button selects **OBS** mode, which will retain the current "active-to" waypoint as your navigation reference. Pressing the **OBS** button again will return to normal operation, with automatic sequencing of waypoints.
14		The **Nearest** button displays the **Nearest Airports** page. Rotating the small right knob steps through the other **NRST** pages.

Page Groups and Pages

The information that appears on the GPS screen is presented on **pages**, and you can only view one page at a time. Some pages are organised into groups of related pages, called **page groups**. Think of page groups as chapters in a book, and pages as the pages within each chapter.

There are three page groups in the Flight Simulator GPS units:

- The **Navigation** page group
- The **Waypoint** page group
- The **Nearest** page group.

For the purposes of this tutorial, only the Navigation (NAV) page group will be explained.

Navigation Page Group

The Navigation (**NAV**) page group includes two pages: the **Default NAV** page and the **MAP** page. While viewing any NAV page, rotate the **small knob** to select the other NAV page. To select a NAV page:

1. JPress and hold the **CLR** button (**QUIT** button on the GPSMAP 295).
   -or-
   Rotate the **large knob** all the way to the **left** to select the **NAV** page group. **NAV** will appear in the lower right corner of the screen.
2. Rotate the **small knob** to select the desired **NAV** page.

Default NAV Page

The Default NAV page appears when you first display the GPS . The **Default NAV** page provides a look-ahead map display indicating your current position.

Default NAV page (at Ballarat, Victoria)

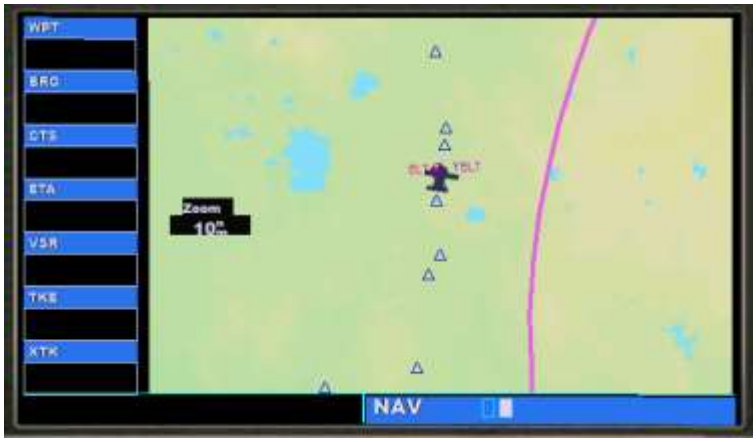
Moving anticlockwise from the top left, the components of the Default NAV page are:

A	**WPT**	The next **waypoint** in your flight plan you are flying towards. This could be a VOR, NDB, intersection (△) or airport. Where a 'GPS Direct' flight plan has been activated, the destination airport only will be displayed.
B	**BRG**	The **bearing** or compass direction from your current position to the next waypoint.
C	**CTS**	The **course to steer** is the recommended direction to steer in order to reduce course error or stay on course. It provides the most efficient heading to get back on the desired course and proceed along your flight plan path. Handy if you have lost geographic and visual reference to the airport if flying locally e.g. flying circuits.
D	**ETA**	The **estimated time of arrival** you will reach your next waypoint. Unless you are flying 'GPS direct', this is not the arrival time at your destination airport, but to the next waypoint.
E	**VSR**	This is the **vertical speed required** to climb or descend from your current position and altitude to reach the altitude of the next waypoint or the destination runway, based upon your current ground speed.
F	**TKE**	The **track angle error** is the angle difference between the desired track and your current track or heading. To reduce the track angle error to zero: if the TKE is a negative number, turn left; if a positive number, turn right.
G	**XTK**	The **cross track error** is the distance you are off the desired course in either direction, left or right.
H	**GS**	The **ground speed** is the velocity you are travelling, relative to a ground position.
I	**CDI**	The **course deviation indicator** shows your position at the centre of the indicator, relative to the desired course (the moving course deviation needle). The **TO/FROM** arrow in the centre of the scale indicates whether you are heading to the waypoint (an up arrow) or if you have passed the waypoint (a down arrow).
J	**ETE**	The **estimated time en route** is the time it will take to reach the next destination waypoint from your current position, based upon current ground speed.
K	**DIS**	This is the **distance** from your current position to the next waypoint.
L	**TRK**	The **track** is the current direction of movement relative to a ground position
M	**DKT**	The **desired track** is the desired course between the active **from** and **to** waypoints.

If you do not select a flight plan or direct-to waypoint, the GPS will only display speed and track data. All other data types will appear blank until you select a destination. Further, A GPS receiver cannot determine an aircraft's heading, only its track across the ground. Never assume that the **TRK** (track) on the GPS display is the same as your heading. If there's a crosswind, it won't be.

Map Page

The second **NAV** page, the **Map** page, displays your current position (an airplane symbol in the centre of the screen), along with nearby airports, navigation aids, airspace boundaries, lakes, and coastlines. Whereas the **Default NAV** page is oriented with the current GPS track up, the **Map** page is oriented with north up.



Map page display (at Ballarat, Victoria)

Along the left side of the page, the GPS unit displays the same data fields as on the **Default NAV** page. To select the **Map** page, turn the **small knob** to the **right**:

Flying GPS Direct

The following example will show how to plan a direct flight from Ballarat airport in regional Victoria to Moorabbin airport in Melbourne.

To select a direct-to destination

1. Press the **Direct-to** button **(A)** The **Select Direct-to Waypoint** page will appear, with the waypoint identifier field highlighted and flashing. **(B)**
2. Click the **small** knob **(C)** once to the **left.** The first letter in the waypoint identifier will flash.
3. Type the waypoint identifier on your keyboard. In this case it will be **YMMB** for Moorabbin Airport.
4. Press the **ENT** button once to confirm the selected waypoint, and twice more to activate the direct-to function.

Select Direct-to Waypoint page

You have now planned a GPS Direct course from Ballarat to Moorabbin Airport, Melbourne.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