San Francisco

FMC Gauge

Version 1.0

Documentation

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FMC Gauge

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INSTALLATION

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

To install it **copy the FMC.CAB to the FSX \Gauges folder**.

To install the gauge in an individual aircraft the panel.cfg must be modified either by adding a new overlay or adding to the main panel if there is space. If there is a slot in the VC it can also be installed there.

If you are unfamiliar with changing the panel.cfg file please note that the panel.cfg file is in a \panel subdirectory of your aircraft folder (which is at …\Simobjects\Airplanes\[Your aircraft]) and can be edited using Microsoft NotePad.

New Popup Gauge

To create a new popup gauge the following text needs to be inserted into the panel.cfg after the last [Windownn] section in the panel.cfg.

```
[Windownn]
Background_color=0,0,10
size_mm=325,512
windowsize_ratio=1
position=0
visible=0
ident=10031
window_size= 0.255, 0.475  (for 1920X1080 screens)
or
window_size=0.203, 0.569   (for 1600X900 screens)
or
window_size=0.317, 0.67    (for 1024X768 screens)

gauge00=FMC!FMC,  0,0,325,512
```

[Windownn] needs to be changed to a number one greater than the last [Windownn] in the panel.cfg.

In addition there needs to be an additional Windownn= statement at the beginning of the panel.cfg. nn needs to be the same number as the inserted [Windownn]. The new window can be called anything – e.g. Window07=FMC.

See below for positioning and sizing

The ident of 10031 is for use with the FMC Icon described below. If you want to call this panel using other methods this can be changed but it will then not be called by the FMC Icon in the package.

To load this panel you can use the icon that is supplied and add the following line to your main panel:

```
gaugenn=FMC!FMC Icon,  xx, yy, 25, 25
```

xx and yy are the coordinates where to locate the icon and 25,25 is the size. It is best to position the icon next to other icons on the screen and size it to a matching size. nn needs to be different to all other gauges in the panel – it can continue beyond 100 but no gaps in the sequence are allowed after a certain point – around 50.

Adding the Gauge to the Main Panel

The following line needs to be added to your main panel:

```
gaugenn=FMC!FMC,  xx, yy, 325, 512
```

Again nn needs to be a unique number while xx and yy are the coordinates on the panel. A size of 325, 312 is suggested but can be changed to suit the panel you are fitting to. Changing the ratio of the sides is not recommended.

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 suggested in the installation instructions above is 0. 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
```

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:

```
Windowsize_ratio=n.nn
```

In the installation instructions a ratio of 1 has been recommended on a screen size of 1920X1080. The size can easily be changed simply by changing the Windowsize_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 **Windowsize_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.

INSTRUCTIONS

Introduction

This gauge was inspired by the Bendix FMC gauge written by Garrett Smith which is included with many aircraft. This gauge however is completely new and although it has very similar functions to the Bendix gauge it uses completely different methods.

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

- Tuning of ILS frequencies (no more map lookups)
- COM and NAV Radios Tuner
- Full function VNAV for any flight plan
- Nearest Airports, VORs, NDBs, and Intersections can be searched up to 3 pages
- High resolution terrain Maps with terrain shadowing
- Other aircraft display (TCAS)
- TAWS Map
- Flight Plan Map
- Detailed Flight Plan
- Easy navigation between pages
- Approach selected and activated with two mouse clicks
- Runway lists
- Movable map
- Approach Transition selection

This gauge is for FSX. It does not work on earlier versions of Flight Simulator. It can work on pretty much any aircraft. It should work in P3D as well. It will work on any screen size although reasonably high resolution is recommended.

Start Up

At start up a blank screen is display and a function can be selected by clicking on any of the function keys. If no Flight Plan is loaded the message “No Flight Plan Active” will display at the bottom of the screen. If a Flight Plan is loaded the message “EN ROUTE ACTIVE” will display at the bottom. Although most functions do not work if there is no Flight Plan, the Maps, Radios, and Nearest functions still work.

INIT Menu

The INIT function initially displays a selection screen to choose either PERF INIT or POS INIT. The bottom two buttons can also be use to switch between different functions.

PERF INIT Function

The PERF INIT Screen displays information about Fuel and Wind for the flight. At the bottom of the screen is a flashing cursor which allows the Cruising Altitude and the Transition Altitude to be changed. Initially by default the Cruising Altitude is set to the cruising altitude defined by the FSX Flight Planner. The Transition Altitude is set by default to 10,000 feet.

Either of these can be changed by keying in a new value then clicking on the button next to the item to change.

POS INIT Function

The POS INIT screen displays positional information about the aircraft. Data on this screen can not be changed.

RTE Function

The RTE Function displays details of the route to be followed. There is no limit on the number of flight segments in a flight plan and in the example shown there are 75 flight segments. This is a flight plan from Geneva to Dallas-Fort Worth.

The arrow on the left designates the current flight segment. Column 3 shows the length of each flight segment and column 4 shows the remaining distance to run to the destination.

APPR Function

The APPR function initially shows all of the Approaches available at the destination airport. In the example of Dallas-Fort Worth there are no less than 37 Approaches to choose from.

Multiple pages can be scrolled using the NEXT and PREV buttons.

To select an Approach click on the button next to the Approach. A list of Transitions to the selected Approach will then display.

APPR Transition Function

The APPR Transition Screen will display all of the Transitions available for the Approach. A Transition can be selected by clicking on the button next to it. Although the number of Transitions per Approach is usually small, multiple pages can be displayed.

Selected APPR Transition

On selection of an Approach and Transition the screen above will appear showing details of the selected Approach. By clicking on the TUNE ILS button the NAV 1 radio active frequency will be tuned to the ILS frequency for this Approach. This can be done at any time.

Clicking on the ACTIVATE button will Activate this Transition and Approach Flight Plan which will replace the current En Route Flight Plan. Note that this can be done at any point in the Flight and, when activated, the aircraft will fly directly from its current position to the entry point of the Transition.

After Activation the Approach Flight Plan can be deactivated and the Flight Plan will revert to the original Flight Plan.

After Activation the Flight Plan (RTE Function) will look like this:

Note that the first segment is always from the position of the aircraft at Activation to the first Waypoint in the Transition. In this example Approach was activated right at the beginning of the flight.

The Altitudes shown are Altitudes fixed from FSX and can not be changed.

COMS Function

The COMS Function displays the frequencies of the COM 1 and COM2 Radios as well as the Transponder Code.

The frequency can be changed by clicking on the button next to the Standby Frequency and rotating the Tuning Knob at the bottom right. This knob is rotated using the left and right mouse buttons. To change from whole number to decimals use the centre click mouse button on the Tuning Dial. In order to swap the Active and Standby Frequencies select the frequency then click on the ◄► button.

Similarly the Transponder code can be changed a digit at a time with a centre click on the mouse to move to the next digit.

NAV Function

The NAV Function is similar to the COMS function but displays the frequencies for the NAV and ADF radios plus the OBS courses.

The Standby Frequencies and courses can be changed in a similar way to COMS using the Tuning Knob and the mouse centre click button. In order to swap the Active and Standby Frequencies select the frequency then click on the  button.

DTO Function

On entry to the DTO function this screen displays with a blinking cursor at the bottom of the screen.

Any Airport, VOR, NDB or Waypoint code can be entered here. Note that if an Airport code is entered only one airport will display so the full airport code must be entered. For other facilities, all facilities with the name entered will be displayed as shown in this example:

A waypoint displayed can be selected using the corresponding button and details of the Waypont will be shown like this:

If an Airport code is entered the result will be:

Clicking on the button next to the Airport will display:

In this case there is 12 pages of information which can be scrolled using the NEXT and PREV buttons including Runways:

and Frequencies:

Clicking on GET MAP on any of these screens will display a map centred on the selected airport or Waypoint.

VNAV Function

Selecting the VNAV function initially presents the first page of the Flight Plan with speeds and altitudes against each waypoint.

The VNAV function is designed around a typical flight profile which, for the purposes of VNAV, is made up of 3 phases – Climb, Cruise, and Descent.

The Climb phase is assumed to take place within the first 5 sectors of the flight plan. Therefore the speeds and altitudes in the first five sectors on page 1 can be changed individually. The gauge prefills the speeds and altitudes for subsequent waypoints where possible. Waypoints on Jet airways in FSX have minimum altitudes built in and the FMC will not allow altitudes lower than the minimum altitude. The minimum altitude can be seen in the example above at TUNOR and later waypoints where no altitude has been entered. Where there is no minimum altitude and no entry it will display as at DJL. The FMC sets the default airspeed at the beginning to 250 knots which is valid for jet aircraft but probably too fast for most propeller aircraft.

When a speed or altitude is changed all subsequent sectors are changed to the same speed or altitude. It is not necessary to enter speeds and altitudes for every waypoint.

Once the 5th sector is passed the FMC assumes that the aircraft is now in Cruise mode and the speed and altitude are perpetuated for the remainder of the flight. Nevertheless both the speed and altitude can be modified twice during the cruise phase at any point in the flight. The new speed and/or altitude will be perpetuated for the remainder of the flight when changed. The altitudes during Cruise still remain subject to the minimum altitudes contained in FSX.

For descent the FMC assumes that it will take place some time in the last 5 flight sectors. Consequently the last 5 flight sectors can be changed individually. Note however that since there will be a switch to Approach mode with a Transition/Approach Flight Plan towards the end of the flight it is less critical to update the descent profile in the En Route Flight Plan. Generally a descent would be calculated down to the entry point altitude of the Transition.

Activating VNAV Mode will transform the screen like this:

When VNAV mode is activated the FMC will pass the speeds and altitudes to the Autopilot as the corresponding waypoint is reached. While activated the pilot will be unable to change the Autopilot speed and altitude. Note that the FMC will NOT switch on the Autopilot but will pass the speeds and altitudes whether the Autopilot is on or not. VNAV speeds and altitudes can still be changed after activation.

When VNAV is activated the message VNAV ON appears at the bottom of the screen on all non-entry screens as shown here:

Also note that during descent phase when speeds may drop the FMC will not extend flaps – the pilot must ensure that flaps are at the correct setting for the speed selected.

During approach mode the speeds can be modified for up to 20 flight sectors but altitudes can not be changed.

Approach VNAV screen looks like this:

PROG Function

The PROG function shows the planned progress of the flight for the next two flight sectors. ETA will not display until the aircraft is airborne.

MAP Function

The MAP function displays a map centred on the aircraft position. Different data will display on the screen when the different buttons are pressed. For example pressing the TAWS button will display a map like this:

The default range of the MAP is 15 nautical miles. This can be increased or decreased with the ZOOM buttons.

NRST Function

The NRST function initially displays the screen shown above. From this a list of nearest Airports, VORs. NDBs, Intersections/Waypoints, or Airspaces can be displayed as shown in the examples below. The system is set to display 3 pages of nearest items.

FMC Gauge


Honeywell
NEAREST VORs 1 / 5
VOR DISTANCE BRG FREQ
< GVA 2.4 nm 045°T 115.750 Mhz
< PAS 5.4 nm 225°T 116.600 Mhz
< SPR 20.7 nm 045°T 113.900 Mhz
< CBY 24.9 nm 214°T 115.400 Mhz
< CBP 24.9 nm 214°T 115.900 Mhz
< AIRPORTS NDBs >
EN ROUTE ACTIVE
INIT RTE APPR COMS NAV
DTO VNAV PROG MAP NRST
PREV NEXT
A B C D E


Honeywell
NEAREST NDBs 1 / 3
NDB DISTANCE BRG FREQ
< GLA 12.6 nm 030°T 375.0 Khz
< AT 22.1 nm 188°T 384.0 Khz
< BOR 33.4 nm 268°T 423.0 Khz
< CH 39.0 nm 193°T 346.0 Khz
< MO 54.0 nm 275°T 400.0 Khz
< VORs INTERSECTIONS >
EN ROUTE ACTIVE
INIT RTE APPR COMS NAV
DTO VNAV PROG MAP NRST
PREV NEXT
A B C D E

TRICK: The number of pages displayed can be increased or decreased using the top right buttons. The first button decreases the number of pages and the second button increases it. There is no limit to the number of pages but the more there are the slower it will be.

Entering Data

Some screens in the FMC allow the input of data including the PERF INIT, COMS, NAV, DTO, and VNAV functions. Data may be entered either through the keyboard or by clicking on the keyboard incorporated in the FMC.

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There is no guarantee that any message will be replied to or that any requested action will be taken.