

CHALK RIVER GRAPHICS

# CrgSim Documentation

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## Installation and User's Guide

Chalk River Graphics

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## Table of Contents

FSX, Prepar3d, and FSX Steam:.....	5
Quick Start 1 Instrument.....	5
Quick Start 2 Instruments.....	6
One Click Start - Multiple Instruments.....	7
One Click Shutdown.....	8
Quick Start 3 Instruments.....	9
Forward.....	11
What is in the Zip File?.....	14
Basics.....	15
Our Test Setup.....	19
Installation and Configuration.....	22
Recommended File Locations.....	22
FSX Interface Program.....	24
Prepar3d Interface Program.....	25
Communications Manager.....	26
Primary Flight Display (PFD) - Captain's Side.....	28
Primary Flight Display (PFD) - First Officer's Side.....	35
EICAS.....	36
NAV Display - Captain's Side.....	40
NAV Display - First Officer's Side.....	50
CRG Locals.....	50
Sound Module.....	54
Utilities Module.....	62
Utilities - Flight Plan Manager.....	65
Flight Plan - Load.....	66
Flight Plan - Edit.....	66

Flight Plan - Import.....	68
Flight Plan - Errors.....	70
Flight Plan - Duplicate Way Point Names.....	73
Flight Plan - Notes.....	74
Utilities - Load Profile.....	76
Utilities Module - Keyboard Interfaces.....	79
Utilities - Autopilot.....	80
Utilities - Radios.....	82
Utilities - Nav Display.....	83
Utilities - Status Window.....	85
Utilities Configuration.....	87
Installing a TO/GA button.....	89
OpenCockpits IOCP Interface (EFIS).....	91
GoFlight Interface (Radios, EFIS and MCP Pro).....	94
How To.....	99
Change Variables.....	99
Change the Nav Display Range.....	100
Change the Nav Display Mode.....	100
Select Object Type Viewed in the Nav Display.....	101
Change Radio Frequencies.....	101
Toggle “Flight Dir”, “Thrust Arm”, and “Autopilot”.....	101
Toggle “VNAV” and “LNAV”.....	102
Change the barometer setting.....	102
Toggle the Nav display of airport names at 80 NM.....	102
Change Autopilot Heading, Altitude, and Speed Values.....	103
Load a New Aircraft Profile.....	103
Load a Flight Plan.....	103
View status of current variables (Speed, Altitude, Heading).....	104

Just select an airplane and fly.....	104
Loading and using a Flight Plan with the Autopilot.....	104
Preventing FSX sound from stopping when selecting another window on the FSX computer.....	104
Configurations Tested in the Lab.....	105
Charts.....	107
Flying with a Flight Plan.....	110
FSX Add On Compatibility.....	114
Auto Land.....	115
Colorado Springs To Jackson Hole.....	117
An Infinite Flight Plan.....	118
15 Inch LCD Panels.....	120
Running a charts only system.....	120
Running a sound only system.....	121
Keyboard Alternative.....	122
In Case of Trouble.....	123
Display Considerations.....	125
Network Considerations.....	127
Units Conversion.....	127
Performance.....	127
Nav Display TCAS Notes.....	129
No Com, No Sim, No Int.....	131
Contact.....	131



## FSX, Prepar3d, and FSX Steam:

This documentation was originally written when FSX was the only flight simulator these instruments were connected to. Since then the flight sim community has more choices. As you read the following pages and you see the term “FSX”, please mentally substitute all of the flight simulator choices. A future issue of this document will be reworded to include all of the possibilities.

### Quick Start 1 Instrument

Here is a quick way to try things out.

- Copy the CrgSim distribution to your FSX computer (best to select a directory other than one of the “Program Files” directories.
- Unzip the CrgSim distribution.
- Start FSX
- In the CrgSim directory **/FSX** start crgfsx.exe
- In the CrgSim directory **/ComMgr** start crgcom.exe
- In the CrgSim directory **/PFDLeft** start crgpfdl.exe
- Many FSX versions start with the Ultralite Trike as the default. Start flying this or any other aircraft that you like. Your Primary Flight Display Instrument started in the upper left of the screen should track the aircraft's movements.
- Time to add another instrument.

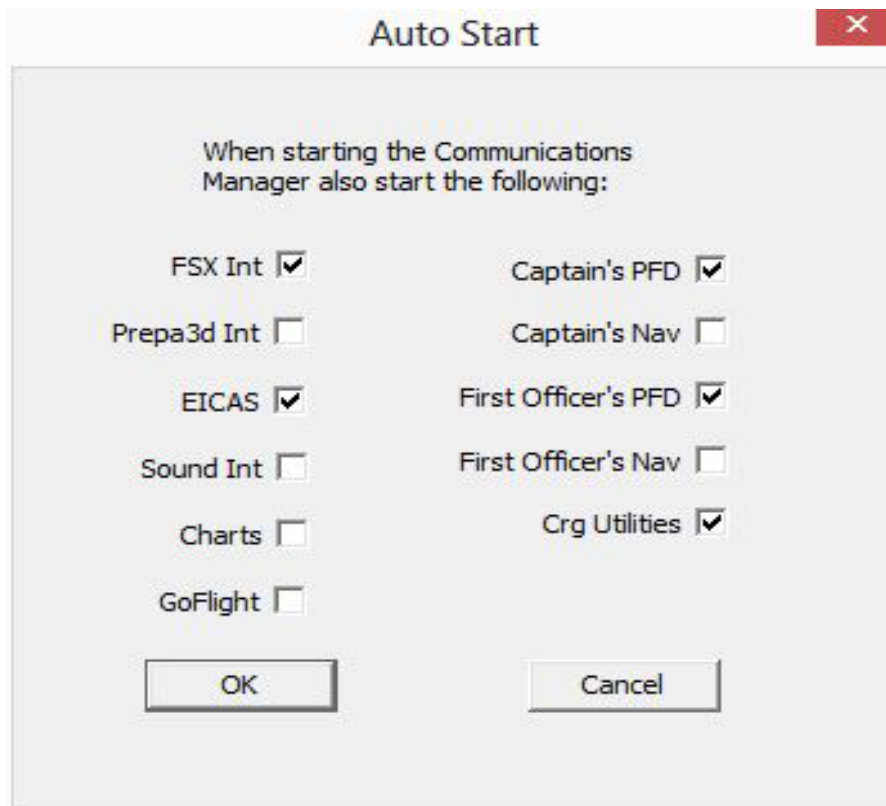
## Quick Start 2 Instruments

- Follow the steps above and then in the CrgSim directory **/NavLeft** start crgnavl.exe.
- Pick an aircraft and fly it. The aircraft movements should track in both the Nav Display and the Primary Flight Display.
- The Nav Display range will probably not be what you like but we cover changing the range later on.

## One Click Start - Multiple Instruments

The following information is best to read after you have selected the instruments that you want to run, decided which computer they are to run on, configured their size, and location, and now want to configure an easier start up.

Although CrgSim components can be run on multiple computers in many cases you will want to run multiple instruments on the same computer. This section describes how you can start all of the instruments that are running on the same computer as the communications manager with one click. On the communications manager screen click on the button labeled "Edit Start File". The following window will appear:



Check the boxes for the other instruments or components that you want to automatically start every time the communications manager starts. This shortcut will only work with CrgSim components that you want to run on the same computer as the communications manager.

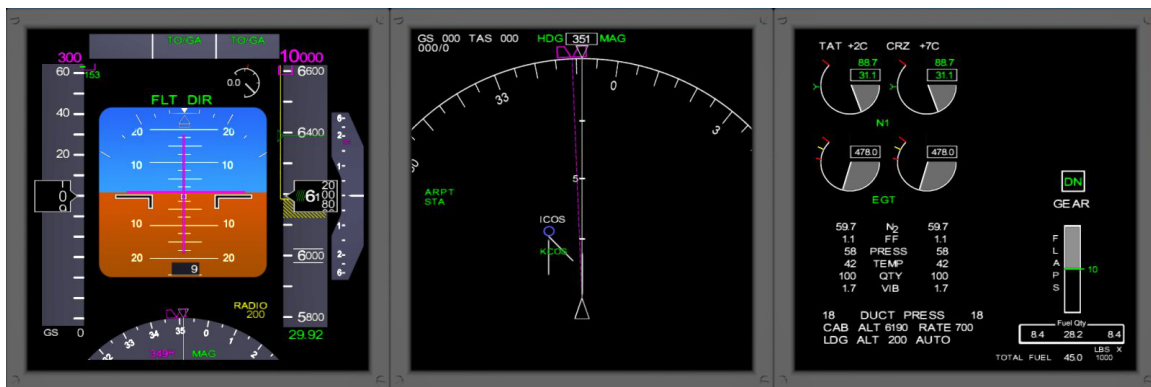
If you want to start up each instrument individually or if they all run on other computers then there is no need to check any of the boxes.

### **One Click Shutdown**

To shutdown the entire CrgSim system just click the “Exit” button on the communications manager window. All of the components will exit regardless on which computer they are running.

## Quick Start 3 Instruments

Although CrgSim was written to support multiple computers and multiple screens, in many cases you may be able to run everything on the FSX computer provided it is powerful enough and you have an extra screen. This section describes how to get started with a two screen layout and has the additional benefit of not having to read the rest of the documentation until later. If you tried out the quick starts above with no worries then this step should work just fine. When successful you should have 3 instruments similar to the picture below:



First the system requirements:

All graphic instruments - require Vista, Win 7, or Win 8 with a graphics card that supports DirectX10. Your system may not have the DirectX10 drivers installed. If not, you can download the drivers from Microsoft. Download **directx\_Jun2010\_redist.exe** and install per directions.

Non-graphic programs (crgfsx.exe and crgcom.exe) - should run on XP as well as the system described above.

To start: copy the CrgSim distribution to the FSX computer (preferably not one of the “Program Files” directory) and unzip the file. Now follow the steps below. If anything goes wrong then it's time to read the rest of the documentation. Also, as you start up each instrument you can press function key 2 and by following the screen directions adjust the instrument size and instrument location. For the 3 Pak display above each instrument was 533 pixels wide on a 1600 pixel wide screen.

- Move into the CrgSim FSX directory and start `crgfsx.exe`.
- Move to the CrgCom directory and start `crgcom.exe`.
- In the PfdLeft directory start `crgpfdl.exe`. Adjust instrument size and location by selecting the PFD instrument (click on it) and pressing the F2 key.
- In the NavLeft directory start `crgnavl.exe`. Adjust instrument size and location by pressing the F2 key.
- In the Eicas directory start `cргеicas.exe`. Adjust instrument size and location by pressing the F2 key.
- Start up FSX on one of the remaining screens.
- If running the GoFlight MCP Pro and/or EFIS now is a good time to start `crgGF.exe` in the GoFLight directory

The steps above should get you started. Additional features are explained in the rest of the documentation.

You may want to start the program (`crgutil.exe`) in the FlightUtil directory if you intend to use flight plans or need a keyboard interface

to FSX and CrgSim variables.

## Forward

CrgSim was written as a programming exercise and to provide an environment that we like to use when flight simming. The environment assumes that there will be no visible main aircraft panel nor will any of the other “sub windows” such as throttle quadrant or radios be visible on the main screen. The only graphics that FSX provides in our setup is the main scenery window.

This assumption has several side effects.

First: some form of input had to be provided to make up for the desire not to use FSX sub windows. As an example: to change radio frequencies it is necessary to use hardware such as the Saitek Radio Module or to use the functionality provided by a separate CrgSim utility program called `crgutil.exe`. Similarly, autopilot variables can be changed with the GoFlight MCP Pro or by the `crgutil.exe` utility program.

Second: since no part of the cockpit or airplane is visible in our setup the type of aircraft selected to fly is not apparent. Flying a default airbus looks the same as flying the default 737 or some other default regional jet. The selected aircraft mainly provides flight dynamics and the absence or presence of some features. For example an aircraft may not have the Nav2 set of radios or may not have “Throttle Arm”.

All interaction, by design, is between CrgSim and FSX (or Prepar3d). So if a third party add-on aircraft operates with the same interaction with the simulator then it should be usable with CrgSim. However, since for our setup, the third party aircraft is not visible, the main benefit that we receive is perhaps a different and more realistic set of flight dynamics and improved sound files. Of course, for your

configuration you may want to have a cockpit view as well as some of the sub windows visible most or all of the time. It's your flight simulator and you get to configure it anyway you want.



We use this software frequently and have discovered and eliminated many things that detract from the flight simming experience for us. Your input on what you like, or don't like, or believe to be wrong is most welcome.

New feature suggestions are also solicited and welcome.

## What is in the Zip File?

The zip file contains 5 instruments and 5 support programs.



- EICAS - Engine Indicating and Crew Alerting System display (crgeicas1.exe) located in directory **EICAS**.



- Captain's PFD - Primary Flight display (crgpfdl.exe) located in directory **PFDLeft**.
- First Officer's PFD - Primary Flight display (crgpfdl.exe) located in directory **PFDRight**.



- Captain's Nav Display - Navigational display (crgnavl.exe) located in directory **NavLeft**.
- First Officer's Nav Display - Navigational display (crgnavr.exe) located in directory **NavRight**.

The support programs:

- **Sound** - Sound module (crgsound.exe) located in directory **Sound**.
- **Communication Manager** - central CRG network switchboard (crgcom.exe) located in directory "ComMgr".
- **Flight Utility** - keyboard interface, flight plan loader, and flight plan editor (crgctrl.exe) located in directory "Utilities".
- **FSX Interface** - the CRG interface to FSX located in the directory "FSX".
- **Prepar3d Interface** - the CRG interface to Prepar3d located in the directory "Prepar3d".
- 

Note: A moving chart program is available in two separate zip files. Documentation for the charts is included in the first zip file.

## Basics

This software provides the ability to display a "real life" sized Primary Flight Display (PFD), Nav Display (ND), and EICAS Display for users of Flight Simulator X. Two PFDs, two Nav displays, one EICAS display, and one Chart display are provided. One set of PFD and Nav displays for the Captain, one set of PFD and Nav displays for the First Officer, and one shared EICAS and Chart displays. The instruments may be run on a different computer (or computers) than the one the simulator is executing on (and should be for best results if the main FSX computer is short on extra CPU cycles).

The NAV displays are independently configurable while flying and each display can have different ranges and modes of operation.

You can run as many or as few of the components as you need. If you are running a single place cockpit then you may want to display just the Captain's PFD and the Captain's Nav Display.

If you have an older computer that you would like to put to good use you may be able to run the CrgSim modules that do not require DirectX10. These include Utility, Chart, and CrgSound.

The Boeing 777 PFD and ND were used as models. Some instrument features are absent but hopefully will not detract from your enjoyment. Most of the testing was done with the FSX default 737 providing the flight dynamics and sound. **These instruments and associated programs are toys, do not use them in any way related to real life aviation.**

Since the Chart display, Comm Mgr, and Controller do not use DirectX but legacy GDI they should run on a Windows XP machine and can be used as a standalone display with just Crgfsx.exe and Crgcom.exe to support them (see below). The sound module should run on Vista and above.

There are a lot of components to CrgSim, the recommended way to use the system is to take your time and bring up one display at a time.

The original goal of the system was to be able to devote one computer to FSX (the most powerful one) and the view forward. No instruments or other displays are run on the main FSX computer to be able to get the maximum quality view. The main display in the test setup is spread across three 24 inch monitors and provides an acceptable level of immersion for us. Subsequent testing has demonstrated that we can run FSX, the CrgSim FSX interface, the communications manager, CRG Flight Utility, and three instruments on the one sandy bridge computer.

CRG Flight Utility (crgutil.exe) provides a keyboard interface to flight and system variables. The variables are divided into autopilot, Nav display, radio frequencies, and general status. CRG Flight Utility

reduces the need to open up a keyboard interface on the FSX computer. This program also includes a flight plan editor, a flight plan loader, and an aircraft profile loader.

Saitek radio hardware works just fine in our setup and allows the Control radio window to be removed.

The GoFlight EFIS and GoFlight MCP Pro interfaces provided by CrgSim allow you to connect these devices to most computers on your local network (see the GoFlight section for more information).

If you have autopilot (MCP/EFIS) hardware from one of the other vendors give it a try. This may eliminate the requirement for the Control autopilot window.

Beta support for Prepar3d is included with this distribution. Prepar3d version 1.4 is working with Windows 7 here in the lab. Instead of using crgfsx.exe (described in the following documentation) use program crgr3d.exe instead when trying to attach to Prepar3d.

Note: For all configurations you will need to start the simulator interface crgfsx.exe (or crgr3d.exe) and the communications manager crgcom.exe.

If you find a problem with the software please let us know. The web site is at [www.crgsim.com](http://www.crgsim.com). It is “read only” since we ran out of time and patience trying to clear the spam from the site. We can be reached at [sim30@crgsim.com](mailto:sim30@crgsim.com)

**Thanks and enjoy.**

## Our Test Setup

The figure below is an image of our test set up. It consists of 3 larger screens to display the scenery, airports, and cities and a set of screens in the foreground that display the instruments.



The 3 screens in the background are driven by a sandy bridge processor computer with a moderately good display card. There are only two main programs that execute on this computer when testing:

- The FSX program with all the instruments and cockpit display removed. In our test setup this gives the best frame rate. We load an aircraft to provide the flight dynamics and then using the options menus remove all visible trace of the aircraft from the screen.
- The CRG interface program. This FSX interface program communicates with FSX, the Prepar3d program communicates with Prepar3d, requesting the data it needs and then sends the data over the local net to the CRG communication manager on the same or another computer. No further processing is done on the FSX computer to preserve frame rates.

In the image above there are 3 foreground 15 inch screens with bezels placed in front of them to give the sense of two separate screens for each 15 inch display.

The outside screens running a PFD and Nav display each are driven by one win7 computer. The leftmost of these displays is a USB attached screen. This was a test to see how well one of these devices performs with the flight sim instruments. Our USB driven display works well, the instruments show up sharper and better looking than the non-usb screen but the update rate is not as smooth as the other non-usb display. Windows desktop is run on another screen attached to this computer and is not in the image above.



The middle screen with the moving chart display (washed out in the photo) and an EICAS are driven by a Win 7 laptop. The display connector is plugged into the VGA connection on the laptop. On the main laptop screen, the CrgSim sound module and keyboard interface/status screens (Control) are also running on the laptop.

On top of the instrument displays is a GoFlight MCP Pro and to the left of the mcp is a GoFlight EFIS. Both are connected with the CrgSim GoFlight Interface.

Not visible is a Saitek radio module which is used for compatibility testing.

## **Installation and Configuration**

To get started unzip the distribution file on one of your computers so you can move the individual components to the computer where they will execute.

CRGSim does NOT modify the registry nor create directories. Installation consists mainly of copying the various components to a directory of your choice on the computer that you plan to execute the component on. To uninstall, just delete the programs and directories that you created during installation.

The first thing to do is to determine where the various components will run. Since installation is relatively easy and since the network components automatically discover where the other components are located there is no complex configuration required. If you later determine you would like the CRG components to run on different computers, no problem, just move their directories to the new computer and start them up.

There is nothing to stop the execution of two copies of any program. For example two copies of the Captain's PFD (PFD Left) can be started but they will not run properly and will just confuse the communications manager.

## **Recommended File Locations**

The simplest way to organize the files on each computer is to create a folder at the highest level called crgsim ([c:\CrgSim](#)) and then copy the appropriate CrgSim component directories to this directory on each computer.

NOTE: To uninstall just delete the crgsim folder on the computer. To update (when a new version comes out) rename the folder to another name of your choice, create a new “c\CrgSim” and install the new version. Assuming you have modified the standard configuration files and want to keep your custom configurations then copy the config files (.cfg) from the old folder(s) to the new folder(s).

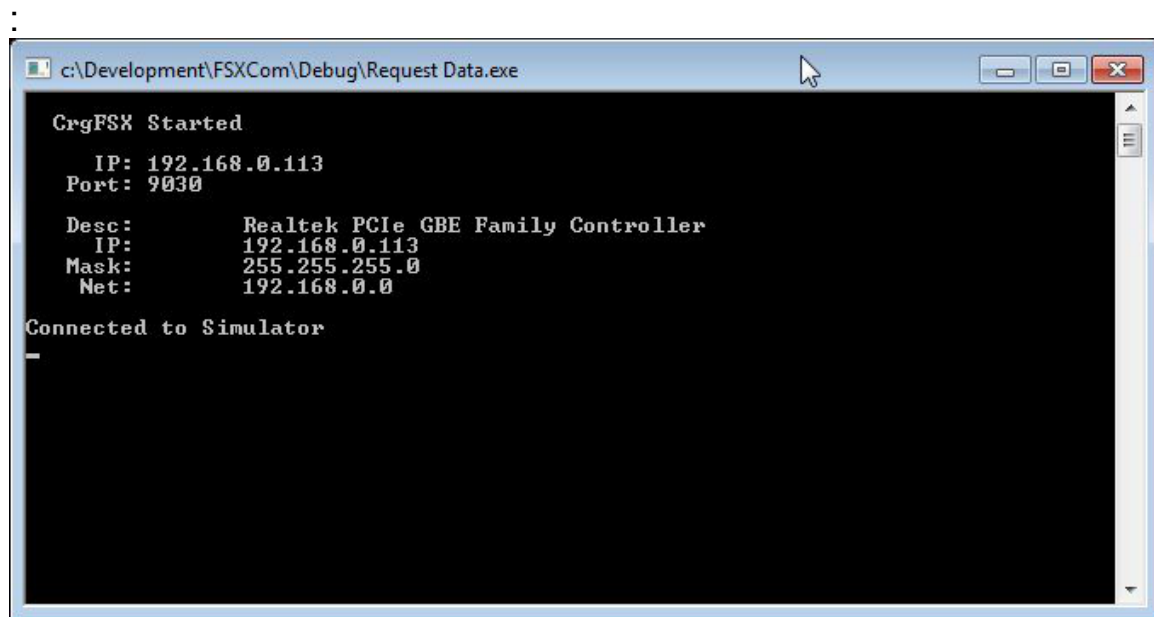
It is not recommended to install CrgSim programs in the “Program Files” or “Program Files (x86)” folder since some versions of Windows will not allow updates to files located in these folders (such as creating and updating program logs).

The best way to configure and run CrgSim is to tackle one component at a time. The following sections explain how to install and run each component. If you don’t wish to run one of the instruments just skip that section, it is not required that all of the instruments be running. In fact you could run just the sound module (no instruments) or just the Chart window if you choose. The minimum system would consist of the CrgSim FSX interface or the CrgSim Prepar3d interface program, the Communications manager and one of the instruments or sound module.

Our un-optimized FSX seems to take up 100 % of one of the cores in the 4 core sandy bridge machine and leave the other cores on average pretty much alone. We have done some testing with this machine: running crgfsx.exe (the interface to FSX), crgcom.exe (the communications manager), three of the instruments and FSX all on this machine to see if there are any frame rate hits or problems with the graphics. All of the crgsim components ran at the desired frame rate and FSX seemed unperturbed.

## FSX Interface Program

The program that communicates with FSX is called **crgfsx.exe** and is located in the FSX directory in the CrgSim distribution. Copy the FSX directory to the computer that you use for FSX. Start FSX and start **crgsim.exe**. After FSX completes starting up you should see the following window on the computer screen



For all configurations one of the simulator interfaces must be started: either **crgfsx.exe** for FSX or **crg3d.exe** for Prepar3d.

The window above indicates that the CRG interface program and FSX are communicating with one another. A good start.

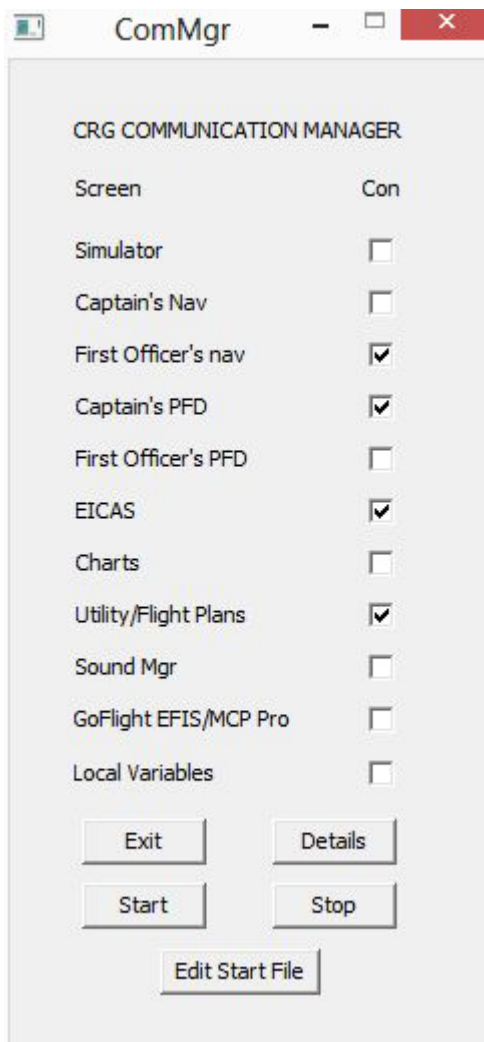
## **Prepar3d Interface Program**

The prepar3d interface window looks almost identical to the window above except that “Crgr3d Started” will display in the upper left part of the window instead of “CrgFSX Started”. If you are using Prepar3d copy the CrgSim Prepar3d folder to the computer running the Prepar3d simulator and start crgr3d.exe.

## Communications Manager

### Installation

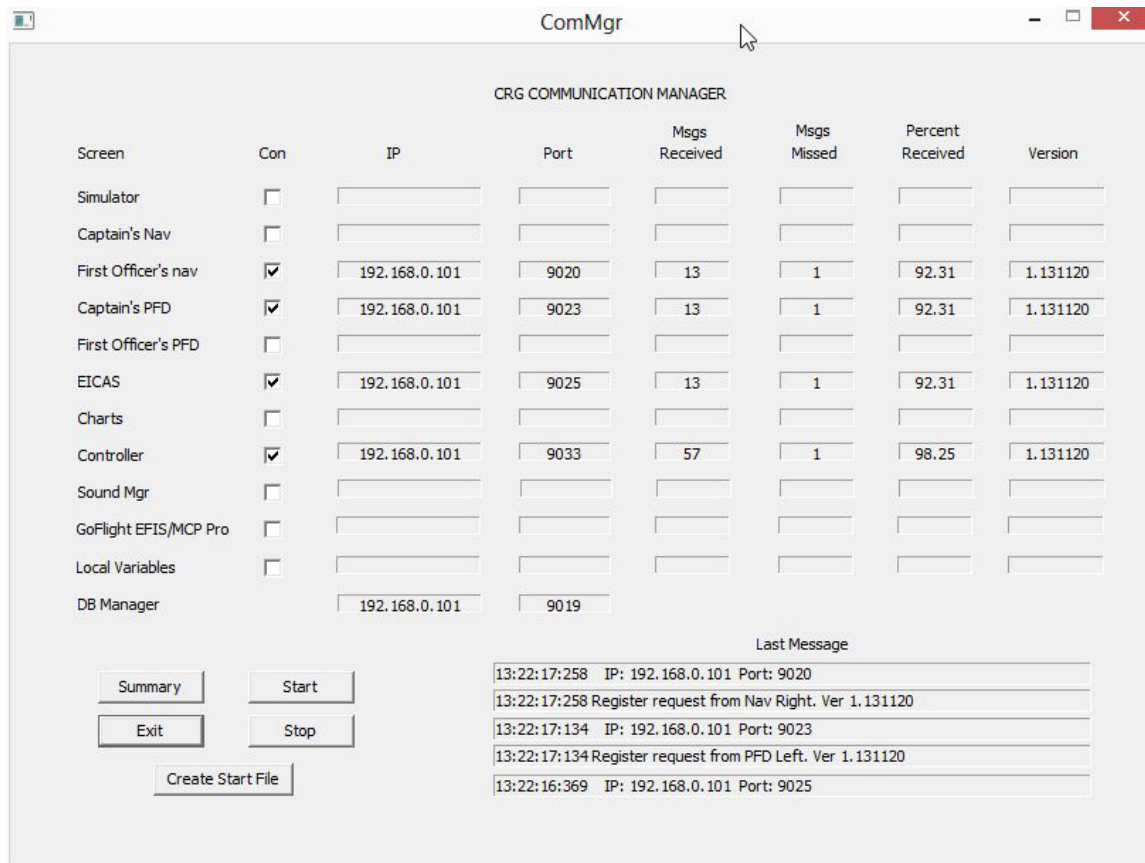
The communication manager (crgcom.exe) is the switching point for all data in CrgSim. It receives information from the FSX interface program and distributes it to all of the CRG programs that have registered with the Communications Manager. It is located in the ComMgr folder in the CrgSim distribution. Copy this folder to the computer that will run it. An older XP computer may be a good choice since the ComMgr does not use any DirectX graphics although a newer Win7 computer will be just fine. After starting the ComMgr you should see a window similar to the one below:



When the CrgSim components connect to the ComMgr a checkmark will appear in the “Con” column.

This is the summary form of the CmMgr. Clicking on the “Details” button will replace this window with the expanded ComMgr display that provides additional detail on the CrgSim networked components such as IP address and port of each registered component, total messages received by component, and percent of good messages received. (There will always be at least one message missed due to serial number syncing).

For all configurations the communications manager must be started.



The image above is the “Details” screen for the Communications manager. Click on the “No Details” button to go back to the summary screen.

On startup crgcom.exe will make one attempt to check if a newer version exists. If you do not want the program to check for new versions start the program with:

`crgsim.exe -nochk`

The ComMgr.log will contain an entry confirming the new version check choice.

At this time you have the CRG support software up and running. Now

it's time to start an instrument. This document is going to start with a PFD but if you would like to try another instrument first just drop down the list below until you find one you like.

## Primary Flight Display (PFD) – Captain's Side

### Installation

Copy the PFDLeft folder to the computer that it will be executed on and start crgfpdl.exe from within the folder. You should see the program start up and then display a PFD window similar to the one below:





There is a lot of information displayed on the PFD. From the image above we are able to determine that the autopilot target speed is 270 knots, the current speed as 266 knots, the target autopilot altitude **was** 11,000 feet although the aircraft is about to be engaged in following the glide slope down. The ILS receiver is tuned to 111.10 (Denver ILS). The ILS transmitter is 21.2 knots from the aircraft. The  $\frac{3}{4}$  dial just above and to the right of the artificial horizon is the current aircraft attack angle.

Although the vertical speed indicator is positive we can assume that when the glide slope is intersected the vertical speed will become negative as the aircraft follows the glide slope down into the Denver airport.

Similarly we can assume that the aircraft has intersected the localizer center line and will be turning slightly to the right to keep on the center line.

The flight mode annunciator tells us that auto throttle is controlling the speed of the aircraft and that both the localizer and glide slope signals have been recognized and are being used to control the aircraft through the autopilot.

The decision height is 200 feet.

This is a good time to go back to the FSX screen and select an airplane and location. The default 737 is recommended for this startup. The Colorado Springs, Colorado municipal airport is a good airport to start with for this documentation. To verify end-to-end connectivity go the main airplane panel and turn the "Flight Director" switch on and off. If the space just above the artificial horizon on the PFD changes from "OFF" to "F/D" you are good to go.

The PFD will appear in a window with no title bar or border. It will have a small black area in each corner. When placed on a solid black background the black will disappear and the corners of the bezel will be rounded. If you wish, use a windows screen configuration utility to set the screen background to black. In Windows 7 right click on an empty spot on the desktop and select “Personalize” from the drop down menu. The all black background selection is on this menu.

In the center of the display is an artificial horizon. The space just above the artificial horizon display is used for status information during start up. The start of the Captain’s PFD should also be reflected in the Communications Manager display.

The status of the PFD is displayed just above the artificial horizon.

- “ - - - -” (four dashes) indicates that the PFD is running OK but not yet connected to the Communications Manager.
- “NO SIM” means that the PFD is connected to the Communications Manager and that the Communications Manager is not yet connected to the Simulator Interface program (crgfsx.exe or crgr3d.exe).
- Once the PFD, the Communications Manager, and the Simulator Interface are communicating with each other the space above the artificial horizon reverts to prototypical use and shows the status of the display (OFF, FLT DIR, or A/P).

## PFD Configuration

To modify the instrument screen location and size select the instrument (click on it) and press F2. This will change the display and it will look like the image below. Use the + and - keys to adjust the instrument size and the direction arrows to move the instrument to the desired location. Press F3 to save the new instrument size and location. You can also select to display or not display the bezel at this time. Pressing the “b” key toggles the bezel display. Be sure to press F3 to save your new bezel selection. Press F2 to go back to the normal instrument display.

The configuration for each instrument is relatively similar. We will discuss in detail the configuration and configuration file for this PFD and then refer back to the discussion for most of the following instruments.



The number of pixels the window is moved or resized with one keystroke can be changed by pressing a number key 1 through 9. For example: to move the window one pixel at a time press 1 before using the direction keys. Then each press of a direction key will move the instrument one pixel. To move the window 9 pixels at a time press 9 before using the direction keys. Each press of a direction key will then move the window 9 pixels.

The instruments were tested within a range of sizes centered around 700 pixels. You should be able to vary this size with the configuration file from 550 pixels to 950 pixels and still have a nice look and feel. Fonts on sizes below 550 pixels will not look as nice. This size range should provide a prototypical physical size when used with many (if not most) displays.

The instruments are expected to be relatively square when viewed on screen. Circles will appear out of round on a display that is not square. This is especially noticeable with the Nav Display. Minor adjustments to the window height and width parameters in the configuration file should allow for deviations of pixel width to pixel height for your specific display.

When F3 is pressed the configuration information is saved in a configuration file in the same directory as the instrument.

On startup **each instrument** reads a configuration file to determine size and location of the display as well as other optional parameters. Parameters are listed in the display configuration file (crgpfdl.cfg, crgpfdr.cfg, crgnavl.cfg, crgnavr.cfg, crgeicas1.cfg) as parameter name/parameter value pairs. The parameter names are case insensitive.

Common parameters are:

- **Winx** - the X location of the left side of the window.
- **Winy** - the Y location of the top of the instrument window.
- **Width** - the width of the instrument window
- **Height** - the height of the instrument window.
- **Bezel** - Include or exclude the bezel around the instrument (yes or no). If you integrate the instruments into your forward instrument panel behind your own physical bezel you may want to exclude the displayed bezel to give you more flexibility in integrating the instruments into your panel.
- **Ip** - override IP address (see communications)
- **Mask** - override IP mask (see communications)

For example an instrument 10 pixels from the left on your screen, 10 pixels from the top of the screen with a height and width of 740 and 747 respectively would have the following parameters in the configuration file:

```
winx      10
winy      10
width     740
height    747
```

**Bezel** is an optional parameter, the default is to display the bezel. To exclude the bezel add the following line to the instrument configuration file:

```
bezel no
```

Comment lines may be used in the configuration file, they are started with the characters **//** followed by a space before the comment:

```
// This is a comment.
```

The lab computer with the instrument displays has two small 15 inch LCD screen connected to the computer with a VGA cables. The screen background is set to BLACK using the windows Control Panel, personalization function. The PFD occupies the left side of the one screen, the right side of the screen is occupied by the ND display. The location parameters in the configuration file for our PFD look like:

```
winx 1610  
winy 13  
width 740  
height 740  
bezel no
```

### **Primary Flight Display (PFD) - First Officer's Side**

Since this step is almost identical to the PFD above you may want to move on to other instruments for now or you may need just the pilot's display for your setup. To install, copy the PFDRight folder to the destination and proceed to configure as above.

## EICAS

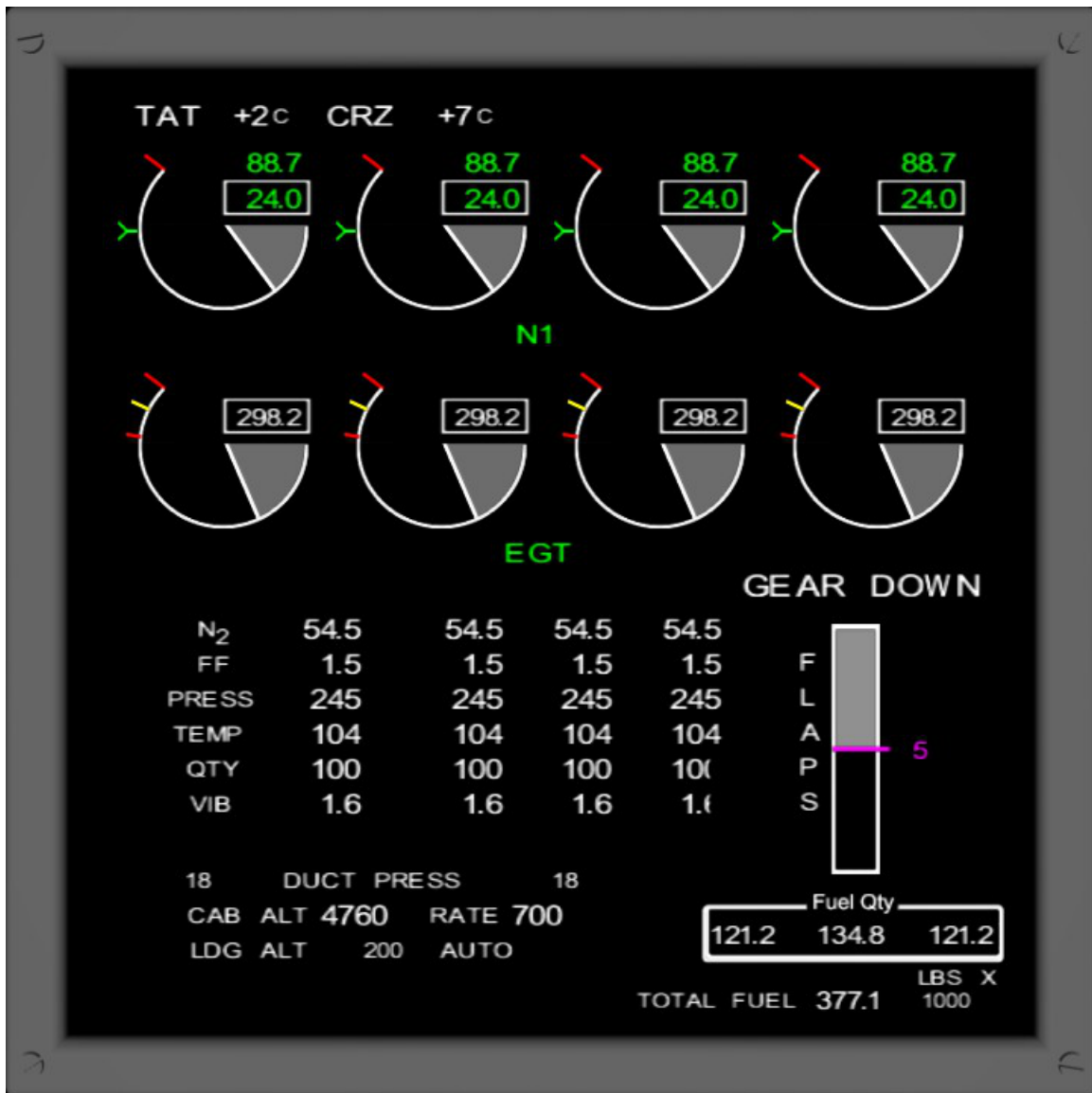
### Installation

Copy the EICAS folder from the CrgSim distribution to its destination and start crgeicas1.exe from within the folder. Try moving the throttle on the FSX aircraft and make sure the EICAS instruments change as you do so. Then move the flaps up and down on the simulator main panel, the flaps indicator on the EICAS should follow the changes.





The EICAS instrument also works with aircraft that have 3 or 4 engines (image below). To make room for the additional gauges the gear up/down indication is now text to the right of the screen under the gauges. The EICAS below is connected to the default 747. It does not display a prototypical 747 EICAS but will still display expected values on the gauges.





If you fly the default 737 the EICAS shown above will be used. All other aircraft (with this release) will use the 777 style EICAS.

## EICAS Configuration

The EICAS size and screen position is configured the same as the PFD discussed above. Also please read the following section on EICAS configuration if you intend to fly more than the default 737.

### EICAS notes:

- The display will determine how many engines your current FSX aircraft contains and configure accordingly.
- Since up to 4 engines may be accommodated the area to the right of the instrument gauges will be blank for two turbine aircraft but will be filled if your airplane has 4 engines.
- If you start at a high altitude airport such as Denver or Colorado Springs it will take a few minutes for the cabin pressure to catch up to the airfield altitude. The value displayed on the CrgSim EICAS has no effect on the simulation and may be ignored if you don't want to wait for the pressure to equalize. While you are flying it will stop increasing cabin altitude at 7,500 feet.
- Fuel supply is listed in pounds of fuel X 1000.
- Duct pressure is static at 18
- The aircraft profile (loaded by Utilities) will provide EICAS with flap position details.

The EICAS instrument has the same configuration file format for location and size as described for the PFD above.

## NAV Display – Captain's Side

### Installation

Copy the NAVLeft folder to the destination computer and start crgnavl.exe. A screen similar to that below (except with a different range and set of airports) will start up. How to modify the range and other display options will be covered in more detail below.



In the Nav Display above (expanded map mode) the aircraft has just reached the PYNON waypoint in the flight plan and is turning toward the waypoint HIPPE. HIPPE is located 32.6 NM away and should be reached at approximately 1624 zulu. Nav 1 is tuned to FCS which is 12.2 KM away, Nav 2 is tuned to PUB located 15.7 miles away. The fatter arrow pointer around 138 degrees on the compass points to the PUB VOR. The thinner arrow tail at 136 degrees points to FCS 180 degrees away from the tail. True air speed is 277 knots and there is a 21 knot wind at 270 degrees at this location. The blue circles are airports. The next waypoint and flight path are magenta. In a real system all active waypoints on the flight path as well as the entire flight path are displayed in magenta.



The image above shows a number of waypoints in the Nav Display in the expanded range circle mode. The aircraft is enroute to PYNON. The display has 10 NM as the selected range.

At startup crgnavl.exe and crgnavr.exe begin a one time scan of the data base looking for objects within range of the aircraft. It may take 10 seconds or so at startup for the display to become fully populated. After the initial scan, there is no delay on locating the displayable objects on the screen when the range and/or display content is changed.

Objects beyond 100 NM are not displayed even when the Nav display range is wider. Longer flight plans will, however, display on the wider

ranges along with the names of each flight plan point.

Many Nav displays are congested when showing waypoints. The waypoint names overlap one another. To help alleviate this problem the CrgSim Nav display will alternate the display of many of the names when they overlap. Not all overlapped names are eliminated but enough of them to dramatically improve the usability of the waypoint display. To turn on/off this feature select the Nav Display and press the “d” key. (It is on by default in the crgnavl.cfg)

You can change the Nav Display ranges, modes, OBS directions, ADF/VOR switch positions, and the type of objects displayed (airports, nav aids, or waypoints) by using the Nav Display window in the Utility Module. With the Utilities - Nav Display window each Nav Display can be separately configured for flight. If you have a GoFlight as part of your system these changes can be made on the GoFlight EFIS.

## Nav Configuration

The Nav display configuration files contain just location, size, and bezel selection. No additional parameters are used.

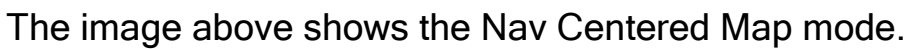
**Note:** The height and width of the Nav display must be the same to have a round compass. If they are not the same the compass circle will wobble as it rotates.



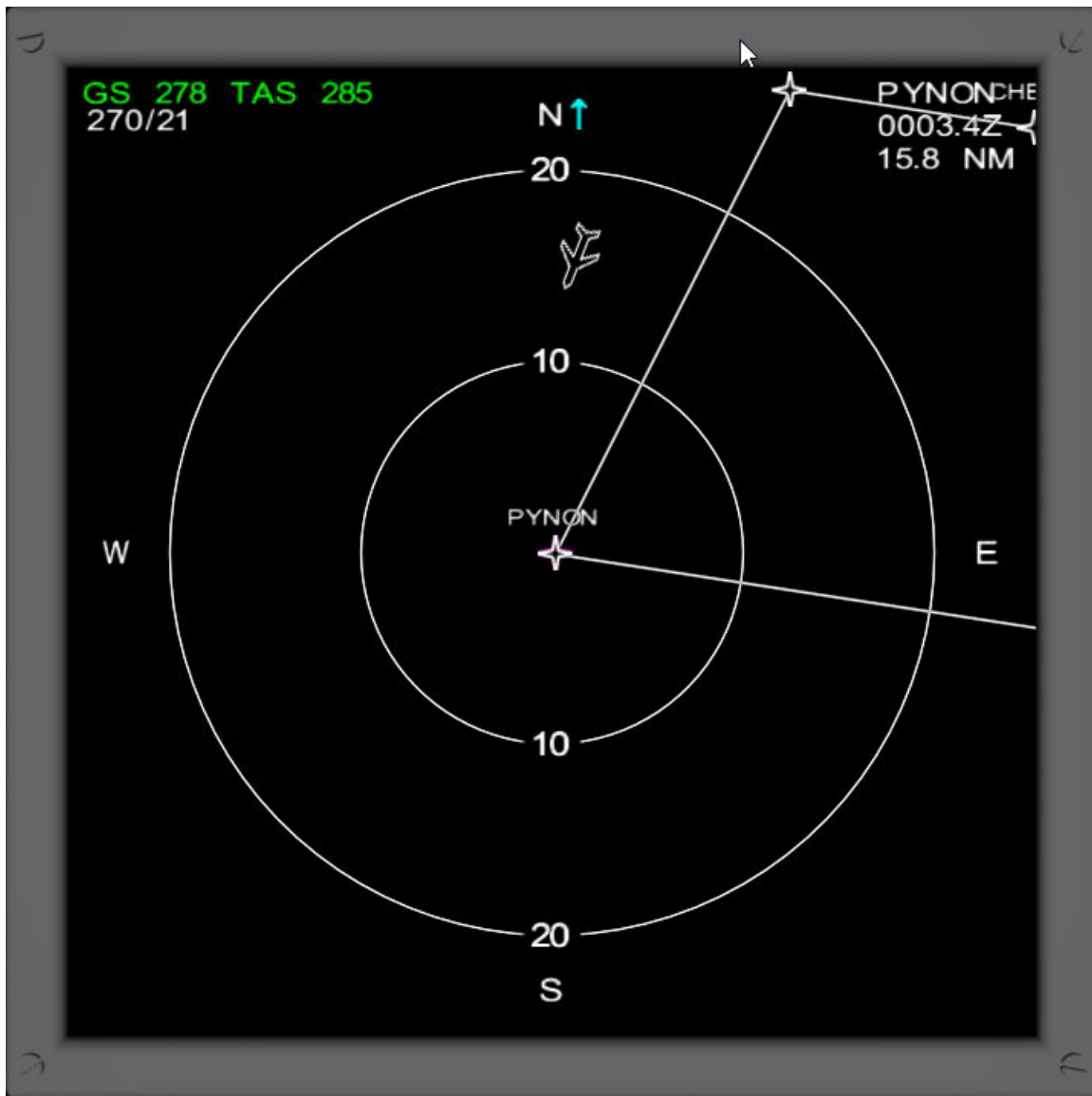
This is the Nav Display in the expanded VOR mode. Two VORs are being received by the radios. The pilot Nav display shows Nav1 in the upper right on the screen and the pilot selected radial to fly along with the deviation from the selected radial. The first officer's display is similar except that it shows OBS 2 and the VOR tuned by Nav 2 (if any) at the upper right.

There is a 4<sup>th</sup> mode that can be used when ILS signals are present that displays the localizer and glide slope information.









The Plan Mode is centered around the active flight plan point. If no flight plan is loaded or if no flight plan point is active this mode will display "NO ACTIVE FLIGHT PLAN". North is always up and if the aircraft is within the Nav Display range it's location will show as a small aircraft outline. In the display above the aircraft is about 15 NM north of the next waypoint (PYNON). The flight plan is called "circle" in the distribution. If LNAV and VNAV are activated and this flight plan is loaded the aircraft will fly around the flight plan path until fuel is exhausted. PYNON is the first and last point in the flight plan.



When a ground station transmitting VOR radials is within the Nav Display range and the signal is being received by the FSX/P3D system, the ground station will display as above showing radials and their reciprocals for the values on the MCP right and left OBS/Course entries. The ground station above is the Black Forest VOR/DME located about 10 miles North East of the Colorado Springs airport.



Above screen shows the Nav Display in expanded App mode with both radios tuned to IOUF at KDEN, about 8 NM out. When in the approach mode and neither radio has a signal with ILS content the test “NO ILS SIGNAL” is displayed on the screen.

## **NAV Display – First Officer's Side**

To start up the First Officer's Nav copy the NAVRight folder to the destination computer and test as described above for the Captain's Nav Display.

## **CRG Locals**

CrgLocals is an optional program and you may not need to install it, especially when starting out with CrgSim. To explain:

A great many variables are available from FSX to drive the instruments. Many of these variables are two way, they are both provided from FSX and they may be sent to FSX. An example is the speed bug. The value is read from FSX and used to set the speed bug in the PFD instrument. The value can also be set in CrgSim and sent to FSX. There are hundreds of these variables and can keep the third party addons busy for a long time.

There are other variables that are not made available by FSX through SimConnect. To access these other variables it is necessary to install an additional CrgSim module that is an FSX dll. It will automatically start every time you start FSX. If you use default 737 EFIS and MCP and want your changes to the Nav display range and mode, and changes to the position of the ADF/VOR switches to be used by CrgSim you may want to install this program. Also, if you are using a third party add on EFIS such as the one from OpenCockpit this may be a needed program. In this case, a change to an OpenCockpit EFIS ADF/VOR switch position is sent to FSX and the switch position is changed in the main panel display. CrgLocals will sense this change, send the change to the CrgSim system causing the whole system (CrgSim, OpenCockpit, and FSX) to remain consistent with respect to this one variable.

If you are using a third party EFIS or just want to use these additional variables and want to install CrgLocals please follow these steps:

- Locate your FSX directory:
  - FSX - for many systems this will be: *"C:\Program Files (x86)\Microsoft Games\Microsoft Flight Simulator X"*
  - FSX Steam - *"C:\Program Files (x86)\Steam\steamapps\common\FSX"*
  - P3D V2.4 - *"C:\Program Files (x86)\Lockheed Martin\Prepar3D v2"*
- Copy the directory CrgLocals to the directory above.
- Locate (search for) your FSX "dll.xml" file. Ours is located in the directory at: (yours will be different)
  - FSX - *"Users\Chuck\AppData\Roaming\Microsoft\FSX"*
  - P3D V2.4 - *"Users\chuck\AppData\Roaming\Lockheed Martin\Prepar3D v2"*
  - FSX Steam - *"C:\Program Files (x86)\Steam\steamapps\common\FSX"*
- Back up your dll.xml file

- Carefully add the following text after the last “</Launch.Addon>” and before the “</SimBase.document>”

```
<Launch.Addon>  
<Name>CrgLocals</Name>  
<Disabled>False</Disabled>  
<Path>CrgLocals/CrgLocals.dll</Path>  
</Launch.Addon>
```

Now the next time you start FSX it will ask you if you want to run CrgLocals.dll. If you say yes FSX will ask you if you want to “designate this module as trusted?” If you answer yes then CrgLocals will be started automatically every time FSX is started. We always say no to this last question for all of our addons. This gives us a chance to choose what will be running with each start of FSX. A minor (for us) inconvenience with each FSX startup but it does give us the opportunity to control which addon DLLs are running. Either way if probably just fine.

If you do start CrgLocals, the program will quietly sleep until CrgCom.exe is started.

CrgLocals now has another function. It plays the altitude callouts and sounds the horn when traffic gets to close on the NAV Displays. It is easy to substitute other announcements; either announcements from the internet or announcements you create. The set of most common altitude callouts should be available in several places on the net. If you prefer silence simply delete the announcement you don't want from the CrgLocals directory.

When there is a status change in the simulator the sounds are muted for about 15 seconds. If the loading of scenery and/or aircraft take much longer you may hear a number of altitude callouts until everything settles down.

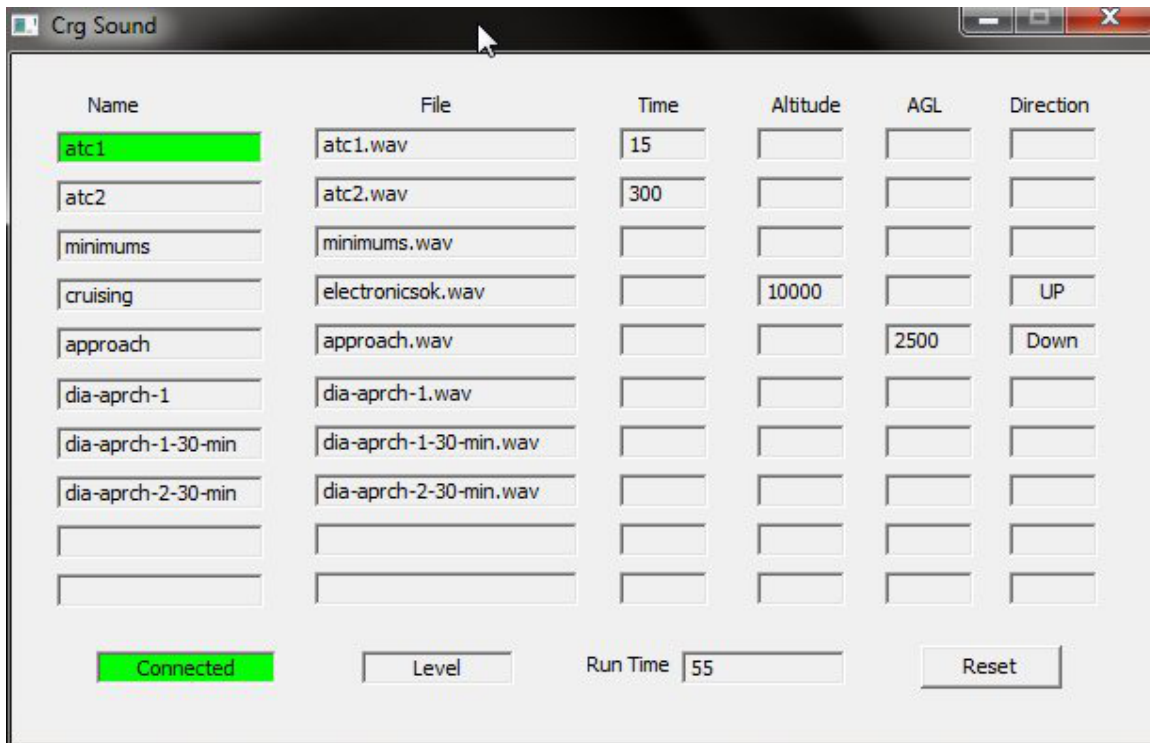


**NOTE:** CrgLocals creates a log file in the same directory as the flight simulator. Some OS versions will not allow this. If CrgLocals is installed and does not appear as connected on the Communication Manager screen it will be necessary to read the log file to assist in problem determination. If there is no log file in the flight sim directory called "CrgLocals.log" create a top level directory called \CrgSim and restart the simulator. If there is no CrgLocals.log file created in the \CrgSim directory then CrgLocals is probably not starting. In this case recheck the appropriate DLL.XLM file.

## Sound Module

### Installation

The Sound Module is great for adding atmosphere and provides a greater sense of immersion to a flight simulation. To install, copy the sound folder to a destination computer.



We have not had much luck playing longer wave files with XP, it seems the longer length sounds do not play or get truncated although if you use MP3 files and play them with WinAmp they should work just fine.

The Sound Module used to provide basic altitude callouts on landing as well as “minimums” and “approaching minimums” announcements. **These functions have been moved to the CrgLocals program.**

When the sound module is started a window similar the one above will be displayed. Actual window size will depend on the number of sound files specified in the configuration file. The window has a number of columns:

- Name - this is the name you give to the sound file. If the name in the configuration file is too long this column will display as blanks.
- File - this is the actual name of the wave file on disk. If the file name in the configuration file is too long this column will display as blanks.
- Time - The sound file will start playing when Run Time is greater than or equal to this value.
- Altitude - The sound file will play when this altitude is reached on descent or ascent depending on the value in the direction column.
- AGL - The sound file will play when this altitude AGL is reached on descent or ascent depending on the value in the direction column.
- Direction - Specifies weather the sound will play on ascent or descent.

There are four fields across the bottom. From left to right:

- Connected indicator: shows “Connected” on a green background if there is a connection to FSX. “Not Connected” on a red background will show if there is no connection to FSX.
- Climb/Descend indicator: If the aircraft is climbing “Ascending” will display, if the aircraft is descending “Descending” will display, and “Level” will display if the aircraft is flying reasonably level.
- Run Time displays the number of seconds that the sound module has been running.
- The right most field is the reset button. Clicking this button will reset the run time to 0 and cancel all sounds that are currently playing.

Note: if you use WinAmp the location of your WinAmp file may be different than the location specified in the distribution sound configuration file. If so you will see an error message on crgsound.exe startup. If you are not using WinAmp just remove the “sndplayer” line from the configuration file. If your WinAmp is located in a different place then make the correction to the “sndplayer” line and restart crgsound.exe.

Start crgsound.exe from within the Sound folder. A display similar to that above will appear except in the "Name" column all of the backgrounds will be gray until 15 seconds have passed. Then you should hear some ATC chatter and the top box background will be green as above. In the lower left corner the green box with the text "Connected" indicates that the program is connected to the CrgSim network. If there is no connection "Not Connected" will be displayed on a red background.

(To play the MP3 files we installed WinAmp on our lab and test systems.)

Then to test: if the first ATC sound is still playing click on the green "Name" field for the top sound. The sound should stop and the background change from green to gray. Then click on the box with "MP3 Example". This action should start WinAmp and WinAmp should start playing an ATC file. You can bundle up a number of ATC sounds into a WinAmp playlist, give the playlist a name, and add it to the sound module sound list as described below.

## Notes:

- Sound files can be played at any time by clicking on the sound name.
- Once a sound file has played automatically based on altitude (or AGL) and direction it will not play again except for clicking on the sound name. Clicking the Reset Button will reset the run time and will rearm the play on altitude feature.
- There are a number of cabin announcement available on the net. Once you find and download a set that you like copy the sounds files that will be used to the same directory that crgsound.exe is executed from. Try searching for vsswacol.zip, vskaual1.zip, vsajcthy.zip, and English.zip on some of the flight sim forums. If you find some interesting announcements please let us know.
- [www.LiveATC.net](http://www.LiveATC.net) is a good place to get long archived recordings (30 minutes or so) of ATC traffic from many different airports. The download files are MP3s so they will have to be converted to wav files to be used by CrgSound unless you create a playlist in WinAmp and use as described below.
- Mp3 and m3u (playlists) are played by WinAmp. Only one playlist or mp3 file may be playing at a time. Multiple sounds are possible with wave files. For example an ATC playlist can be playing with WinAmp and at the same time altitude callouts can be made on descent with wave files.
- When crgsound is started the playlist can be started by clicking on the playlist name. A second click should terminate WinAmp. If a playlist or mp3 file is being played then other mp3/m3u entries cannot be started until the currently playing mp3/m3u file completes or is terminated by clicking on the entry in the name column.

CrgSound has been tested on Windows 7 and Windows XP. On XP the longer files did not play, it seems there is a length restriction (at least on our test computer) so if you have a large wave file that does not play you can convert the sound to MP3 or try cutting the file into segments with an audio editor. Try including one of the included short sounds (Minimums.wav) in the crgsound.cfg file as a test of XP.

To provide the ability to play long sounds during flight CrgSound can start WinAmp with a playlist (m3u file). To use the WinAmp feature (assuming you have WinAmp installed on your computer):

- Create a playlist in WinAmp with the mp3 files you want to hear.
- Save the playlist with a name of your choice.
- Add the m3u playlist name to the crgsound.cfg file (per the example included with the distribution)

The screenshot shows the 'Crg Sound' application window. It contains a table with columns: Name, File, Time, Altitude, AGL, and Direction. The first row is highlighted in green. Below the table are several controls: a red 'Not Connected' button, a 'Level' slider, a 'Run Time' field showing '26', and a 'Reset' button.

Name	File	Time	Altitude	AGL	Direction
ATC Boston # 1	KBOS1.wav	15			
ATC Boston # 2	KBOS2.wav	1870			
Boston Play List	CrgPlaylist.m3u				
Example	Minimums.wav				
MP3 Example	KBOS-ATC-1.mp3				

Not Connected      Level      Run Time 26      Reset

The ATC files are provided by permission of liveatc.net. This is a great place to get hours of ATC background chatter.

## Sound Module Configuration

The information displayed under the columns is specified in the sound configuration file (crgsound.cfg):

- snddef - begin each sound file definition with this keyword.
- sndname - your display name for the sound.
- sndfile - the name of the sound file on disk.
- sndtime - an optional parameter that specifies the runtime at which to start playing the sound.
- sndalt - an optional parameter specifying the altitude at which to play the sound. (see snddir below).
- sndagl - an optional parameter specifying the altitude above ground level at which to play the sound (see snddir below).
- snddir - this parameter specifies whether to play the sound on ascent or descent. For example one would expect the “prepare for descent” announcement to play on descent instead of onclimb out. To play on descent enter “down”, to play on ascent enter “up”.
- sndend - this indicates that configuration for this sound is complete.



- The following is an example of a valid sound definition in the sound configuration file:
  - snddef
  - sndname cruising
  - sndfile ElectronicsOk.wav
  - sndalt 10000
  - snddir up
  - sndend

This could be the specification for a cabin announcement indicating that it is OK to start using “approved” electronic devices. The sound file would play as the aircraft passed through 10,000 feet on ascent

## Utilities Module

With functions provided by the Utilities Module (crgutil.exe) you can modify a number of FSX variables without the need to go to the FSX display and startup a FSX sub window. The Utilities Module is a mouse interface and keyboard interface. Utilities should run OK on XP as well as newer versions of Windows.

We like to run FSX with just the scenery displayed on the main window and the instruments displayed on other monitors. Even with EFIS, MCP, and Radio hardware attached to the network it was still necessary to occasionally select the main window, bring up the instrument panel, and then make a required change to a simulator variable. Not exactly an immersion inducing activity.

To get around this problem **Utilities** was created. These are simple windows that provide the display of some FSX variables and allow modification of selected simulation variables without going to the main screen. Since there is a “brake” function on our joystick, after selecting an airport and aircraft, a flight can be made without using the keyboard attached to the FSX computer thus increasing the sense of immersion.

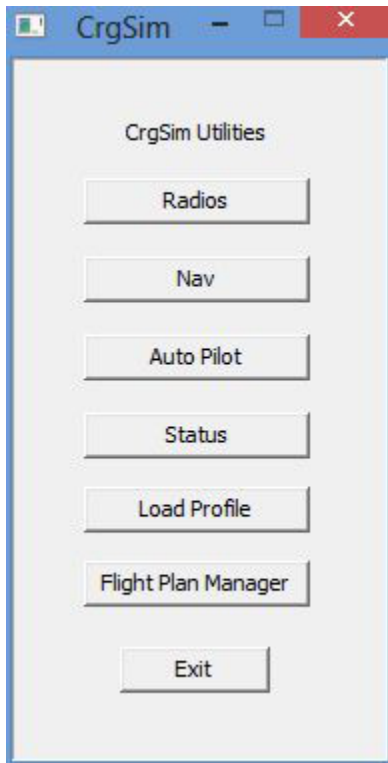
In this case the FSX main keyboard is only used to press the escape key to end the flight. If you decide to use **functions** provided by Utilities there is a PDF file (KeyAssign) that can be viewed online or printed out to use as a reference to the allowable keys that may be used.

Be sure that one of the 4 windows has been selected with the mouse so that windows will properly direct the keystroke to the main program, otherwise there will be no response to any keystrokes by CrgSim.

The Utilities module provides a mixed set of functions:

- Flight Plan Management - create, edit, import, and load flight plans.
- Aircraft Profiles - load an aircraft profile that matches the default aircraft you select in FSX or Prepar3d. The profile sets up aircraft flap settings, V1, VR, V2, Vref so the EICAS and PFD function accurately.
- Keyboard Interface - use the keyboard to change simulation variables for radios, nav displays, and the autopilot.
- Monitor - use the Status window to monitor basic simulation variables such as altitude and air speed.

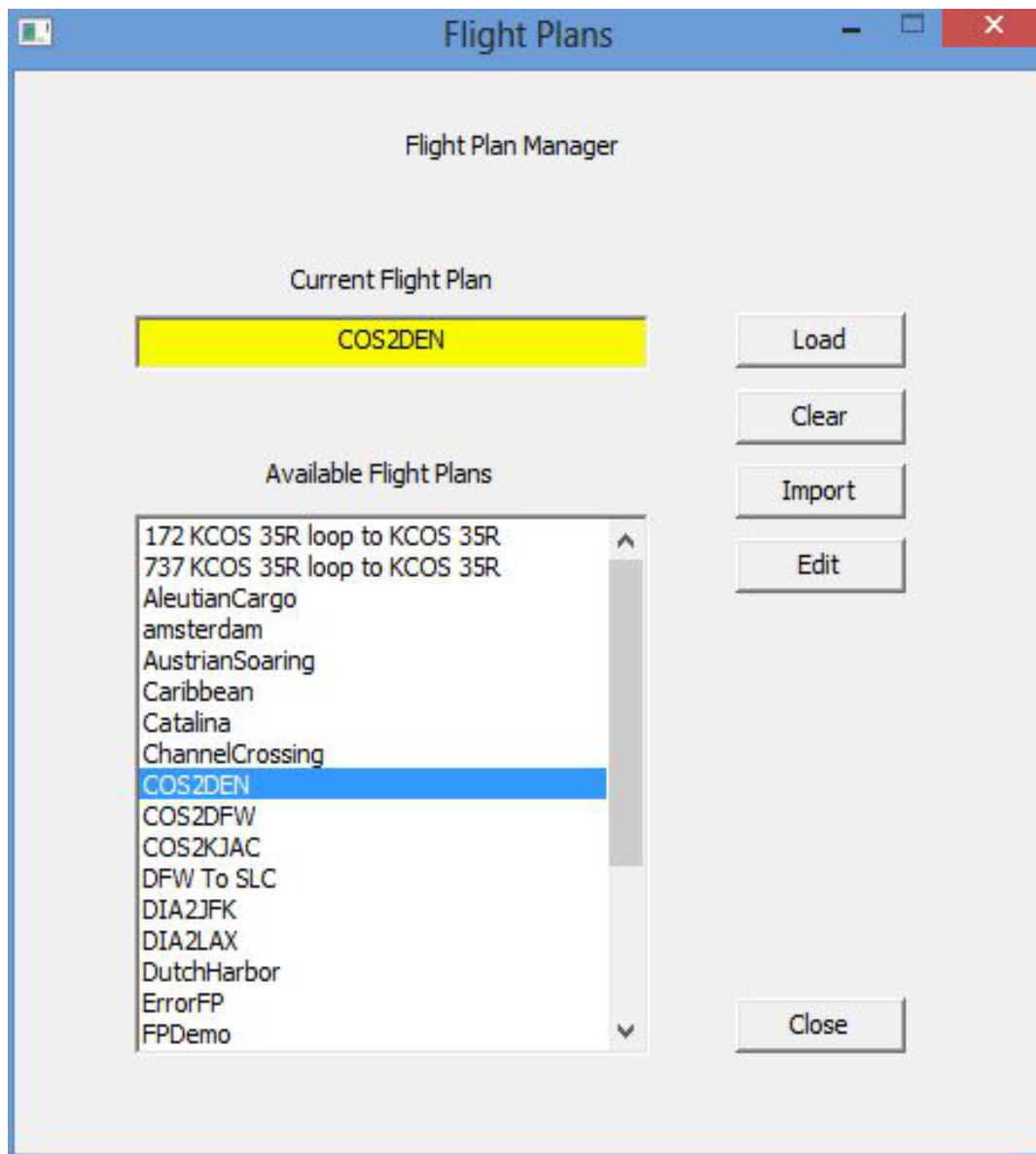
The Utilities Window contains a set of buttons that allow you to choose the function of interest.



- Radios - open the Radios interface.
- Nav - open a window that provides the ability to modify the nav display modes and ranges with the keyboard.
- Autopilot - this window provides the ability to change most of the autopilot settings and modes.
- Status - use to monitor basic simulation variables.
- Load Profile - load an aircraft profile.
- Manage Plans - select this button to create, edit, import and load flight plans.

## Utilities – Flight Plan Manager

The Flight Plan Manager is used to create, load, and edit flight plans. An example screen is below:



## **Flight Plan - Load**

To load a flight plan click on the selected flight plan in the flight plan list. This will cause the flight plan name to appear under the “Current Flight Plan” label with a yellow background. Then click the “Load” button. If the flight plan is successfully loaded the background will turn green (as in the image above). If there is a problem loading the flight plan the background will turn red.

After a successful load the flight plan is distributed to the Nav Displays and to the CrgSim FMC (no window associated with the FMC). Depending on the speed of the local net this could take a few seconds.

Clicking the “Clear” button removes the flight plan and signals the rest of the instruments to disregard any flight plan information.

## **Flight Plan - Edit**

To create or modify flight plans click on the “Edit” button on the Flight Plan Manager screen. This will start the flight plan editor. The image below shows the flight plan edit screen after a flight plan has been loaded for editing:

CRGSIM

File

CrgSim Flight Plan Editor

	WP Name	Lat	Long	Speed	Alt	Nav 1	Nav 2	OBS 1	OBS 2	ADF 1	ADF 2	
1.	TUNTE	38.8235580	-104.6857250	240	9000	112.500	112.100	321	65	407	335	○
2.	MOGAL	39.1254170	-104.6851670	300	20000	112.500	112.100					○
3.	FQF	39.6901389	-104.6209722		25000	116.300	116.300	200	68	260	321	○
4.	GLL	40.5038611	-104.5530000			114.200	114.200	200	68			○
5.	LAR	38.9943310	-9.0403890			117.600	117.600			245		○
6.	OCS	41.5902222	-109.0153333			116.000	116.000				290	○
7.	KJAC	43.6065760	-110.7381320	200	4000	115.400	115.400					○
8.												○
9.												○
10.												○
11.												○
12.												○
13.												○
14.												○
15.												○

File Name

COS2KJAC.fpf

Close

Clear Line

Delete Line

Insert Line

To load a flight plan click on the menu item “File” then “Open”.

With the File menu you can:

- create a new flight plan,
- open an existing flight plan,
- save a flight plan,
- save a flight plan with a new name,

## **Flight Plan - Import**

The import function is used to load FSX format flight plans, convert to the CrgSim format, and then save as a CrgSim flight plan.

This feature has been tested on most of the default FSX flight plans. It has been tested on some FSX flight plans created by 3<sup>rd</sup> party flight plan creators. If you have a flight plan that fails to import please send the flight plan to us so we can evaluate the reason for the failure.



Each flight plan point has a number of required and optional fields:

- WP name - this is a required field. When the point name is entered the system checks the database for an airport, nav aid, or waypoint name that matches the field name. If found the latitude and longitude fields are filled in. If no match is found the background of the latitude and longitude fields turn yellow indicating that these fields are still required.
- Lat - latitude of the flight plan point.
- Long - longitude of the flight plan point.
- Speed - speed in knots that the aircraft will be requested to fly en route to the flight plan point.
- Alt - altitude in feet (automatically rounded to the nearest hundred) that the aircraft will be requested to fly en route to the flight plan point.
- Nav 1 - frequency of the # 1 nav radio (108.0 MHz to 117.95 MHz). The value is automatically rounded to 50 Khz spacing.
- Nav 2 - frequency of the # 2 nav radio (108.0 MHz to 117.95 MHz). The value is automatically rounded to 50 Khz spacing.
- OBS 1 - the Omni Bearing Selector direction for OBS # 1. Valid from 0 to 359 degrees.
- OBS 2 - the Omni Bearing Selector direction for OBS # 2. Valid from 0 to 359 degrees.
- ADF 1 - Frequency to set the # 1 low frequency receiver while en route to this point (190 Khz to 1750 Khz).
- ADF 1 - Frequency to set the # 1 low frequency receiver while

en route to this point (190 Khz to 1750 Khz).

## Flight Plan - Errors

The image below demonstrates some of the flight plan errors that the editor will detect and identify. In most cases after an invalid number is entered the explanation for the red background will be displayed in the field above the “Clear Line” button.

The screenshot shows the CRGSIM CrgSim Flight Plan Editor window. It contains a table with 12 columns: WP Name, Lat, Long, Speed, Alt, Nav 1, Nav 2, OBS 1, OBS 2, ADF 1, and ADF 2. The table has 15 rows. Rows 1 through 12 contain data, while rows 13 through 15 are empty. Several cells in the table are highlighted in red, indicating errors. The errors are: Row 2, Alt (-100); Row 3, Speed (0); Row 5, Nav 2 (200.000); Row 6, Lat (58.7247222) and Long (-156.7523333); Row 8, OBS 1 (400); Row 9, ADF 1 (112.2). A message box at the bottom right states: "The AdfFreqs must be greater than or equal to 190 kHz and less than or equal to 1750 kHz." The File Name field at the bottom left contains "FPDemo.fpf". The window has a "Close" button and three buttons: "Clear Line", "Delete Line", and "Insert Line".

	WP Name	Lat	Long	Speed	Alt	Nav 1	Nav 2	OBS 1	OBS 2	ADF 1	ADF 2
1.	PANC	61.1699190	-149.9978470	200	7000	111.100	113.500	300	290	400.5	390.0
2.	ANC	61.1507970	-150.2065560	220	-100	111.100					
3.	ENA	60.6147060	-151.1952420	0	15000			165			
4.	TUCKS	60.2229780	-152.4609140	300	19000			155	200		
5.	CIFJI	59.5464750	-154.5561390				200.000				
6.		58.7247222	-156.7523333		25000					410.0	397.0
7.	TANIE	57.9697720	-158.2125080			116.200					
8.	CUDDA	56.7991940		290				400			
9.	BINAL	55.7666610	-161.9990080		19000			155		112.2	
10.	CDB	55.2673750	-162.7742390	250							
11.	DUT	53.9051750	-166.5491440		10000	112.200	111.100				
12.	PADU	53.8955720	-166.5392670								
13.											
14.											
15.											

File Name: FPDemo.fpf

The AdfFreqs must be greater than or equal to 190 kHz and less than or equal to 1750 kHz.

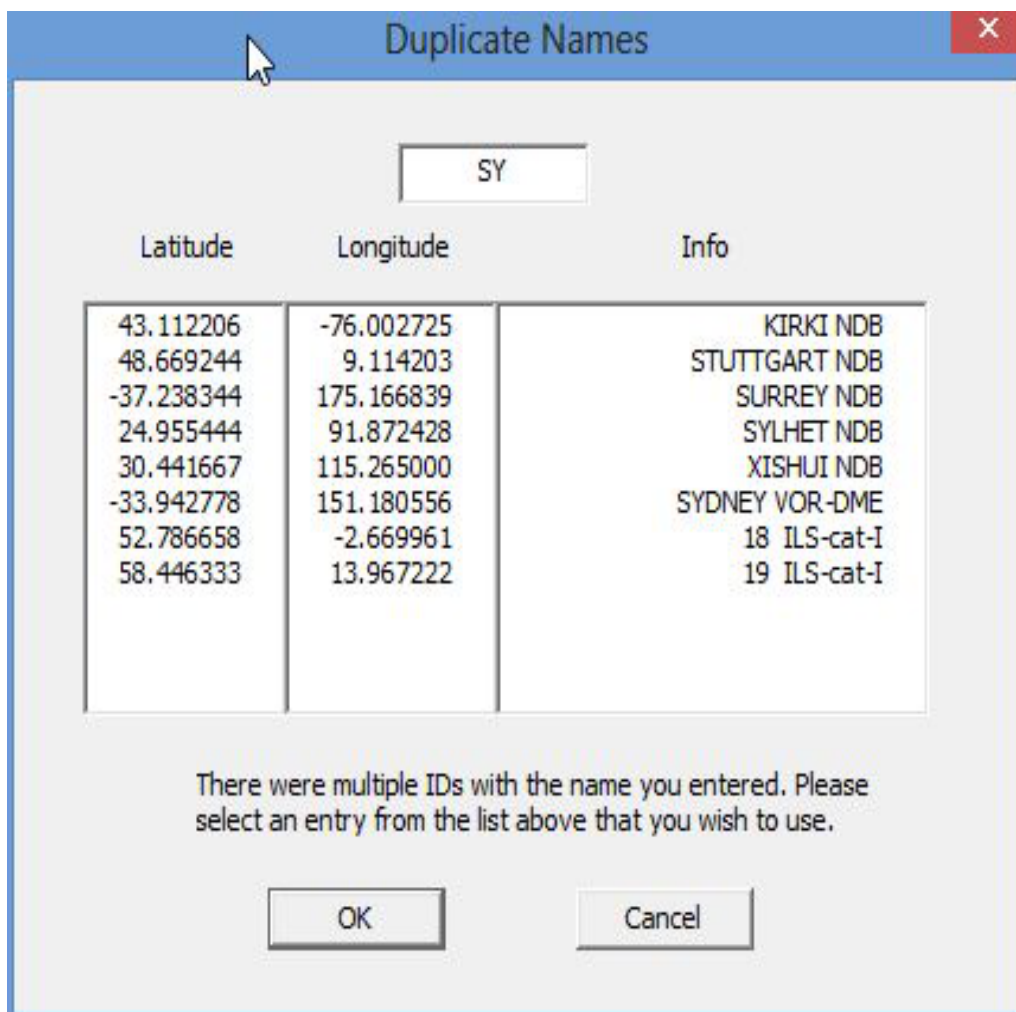
Close Clear Line Delete Line Insert Line

- Line 1 - latitude and longitude are not identical to the values in the CrgSim database. This could happen when importing a flight plan that contains a latitude and/or longitude for the way point that is different than default values (note that the imported value could be more accurate than the CrgSim value). It is also possible to enter a way point name, then modify the latitude and/or longitude. The yellow background indicates that the values differ, it does not indicate that this is an error.
- Line 2 - invalid altitude. A negative altitude is not allowed in the flight plan. The red background indicates an error.
- Line 2 - way point name, latitude, and longitude all have a yellow background. Some way point names are duplicated in different parts of the world. For example the way point "SY" has 8 entries in the data base. When a way point with a duplicated name is entered in the first column the editor gives you the opportunity to select which way point latitude and longitude you want to use. All three fields are displayed with a yellow background to indicate that this is a way point selected from duplicate way point names.
- Line 2 - line number with red background. The red background indicates that one or more columns in this line is in error (the altitude entry in this example).
- Line 3 - speed column has a red background. A speed of zero is not valid. This also turns in the red background for the line number.
- Line 5 - The Nav 2 column has a red background. This field contains an invalid Nav frequency.

- Line 6 - the way point field and the latitude and longitude values have a red background. A way point name is a required field. You can enter a way point name that is not in the database along with custom latitude and longitude values if you so desire.
- Line 8 - the Obs field has a red background. Obs values must be in the range of 0 to 259.
- Line 10 - this is the same situation as line 2 above.
- Line 12 - this is the same situation as line 1 above.

## Flight Plan - Duplicate Way Point Names

Some way point names are duplicated in different parts of the world. If a way point name is entered in the way point column while editing a flight plan a window will appear allowing a choice to be made between the various latitudes and longitudes associated with the way point names. The image below shows an example screen that will appear if the way point name of “SY” is entered:



## Flight Plan - Notes

- Entries for the point name and latitude and longitude are required. All other fields are optional.
- An invalid field value is indicated by a red background in the field.
- Most errors are explained in the box above the edit buttons in the lower right part of the screen.
- To clear a flight plan display select the menu item “File” followed by “New”.
- To insert a new point in the middle of a flight plan click on a radio button (column of buttons to the right of the flight plan) at the place where you want a new point and then click on the “Insert Line” button in the lower right part of the screen.
- The other two edit buttons are used in a similar fashion.
- To give a different latitude and/or longitude to a point in the database enter the point name then select latitude or longitude and enter a new value. The new value is only active for the flight plan you are editing and does not get placed in the database.
- A flight plan line that contains all good values will show a green line number.

- A flight plan line that has one or more errors will show a red line number.
- A flight plan with errors can be saved for later editing but will not be successfully loaded by the flight plan loader.
- To give a flight plan a new name select “File” followed by “Save As” and then enter the new name when requested.

## Utilities – Load Profile

A CrgSim aircraft profiles contain information about each of the default FSX turbine aircraft. The profiles contain:

- Speeds for V1, VR, V2, and VRef.
- Positions for each of the flap positions
- Max and Min speed values (“bricks”)

These values are used by the PFD to determine where to put the “Vees” next to the speed tape and by the EICAS to determine how to display the flaps box. Selecting the correct aircraft profile is not necessary for CrgSim to operate but the EICAS flaps box and the velocities by the PFD speed tape will not be correct.

If you are satisfied with the included aircraft profiles then there is no need to read further in this section. If you decide to modify some of the profile values then please refer to the definitions below.

Most of the values contained in the aircraft profile depend on a number of factors such as fuel load, passenger load, ambient temperature, altitude, and barometric pressure. Many are determined by the flight computer based on values entered by the flight crew. The profiles included in the distribution are static values. If you want to set up a different set of parameters for a specific condition feel free to copy and rename one of the profiles and then edit the flight values to those more to your liking or conditions.



- V1 - maximum speed at which a rejected takeoff can be initiated.
- VR - rotation speed
- V2 - minimum speed that needs to be maintained up to acceleration altitude.
- Fuhi - full flaps up do not exceed speed.
- Fdlo - full flaps down do not exceed speed
- Fulo - full flaps up minimum speed
- Fdlo - full flaps down minimum speed
- Vref - landing reference speed at a point 50 feet above the landing threshold. VRef is indicated to the right of the speed tape by "RF".
- Maxclimb - when climbing this is the value CrgSim will send to the MCP. Most of the values are extra conservative to prevent stalling on climbout.
- Maxdescend - when descending this is the value CrgSim will send to the MCP. This must be a negative value.

The flaps portion of the EICAS display operates similar to the real EICAS display. When a new flap setting is set by the pilot the setting bar moves to the new location on the flap display and the bar and target flap detent name turn to magenta. As the flaps move to the target setting FSX provides a continuous stream of flaps percentage numbers that show the progress of the flaps to the new value. The EICAS screen uses these numbers to move the flaps “thermometer type of display”. When the actual flaps percentage reaches the target percentage the flap setting bar and flaps detent name change to green.

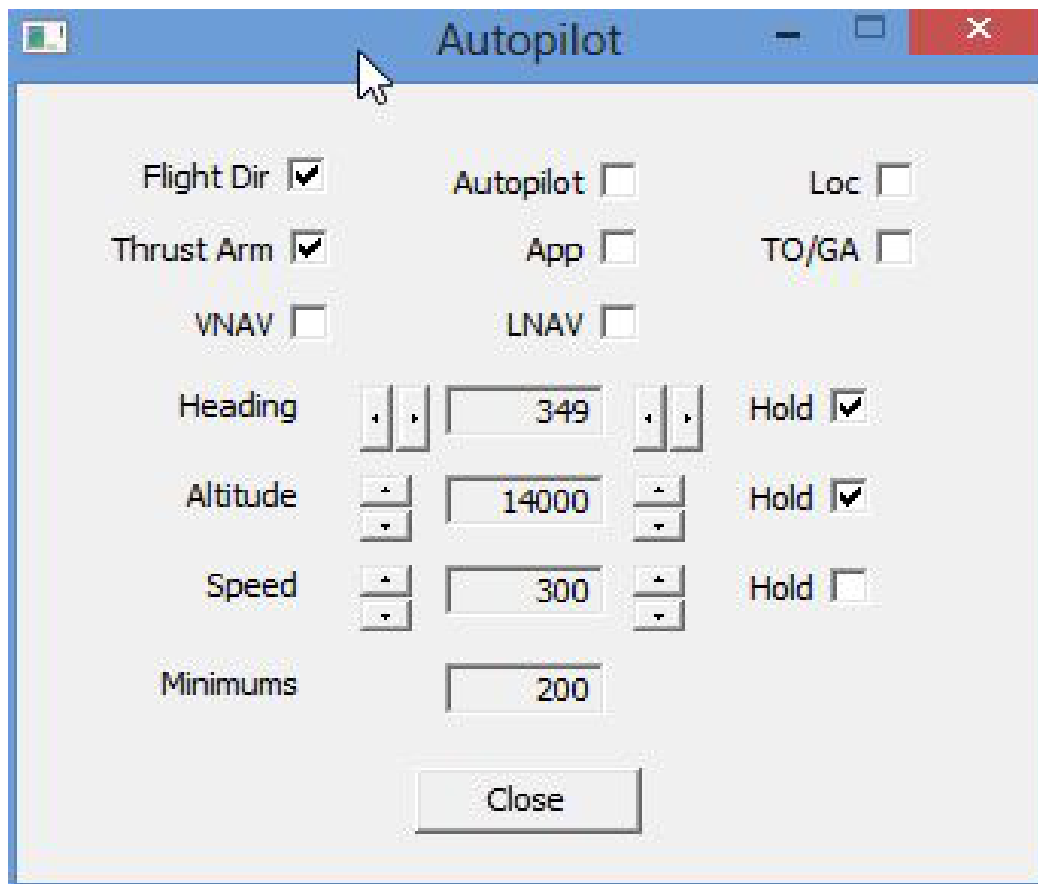
If the percentage flaps is not set correctly for a given detent then the percentage as reported by FSX will never reach the target percentage specified in the EICAS configuration file and the setting bar and detent name will never turn green and indicate that the flaps have reached their target setting.

## **Utilities Module - Keyboard Interfaces**

Three small windows are provided as part of the Utility Module to monitor and modify variables associated with the radios, nav display, and autopilot. These windows accept input from a local keyboard and do not require starting sub windows in/on the FSX display.

## Utilities - Autopilot

Use this window to change switches and variables associated with autopilot functions. If you have MCP hardware then this window is probably not required unless you would like another point to monitor these variables.



If there is not an MCP in your hardware lineup then the autopilot window can be used to change some functions that are not recognized by FSX such as VNAV and LNAV.

**Autopilot Heading** - the spin control to the left of the autopilot heading value changes it by 10 degrees. The spin control to the right of the value changes heading by -1 degree. The Left Arrow key changes heading by one degree negative. Ctrl-left arrow (press the Ctrl key and the left arrow at the same time) changes heading by -10 degrees, Ctrl-right arrow changes heading by +10 degrees.

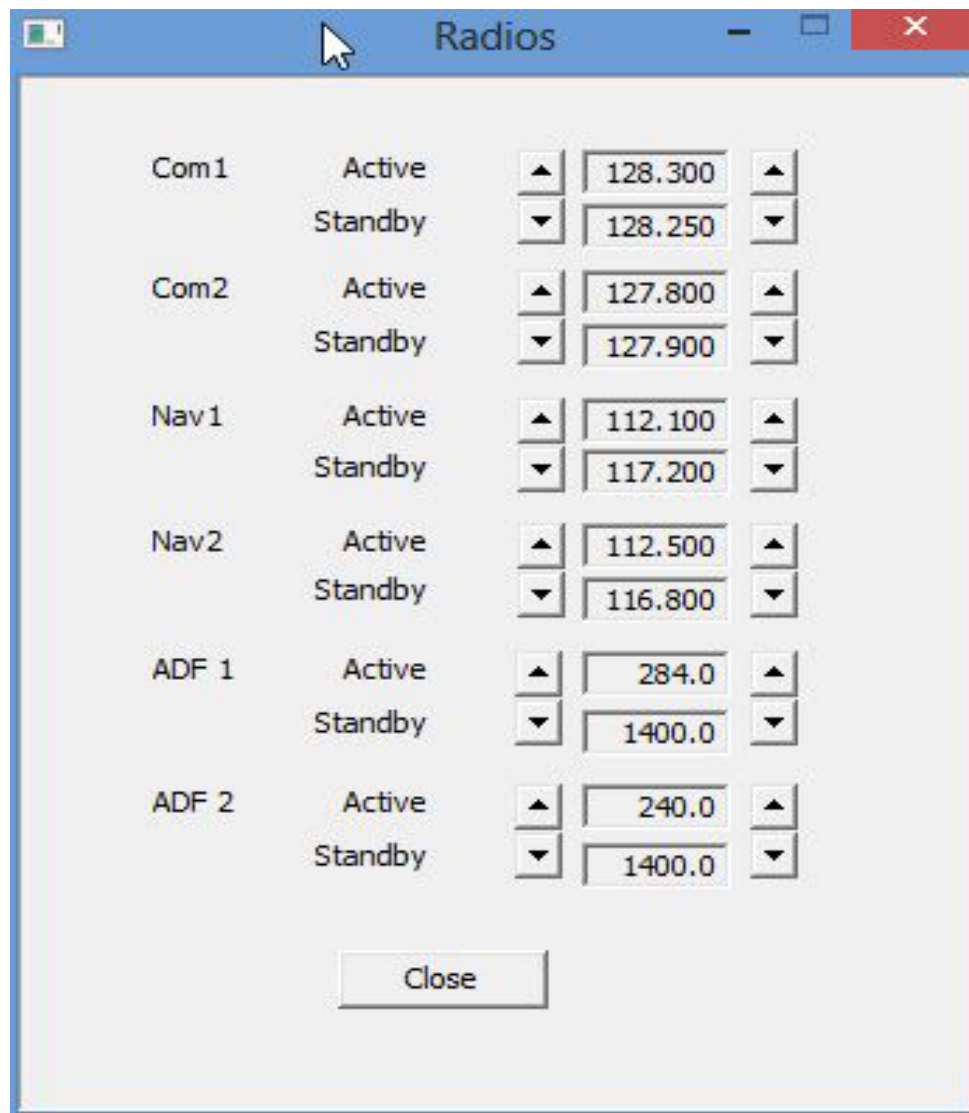
**Autopilot Altitude** - the spin control to the left of the altitude value changes it by 1000 foot increments. The spin control to the right of the value changes it by 100 foot increments. Up arrow changes autopilot altitude by +100 feet. Down arrow changes by -100 feet. Ctrl-Up Arrow changes altitude by 1000 foot increments. Ctrl-Arrow Down changes altitude by -1000 foot increments.

**Autopilot Speed** - the spin control to the left of the value changes speed by 10 knots, the spin control to the right of the value changes it by 1 knot. The 'z' key changes autopilot speed by -1 knot, the 'x' key changes speed by +1 knot. Ctrl-z changes speed by -10 knots, Ctrl-x changes speed by +10 knots.

**Note:** Thrust Armed must be "On" for the autopilot to begin controlling speed for some aircraft.

## Utilities - Radios

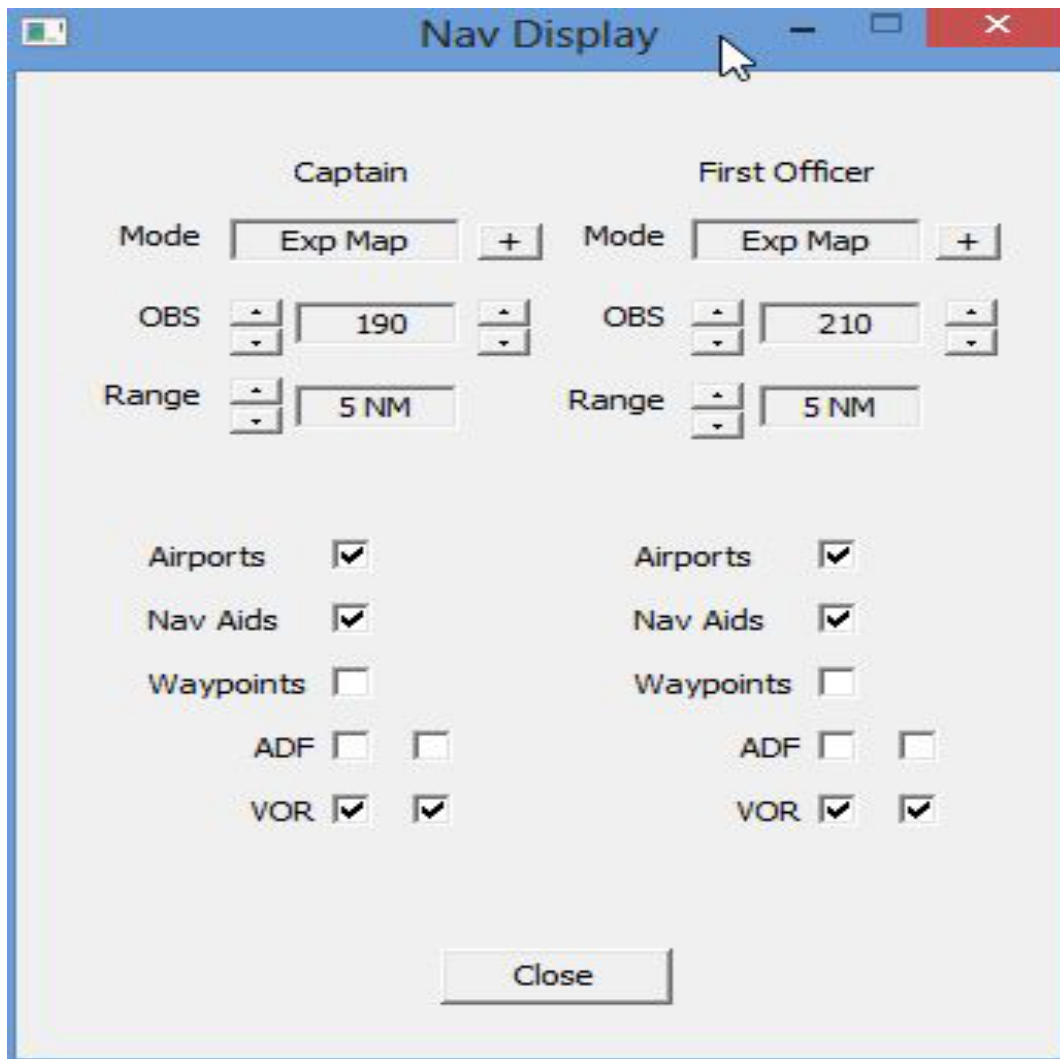
The radios window can be used to change frequencies of the various radios found on a modern aircraft.



The control to the left of the frequency changes the frequency for 1 Mhz. The control to the right of the frequency changes the frequency by either 50 or 100 Khz depending on the radio type. Click on either active or standby frequencies to swap them.

## Utilities - Nav Display

The Nav Display window provides many functions found on an EFIS. If you have a hardware EFIS then most likely you will not need this window.



Changes made to variables on this window should be reflected on the Nav Display instruments that are running and are connected on your system. Standard FSX variables do not include the VOR/ADF switches so this window is the only way to change these variables on a default aircraft without an EFIS.

To change mode for the nav display, click on the small button with a “+” in the center located to the right of the mode window. It will cycle through supported nav modes.

OBS values are changed with the controls to the left and right of the OBS value. Left controls change value by 10 degrees, right controls change value by 1 degree.

Range for each individual Nav Display can be controlled by the control to the left of the range display.

Select which items you want displayed on the Exp Map mode by clicking the appropriate check box under the nav display you want to control.



## Utilities - Status Window

The status window displays variables such as current altitude, airspeed, and gear status. None of these variables are changed with this window, instead use the keyboard or appropriate piece of flight simulation hardware.

Heading	<input type="text" value="351"/>	Flaps	<input type="text" value="detent 4"/>
Altitude	<input type="text" value="6193"/>	Gear	<input type="text" value="DOWN"/>
Speed	<input type="text" value="0"/>	Barometer	<input type="text" value="29.92"/>
Pause	<input type="text" value="ON"/>	Frame Rates	<input type="text" value="OFF"/>
Net Stats	<input type="text" value="OFF"/>		
Tot C Msgs	<input type="text" value="0"/>	Missed C Msgs	<input type="text" value="0"/>
Tot L Msgs	<input type="text" value="1965"/>	Missed L Msgs	<input type="text" value="0"/>

This window also displays certain CRG internal variables such as number of messages sent from FSX to the CRG Com Mgr (Tot C Msgs) as well as the number of those messages that have been dropped or lost.

Toggle frame rate displays on CRG instruments - key 'f'

Toggle simulator pause - press the key 'p'

## Utilities Configuration

An optional Utilities configuration file can be used if the utilities functions frequently used. The configuration file specifies locations for each of the sub windows so they will appear in the same position every time instead of needing to reposition each window.

The optional configuration file for Utilities contains the following parameters:

- statusx - status window x location
- statusy - status window y location
- autox - autopilot window x location
- autoy - autopilot window y location
- navx - nav window x location
- navy - nav window y location
- radiosx - radio window x location
- radiosy - radio window y location
- showstatus - yes or no (automatically show status window)
- showautopilot - yes or no (automatically show autopilot window)
- showradios - yes or no (automatically show radios window)
- shownav - yes or no (automatically show nav window)

The lines below are an example of how to specify starting locations for the Keys autopilot, status, nav, and radios windows. In this example the status window is automatically started when Utilities is started.

statusx	10
statusy	10
autox	300
autoy	10
navx	10
navy	300
radiosx	300
radiosy	300
showstatus	yes

## Installing a TO/GA button

If you have a yoke with a button on it that you can use for TO/GA (or other device with a button that you want to use) then the following may work. (at this time please regard this capability as beta code).

This has been tested with the Saitek yoke which will be used as the example.

With the simulator running select options->settings->controls. Then select calibrate. The "Game Controllers" window should display one or more controllers. Remember the position in the list of the controller you wish to use. Now select that controller and click on PROPERTIES in the lower right part of the window, The new window will have two tabs. In the TEST tab there will be a section for analog controls (thrust, elevators, ailerons ...). At the bottom of the window there is a section that displays all of the available buttons on the yoke. Press the button you wish to use for TO/GA and remember the number. Then close the settings window.

Now in the CrgFsx directory create a file crgfsx.cfg. Add two lines to the file. If your controller was the second in the list it will be: position in list minus one)

```
joystick    1
```

If the button you are planning on using is 3 then add:

```
toga        3
```

Save the file.

To test have running: crgfsx and crgcom, Then start a flight and with the simulator running and selected (click on the simulator screen to select) press your TO/GA button. The word "To/go should appear in the crgfsx screen. If so you are good to go.

CrgUtil must be running for TO/GA to have any effect. CrgUtil contains a rudimentary FMC and is the program that will act on the TO/GA signal. TO/GA will be ignored if the flaps are “full up”.

After takeoff and upon reaching a certain altitude auto speed will be enabled so it is a good idea to have auto thrust enabled and a desired speed dialed in the MCP (or utility screen).

## **OpenCockpits IOCP Interface (EFIS)**

The CrgSim OpenCockpits (OC) IOCP interface gives you the ability to use the OC EFIS hardware with just about any default FSX aircraft including the FSX ultralight tricycle.

The CrgSim Nav display is controlled by the OC EFIS so when you change the EFIS range and mode the Nav Display changes accordingly even if the FSX aircraft does not have an EFIS.

These installation instructions assume you know how to modify your SIOC file and how to install and maintain the OpenCockpits EFIS.

On the computer and directory that you have the OpenCockpits IOCP installed do the following:

- First back up your existing SIOC file. This is always a good idea when modifying your SIOC.
- Find the EFIS section in your SIOC and disable (or remove) the FSUIPC connection for the EFIS variables. The affected variables can be found in the CrgSIOCEFIS.txt file distributed with CrgSim.
- Now combine your SIOC file with the CrgSIOCEFIS.txt file. You may have renumber some CrgSim EFIS variables if they are already in use in your SIOC.

Now copy the IOCP directory from the CrgSim release directory to the computer and directory that you wish to execute it from. Note that many people simply unzip the CrgSim release and execute the programs from the directories created by the unzip operation.

In the CrgSim IOCP directory:

- If you changed some of the CrgSim EFIS variable numbers in the steps above then edit the CrgIOCP.cfg file and make the variable numbers in that file the same as the variable numbers in your SIOC file.
- Change the IP address of the first parameter in the CRGIOCP.cfg file (iocrp-ip) to the IP address of the computer on which you are running the OC IOCP. Usually the same IP as FSX unless you have a larger system.

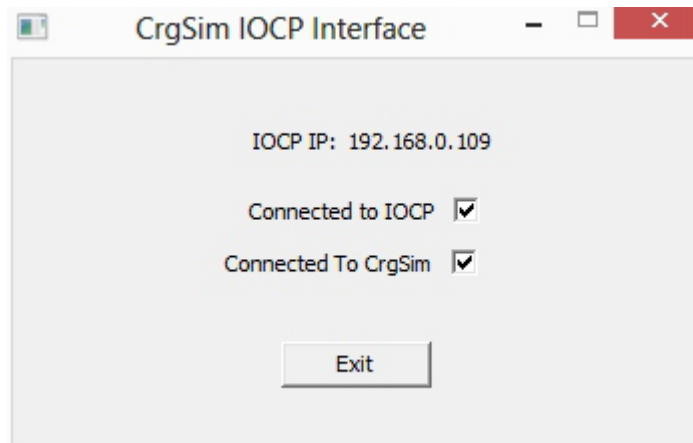
To test your OC EFIS interface you will need to install and run:

- the CrgSim FSX interface OR the CrgSim Prepar3d interface.
- the Communications manager
- the CrgSim locals package. (not necessary if you don't want to have the FSX default aircraft display OC EFIS changes on the MIP or if the aircraft you fly does not have an EFIS.)
- the CrgSim IOCP interface
- the CrgSim Nav display (either Captain's Nav or the First Officer's Nav, either one)

Now start FSX and select an aircraft. For a quick test use the default Ultralight Tricycle.

Start your normal OpenCockpits software, be sure to select the new SIOC file you just modified above.





The CrgSim IOCP interface window (above) will display the IP address of the OC IOCP server that you put in the CrgIOCP.cfg file. When CrgIOCP.exe has a connection with the IOCP server a check mark will display in the upper check box and when CrgIOCP.exe has a connection with the CrgSim communications manager a checkmark will appear in the lower check box.

Move the range selector on the OC EFIS, the CrgSim Nav display should change ranges to match the range on your EFIS selector.

Move the mode selector on the OC EFIS, the CrgSim Nav display should change modes to match the OC EFIS mode.

If the Nav Display follows your operations on the OC EFIS then you should be good to go.

You will need to install the CrgSim PFD to test the minimums and barometer rotary knobs.

If you encounter any problems the IOCP console is a great help sorting out the variable changes.

## **GoFlight Interface (Radios, EFIS and MCP Pro)**

Why connect the GoFlight EFIS and MCP Pro to CrgSim instead of the default FSX connection?

If you primarily fly with the default aircraft the CrgSim interface will allow your changes to many of the flight parameters to be reflected in the CrgSim instruments (VNAV, LNAV, Nav Display Range, Nav Display Mode,...)

If you primarily fly with add on aircraft AND you are happy with the way changes made to the GoFlight instruments affect the add on aircraft then you will probably want to leave the existing configuration in place.

If both the GoFlight driver and the CrgSim GoFlight driver are run at the same time there will be unusual and undesired behavior. To use the CrgSim GoFlight driver be sure to disable the standard GoFlight driver.

So, if you have the GoFlight EFIS and/or MCP Pro you have several choices on how to connect the hardware.

1. Connect the devices to the FSX computer and run the standard GoFlight drivers.
2. Connect the devices to a computer other than the FSX computer and run the CrgSim drivers.
3. Connect the devices to the FSX computer, disable the GoFlight drivers and run the CrgSim drivers.

If you want the EFIS and/or MCP Pro to drive the CrgSim instruments then either connect the devices to a NON FSX computer or follow the directions below on disabling the GoFlight driver. Choice 3 takes longer to explain than actually doing it.

If you want to connect the GoFlight devices to the FSX computer AND want to use the CrgSim interface you will have to disable the GoFlight FSX drivers.

To support the GoFlight EFIS or MCP Pro within CrgSim copy the GoFlight folder to the computer that you want to connect the GoFlight hardware to. Then:

- From the GoFlight web site ([www.goflightinc.com](http://www.goflightinc.com)) click on “Support” and from that page download “GF Config Setup 2.23”
- Install “GF Config Setup 2.23”
- Plug in the USB cables from the GoFlight EFIS and/or MCP Pro.
- In the CrgSim GoFlight folder execute crggf.exe.
- A window should open that displays the number of MCP Pros recognized and the number of EFISs recognized. If the GoFlight hardware is plugged in and the count for both devices is zero then you may have to do one OS restart to have the hardware recognized.

If you have more than one EFIS a small configuration file is used to sort out which EFIS is for the Captain and which EFIS is for the First Officer. The name of the configuration file is crggf.cfg.

If you have more than one EFIS connected then one EFIS will have a hardware number ID of 0 and the other EFIS will have a hardware number of 1.

To determine which hardware number belongs to which EFIS click on the CrgSim GoFlight interface window (opens when you execute crggf.exe) and then press the 'E' key. A debug window should open. When a switch or button on an EFIS is moved the resulting values should display on the debug window. The value of interest here is the ID. For example if you press the ARPT button on the Captain's EFIS

then the value displayed in the ID box (0 or 1) will be the value you use in the configuration file:

```
efisleft <number displayed from above>
```

Do the same with the First Officer's EFIS and enter the value on another line:

```
efisright <number from the EFIS debug window>
```

So assuming that you see a 1 for the Captain's EFIS and a 0 for the First Officer's EFIS then your configuration file would look like:

```
efisleft 1
```

```
efisright 0
```

Restart crgkf.exe and you should be good to go. To test, move the range dial. The range of the corresponding CrgSim Nav Display should follow changes made to the EFIS range dial.

If you have one EFIS then switch and button changes on the EFIS are reflected in both the Captain's Nav Display as well as the First Officer's Nav Display.

**Note:** The GoFlight EFIS and MCP Pro can also be operated in the normal manner, Just follow the standard installation instructions provided by GoFlight and do not start the CrgSim program crgkf.exe.

Note that the CrgSim Communications Manager must be running to connect the EFIS and MCP Pro to the CrgSim system. The upper left check box (Com Connected) in the interface window will have a check mark in it if the interface “sees” the communication manager and has established a connection to it.

A check mark in the Sim Connected box indicates that the Communication Manager has established a connection to the flight simulator and you should be ready to fly.

## Radios

The configuration file in the distribution contains USB assignments for Com1, Com2, Nav1, and Nav2. These assignments are arbitrary and will probably not be accurate for your own setup. Actual USB assignments will be determined the first time you plug in your GoFlight radios. If you do not have any radios the assignments in the configuration file will not cause any problems if left there.

Proper assignment of USB ports to radios is easy. For example: assume you have two Nav radios and the initial assignment is:

nav1	0
nav2	1

Start the CrgSim driver and FSX. Try changing the frequency on Nav1. If the NAV1 frequency on the FSX radio display changes as expected then you are good to go. If the wrong Nav radio frequency changes then swap the assignments above so that Nav1 is 1 and Nav2 is 0. Then restart the CrgSim GoFLight driver. If the radios are plugged into different USB ports then the assignments will probably change and it will be necessary to do the test above again.

In flight operation to change the frequency frequency megahertz turn the rotary knob on the right of the radio. To change the frequency kilohertz push the knob in and then turn. The center square push button swaps standby frequency and active frequency. The right square push button

**How to disable the standard GoFlight interface** (You only need to do this if the GoFlight MCP Pro and/or EFIS are connected to the FSX computer AND you want to use the CrgSim interface instead.)

When FSX runs add on software for the first time it will ask you if you want to allow FSX to start the new software. If you click “yes” it will then ask if you want to automatically start the software each time FSX

is started. If you clicked “yes” FSX will add an entry to the exe.xml file to start the new add on software automatically every time FSX starts.

To stop automatic start up of add on software it is necessary to remove this line in the exe.xml file. Then on each FSX start up, FSX will ask you if you want to run the add on software. Just reply no to use the CrgSim software.

If, in the future, you want to have FSX automatically run the add on software just reply “YES” to the startup question and reply “YES” to the following question from FSX (do you want to automatically run the software on startup).

For Vista, Win 7, and Win 8 you should be able to find the exe.xml file in the directory at:

`c:\users\<your id>\AppData\Roaming\Microsoft\FSX`

Back up the file now. Then open the file with an editor and search for the line containing “GFDevFSX”. When you find the line, delete it, and save the file.

Restart FSX and when asked if you want to run GFDevFSX.exe reply “No” and continue the FSX startup.

## How To

### Change Variables

Depending on your configuration there are usually several ways to change flight sim variables:

- Use the usual FSX panel
- Use CrgSim defined keystrokes through the Utilities Window or a child window (Autopilot, Nav Display,...)
- Select an instrument and change variables with keystrokes (see below).
- Use installed hardware such as the GoFLight EFIS and GoFlight MCP PRO.
- Click on appropriate variables in a utilities sub window.

The “how to” sections below will not cover the usual FSX methods since these are documented elsewhere.

Note that the method or keystrokes used to change variables may (and probably will) change depending on the method you use. Selecting individual instruments allows the assigning of more meaningful keys compared with entering keystrokes in the Utilities window.

## **Change the Nav Display Range**

- Utilities sub window - In the Utilities window, click on the “Nav” button, then in the Nav window click on the range buttons for either Captain or First Officer.
- Utilities Keystroke - select the utilities window or any of the sub windows and use the keystroke defined in KeyAssigns.pdf.
- GoFlight EFIS - if the software is running with the CrgSim drivers (see the GoFlight section) just use the EFIS range knob.
- Nav Display Window - click on the Nav display window (the upper left text (“GS”) will change to green indicating that the instrument has been selected. Then press the up arrow to increase range or the down arrow to decrease range.

## **Change the Nav Display Mode**

- Utilities sub window - click on the “Nav” button, then click on the mode button (the “+” sign) for either Captain or First Officer.
- Utilities Keystroke - select the utilities window or any of the sub windows and use the keystroke defined in KeyAssigns.pdf.
- GoFlight EFIS - if the software is running with the CrgSim drivers (see the GoFlight section) just use the EFIS mode knob.
- Nav Display Window - click on the Nav display window (the upper left text (“GS”) will change to green indicating that the instrument has been selected. Then press the “m” key. Each keystroke will cycle to the next mode.



## **Select Object Type Viewed in the Nav Display**

- Utilities sub window - In the Utilities window, select Nav, then click the appropriate check boxes (airports, stations, waypoints) for either captain or first officer.
- GoFlight EFIS - if the software is running with the CrgSim drivers (see the GoFlight section) just press the appropriate EFIS button to toggle airports, stations, or waypoints.
- Nav Display Window - click on the Nav display window (the upper left text ("GS") will change to green indicating that the instrument has been selected. Then press the "a", "s", or "w" keys to toggle the display of the items.

## **Change Radio Frequencies**

- In the Utilities window click on the "Radios" button. In the resulting radios window there are frequencies for two com radios, two nav radios, and two adf radios.
- A separate add on from Saitek can also be used to change frequencies.

## **Toggle "Flight Dir", "Thrust Arm", and "Autopilot"**

- Utilities Keystroke - in the Utilities window or any Utilities sub window use the keystrokes defined in KeyAssign.pdf.
- Utilities sub window - In the Utilities window click on the "Auto Pilot" button. In the resulting autopilot window there are toggle boxes for each of these variables.

## **Toggle “VNAV” and “LNAV”**

- In the utilities window click on the “Auto Pilot” button. In the resulting autopilot window there are toggle boxes for each of these variables.
- GoFlight EFIS - if the software is running with the CrgSim drivers (see the GoFlight section) just press the appropriate MCP button to toggle LNAV and VNAV.

## **Change the barometer setting**

- PFD Instrument - select a PFD (the “GS” at the bottom of the speed tape will turn green to indicate that the instrument has been successfully selected. Then press “ctrl+b” to increase the barometer setting or press “b” to decrease the barometer setting.
- Utilities Keystroke - in the Utilities window or any Utilities sub window use “ctrl e” to increase the barometer setting or “e” to decrease the barometer setting.

## **Toggle the Nav display of airport names at 80 NM**

Select the Nav instrument and press the letter “e”.

## **Change Autopilot Heading, Altitude, and Speed Values.**

- In the “Utilities” window click on the “Auto Pilot” button. In the resulting autopilot window are buttons to change these variables as well as toggling “Speed Hold”, “Altitude Hold”, or “Heading Hold”.
- GoFlight EFIS - if the software is running with the CrgSim drivers (see the GoFlight section) just rotate the appropriate MCP Pro knob to change values.
- Nav Display Window - click on the Nav display window (the upper left text (“GS”) will change to green indicating that the instrument has been selected. To change auto heading use the right or left arrow keys. Use the up arrow to increase the altitude bug value or use the down arrow to decrease the altitude bug value. Then press the “a”, “s”, or “w” keys to toggle the display of the items. To increase the speed bug value press “ctrl+s”. TO decrease the speed bug value press “s”.
- PFD instrument - select (click on) a PFD. The “GS” just below the speed tape will turn green to indicate the instrument is selected. Then use the right arrow key or the left arrow key to change the auto heading.

## **Load a New Aircraft Profile**

- In the Utilities window click on “Load Profile”, then select from the profiles presented.

## **Load a Flight Plan**

- In the Utilities window click on “Load Flight Plan”, in the resulting window select and load the flight plan of your choice.

## **View status of current variables (Speed, Altitude, Heading)**

- In the “Utilities” window click on the “Status” button. These variables (and others) are available (read only) in the resulting “Status” window.

## **Just select an airplane and fly**

- If you have the CrgSim Communications Manager and the CrgSim FSX interface running as well as the instrument(s) of your choice then in FSX proceed as normal. Select an aircraft and starting location. If you selected one of the default turbine aircraft then use “Utilities->Load Profile” to load a profile matching your selected aircraft.

## **Loading and using a Flight Plan with the Autopilot**

- Go to the section entitled “Flying with a Flight Plan.”

## **Preventing FSX sound from stopping when selecting another window on the FSX computer.**

The short answer is you probably can't. If you run your CrgSim instruments on another computer then selecting one of the instruments should have no effect on FSX sound.

If you run the instruments on the FSX computer then selecting an instrument to modify a simulation variable will halt FSX sound until the FSX window is reselected.

If you want to run the instruments on the FSX computer and have an older computer you can try executing the communications manager and Utilities on the older computer. This configuration may have a slight but unnoticeable effect on performance.

## **Configurations Tested in the Lab**

**Note: The PFD and NAV displays** are based on Directx 10 and have been tested on Windows 7. They will not work on XP. They have not been tested on Vista but are expected to work if DirectX 10 drivers are installed. Both programs require a Directx 10 compatible graphics card.

In the lab the following configurations have been tested:

**1. Both crgcom and all instruments executing on the same computer.**

FSX Standard - XP machine #1  
crgcom - Windows 7 64 bit machine #2  
Instruments - Windows 7 64 bit machine #2  
Keys - Windows 7 64 bit machine #2

**2. Crgcom and instruments executing on different computers.**

FSX Standard - XP machine #1  
crgcom - Windows 7 64 bit machine #2  
Instruments - Windows 7 64 bit machine #3  
Keys - Windows 7 64 bit machine #3

**3. Crgcom and instruments executing on different computers.  
Instrument computer is WiFi connected.**

FSX Standard - XP machine #1  
Crgcom - Windows 7 64 bit machine #4  
Instruments - Windows 7 64 bit machine #5 (WiFi)  
Keys - Windows 7 64 bit machine #5 (WiFi)

#### **4. Simulator running on Windows 7 computer**

FSX Accelerated - Windows 7 machine #6

crgcom - Windows XP machine #1

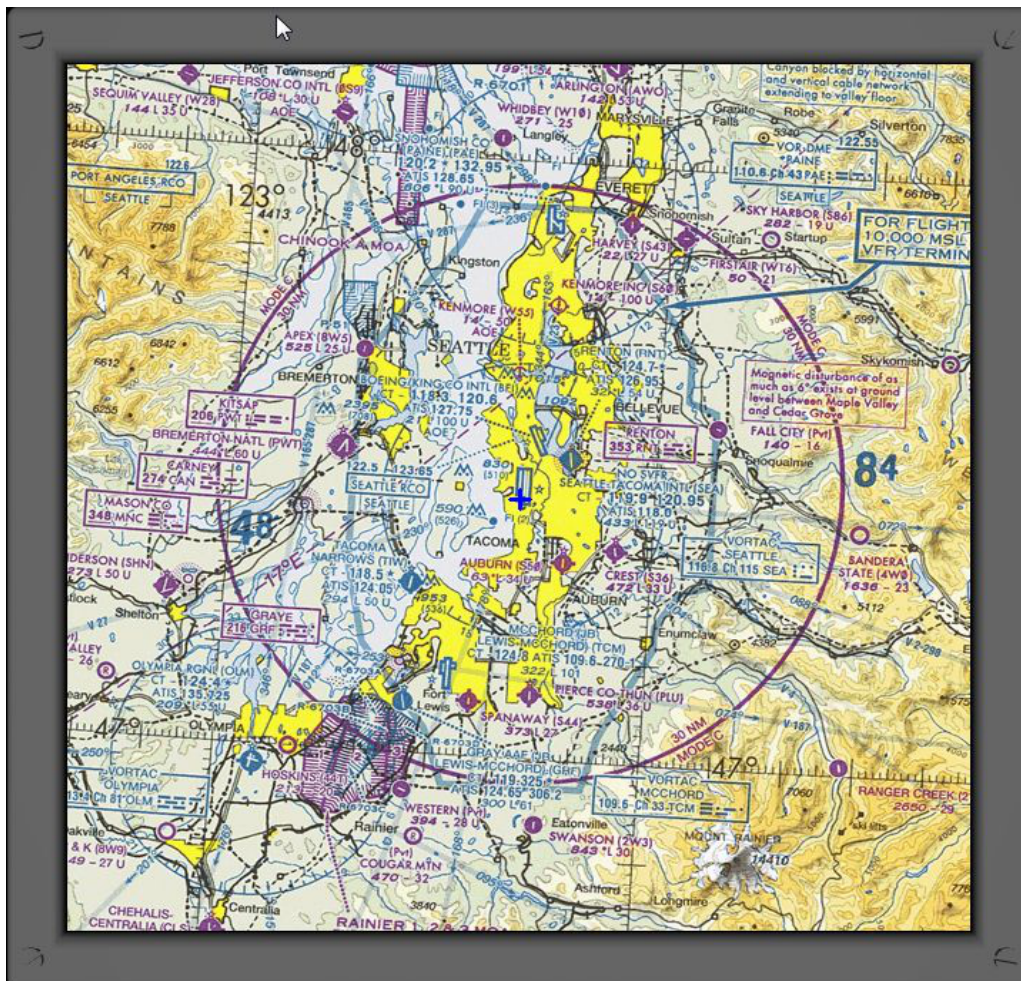
Instruments - Windows 7 64 bit machine #5 (WiFi)

Keys - Windows 7 64 bit machine #5 (WiFi)

Note: Out WiFi connection to machine #5 is relatively weak in the LAB. There is a facility for calculating UDP packet loss. For this configuration UDP loss was about 8%. This packet loss did not detract from the proper operation of the Instruments.

## Charts

CrgChart is distributed in a separate zip file that includes the charts, executable, and documentation. To install charts, please download a copy of the latest CrgChart distribution and follow the included instructions. There is probably no 777 prototype to compare the chart window to but it is run most of the time here. The following are some images from the distribution:



The image below is a Wide Area Chart display of the SeaTac airport area.

Wide Area Charts for most of the United States are included with the CrgSim Charts distribution.

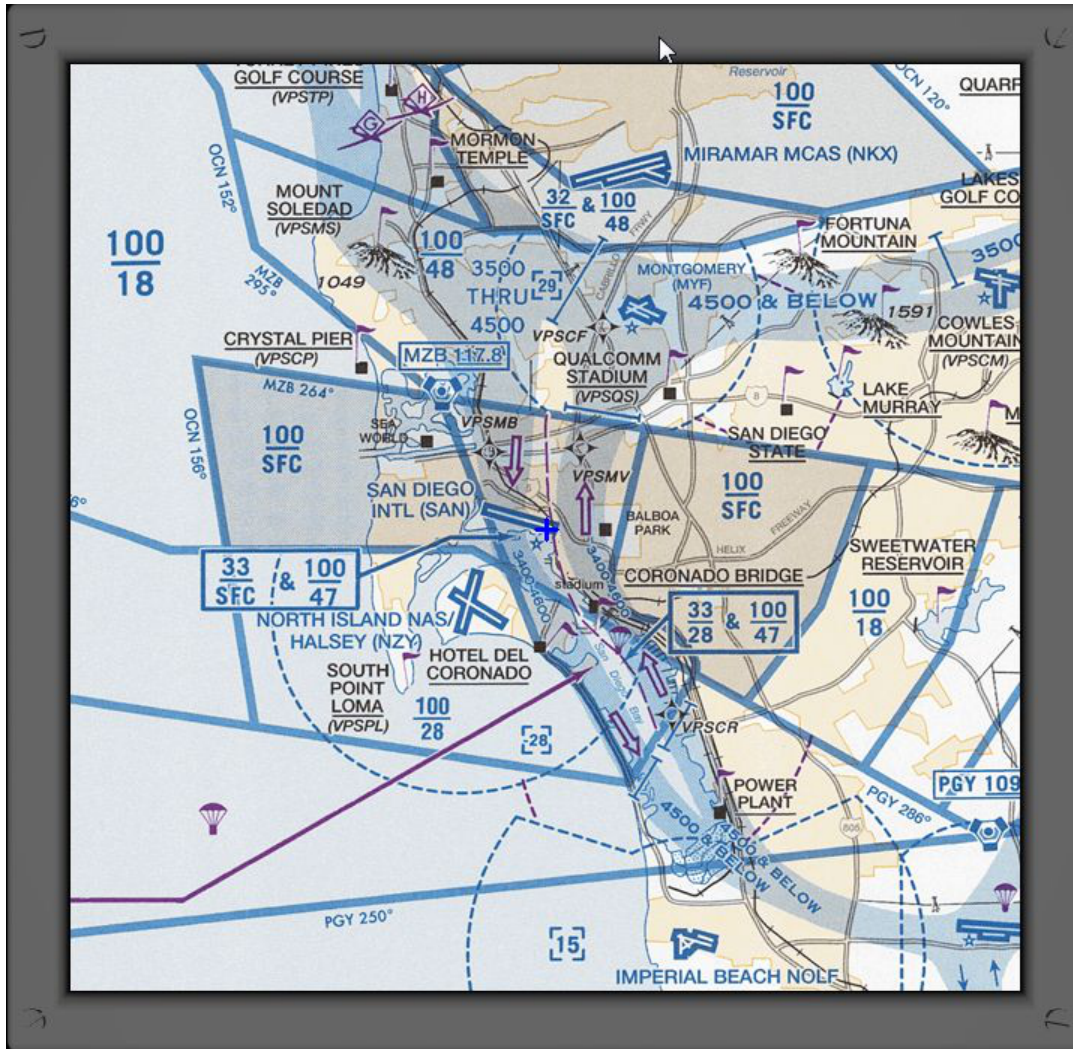
A new chart.exe is occasionally distributed with a new release if the Crg database has been changed. If you are using Charts be sure to copy over and use this new chart version.

A new version of charts now shows other aircraft on the selected chart within a 20 mile range (or up to the limits of the selected chart) of the user aircraft.

Keys 1.2.3 and 4 now select the chart range and type of chart. In general we try to avoid using the keyboard so there may be a better way to select the chart. Perhaps a pokeys driven rotary switch. Stay tuned.



The Figure below shows a typical VFR chart, this one is of the San Diego area.



VFR charts for Baltimore Washington, Chicago, Houston, Los Angeles, Seattle, and San Diego are included with the current set of chart releases.

## Flying with a Flight Plan

After a flight plan has been loaded one or more points will be displayed on the Nav Display if they are within current range of the Nav Display. The first flight plan point will be activated. Each proceeding flight plan point will be activated by flying within approximately 2.5 miles of the point. Once activated the next active point is displayed in magenta and the line to the point is also displayed in magenta. Intersecting a flight plan path will not activate the flight plan. If you miss a point just fly within range of the next point on the flight plan to activate it. If you are using the autopilot and VNAV/LNAV you will be taken automatically to the next point at the specified altitude and air speed.

To automatically fly the flight plan, turn on Autopilot, VNAV, and LNAV on the Keys autopilot window. The Utilities program has a basic flight plan computer that will issue commands to the FSX/Prepar3d program to fly the flight plan. The routine will also attempt to compensate for moderate crosswinds to remain on the track from one point to the next.

Once the last point on the flight plan has been reached VNAV and LNAV will turn off and the last heading and altitude will be maintained.

One of the flight plans included in the distribution called "Circle" will continually fly around a closed loop until the flight plan is manually terminated by selecting a "Load Flight Plan" window and pressing the clear button.

Flight plans can be reset by reloading them or pressing the F3 key while a Keys window has focus. They can be reloaded or changed while flying. When a flight plan is reloaded or changed VNAV and LNAV are turned off. If you want to use either or both VNAV or LNAV turn them on again on in the Keys autopilot window.

CrgSim follows the flight plan by sending altitude and heading commands to the autopilot in FSX/Prepar3d.

Here is the sequence for loading and flying a flight plan from the Colorado Springs Airport. The flight plan specifies a path after taking off on runway 35L going North to circle around and set up for landing on 35 L again.

- With FSX select the Colorado Springs airport, runway 35L
- Select the default 737 in FSX
- With the Utilities window select profile “737 Default.crgpro.”
- With the Utilities window select “Load Flight Plan” then load flight plan “KCOS 35R loop to KCOS 35R.fpf”. The flight plan path should be visible in your Nav Display window. The first flight plan point will be magenta.
- Turn on LNAV and VNAV either on the Utilities/Autopilot window or with the GoFlight MCP Pro. The new heading, speed, and altitude should be automatically entered into the MCP or Utilities/Autopilot window.
- Set your flaps to the take off position
- Turn on Auto Throttle Arm.
- Advance the throttles and take off.
- Above 400 feet AGL both the Heading Hold and Altitude Hold buttons will be illuminated (in the autopilot window or your MCP).
- For this flight around 1,000 feet AGL turn on the Autopilot and Speed Hold.

- If everything looks normal sit back and enjoy the trip.
- Before overflying the last waypoint start getting the aircraft set up for landing. (turn off VNAV and LNAV, set autopilot speed, set flaps, and eventually landing gear.).
- Begin your decent and land.
- Repeat as necessary

VNAV and LNAV must be turned on to fly a flight plan. These controls are not sent to the simulator so your single engine flight plan can fly with both of these functions enabled. Using the default 737 a typical takeoff could be:

Using the autopilot Keys window turn on flight director, auto throttle arm, VNAV and LNAV.

Set flaps for takeoff.

Increase throttle part way, when the engines have spooled up click on TO/GA.

Control the aircraft down the runway. At approximately 80 knots the annunciator will announce HOLD. Continue to control the aircraft.

On positive altitude gain raise the gear.

At approximately 400 feet AGL speed control will be activated and altitude hold and heading hold will be armed.

Click on autopilot when desired.

If a flight plan has been loaded and is activated you can set back and watch.

If a flight plan has been loaded but is not yet activated use the autopilot controls to fly toward the first waypoint.

Note that the TO/GA switch will not be activated on takeoff if the flaps are full up.

## FSX Add On Compatibility

If a third party add-on exchanges all variables with FSX then CrgSim and the third party product should work together. For example if a third party aircraft sets a radio frequency by sending the frequency to FSX, then CrgSim is able to read that frequency from FSX so for this particular variable the two products can be considered compatible.

Assume though that a 777 add-on uses VNAV and LNAV and does not send these variables to FSX (where would they go anyway?) then CrgSim cannot read those variables. Some add-on aircraft keep a large number of variables private. These are not good candidates for inter-operating with CrgSim. In cases where an SDK is available from the manufacturer then the possibility of compatibility increases.

Interoperability may not be a big issue since the default aircraft (or add-on aircraft) provide just the flight model if you do not display the cockpit on the main FSX/Prepar3d screen. The 2d or 3d cockpit is not used in this case. This form of operation with a flight simulator may not be desired by many people though. CrgSim running without a cockpit display is just one of many options.

## Auto Land

We use a short flight between Colorado Springs, Co. and Denver, Co. as a test flight to check out a release. It is a fun and short flight ending with auto land at Denver. Here's how to set it up:

In the Utilities screen click on the "Load Flight Plan" button. Select COS2DEN and click "Load".

- Select the Colorado Springs Airport (COS) and runway 35R.
- Turn on the flight director
- Set A/P speed to 300 knots
- Arm auto throttle
- Set A/P altitude to 10,000 feet and click the Alt Hold button
- Set A/P heading to 349 degrees and click the Heading Hold button
- Nav1 and Nav2 will automatically be set to a Denver ILS frequency when getting close to Denver.
- Turn on VNAV and LNAV (Keys autopilot screen)
- Increase throttle to about 60%. Then a few seconds later click on TOGA (Utilities->Autopilot screen) or press FK5 (one of the Utilities windows must have focus to recognize keystrokes)
- Take off and after verifying a positive rate of climb raise the gear.
- After the gear is up, set auto throttle to on, this should begin controlling your air speed to the value set above.
- Click the Cmd button to turn on the A/P. Raise the flaps.

The Denver signal should be acquired about 27 NM out after passing waypoint BOOBU or CORDE. When you see the glide slope diamond appear on the Primary Flight Display to the right of the artificial horizon and the altitude diamond appear to the right of the artificial horizon click on App (Utilities autopilot screen) and the plane should begin to automatically set up for landing. When APP (Approach) is activated both Altitude Hold and Heading Hold will be automatically turned off. Turn off LNAV and VNAV.

Be sure to wait until both the localizer diamond and the glide slope diamond appear before clicking APP.

You will have to control the speed, flaps, and gear. Set auto brake if desired if you have a cockpit display, otherwise apply brakes after touch down. At 1500 feet AGL LAND 3 should appear above the artificial horizon. On touch down turn auto throttle off, set throttle to zero, turn A/P off and start braking. You can turn off Speed Hold some distance out to begin controlling the throttle yourself. You can also disconnect the autopilot at 200 to 300 feet AGL to finish the flare yourself.

**Any similarity between this flight and reality is purely coincidental.**



## Colorado Springs To Jackson Hole

Similar in setup to the Autoland at Denver, load the COS2KJAC flight plan and take off as you would above. This flight plan takes longer but is more of a challenge at the end. The last leg ends up in Jackson, Hold at 25,000 feet is you stay on the flight plan the whole time.

But 25,000 feet is not where you want to be on arrival! The challenge is to descend to a lower, but still safe, altitude and use the final flight plan position to line up on the Jackson Hole airport. When, not if, you land successfully take a look to the North West at the magnificent Grand Tetons. As a final effort you may find waypoints and/or NavAids in the Jackson Hole area that you can use to descend to and to line up with for the final approach into the Jackson Airport.

## An Infinite Flight Plan

A flight plan called **circle.fpf** is included in the distribution in the same directory as the Communications Manager. This flight plan is used here for extended testing since it will vector the aircraft around in a continuous loop until cancelled or until the aircraft runs out of fuel.

To run this flight plan:

- select Circle from the flight plan list.
- select runway 17 (left or right) at the Colorado Springs Airport.
- Arm Auto Throttle (Utilities autopilot window)
- Set the Nav display range wide enough to be able to see the PYNON waypoint (Utilities Nav window or EFIS range)
- Rotate Auto Heading to intersect PYNON. (Utilities autopilot window)
- Set auto speed to 250 knots. (Utilities autopilot window)
- Set auto altitude to 9,000 feet (Utilities autopilot window)
- Turn on VNAV and LNAV (Utilities autopilot display) (Utilities autopilot window)
- Turn on the Flight Director (Utilities autopilot window)

Set throttle to around 60%, then a few seconds later click on TOGA (Utilities autopilot window). Rotate at VR, raise the gear on positive rate of climb, and click on Speed hold. Turn on the autopilot.

Use auto heading adjust to fly to PYNON, when within approximately 3.6 miles the flight plan will be activated and VNAV and LNAV will begin controlling the aircraft. The next waypoint should turn from white to magenta and the aircraft should turn in the direction of waypoint HIPPE. Feel free to experiment with different Nav frequencies, altitudes, speeds, and vertical speeds in this flight plan. Probably a good idea to cancel the flight plan (turn VNAV and LNAV off) when fuel gets low and then return to the airport of your choice.

## **15 Inch LCD Panels**

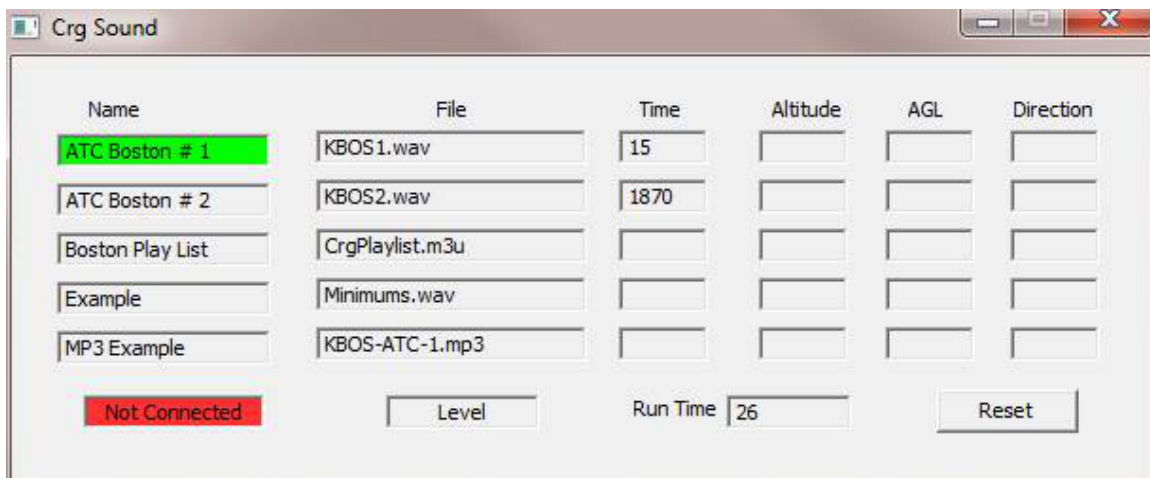
It seems that 15 inch LCD displays (and smaller) are getting hard to find and can be expensive. As an experiment we obtained some used 15 inch displays from a local computer repair store for very low prices. The displays were removed from their plastic cases, mounted behind panel cut outs, connected to the computer through VGA cables, and look great. For this size, high resolution displays are not a requirement.

## **Running a charts only system**

If you want to use just the charts capability of CrgSim then you will need just one extra computer running XP or above. Install the Communications Manager and Charts on the same (non FSX) computer and install the FSX Interface on the FSX computer.

## Running a sound only system

If you want to use just the sound capability of CrgSim then you will need just one extra computer running Vista (see note about XP and long sound files) or above. Install the Communications Manager and Sound on the same (non FSX) computer and install the FSX Interface on the FSX computer. Enjoy your aircraft with altitude call outs, even the Cessna 172 will now have altitude call outs.



The screenshot shows the 'Crg Sound' application window. It contains a table with columns: Name, File, Time, Altitude, AGL, and Direction. The first row, 'ATC Boston # 1', is highlighted in green. Below the table are controls for 'Not Connected' (red button), 'Level' (text box), 'Run Time' (text box with value 26), and a 'Reset' button.

Name	File	Time	Altitude	AGL	Direction
ATC Boston # 1	KBOS1.wav	15			
ATC Boston # 2	KBOS2.wav	1870			
Boston Play List	CrgPlaylist.m3u				
Example	Minimums.wav				
MP3 Example	KBOS-ATC-1.mp3				

Not Connected      Level      Run Time 26      Reset

## Keyboard Alternative

The Genovation programmable keypad has also been tested with Crgsim. Their 6x4 keypad was programmed to generate the key sequences found in KeyAssign.pdf (included with this distribution) so many functions are available through the keypad such as gear up/down, AP on/off, speed, altitude, and heading functions, and flaps up/down. It is still a keypad but much less intrusive than a typical computer keyboard.

The keys are covered with a removable transparent cap so you can put your own labels on each key.



## In Case of Trouble

### 1. Communications Manager does not list any Register Requests from the simulator:

- Make sure that `crgfsx.exe` or `crgr3d.exe` are running on the simulator computer.
- Examine the ComMgr log and verify that the ComMgr startup IP address and port number in `crgcom.log` are correct.
  - Use the windows command line “`ipconfig`” to list the available adapter addresses.
  - Ensure that the port number is not in use by another program.
- Examine the `CrgFsx.log` file in the Flight Simulator X computer.
  - The start time should reflect the local computer time that the simulator was last started.
  - Make sure the listed IP address and host name are correct.

### 2. Communications Manager does not list any Register Requests from the instruments and other modules.

- Make sure that **`crgcom.exe`** (the Communications Manager) is running and that no anti virus packages are blocking messages. The CrgSim components communicate with UDP. No messages are sent to anywhere outside of your local net except once on startup

from the Comm Manager when optionally checking for a newer version.

- Examine the instrument logs (CrgPfdR.log is the log file for the right PFD) located in the directory that the PFD executable is located. The instrument log should have a line that says: "HostName:" , and another that says "Selected IP" and another line that says "Monitor Port is:".
  - Ensure that the Host Name and IP are correct. Verify by using the command "ipconfig /all" in a command line window.
  - Look for a line that says "GetUdpMsg() - Connected to ComMgr". If this line is missing the instrument and the ComMgr are not communicating.
  - After the "Connected" message above, the IP and Port of the ComMgr will be listed. Check that these values match the "Selected IP" address and "Port Number" listed in the ComMgr Log File.
- Note that CrgSim components will look for a non-routable network address (172.x.x.x, 10.x.x.x, 192.x.x.x) to use in case there is a VPN address (for example: from Hamachi) in the IP list.

3. The numbers on the GoFlight MCP are flashing or otherwise acting strange.

- The most likely problem is that both the GoFlight drivers and the CrgSim drivers are running at the same time. Only one set of drivers should be running.



4. The flaps animation (moving gray area) on the EICAS does not match the magenta bar identifying the flaps target position.

- The default aircraft profile is for the default FSX 737. Other profiles (example: default 777) are available in the Utilities directory. The profile must match the aircraft being flown for the flaps animation to work correctly.
- Using one of the existing aircraft profiles you can create a custom profile with flap position count and flap positions matching the aircraft you are flying.

## Display Considerations

In our lab there are 5 windows: PFD right, PFD left, EICAS, ND right, and ND left. Each display is a separate program and creates a separate movable resizable window. The displays used here in the lab are small 15 inch monitors. Each monitor has a black background and displays one PFD and one NAV. The windows do not have a border or title bar and therefore are not moveable or resizable by the usual way of grabbing the border or title bar and dragging. The position and size of the displays are specified by a configuration file so you do not need to move things around every time your system is started. Once set the PFDs and NDs will start up in the same location specified by the configuration files.

Each instrument includes a bezel by default. If you place your instrument behind a physical cutout in your forward cockpit panel you can specify removal of the bezel to provide a little more flexibility for you.

The PFDs and NDs are designed to be a relatively square display on the screen. For displays where the pixel aspect ratio is not square the width and height in the config file can be adjusted to produce a square display. The display will look presentable down to about 550 pixels square but looks best close to 700 pixels square and above.

## **Network Considerations**

All CrgSim components have to be run on computers located on the same local network as the simulator. The components locate one another via UDP messages so any intervening routers or switches on the local net must pass these messages. Local net (192..., 172...) UDP broadcast messages are not routable so they will not be passed on to the internet. After connecting, inter CrgSim component communication is via UDP.

On startup each CrgSim component inspects the computer's internet adapter to determine available IP addresses and net masks. It then selects one to use. This is successful most of the time. Since a computer may have multiple IPs and multiple Ethernet adapters it is possible that the component will chose one that has no connectivity to either the simulator local net or to the other components. You can override the IP and/or net mask with either command line parameters or by configuration files depending on the component. Most local nets will probably have an address beginning with 192.168.x.x.

To find out information about your computer's network interface open a (MS Windows) command line window and type "ipconfig /all".

## **Units Conversion**

At this time altitude units are in feet. A PFS "meters box" is on the list of changes to make.

## **Performance**

There are two computers in the lab that have been used to check performance. One computer has an AMD Phenom II X4 840T processor and the other has an AMD Phenom II X4 820 processor. Neither of the processors is considered high performance but they are decent performers. Both computers run Windows 7 and DirectX 10.

The target fps for all instruments at this time has been set to 20. Just below the fps there is another line that begins with "PAUSE". This line displays the sleep time necessary to maintain a 20 fps update rate. Note that the display image is updated at a much faster rate, the rate that fps is referring to here is the screen content update rate.

On our slower machine (820) with all of the instruments running (two PFDs and two NDs), the Communications Manager, and Utilities fps is 20 and Pause is 32. Looking at the process monitor the load on the CPU is minimal. However, right after startup there is something causing the fps rate to drop to 7 or 8 and the pause value to go to zero. The instruments perform choppy and the look and feel is not satisfactory. CPU core 3 is loaded to around 25% while the other cores hover around zero. By terminating some of the background programs the performance rate eventually jumps to desired values. This has not been associated with any particular program and remains a mystery.

Lab performance is almost always improved significantly by turning off the "Themes" service with the task manager. Start the task manager, select services tab, right click on Themes and select "Stop Service". On reboot the Themes service will restart normally.

On the faster machine (840) things have always run with the system configured normally.

## Nav Display TCAS Notes

The Traffic Collision Avoidance System (TCAS) warnings in CrgSim are different than in the real world system:

In the table below the horizontal legend is the altitude separation between the aircraft, the vertical legend is the horizontal distance separation between the aircraft. The table cells contain the TCAS symbol displayed in CrgSim TCAS.

		<3000	<2000	<1000
	>3000	>2000	>1000	
10 > Dist	Info	Info	Info	Info
6 >Dist<10	Info	Info	Info	Prox
4 >Dist < 6	Info	Prox	Prox	Alert
2 >Dist < 2	Prox	Prox	Alert	Alert
Dist < 2	Prox	Alert	Alarm	Alarm

- Info - a magenta diamond
- Prox - a filled magenta diamond
- Alert - an amber/yellow filled circle
- Alarm - a red filled box

### Aircraft Marker Display Notes:

- If an aircraft is greater than 5000 feet in altitude separation or greater than 10 NM distance from yours no altitude separation will be displayed above/below the aircraft marker.
- Aircraft less than 5000 feet above your aircraft will have the altitude separation displayed above the aircraft marker. For example: an aircraft 3330 feet above will have +33 displayed above the aircraft marker.
- Aircraft less than 5000 feet below your aircraft will have the altitude separation displayed below the aircraft marker. For example: an aircraft 2740 feet below will have -27 displayed below the aircraft marker.
- If an aircraft is climbing an up arrow will display to the right of the aircraft marker.
- If an aircraft is descending a down arrow will display to the right of the aircraft marker.
- If the highest traffic warning on the screen is ALARM the word "TRAFFIC" will be displayed in RED.
- If the highest traffic warning on the screen is ALERT the word "TRAFFIC" will be displayed in amber/yellow/
- TFC will be displayed in the lower left part of the Nav Display Screen indicating that TCAS on "ON".

## No Com, No Sim, No Int

There are 3 programs that must be running for the instruments to receive flight data for display. Chart, Nav Display, and PFD will display an error message if one or more of these programs is not found in the local network.

- NO COM - the instrument cannot locate the Communications Manager.
- NO INT - the interface to FSX or Prepar3d cannot be located on the local network.
- NO SIM - The communications manager and the interface to FSX/Prepar3d is running but the interface cannot locate FSX/Prepar3d.

Note that if the interface is not running the communications manager will still maintain contact with all of the components however response to commands will be slow.

## Contact

You can contact us at [sim30@crgsim.com](mailto:sim30@crgsim.com). We are especially interested in your comments, any problems you might have with the programs, and things that you like (or don't like) about them.

After spending a large amount of time removing non-flight sim posts (drugs, counterfeit boots, ... for sale) we reluctantly had to convert the web site to read only.