Briefing

Starting the FlightGear Simulator

You can start FlightGear on 2 very different ways:

1. ***FGrun***: This is the easy way! Here you use a GUI to just select the wanted Options. FGrun then combines these to a normal FlightGear command-file and issues that to the system. FGrun also remembers your last selections and presents those on start-up. You can save the settings and recall - so you can prepare many of those settings for different events/opportunities. FGrun is already included in the basic packages for Windows and MAC OS X. If you want to install it (e.g. on your Linux-System) see http://sourceforge.net/projects/fgrun/ for downloading and installation instructions.

2. ***Manual:*** Here you search and define all Options by yourself and type them into a command-line or command-file. This is the most flexible way of doing it - but relatively complex and time-consuming

For both of these ways of starting you must know something about the most important "options" - as follows:

The Major Options

You can start FlightGear just by typing "***fgfs***" (or clicking onto such an ICON). FlightGear will then start in San-Francisco on the active runway in a Cessna c172p with running engines - just waiting for you to push the throttle.

But you probably will change that default behavior pretty soon - and you can do so by defining over 150 options. Some of those you might change very often (e.g. the aircraft, airport, etc.), some only once in a while (e.g. the input/output devices you use, etc.) and some only very seldom - if at all (e.g. logs, tracers, etc.). In the following we will describe just the most used ones - a complete list of all options you find in the appendix.

You define the options you want to use by issuing the start-command like:

```
fgfs --Option1 --Option2 ...
```

Be sure that those "**--**" always are 2 dashes - some system tend to join those 2 to one long one -- and that may become your first error for which

you might search for hours or even days! If you have problems preventing the system from joining those 2, try to mark that single one and overturn it again with the 2 dashes and then DO NOT USE THE ENTER-KEY but just click with your mouse somewhere else!

System Options

Before it can start the system needs to know some basic informations. Those are generally set during installation - but just in case: You can change them any time:

--fgroot=*$FG_ROOT*
defines the directory where the program finds the data (aircraft, etc). You see already here, that you could place your (big chunk of data) onto some other disk!

--fgScenery=*$FG_SCENERY*
the directory where the sceneries reside

--config=*path*
Some models may ask you to enable some special functions (open doors, shoot guns, towing a glider, etc.). They will tell you during installation which XML-file they require - and you pick that up with this command.

--control=*your primary control-unit*
Define with which device you will work most: With a joystick, mouse or keyboard. Make sure that device is connected to your system prior to start FlightGear (or FGrun). This is especially important if that device is a joystick! And be aware that those devices may interact with each other! e.g. if you control by Keyboard, but also have a joystick installed, the "joystick home-position" might not allow you to change "analog values", e.g. ailerons, speed, etc. by the keyboard!

--language=*(de, fr, it, ...)*
Starting with FlightGear 2.0 you can define the language-group you want to use for your FlightGear menus. *(But there are not yet many languages available! See all installed translations in your directory: $FG_ROOT/Translation.)*

--browser-app=*path*
In case you have different Internet-Browsers installed, you define here which one FlightGear shall use.

Further details you find in "General Options"

Define the Aircraft

FGrun will present you a List with all the models installed - but if you do not use FGrun (but still want to use other models than just the C172p!) you have to define at least:

--aircraft=*model*

For a list of models available see the directory $FG_ROOT/Aircraft (or use the option "*--show-aircraft*" with your start-command).
Further details you find under "Aircraft-Options".

Define the Startposition

You may start at any point anywhere on earth - the only restriction is: You must be able to define that place somehow! And do not be disappointed if you see just deep blue water after starting - that would indicate that you did not yet have the sceneries installed for that location!

You can define your starting point by:

- **an Airport:** For that you have three sub-options:

  Define Airport and Park-position: This Option is the only one matching reality - and should be used each time. But not all Airports in FlightGear do have designed park-positions yet! If you do not use FGrun *(which would list them for you to select)* you can find the available Park-positions for an airport in the data-file *$FG_ROOT/Scenery/Airports/I/C/A/ICAO/ICAO.parking.xml.* For San-Francisco that would be *$FG_ROOT/Scenery/Airports/**K/S/F/KSFO.parking.xml***
  - you could define e.g.: ***--airport=KSFO --parkpos=B26***

2. **Define just an Airport:** In this case FlightGear chooses itself a runway that is best fitting according to wind etc. -- and by that finds exactly that runway, that everybody uses. That probably leads to many bad wishes from
   - other pilots just being on short final and suddenly find there runway blocked by you
   - other pilots suddenly sitting with their plane inside your plane
     - you could define e.g.: ***--airport=KSFO***

3. **Define Airport and Runway:** This is the worst selection at all, because in addition to the problems with item 2, you now may even start against the other traffic (and wind) - that surely will tempt the other pilots to even "worse wishes" against you! We suggest this solution only in cases were there is a small, unused runway available - which you leave as son as possible!
   - you could define e.g.: ***--airport=KOAK --runway=33***

Instead of using one of the last two, it would be much better to use the next option:

- **by GPS Data:** You can use MPmap, a normal map, a Handy with GPS, etc. to get the Longitude and Latitude and add to that a wanted heading. e.g. for KRHV
  - you could define: ***--lat=37.334047 --lon=-121.816320 --heading=234***

You may find more details about that location in chapter "VFR Cross-Country"

- **by Navigation-points:** These could be: VOR, NDB, FIX, Carrier, airports, etc. If you use a VOR or NDB be aware that there may be used the same ID for several items. e.g. there is a "VOR Richmond" with an ID="RID". That same ID is also used for the "VOR RIED" in Germany, south of EDDF. So you cannot really be sure where you will show up! You better verify it prior using it!
    - you could use the following options:

      `--vor` `or` **`--ndb`** `or` **`--fix`** `or` **`--carrier`** `or` **`--airport`**
      `--offset-distance` `and` **`--offset-azimuth`**
      `--on-ground` `or` **`--altitude=`**`ft`

  You could e.g. start exactly above the Fix=HAN85 which is on the ILS-localizer for runway 21 at EDFH. For the c172 you might choose an initial speed of 100 kn and the altitude (according to the ILS-glideslope) shall be 3000 ft.:

    - *you could define:* ***`--fix=HAN85 --heading=210 --vc=100 --altitude=3000`***

  Be aware that some options may overwrite others! e.g. "--vc" (velocity) would overwrite a somewhere else defined "--enable-freeze" which would stop everything!

Features and Rendering: (very nice - and very slow!)

It is a big advantage that may experts have chosen FlightGear for their hobby - and that they are constantly improving visibility and rendering effects etc. That is wonderful for some users - for others it can result in problems! Especially if they have an older, not that powerful PC! If your PC-response-times are getting very slow check your FPS (`menu → View → Display Option → Show Frame Rate`) before and after you activated/deactivated some of these features (like fog, AI-models, etc.). And then test the FPS somewhere outside in the open country and compare it to e.g. KSFO (San Francisco) and/or LFPG (Paris France). Especially the city of Paris is modeled with a whole lot of buildings: That is wonderful because you can do sightseeing to all the touristic attraction in e.g. a little Cessna -- but you need a "good" Computer with a very good Video-Card" to be able to enjoy it!

So watch how many of the Feature and/or Rendering options you are activating!

Networking

If you have a permanent Internet connection at your disposal you may be using many other Features (e.g. Multiplayer, FGCOM, etc.) - see the chapter Features for that. Further Details you find in the Networking options

Starting with FGrun

Start FGrun like any other program in your PC. In case you do not find a Start-ICON on your desktop and FGrun is also not listed in your Program-Lists, then verify that FGrun is installed. If installed it usually resides in the same $FG_PROG-directory as FlightGear itself. Basically there are two versions of the FGrun:

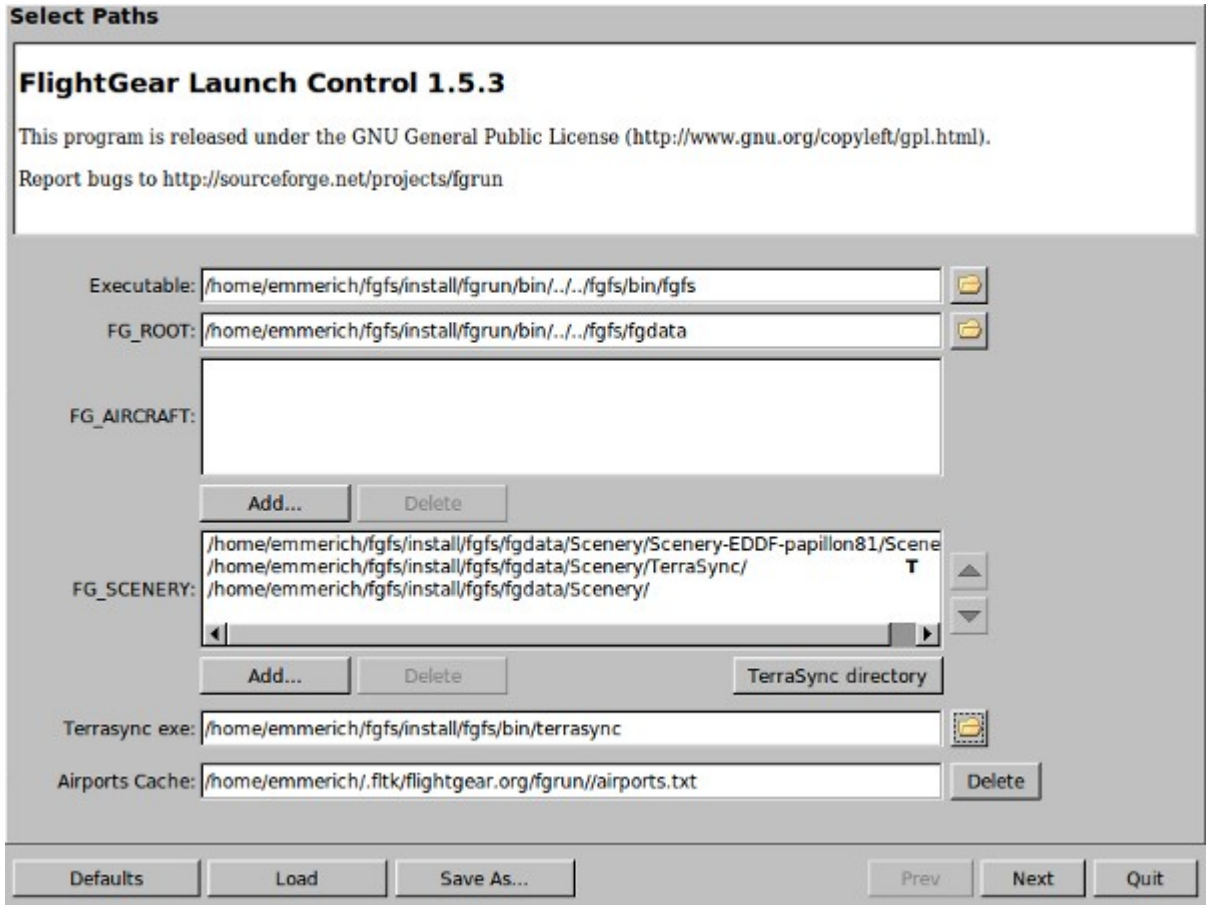
- “FlightGear_Launch Control” for Windows and Unix/Linux
- „GUI Launcher“ for Mac OS X

“FlightGear Launch Control” for Windows and Unix/Linux

Please see in the following how the major options are set in FGrun for Windows and Linux - for more details see: http://wiki.flightgear.org/index.php/FlightGear_Launch_Control.

After having started FGrun it will first show you the second page! That sounds odd - but has a good reason: On page 1 there are system options which needs to be accessed only very seldom! While on page 2 you select the aircraft - which is needed much more often. So:

To view or change the "System Options" you first have to press "Prev" on the "Page 2":	



FGrun Page 1:

The variables $FG_ROOT and $FG_SCENERY and $FG_PROG probably have been set already during installation - otherwise see the definition of those variables in the part "Installation".

Notice: *The shown FGrun images are from a LINUX/UBUNTU installation, done with the "Scripted Compilation on Linux Debian/Ubuntu", which makes installation also for LINUX very easy - but installs not according to the LINUX-Distribution standards - so You may notice the unusually long directory-paths!*

Under "***Executable***" must be given the standard start-command for FlightGear $FG_PROG/fgfs

In FG_ROOT is the defined the variable $FG_ROOT.

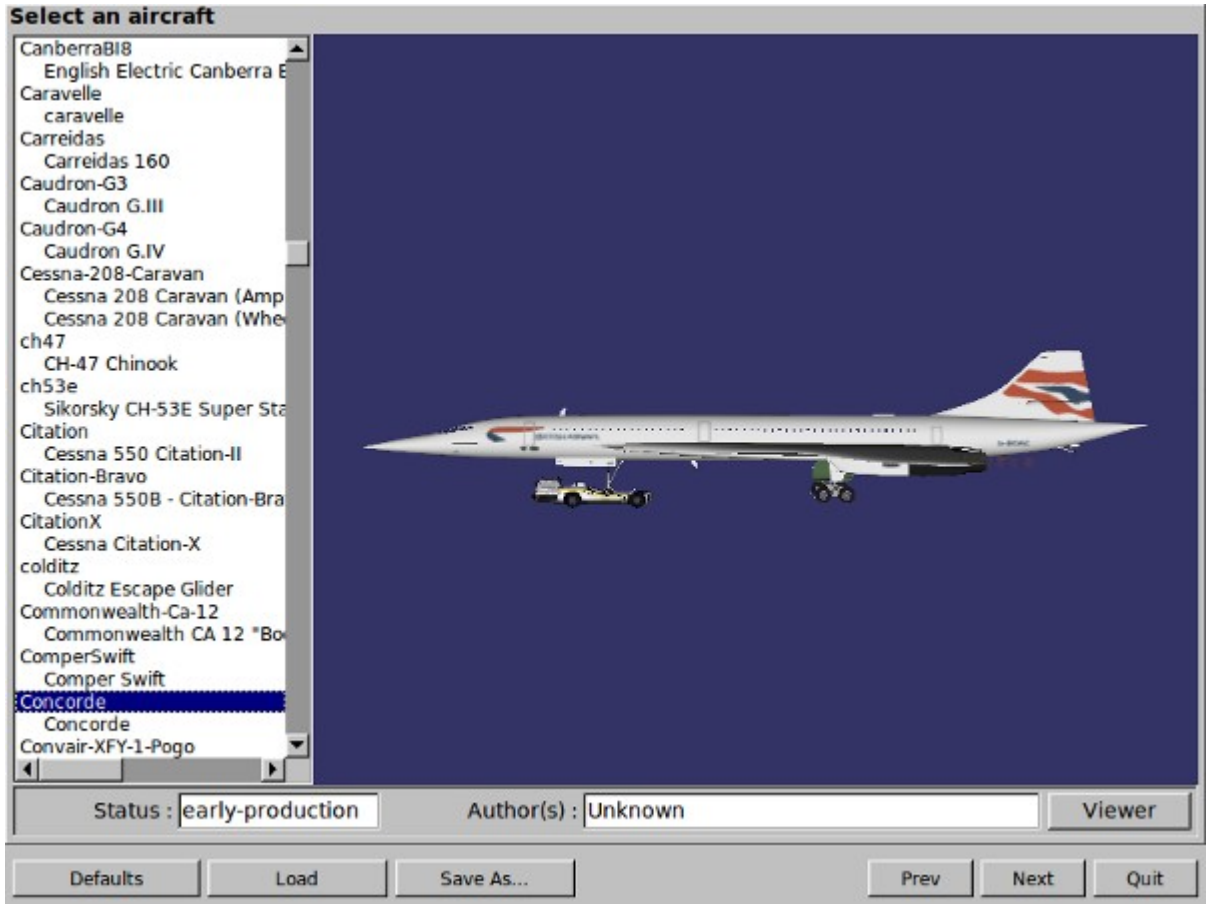
FG_AIRCRAFT is not yet used

In ***FG_SCENERY*** you find the variable "$FG_SCENERY". Notice that the first entry is a test-version for a new scenery - after that there is the TerraSync-directory - and only last the standard FlightGear directory. That is the order in which FlightGear searches for any given piece of scenery! New sceneries will be ***downloaded*** into the directory marked by "T" -- independent of what you named the "TerraSync"-directory *(of course you better define the TerraSync-Directory as the one where TerraSync downloads the new sceneries into!)*.

If you want to use TerraSync you must define the "Terrasync exe" in its field - it should be $FG_PROG/TerraSync.

The "Airports-Cache" defines where FGrun saves a list of airport-pointers - that is usually within $FG_HOME. When starting FGrun for the first time it searches in a big database for all airports available, to offer them to you for selection. Depending on how much scenery you have installed, that may take a long time! So FGrun does it only when it does not find the "airports.txt" at startup. After you installed new scenery you should initiate a rerun by the "Delete"-button here -- or by the "Refresh"-button on page 3.

After you clicked "Next" you are on the following page - which usually is shown first!

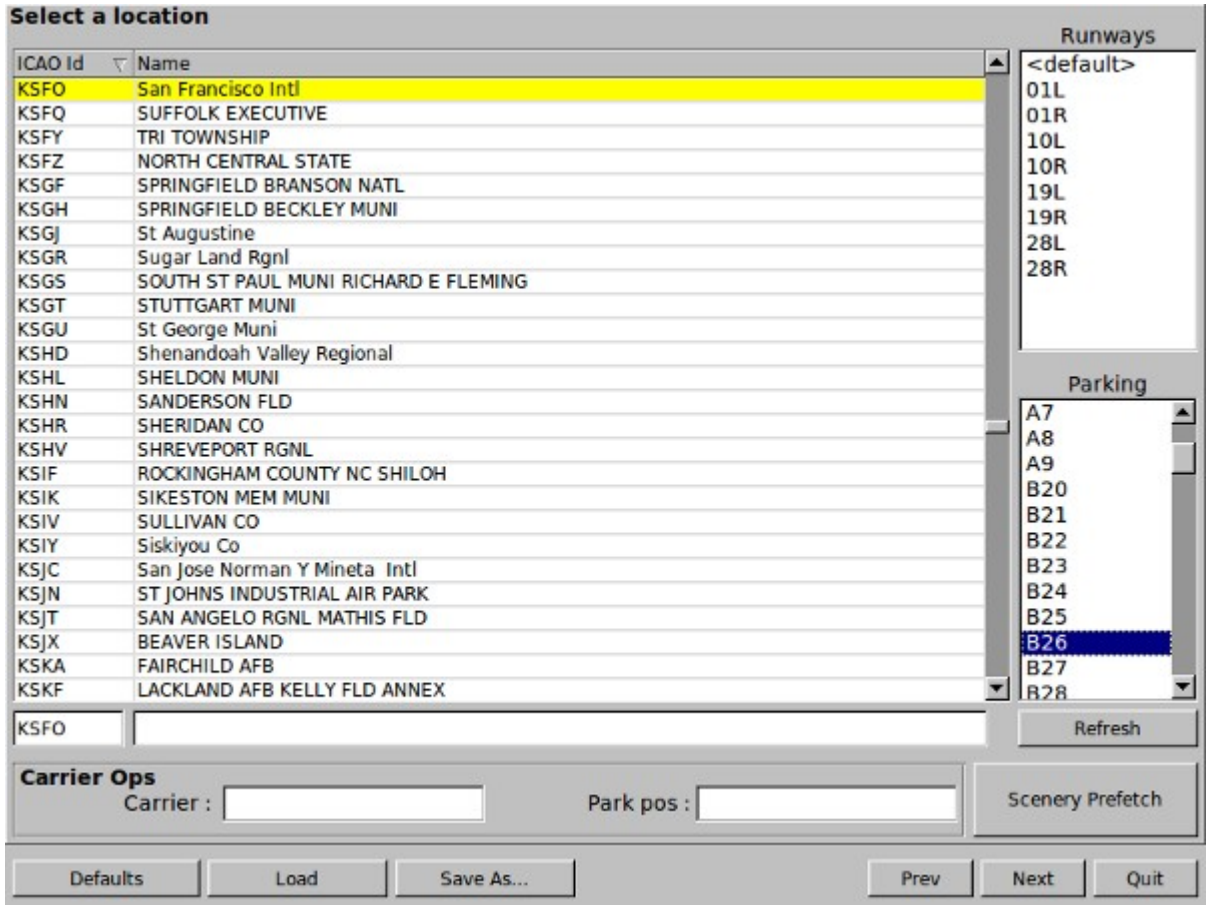


FGrun page 2:

In the left column you select the aircraft you want to fly.

After selecting you may watch it from all sides by moving the mouse over it while the left mouse-button is pressed.

Watch the given "Status" in the lower part - that is a definition by the designer himself. You should not expect an "error-free model" when the status is not "production" or similar.



FGrun page 3:

Define the initial airport in the left part of the image *(other types of start-locations you find on the "Advanced" page under "Initial position")*.

You may either select an "ICAO Id" or a "Name" by mouse-click or you type (parts of) the name into the input field under the table - and the system will search for it.

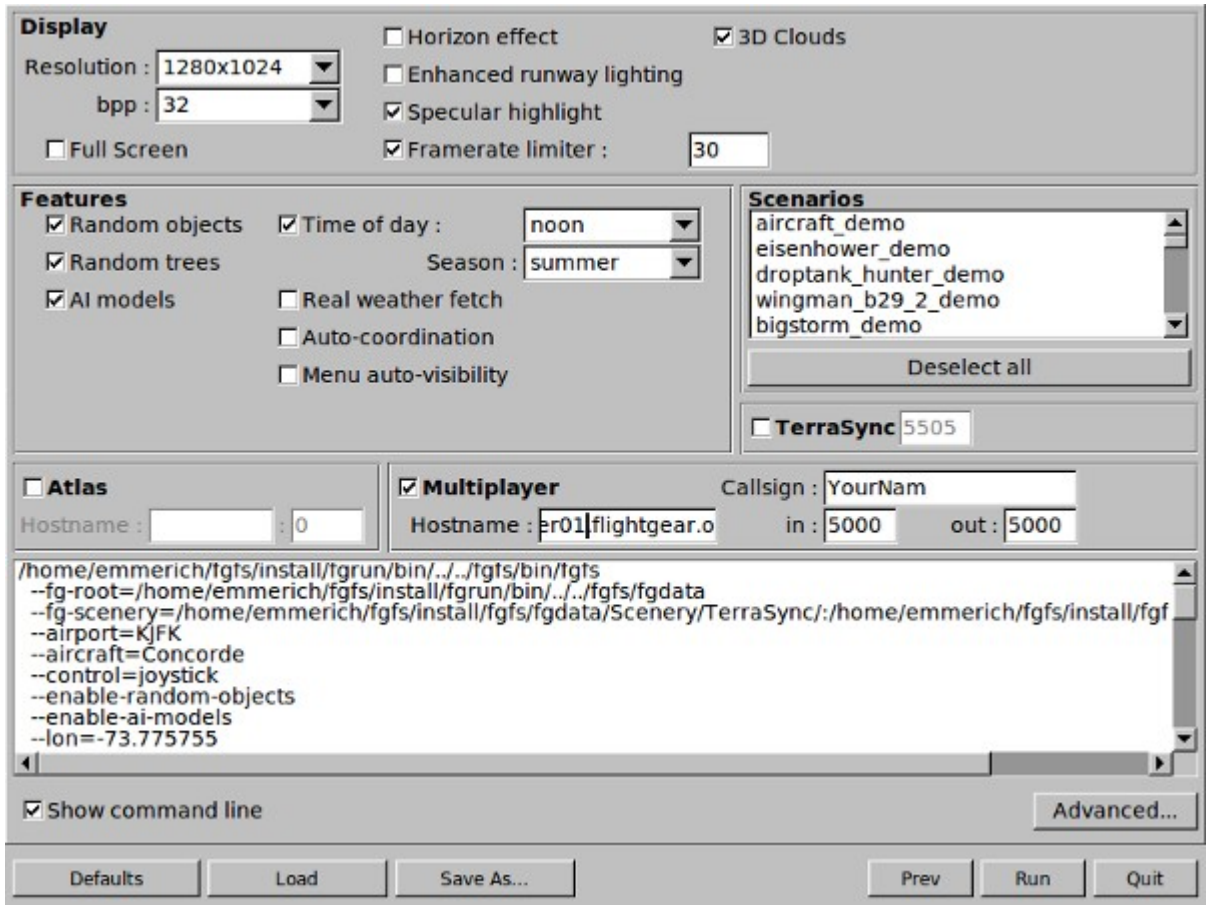
In the right lower part you select a "Parking"-lot (or Gate or Terminal). If there is no entry in that "Parking"-list then you may

- select nothing more: Then the system selects a best fitting runway to pop up on
- or you select a "Runway" in the upper right list.

Remember that you should not use these last 2 Options when flying in "Multiplayer-mode"! See "Starting Positions

For the Carrier usage see the Carrier operations.

If you do not yet have the scenery installed for the wanted airport, you might use "Scenery Prefetch" to get that scenery prior to start! *(Of course you must be connected to the Internet if doing so!)*



FGrun page 4:

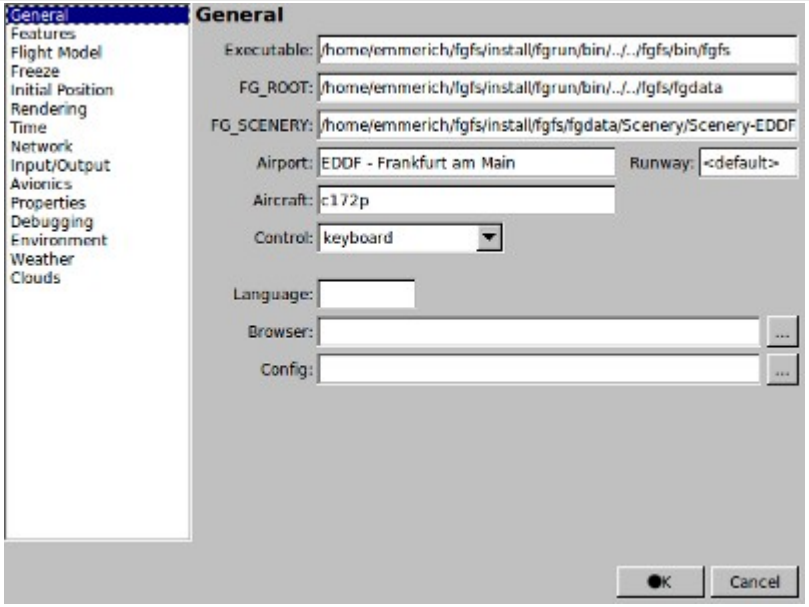
here you define the basic environment:

- activate "AI models" if "Multiplayer" is activated - otherwise you will not see the other models!
- activate "Show command line" to evaluate which options are defined how (you may use those in case you want to write some special Command-Files).
- Activate "TerraSync" if you want to refresh your sceneries - or download new parts "on the fly" (see TerraSync)
- Please enter a unique "Callsign" for your Multiplayer-sessions!
- If you have performance problems with your PC you may use the "Framerate limiter". With that the system will not try to be as fast as possible (and then may get surprised if workload suddenly rises!). A Framerate of 25 is standard for films - so I usually use 20 and have some other applications running in parallel! *(Even a FPM of 10 is usable!)*

Remember: The other options may pull down your system-performance - so be careful when you have an older system or notebook!

If you click "Advanced.." on the previous page, you will be presented with the following pages.

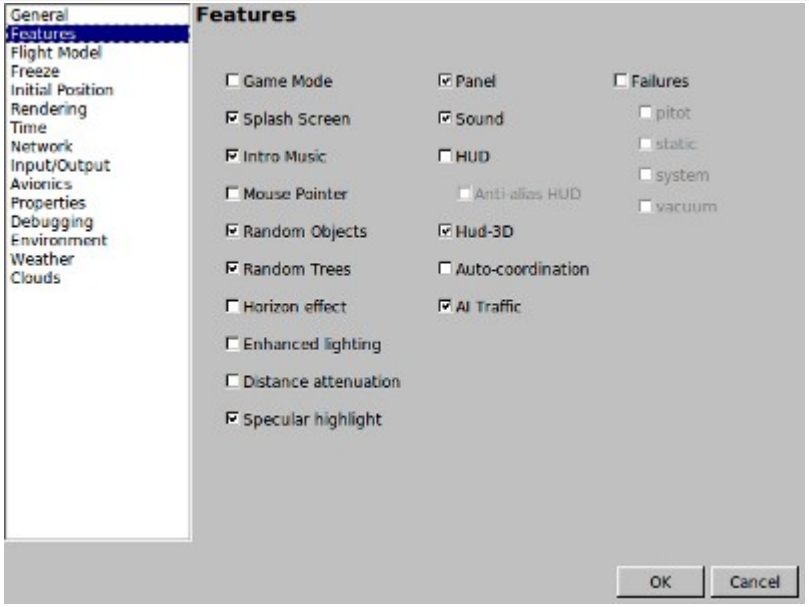
On those select a header in the left column to go to that sub-page!



General

(click `--options` to see the command details)

- **Executable, $FG_ROOT und $FG_SCENERY** etc. had been set already during installation or on FGrun page 1
- **Airport & Parkinglot & Runway** had been set already on FGrun page 3
- **Aircraft** had been set already on FGrun page 2
- **Control:** Define which is your prime control-unit: Joystick, Mouse, or Keyboard. Make sure the wanted device is plugged prior to starting FlightGear!
- **Language:** Starting with FlightGear Version 2.0 you can define in which language the menus will be displayed. See the directory "$FG_ROOT/Translations" for a list of available languages. *(You are invited to add more!)*
- **Browser:** In case you have different Internet-Browsers installed you define here which one shall be used for FlightGear.
- **Config:** Some Models do need special XML-Data for special effects. The installation-instruction for that model should define what should be entered here.



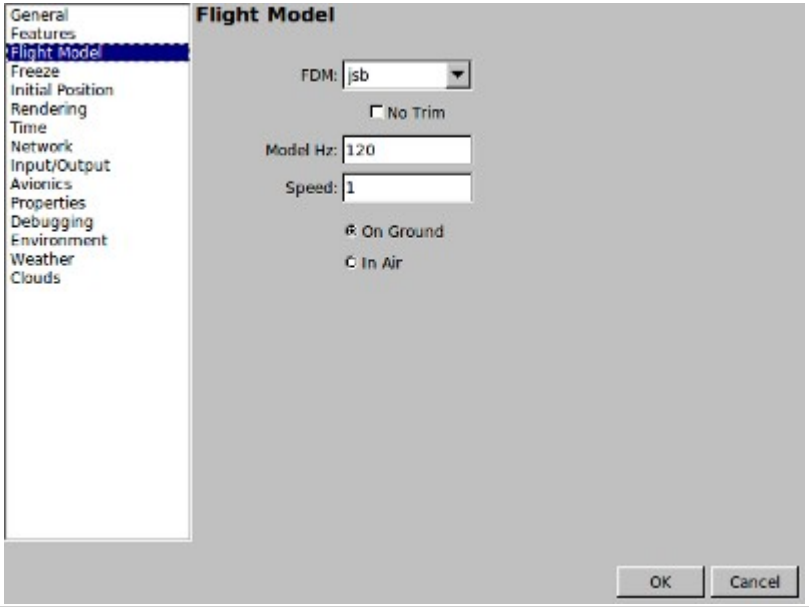
Features

(click `--options` to see the command details)

Most of these fields will show a PopUP explaining that item, when you hold the mouse-pointer over it. Just a few remarks here:

- Be careful when using these wonderful options! Some PCs and/or Graphic-Cards may become overloaded!
- "***Auto-Coordination***" may help beginners a lot by not having to control ailerons and rudder separately. But with it you cannot perform some very useful maneuvers, like Slip etc.
- ***AI-Traffic*** produces artificial aircraft and air-traffic. But those are limited to your local PC - in a Multiplayer environment each user will see some different traffic -- so you switch that off when having Multiplayer activated!
- "***Failiures***" allow you to define problems you want to be suprised by during the flight! It may be easier to set those from inside the cockpit via: "***menu --> Equipment --> failures***".

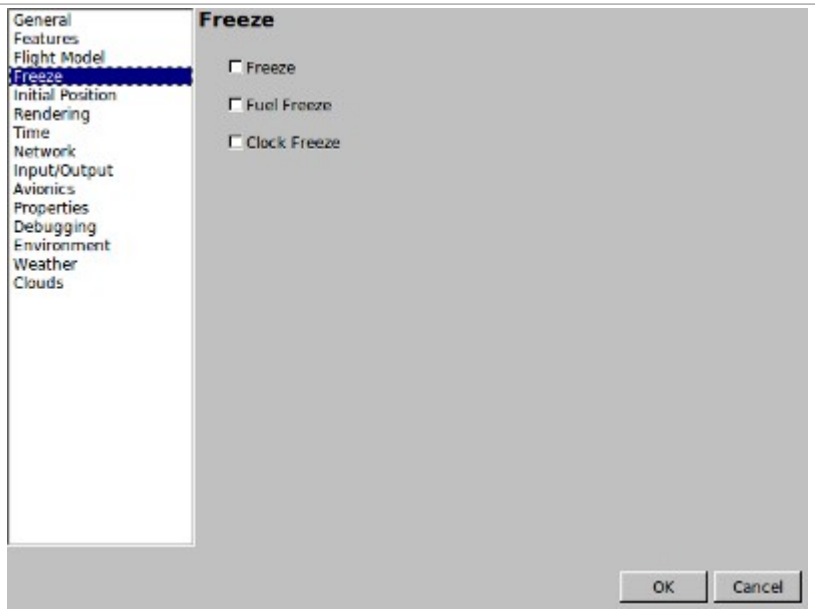
HUD: Is grouped by itself in the options-list



Flight Model

(click `--options` to see the command details)

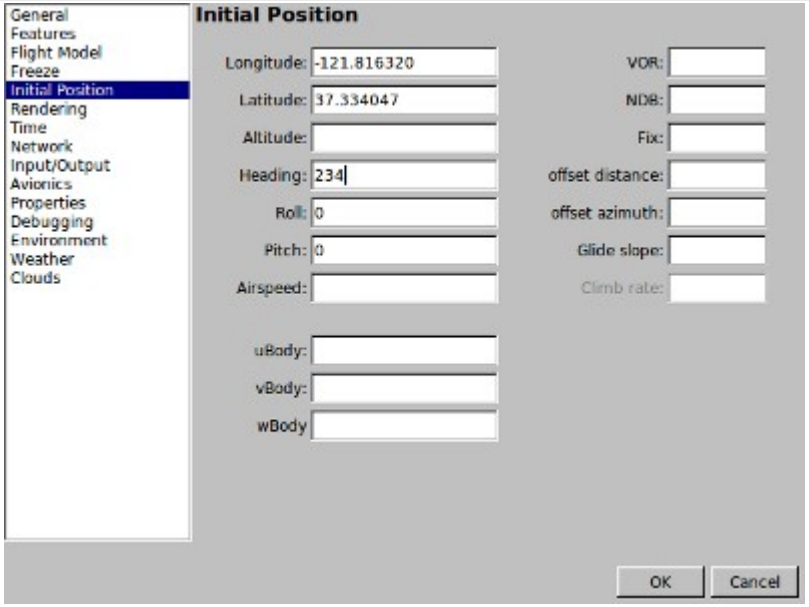
- Usually the models will define them-selfs which FDM they need during start-up.
- ***So the standard user should not change anything here!***
- For more informations see the Flight-Dynamics-Models



Freeze

(click `--options` to see the command details)

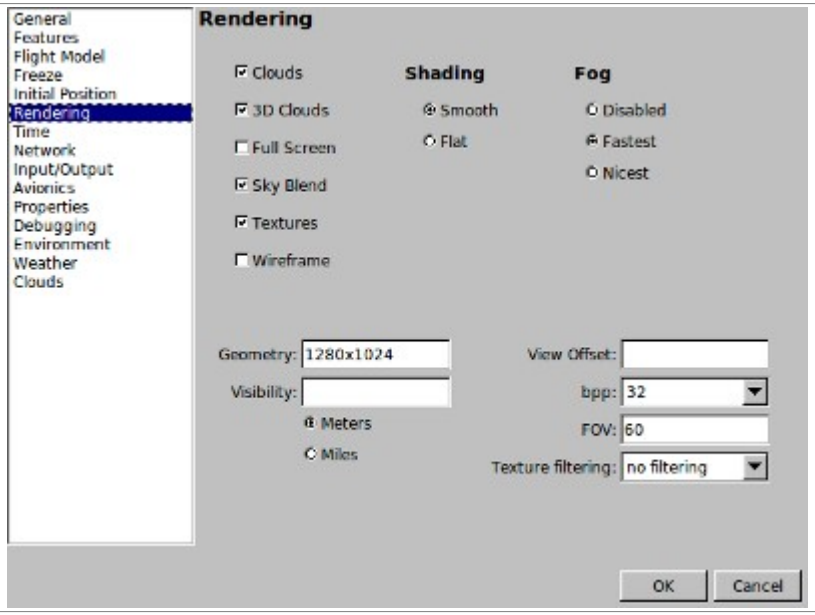
- **Freeze** starts FlightGear in the "pause"-mode, i.e. nothing happens unless you free it by keying "p". Be careful: Some models will not show up when starting in this mode!
- **Fuel Freeze** is a completely unrealistic modus: You can fly forever without burning any fuel - which is very nice for the environment - but very bad for your reputation as a pilot! And you will miss some of the fun when noticing that a fully loaded aircraft behaves drastically different compared to a light weighted one! That may shock you some times, especially during Starts and/or Landings!
- **Clock freeze** just stops the Simulation Time**.** ***Watch it:*** Some models will not function in this mode!



Initial Position

(click `--options` to see the command details)

- These options have been discussed already in the chapter "Define the Startpositions"
- ***Watch it:*** Whatever you define here will overwrite what you define on FGrun page 3. Many people *(like me)* forget that they defined something here and then wonder (days later) why FlightGear does not accept the definition of an airport etc. on page 3 !!!



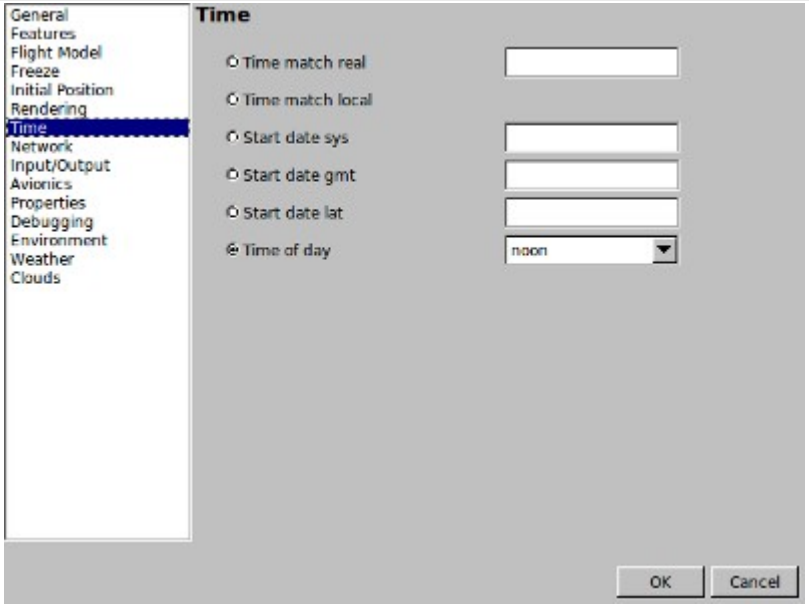
Rendering

(click `--options` to see the command details)

(Hold the mouse over an item to get hint-PopUp)

These options define some nice options for how to display things on your display!

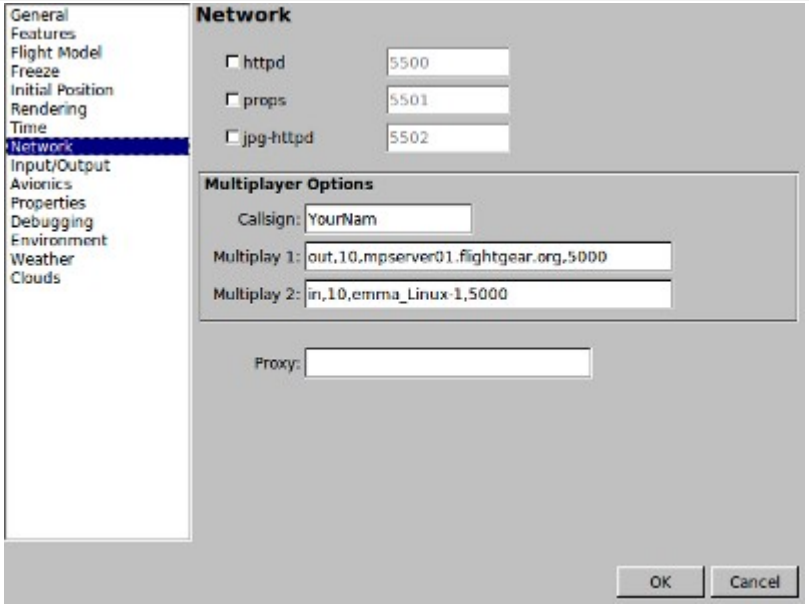
And that means: It may affect the FPS of your system -- so you should watch what happens when you activate those!



Time

(click `--options` to see the command details)

self-explanatory



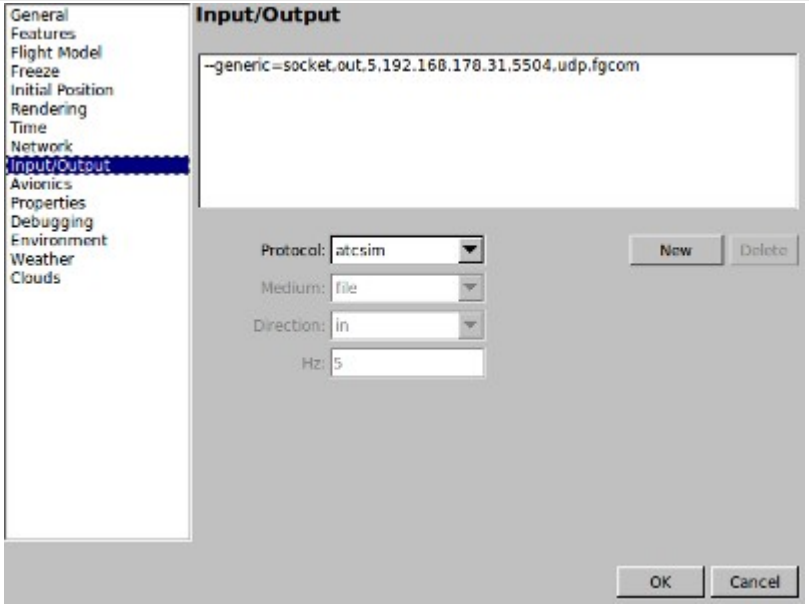
Network

(click `--options` to see the command details)

- In the upper part you define ports to interface to other programs, see the `--options` for details

- The values for "Multiplayer Options"
  - **Callsign:** Your personal Multiplayer-ID (maximum 7 alphas)
  - **Multiplay 1:** Define a "mpserverXX", ref. Multiplayer Howto
  - **Multiplay 2:** In the center is either the name or the IP-number of your PC

- **Proxy:** If you use a Proxy-server define it here!



Input/Output

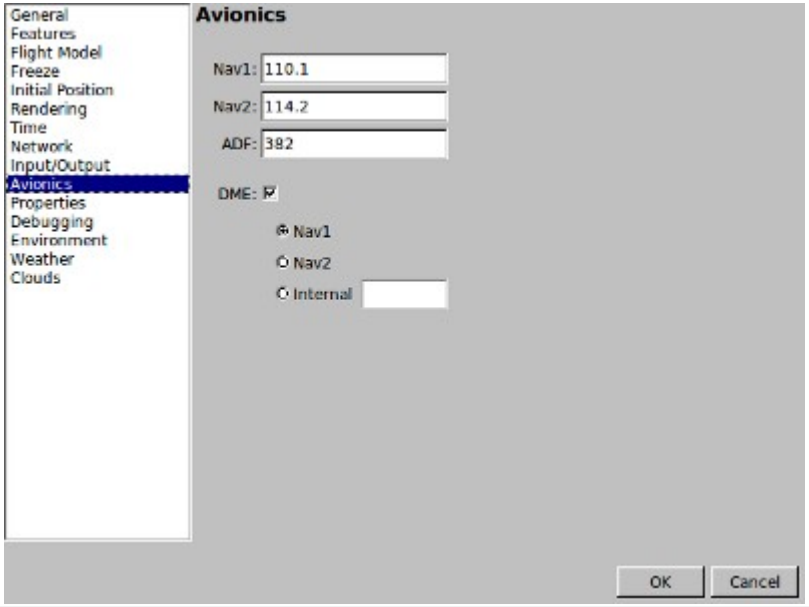
(click `--options` to see the command details)

Here you define the Interfaces to other applications. Open the field "Protocol" to see a list of all available options.

Start with selecting "New" (or an existing entry to edit)
then open the field "Protocol" to see a list of all available options.

For FGCOM you need
--generic=socket,out,10,localhost,16661,udp,fgcom

For Atlas you need
--atlas=socket,out,1,localhost,5505,udp



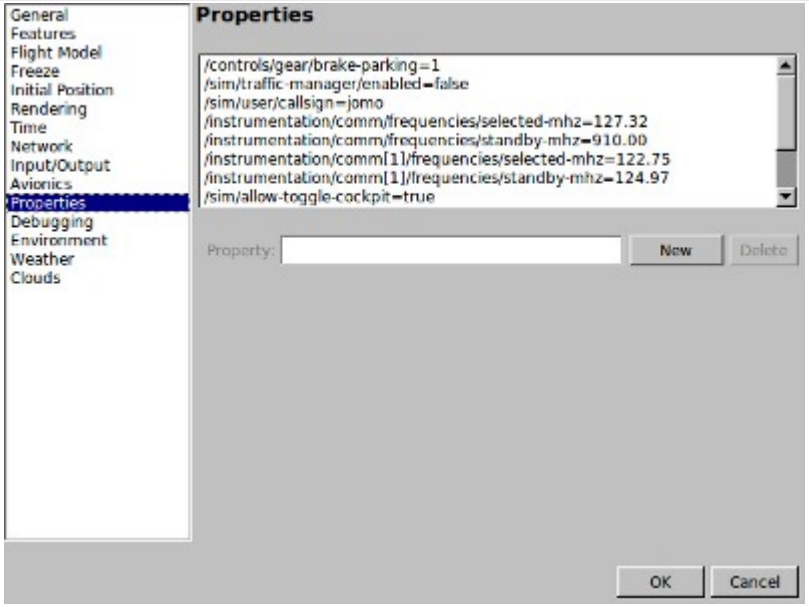
Avionics

(click `--options` to see the command details)

Just define the Navigation Radio-Frequencies.

Notice that you can only preset the "Selected" frequencies - not (as usual) the "Standby". That way you can preset the Radios direct for startup!

See the detailed description in the part "Radio-NAV"



Properties (click `--options` to see the command details)

Properties are all the values that are used/calculated during the simulation.

In "***menu » Debug » Browse Internal Properties***" you can view, change, trace etc. all those values.
Here you can predefine values, so that those values are as you would like to have them at startup. e.g.

- Set the Prakingbreak, if you do not like to start rolling without telling the aircraft to do so
- Disable the AI-traffic if e.g. you start in Multiplayer mode
- Define your Callsign for AI-ATC usage, this is different to the one defined on page 4!
- Set the frequencies for your radios
- etc.

To enter a **new** value start with "New" -- to **edit** click onto the existing line.

Debugging (click `--options` to see the command details)

The "Debugging Tools" are not commonly used by Users.

Weather (click `--options` to see the command details)

The "Weather" settings are right now changing - have a look at http://wiki.flightgear.org/index.php/Weather

„GUI Launcher“ for Mac OS X

In Mac OS X the FGrun looks different from the outside, but is based on the same principles. Also selecting the options is relatively similar but not via 4 pages after each other, but selected in parallel from the front-page.

The settings of the directories is not of any significance, because the "GUI Launcher" is completely integrated into Mac OS X. Thus most settings as on page 1 of FGrun are not needed.

Go to the aircraft-selection by clicking onto the toothed wheel at the right side of "Aircraft" (similar to page 2 of FGrun). You could also click onto "Advanced Features" and then select "Aircraft"

Go to the Airport-selection by clicking onto the toothed wheel at the right side of "Airport" (similar to page 3 of FGrun). You could also click onto "Advanced Features" and then select "Airport" under "Positions"

Activate "Download scenery on the fly" to activate TerraSync (similar to on page 4 of FGrun).

Activate "Navigation Map (Atlas)" to activate Atlas (similar to on page 4 of FGrun).

With "Advanced features" you reach similar functions like in the FGrun advanced pages.

You then start FlightGear with "Start Flight".

Starting Manually (by Hand!)

There are 4 technical different ways to start FlightGear ***without FGrun***:

1. ***Start-Icon:*** During installation there probably has been placed a ***Start-Icon*** onto your desktop and/or a Program-Entry into your Program-menus. You can just use those and FlightGear will place you in a Cessna C172p onto a runway at KSFO (San Francisco). This is a very easy way to start FlightGear the first few times - but may become boring pretty soon. So you may want to use an additional ***Option-File***.

2. ***Command-line:*** If there are only some options that you want to define, you can type those (together with the Start-Command) into a **Command-Line** and start. But after some time you probably become very tired of typing all that staff again and again! So you might also use the ***Option-File*** for additional options.

3. ***Option-File:*** At each start FlightGear is designed to look for an ***Option-File*** when starting. That means you can type all your options into a file - and just change a few option-settings from time to time. The drawback here is, that you have only one file - thus you constantly have to change that file for different events.

4. ***Command-File:*** So you might want to use many ***Command-Files*** instead. Those are the same as the Option-File, but also include the start-command(s)! That way you can save as many of those files as you want, for as many events you want. You may e.g. have 1 file for casual occasions (which you change whenever needed) and some more which you just call up for certain occasions.

Start with a Command-Line

Windows:

- up to and including **Windows XP** click "*Start » Command*" and type your Command (with the options) into the line popping up.
- starting with **Windows Vista** click "*Start*" and type into the line popping up just above it.

In case you run into problems, you might type in that line just "cmd" - that will open a command-window in which you type your command. That way you can monitor also the Windows processing and see if Windows or FlightGear have a problem with your command, as written.

Just to verify that everything is fine, start with a simple command like e.g.:

```
C:\Programme\FlightGear\bin\Win32\fgfs.exe --fg-root=C:\Programme\FlightGear\data
--fg-scenery=C:\Programme\FlightGear\data\Scenery
```

The above must be written into ONE line and you must be sure that before each option there are TWO dashes! Some systems do join those TWO to ONE on ENTER. If that happens over-type the 1 dash with 2 and then click with your mouse somewhere else - that will end the input without changes!

Linux:

Open a "Terminal" (Command-Window) and type the command:
(Watch for the correct directories! In the following the "`/usr/local/bin/`" must be replaced by your $FG_PROG !)

```
/usr/local/bin/fgfs --fg-root=/usr/share/FlightGear/data --fg--
scenery=/usr/share/FlightGear/data/scenery
```

The above must be written into ONE line and you must be sure that before each option there are TWO dashes! Some systems do join those TWO to ONE on ENTER. If that happens over-type the 1 dash with 2 and then click with your mouse somewhere else - that will end the input without changing!

Mac OS X:

Open "*Terminal.app*" and enter into */Applications/Utilities* the following 2 commands after each other, e.g.

```
cd /Applications/FlightGear.app/Contents/Resources
./fgfs --option1 --option2 ....
```

Here that are 2 commands in 2 lines! *Be sure that before each option there are TWO dashes! Some systems do join those TWO to ONE on ENTER. If that happens over-type the 1 dash with 2 and the click with your mouse somewhere else - that will end the input without changing!*

Start with an Option-File

As said above: Whenever FlightGear starts up it looks for a file "***fgfsrc***" in which you can write your options one after the other. Thus you can save lots of typing - you just type single lines inside this file for different occasions. In case you usually change only a few options at startup, you could have all your standard "seldom changing" options in that file - and start FlightGear with the start-command and a few of the variable options (like e.g. **--aircraft**=*model* **--airport**=*ICAO* **--parkpos**=*Ann*).

- ***For Windows*** this option-file must be named „***system.fgfsrc***" and reside in the directory „***$FG_ROOT***". That means you cannot define $FG_ROOT inside this Option-File because FlightGear needs to know the variable „***$FG_ROOT***" in order to find that file! So you may start like e.g.:
  fgfs ***--fg-root***=*c:\Programm Files\FlightGear\data* *--**aircraft**=model --**airport**=ICAO --**parkpos**=Ann*
- **For Linux** this option-file must be named „***.fgfscr***" and reside in your private directory "~/". Watch the "dot" in front which makes it to a "hidden" file, i.e. you may have to tell your "File Browser" to list also hidden files to see it! So you may start like e.g.:
  fgsf **--aircraft**=*model* **--airport**=*ICAO* **--parkpos**=*Ann*
  - ***For Mac OS X:***
    - To my knowledge you do not have that option there - the FlightGear is always started via the "GUI Launcher"

You generate such an option-file by opening your standard system editor (for windows the "wordpad"!) and type in the options one after the other:

„.fgfsrc" resp. „system.fgfsrc"
--fg-root=/usr/share/FlightGear/data --fg-scenery=/usr/share/FlightGear/szenerie

```
--airport=EDDF
--parkpos=B46
--aircraft=SenecaII
--control=joystick
--disable-random-objects
--prop:/sim/rendering/random-
vegetation=false
--disable-specular-highlight
--enable-ai-models
--enable-real-weather-fetch
(etc.)
```

- Replace the values for "--fg-root" and "--fg-scenery" with their values according to $FG_ROOT and $FG_SCENERY
- Do not change the "/" in "-prop:/sim/rendering/random-vegetation=false", those are "Property-Values" and written the same way for all Operating-Systems!
- Do NOT define those here if you define them with the start-command -- otherwise they will overwrite those!

Start with a Command-File

The Command-File is the same as the Option-File - except:

- in addition it includes the start-command itself, including the path to it
- the file may be saved in any directory you like and may be named as you like!

According to your Operating System:

- ***Windows:***
  - Create the file with the "Wordpad"
  - Save the file as a "*.bat" (e.g. "***myFGFS_xyz.bat***", it must be of type "***bat***"!)
  - Save the file into any directory to which you have read/write access

- ***UNIX/Linux:***
  - Create the file with any System-Editor (do not use high-sophisticated ones!)

- Save the file by any name you like (we suggest e.g. "***myFGFS_xyz.txt***")
- Save the file into any directory to which you have read/write access
- Make sure the properties of the file define it as "***Executable***" *(Usually a right mouse-click onto the name, select "Properties --> Security --> Executeable")*

- ***Mac OS X:***
  - To my knowledge you do not have that option there - the FlightGear is always started via the "GUI Launcher"

- then you start FlightGear by starting this file like any other program-file (usually: Double-click it!).

See as an example my Command-File, that I used for the IFR X-Country KRHV to KLVK:
(You could copy those and just change the upper 3 lines if needed! Or change single lines to fit your needs/taste!)

UNIX/Linux: "KRHV_IFR"	**Windows: "KRHV_IFR.bat"**	Notes
/opt/flightgear/bin/fgfs \ --fg-root=/usr/share/flightgear \ --fg-scenery=/usr/share/flightgear/Scenery \ --geometry=1280x1024 \ --callsign=jomo \ --aircraft=c172p \ --lon=-121.816320 \ --lat=37.334047 \ --heading=234 \ --disable-real-weather-fetch \ **--enable-clouds3d** \ --ceiling=750:3250 \ --visibility=1000 \ --wind=270@5 \ --prop:/enironment/config/aloft/entry/visibility-m=30000 \ --timeofday=noon \ --enable-ai-models \ --disable-sound \ --generic=socket,out,10,localhost,5504,udp,fgcom \ --multiplay=out,10,mpserver01.flightgear.org,5000 \ --multiplay=in,localhost,5000 \	"E:\FlightGear 2.4.0rc5\bin\Win32\fgfs.exe" ^ --fg-root="E:\FlightGear 2.4.0rc5\data" ^ --fg-scenery="E:\FlightGear 2.4.0rc5\data\Scenery" ^ --geometry=1280x1024 ^ --callsign=jomo ^ --aircraft=c172p ^ --lon=-121.816320 ^ --lat=37.334047 ^ --heading=234 ^ --disable-real-weather-fetch ^ **--enable-clouds3d** ^ --ceiling=750:3250 ^ --visibility=1000 ^ --wind=270@5 ^ --prop:/enironment/config/aloft/entry/visibility-m=30000 ^ --timeofday=noon ^ --enable-ai-models ^ --disable-sound ^ --generic=socket,out,10,localhost,5504,udp,fgcom ^ --multiplay=out,10,mpserver01.flightgear.org,5000 ^ --multiplay=in,10,localhost,5000 ^	1) 2) 2) 3) 3) 3) 4) 5) 4) 4) 4) 4)

--prop:/sim/frame-rate-throttle-hz=20 \ --prop:/controlls/gear/brake-parking=1 \ --prop:/sim/traffic-manager/enabled=false \ --prop:/instrumentation/comm/frequencies/selected-mhz=119.8 \ --prop:/instrumentation/comm/frequencies/standby-mhz=125.2 \ --prop:/instrumentation/comm[1]/frequencies/selected-mhz=118.10 \ --prop:/instrumentation/comm[1]/frequencies/standby-mhz=119.65 \ --prop:/instrumentation/nav/frequencies/selected-mhz=114.1 \ --prop:/instrumentation/nav/radials/selected-deg=9 \ --prop:/instrumentation/nav/frequencies/standby-mhz=110.5 \ --prop:/instrumentation/nav[1]/frequencies/selected-mhz=116.6 \ --prop:/instrumentation/nav[1]/radials/selected-deg=114 \ --prop:/instrumentation/nav[1]/frequencies/standby-mhz=116.0 \ --prop:/instrumentation/adf/frequencies/selected-khz=374 \	--prop:/sim/frame-rate-throttle-hz=20 ^ --prop:/controlls/gear/brake-parking=1 ^ --prop:/sim/traffic-manager/enabled=false ^ --prop:/instrumentation/comm/frequencies/selected-mhz=119.8 ^ --prop:/instrumentation/comm/frequencies/standby-mhz=125.2 ^ --prop:/instrumentation/comm[1]/frequencies/selected-mhz=118.10 ^ --prop:/instrumentation/comm[1]/frequencies/standby-mhz=119.65 ^ --prop:/instrumentation/nav/frequencies/selected-mhz=114.1 ^ --prop:/instrumentation/nav/radials/selected-deg=9 ^ --prop:/instrumentation/nav/frequencies/standby-mhz=110.5 ^ --prop:/instrumentation/nav[1]/frequencies/selected-mhz=116.6 ^ --prop:/instrumentation/nav[1]/radials/selected-deg=114 ^ --prop:/instrumentation/nav[1]/frequencies/standby-mhz=116.0 ^ --prop:/instrumentation/adf/frequencies/selected-khz=374 ^	

Notes: *(For a description of all the unique commands see the Appendix)*

1. The directory + the start-command for FGFS
2. The directories for fg-root and fg-scenery
3. Defining a private "VIP parking lot" (instead of the usual "--airport= " etc., see above "Define the Startposition")
4. See the "weather cooking" at the "IFR Cross-Country Preflight Weather Setting"
5. **--enable-clouds3d** is a relatively new option, that may not be in your release yet - and watch it: It uses lots of your Graphics-Power! But it looks a lot better!

You can create as many Command-Files as you like with names telling you what they are for .

The Instruments

Many models in FlightGear may have 2D *(2dimensional)* and/or 3D *(3dimensional)* panels. The 3D-panels always look much more realistic - but often

are less readable! If both panels are available You can select between those two with: „***Menu → View → Display Option*** → ***Toggle 2D Panel***“. In the following we use the pretty 3D-Version:


1
2
3
4
5
6
AIRSPEED
KNOTS
7
L
R
2 MIN TURN
8
R.P.M.
9
10
11
ALTITUDE
12
VERTICAL SPEED
100 FEET PER MINUTE
UP
DOWN
13
14
15
16
17
18
19
20
21
22
23

Some of those instruments you can also set by mouse. For that each instrument has areas where you place your mouse-pointer to operate - in the above picture you see those marked with yellow outlines. You switch those yellow marks on/off by "***Ctrl+c***". If there are multiple areas you usually decrease the values by clicking into the left area - and increase in the right. Often you can accelerate the setting by clicking with the center-button *(wheel)* instead of using the left button. Some of the dials can also be set by rotating the mouse-wheel.

Please see in the following the most important instruments ***for all aircraft,*** explained in a basic model like the C172p. And watch especially the most important of the most important in the "***Golden T***": Those are the ones you constantly have to keep an eye on: ***6, 9, 11, 10***!

But of course you need to know (and watch) them all, thus here they come with their functions and usage:

1. ***Clock:*** Shows always the Simulator-Time, which my be very different to your "normal time". See the different options in the Appendix-chapter "Time".

2. ***Suction Gage*** = Shows the "Suction pressure" which is needed for the Gyros in the "artificial Horizon" (9), "Gyro Compass" (19), etc.

3. Filling of the left and right ***Tanks*** (inside the wings).

4. ***Oil.Temp*** and ***Oil.Press***

5. ***Ampere*** and ***Volt*** of the power supply (battery, generator)

6. ***Airspeed*** = IAS (Indicated AirSpeed):

This is the speed within the air, in opposition to the speed above ground (GS or close to TAS). Notice the typically colored markings:

white = never exceed speeds with Flaps
green = normal operation area *(notice that with Flaps you may fly slower!)*
yellow = you are not yet damaging the airframe etc. -- but the engine may express it's dislike after some time!
Red = danger of structural damages *(loosening wings or similar)*

7. ***Turn Coordinator***

Indicates the "Rate of Turn" for "L"eft and "R"ight turns. When the controls (especially Aileron and Rudder) are perfectly coordinated then the ball in the lower part will stay in the center.

The left picture shows the modern version - the right one is the older version. In this manual you my find either version in different chapters. The indicated values and marking are the same - so there is no significant difference.

8. ***R.P.M.*** (Revolution Per Minute)

Because there is no Gear-Box the revolutions are the same for the propeller and the engine.

- While climbing the RPM may be just a little above the green area
- While cruising *(for longer time spans)* the RPM definitely should remain in the green area
- During approach and final the RPM is often below the green area

9. ***Attitude Indicator or Gyro-Horizon***

It's central position indicates already it's importance: It gives you the best and fastest indication of the aircraft-status - it surely is the most important instrument when flying without seeing the real horizon (IFR)!

The line between brown/blue represents the horizon. In the center there is a little dot, representing the nose of your aircraft. This of course should always be on that line, as well in level flight as also during Turns. During climb/descent it indicates on the center scale the AoA. Left and right of that point you see symbolic wings, helping you to level out.

In the upper part you see how much you are tilted: The first 3 scale markings are 10° each, then 30°. At the beginning you should stay within 10-20°!

- With the black rotary button at the lower edge you adjust the height of the aircraft-symbol in relation to the horizon. During cruise the wings of it should be leveled with the horizontal line between blue/brown) - that way you notice deviations the fastest.

- The button at the lower right arrests the cage with the gyros etc. to prevent them from getting damaged during bad turbulences. Just push the button in when needed -- and do not forget to restore it afterward!!

10.***Heading Indicator or Directional Gyro***

You must correlate this Gyro from time to time with the magnetic compass (17), because the gyros will deviate over time!

- With the left button you adjust the Gyro to the indication of the magnetic compass
- With the right button you adjust the red marker to the course you want to fly, in order to visualize deviations fast -- and also as input for the autopilot (if you use it). Watch it: When you change the setting while using the autopilot, the autopilot will always turn the shortest distance (<180°)! Thus: If e.g. you fly (as shown) 280° and change the marker to "180°" the autopilot will turn LEFT! If you want to turn RIGHT you must go in two stages: First set the marker to the right (e.g. 60°) - and just before you reach that heading you set it to the wanted 110! So: If you need to turn into a certain direction, make sure the turn is not bigger than 180° (or cut it in pieces!).

11.***Altimeter***

There are many types of altimeters - here you see one with 3 pointers: The biggest one for 0-999 ft, the middle one for 1.000-9.000 ft, and the small one for 10.000-90.000. The altitude shown in the picture is: 00.000+1.000+400 = 1.400 ft!

In the lower left corner you see the rotary button to adjust the QNH, which is indicated in the little window inside the scale on the right side. You adjust the QNH:

- when on ground on an airport by adjusting the altimeter to the altitude of the airport
- or by setting the QNH according to ATIS or weather-report, etc. If that QNH scale is not available (or not readable) you can set it via „***Menu → Equipment → Instrument Settings → ALT Setting***“.

Some words to the technicalities: The altimeter does NOT really show the "altitude", but the barometric pressure surrounding it. Just because the barometric pressure decreases with altitude it can calculate the altitude you are at, if it knows the difference from the pressure at 0 ft (sea-level) and the actual pressure surrounding you! So if ATIS (or whatever) tells you the QNH (on altitude "0"!) you set that into your altimeter and the altimeter then calculates the altitude based on the difference between the QNH and the actual barometric pressure around you (your plane). ***Never forget:*** The altimeter always calculates the altitude based on "0" (sea level) -- so there is no indication at all how high you are over ground - to calculate that (by checking a map!) is the "Pilots-Responsibility" -- and I guess that is YOU!

12.***Vertical Speed***

Indicates the speed by which you climb/descent in feet/minute.

Be aware: That indication is always pretty much delayed, because the plane first has to change the altitude to a certain amount in a certain time, before the instrument can calculate the difference over time! So: ***Do not follow the needle*** but just control the effect of your doing over time!

13.***VOR 1:*** See "Radio-NAV", chapter: The NAV-Radio = VOR & ILS

14.***VOR 2:*** See "Radio-NAV", chapter: COM/NAV-Radio 2

15.***ADF:*** See "Radio-NAV", chapter: ADF / NDB

16.***Radio-Stack:*** All the Radios needed for communication and navigation. See "Radio-NAV", chapter: Radio-Navigation

17.***The "normal“ Magnetic-Compass***

This is just a magnetic needle, as it is since some hundreds of years. It is very, very simple and thus very, very reliable *(except that it does not point to the "Northpole" as shown on maps - but to the "magnetic North", see e.g. http://en.wikipedia.org/wiki/North_Magnetic_Pole)*

Watch it: That compass is rather free/movable mounted - so you can trust your reading only after flying in a rather stable attitude for some time!

18.Ignition Switch :

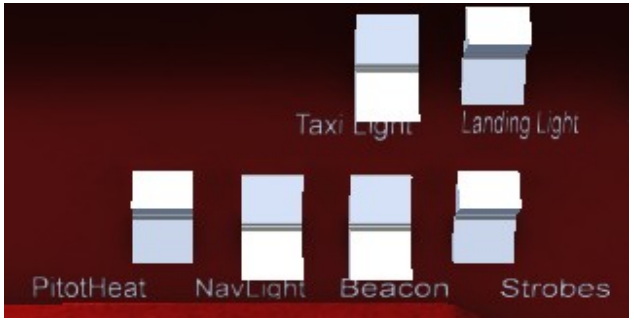
Click into the 3 areas or use the keyboard-strokes as follows:

- Center area (=„**}**“) move from „OFF“ over "Magneto R(ight)" to "Magneto L(left)" to "Magneto BOTH"
- Left area (=„**{**“) move reverse from „BOTH“ to „OFF“
- Right area „START“ (=„**s**“). As also in cars you should keep "START" pressed some time, till the engine rotates freely.

19.***Yoke:***

Controls the Elevator and Ailerons

20.***Electrical Switches***



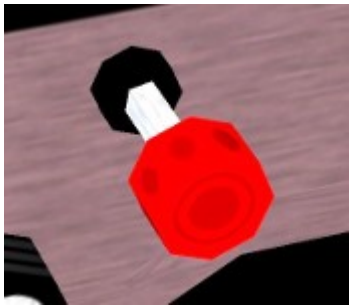
The yoke makes it rather difficult to get to those - thus the designers offer you a C172 unique help: „`Menu → Cessna C172P → Show/hide yoke`“.

- ***Taxi Light:*** Lightens up the runway - use while taxiing
- ***Landing Light:*** Must not be used on ground, except during start and landing! Switch it on when you get the "Clearance to Take Off" and switch it of when reaching cruising altitude, and reverse - you ***must*** switch it "***off***" when leaving the runway! It ***must*** be "***on***" when on approach and/or in a pattern! Also during daylight!
- ***PitotHeat:*** This is no light but the heater for the Pitot, which measures the speed of the air going through it. i.e if there is icing in that Pitot you will not get a correct IAS-reading! You should always switch this on during icy conditions in winter or when descending from high altitudes!
- ***NaviLight:*** Switches on the red light on the left wing, the green light on the right wing, and the white one at the tail.
- ***Beacon:*** Is a blinking red anti-collision light. For small planes that is located on the tail-unit - for big ones there often is one on top and one underneath the plane.
- ***Strobes:*** That are white flashlights - to be seen from far distances. They are allowed only in the air (never on ground!)

21.***Carburetor Heat***

22.***Throttle***

23.**Mixture**



This is comparable to the choke in cars. You change the air/gasoline mixture, because the air-density changes when climbing/descending!

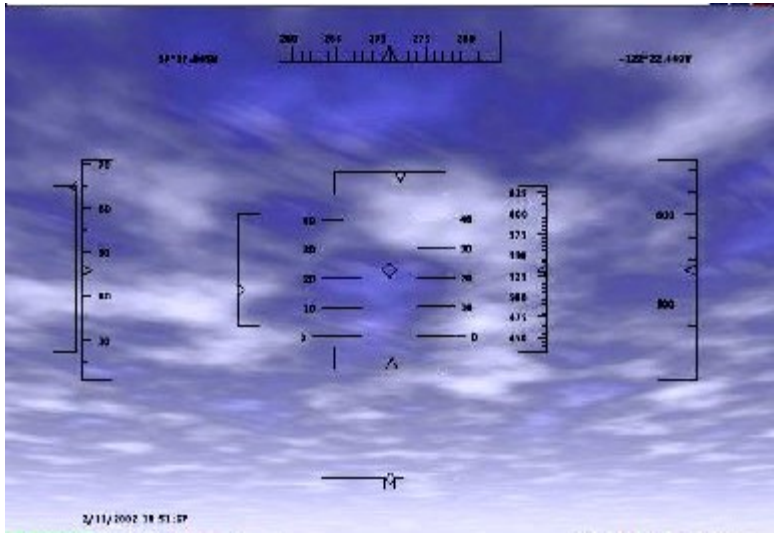
Watch the RPM and speed: When that drops (without obvious reasons!) you should try to adjust the mixture (see part 5 chapter Mixture). Usually you will see a serious change at about 7000 ft, depending on the weather.

And be sure: As well as within a car you can stall also an aircraft-engine with that. Actual that is the preferred method to switch off the engine (intentionally, on ground!)

24. ***FPS***- (Frames per Second)

You may monitor the FPS by activating "`Menu → View → Display Options → Show Frame Rate`".

The HUD *(Head Up Display)*



FlightGear also provides a HUD (Head Up Display) . HUDs are generally found in military aircraft and some very advanced jets. However, FlightGear allows you to use a HUD in just about all models.

To activate the HUD, press '**h**'. Multiple "h" will then change the color, and finally switch off the HUD.

Typing "***H***" will change the brightness of the display.

Using "***i***" and/or "***I***" will change the size of the display.

The HUD shown above displays all main flight parameters of the plane:

- In the center you find the pitch indicator (in degrees)
    - with the aileron indicator above and the rudder indicator below.
    - and the elevator indicator the left of the pitch scale along with a pitch trim indicator. On the bottom there is a simple turn indicator.

- At the top you see the actual heading
    - to the left and right of it the position in longitude // latitude
    - in the very top left there may be shown the waypoints and other informations from the Route-Manger

- There are two scales at the extreme left regarding the speed:
    - The inner one displays the speed (in kts)
    - while the outer one indicates the position of the throttle.

- The two scales on the extreme right display your height
    - the left one shows the height above ground in fee - i.e. it should be "0" when on an airport
    - while the right one displays the height above sea-level feet (i.e. according to the QNH).

Keyboard, Mice, Menus and Joysticks

In the following we will introduce you to the available controls for operating the Simulator and/or the models.

You find a short summary of the keyboard- and mouse-controls also on http://www.flightgear.org/Docs/FGShortRef.pdf, which you can download and print.

If you did already start the simulator you can also view those codes by opening „***Menu → Help → ...***“ and then:

→ „Basic Simulator Keys“ are the ones dealing with the Simulator
→ „Common Aircraft Keys“ are the ones fitting all models
→ "Current Aircraft Keys" are special for that unique model you are sitting in right now

After you start a new model look if there is a new item in the menu-bar, usually with the name of your model. There may be given some very interesting hints to operate your unique model!

Keyboard-Controls

You could fly all models just by using the keyboard - but for manipulating the analog controls (e.g. ailerons, rudder, elevator) you may want to use mouse-support. But even better would be a joystick. But whatever you are using: The keyboard-codes will always be available in addition! And for many actions the keyboard remains the only input-device.

These key-bindings are not hard-coded, but user-adjustable. You can check and change these setting via the file ***keyboard.xml*** which can be found in the $FG_ROOT. This is a human-readable, plain ASCII file. Although it's perhaps not the best idea for beginners to modify this file, more advanced users will find it useful to change key bindings according to their wishes, e.g. to match other simulators. ***But be very careful: In that case your simulator and models will react different to others - i.e. you might not be able any more to compare problems in your operations with that of your friends, forum, etc.!!!***

If you are not afraid of that, here is an example:

You find in *$FG_ROOT/keyboard.xml* the following:

Code:	***Explanation:***
<key n="33">	33 is the ASCII-Code for „!“, that is the technical code send by your keyboard
<name>!</name>	That is just to tell **you** (user) what it usually stands for Describes the functioning plain words (see e.g. the chapter "Control the Engine".
<desc>Select first engine</desc>	Start of the Execution Command
<binding>	Tells where to find the predefined command (see $FG_ROOT/Nasal)
<command>nasal</command>	controls = is the filename (+.nas) » „controls.nas“ selectEngine(0) = is the name of the used routine inside the controls.nas

<script>controls.selectEngine(0)</script> </binding> </key>	End of the command The END (started with "*<key..>*" and ending with "*</key>*"!

You could:

- only change the ASCII ("33") to any ASCII you like - and after reboot that newly defined ASCII will select the first engine
  - *for your own benefit you should also change the describing <name>**!**</name> to the now related letter*
  - *the former "33=!" will just type a "!" when keyed in - FlightGear does not care any more*

- or you change the inside of <script>...</script> to tell FlightGear another routine to execute
  - for your own benefit you should also change the <desc>...</desc> accordingly

And whenever any errors pop up (soon - or in some years):
Remember that you changed the Code -- and also FlightGear or a unique model may rearrange that Code in some future!

Keys to control the Aircraft

- Be sure that the FlightGear-window is in focus
  - then use the NumPad-keys when Num-Lock is on
  - or the "normal" keyboard-keys

NumPad	***normal key***	***Action***
9/3	Bild ▲/▼	Throttle
4/6	← →	Aileron
8/2	↑↓	Elevator
0 / Enter	Insert / Enter	Rudder
5	*(none)*	center all
7/1		Elevator Trim

	Pos1 / End	

Keys to control the Engines

Key	***Action***

!
@
#
$
}
{
~
	Select 1st engine
	Select 2nd engine
	Select 3rd engine
	Select 4th engine
	Decrease magneto on selected engine
	Increase magneto on selected engine
	Select all engines

s M/m N/n	Fire starter on selected engine(s) Lean/Enrich selected engine mixture Decrease/Increase selected propeller RPM

Keys to control the **View-Direction**

NumPad +UpCase	***Action***
8 7 4 1 2 3 6	Forward Left/forward Left Left/back Back Right/back Right

9	Right/forward

Keys to control the **Field of View**

Key	***Action***
P c S Shift-F5/F6 Shift-F7/F8 Shift-F3 Ctrl-c i/I h/H	Toggle instrument panel on/off Toggle3D/2D cockpit (if both are available) Shift the panel in y direction Shift the panel in x direction Read a panel from a property list panel/cockpit hotspot visibility Minimize/maximize HUD Change color of HUD/toggle HUD off forward/backward
x/X v/V Ctrl-v z/Z F10	Zoom in/out Cycle view-modes forth/back Reset view direct to Pilot-view Increase/Decrease visibility (fog) Menu on/off

Keys to control the Auto-Pilot

FlightGear supports 2 types of Autopilots:

- a "common one" which can be used for about all models, even if that model in reality does not have an Autopilot
- and "model-unique ones" that may be operated with different menus, keys, mouse-options, etc.

For the "common ones" you can use the following keys *(that may or may not work also on the "unique" AP!)*

Key	*Action*
Ctrl+A	Toggle altitude lock
Ctrl+G	Toggle glide slope lock (NAV 1)
Ctrl+H	Toggle heading hold
Ctrl+N	Toggle NAV 1 lock
Ctrl+S	Toggle autothrottle
Ctrl+T	Toggle terrain follow (AGL) lock
Ctrl+U	Add 1000 ft. to your altitude (emergency)
Ctrl+F6	Toggle autopilot heading mode
Ctrl+F11	Autopilot altitude dialog

Ctrl+T controls your model like a „Cruise Missile“.
Ctrl+U may save you in an emergency!

With an active AP the following NumPad-keys change their function:

Key	*Action*
8/2	Altitude adjust
4/6	Heading adjust
9/3	Autothrottle adjust

Other Keys

Key	*Action*
B	Toggle parking brake
b	Apply all brakes
g/G	Raise/lower landing gear
, *(comma)*	Apply left brake (useful for differential braking)
. *(dot)*	Apply right brake (useful for differential braking)
l *(el)*	Toggle tail-wheel lock)

][	Extend/Retract flaps
p a/A t/T shift+F2 shift+F1 F2 Esc	Pause Sim Simulation speed up/slow down Clock speed up/slow down Save current flight to fgfs.sav Restore flight from fgfs.sav Save screen shot Exit program

Mouse-Controls

In addition to the common mouse-actions like e.g.:

- select a menu-item
- activate certain functional areas (buttons, areas, etc.)
- open the "property-menus"
- etc.

FlightGear activates 2 different modi to be used:

1. „Normal mode“ - as usual
2. „Control mode“ - controls the aircraft like a joystick
3. „View mode“ - allows fast changes in viewing directions

You change between the different modes by clicking the right mouse-button.
(Sorry enough: By doing that you do loose the "normal" functions of the right mouse-button, e.g. open properties)

Normal Mode → Mouse-Pointer: Normal (arrow-pointer)

In this mode the mouse functions as usual - except: You cannot use the right button as used to in standard applications!

Within FlightGear you use the left button as usual to activate buttons, controls, etc. But often you might not see where to click to operate a certain

unit! In order to help, you might press *"**CTRL-c**"* - that will show the "***hotspots***" marked by a yellow outline. In those you can:

- change the state of a control-element by clicking into that "hotspot" with the left mouse-button
- operate specially secured elements by clicking with the center mouse-button (or wheel)
- rotate dials with the mouse wheel
- for most dials there are also 2 areas to rotate left/right by "clicking", those usually react slow with normal mouse-clicks and fast with clicks of the center mouse-button (or wheel)

Control Mode → Mouse-Pointer: +

In control mode you can control the aircraft controls by moving the mouse. This mode is indicated by a cross-hair mouse cursor.

In this mode

- moving the mouse left/right controls the ***ailerons*** (rolling the aircraft)
- moving the mouse forward/backward controls the ***elevator*** (changing the pitch of the aircraft)

- holding the left mouse button down changes the behavior so that
  - moving the mouse left/right controls the ***rudder***

- holding the middle mouse button down
  - and moving the mouse forward/backward controls the ***throttle***.

- Finally, the scroll-wheel may be used to set the ***elevator trim***.

This mode is particularly useful if you do not have a joystick, as it provides much better control of the aircraft than using the keyboard. If you intend to use the mouse to control the aircraft regularly, it is recommended that you enabled auto-coordination, so the ailerons are linked to the rudder. This can be done using the option `--enable-auto-coordination` *(see Starting the FlightGear Simulator)*.

Viewing Mode → Mouse-Pointer: <=>

One more click with the right mouse-button brings you to the Viewing-mode. This mode is indicated by a double-headed arrow cursor.

In this mode

- simply moving the mouse changes the ***view into that direction***. This is particularly useful for looking around the cockpit, or out a side window.
- the scroll-wheel can be used to ***zoom in or out***.
- clicking the left mouse button ***resets the view*** back to its initial position, usually straight ahead
- holding down the middle mouse button and moving the mouse allows you to move the ***viewpoint itself left/right and up/down***
- moving the mouse while both the middle button and Ctrl are held down allows you to move the ***viewpoint forwards and backwards***

One more click with the right mouse-button brings you back to the "Normal mode".

The Menu-Bar

The menu bar provides access to a variety of options for the simulator and the aircraft. In addition many aircraft have their own menu items, e.g. from just changing their registration to automatically starting its engines, opening doors, Carrier-Hooks, etc.. Those can be found at the end of the menu bar, usually under the name of that aircraft. But also under "Help" you may find unique parts for the model you currently use.

To display or hide the menu bar, press ***F10***. When hidden, you can display the menu automatically by moving your mouse to the top of the screen.

The menu bar provides the following menus and options:

- File
- View
- Location
- Autopilot
- Environment
- Equipment
- AI *(artificial Intelligence)*
- Multiplayer
- Debug
- Help

File

- **Reset *(Shift-Esc)*:** resets the flight to the selected starting position. Comes in handy for a retry if you get lost or something goes wrong.

- **Screenshot *(F3)*:** Saves the actually shown FlightGear-Window into a "fgfs-screen-XXX.jpg" file. This picture also contains all open PopUps and also the File-Select menu**.**
  - *you may predefine the location to save by a "`--prop`"-option. e.g.*
    - `--prop:/sim/paths/screenshot-dir=YourDirectory`

  - In case you forget where you saved the files, you find that pointer in:
    - *`Menu/File/Browse Internal Properties/sim/paths/screenshot-dir/screenshot-last`*

- **Sound-Configuration:** Configures the volume for various sound channels, and whether they are heard outside the aircraft. That does NOT include the sounds of feature programs like FGCOM, Festival, and alike.

- **(Browse Internal Properties:** These are shown since FlightGear version 2.0 under "Debug")

- **(Logging:** This is shown since FlightGear version 2.0 under "Debug")

- **Quit (Esc):** This is the "orderly end of session" saving the actual options/settings prior closing. If you use the "X" in the Window-Bar all new options/settings set in this session will just be lost.

View

- **Display Options** (since Ver.2.0): Configures various display options, including whether the 2D panel, frame rate and chat messages are displayed.

- **Rendering Options:** Configures various graphical features. This allows you to trade eye-candy such as shadows, 3D clouds and specular reflections for frame-rate. To help you achieve a good balance, enable the “Show Frame Rate” option in the Display Options menu, which will show the current frame-rate in frames-per-second in the bottom right of the screen. Most people find a frame-rate of around 20fps adequate for flying. The frame-rate is affected by the graphical features you have enabled, the current visibility (set by ***Z/z***), the number of objects in view and their level of detail (LOD).
  - To test your settings fly somewhere over the ocean and check the FPS. Then do the same flying in a very busy, much modeled area like e.g. KSFO, LFPG, or fly over the area of the City of Paris/France, etc., and check again. If the FPS drops below a usable rate try to reduce the options and/or limit the FPS, e.g. to 20 frames/sec. *(Even 10 FPS may be acceptable)*

- **View Options:** Defines which views you can select with „***v***“/„***V***“.

- **Cockpit View Options:** Configures the view within the cockpit, the pilot’s head movement, black-out due to high G (gravitation forces), and red-out due to negative G.

- ***Adjust LOD Ranges*** *(Level Of Details)**:*** Sets the range at which different levels of detail are displayed. This affects the textures and objects displayed in the simulator. The standard settings are:
    - up to 1 mile you see all details
    - up to about 5 miles you see just the contour of the models
    - up to about 15 miles you just see shadows of the objects - i.e. you see there are coming mountains - but you have no idea how high, where there are valleys. etc.

- **Adjust View Position:** This gives you three buttons, that allow you to move your "point of Viewing from". Adjusting it here is rather inaccurate - smaller steps you can adjust by using the mouse (see there). And very precise you can set those in the "`menu » Debug » Browse Internal properties`", see the "`/sim/currentview`“ withe values `x-offset-m, y-offset-m,` and `z--offset-m.`

- **Toggle Glide Slope Tunnel:** Displays a virtual tunnel to guide you down to the runway on a normal approach path. Useful if you are training setting up your approach for landing.

- **Instant Replay:** This is a very nice feature to reevaluate whatever you have done (good or bad) just before. Here you set the time-span that will be saved constantly and that you can replay whenever you want.

- **Stereoscopic View Options:** Configures stereoscopic display, using Red/Green glasses or other display methods.

Location

- **Position Aircraft on Ground** positions the aircraft on the runway of any installed airport. You need to know the ICAO code for the airport you wish to start from (e.g. KSFO for San Fransisco International). (Also see the WIKI http://wiki.flightgear.org/index.php/Initial_Starting_Positions)

- **Position Aircraft (in air)** positions the aircraft at an arbitrary point in the air. You must select a known ground point, e.g. an airport, VOR, long/lat coordinates, and a position relative to that point, e.g distance, direction, altitude. You can also set your initial speed and heading. This is useful for practicing approaches. (Also see the WIKI http://wiki.flightgear.org/index.php/Initial_Starting_Positions)

- **Select Airport from List** positions the aircraft at an airport. You can search amongst all the airports that you have installed. Clicking "Apply" will place you at that airport on a runway appropriate for the current wind.

- **Random Attitude:** Sets the aircraft with a random heading, speed and attitude. Useful for practicing recovery from unusual attitudes.

- **Tower position:** Moves you directly to the tower of your choice - but without your aircraft. So if you are at EDDF/Germany you can just have a look on what is going on at KSFO/USA. Again: Only your view changes to that location, and thus you can only use the "View-Options": "Tower View" and "Tower View Look From".
    - When you select "Preset" you will be reseated back into your aircraft.

Autopilot (AP)

This menu is only available for aircraft that have the default autopilot configured. Some aircraft may have their own autopilot which is configured through the panel, in which case this menu is disabled.

- **Autopilot Settings** configures the aircraft autopilot. You can set the autopilot up in a variety of different ways - from simply keeping the wings level, to following an ILS.
    - *For details see the WIKI http://wiki.flightgear.org/index.php/Autopilot*
    - *See also how to set the Autopilot at the device in chapter Radios-AP*

- **Route Manager** generates the route (list of waypoints) for the autopilot. Waypoints can be airports, NAV-aids, or fixes. The heading, distance and time to the current waypoint may be displayed in the HUD.
    - For details see http://wiki.flightgear.org/index.php/Route_manager

- **Pop Waypoint:** Removes the top waypoint from the route list.

- **Clear Route:** Clears the complete current route.

- **Set Lat/Lon Format:** Toggles the HUD Latitude/Longitude format between decimal minutes and seconds.

Environment

- **Global Weather** shows the current weather. You can change the weather scenario between various general weather scenarios, configure weather manually, or use the weather reported by the closest weather reporting station (usually a airport) via METAR.

- **Local Weather** allows you to place individual clouds anywhere you wish.

- **Local Weather Tile** configures specific weather scenarios in the local area, which may change over time.
- **Local Weather Config** allows you to fine tune local weather settings for performance.
- **Time Settings** allows you to set the current time in the simulator, speed up the simulation, and change the rate at which time passes in the simulator. Also displays UTC and local time.
- **Wildfire Settings** configures whether aircraft crashes create realistic wildfires, which may spread and be extinguished using an appropriately equipped water bomber aircraft. For details see http://wiki.flightgear.org/index.php/Wildfire_simulation.

Equipment

- ***Map:*** displays a moving map, showing airports, navigational beacons etc. There is a description to it in chapter MAP in Part RNAV.
- ***Stopwatch*** displays a simple stopwatch. Useful for instrument approaches. (Prior ver. 2.0 this was located under "Debug")
- ***Fuel and Payload*** allows you to set the fuel and current payload within the aircraft. Only available on some aircraft.
- ***Radio Settings*** **(F12)** sets the frequencies and radials being used by the radios and navigational equipment. For details see the part "RNAV - Radio Navigation"
- ***GPS Settings*** configures waypoints and views course information for the GPS. For details see http://wiki.flightgear.org/index.php/GPS
- **Instrument Settings** allows you to set the "Altimeter Pressure" and "Heading Indicator Offset".
- ***Random Failures*** allows you to configure
  - MTBF = „Mean Time Between Failures“ -- e.g. "happens every 1 hour"
  - MCBF = „Mean *(start/stop)* Cycles Between Failures“ -- e.g. "happens every 3rd flight"

  For technical details see http://en.wikipedia.org/wiki/Mean_time_between_failures
- ***System Failures*** configures random failure of aircraft systems, such as e.g. the vacuum system.
- ***Instrument Failures:*** configures random failure of specific aircraft instruments.

AI = Artificial Intelligence

The former "ATC/AI" was changed drastically for version 2.0. For details see http://wiki.flightgear.org/index.php/AI_Systems#ATC.2FAI. The new sub-menus are:

- ***Wingman Controls:*** Allows you to control AI-wingmen (depending on aircraft). For details see http://wiki.flightgear.org/index.php/Howto:_Add_wingmen

- ***Tanker Controls:*** Allows you to dynamically create an air-to-air refueling tanker, if your aircraft supports it. For details see *http://wiki.flightgear.org/index.php/Howto:_Aerial_refueling*.

- ***Carrier Controls:*** Allows you to control an AI aircraft carrier. For details see http://wiki.flightgear.org/index.php/Howto:_Carrier

- ***Scenario Select:*** Configures the active AI scenarios. Note that this will only take effect after the simulator is re-started.

Multiplayer

This item is deactivated if you are not connected to a MP-Server via Internet!

- ***Chat Dialog***: Opens a dialog-window with
  - a list of the last messages exchanged between the Multiplayers (in an area of 100mi radius)
  - an input field to type and send a message to others. The system will automatically add your Multiplayer-ID in front - so you should start the message with the ID of the addressee and then type the message.

- ***Chat Menu (-):*** allows you to send common chat messages to other aircraft in the multi-player environment. Some menus contain sub-menus of options. See examples of a usage in the parts "VFR Cross Country" and "IFR Cross Country"

- ***Pilot List:*** Opens a list of all Multiplayers in a radius of 100 mi. That list contains the Pilot-ID, his aircraft, his altitude, the distance from you to him, and the heading to him (so you can try to join him). Starting with version 2.0 there is a field that neglects a "non wanted pilot" in the list - so he might not bother you any more!

- ***MPCarrier selection:*** *(new in Ver.2)* displays a list of the available MPCarriers in an area of 100 mi.

Debug

This menu contains various options outside the scope of this guide. Here we will only list those entries, which had been included under "File" prior to FlightGear version 2.0:

- **Browse Internal Properties:** All values that are used during the simulation are listed here in a structure similar to File-Directories. You can navigate in that structure as usual. You can view, change, and trace all values from here *(but it may happen that a value will be changed back again very soon -- if it depends on other values!)*. In order to:
    - ***Change:*** Click the wanted value - that will be copied into the input-filed at the bottom - where you can change it. Hit "set" or "Enter" when ready
    - ***Trace:*** Click onto the wanted value while the Shift-Key is pressed - the trace will be shown in the upper left corner of the FlightGear-window
    - ***Binary Values*** may be flipped by clicking while "Ctrl" is pressed

- **Logging:** Will bring up a PopUp in which you can define
    - the name under which that log shall be saved
    - which values shall be logged
    - the time-intervals between the loggings
    - which type logging shall be performed

Help

- ***Help*** opens the help system in a browser window.

- ***Aircraft Help*** displays information specific to the aircraft

- ***Joystick Information*** displays information about any joystick in use, including axis and button assignments. This menu is disabled if no joystick is attached! See a description in the following chapter "Joystick Support"

- ***Basic Simulator Keys*** lists the basic keys for controlling the simulator. See a detailed list also in chapter Keyboard-Controls

- ***Common Aircraft Keys*** lists the basic keys for controlling the aircraft. See a detailed list also in chapter Keyboard-Controls

- (**Toggle Glide Slope Tunnel:** Is now listed under "View")

- ***Current Aircraft Keys*** shows unique keys for the active model and/or additional informations for it.

- ***Start Tutorial*** allows you to start an "In-Simulator" tutorial for the current aircraft. This is only available on some aircraft. For more informations see the feature KI-Teacher.

Joystick-Support

Could you imagine a pilot in his or her Cessna controlling the machine with a keyboard alone? For getting the proper feeling of flight you will need a joystick, a yoke, rudder pedals, some external engine-controls would be nice too, even a complete "real" cockpit with Pilot-seat would be nice - right? However, the combination of numerous types of joysticks, flight-sticks, yokes, pedals etc. on the market for all the different Operating Systems and manufactures, makes joystick support a non-trivial task in FlightGear.

Not the smallest problem is always listing all possibilities - so *I will make it ease for myself:* ***Throughout this book we will use the name "joystick" for all of those externally connected controls - independent of their function and handling!*** (With the exception of keyboard and mouse!).

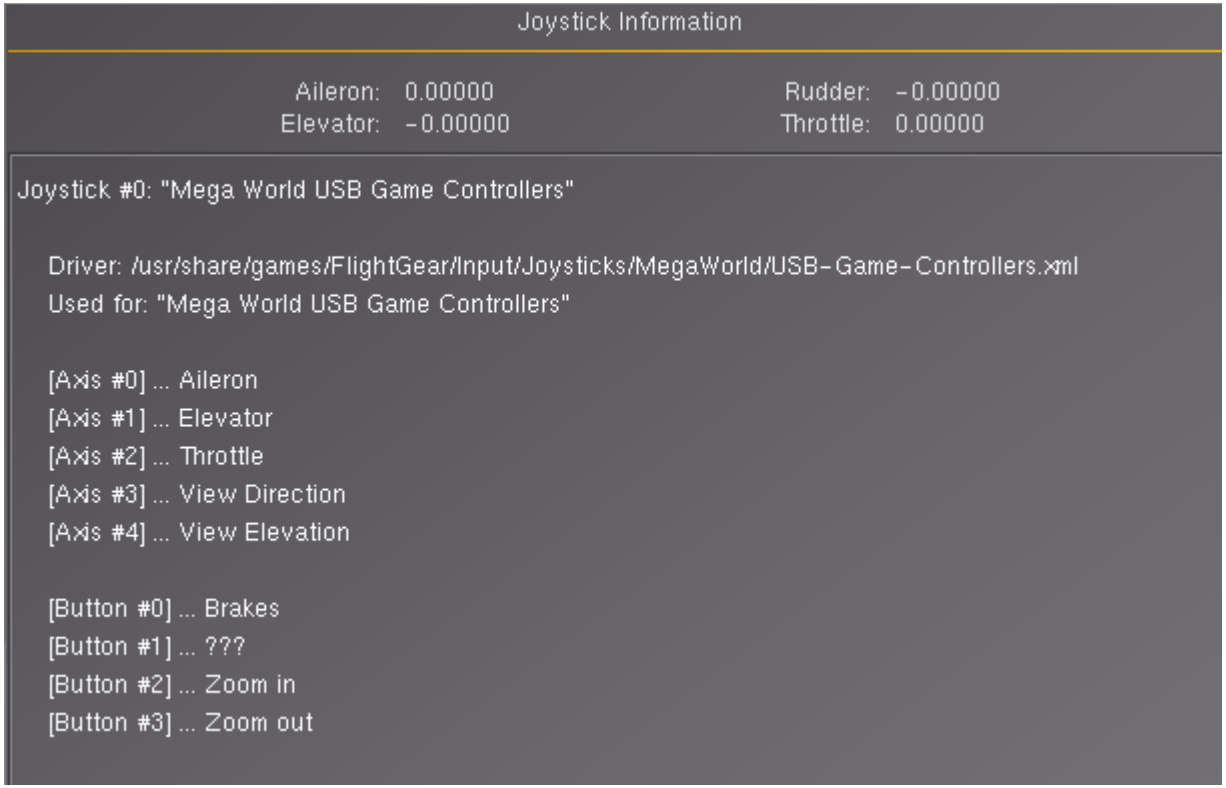
For the technical aspect FlightGear has an integrated joystick support, which automatically detects any type of "joystick" attached and detected by the Operating System. In order for this joystick auto-detection to work, a joystick bindings XML-file must exist for each joystick. This file describes what axes and buttons are to be used to control which functions in FlightGear. The associations between functions and axes or buttons are called “bindings”. FlightGear includes several such binding-files for several joystick manufacturers in folders named for each manufacturer. For example:

> If you have a "CH Products" joystick, look in the folder `$FG_ROOT/Input/Joysticks/CH` for a file that might work for your joystick. If such a file exists and your joystick is working with other applications, then it should work with FlightGear the first time you run it. If such a file does not exist, then we will discuss later how to create such a file by cutting and pasting bindings from the examples that are included within FlightGear.

Just try the following Test! If this does work for you, lean back and be happy!

Testing the Joystick

You can see what FlightGear has detected as your joystick by selecting ***`Menu » Help » Joystick Information`***. e.g.:



- A joystick was detected! That means your Operating System did find an appropriate system-driver and also FlightGear did find a fitting XML-Bindings-File

- There is only one joystick connected - and that has the ID-number "0" (computers start counting with "0", not "1" like we humans!)

- The joystick did identify itself as „Mega World USB Game Controlers“. This name is hardwired inside the joystick itself and is transmitted during the "handshaking routine" between system and joystick.

FlightGear also tells us which XML-Binding-file it found for that stick: *$FG_ROOT/Input/Joysticks/Mega World/USB-Game-Controlers.xml.*

(in this example you see a directory-structure as is typically for Linux -- for Windows the beginning of the stream will look different)

- The joystick has:
  - 5 analog controls: "Axis #0" to "Axis #4"
  - 4 digital controls: "Button #0" to "Button #3"

- Because they are listed we know that they are functional
  - even if we might not like the function that is assigned to it *(we can change it if we want!)*
  - and yes: Also "Button #1" has a correct assignment! The designer of the XML-file just forgot to tell us what it is (e.g. "*<desc>view cycle</desc>")* - but that is just a "nice to have" info for us humans - the system does not care about it! *You can correct it if you want!*

- None of the "Axis" is outside its "0-position". Just try it: Move your joystick a little and watch the numbers changing in the upper part of the window.

- Sorry: But you cannot test the buttons as easy!

Based on that you can decide

- if there is an error
- if the assignment is as wanted (if the designer did care to tell us (see "Button #1")!)

If anything needs to be debugged or changed or if you just want to know more about it, got to: http://wiki.flightgear.org/index.php/Joystick.

Otherwise just use it and be happy!