FSUIPC4: Application interfacing module for Microsoft Flight Simulator X

Flight Simulator Universal Inter-Process Communication 4

by Pete Dowson, © 14th June 2007

Support Forum: http://forums.simflight.com/viewforum.php?f=54

Version 4.12 of FSUIPC4.dll

Note: All my Windows based software is always available in the latest versions from http://www.schiratti.com/dowson. (Selected modules are also available elsewhere).

This is *not* my web site (I have none) but the list is there courtesy of Enrico Schiratti

Assorted extras and interim updates will be available from my Support Forum (link above)

PLEASE ALSO SEE THE FSUIPC4 READ ME DOCUMENT IN THE ZIP

(it will often contain important release-specific information about known problems)

As well as the document you are now reading, this package contains "Install FSUIPC4.exe" that will install the following parts in a Modules folder, which will be created if necessary, in your FSX folder.

FSUIPC4.dll	The FS module itself, version 4.12
FSUIPC4 User Guide.pdf	This document, in Adobe Acrobat format
FSUIPC4 History.pdf	A list of changes in each version (Acrobat format)
FSUIPC4 for Advanced Users.pdf	More technical information only (Acrobat format)
List of FSX Controls.pdf	FSX controls list (Acrobat format)

For other bits and pieces, like TrafficLook and WeatherSet, please visit my Support Forum. You will also find interim versions and bug fixes there—well worth a regular scan. The link is shown above, in the subtitles.

If you want programming details you need to get the FSUIPC4 Developer Kit, (SDK).

Please try to read at least some of this document. It only grows as I add answers to some of the many questions folks send to me. If you have a question, please check here first. It has probably been asked and answered already!

In particular, your attention is drawn to the sections entitled "Important Notes …" near the end of the document. These discuss assorted matters which are sometimes a matter of concern to FS user and which can impinge upon the use of FSUIPC.

… Thanks!

<u>Contents</u>

Introduction: what is FSUIPC4?

FSUIPC4 is a completely new version of FSUIPC designed for FSX and hopefully all future versions of Microsoft Flight Simulator. It is built around the new Microsoft interface named 'SimConnect' which is used almost (but not yet quite) exclusively for its interactions with FSX. This should guarantee it compatibility with future versions as Microsoft become responsible for maintaining the simConnect interface itself.

The function of FSUIPC, now that developers have an official Microsoft interface they can use, is still twofold, as it has been over the last seven years. It is just that one side of it will probably see less application as time goes on. The two aspects are:

1. The provision of an interface to FSX and beyond for application programs and add-on aircraft which is compatible with that provided by previous FSUIPC versions for FS2000, FS2002 and FS2004 (and, if you go back to FS6IPC days, FS98). The advantage of this is that programs already working on FS2004 (say) should, if they use FSUIPC, work immediately with FSX (*if they don't, I want to know, please!*).

   In time I would expect newer versions of FSUIPC-using application, and, indeed, complete new applications, to arise that interface to SimConnect directly. Hence, this part of FSUIPC4 is unlikely to see a great deal of new development (additional offsets and the like)—at least certainly not as much as has occurred in the past.

   This aspect of FSUIPC4 is available to applications irrrespective of the user's status. In other words, user purchase and registration of FSUIPC4 has no bearing on the local FSX PC support of FSUIPC-interfacing programs (*support for Networked clients of WideFS does however still need purchase of the WidefS key*).

2. The main part of FSUIPC4, and the one which actually justified it as a payware add-on for all those who purchased it in the past, are the user features which is the subject of this document. It is these features you get if you purchase a Key to register. As well as those facilities familiar to previous users, for programming buttons, axes and performing more precise joystick calibrations, the functions of the original AutoSave and GPSout modules are now part of the benefits of subscribing to FSUIPC4, and are built in facilities with on-line option setting.

Note that some of the main features of previous versions of FSUIPC, those for manipulating the weather, are not, at the time of the first FSX release, as useful or as recommended as they were. This is because the SimConnect facilities for weather reading and writing are not yet fully up to scratch. Some facilities have been provided, but please don't expect them all to be fully working yet. In general, they work a little better with external weather sources like ActiveSky than they do with FSX's own downloaded weather. But expect to see great improvments in how the weather features operate as time goes by.

Paying for FSUIPC Registration

Why should I pay for FSUIPC?

The short answer is that you do not have to. The registration by users of their copy of FSUIPC4 is not compulsory. Here are the pros and cons:

What you get if you don't pay:

- The ability to run all FSUIPC-dependent application programs. (Commercial and shareware products pay a fee or subscription. All genuine freeware programs get free access keys on application).

What you get if you pay:

- Facilities for joystick calibration, some fancy assignment capabilities, and button programming, all with aircraft-specific assignment capabilities so that you can do different things with the same controls on different aircraft.

- Key press programming facilities, also aircraft-specific is desired.

- A few frills like facilities to load Flights or Plans from *any* folder in reach of Explorer, keeping the FS time in sync with the system clock, pausing automatically after the flight is restored following a crash, extending battery life, throttle syncing, allowing intervening actions during pushback without losing direction selection, and others.

- Assorted weather filtering options—not all of them so useful yet, but with FSX SP1 installed it is getting better, and I am hopeful for the future.

- AutoSave options—to save a Flight regularly, as a background task so you can resume from a few minutes before in the event of a crash or a need to reproduce some problem.

- GPSout facilities: optional output of NMEA or AV400 sentences to mapping programs either via a serial port (COM) connections, or via WideFS.

- The possibility of additional user options to come. There are a few on my list, but I cannot guarantee any until I get to them and study the implications. I am also open to requests and suggestions, as in fact I have been over that last four years -- that is how FSUIPC has become what it is. If you are interested in the growth in this area even only over the last few versions, please review the History document, included in the ZIP separately.

- Support from myself for any queries or problems arising from the use of FSUIPC, or identifiable as FSUIPC even when using an application. I would still expect the application developer to be the prime support for his own application, and it is easier for him to sort out FSUIPC interfacing problems with me rather than between the user and me, if you see what I mean.

- All this for at least the life of FSX *and any official updates*, provided I live that long. I cannot actually guarantee to continue this into and beyond FSXI or whatever, that would really be asking too much. However, your registration will certainly remain applicable for all version 4.xx releases, which will take us up to the release of the next FS version.

How much do I pay? How do I pay?

For most folks there is only one place for payment and registration, and that is via SimMarket, at:

http://secure.simmarket.com/product_info.php?products_id=2068

For those who don't like Internet transactions, or don't have Internet access, don't worry, I provide details below of other ways. The pricing is as follows:

FSUIPC 4	EUR24.00 (+VAT where applicable)
WIDEFS 7	EUR24.00 (+VAT where applicable)
BUNDLE	EUR36.00 (+VAT where applicable)

UPGRADE ENTITLEMENT:
    (WHEN ANY PREVIOUS VERSION PURCHASED AFTER APRIL 14th 2006)

FSUIPC 4 UPGRADE	EUR12.00 (+VAT where applicable)
WIDEFS 7 UPGRADE	EUR12.00 (+VAT where applicable)
BUNDLE UPGRADE	EUR24.00 (+VAT where applicable)

Euros are stipulated because SimMarket operates in Euros. They accept other currencies, depending upon the payment method, but the price is always based on the Euro. As a rough guide at the time of writing the Euro is worth about $US1.27 or about 68 pence in the UK, making the pricing for FSUIPC4 about $US30, or £16 sterling UK. Note that new European tax rules for Internet based sales came into force in June 2003 which means that EU purchasers also have to pay VAT ("Value Added Tax"), which will be at the rate of the supplying country—Germany, in this case, 16% (but rising to 19% in January 2007!).

A word about **WideFS7**. This is now truly a part of FSUIPC4, in the sense that the FSUIPC4 module contains the equivalent of "WideServer". The Client part is the same as before, and downloadable separately in the usual WideFS.ZIP package. Just use the Wideclient.EXE from the latest WideFS.ZIP but not the WideServer.DLL. The full WideFS documentation is also only in the WideFS.ZIP package.

Note that the WideFS part of FSUIPC4 has its own its own Logging, but its settings are in a section of the FSUIPC4.INI file. Once you have paid for and registered WideFS7 through the FSUIPC4 options (described below) you will be able to enable and disable it whilst running FSX. Each time you re-enable it the parameters from the INI file are re-read, so you can actually change things there without reloading FSX.

Here are the details of the different ways of paying at SimMarket (see http://secure.simmarket.com/paymentoptions.php for the latest. This is quoted directly from there, by permission):

We want to make buying as smooth and easy as possible for you.

simMarket aims to provide the largest range of payment options available over the Internet today, allowing you to choose the payment option best suited to your personal and business needs.

All of these options have been designed to be as safe and secure as possible for your peace of mind. Our site uses the latest in security so you can be sure your transaction is 100% safe.

- **Credit Cards**
- **(Debit Cards) PayPal**
- **Bank Transfers**
- **Cash**

Credit Cards
We accept all major credit and charge cards including Visa, MasterCard, American Express and JCB.
simMarket does not store your credit card details at any stage.

We use only German Industry recognised transaction Encryption and Payment Gateway Technology.

To help protect you, we use the international standard SSL (Secure Sockets Layer) security, which is the most secure way to send credit card details over the Internet. SSL works with Netscape Navigator / Microsoft Internet Explorer versions 3.02 or higher. It is automatic, and you will receive instant notification if your browser does not support SSL.

When you access a secure page in Internet Explorer a small padlock will appear at the bottom of your browser (for Netscape, the key at the bottom will be blue and unbroken), where you can verify our company and encryption level.

PayPal
You do not need a PayPal account to pay for your purchase as a credit or debit card may be used without subscribing. Please see www.paypal.com for further details.

Bank Transfers
You can make bank transfers to us. When you proceed to the checkout select the Bank Transfer payment option, and follow the payment option information carefully. **You must ensure that all bank charges are covered by you, e.g. that the total amount of the order is fully credited to our account.**

Our Bank Details :
Account Owner: The simFlight Network
Bank Name: Postbank, Germany
Account # 13003705
BLZ # 600 100 70
IBAN: DE41 6001 0070 0013 0037 05
BIC: PBNKDEFF
SWIFT: PBNKDEFF
Reference: Your Order Number

Orders made using the Bank Transfer option will not be despatched until the total amount has been received on our bank account in full.

Cash
Cash purchases are available. When you proceed to the checkout select the Cash Orders payment option, and follow the payment option information carefully. Please send to this address only:

      The simFlight Network
      Customer Sales Dept.
      Anna-Stenner-Str. 42
      55129 Mainz
      Germany

We recommend sending by registered mail for maximum securance.
Note: Currencies accepted are EUROS and US Dollars only

Orders made using the Cash option will not be despatched until we have received the full amount..

Installation

First, you need administrative privileges to install FSUIPC4. If you are running as an ordinary user you may be able to use "Run As" to save Logging out and back on as Administrator.

Place the "Install FSUIPC4.exe" program onto your desktop, or into a temporary folder, and double click it to make it run.

This will do several things, in order:

1. Finds your FSX installation: It will do this by checking the Registry. If, for some reason, the Registry is not pointing correctly to your FSX installation the installer will present you with a standard Exploer type window and ask you to locate FSX.EXE, the actual FSX main program.

2. Checks the version of FSX.EXE: FSUIPC4 will not install if the version of FSX does not match the version (or one of the versions) for which this release was built.

3. Checks the versions of SimConnect available (yes, there can be more than one). If none match the encoding used by this version of FSUIPC4, the installer cannot continue.

4. Checks for existing FSUIPC4: If there is already a Modules folder in the FSX installation, and that folder contains a version of FSUIPC4 later than the one being installed, the latter will not install. Otherwise the modules folder is created if necessary and FSUIPC4.DLL is copied into it.

5. Enables special permissions for the Modules folder, so that on Windows Vista the INI, LOG and KEY files can be created and updated whilst FSX is running.

6. Finds the path to your FSX.CFG file—or all of those that may be used if more than one. These are in folders related to the users of FSX. If a suitable path is not found, installation cannot be automatically completed. You will have to find it yourself and then either Edit the DLL.XML file you find there, or create a new complete DLL.XML file. Without this, FSX's SimConnect system will not load FSUIPC4. (*Details of the DLL.XML file will be posted on the Support Forum—I'd like to know of such cases so something better can be done if possible*).

7. Finally, other files in the package are copied into the Modules folder alongside FSUIPC4.

Whilst it does this it will display what it is doing on screen, in a readable text "Log", like this:
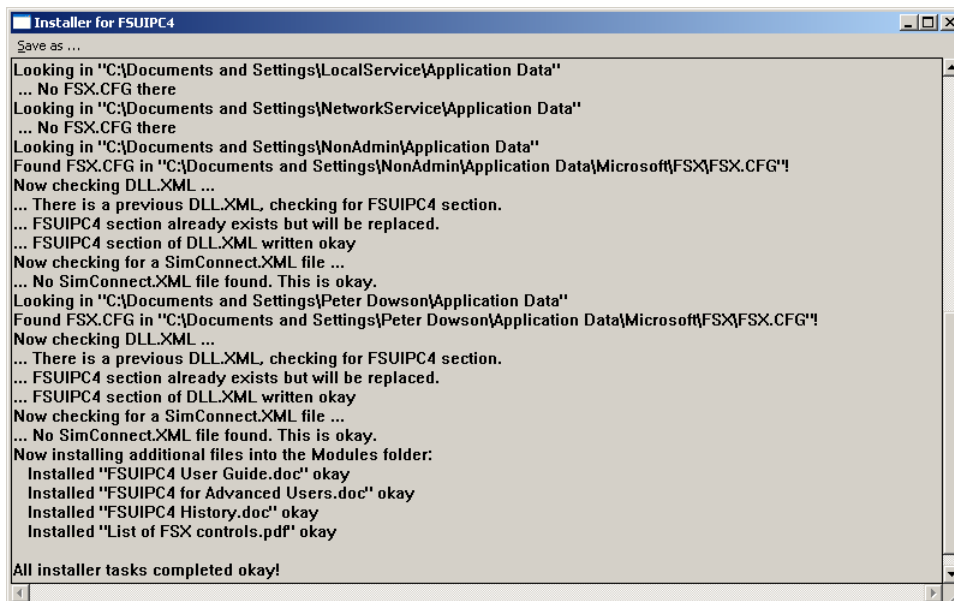
If all is well, the last few lines should be as shown above at the end of the Log, and you will get a confimatory prompt looking like this:

If anything goes wrong there will be information about this is the Log, and you will get a different prompt, telling you of the problem. If this happens, *before* clicking "Ok", scroll through the Log (there's a scroll bar on the right if the log is longer than the Window) to look for lines mentioning problems or errors or warnings. If you want help, click on the "Save As" entry in the Menu and save the log with a name such as "FSUIPC4 install.log". This will contain everything needed to help you. Just show its contents in a message to me in my Support Forum.

Next … running FSX. But read this first:

If you are *not* Registering FSUIPC4 (because you are installing it only in order to run application programs or add-in aircraft panels) then you have now completed installation and can simply load up Flight Simulator and go fly. The only user facilities you have in FSUIPC4 are those shown in the Add-Ons–FSUIPC dialogue, including message display options (previously handled by AdvDisplay) and Logging.

However, if you have obtained a Registration Key for FSUIPC4 and/or WideFS7, then there are more things to do before flying. First off, if you are *not* in a mode now in which you have full administrative privileges, you need to log out and log back in as the administrator (this is usually the first user of the system). Then, please load up Flight Simulator, get to the normal flight mode screen (not the initial selection menu), and continue at the section below entitled **Entering Registration Details**.

Windows **VISTA** users will need "elevated" administrative privileges in order to Register. To obtain these please run FSX using the right-click "Run As …" option to run as the administrator. You don't have to always run FSX in this way, only to enter the Registration.

When you first run FSX after installing a new add-on such as FSUIPC4, you will often be presented with a Security check question from Windows. If you get one like this after installing FSUIPC4:

Click the **Don't Run** button! You have a corrupted copy of FSUIPC4.DLL, one which may have been infected with a virus or been interfered with. Download a fresh copy.

FSUIPC4 is codesigned, and the proper security check you should see looks something like this (the version number may not be the same, of course):

Now, you could simply click on **Run** here and get into FSX … but if you do this, then each and every time you install an update you will have to go through this same Security Check. If you trust software from me (Peter L. Dowson) just take an extra moment now, and click that **More Options** button. This will give you the option to tell Windows you trust all software properly signed by me, so it will never bother you again with these questions:
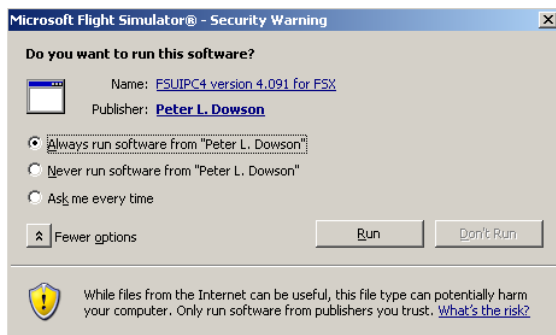
Check *Always run software from "Peter L. Dowson"* and then press the **Run** button.

> If you ever want to rescind this decision, you can do this in Internet Explorer. Go to Tools–Internet Options–Content–Publishers–Trusted Publishers, select the Peter L. Dowson entry, and click **Remove**. I hope I never give you cause to do this, but if you decide to, please write to me and tell me why.

De-Installation

If you ever want to remove FSUIPC4 from your FS installation, so that it cannot possibly have any further effect, just delete the FSUIPC4.DLL file from the Flight Simulator X Modules folder. You can delete the FSUIPC4.INI and FSUIPC4.KEY files as well, and any FSUIPC4 and WideServer logs you may find there, but with the DLL removed those other files will be doing nothing

Please note that without FSUIPC4 none of my other modules will operate either. These include PFCFSX.DLL and EPICINFO5.DLL and their INI, CFG or LOG files.

To simply compare things with and without FSUIPC4, move it to a safe place, run FSX, close FSX, then move it back. You only lose the ability to run it when it is in place if the installation file (DLL.XML) is changed or removed form its correct folder.

Entering Registration Details

With FSUIPC4 correctly installed, and Flight Simulator running and ready, look at the Menu. (Press ALT to bring it up if it is hidden). There should be an "Add-Ons" item, probably the vary last word at the right-hand end of the menu. If it isn't there then either the version of FSUIPC4.DLL doesn't match the available versions of Simconnect (which should not happen if the Installer succeeded), or something has gone wrong with the placement or editing of the DLL.XML file.

If the Add-Ons menu is there, select it. You should then see "FSUIPC …". Again, if you don't, the install failed—but in this case it is likely to be only the DLL.XML file which is incorrectly edited or placed.

If you have the correct menu entry, select it and you will get the FSUIPC settings display shown here on the left (the version number and date may be different). The right-hand picture shows a fully registered copy.
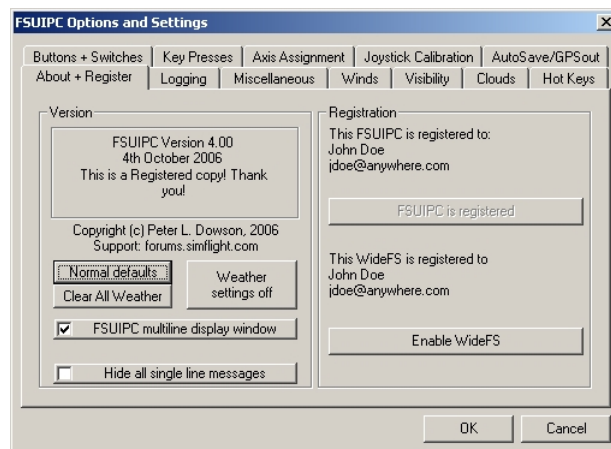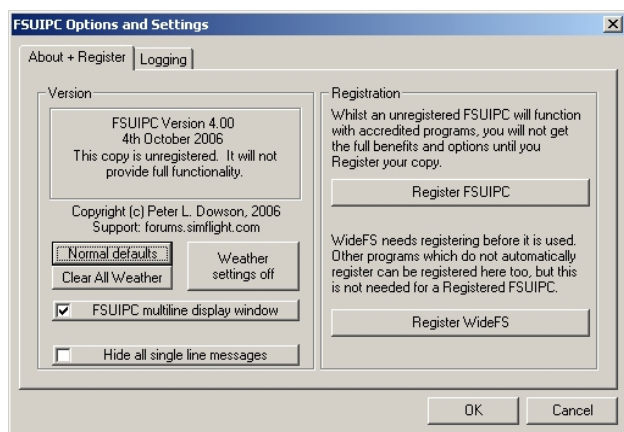
You will see that in the left-hand example the copy is described as "unregistered", and the entire right-hand part is entirely concerned with Registrations. If you are not logged in as the administrator the message at the top right will be different, and warn you that you cannot Register at this time. You will have to close down FS and log in as administrator to register. The registration process in akin to program installation in this regard.

User registration

If you pay for a registration key for FSUIPC4 then you get access to all the facilities it provides, accessed via the assorted Tabs shown in the right-hand picture above.
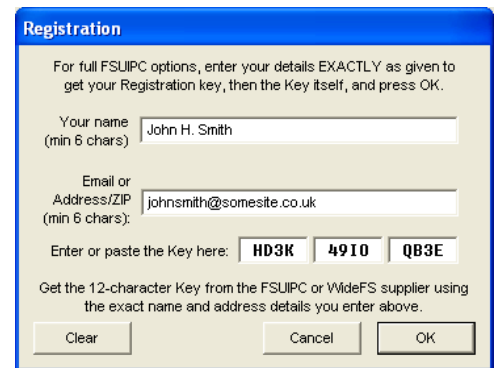
The 12-character key you will purchase is inextricably related to the name and address (normally your email address) you used when applying for the Key. It is this information you need to enter. Click the **Register FSUIPC** button and enter the details *exactly* as you are given in the details supplied with the Key—see the example on the right.

Note that it does *not* matter if your email address is changed later. It is not used as an email address, on as a means of identifying you as the license holder. The only time a change may present a problem is if you purchase FSUIPC4 one day, and WideFS7 another day, after changing the email address (or vice versa, of course). The registration must have the same name and address in both cases, so be sure to mention this when making the second purchase, and supply your old email address at the time.

After successful entry, FS *must* be restarted before the registration becomes effective.

These keys are remembered by FSUIPC4 in a file called "FSUIPC4.KEY", which is saved alongside FSUIPC4 in the Modules folder.

Save a copy of your FSUIPC.KEY file (from the FS Modules folder). If you change computers, or reinstall Windows, you will need to re-enter the registration details and these are recorded for you in that KEY file, which you can read in any text editor. Note that Keys can exceptionally be provided which expire on a certain date, or they can last forever. Normally, for full payment, an everlasting key will be provided.

WIDEFS7: WideServer registration, and WideClient

WideFS7 registration follows an identical procedure and can be done at the same time. Please note that your name and address details *must* be identical for both, and, in fact, will be copied for you by FSUIPC4 when you press the **Register WideFS7** button. But the access key will always be different. It, too, is saved in the FSUIPC4.KEY file.

After re-loading, if you registered WideFS7, it can be disabled and enabled using the button on the right-hand side (as shown in the right-hand picture of the pair above). You will find the parameters for WideServer in the [WideServer] section of the FSUIPC4.INI file. You will not normally need to change anything there, though you may want to experiment with different protocols (ProtocolPreferred parameter). To do this you can disable WideFS7 on the options screen, edit the INI file, then re-enable WideFS7 again.

Except for the fact that the WideServer.DLL doesn't exist separately, and the parameters are in the FSUIPC4.INI file, the documentation for WideFS7 version 7.xx is the same as for WideFS 6.xx, as included in the main WideFS.ZIP file which you can download from the usual places. Please note that any version of WideClient from 6.50 onwards is compatible with WideFS7's Server—there is no specific "version 7 WideClient"—but you are advised to use the latest available (6.72 at the time of writing).

> MOST OF THE REST OF THIS DOCUMENT IS VALID ONLY FOR REGISTERED COPIES OF FSUIPC4
>
> The only facilities available to unregistered users are the Message Windows Options (described soon) and the Logging and Monitoring facilities (described much later)

Setting FSUIPC options

Options for registered installations of FSUIPC4 are controlled by parameters in a file called FSUIPC4.INI. This is not supplied with FSUIPC4, but it is generated the first time you run FS with FSUIPC4 installed. It sits with FSUIPC4 in the FS Modules folder. Most of the options of general interest are accessible whilst running FS, via a Menu entry. This is by far the best and easiest way to access the more popular options. There are still some you can only access by editing the FSUIPC4.INI file, but most of these are not useful to most users and are only described in the Advanced User's Guide. The main exception is the facility for running additional programs automatically when running Flight Simulator.

With FSUIPC4.DLL correctly installed and registered, and Flight Simulator running and ready, go to the FSUIPC4 options. (You know how to do this now, as you had to go there to enter your registration details—use the Mouse to select the Add-Ons menu entry, then FSUIPC, or simply press ALT then D then F).

Unless you are starting off with a copy of FSUIPC4.INI copied over from a previous version or installation (see below notes for power users upgrading from previous versions), press the **Normal defaults** button. This may not change anything, but it just makes sure that in the discussion below we are both talking about the same thing.

You don't need to understand all parts of the Options and Settings to use FSUIPC4. But if you want to get maximum benefit it would be worth making a little effort. You can experiment anyway without doing any real harm, and you can always press **Normal defaults** at any time, and start again.

Another button here, **Weather settings off**, is there mainly to help WidevieW users to set up their *client* PC (not the *server*) so that WidevieW can copy the weather over correctly without FSUIPC interfering. WidevieW is a system for multiple views of FS over a Network, and is made by Luciano Napolitano.

The **Clear All Weather** button is just a convenience provided for those who use FSUIPC's weather control and find it awkward to clear weather in FS's own dialogues. As you'll see, there's also a way of assigning this to a "hot key" so you can do it without going into menus at all. Note that FS won't actually clear the weather until you return to normal flight mode—i.e. exit the dialogues. Also, in FSX weather clearing can take a while—it isn't always immediate.

Before going on to look briefly at each page of Options provided by FSUIPC, a quick word about how to operate the window. The tabs at the top select between various "pages" of options. You can visit all these, make changes, as you like, but nothing is actually changed until you press the "OK" button. If you press the ESCape key or "Cancel", or close the window using the close button at top right, then *none* of the changes you have made on *any* page will be effective. Pressing the "OK" button confirms *all* the changes made in *all* pages. You can re-visit any and all before confirming them in this way.

POWER USERS note: if you have a lot of investment in your Buttons, Keys, axes or Joystick Calibrations via FSUIPC version 3 then you will want to retain most, if not all, of that work. This is okay—those parameter sections are identical in FSUIPC4, though there are many additional FS controls in FSX and some may have different functions or be omitted. Just use an editor to copy just the [Buttons …], [Keys …], [Axes …] and [JoystickCalibrations …] sections over from your FSUIPC.INI file to your new FSUIPC4.INI file. After that, check they all work and possibly re-assign those which have changed.

Message Window Options

FSUIPC4 provides support for a message window in the style of the in-built FS ATC window. This will display only multi-line messages sent to FSUIPC4, such as (and particularly) the Radar Contact menu window.

Options concerning the FSUIPC4 message window appear on the About/Register screen, which is available to all FSUIPC4 users. The feature may already automatically be enabled when FS is first loaded, but it can be turned on and off (to use only ShowText for example) in the front option screen. There are two other options there:

- One, which is removed if the multi-line FS window is enabled, and which when checked stops multi-line messages going to FS's default message window. Use this if you want to use ShowText to display the multi-line text, such as on another screen or even another PC via WideFS.

- The other option which can be used to suppress all single-line messages in FS's normal message window. This removes ATIS messages and multiplayer login/out notifications as well as single-line messages from external programs.

Note that the new multiline FS window itself is part of FS: it can be moved and sized (unless locked in the Miscellaneous options), and undocked. Its position, size and docked state details are saved by FS (in its FLT files when they are saved). The details go into a section with the window name. The window only disappears when it is empty, but FSUIPC recognises the "AdvDisplay" hot key and will toggle the window on and off. This "AdvDisplay" toggle facility is now also available as an FSUIPC control, assignable in the Button options.

For unregistered users, the **AdvDisplayHotkey** parameter can be configured in the FSUIPC4.INI file (details are in the FSUIPC4 Advanced Users document).

The default message colour is Red, and it cannot currently be changed. Additionally you cannot change the Font size or style. The window is an in-built FS one, and I know of no way to edit any of them.

AutoSave and GPSout

Both of these functions are now extras built solidly into FSUIPC4. Registered users can enable them and set their options in the Tab marked AutoSave/GPSout, illustrated here:
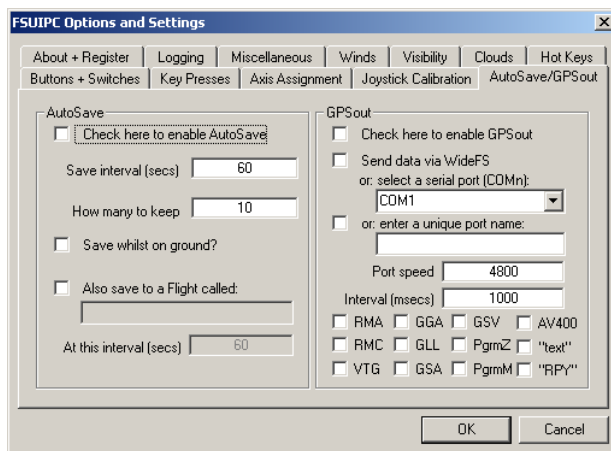
The two facilities, although sharing a Tab, are entirely independent of each other. Each is separately enabled using the first check box on each side, and all the options can be set and changed here. No INI or CFG file editing is needed. If you want to inspect the parameters they go into their own [AutoSave] and [GPSout] sections in the FSUIPC4.INI file.

A brief description of each of these facilities follows:

AutoSave

AutoSave saves flights ("FLT", "WX" and "FSSAVE" files) at regular intervals, so you can retry that crashed landing or quickly recover from other problems.

By default, when enabled, AutoSave saves a flight every 60 seconds, and keeps the last 10 files. These files are placed in the standard user data folder selected by FSX. They are named as follows:

> **AutoSave day hhmmss**

where 'day' is day of the wek. The time is the computer's local system time, NOT the one on the FS clock. This format allows you to easily select a suitable file to restart from. With 10 files at one minute intervals you have the last 10 minutes covered.

Note that AutoSave does not normally save these files whilst the aircraft is on the ground (EXCEPT maybe in slew mode if you started this mode in the air). This allows you to take a breather and recoup after a crash! <G>. If you really want it to save files when on the ground, you can check that option (see the picture above).

The files aren't saved whilst FS is paused, either, to avoid overwriting all those useful ones which identical copies of a paused simulator!

AutoSaved files are visible from the Missions Interface if you check the "Show saved missions" checkbox. This is nice to have, particularly if, as you try to work through missions, you run foul of any serious problems and crash. These flights will automatically disappear from being listed under the applicable mission after being overwritten by newer Autosave files that don't pertain to that mission.

You can also select an option to save an additional file set which has a fixed name and which is saved regardless of FS's mode or state. For this check the "Also save .." option and provide a name, such as "My Restart". The default interval is 60 seconds, but you can edit that too. The idea here is that you can set "My Restart" or whatever as your default flight, so after an program or hardware crash, or power outage, you can simply load up FS and continue from a few seconds before the problem.

If you want only this behaviour, and no timed files, set the "How many to keep" number to zero. Then only the "also file" will operate.

Note that if you decrease the number of files retained, you should also delete the excess files in the FSX files folder as they will then be left untouched by AutoSave.

GPSout

GPSout provides the facilities to make FSX look like a GPS device emitting positional and other interesting information to any program (or device) equipped to have a real GPS connected via the standard type of NMEA serial port connection. By this method you can have moving maps and other guidance software, normally running on a separate PC, following your flights in FSX.

You will need to connect your flying PC to your moving map PC with a serial "null modem" cable (ie send and receive crossed over), and configure your map program accordingly. Alternatively, if you use WideFS you can tell GPSout to send the GPS data to the Client PCs. You will need to configure those in the WideClient.ini files. A virtual serial port program (freeware) from MixW is available from my Support Forum. You can use this to generate a pair of linked virtual serial ports to connect between GPSout and a receiving porgram on the same PC, or between WideClient and the receiving program on a client PC. Either way, no cables are needed with this method.

GPSout *may* not support all other moving map and atlas programs, but it has been tested with:

> AutoRoute 2001: use GGA sentences
> AutoRoute Express 98: use GGA
> Anywhere Map, by Control Vision: use RMC, GGA and GSA
> MapPoint 2001: use GGA or RMC
> Map'n'Go: use RMC
> Jeppesen FliteMap: use RMC and PgrmZ with a Garmin NMEA setting,
> > or (for versions 8 & 9) RMC, GGA and GSA.

It is also known to work with real Garmin GPS units which support input in the "Series 400 Aviation" format (this may also be known as ARNAV, or KING format). For this you should set just AV400 as the only sentence, and the speed is normally 9600 in this format, but it may be adjustable.

I've received confirmation that the "Aviation In" mode works with the AV400 protocol, with the Garmin GPS III Pilot and the GPS x96 series aviation models. The GPS has to be in simulator mode, and then shows the correct track and vertical data as well as position and speed. One Garmin 496 user provided this information:

Garmin 496

First of all, you will have to buy the optional cable: Part Number: 010-10514-00 Description: "PC interface cable (RS232 serial port connector) for Garmin 496". The 496 comes with a USB cable, but I could not make it work. The GPSout settings are:

> Sentences=AV400
> Interval=1500
> Port=COMn (whatever COM port you connected it to)
> Speed=9600

In the Garmin go to 'Main menu' then 'Set up', and then to the 'Interface' tab. For 'Serial data format' select 'Aviation in'. Don't forget to put the GPS in 'Simulation mode' in the 'system mode' settings.

Use with PDAs may also be possible, though I've never succeeded in doing this. For those who have an older Palm PDA, one with serial PC connection rather than the now ubiquitous USB, you can get software that will turn the PDA into a moving map device, working with GPSout, from www.gpspilot.com. Look for "Atlas" or "Fly" applications. For these you need to run the link at 4800 baud and sentences RMC and GGA should be specified for GPSout.

For the IPAQ, try "PocketFms" (pocketfms.com), a Donationware program. This is reported to run well in an Ipaq 3670 with the following settings:

> Sentences: RMC, PgrmZ and GGA
> Interval: 100
> Speed: 52600

For PDAs on a USB connection I've received the following information which may help those with only USB connections on their Pocket PC:

- Check the unique port name option, and enter the name as \\\WCEUSBSH001

- Kill ActiveSync on both the PC and PocketPC, fire up your PocketPC GPS software and select COM9/USB as your GPS reciever from within the PocketPC software. Hopefully everything should then be working together.

This has been tried (with older versions of GPSout) on a Medion PDA (rebranded Mitac Mio 168) and an HP iPAQ without problems, and at baud rates up to 19200 using both the Medion Navigator (for cars) software and the PocketFMS software. Apparently both worked particularly well.

GPSout can also be used with some GPS emulator software—the Lowrance 500 and 1000 emulators from www.lowrance.com. The following settings are reported to be okay:

> Sentences: RMA, RMC, GGA, GSA
> Speed: 4800

though I think "RMA" should be left off as it is a total subset of RMC.

Another hint has been published for these emulators: you can set it up to accept NMEA in, but don't do this, This will probably work if you have a real Lowrance 500 or 1000, but just start the emulator and it should get a position.

Some notes on the NMEA sentences:

> RMC: best for FliteMap, provides course and ground speed, but no altitude
>
> RMA: similar
>
> PgrmZ: Garmin NMEA 0183 extension for Altitude only: use with RMC
>
> GLL: used by Microsoft Autoroute 2001 but GGA works better
>
> VTG: usually used with GLL to provide course and ground speed data
>
> GGA: also works with FliteMap and others, and provides altitude, but not course and speed
>
> GSA: provides no useful information from GPSout, but appears to be needed by some applications (such as "Anywhere") in order for it to be able to use the altitude in the GGA sentence.
>
> GSV: similarly, nothing useful from GPSout but fixed satellite data for some programs which seem to need it.

On my part, GPSout has only been thoroughly tested with FliteMap. With version 7 of that program, in the LORAN/Gps connection, select "NMEA 0183 RMC (9600)", or find a Garmin NMEA setting. In versions 8 and 9 of Flitemap there are far more options, under "Connections–External Device Setup". Those I now find work best are the Garmin NMEA settings. All the values are recognised if you send RMC and PGRMZ sentences, or RMC, GGA and GSA, and you can choose a really decent speed like 19200 as well.
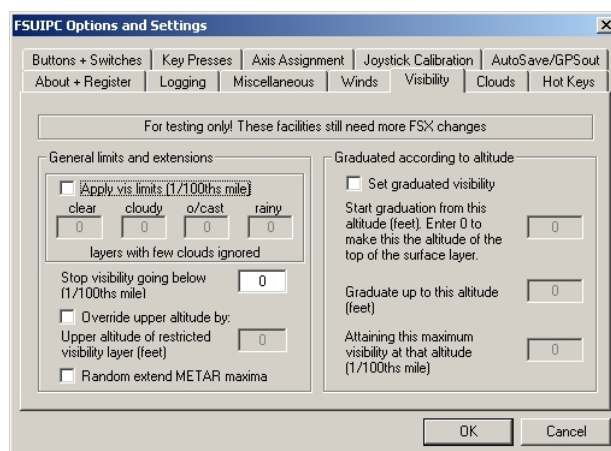
Winds
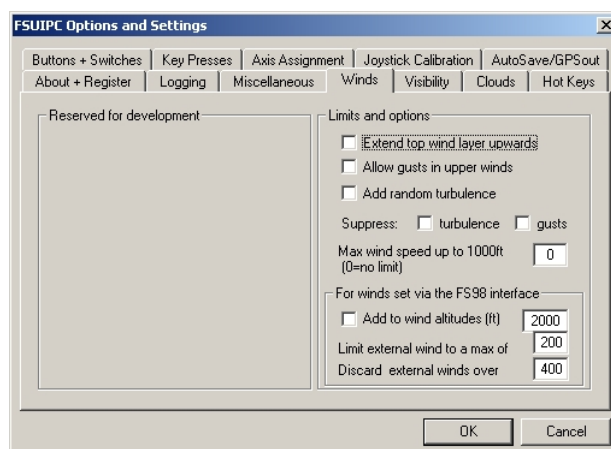
This is what the Winds page looks like at present. As you can see, it isn't finished yet! This is because the winds in FSX aren't yet fully controllable I'm afraid. You can experiment with these options now if you like, and by all means report on the interesting things you find out, but please do expect to be surprised or dismayed at present.

The facilities are intended to work both as filters on external weather being injected (through FSUIPC4) into FSX, and also, if the "Miscellaneous" option is set to allow it (see later), on the weather set in FSX by its own system, primarily downloading. If you have installed the SP1 update for FSX, by all means try this latter option. Otherwise I wouldn't recommend it.

Okay, let's look at the options here at present, starting with the easier ones:

- **Limit wind** and **discard …:** These two limits on external winds are there to prevent odd things happening if a weather program operating across an Internet link gets corrupted data and attempts to set ridiculous wind speeds. This only applies to programs using the original FS98-compatible interface to FSUIPC4, *not* to programs like FSMeteo or ActiveSky, which, until direct SimConnect versions are available, both use the New Weather Interface (NWI).

- The **Add to wind altitudes** option allows you to make FSUIPC4 add a specified number of feet to the altitudes of each wind layer specified by the external weather control program you are using, if any. This is only present to get around the problem apparent with some programs where, at high altitude airports, the surface wind is specified with an upper altitude at or below ground level! Again this is only used for winds provided via the FS98 interface.

- **Extend top wind layer upwards** gets over problem where only the surface wind is provided and this ends at 2000 feet or so above ground. With this option enabled, the same wind extends all the way up to 100,000 feet. This option may be useful when older weather programs are used.

- **Allow gusts in upper winds** does not make such gusts, but simply does not remove them. Normally FSUIPC4 stops gusts in all wind layers except the surface one, as upper wind gusts simply aren't realistic.

- **Add random turbulence** does just that. The turbulence may be added to any and all wind layers. See the next two options too.

- **Suppress turbulence** stops any wind turbulence or variance being set at all.

- **Suppress gusts** is there for folks who don't like any gusts. Use this when learning to fly!

- **Maximum surface wind speed** is self-explanatory. Useful when learning to fly, or if you think the flight modelling in the simulator is all wrong with cross wind approaches.

Visibility

This is the Visibility page with default settings. As with the Winds, you can experiment with these options now if you like, and by all means report on the interesting things you find out, but please do expect to be surprised or dismayed at present.

The facilities are intended to work both as filters on external weather being injected (through FSUIPC4) into FSX, and also, if the "Miscellaneous" option is set to allow it (see later), on the weather set in FSX by its own system, primarily downloading. If you have installed the SP1 update for FSX, by all means try this latter option. Otherwise I wouldn't recommend it.

The main options here of note are the ones to enable the visibility to be limited and to provide a visibility that is graduated from a defined surface value up to a maximum at cruising altitudes.

If enabled, by default the **graduated visibility** option starts at the top of the visibility layer and graduates the visibility value from there up to the upper altitude. This is done with a lower altitude for graduated visibility set to 0.

If you enable the **limits** (top left) then the four different maximum values (which are for the surface level visibility only) become active. One is for when it's raining or snowing, defaulting to 10 miles, two are for cloudy conditions, defaulting to 20 miles, and the other is for 'clear' conditions, defaulting to 60 miles (so effectively defeating the graduated visibility action). Please note that in this context 'clear' means no cloud layer with more than 2/8ths cover, so allowing for nice "wispy bits", and 'overcast' is assumed when there are 7/8ths cover in any layer. If it is cloudy or overcast *and* raining or snowing then the minimum of the two relevant values set for these conditions is applied.

If a non-zero **minimum visibility** is specified, this is applied after all the other values. It is applied to all weather, regardless of other options.

Te **upper altitude of restricted visibility** can be set, allowing you to limit the thickness of the fog or mist layer so that when you climb out of it you get blue skies (or fancy clouds) above and around you, but still see the mist below.

Random extend METAR maxima is provided to deal with the fact that most of the weather reports ("METARs") used by weather programs use a notation, when specifying visibility, which just gives "10SM" (10 Statute Miles") or "9999" (9,999 metres) for the visibility, whenever it is *at least* that good. The only exceptions, which are few and far between, are those weather stations that are actually attended and have the reports compiled manually rather than automatically.

With the option enabled, FSUIPC4 checks the visibility being set and adjusts it in three specific circumstances, as follows:

1. If the external program sets it to a value between 99.95 and 100.04 miles, it is reset to 6.20 miles. This is in order to rectify the results from any programs that take the 9999 metre maximum METAR visibility and transmit it literally as a number of 1/100ths of statute miles.

2. If the value is then in the range 6.15 to 6.24 miles (i.e. close to the 9999 metres maximum of a metric METAR), then on releases before FS2004 it is adjusted to a random value between 6.20 miles and the current maximum value. On FS2004, because the "grey sky threshold" is 10 miles, it is instead adjusted to a random value between 10.10 miles and the current maximum value.

3. If the value is between 9.95 and 10.05 miles (i.e. close to the 10 statute mile maximum of a U.S. METAR), then it is adjusted to a random value from 10 miles to the current maximum (10.1 miles minimum on FS2004).

Note that the random extension is computed only once every five minutes or so, to avoid constant changes in visibility should the weather control program re-write the value from time to time.

Clouds
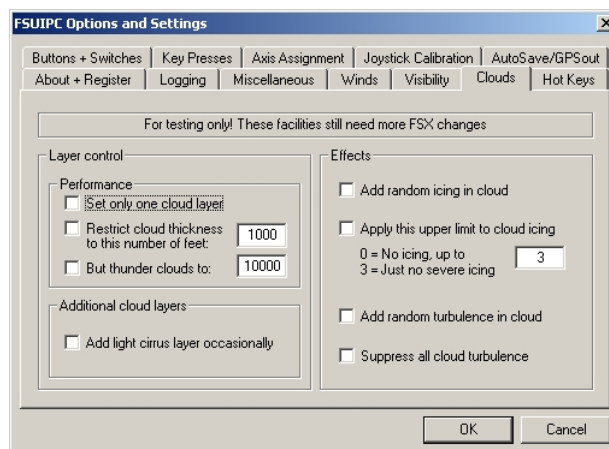
This is the Clouds page with default settings. As with the Winds, you can experiment with these options now if you like, and by all means report on the interesting things you find out, but please do expect to be surprised or dismayed at present. FSX has a mind of its own when creating its cloud effects.

The facilities are intended to work both as filters on external weather being injected (through FSUIPC4) into FSX, and also, if the "Miscellaneous" option is set to allow it (see later), on the weather set in FSX by its own system, primarily downloading. If you have installed the SP1 update for FSX, by all means try this latter option. Otherwise I wouldn't recommend it.

These facilities are provided:

Add light cirrus layer: to make the sky more attractive. each time there's a change in the altitudes of clouds below, there's a 20% chance that the cirrus layer will be omitted even if the option is enabled.

Limit icing levels: the number here is the maximum you wish to see—from 0 (no icing) to 4 (no limit: severe icing is accepted).

Random turbulence, **Random icing**: these, when generated, which will change over a period of time.

Conversely, you can elect to **suppress all cloud turbulence.**

Miscellaneous

This is called "Miscellaneous" because at present it contains several options that simply don't really fit anywhere else. However, at present, with the current state of the weather facilities, it probably contains most of the more interesting options. This is what the page looks like with default settings:
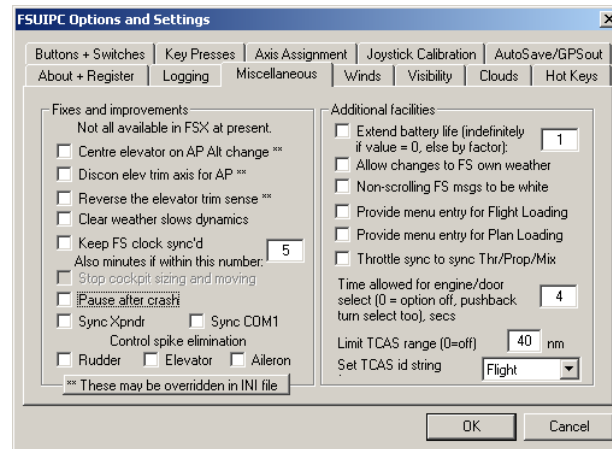
Let's look at the "Fixes and Improvements" first:

- **Centre elevator on AP Alt change** makes FSUIPC4 centre (zero) the elevator input when the Autopilot ALT hold mode is enabled or disabled. This is mainly of use for keyboard flyers, where the original keyboard-set value for the elevator is retained, ineffectively, whilst the A/P controls the vertical modes, but which then undesirably re-asserts itself when the A/P control is relinquished. ***See also the note in box below.***

- **Disconnect elevator trim axis for A/P**: This option is aimed at those who are using an analogue trim axis instead of the more usual trim up/down buttons, wheels or levers. When the FS autopilot has control vertically (such as in altitude hold or glideslope acquired modes), it disconnects the elevator axis so that joystick inputs don't upset things, but doesn't do the same with the trim axis. This FSUIPC4 option fixes that. If it is enabled it also disconnects the trim axis if an add-on or external autopilot disconnects the elevator axis via the special facilities in the FSUIPC4 interface (ref: offset 310A for programmers among you). ***See also the note in box below.***

- **Reverse elevator trim sense**: This provides corrective action for some panels which try to control the aircraft pitch with the trim axis on a setup where this has been reversed. ***See also the note in box below.***

> **NOTE: Aircraft-specific Overrides**
>
> The settings of the three options described above can be overridden for specific aircraft. This does require editing in the FSUIPC.INI file, and it depends upon you having already performed some aircraft-specific Joystick Calibrations for the relevant aircraft.
>
> This is done by including the appropriate parameter(s), with **Yes** or **No** settings, as desired, in the aircraft-specific [JoystickCalibration.<...>] section of the INI file. Such entries will override the Miscellaneous settings for the specific aircraft only. The parameters relating to the four options are as follows:
>
> | | |
> |---|---|
> | **DisconnTrimForAP** | for 'Disconect elevator trim axis for A/P' |
> | **ZeroElevForAPAlt** | for 'Centre elevator on A/P alt change' |
> | **ReverseElevatorTrim** | for 'Reverse elevator trim sense' |
>
> Note that you can edit these into the INI file whilst FS is running. Changes can then either be loaded by going to the Joystick options and explicitly reloading them, or simply by changing aircraft.
>
> The global default setting of these options remains as shown in the Miscallaneous options page—the indications there do not change as a result of aircraft-specific overrides. A warning note is added to that effect.

- **Clear weather slows dynamics**: FSUIPC4 provides a "clear weather" hotkey facility, and a button on the About page, and also clears weather when requested by AWI (Advanced Weather Interface) weather programs, or automatically for external programs using the FS98-style weather interface. This action is normally needed before external programs try to impose any weather on FS, otherwise things get into a tangle and you don't get the right results. However, in FSX there's also a facility for having the weather dynamically changing (faster) of its own accord. This can be quite nice, but again it means you don't get what you expect. This option, when enabled (as it is by default) makes the mentioned "clear weather" actions also reset the weather dynamics to "slowest change". This is not a permanent change—next time you load up FS the slider will be back where you previously had it set.

- **Keep FS clock synchronised**: This facility compensates for the phenomenon of FSX losing time. It just synchronises the seconds values (and optionally the minutes) with that of your PC's system clock. Provided you always keep to the normal 1x simulation speed this should stop FS time running slower and slower compared to real time (or, rather, PC time, which may not be quite the same as real time either). At other than 1x simulation speeds the facility is temporarily disabled to avoid odd things happening on the FS clock.

  The time is only adjusted on the minute (i.e seconds = 0), because FSX only provides a seconds zeroing facility. Further, it won't attempt to do this if the time difference is greater than the value shown (default 5 minutes). If you set that value to 59 minutes or more you effectively synchronise both minutes and seconds. **BUT** please note, any time adjustment of more than a minute or so will cause FSX to reload textures and you will get the occasional progress bar. This often happens, for example, after exiting from the menu system, whilst FSX's clock has not been updating.

- **Sync Transponder** and **Sync COM1**: These facilities are provided to automatically write-back the Transponder value and the COM1 in-use and standby frequencies whenever they change. These are used to overcome synchronisation problems for these two components in multiplayer and shared cockpit modes.

  To avoid fast feedback problems preventing changes to these values, there is a delay imposed before the changes are written back. By default theses are 1000 milliseconds (1 second) for the transponder and 100 milliseconds for the COM1 frequencies.

- *Not working yet:* **Stop cockpit sizing and moving** is an option which is meant to prevent you from re-sizing or moving any part of the panel or the docked scenery views. This option is for those of you who get annoyed by the accidental movement or resizing of parts of your cockpit when you are using the mouse merely to click a switch or adjust a control. Just remember, if you set this option, that you will need to temporarily un-set it if you want to re-arrange anything. This includes moving switchable parts of a cockpit, such as the radio stack, GPS, or throttle quadrant.

  [NOTE: This option does *not* work if you have your Windows' Display Properties set to "show window contents while dragging", in the list of options in the Effects tab. FSUIPC then has no chance to prevent the re-draw]

- **Pause after crash**: This option merely makes FSX enter 'paused' mode when it has reloaded a flight after a crash. I found this very useful in some situations where the reloaded flight places the aircraft part way into an airport building instead of correctly on the ramp. I think this also happens with some of the "Go To Airport" parking selections. At least with it paused you are able to select slew, unpause, and move the aircraft to a safe location.

- **Control Spike Elimination** provides controls to ignore signals specifying maximum possible deflection on rudder, aileron or elevator. These were mainly useful in conjunction with Wilco's 767PIC on FS2002, which seemed to cause spurious rudder 'spikes' when flown with the yaw damper switched off, and also occasional spikes on the elevator (especially with the 1.3 version update). Whether they have any real application with FSX remains to be seen (please tell me).

  Please note that if you fly with any of these options set you should also consider calibrating your controls in FSUIPC (see the Joysticks section, later), setting a "dead zone" at either extremes of the travel. If you don't do this you may find it impossible to obtain maximum deflection. Calibrate first, with the "spike removal" option off, then test it with the option back on.

Additional facilities provided by FSUIPC and selected here are:

- **Extend battery life** keeps the voltage on the battery above failure point for longer. The battery discharge can be prevented from reducing the voltage too low for a specified multiple of the normal FS run-down time. The default is '0'—the battery voltage will be kept up indefinitely. The factor can be 1–999. For example, if the battery normally fails after 90 seconds, then a factor of 40 will keep it going for one hour. A factor of 1 is the same as disabling the facility.

  Note that once the battery has discharged FS records an electrical failure in any case. FSUIPC4 cannot re-charge a battery once the voltage has been allowed to drop. FSX may not let you clear the electrical fault in its menu—you must recover power by either reloading the aircraft or, better, getting an engine started to re-charge the battery.

- **Allow changes to FS own weather** allows the weather filtering actions to be applied to FSX's own weather. It does this by trying to locate up to 9 weather stations at or around the user aircraft posion and modifying the weather set at each and

every one, regularly and cyclically. *This is an interim measure, as one day it is hoped to actually identify exactly the three WX stations contributing to weather at the aircraft location, and change only those.*

At present, unless you have installed the SP1 update for FSX, it is best to leave this option unselected. The results of what FSUIPC4 tries to do are not completely satisfactory yet, though the parameters used are perfectly good. It is hoped that further updates to SimConnect will correct the remaining problems in due course.

- **Non-scrolling FS messages to be white:** This option merely allows application messages displayed in FS's own message bar (normally near the top of the outside view) to be coloured white on green, rather than the usual red on green. [Note that this only works after you have installed the SP1 update for FSX].

- **Provide menu entry for flight loading:** in its own Menu system FSX unfortunately only allows loading of Flights from the default location ("My Documents\Flight simulator X Files"). This FSUIPC4 option allows loading of Flights from anywhere within reach of a standard Explorer file selection dialogue. When checked you will find an extra entry in the Add-Ons menu.

- **Provide menu entry for plan loading:** in its own Menu system FSX unfortunately only allows loading of Plans from the default location ("My Documents\Flight simulator X Files"). This FSUIPC4 option allows loading of Plans from anywhere within reach of a standard Explorer file selection dialogue. When checked you will find an extra entry in the Add-Ons menu.

- **Throttle sync to sync Thr/Prop/Mix:** When selected, this makes the Throttle Sync Hot Key (see the Hot Keys section) synchronise the Prop pitch and Mixture settings to the Engine 1 values, as well as the throttles.

- **Time allowed for Engine/Door select:** This controls the FSUIPC4 facility to allow the Engine and Door selection keys (SELECT 1–4) to be separated from the original control by any other non-select using FS controls. In other words, after E for Engine or Shift E for Exit/Door, the pressing or 1, 2, 3, and/or 4.

  Primarily this is of use with advanced aircraft panels which send controls regularly, internally, thus disrupting such selections. The option can be disabled by setting the time allowed to 0. Otherwise the value is the number of seconds allowed for the one or more selections.

  Also, with this facility enabled (i.e. any non-zero value) FSUIPC4 provides FS pushback direction from the SELECT 1 and 2 controls (again, normally the main keyboard keys 1 and 2), no matter how long since the pushback was started, provided it is still going on. This improvement allows you to, for instance, look out of the side windows or start engines during initial pushback without thereby losing the ability to select the turn direction with the SELECT (1 or 2) keys or controls.

- **Limit TCAS range** is for FS2002/4 and applies to *airborne* AI traffic. If this is set to 0 no limit is applied, but there is then a danger that busy areas will have more aircraft than can be accommodated in FSUIPC's tables (currently these can cope with 96). The default is 40 nm, which should be ample. There is little point in setting it much greater than 80nm as that seems to be the range in which FS generates flights in any case. When the tables are full, those aircraft which are furthest away won't be listed, so nearby TCAS warnings should still be good. Ground traffic, which has its own table (also currently up to 96 aircraft) are subject to a built-in range, fixed at 3 nm when your own aircraft is on the ground, or 6 nm when you are airborne.

- **Set TCAS id string from** … allows you to determine how FSUIPC provides A.I. aircraft identification to any program using the TCAS data. Probably not many strict TCAS displays show aircraft ID or type, but the information is available. You can choose from the following ways of distinguishing the aircraft:

Flight	for airline plus flight number, or tail number, as available (this is the default and recommended)
Tail	for tail numbers only
Type	for the ATC aircraft type, generally only the Make, at least for default aircraft
Title	from the aircraft title (in the .CFG file), truncated to 17 characters
Type+	for the type as above, truncated if necessary, plus the last 3 characters of the tail number
Model	for the aircraft model

The utility "TrafficLook", as supplied with previous versions, can be used with FSUIPC4—you can see the difference in these latter selections in its display. In the File menu of Trafficlook you can select Airborne or Ground traffic. If you want to see both, run two copies. If you are new to FSUIPC, get TrafficLook and other extras from my Support Forum (link in the subtitles to this Guide).

Logging
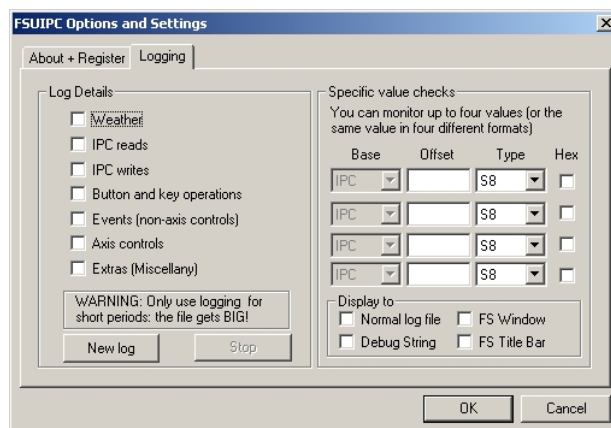
FSUIPC4 contains considerable weather and application program debugging aids, through its logging facilities. You shouldn't need to use these unless you run into problems with an application and want to help the author sort it out. The files produced by the logging facility may be interesting to you—try enabling the Weather logging and looking for FSUIPC4.LOG (or FSUIPC4.n.LOG files where 'n' is a sequence number) in the Modules folder. They are simple text files, and when weather logging is operating they will contain a complete history of the weather changes which occur.

Perhaps of possible interest to many users are the facilities to log Events (all FS controls other than those from Axes), and, separately, Axis control inputs. In particular you may be interested to see the results of pressing buttons or keys, to see how FS is interpreting these actions. Also, many of the more complex Panels do send a lot of controls very frequently, for reasons which, when you look at what is sent, seem pretty obscure. It is interesting to see such ways of utilising the excess power of your PC.

The button and key operations logging will be primarily of use to those of you who make good use of the comprehensive key and (especially) button programming facilities available in FSUIPC4, especially when editing the FSUIPC4.INI file for more powerful and conditional options. The logging will help you understand exactly what is going on.

As you can see from the illustration above, there are also some technical developer-oriented facilities provided in this page. They are described in the Advanced User's document, but you should note that this is really intended only for programmers and other users of the FSUIPC4 SDK.

Hot Keys
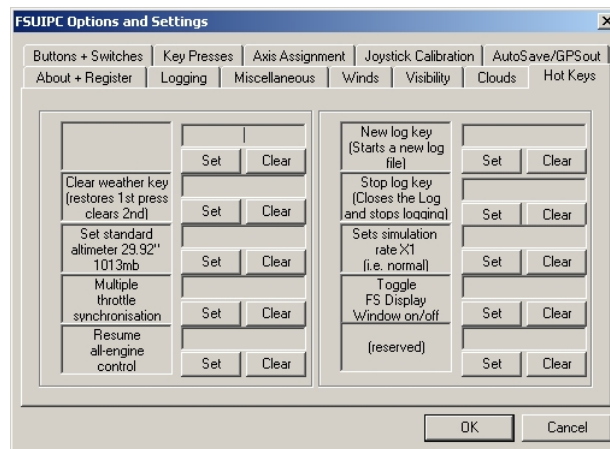
At present several functions in FSUIPC4 can be controlled by assigned keypresses. These are:

- **Clear weather:** a single hot key combination with a dual function. The first time this is used it *restores* the last set external weather, if any. The second time, with no intervening changes, it clears the weather entirely, setting the FS default clear weather. The recommended Hot Key setting is **Ctrl+Shft+W**. This action also resets the dynamics to "slow change" *unless* this option has been disabled in the **Miscellaneous** page.

- **Set standard Barometer** on the altimeter. This is used to set the altimeter to 29.92" (1013.2mb) for flying flight levels.

- **Throttle Sync:** This operates a facility to make all throttle inputs, for any engine, affect the throttle inputs to all engines. It's a toggle function—if it is on then using it again turns it off. For best use of this facility you will want to also calibrate the separate throttles in FSUIPC4's Joysticks pages.

  If you are only using a single throttle then this won't make a lot of difference except that *every* time you use it FSUIPC will make the throttle selection (i.e. the keypress E+1 … etc) apply to all engines. However, it works a lot better even then if you've calibrated the throttle axis in FSUIPC4's **Joysticks** pages.

  If you also select the option to synchronise propeller pitch and mixture settings (see the **Miscellaneous** page), then the same Hot Key operates all three together. There again, if you are using joystick axes for propeller pitch and/or mixture you should calibrate them in FSUIPC4's **Joysticks** pages.

- **Resume all-engine control:** This merely does the same as the keyboard sequence E 1 2 3 4 (or less for fewer engines)

- **New log:** starts a new log file (see Logging, above). The current (latest) log file is always called "FSUIPC4.LOG", previous ones being renamed "FSUIPC4.n.LOG" where 'n' is a sequence number.

- **Stop log:** does as it says, stops logging, closing the current log file and starting a new one with only default logging, no detail. The file just closed will have the latest serial number, filename format FSUIPC4.n.LOG.

- **Set simulation rate back to normal (x1):** This is really only useful to those who fly at fast simulation rates like x16 and want to get back to normal in one keypress to avoid some of FS's texture reloads.

- **Toggle FS Display Window On/Off:** Operates in conjunction with the FS display facility (e.g. for Radar Contact menus) which was described near the beginning of this Guide.

Note that these Hot Keys can be assigned to joystick buttons, by programming the button to produce your assigned keypress combination, This is described in the next section.

Buttons
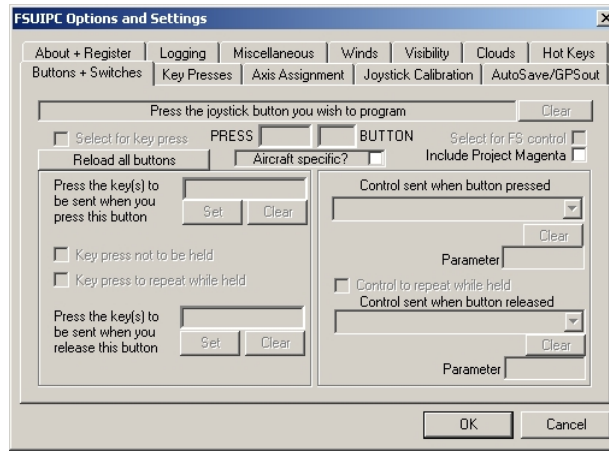
This page provides facilities for programming joystick buttons. Whilst this is particularly suited to EPIC, GoFlight and PFC users, it is by no means specific, and so can be useful for any joystick system with 'spare' buttons. The only proviso is that, except for the special support for EPIC, GoFlight and PFC, these are visible through the Windows joystick interface (the Game Controllers applet in the Control Panel), using the standard Windows facilities. *FSUIPC4 does **not** use DirectX, so it may not see newer 64-button ranges.* Notes on specific types of "button" connections are provided below.

You might well ask why this facility is provided here at all when FS offers something similar. Well, these are the additional features available in FSUIPC4:

- The actions can be programmed differently for different aircraft. Just check the box "aircraft specific" and then everything you program will operate for the currently loaded aircraft only. Anything programmed without that checkbox selected will also be available, unless overridden by an aircraft-specific assignment.

- Buttons can be made to cause key presses. This is useful for accessing those FS add-ons which do not provide "controls" as such, but do react to keystrokes—for example, advanced panels such as those from PMDG and PSS, external programs such as Radar Contact, and many assorted utilities.

- The range of FS controls assignable here exceeds those that can be assigned in the FS Assignments dialogue (and the CFG file), and fixed parameter values can also be supplied with them so they can be used to set (fixed) values as well as operate switches.

- Controls aimed at other programs can be included. Currently these include Roger Wilco and Advanced Voice Client (both for push to talk functions), Project Magenta and generally any WideFS client programs via the WideClient "KeySend" facility.

- Sequences of actions, whether key presses, or FS controls, or a mixture, can be programmed. However, this facility can only be accessed by editing the **FSUIPC4.INI** file, as it would have made the FSUIPC4 options page too complex for most users. Full details for editing the Button programming in the INI file are provided in the Advanced User's Guide.

- Compound (or conditional) button actions can be programmed—with the action of one or more buttons being determined by the state of one or more other buttons or switches. This can be used, for example, to program a bank of buttons for different things depending on a toggle or multiple position switch, hence multiplying the effective number of buttons available. The same facility can also be used to cope with those types of rotary switches that indicate which direction the spindle is being turned by the phase relationship between two button lines. Again, this more complex facility can only be accessed by editing the **FSUIPC4.INI** file, and is described in the Advanced User's Guide.

- Button actions can be made conditional on values or bits in FSUIPC4's offsets, opening up a whole realm of possibilities, such as different things to be done when on the ground as opposed to flying, or with engines running or not, and so on. These also need editing in the INI file and the facilities are described in the Advanced User's Guide.

GoFlight equipment

GoFlight buttons and rotary dials can also be programmed here—but take care that you don't have both Goflight and FSUIPC4 acting on the same buttons as FSUIPC4 is not able to override the original programming. For GoFlight buttons to be recognised you must have the GoFlight module (GFDev.dll) installed *either* in the GoFlight program folder (where the Gfconfig program is installed) *or*, possibly easier, just place a copy into the FSX Modules folder, alongside FSUIPC4.DLL.

If you install the latest version of the GoFlight software the correct DLL is installed automatically for you, but otherwise I provide one you can download from my Support Forum (by kind permission of GoFlight Inc).

GoFlight buttons will all have high "joystick" numbers in FSUIPC4.

PFC equipment controlled by PFCFSX.DLL

If you are using PFC equipment driven by my PFCFSX.DLL driver for FSX, then all the buttons, switches and digital rotary knobs on that equipment will also be visible and programmable here, just as if they were on joystick inputs. These will have Joystick numbers of 16 or higher, above the 0–15 range allowed for normal Game Port or USB joysticks in the Windows joystick interface. If you do program any PFC buttons here, the normal function in PFCFSX.DLL will not be applied. Normal PFC functions will be automatically resumed, however, when you delete the programming in FSUIPC4 (either by using the Clear button here, or deleting the entries in FSUIPC4.INI).

Remote buttons through WideFS

If you are a WideFS user, then with versions 6.22 or later of WideClient.EXE on the Client PCs, FSUIPC4 will recognise any Windows, EPIC or GoFlight buttons on any of the connected Client PCs. Each Client PC will add 1000 to the "joystick number", so each will still be unique. More details about this feature are provided in the WideFS documentation.

Before attempting to use these facilities, please make sure that the buttons you wish to program are *not* already programmed to provide FS facilities in FS's own assignments (see the menu entry Options–Controls–Assignments), or for GoFlight, in the GFconfig program. If you want to program them here rather than there you must delete the assignments there, otherwise you will get both actions when you press the buttons.

Buttons connected via Aerosoft's 747 MCP

FSUIPC4 makes special provisions for third party button inputs, ones not seen through Windows joystick drivers, or the GoFlight drivers, or my own PFC driver. This is by a set of reserved "offsets" in FSUIPC's interface—0x3340 to 0x3363, to be exact (these are hexadecimal values, they would be 13120 to 13155 in decimal). This area allows up to 288 different switches or buttons to be recognised and programmed. All it takes is an application program to actually operate the bits in this area. I call these 288 button bits "virtual buttons", because they may not even relate to real ones—it is all up to the program driving them.

Not coincidentally, the Aerosoft MCP747 hardware allows the attachment and programming of up to 288 user buttons or switches. The Aerosoft driver is capable of being programmed to write to FSUIPC4 offsets, so these buttons can, if required, be further programmed in FSUIPC4.

I am not about to reproduce Aerosoft's documentation here, but will just give a few pointers for clarification, as some confusion has arisen. For this, I will take just one example—operating FSUIPC4's first virtual button. This is the first bit in the first byte and will be seen in FSUIPC4 as "joystick 64, button 0".

Right. Hexadecimal 3340 is decimal 13120. The "mask" (value) for the first bit is 1. You want that bit to turn on when you press the button, off when you release it. So, following the Aerosoft documentation you get an entry in its file like this:

    13120,1,1,0,1,0,0,Virtual Button 1

According to the list of fields in the Aerosoft document:

    Decimal address of variable 'in FS2002' (here it means in FSUIPC!) = 13120
    Number of bytes in address = 1 (you only need 1 bit in fact)
    ON value = 1 (to set the bit)
    OFF value = 0 (to clear the bit)
    16-bit mask = 1 (to avoid changing any other bits, I hope)
    Special function code = 0, no repeat wanted
    Special function value = 0, no special function

Description = whatever you like.

However, there is one other thing that it is very important to deal with. The Aerosoft driver allows any connected button to be treated, in its resulting actions, as one of the following (thanks go to Andrew McLean and Nico Kaan for this explanation):

Momentary: When the physical button is pushed, or the switch goes from off to on, the "momentary" function sends a "1" to the FSUIPC4 offset. When the button is released nothing is sent to FSUIPC4. That is, there is no "0" command sent at all. This mode may be useful for some things, but not really for FSUIPC4's virtual buttons. FSUIPC4 recognises buttons by the *change* in the bit from 0 to 1, but if it gets stuck at 1, that's it … no more actions!

Toggle: When the physical button is pressed or switched turned on, a "1" is sent to FSUIPC4, and when it is released or switched off, a "0" is sent. This is *exactly* what would happen with a normal Joystick button, and it the one you should generally use with FSUIPC4's virtual button facilities.

Flip flop: This inverts the state of the bit when the button is pushed. In other words, if it is on, it will turn it off, if it is off, it will turn it on. You can use this in FSUIPC4 button programming if you need a button state which latches—i.e. you are using a button but really should have used a toggle switch. (FSUIPC4 can latch buttons for you, but only using button 'Flags' and editing the FSUIPC4.INI file for them—a subject covered in the Advanced User's documentation).

Programming the buttons

Okay, assuming now that you have a 'spare' button to program, and this is definitely not already assigned in the FS assignments or in GoFlight, you can proceed as follows:

1. First, please make sure that your device, the one with the buttons, is plugged in and working BEFORE running Flight Simulator. The Windows joystick interface used by FSUIPC4 to scan the buttons may not recognise any devices that are plugged in after Flight Sim has started. I know USB is supposed to be "hot pluggable", but this doesn't always seem to be the case with respect to running programs.

2. With the FSUIPC4 "Buttons" page showing, as above, check or uncheck the "Aircraft Specific" option, according to whether you want to edit buttons for this aircraft only, or for global use. If you do select "aircraft specific" you will see the name of the current aircraft showing in the title bar of the options. (Note: *if you are using the abbreviated aircraft names option, this may be the abbreviated name that will be used. This option requires editing the FSUIPC4.INI file after programming, and is described only in the **Advanced User's** document).*

3. Now press the button you want to program. If it is visible to FSUIPC4 then it will be identified on the screen by Joystick Number (0–255 for local buttons) and Button Number (0–39). Please take careful note of the fact that this numbering starts at 0 *not* 1. Windows "Game Controllers" actually numbers from 1.

    For buttons being pressed on a WideFS client PC there will be a much larger joystick number: plus 1000 for Client 1, 2000 for Client 2, and so on.

    Note that FSUIPC uses the original FS convention of using button numbers 32–39 for the possible 8 directions on a "Point Of View" (POV) Hat. The directions are 32 (forward), then 45 degree increments clockwise to 39 = forward left. Please see the Box below for details of how to assign these buttons to imitate a full "point of view" Hat in FS.

    If the "button" is in fact a toggle or rotary then you may need to toggle it or turn it twice. This is because, when programming (only) FSUIPC is only looking for changes from "off" to "on", so it won't see a change from "on" to "off". This is necessary because of the way some multi-way switches work.

    With the GoFlight rotaries there will be four different button numbers available—in sequence, fast left, slow left, slow right, fast right (i.e. like video recorder controls:

    << < > >>

    To get the "fast" values you will have to turn the rotaries quite fast. Sometimes, though, turning them too fast seems to cause nothing to be seen! You need to experiment before committing any assignments.

    Please note that rotary input is implemented by alternately setting a switch on then off. Each change will usually be one 'click' of the knob. If you want action on each and every click you will have to program the same thing on both the "press" and "release". ***Do not set the repeat option with the rotary switches***.

4. If you had already programmed this button in FSUIPC for this aircraft (or globally if the "aircraft specific option isn't checked), then the current programming details will be shown. If you had programmed sequences or mixed actions in the INI file, only the first action will show here and will not be editable—you can only do that in the INI file. Otherwise you can 'clear' all the programming or edit it as desired here.

    For an un-programmed button, select first whether you want to make it produce a keystroke, or an FS control. The actions then are different:

5. **Key press programming** is done by pressing the 'Set' button, for button press or release (or both, if you want) then entering the key press or combination you want. The value won't appear until the key press is complete, but you can use combinations of **Ctrl**, **Shift**, **Tab**, **Alt** and one normal 'graphic' key.

Take care if you elect to use **Alt**, as this is always the Menu access key. If you want to use it to pull down a menu, then fair enough, but if you want to also select a menu entry you need a key sequence, programmable only in the FSUIPC4.INI file. (An example of this is actually given in the Advanced User's Guide). Also FSUIPC cannot send keystrokes **to** FS dialogues—they are 'modal', which means nothing else in FS is actually running whilst they are shown, including FSUIPC4.

For a key press occurring when you press the button, you can program it to operate transiently—i.e. the key(s) are pressed and released almost immediately—otherwise the keys will be kept pressed until you release the button. **[Do NOT do this with ALT combinations**].

If you have the keys kept pressed whilst the button is pressed, you can opt for the keys to be repeated, just as on the real keyboard. However, the repeat rate is fixed at around 6 per second.

If you set a key press to occur when the button is released, this is always a transient key press, with no repeats. The key press for button release does not have to be the same as the one on button press, and can be used on its own.

Note that key presses produced by FSUIPC4 using this facility are detectable as Hot Keys both by FSUIPC4 (see the Hot Key facility) and by any external program using the FSUIPC4/WideFS Hot Keys facility (see the FSUIPC4 SDK).

Also note that Roger Wilco or AVC users do not need to allocate the correct keypress as assigned in their voice program. Some versions of RW do not obtain keys in a way that FSUIPC4's key press facilities can get to in any case. Instead, use the FS control programming part instead—special PTT commands have been added to the FS controls list specifically for this purpose (see below).

6. **FS Control programming** involves simply selecting the FS Control you want to occur from the drop-down list. Note that this list is very long, and is rather cryptic—the names here are mainly the names actually used in FS and are obtained from FS dynamically. The only exceptions to this are some special commands added by FSUIPC4, including:

- Two controls to operate the Roger Wilco (RW) and Advanced Voice Client (AVC) "push to talk" facilities (more below).

- Three controls to handle FSUIPC4's "button flags", used in conditional button programming. *Button flag clear, set and toggle* are programmable both here and in the **Keys** programming page, but they can only be used in complex button programs by editing the FSUIPC4.INI file. This is described fully in the Advanced User's Guide.

- A control for sending **KeySend** messages to WideFS clients running on other PCs. The specific KeySend number is set as a parameter (1–255) and is equated to a key press directed to a client program in the relevant WideClient.ini file. Just be sure to set the parameter for the KeySend control to the same number ("N" in KeySendN=…) used in the WideClient.ini file, as it is this which related the two. (Please see the WideFS documentation for more details of its KeySend facilities).

- Optionally many extra controls for Project Magenta modules. To see the PM controls in the drop-down lists check the option box on the page. All the Project Magenta entries start with "Pm" and the Airbus-specific ones "Pm Ab". A list of those supported is provided in the FSUIPC4 Advanced Users Guide.

- An **Autobrake Set** control, to directly set the autobrake (0=RTO, 1=off, 2–5=settings to Max).

- A set of "fast" FS autopilot value increment/decrement controls. These add to the default FS "inc" and "dec" controls with ten times the increment. Values handled are Altitude, Speed, Mach, V/S, Heading, and both OBIs (Courses).

- A set of controls to adjust the in-use radio frequencies directly, as well as controls to set the transponder using only two dials instead of four.

- A **Traffic density set** control, which sets the FS AI airline traffic density to any value from 0 to 100% according to the parameter value provided. The GA and shipping densities are adjusted to, in the same proportions, but the airline value is the guide.

- A **traffic density toggle** control, which turns the AI airline traffic off (density = 0) if it is on, but if it is already off it turns it on, using the density value provided in the parameter *or* 100% if that is omitted or set zero. This also operates on the GA and shipping traffic.

- **Spoiler inc** and **Spoiler dec** controls, which raise or lower the spoilers (speed brakes) by a small amount on each use. The increment is set, by default, to give 32 steps in the whole range, but you can change that in the FSUIPC4.INI file—see the Advanced User's document.

- **Freeze pos** controls (on, off and toggle) to freeze the aircraft's geographical position (latitude/longitude) but allowing it to otherwise fly normally, including altitude changes. [*However, please note that FSX actually comes with its own control for this, though I've not yet tried it*].

- **Engine N Autostart:** Separate engine auto-start controls.

- **Throttles on, off, toggle:** Controls to disconnect and re-connect throttle inputs.

- **Offset** controls, which allow values to be written to FSUIPC4's offsets, for all sorts of actions and effects. There are controls for byte (8 bit), word (16-bit), double word (32-bit) and both 32-bit and 64-bit floating point values, and facilities for bit setting, clearing, toggling, incrementing and decrementing (the latter two only for byte and word values). When using these, another input field appears on screen for the entry of the specific offset, which is best entered in hexadecimal (precede the value with the letter 'x'). The value is provided as a parameter and this too can be entered in hexadecimal, preceded by 'x'. For full information on these please refer to the Advanced User's documentation.

Offset Increment/Decrement Controls

The increment/decrement controls operate on signed (Sbyte, Sword) or unsigned values (Ubyte, Uword), and have a more complex parameter that specifies both the increment/decrement (always positive) and a limit, thus:

<increment value> / <limit>

This allows things like Trim adjustments to be programmed to be whatever speed you like, or even multiple speed if you have enough buttons or levers to spare. Taking Trim as the example:

The elevator trim is a signed WORD at offset x0BC0. For this sort of information you'd need the Programmer's Guide in the FSUIPC4 SDK. Its range is −16383 (full trim down) to 16383 (full trim up). So, when programming your button/levers:

1. Select the "Offset SWord Increment" control to program the nose up trim.

2. Enter x0BC0, or just xBC0 into the offset edit box.

3. Enter 256/16383 in the parameter box. The 256 is the increment and 16383 is the limit. This will give 128 steps between −16383 and +16383 inclusive (32768 / 256 = 128). If you want a faster, coarser trim adjustment specify a larger increment, and of course vice versa for a slower, finer adjustment.

4. You'll probably want it repeating whilst held, so check that too (*but never set repeat for rotary switches which can be left in an 'on' position, nor latching switches*).

5. Do the same for the decrement, with a parameter of 256/−16383 (−16383 being the lower limit). Note that the decrement is still positive—you can only provide positive numbers for this part. It is the definition of increment or decrement which controls the addition or subtraction.

6. When reviewing such assignments you may see the parameters showing in hexadecimal (preceded by 'x'). This is an optional way of inputting these in the first place, just as with the offsets.

For some help in untangling the real Flight Sim controls you can refer to my "FSX Controls" document, which is included in the files installed for you into the FSX Modules folder. It is in PDF form (for reading with Adobe Acrobat). For FSUIPC4 added controls refer instead to the Advanced User's Guide.

The best way to work them out, really, is to try them—pick one that seems to indicate that it may do what you want, and see if it does. I know for sure that some of them do not work, or at least do not work the way you might hope or expect.

Most if not all of those with the word "set" in their name are controls that take a parameter. Axis controls are like this of course, but so are, for example, the controls "MAGNETO SET" and the equivalents for each of four separate engines. Note that these do not necessarily work—if fact I don't think the MAGNETO controls work as they should.

Naturally, there is no way FSUIPC can dynamically provide different parameters for a single button. You can have a single button send a control with a fixed parameter—you specify this in the parameter field. A good example is a button to set the "standard barometer" setting (1013.2 hPa or 29.92"), for flying Flight Levels. For this, select:

Kohlsman Set	as the control, and
16211	for the parameter (1013.2 mb x 16 = 16211)

Another useful example is a button to exactly centre the elevator trim:

Elevator Trim Set	is the control, and
0	is the parameter

Again, as with key presses, you can have a separate control sent when you release the button, and you can also specify that the earlier control should be sent repeatedly whilst the button is held. A typical use of different controls on button press and release is for Views, from a Hat. For example:

Button 33 (forward right) might be programmed with

View Forward Right	on press
View Forward	on release

If you want to mix key presses and FS controls, or send a sequence, you need to edit the FSUIPC.INI file. This is described in the Advanced User's Guide.

For Roger Wilco or Advanced Voice Client (AVC) users, at least those running the voice program on the same PC as FS, you do not need to try to allocate the correct keypress as assigned in that program. Some versions of RW do not obtain keys in a way that FSUIPC's key press facilities can get to in any case. Instead, just scroll down the FS controls list for the pair "Ptt Transmit Off" and "Ptt Transmit On". Set the press of your button to operate the "On" and the release to operate the "Off". This is known to work will all currently available versions of Roger Wilco and with recent versions of Advanced Voice Client.

Finally, if you want to clear ALL the FSUIPC button programming, without pressing each button and pressing "Clear" in turn, just delete the complete [Buttons] section (for global buttons) and [Buttons.<aircraft name>] sections (for aircraft-specific buttons) in FSUIPC.INI. Try to do this when FS is not running. Most changes to the INI file are only noticed by FSUIPC when FS is started, though both the Keys and Buttons sections are reloaded when you change aircraft.

Example of assignments for HAT programming for smooth panning
(Note that this has been tested in FS2004 but not yet FSX)

Assuming 'j' is the joystick number on which the Hat to be programmed is situated:

Push forward: program button j,**32** as PAN UP on press, to repeat, and PAN RESET COCKPIT on release
Push forward & right: program button j,**33** as PAN RIGHT UP on press, to repeat, and PAN RESET COCKPIT on release
Push right: program button j,**34** as PAN RIGHT on press, to repeat, and PAN RESET COCKPIT on release
Push back & right: program button j,**35** as PAN RIGHT DOWN on press, to repeat, and PAN RESET COCKPIT on release
Push backward: program button j,**36** as PAN DOWN on press, to repeat, and PAN RESET COCKPIT on release
Push back & left: program button j,**37** as PAN LEFT DOWN on press, to repeat, and PAN RESET COCKPIT on release
Push left: program button j,**38** as PAN LEFT on press, to repeat, and PAN RESET COCKPIT on release
Push forward & left: program button j,**39** as PAN LEFT UP on press, to repeat, and PAN RESET COCKPIT on release

For those familiar with the INI file parameters, this could look something like this (with comments added and joystick #0 assumed):

```
1=R0,32,C65734,0 ; PAN_UP
2=U0,32,C66415,0 ; PAN_RESET_COCKPIT
3=R0,33,C65856,0 ; PAN_RIGHT_UP
4=U0,33,C66415,0 ; PAN_RESET_COCKPIT
5=R0,34,C65672,0 ; PAN_RIGHT
6=U0,34,C66415,0 ; PAN_RESET_COCKPIT
7=R0,35,C65857,0 ; PAN_RIGHT_DOWN
8=U0,35,C66415,0 ; PAN_RESET_COCKPIT
9=R0,36,C65735,0 ; PAN_DOWN
10=U0,36,C66415,0 ; PAN_RESET_COCKPIT
11=R0,37,C65855,0 ; PAN_LEFT_DOWN
12=U0,37,C66415,0 ; PAN_RESET_COCKPIT
13=R0,38,C65671,0 ; PAN_LEFT
14=U0,38,C66415,0 ; PAN_RESET_COCKPIT
15=R0,39,C65854,0 ; PAN_LEFT_UP
16=U0,39,C66415,0 ; PAN_RESET_
```
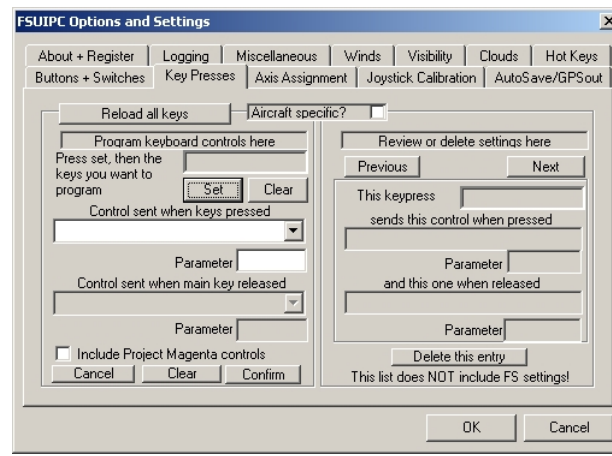
Keys

Normally you will assign keys to Flight Sim operations in the Options–Controls-Assignments dialogue in FS itself, or possibly by directly editing the FS CFG file. However, there are more controls than are assignable in that way, and the assignmednts cannot be made conditional on the current aircraft (for instance)..

FSUIPC4 therefore offers its own way of assigning keystrokes. In this page you can assign simply single keys or combinations of those with Shift, Control, Tab, Menu and Win. (The "Win" key is either of the keys marked with the Windows symbol, and needs to be used with one of the others held down first, whilst the "Menu" key is the one with a menu icon on it, to the right of the right-hand Windows key).

The Alt key is also available for such combinations, but its use is not advisable unless you always have the FS menu showing—otherwise any use of ALT will bring up the menu bar even if the combination you are using does not invoke a menu item.

If you assign keystrokes to FS controls here, those keystrokes will not be seen by FS's own keystroke assignment programming, so you can either use FSUIPC4 to supplement the normal assignments (recommended), or to replace them altogether (take care).

Hot Keys assigned elsewhere, in FSUIPC4's Hot Key page or by external programs, take precedence over these assignments just as they do over FS assignments.

Key press actions can be made conditional on values or bits in FSUIPC4's offsets, opening up a whole realm of possibilities, such as different things to be done when on the ground as opposed to flying, or with engines running or not, and so on. These need editing in the INI file and the facilities are described in the Advanced User's Guide.

Okay, on with the show. Looking at the Keys option page, above (or on your screen), you'll see that it is divided into two parts. The left side is where you will add assignments or modify existing ones. The right side is only used to review or delete existing assignments (in FSUIPC4 *only*).

You can assign keys to operate globally, with all aircraft, or to operate only when the current aircraft is loaded. This selection is by unchecking or checking the "Aircraft Specific" selection. Do this first, before starting to program or review key settings. If you program a key both for global and specific use, the latter prevails whenever the aircraft is loaded—you don't get both actions simultaneously. If you do select "aircraft specific" you will see the name of the current aircraft showing in the title bar of the options. (Note: *if you are using the abbreviated aircraft names option, this may be the abbreviated name that will be used. This option requires editing the FSUIPC4.INI file after programming, and is described only in the* **Advanced User's** *document).*

To assign an action to a keypress, press the **Set** button in the left hand panel. The edit box above displays "PRESS KEY". Press your key combination, for example TAB+Q, and you will see it displayed. Nothing is displayed until you have completed the combination with a graphic, cursor or function key. Shift-type keys (and Tab) cannot be used alone.

You can now assign an action to that key press. You can also assign an action to be carried out upon the key release—but this is not implemented *unless* you have an action for the press. In other words, you can have a single action, which occurs when the key is pressed, or a dual action, one when it is pressed and another, probably different, when released. The dual facility tends to be only useful for holding temporary situations, like views or additional windows.

Use the drop-down control list to find the control you want to assign. Note that this list is very long, and is rather cryptic—the names here are mainly the names actually used in FS and are obtained from FS dynamically. The exceptions are some special commands added by FSUIPC. The latter include:

- Two controls to operate the Roger Wilco (RW) and Advanced Voice Client (AVC) "push to talk" facilities (see earlier). These work with Squawkbox 3 too.

- Controls to operate the "PVT" private voice push-to-talk facility in Squawkbox 3 (this needs SB 3.0.4 or later).

- Three controls to handle FSUIPC4's "button flags", used in conditional button programming. *Button flag clear, set and toggle* are programmable both here and in the **Keys** programming page, but they can only be used in complex button programs by editing the FSUIPC4.INI file. This is described fully in the Advanced User's Guide.

- A control for sending **KeySend** messages to WideFS clients running on other PCs. The specific KeySend number is set as a parameter (1–255) and is equated to a key press directed to a client program in the relevant WideClient.ini file. Just be sure to set the parameter for the KeySend control to the same number ("N" in KeySendN=…) used in the WideClient.ini file, as it is this which related the two. (Please see the WideFS documentation for more details of its KeySend facilities).

- Optionally many extra controls for Project Magenta modules. To see the PM controls in the drop-down lists check the option box on the page. All the Project Magenta entries start with "Pm" and the Airbus-specific ones "Pm Ab". A list of those supported is provided in the FSUIPC Advanced Users Guide.

- An **Autobrake Set** control, to directly set the autobrake (0=RTO, 1=off, 2–5=settings to Max).

- A set of "fast" FS autopilot value increment/decrement controls. These add to the default FS "inc" and "dec" controls with ten times the increment. Values handled are Altitude, Speed, Mach, V/S, Heading, and both OBIs (Courses).

- A set of controls to adjust the in-use radio frequencies directly, as well as controls to set the transponder using only two dials instead of four.

- A **Traffic density set** control, which sets the FS AI airline traffic density to any value from 0 to 100% according to the parameter value provided. The GA and shipping densities are adjusted to, in the same proportions, but the airline value is the guide.

- A **traffic density toggle** control, which turns the AI airline traffic off (density = 0) if it is on, but if it is already off it turns it on, using the density value provided in the parameter *or* 100% if that is omitted or set zero. This also operates on the GA and shipping traffic.

- **Spoiler inc** and **Spoiler dec** controls, which raise or lower the spoilers (speed brakes) by a small amount on each use. The increment is set, by default, to give 32 steps in the whole range, but you can change that in the FSUIPC.INI file—see the Advanced User's document.

- **Freeze pos** controls (on, off and toggle) to freeze the aircraft's geographical position (latitude/longitude) but allowing it to otherwise fly normally, including altitude changes. [*However, please note that FSX actually comes with its own control for this, though I've not yet tried it*].

- **Engine N Autostart:** Separate engine auto-start controls.

- **Throttles on, off, toggle:** Controls to disconnect and re-connect throttle inputs.

- **Offset** controls, which allow values to be written to FSUIPC4's offsets, for all sorts of actions and effects. There are controls for byte (8 bit), word (16-bit), double word (32-bit) and both 32-bit and 64-bit floating point values, and facilities for bit setting, clearing, toggling, incrementing and decrementing (the latter two only for byte and word values). When using these, another input field appears on screen for the entry of the specific offset, which is best entered in hexadecimal (precede the value with the letter 'x'). The value is provided as a parameter and this too can be entered in hexadecimal, preceded by 'x'.

  For more details of the **Offset Increment/Decrement** controls, please see the Boxed section under **Buttons**, earlier.

For some help in untangling the real Flight Sim controls you can refer to my "FSX Controls" document, which is included in the files installed for you into the FSX Modules folder. It is in PDF form (for reading with Adobe Acrobat). For FSUIPC4 added controls refer instead to the Advanced User's Guide.

The best way to work them out, really, is to try them—pick one that seems to indicate that it may do what you want, and see if it does. I know for sure that some of them do not work, or at least do not work the way you might hope or expect

Most if not all of those with the word "set" in their name are controls which take a parameter. Axis controls are like this of course, but so are, for example, the controls "MAGNETO SET" and the equivalents for each of four separate engines. Note that these do not necessarily work—if fact I don't think the MAGNETO controls work as they should.

Naturally, there is no way FSUIPC4 can dynamically provide different parameters for a single button. You can have a single keypress combination programmed to send a control with a fixed parameter—you specify this in the parameter field. A good example is a key to set the "standard barometer" setting (1013.2 hPa or 29.92"), for flying Flight Levels. For this, select:

Kohlsman Set	as the control, and
16211	for the parameter (1013.2 mb x 16 = 16211)

Another useful example is a key to exactly centre the elevator trim:

Elevator Trim Set	as the control, and
0	is the parameter

If you want, you can make FSUIPC4 send a sequence of FS controls when you use a key press, but for this you will need to edit the FSUIPC4.INI file. This is described in the Advanced User's Guide. You can only edit or program the first such control in the dialogue.

The review and deletion facility forms the right-hand part of the options page. Here you can simply scan through all your FSUIPC4 assignments (*not* those made in FS's dialogue or CFG file). The list is shown in the order they appear in your FSUIPC4.INI file, and cycles back to the beginning at the end and vice versa. You can delete any assignment here by using the **Delete this entry** button.

Finally, if you want to clear ALL the FSUIPC4 key press assignments, without pressing "Delete this entry" for every one, just delete the complete [Keys] section (for global keys) and [Keys.<aircraft name>] sections (for aircraft-specific keys) in FSUIPC4.INI. Try to do this when FS is not running. Most changes to the INI file are only noticed by FSUIPC4 when FS is started, though both the Keys and Buttons sections are reloaded when you change aircraft.

Axis assignments

Assignment of joystick buttons, joystick levers (called axes here) and key presses can all be done, quite normally, in FS via the Options-Controls-Assignments dialogues. We have already seen that FSUIPC4 can expand upon the assignment of Buttons and Key presses, allowing a much wider range of controls to be assigned, including special ones added by itself, and, quite usefully, allowing different assignments for different aircraft, automatically changing when aircraft are loaded.

In this section we shall see that the same flexibility can be achieved with the assignment of joystick axes too. Axes are those devices which provide a variable parameter rather than just an 'on' and/or 'off' event like a button, keypress, or switch. Most axes are controlled by the joystick or yoke itself (for aileron and elevator control), rudder pedals, analogue brakes, and those levers or push-pull rods associated with throttle, mixture and propeller pitch controls.

FSUIPC4 offers a greater range of controls for axis assignment, and can make them aircraft-specific too. Further, it can cause non-axis controls to be sent as the axis parameter passes into, out of, or through specific calibrated areas of the axis range. It can even produce multiple FS control inputs for one axis input—up to four axis results into FS, thus allowing single lever control of multiple engines, in different configurations according to the aircraft loaded. It even offers a facility to insert a delay in the sending of axis values to FS—apparently this is needed for accurate simulation of some helicopter models. This latter facility, however, can only be set by editing the FSUIPC.INI file, and is described in the Advanced User's document, not here.

> One additional axis of note is the **Steering Tiller**. Note that FSX does actually provide a Steering Axis (which, when I've tested, I will be adding to the calibration possibilities in FSUIPC4). The FSX offering may well make the FSUIPC4 tiller provisions redundant, but I don't know yet so I have retained them—it helps provide continuity for existing users of FSUIPC3 in any case.
>
> The FSUIPC4 version still uses the FS Rudder control, but can be calibrated separately (eg to be more responsive—use the inverse S-shaped slope options). If the steering tiller axis is assigned, you must then calibrate it in FSUIPC4's Joysticks section (this is on the same page as the PAN controls … sorry!). You need to calibrate the rudder axis in FSUIPC4 too. Then the two are used together as follows:
>
> When on the ground and at any ground speed less than 60 knots (default—adjustable by the **MaxSteerSpeed** parameter in the INI file), the actual FS rudder action is controlled by a blend of the tiller and rudder axis inputs. At low speed it is predominantly tiller, and as speed increases the tiller becomes gradually less effective and the rudder input more so. Above the **MaxSteerSpeed**, or in the air, the tiller has no effect.
>
> As with all of the axis and joystick facilities, the calibrations, assignments and parameters such as **MaxSteerSpeed**, can be different for different aircraft.

IMPORTANT: Before making any assignments in FSUIPC4, you should be sure that the same axes are not being assigned in FS itself. This isn't as easy as it sounds, because when FS sees a new control attached it does automatic assignments. If you just want to use FSUIPC4 to program the odd axis, but leave the rest to FS, then it is best to just go into FS's assignment dialogues and de-assign the axis you want FSUIPC4 to handle. But be sure to check this on your next load of FS, just in case it gets reassigned automatically. It does happen—*especially* if you are in the habit of unplugging your USB devices!

The other reason you may want FS to handle some axes rather than FSUIPC4 is for Force Feedback. FSUIPC4 does not use the same methods to access joysticks as FS and does not support Force Feedback.

If Force Feedback isn't a requirement, and you want the maximum flexibility (and most efficiency—I believe FSUIPC4's joystick handling is *still* actually faster than FS's), then the best way forward is to disable FS's joystick facilities altogether, then program all buttons and axes in FSUIPC4.

Okay. Now load FS and go to FSUIPC4's options. Select the Axis Assignment tab, and you will see this:
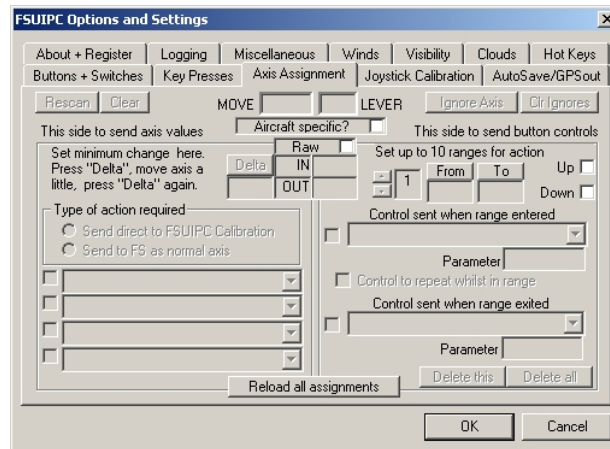
This does look a bit daunting, and maybe a bit messy too, but there's a lot to get into one small page. Maybe one day I can spend much more time on the aesthetics and less on the features. But for now, please bear with me. I have at least tried to make things look familiar where the facilities are similar to those in other sections.

The main reason there is a cluttered look to this section is that there's a lot going on: the facilities are very flexible and powerful. To make things easier to follow I will include rather more pictures here than I usually do. First, let's start at the top with this little section:

Here I have a device attached and I have moved one of its axes—the "Y" axis, or elevator (usually). Note that, because axes are providing data all the time, quite often on entry to this section of FSUIPC4 options, one of those axes will have already been detected as moving and will therefore already be displayed.

Here, the Joystick number is 0. FSUIPC4 handles up to 16 joystick devices, numbered 0 to 15, each with up to 12 "axes". The possible axis identifications are X, Y, Z, R, U, V, S, T, P, Q, M and N. The first six (XYZRUV) are the original non-directInput axes FSUIPC has long supported, whilst S and T are Sliders, and P, Q, M and N are all "Point-of-View" (POV) controllers which cannot be used like genuine analogue axes.

Of these it is common for X and Y to be assigned to aileron and elevator, respectively, Z or S to throttle, R to rudder, leaving U and V for additional uses such as Mixture and Prop, or analogue toe brakes, and the inevitable POV (P) for view selection or panning.

If the displayed axis is not the one you want to set, try clicking on the "Rescan" button (top left), then moving the axis you want to set. If the wrong one comes up again it will be because that one is apparently changing more than the one you want—FSUIPC4 selects the one with the greatest changes. To get over that you can choose, temporarily, to ignore the axis that is interfering with your efforts. To do this, click on the "Ignore axis" button, over there on the right. This doesn't ignore it forever, only dring the scanning. You can ignore as many as you like, and clear the whole list of ignored axes by clicking on the "Clr ignores" button at any time.

The other parts of this centre part of the display are:

- Aircraft specific checkbox: this is where you can tell FSUIPC4 that the assignments for this axis are specific to the current aircraft. If this checkbox is not checked then the assignment applies to all aircraft that do not have any of their own specific assignments. NOTE that this is different to the way it operates in Button and Key assignments. Your generic (non-specific) assignments do *not* apply to any aircraft for which you make specific assignments. This difference is necessary due to the active nature of axes compared to unpressed buttons or keys.

  FSUIPC4 only retains one set of assignments in memory and therefore in action. This will be the general [Axes] set if the currently loaded aircraft has no specific assignments, otherwise it will be the latter. Also, the short aircraft name option (needing INI file editing) applies just as for Buttons, Keys and Calibrations.

  When the aircraft specific option is selected for an aircraft you are presented with an option to retain (copy) all the general ones, to work from as a basis, or to start from a clean sheet. For minor variations you will probably opt for the former, but

if you have completely separate controls for, say, a Boeing and an Airbus, or a prop and a helicopter, then you might find it easier to start again for each one.

If you try to uncheck the 'aircraft specific' option, you will be offered the choice to delete all the specific assignments for the current aircraft. If you decline, then the aircraft specific setting remains. This is a cleaner way of removing aircraft settings than deleting the section in the INI file.

At various stages you may be given the option to save any changes made so far. If you don't do this then axis assignment changes since entering the Options system may be lost.

- Raw checkbox: this is rather technical, so skip this explanation if you like and come back later. For now leave it unchecked.

FSUIPC4 now use DirectX. This provides two ways to read joystick axis values—'raw' and 'calibrated'. In Raw mode, none of the calibration performed in "Game Controllers" is applied. The value passed through to the program is the actual value read from the device (or rather its driver).

FSUIPC4 can use either. You'll usually find that raw values are more honest in showing the true resolution of your device. Where calibrated values will seem to vary enormously between large numbers like –32767 and +32767, the raw values are often just 0 to 65535, 255, or even 127. There are higher resolution devices about which may provide larger ranges, but not many. The main exception is the EPIC card which can, via its "soft" (programmed) axis facilities, provide full 16 bit values.

The main use of the Raw input facilities is when you are using an axis to set a precise value, such as a heading, altitude, speed, or even a radio frequency. For this you will almost inevitably be using a precise programmable input device, such as EPIC as previously mentioned. For all 'normal' analogue input needs, you may as well leave the setting to the default and calibrate in Game Controllers.

Note that, in the illustration the 'Raw' option is disabled (greyed out). This is because I have other axes on the same joystick already set using the normal calibrated input. This is a restriction on the way the Windows API works when polling joystick axes. All 6 axes on a specific joystick must be read in the one mode, calibrated or raw. You cannot mix the modes on a single joystick. If you need to change the Raw/Calibrated option once an axis has been assigned, you will first have to clear all axis assignments on that joystick.

- Delta value (256 here): this value is the minimum change in the axis input that will be used by FSUIPC4 to cause any event (axis or other control to FS). The idea of this is to prevent minor jitters or very small changes from resulting in a massive queue of events being sent to FS for its attention. In the main, calibrated axis resolutions are much lower than folks may imagine—possibly only 30–60 different values in reality for the average hardware device. And the resolution of FS's reaction to different values is not designed to be that much better, for the obvious reason is that it need not be, with such low resolution inputs. Therefore, bombarding FS with many changes that make absolutely no difference is a waste of processing time.

Except for the POVs, FSUIPC4 sets a default Delta value of 256 for calibrated input, but only 1 for Raw input—the latter on the basis that often the reason for the choice of 'raw' in the first place is to set a specific exact value. It is in your interest to set the highest Delta value that still gives you all the sensitivity and resolution you need. To change the Delta, click the Delta button, move the joystick lever the minimum fraction you want to detect, then press the button again. If you don't press it again within a few seconds, the delta value will be set to whatever change it has seen in that time, so take care.

- The IN and OUT values here show the actual input value from the joystick ("IN") and the value actually used after the Delta change check has been applied ("OUT"). With the default Delta value the IN and OUT values will almost always be the same. Only if you set the Delta to a value greater than the resolution of the axis will you often see differences.

Okay. Now let's progress to the main points of this section: the actual assignments. You will see immediately that there are two halves for this. The left half deals with the normal assignment of axis controls to the currently selected axis. We'll deal with that first, as it is the one you'll be using most. The right half allows you do send button or switch type controls (even keypresses using an FSUIPC4 control for this) when certain parts of the axis range are entered, exited or passed through. And, although they look like two discrete parts, you can actually program the one axis to do both types of things.

First, then, the axis control assignment:
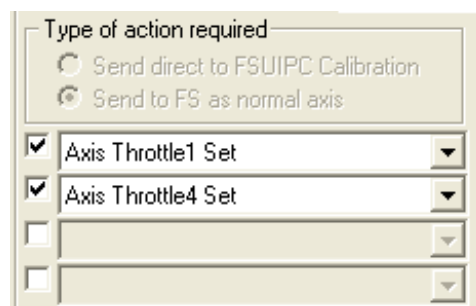
First, note that there are two ways you can assign axis controls. The normal (and default) method is to assign them to the available FS axis (or analogue parameter) controls. This is the "Send to FS as normal axis" selection. The drop down list contains not only all of those controls which FS's own axis assignments provide, but all those which FSUIPC4 knows about too—including, for example, the older 'THROTTLEn SET' controls which FSUIPC4 uses to provide reverse thrust zones on the same axis. Added to FS's internal list are those FSUIPC4-specific controls which can take parameters, like Autobrake Set, though some of these would really need the Raw input setting to be of use (on

this side of the dialogue anyway).

In the illustration you will see that you can assign up to four different controls to the one axis. You enable each of the four by checking it to the left. This provides full flexibility for "mapping" your levers to selected engines and so on. Together with the aircraft specific option and the automatic loading of the correct settings (and calibrations, if you calibrate in FSUIPC), you have the utmost flexibility. In this example I've assigned an axis to the throttles for engines 1 and 4, the outer two on a four-engined aircraft. I would likewise assign another lever to control the throttles of engines 2 and 3, the inner engines. Such variations are possible here, which just aren't easily supported elsewhere.

Turning to the other assignment method, the one labelled "Send direct to FSUIPC calibration" actually bypasses FS altogether until the axis input has been through FSUIPC4's own Joystick Calibration section. In this case the drop-down shows only those controls which can be calibrated in FSUIPC4, but this includes some which you would otherwise have to assign special numbers to in FSUIPC4.INI as described in the Advanced User's guide. For example these include Aileron Trim, Rudder Trim, and the four Cowl Flaps controls. (Part of the drop-down list for this option is shown in the illustration to the right).

Among the special controls there are three "combination" controls, which allow one axis to be treated differently depending upon FS's mode. These are:

|	
Aileron/SlewSide	controlling ailerons in flight mode, lateral slewing in Slew mode
Elev/SlewAhead	controlling elevator in flight mode, longitudinal slewing in Slew mode
Rudder/SlewHdg	controlling rudder in flight mode, yaw slewing in Slew mode
Throttle/SlewAlt	controlling throttle in flight mode, vertical slewing in Slew mode
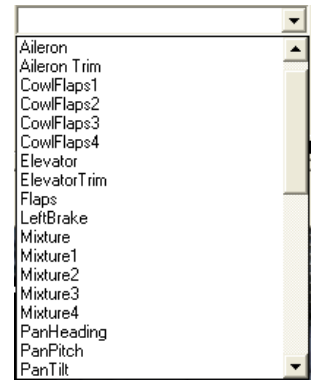
Whichever you choose, you can still use the FSUIPC calibration section as normal—in fact you *have* to in the case of the "direct to FSUIPC" controls. In other words these all need selecting and calibrating in the Joystick Calibrations section, which Flight Mode settings set and calibrated in flight mode, and the Slew mode settings in slew mode.

NOTE, however, that using the Direct to FSUIPC option will make the selected axis controls bypass any advanced cockpit panel coding you may be using. Try things first, and if they do not work with your panel you will probably need to revert to the normal methods.

To change between the 'normal via FS' and 'direct to FSUIPC' methods you will have to de-assign the axis controls first. Do this by removing the check mark to the left of each assignment.

Now for the slightly more complex right-hand side of the Axis assignments section. Here are two pictures that I'll explain, as examples:
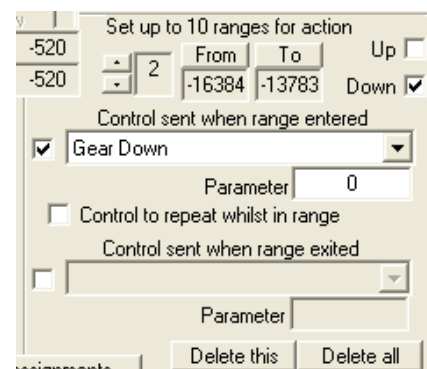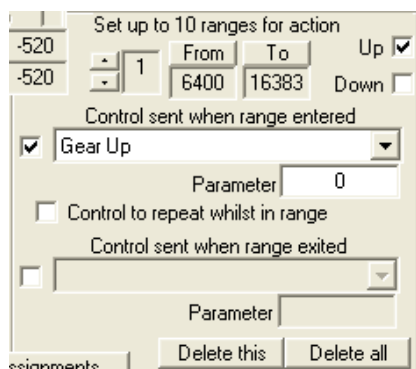
In this section you can set up two 10 zones (ranges of values) on the current axis that will each, separately, trigger a control. The controls are any of the button/switch controls that you can assign in FSUIPC4's button section—all are listed in the drop down according to the same rules as on the Buttons + Switches tab. Those controls which take a parameter can do so here, and you can enter an offset too for the FSUIPC4 offset controls. Everything is exactly comparable to assigning buttons, except that the trigger is related to the values arriving from the axis.

First you set the range of values in which this action will occur. The little spin control on the left selects which of the 10 ranges you are now setting (you can go back and change or adjust them using that spin control). Then you simply move the lever to the two extremes of the range, clicking the "From" button at one end (the lower number) and "To" at the other (the highr number). If you get these the wrong way round, no matter—FSUIPC4 will still understand. The values should be different, though.

The check boxes 'Up' and 'Down" allow you to select whether the action is to occur when the axis is moving from low values to higher ones ("Up"), or the other way ("Down"), or both. This allows you do have different things happen one way than the other.

You can assign one control to be sent when the specified zone is entered, and a separate one to be sent when the specified zone is exited—both or either, your choice. Check the box to the left of the relevant drop-down to enable it.
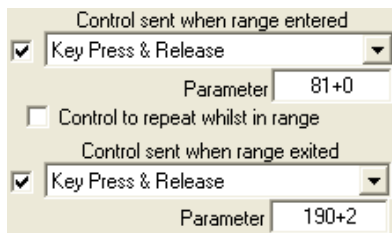
In the example above, I have programmed a joystick lever to operate the Gear. When the lever is pushed away/up, into the higher range (6400 to 16383) I get a Gear Up, when it is pulled to me/down, into the lower range (−16384 to −13783) I get a Gear Down.

Other points to note here are:

- You can have the "entry" control repeat, at about 10 or so per second, whilst the axis remains within the range—just check the "control to repeat ..." option.

- To delete any one of the 10 separate ranges assigned here, just find it and use the "Delete This" button. To delete all the ranges (but leave any axis assignments on the left-hand side) use the "Delete All" button.

- The "Clear" button at the top left of the page clears all axis assignments for the vcurrent axis, both left and right.

Finally, one final question should occur to you: in the Buttons+Switches section you can assign FS controls or Key Presses. The Key Press assignments come in useful for those add-on aircraft panels which don't provide controls for everything. Suppose I want to send keypresses based on an axis position?

This *is* possible using added FSUIPC controls to send Key Presses. Scroll down the drop down list of controls and you will see the three options: Key Press and Release, Key Press/Hold, and Key Release. These take a parameter that defines the key press to be used. Here's a rather unlikely fictitious example:

When my selected axis zone is entered, I am sending Key Press 81+0. Here the '81' is a KeyCode and '0' are the Shift keys I need. KeyCodes are listed in the Advanced User's guide—81 is 'Q'. The shift key combinations you can have are also listed in that document. Here I just want a plain Q (for FS's sound toggle—for which I should really have used an FS control of course), and I could use '8' or '0' for that.

When the zone is exited I am sending 190+2. The 190 Key code is the .> key, the one normally allocated in FS to brakes. The +2 sets the Control shift, so this is "Ctrl+.", which will operate the parking brake toggle by default.

In both cases I would be better off using an FS control from the drop-down, but with an add-on panel, or FSUIPC's own Hot Keys, or even an external program looking for a hot key, you can see that the key press control will be useful.

Joystick Calibration

The calibration of joysticks has always been a difficulty with Flight Simulator. There are calibrations you can perform in the Control Panel (in the "Game Controllers" applet), and in Flight Simulator itself you can set sensitivities and "null" or "dead" zones. These are all very well, but the results have always seemed to me less than precise. And getting and keeping accurate centring on the axes that need it is often a pain. So I added facilities for final "tuning" of joystick controls, once they've been through FS's assignments and main calibration.

Selecting the "Joystick Calibration" tab in the FSUIPC4 options you will see something similar to this:
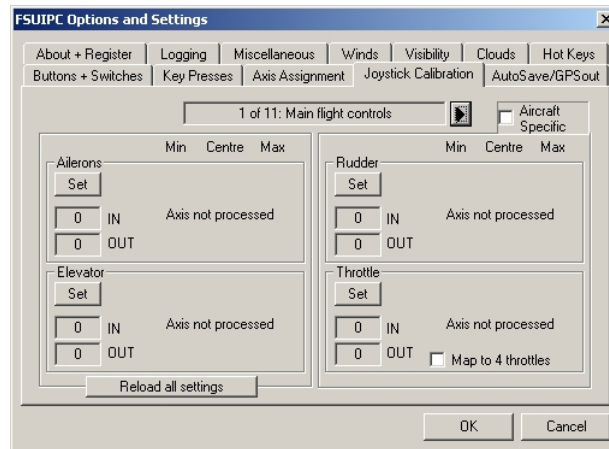
FSUIPC4 does not interfere with any joystick axis at all by default. You have to set an axis in one of the Joystick pages first. In this picture only the Throttle is shown not selected, so three of the four axes included on this page will be handled by FSUIPC4.

The numbers for IN and OUT under the left-hand Set/Reset buttons are actual values arriving at FS's simulation control in real time, as you move the controls. When FSUIPC4 is not processing an axis, the OUT value will be the same as the IN value, otherwise it will show the results of FSUIPC4's processing. For those axes where FSUIPC4 is supplying a function not actually provided in FS (as in the case of the Reverser axis), you normally won't see any values unless you elect to process it by pressing the 'Set' button—pressing 'Set' changes it to 'Reset' and this indicates that FSUIPC4 is doing something with that axis.

When you set an axis by pressing 'Set', two or three new "Set" buttons for the axis become available and the main one becomes the "Reset" button (used then to stop FSUIPC4's processing), so, as an example, page 1 with some things being calibrated may look like this (*Note that this picture is actually from FSUIPC3, but it illustrates the subject identically*):
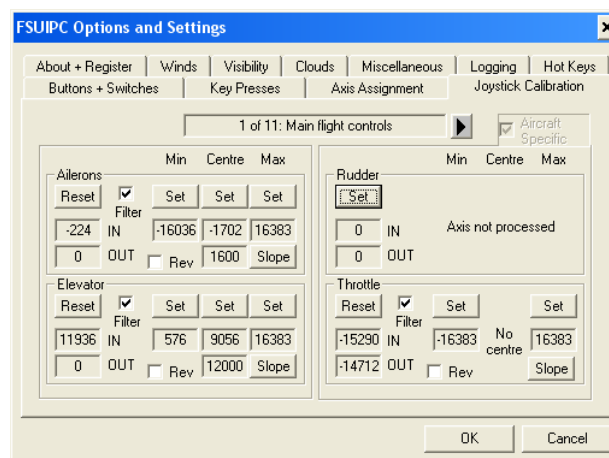
The numbers shown under the 'Set' buttons are those which will be used to scale the inputs, stretching or compressing them to fit the specific needs of the control, and also to set dead or null zones. You don't need to worry about the numbers particularly, as you will calibrate by simply moving the axis and clicking the buttons.

The default settings which first appear when you set an axis give full range (no scaling) appropriate to the axis type, with no limit dead zones and only a nominal (about 3%) central dead zone where this is applicable.

Unless you are using FSUIPC4's Axis Assignment and other facilities for complete control of your joystick inputs, then before starting to use FSUIPC4 for joystick handling, there are two things it is useful to do, to get maximum benefit:

(1) Go to the FS joystick options and make sure you have the **sensitivity** at maximum and the **null zone** at minimum. Any other setting will reduce the range of your joystick and make FSUIPC4's more accurate calibration less effective.

(2) For more predictable responses from your joystick, consider editing the FS CFG file and adding:

```
STICK_SENSITIVITY_MODE=0
```

To the [CONTROLS] section. This makes FS treat the raw joystick readings in a linear fashion. By default, since FS2000, FS has applied a time-change formula to the axes that, in my opinion at least, can give rise to some unwanted behaviour. You will need to edit the CFG file *before* running FS, as any changes you make whilst FS is running will be overwritten. [*Note that this is actually still applicable in FSX*]

Of course, if you are using FSUIPC4 for everything to do with joysticks, be sure instead to disable the joystick input in FS's own Options-Controls menu). You won't want to do this if you are using a Force Feedback device, unless you don't like that option, as FSUIPC4 does not use DirectX and does not support Force Feedback.

Now, to calibrate any axis, just do this:

1. For most axes, you need to be in normal flight mode (i.e. not **Slew**). However, if you wish to calibrate your joystick for slew movements, you *must* enter slew mode (e.g. press Y) before entering the FSUIPC4 options. FSUIPC4 like FS itself only sees slew axes when in slew mode, and only sees normal flight axes when not in slew mode.

2. Move the control for this axis and verify that the values for IN and OUT are changing. If they aren't, then you've either got the wrong control or your configuration is wrong (in FS's CFG file or its Options-Controls-Assignments).

3. Set the axis, to obtain the individual set buttons, if these aren't already showing. Do this by pressing the Set button on the left, turning it into the 'Reset' button.

4. Move the control in either direction and verify that the value is changing up or down as you'd expect. Aileron and rudder controls increase (more positive numbers) when turned left, decrease (more negative numbers) when turned right. Elevator controls increase when pushed (nose down), decrease when pulled (nose up). All others are pretty logical—more is higher, less is lower. If your axis is changing in the wrong direction you will need reverse the axis, either in FS itself, or here in FSUIPC4 (see the little 'Rev' checkbox?).

5. Now move the control to its lowest (right-most/rear-most) position. If you want a dead area, relax it the amount you want to stay fixed, then press the "Set" button in the "min" column (for 'minimum'). The currently read value is recorded in the box below the button.

6. For controls which have centres or intermediate 'idle' positions (aileron, elevator, rudder, spoiler, trim *and* the separate throttle and propeller pitch controls where centre (idle) is between forward and reverse), position the control in its centre, détente (e.g. "arm" for spoiler) or default position. Pressing the centre "Set" button will enter the value in one or other of the two boxes beneath. Each time you press Set the alternate value is recorded, and the boxes show the two most recent values in order (lower above higher). If the values are the same you will have no dead zone around the centre.

   [*Note that the Flaps control uses the "centre" calibration mechanism to set positions for every flap détente—please refer t the separate section, later, for the way to deal with flap levers with détentes for specific settings*]

   If you want to be able to simply take your hands and feet off the controls and expect them to centre well automatically, you will almost certainly need a central dead zone. You will also need one on a throttle or other control with a reverse range, otherwise finding idle will certainly be a problem.

   You can *either*:

   - simply push/pull/swivel the controls in different directions and let go, so that they centre with their normal variation, and press the centre Set for the two most extreme values you get for the supposedly centred control, *or*

   - more precisely, and the only way with throttles and other levers, move the control one way a little, press the centre Set, then the other way a little, and press Set again. This way you get to choose the size of the dead zone with more precision.

7. Move the control to its highest (left-most/forward-most) position. Again, if you want a dead area relax it an appropriate amount, then press the Set button in the "max" column.

8. You can select a response curve ("**slope**"). There are 31 different slopes to choose from, ranging in one direction from linear (default) to one with a very flat centre (for reduced sensitivity—i.e more control movement needed for same effect) and steep ends to reach the maximum deflections, and in the other direction to the reverse extreme: steep centres and flat extremes.

   To select the slope desired, press the **Slope** button. You will see a window like these:
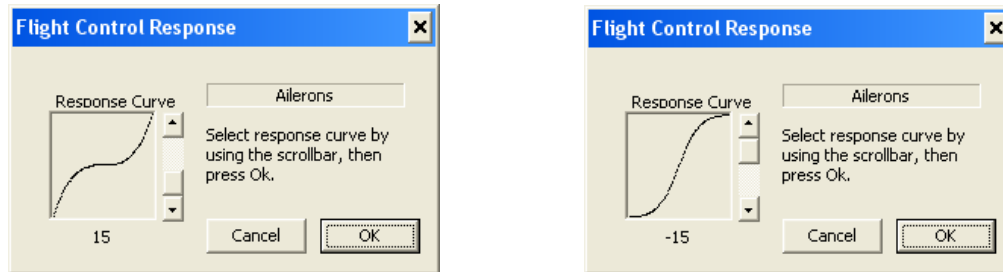
   Here the one on the left is slope 15, the one with the flattest centre response (i.e. more stick movement, less effect) and steepest extremes, and the one on the right is slope –15 which is the other extreme, a very steep and therefore over-sensitive centre, and flat extremes. A flat response, the default, is slope 0.

   For axes with no centres you only get to right-hand part of the slope, but the same variety is available. For axes with "off-centred" centres, such as the separate throttles with a small reverse zone below an off-centred idle position, the left hand part is kept linear in order to be sure that the very extreme left position can be reached. The slope changes apply only to the right-hand or positive part of the lever movement.

   Just move the slider in the scroll bar down to the position for the sort of response you'd like. Press OK when you are happy, or Cancel to leave it as it was. Note that the response curves are only applied when the axes are calibrated in FSUIPC4, though the slope settings are remembered anyway, even if no calibration is set.

9. There are two other options you may be wondering about. **Filter** allows you to switch on a simple digital filter for the axis. This tries to suppress fast changes such as jitter. Because it is kept simple (for performance reasons) it isn't perfect, but if you do suffer from jitter on an axis, try enabling it. It won't do any harm and it may help. [*Note that enabling the filter action on some axes, particularly Brakes, can apparently adversely affect the way some advanced cockpits operate. If you have any doubt do **not** check the Filter option*].

10. The other option is **Rev**. If you check that, FSUIPC4 reverses the axis completely, just before supplying the calibrated value to FS. All the calibrations and so on are done exactly as above—if you select Reverse you will simply see the Output value change. This option is provided for the few cases where the FS option for axis reversal doesn't appear to work, or doesn't apply in any case.

11. On the four throttles page there is an option (lower centre) to exclude THROTTLEn_SET axis controls. This is provided to handle a specific problem when calibrating the throttles in some advanced add-on aircraft. By default FSUIPC4 handles both the older FS2000 and FS98 controls and the newer FS2002, FS2004 and FSX controls. However, some new aircraft use the older controls themselves, and this clashes with FSUIPC4's calibrations. If you have problems only when calibrating using these separate controls (e.g. to gain a reverse zone on your lever(s)) then try enabling this option. It is known to be needed for the FeelThere ERJ145, for instance.

That's it. Do this for each axis you feel needs it. Scroll through the 6 pages of Joystick axis settings and choose the ones you have connected. Note that, in *all* cases, calibration values increase left-to-right. That is, the boxes under the assorted "Set" buttons used in calibration can only be set such that the value in the right-hand one ("Max" usually) is greater than that in the left-hand one ("Min" perhaps), and the centre pair, if any, are in between these extremes.

There are several special cases you may want to deal with:

- If you have a single brake lever or pedal assigned to "BRAKES" in FS's CFG file, be sure to use that single axis to calibrate *both* the left and right brake exactly the same (right-hand side of page 2 of 6), otherwise every time you brake you will swerve to one side.

- If you have a single throttle control and you'd like to have an idle and reverse zone on this, then in the throttle part of page 1 select the "Map to 4 throttles" option. Then turn to page 3 of 6 and calibrate your throttle using the throttle 1 axis. The other three will match exactly. Choose the minimum (full reverse) and maximum (full forward) in the usual way, but then make a centre 'idle' zone wherever you want it on your lever's movement—close to a détente or other stop if you have one.

- Similarly, you can use a single propeller pitch control lever to provide reverse pitch control (useful on the KingAir, for example). In the prop pitch section on page 2 of 6 select the "Map to 4 props" option, then turn to page 5 of 6 and calibrate your propeller control using the prop pitch 1 axis. The other three will match exactly. Choose the minimum (full reverse) and maximum (full forward) in the usual way, but then make a centre 'idle' zone wherever you want it on your lever's movement—close to a détente or other stop if you have one.

- Again, you can use a single mixture (or 'condition') control lever to provide a specific idle zone above the full cut-off minimum position—also useful on the KingAir. In the mixture section on page 2 of 6 select the "Map to 4 mixt" option, then turn to page 4 of 6 and calibrate your mixture/condition control using the mixture 1 axis. The other three will match exactly. Choose the minimum (cut-off) and maximum (full rich) in the usual way, but then make a centre 'idle' zone wherever you want it on your lever's movement—close to a détente or other stop if you have one.

- If you have twin throttle levers and you'd like to control left wing engines and right wing engines separately on both 2 and 4-engined places, then make sure both throttles are operating correctly with twin planes then go to the third page of the Joystick controls in FSUIPC, the one showing 4 throttles. Calibrate throttles 1 and 2 then check the option "Map 1->12, 2->34". This will do the job. The mapping only occurs when a 4-engined aircraft is loaded. This facility also applies to the mixture and propeller pitch levers.

- A similar facility is available for flying 3-engined aircraft with two levers. In this case the first lever controls both engines 1 and 2, and the second one controls engine 3. Follow the same calibrations as in the previous instance, but then check the option "Map 1->12, 2->3". This mapping only occurs when a 3-engined aircraft is loaded. This facility also applies to the mixture and propeller pitch levers.

> **IMPORTANT:** If you have more than one throttle, and calibrate them separately on Page 3 of the FSUIPC4 Joystick options, you need to take care with any aircraft panels equipped with an "Engine Control Unit" (ECU) or "Electronic Engine Control" (EEC). The aircraft panels equipped with these are altering the values you send from your throttles in order to keep the engine within set bounds. But they do this by sending the same controls as your real throttles, so FSUIPC4 applies calibration to those as well as yours. If you calibrate with the idle position well below centre (i.e. negative), which is quite likely, as you will want to use a smaller portion of the travel for reverse than for forward thrust, then the "idle" value of 0 sent by the panel will equate to some positive forward thrust.
>
> There is no easy answer to this. You will either have to calibrate taking care to keep the idle area centred on the value 0, or disable the Engine Control Unit in the panel.

- FS does not operate its "elevator trim" facilities on the pitch control of helicopter models. If you want a pitch trim control for these, FSUIPC4 can provide it for you. You must calibrate the elevator axis itself (i.e. the Y axis of the cyclic) in FSUIPC4, and edit the FSUIPC4.INI file, adding '**ApplyHeloTrim=Yes**' to the appropriate [JoystickCalibration …] section in the FSUIPC4.INI file. FSUIPC4 will then apply both FS elevator trim inc/dec and axis controls to the aircraft's pitch axis. For more details see the **ApplyHeloTrim** parameter in the Advanced User's document.

- The Spoiler (speed brake) control is a little special. It has no "centre" as such, but the facilities for setting a centre in FSUIPC4 are used to calibrate a zone on your lever in which the spoiler should be "armed". You don't need to do this, it is options: if the two centre calibration values are the same (i.e. there is no centre "zone"), then there is no arming action taken by FSUIPC4. If, however, you do calibrate with a centre zone, then the values from "minimum" (the left most value), or lower, up to the lowest of the Centre values will all select spoilers down (i.e. parked). The centre zone will arm the spoilers, and the range from the higher of the two centre values up to the maximum (the right-most value) will actually operate the full range from 0% to 100% deployed.

  Note that if you arm the spoilers when on the ground, FS will deploy them to 100%, as if you have just touched down. However, they should return to the "armed" position when the throttles are advanced.

- The Flaps axis control can be calibrated simply, just like the other axes. If the simple approach is taken then FSUIPC4 will compute zones along the calibrated range for selection of each of the flap settings available with the current aircraft. However, for those of you who are building a flaps lever with détentes for the flap selections specific to your chosen aircraft, facilities exist to calibrate the axis values to match your détentes precisely. This is described in the following section.

CALIBRATING FLAPS WITH SPECIFIC DÉTENTES

Go to page 6 in the Joystick Calibration tab, the one with the Flaps details shown. After pressing the "Set" button, to indicate you want to calibrate the flaps, you will see something like this (the 737 is loaded here):

As it stands you can go ahead and calibrate the flaps axis just like any other. The secret for setting specific détente zones is all behind the button labelled "Dt", for Détentes. It's a toggle. Click on it once and you'll see changes, as shown in the second picture, below:

There are now two 'centre' values showing, a "Cl" button (for Clear), and the column headings showing #0 #1 and #2, with a little spin control next to the centre #1. Note that the spin control and the #1 are above the two newly appeared centre values. THIS IS IMPORTANT!

The left heading number (#0) indicates that the 'Minimum' (left-most) calibration is the limit for 0 flaps—that is no flaps, or flaps completely up. The zone for this no flap setting goes from −16384 up to the value calibrated in this column. You set this value by using the leftmost of the three Set buttons, and the value calibrated here remains set for Flaps 0.

The right heading number (#2 at present) is the highest flap number so far entered—because we must have a 'flaps down' and a 'full flaps', and at least one 'centre' (intermediate) flap value. Thus, the initial default is for flaps #0, #1 and #2. Note that these are flap numbers, always sequential, not flap angles!

The process to calibrate your détentes is as follows:

1. Set the flaps lever to a position a bit inside the Flaps Up position/notch (i.e. towards your Flap #1), and make this the minimum (i.e. click the left-hand 'Set'). The zone for Flaps 0 is now set. You don't change the minimum again (unless you need to adjust Flaps 0 zone on the axis).

2. Set the lever to a position a bit before the Flaps Full position/notch (i.e. at the other end, but not quite 'full'), and make this the maximum (i.e. click the right-hand 'Set'). The zone for Flaps Full (currently #2, but that will change as we add more détentes) is now set. You don't change the maximum again (unless you need to adjust the Flaps Full zone on the axis).

    So far it has been like a normal axis calibration. In fact, if you'd already calibrated the axis in this way before selecting 'Dt', the correct values would likely have already been set in Min and Max. All that now remains to do is set all the intermediate positions, to match zones around your own lever's détentes or notches.

    ALL this is done in the centre column, alone.

    The first flap to calibrate is #1. Use the spin control up and down keys (near top centre) to select flap #1 if #1 isn't already shown there.

3. Move the lever to just before the first flap down position/détente, i.e. close to the Flaps #0 zone, but above it. Then click the centre Set button. The value will record as one of the centre column values, and defines one end of the zone that will be considered setting Flap #1.

4. Move the lever to just after the same flap notch, and click the centre Set again. This second, higher, value will become the second centre column value.

    Congratulations, you have just defined the zone for Flap #1. The centre column heading is still #1, showing this as the selected flap number.

5. Now use the little spin control (top arrow) to increment the centre flap number (the one just to the right of the spin control) to the next value.

    Note that flap numbers can only be increased until the TOTAL number of flaps détentes recorded is the same as the number for the currently loaded aircraft (as shown in the Joysticks section below the flaps calibration section). So, for a 737, the headings end up as #0, #7, #8 (for a total of 9 positions 0–8).

6. Move the lever to just before the next flap position/détente. Then click the centre Set button. The value will record as one of the centre column values, defining one end of the zone which will be considered setting the selected Flap number.

7. Move the lever to just after the same flap notch, and click the centre Set again. This second, higher, value will become the second centre column value. And that's the next détente zone defined.

    Here's an example for a 737 fully set with the 9 needed positions (7 'centre' values, plus the minimum #0 and maximum #8). Here I've actually been reviewing the settings, and although all 9 are set (as shown by the #8 as the right column heading), I'm looking at the range for #5:

8. Repeat steps 5 to 7 until all the intermediate détentes are set—ALL with two values, all showing in the centre column when the relevant flaps number is shown above, next to the spin control.

That's it. If you make a mess, just press the 'Cl' button ("Clear") and start again. The values can be reviewed and re-adjusted at any time, individually (that's why the spin control can go up or down), but take care not to have overlapping zones else things may go a little odd. I you hear a 'ding' when pressing a Set then you have a value out of order. That is a no-no. They must all increase, left to right, flaps #0 to flaps #n.

All the détente calibration values are maintained independently of the simpler, analogue, calibration values. Pressing the 'Dt' button will swap between the two methods. You don't lose any détente numbers unless you press "Cl" to Clear them.

When you press Ok, the values are saved in the INI. For example:

> FlapStarts=–16384, –16219, –15450, –12975, –6980, –573,4606,15600,16217

> FlapEnds=–16256, –16200, –15417, –12950, –6950, –550,4644,15650,16384

The –16384 and +16384 extremes are fixed—you can change them in the INI but you really shouldn't, and there is no need to.

The 'Dt' button toggles this parameter:

> FlapDetents=Yes

If this is 'No' the détentes are still loaded, just not active.

Of course, as with all things in the Joystick Calibration, Buttons and Keys sections, you can have different sets for different aircraft. Otherwise the détentes you specify will be applied as well as possible to an aircraft with a different number of flap positions … hmmm. <G>

DETAILS OF FS's AXIS CONTROLS

Each axis that you can assign and calibrate is known to FS by a control name. Here are the names and brief descriptions of those that can currently be handled by FSUIPC4:

Axis name in FS cfg file	Function	Notes
AXIS_AILERONS_SET	Joystick/yoke ailerons, also known as 'X' axis	Values used in FS run from –16384 (extreme right) to +16384 (extreme left), with 0 as centre
AXIS_ELEV_TRIM_SET	Elevator trim adjustment	–16384 to +16384, with 0 neutral trim
AXIS_ELEVATOR_SET	Joystick/yoke elevator, also known as 'Y' axis	–16384 (pull back/nose up) to +16384 (push forward/nose down), with 0 as centre
AXIS_MIXTURE_SET	Fuel mixture control	–16384 (lean) to +16384 (rich), but see also MIXTURE_SET below

AXIS_PROPELLER_SET	Propeller pitch control	−16384 (feathered) to +16384 (full), with no reverse. See also PROP_PITCH_SET below. FSUIPC allows you to map this onto the 4 separate propeller pitch controls (PROP_PITCHn_SET) if you need reverse pitch control on the same lever.
AXIS_RUDDER_SET	Rudder input, normally from pedals but also from twist function on some joysticks. Also known as the 'R' axis	−16384 (extreme right) to +16384 (extreme left), with 0 as centre. Note that if you fly with the rudder "spike" eliminator enabled (see the **Miscellaneous** section, earlier), then you will probably need to first calibrate your rudder, making sure you have adequate 'dead' zones at either extreme. If you don't do this then attaining maximum deflection may not be possible
AXIS_SPOILER_SET	Spoiler input, allowing precise spoiler positioning for excellent descent control.	−16384 (retracted) to +16384 (fully deployed). If enabled, FSUIPC maps this control to SPOILERS_SET, so it really matters little which you choose.
AXIS_THROTTLE_SET	Throttle input, whether from a throttle level, push/pull rod, or wheel. Also known as the 'Z' axis	Running from −16384 to +16384 for idle up to full thrust, this is a single throttle which operates all selected engines (the selection being by E on the keyboard followed by 1, 2, 3 and/or 4). No reverse is normally available on this control, but FSUIPC4 allows you to map this onto the 4 separate propeller pitch controls (AXIS_THROTTLEn_SET) if you want reverse thrust control on the same lever**.**
AXIS_LEFT_BRAKE_SET AXIS_RIGHT_BRAKE_SET	Separate brakes normally operated by toe pressing actions on the rudders.	−16384 (off) to +16384 (full on). FSX seens to use an exponential growth function on these – a flattened initial response but steep at the fller braking end.
AXIS_FLAPS_SET	Selection of flap setting by relative position	Flaps are set in 'notches' or 'détentes', not continuously. FSUIPC4 interprets the incoming axis value and sets the resulting output to the nearest exact notch position for the currently loaded aircraft. The range is −16384 (flaps up) to +16384 (full flaps)
MIXTURE_SET AXIS_MIXTURE_SET (FS2002/4)	Fuel mixture control	0 (lean) to +16384 (rich). If enabled, FSUIPC4 maps this control to AXIS_MIXTURE_SET, so it really matters little which you choose.
MIXTURE1_SET MIXTURE2_SET MIXTURE3_SET MIXTURE4_SET AXIS_MIXTURE1_SET (FS2002/4) AXIS_MIXTURE2_SET AXIS_MIXTURE3_SET AXIS_MIXTURE4_SET	Separate fuel mixture controls for each of up to 4 engines	0 (lean or cut-off) via 8192 (idle) to +16384 (rich) Centering is provided for the 8192 value so that turbo controls with détentes on the mixture levers can be calibrated with a usable 'dead' zone. By default, however, this dead zone is eliminated by having both upper and lower input values for it set the same.
PROP_PITCH_SET AXIS_PROPELLER_SET (FS2002/4)	Propeller pitch control	−4096 (reverse) via 0 (feathered) to +16384 (full). But if enabled, FSUIPC4 maps this control to AXIS_PROPELLER_SET, so it really matters little which you choose.
PROP_PITCH1_SET PROP_PITCH2_SET PROP_PITCH3_SET PROP_PITCH4_SET AXIS_PROPELLER1_SET AXIS_PROPELLER2_SET AXIS_PROPELLER3_SET AXIS_PROPELLER4_SET	Separate fuel mixture controls for each of up to 4 engines	−4096 (reverse) via 0 (feathered) to +16384 (full). All four are operated together if you map a single axis assigned to AXIS_PROPELLER_SET or PROP_PITCH_SET to these. FSUIPC4 handles these identically.

SPOILERS_SET AXIS_SPOILER_SET	Spoiler input, allowing precise spoiler positioning for excellent descent control.	0 (retracted) to +16384 (fully deployed).
THROTTLE1_SET THROTTLE2_SET THROTTLE3_SET THROTTLE4_SET AXIS_THROTTLE1_SET AXIS_THROTTLE2_SET AXIS_THROTTLE3_SET AXIS_THROTTLE4_SET	Separate throttle controls for each of up to 4 engines, with reverse thrust capability	–4096 (full reverse*) via 0 (idle) to +16384 (full forward). All four are operated together if you map a single axis assigned to AXIS_THROTTLE_SET to these. FSUIPC4 handles both types identically, *except* when calibrating the 4 axes separately, where there's now an option to only process the new AXIS_ ones. This option is useful for those aircraft panels which themselves use the older controls for "fly-by-wire" type operation. * The actual negative value for "full reverse" is defined in the aircraft parameters (the .AIR file). FSUIPC4 calibrates reverse to match the aircraft, so you will see different values here, not just the nominal '–4096'.
AXIS_PAN_HEADING AXIS_PAN_PITCH AXIS_PAN_TILT	Used in FS virtual cockpit mode.	Range –16384 via neutral 0 to +16384
AXIS_SLEW_AHEAD_SET AXIS_SLEW_ALT_SET AXIS_SLEW_HEADING_SET AXIS_SLEW_SIDEWAYS_SET	Slew mode controls	Range –16384 via neutral 0 to +16384 Note that these are only used in Slew mode. FSUIPC4 cannot see them in flight mode.
COWLFLAP1_SET COWLFLAP2_SET COWLFLAP3_SET COWLFLAP4_SET	New support in FSX, but still not assignable in the FS menu	Assign via FSUIPC4 Axis assignments, calibrate in the FSUIPC4 joystick calibration pages.
RUDDER_TRIM_SET AILERON_TRIM_SET	New support in FSX, but still not assignable in the FS menu	Assign via FSUIPC4 Axis assignments, calibrate in the FSUIPC4 joystick calibration pages.

RESETTING DEFAULTS

Please note that resetting the FSUIPC4 defaults (using the buttons on the "About" page) does not change the joystick calibration system. This is deliberate, as it could be very annoying having spent a while carefully setting up the joysticks perfectly just to have them obliterated through pressing the "defaults" button once. If you want to switch any of this off, either de-select them individually (pressing the Reset button disables the FSUIPC4 axis processing actions and restores defaults), or, to do this for all at once, edit the FSUIPC4.INI file after closing FS and delete the entire section called [JoystickCalibrations].

IMPORTANT NOTES

This version was developed using the new SimConnect interface provided in FSX almost exclusively. There are some minor "hacks" still, to do a few things not *yet* supported by SimConnect, but otherwise how it works and what it can do is totally dictated by the features in SimConnect. Those of you with the Deluxe Edition of FSX have as much information as I do about these—SimConnect is documented in the 'Core Utilities' section of the SDK, which you'll find in its own folder on one of the DVDs.

At first release there are still some problems with SimConnect's facilities. Most of these will not affect users directly, only application programmers. Notes about the state of the IPC (Inter-Process Communication) interface supported by FSUIPC4 is available via supplements to the FSUIPC4 SDK made available through my Support Forum.

However, one important area which does affect users and which is still rather deficient is the weather. Reading and writing weather data are both quite handicapped at present, and this, I am informed, will be the focus of early SimConnect improvements—some of which have already been provided in the SP1 update which is thoroughly recommended.

Consequently the weather facilities provided in FSUIPC4 version 4.00 are not as I would like them to be. Not only are they less than in previous versions, but those that are provided do not always work as intended. You are most welcome to try them, but please install the SP1 update for FSX first. Then you can try setting the Miscellanous page option to change FS's own weather. There shouldn't be as much of a problem using the same features for weather control programs such as the FS2004 versions of FSMeteo and ActiveSky, but you shouldn't expect their weather-setting capabilities to be perfect either, yet.

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