

Camera configuration in FSX

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In this document we summarize the procedure to create custom camera views and to assign keyboard shortcuts up to 10 of them in MS Flight Simulator X.

We believe that while the result of the method proposed here will be somewhat weaker than that of professional solutions like EzDok (<http://www.ezdok-software.com/>), it also has several advantages:

- Does not require payware components
- Does not influence FSX's standard hotkey and joystick handling
- Does not introduce a new module that might not be fully stable
- Keeps the default Top-Down view that seems not to be available with EzDok
- Keeps the aircraft centric camera movement that seems not to be available with EzDok

Disadvantages of the solution:

- No extra fancy effects
- Maximum 10 hotkey triggered camera views
- Less convenient, less automatic view creation

I appreciate the authors of the following references:

The view creation process is based on tips from Jcboliveira: http://www.fsdeveloper.com/wiki/index.php?title=Change_camera_views
Understanding Cameras in FSX: <http://www.fstipsandaddons.com/tutorials/understanding-fsx-cameras.html>

Preface

Throughout the document we will define camera view definitions in camera.cfg, aircraft.cfg and in *.flt files. A detailed description of the file structures and properties is available in the official documentation. We will only discuss the usage of the files in respect of custom view creation and hot key assignment.

Documentation:

Camera Configuration: <https://msdn.microsoft.com/en-us/library/cc526984.aspx>
Flight Files: <https://msdn.microsoft.com/en-us/library/cc707071.aspx>

File locations:

- Global cameras are defined in the user's %APPDATA%\Microsoft\Roaming\Microsoft\FSX\camera.cfg file. The template of this file can be

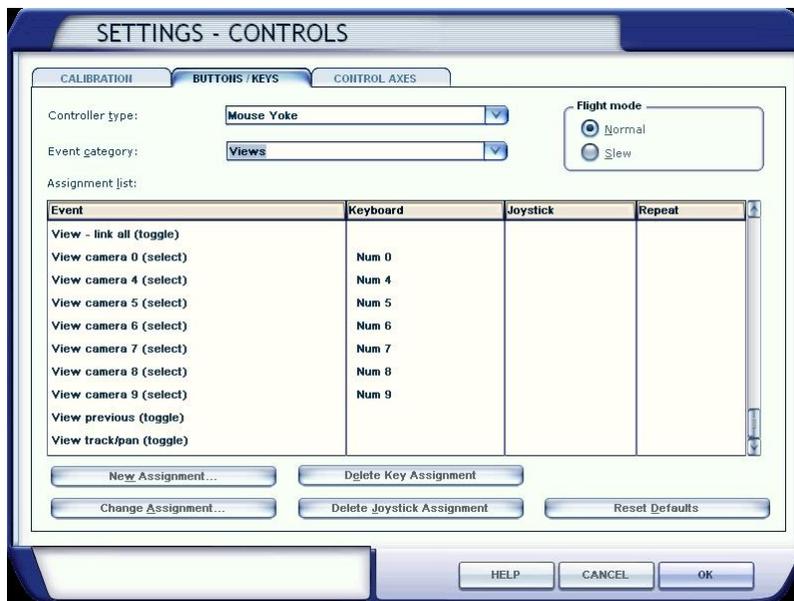
found in the root of the FSX installation folder. FSX is using the template file only when a user launches FSX the first time (or if the user file version is deleted).

- Aircraft specific cameras are defined in the aircraft.cfg file in each aircraft folder.
- Saved flights in Documents\Flight Simulator X Files*.FLT files store actual zoom and view settings.

Within this documentation we discuss virtual cockpit, outside and aircraft views, but the basic concept is valid for the other views as well.

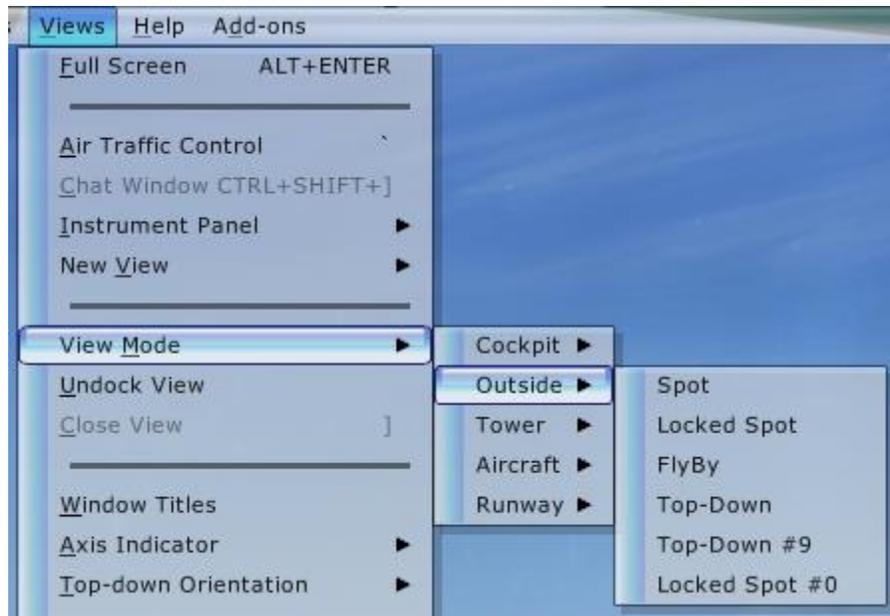
General information

Camera view manipulation hotkey assignments can be defined within the Views event category in the Options / Settings / Control dialog box. Most events mentioned in this chapter refer to this category in the configuration menu.



Camera views are listed in the FS View menu in groups based on the camera's Category value:

- Cockpit
- Outside
- Tower
- Aircraft
- ... and some more esoteric



Button and keyboard shortcuts can be defined for switching between views within and among the categories (default keyboard values are in brackets):

| | |
|--|--|
| View (next category) | Jumps to actual view in the next category (S) |
| View (previous in category) | Jumps to the actual vie in the previous category (Shift-S) |
| View (next in current category) | Jumps to the next view in the current category (A) |
| View (previous in current category) | Jumps to the previous view in the current category (Shift-A) |

Camera views defined with `CycleHidden=Yes` parameter will be excluded from this cycling. These views can only be accessed from the menu or by using assigned hot keys.

Zoom and view can be changed “on-the-fly” by assigned joystick buttons and/or keyboard keys. It is very useful to assign keyboard shortcuts for resetting these zoom and view settings to their configured values:

| | |
|-----------------------------------|---|
| Eyepoint reset | Resets the eyepoint to the values defined in the Camera’s InitialXyz and InitialPbh settings. |
| View (set to default – 1x) | Resets the view zoom setting to the value defined in the Camera’s InitialZoom setting. |

Also we will find it useful to fast reload an aircraft after modifying aircraft specific camera settings. There is no predefined shortcut for that, so do it yourself:

| | |
|--------------------------|---|
| Aircraft (reload) | Reloading the aircraft and rereading configuration files. You might quite safely use it even during a flight once you experience problems, or if you would like to put config file changes in effect immediately. |
|--------------------------|---|

To be able to use modified global camera settings one should restart the complete flight simulator.

Hotkey – Camera view assignment

Assigning hotkeys (or joystick buttons) to camera views is a two-step process:

1. Define a sequence number between 1 and 10 in the HotKeySelect parameter of the camera
2. Assign an appropriate hotkey and/or joystick button to the corresponding event

To accomplish the first step add or modify the HotKeySelect parameter of the camera. Be careful not to assign the same number to multiple cameras. In the example below we assigned number 5 to the “Radios And Engine Gauges” camera. The property name (“HotKeySelect”) is misleading, as this is not yet the hot key itself. It is just an index value that will be paired to an appropriate hotkey through an event in the next step.

```
[CameraDefinition.22]
Title = "Radios And Engine Gauges"
Guid = {b1c13532-89ca-11db-b606-0800200c9a66}
Origin = Virtual Cockpit
...
AllowZoom = TRUE
InitialZoom = 0.9
InitialXyz=0.06, -0.1, 0
InitialPbh=18.0, 0, 17
Category = Cockpit
HotKeySelect=5
```

Each index between 1 and 10 is bound by the system to a view event as defined in the following table. You have to assign a hotkey or joystick button to the appropriate event. In our example (HotKeySelect = 5) we should assign the selected hotkey to the **View Camera 5 (select)** event.

| HotKeySelect | Button/Keys event | Comment |
|--------------|-----------------------------|--|
| 10 | View Camera 0 (select) | |
| 1 | Virtual Cockpit (shortcut) | Default: F9 and assigned to [CameraDefinition.002] “Virtual Cockpit” |
| 2 | 2-D Cockpit View (shortcut) | Default: F10 and assigned to [CameraDefinition.001] “Cockpit” |
| 3 | Locked Spot View (shortcut) | Default: F11 and assigned to [CameraDefinition.004] “Locked Spot” |
| 4 | View Camera 4 (select) | Default: F11 and assigned to [CameraDefinition.006] “Top-Down” |
| 5 | View Camera 5 (select) | |
| 6 | View Camera 6 (select) | |
| 7 | View Camera 7 (select) | |
| 8 | View Camera 8 (select) | |
| 9 | View Camera 9 (select) | |
| | Top-Down View (shortcut) | Seems to return to actual view in VC |

By default hotkeys are defined for four cameras in the global camera.cfg file: “Virtual Cockpit” [F9], “Cockpit” [F10], “Locked Spot” [F11] and “Top-Down” [F12].

The individually named **XXX (shortcut)** events are misleading, as they are in fact not specific to those views. They simply invoke cameras indexed between 1 and 3. One can simply reuse these indexes and events to trigger any custom views instead of the default ones. Thus we have 10 shortcuts available to trigger our preferred views.

COMMENT: Interestingly the **Top-Down View (shortcut)** event is not triggering a given view (view 4 as expected) as expected, but it is bound to the VIEW_CAMERA_SELECT_START internal event and presently brings back to the active view in the VC category.

Camera creation examples

In this chapter we go through the process of creating a new camera view using a template view:

1. Create a copy of a suitable camera that could serve as a template for the new camera
2. The order of the cameras in the file will determine how they will follow each other if you ask for the next or previous view within the category.
3. Give a unique [CameraDefinition.XXX] name. It seems XXX does not have to be a number, it could be a string as well. If two cameras share the same name, only the first will be used.
4. Give a Title that will be displayed at the top-right corner when you change views.
5. Generate (<http://createguid.com/>) and enter a unique GUID.
6. Define a description of the view.
7. Define zoom, X-Y-Z position (m), pitch-bank-heading (degree) and other parameters for the view
 - InitialXyz - Camera XYZ position offsets from the default location in meters (-500 to 500). Three decimal values separated by comma. X is left-right, Y is up-down and Z is forward-back. The first is the positive direction in all cases. There must be a space between the values. For example: InitialXyz=-0.03, 0, -0.25
 - InitialPbh - Camera pitch (-90 to 90), bank and heading (-180 to 180) orientation offset from the default in degrees. Note that positive pitches give a downward view. Positive headings are to the right. Three decimal values separated by comma. There must be a space between the values. For example: InitialPbh=22.8, 0, 0
 - Initialzoom - Sets the initial zoom (0 to 512).

The example shows how parameters should be changed to modify a standard forward view (left) to a close-up panel view (right).



InitialZoom = 0.4
InitialXyz=0, 0, 0
InitialPbh=0, 0, 0



InitialZoom = 0.9
InitialXyz=-0.03, 0, -0.25
InitialPbh=22.8, 0, 0

The following example shows the parameter changes to create an interesting pilot view (right) from the standard right wing view (left). This is in fact an external (aircraft) view as the animated pilot is not visible in an internal view. The viewpoint was moved into the cockpit and the zoom had been adjusted.



InitialZoom = 0.9
InitialXYZ = 20, 0.7, 0
InitialPbh = 1.5, 0, 266.5



InitialZoom = 0.8
InitialXYZ = 1.26, 0.7, -0.12
InitialPbh = 8.3, 0, 278.5

Camera designing tips

Hereby we provide some tips and tricks for creating or modifying views.

Positioning and zooming

Setting the proper values might be a difficult task. Hereby we introduce a method that helps creating new camera views based on an existing view (in the aircraft.cfg). We will modify the view from within FSX using standard eye point manipulation keys, save the flight and read the modified camera settings from the flight file.

The steps are as follows:

1. Prepare a copy of a suitable camera and perform all necessary modifications to make it unique. The new view still looks like its "parent" view.
2. Make a note with the GUID of the new view. We will use this later.
3. Save the aircraft.cfg file.
4. Reload the aircraft (you should restart the FS if you modify a global camera in the camera.cfg file)
5. Switch to the new view from the menu or by using the view category and item circling hotkeys.
6. Change the position and the zooming using the eye point move and the zoom keys and the view pan control until you get the desired camera view. Be aware that there is fine zooming possibility as well for proper adjustment.
7. Save the flight.
8. Open the flight file (*.FTL) from the users FS folder in an ASCII editor.
9. Search for the corresponding camera data using the saved GUID.
10. Make a note about the Zoom, Translation and Rotation values.
11. Go back to the aircraft.cfg file and adjust the InitialZoom, InitialXYZ and InitialPbh settings as described below. You should understand that Zoom directly contains the desired zoom value, but Translation and Rotation defines difference compared to the values defined in InitialXYZ and InitialPbh.

12. Save the aircraft.cfg file, reload the aircraft and test the view.
13. If necessary repeat the process from step 6 until you get the proper view.

Example calculation:

The calculation below shows that we simply copy the zoom factor from the flight file to the aircraft.cfg file. For the other parameters we get the result by summing the original values in the aircraft.cfg file and the difference values in the flight file.

WARNING: Be aware that while InitialPbh stores values in pitch, bank and heading order, Rotation stores the same values in pitch, heading and bank order.

| Original setting in the aircraft.cfg file | Flight file settings | New settings in the aircraft.cfg file with some rounding |
|---|--------------------------|--|
| InitialZoom = Z1 | Zoom = Z2 | InitialZoom = Z2 |
| InitialXyz= X, Y, Z | Translation = dX, dY, dZ | InitialXyz= X+dX, Y+dY, Z+dZ |
| InitialPbh= P, B, H | Rotation = dP, dH, dB | InitialPbh= P+dP, B+dB, H+dH |

In the example below we are creating the interesting pilot view based on the right wing external view (see images above). We might round the numbers to delete insignificant digits. However be careful as XYZ values are measured in meter, so even the second digits (cm) might have relevance.

| Original setting in the aircraft.cfg file | Flight file settings | New settings in the aircraft.cfg file with some rounding |
|---|---|--|
| InitialZoom = 0.9 | Zoom = 0.80000213 | InitialZoom = 0.8 |
| InitialXyz= 20, 0.7, 0 | Translation = -18.73987113, 0, -0.1204561 | InitialXyz= 1.26, 0.7, -0.12 |
| InitialPbh= 1.5, 0, 266.5 | Rotation = 6.8131066, 11.97547432, 0 | InitialPbh= 8.3, 0, 278.5 |

If you base your new camera on the standard [CameraDefinition.002] “Virtual Cockpit” camera from the global camera.cfg, you don’t even have to make any calculation, as that view is using horizontal, forward viewing eye point exactly from the reference point of the cameras. Just copy and paste the corresponding values from the flight file to the aircraft.cfg file (possibly rounded). In this example we are creating the close-up IFR panel view shown above:

| Original setting in the aircraft.cfg file | Flight file settings | New settings in the aircraft.cfg file with some rounding |
|---|--|--|
| InitialZoom = 0.7 | Zoom = 0.90005023 | InitialZoom = 0.9 |
| InitialXyz is default, not included | Translation = -0.031065, 0, -0.2498407 | InitialXyz= -0.03, 0, -0.25 |
| InitialPbh is default, not included | Rotation = 22.81108716, 0, 0 | InitialPbh= 22.8, 0, 0 |

Placing the camera to the proper file

As we had seen cameras can be defined either globally (camera.cfg) or aircraft specific (aircraft.cfg). FSX defines the basic internal and external cameras into the global file and assigns them hotkeys. It is possibly not wise to delete cameras from the global file, as in this case a general aircraft (where we had not defined substitutes for the removed cameras) might lack some basic views. However we might de-assign the hotkeys from some of these cameras and assign it to the aircraft specific, fine-tuned ones.

Reference points

The view coordinates are measured in a coordinate system that is based on the following references in the aircraft.cfg file:

| | |
|---------------------------------|--|
| reference_datum_position | Longitudinal, lateral, vertical distance in feet from FlightSim Reference position (1/4 chord, centerline, waterline). Defined in the [Weight_and_balance] section. |
| eyepoint | The reference eye point (generally the pilots eyes) relative to the aircrafts datum reference point in feet (longitudinal, lateral, vertical distance). Defined in the [Views] section |

Excerpts from the default C172's aircraft.cfg:

```
[WEIGHT_AND_BALANCE]
reference_datum_position= 3.6, 0, 0

[Views]
eyepoint= -3.95, -0.85, 1.9
```

As the reference eye point is the pilots head, the eye point coordinates of the basic pilot forward views are 0, 0, 0 (meter), thus the InitialXyz parameter is not provided. The pitch, bank and heading for these views is also 0, 0, 0 (degree) thus InitialPbh parameter might be also missing.

WARNING: Be careful as while most distances are measured in feet, InitialXyz parameters should be defined in meters.