

## INTERFACING WITH EXTERNAL HARDWARE

If you've made the investment in the PMDG package, it's a pretty safe bet that you've already got at least one piece of external hardware attached to your system. Many people start with a joystick or control yoke, then add things like rudder pedals, throttle quadrants, and other controllers to give the experience a more immersive feel.

The challenge once the controllers are installed is to make the controller operate the functions you desire, whether they be the joystick axes or the landing gear or the flaps or the lights or...

These functions are generally called EVENTS in FS9, and they are paired up to a keystroke or joystick axis or button in the FS9 Options/Assignments menu. But the PMDG complicates this a bit, because many PMDG functions (like the autopilot) are built "instead of" the FS9 functions and thus cannot be assigned in the FS9 menus. The developers did a lot of work to make many of these advanced functions accessible, but not all of them are addressable.

### Using FSUIPC to assign PMDG functions to joystick buttons

In general, the breakdown between functions that are FS9-based and PMDG-Specific are shown in the table to the right. Many MCP changes (such as changing course) made in the PMDG are "echoed" to the default FS9 autopilot, so external devices that display these values generally will display properly, but some do not.

So, in order to set up your controller, you will need to consider whether the event you want to program is an FS9 event. If it is, you can use the FS9 assignments, or the software that comes with the controller (i.e. the go-flight program) to assign the event. If it's a PMDG function, you'll need to follow this process.

PMDG does allow users to assign unique keystrokes to most PMDG functions, which solves half the problem. The other half – how to get a button to generate the keystroke – is solved using the registered version of FSUIPC.

FS9-Based	PMDG Specific
Radios	Autopilot
Gear	Electrics
Flaps	Hydraulics
Views	Pneumatics
Throttle	Spoilers**
Lights*	EFIS
Barometer	MCP
	FMC
*Hybrid - FS9 events may work but are not reflected in switch/control movement in the PMDG. **Spoiler logic in FS9 is hopelessly inadequate for proper simulation.	

## A Word About FSUIPC

The flight sim community owes a huge debt to Peter Dowson, who created the FSUIPC module to expose a standard interface to the “guts” of flight simulator. This product is what makes things like the PMDG sim, the weather processing packages, the tools for online flying, etc. possible. Buying a product that uses it (like the PMDG) gets you a license that exposes the basic functions and allows the software you purchased to function. But FSUIPC also has many internal functions that help you adjust your simulator to behave the way you wish - which makes it a “must have” item for flight simmers. You need to pay a license fee to unlock these functions, which include;

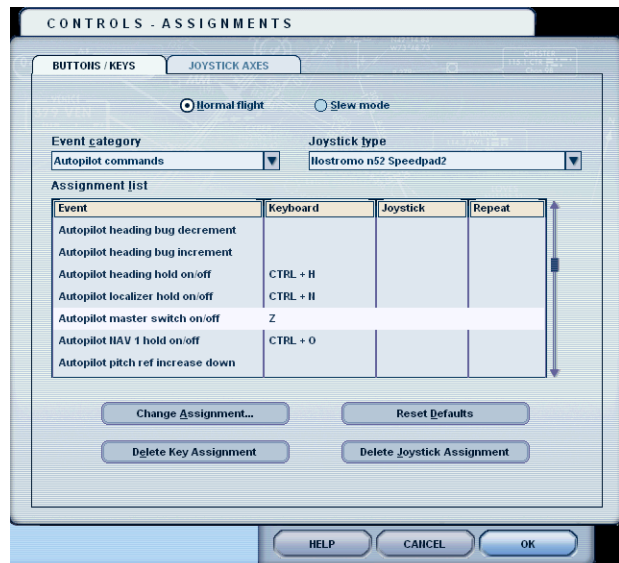
- Sophisticated weather processing
- Joystick/controller calibration and assignment
- Keyboard mapping
- Highly detailed logging
- Interface to multiple computers - so you can run utilities on a separate PC from flight sim and have them communicate over a network.

You must have the registered version to do the control mapping in this chapter - you can find everything you need at <http://www.schiratti.com/dowson.html>.

In this section, we’re going to assign one button on a CH Products Flight Yoke to operate the FS9 autopilot function (and the PMDG autopilot disengage switch), and another button to activate the control wheel steering (CWS) A on the PMDG.

The first step is to assign a common keystroke to the FS9 Autopilot function and to the keystroke used by PMDG for the autopilot disconnect function. We’ll use the “Z” key for this since it’s normally the default in FS9.

Start by verifying the keystroke in FS9. In the FS9 menu bar, select Options, Assignments, and then the Buttons/Keys tab. Select the Autopilot commands in the Event Category, find the Autopilot master switch on/off event, and confirm that the “Z” key is set for the keyboard command – if it’s not, set it by double clicking on the “change assignment” button.



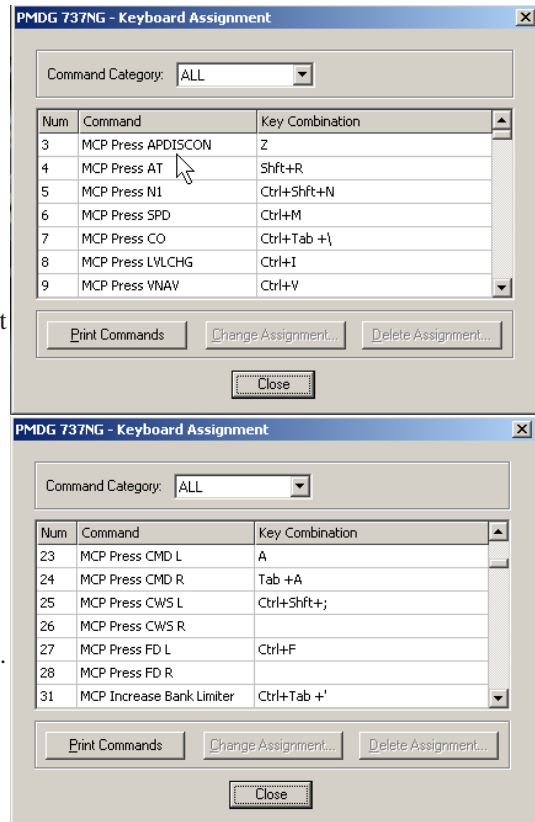
Next, select PMDG in the options bar, and then select General, and then Keyboard Commands. A dialog box will come up and you should set the Z key for the MCP Press AppDiscon function.

While we're in this menu, let's set the CWS A keystroke command as well. Scroll down to number 25 and use "Ctrl+Shft+;" as the keystroke sequence. Close the key assignments box.

Now we've got keystrokes assigned – "Z" to the autopilot disconnect function, and "Ctrl+Shft+;" to the CWS A function. We now have to make the buttons generate the keystrokes.

On your controller, pick two buttons, and make sure they are NOT assigned to any event in the FS9 assignments menu. I am using the two buttons on the top of the left horn of the CH products yoke. The bottom one will be the autopilot disconnect, and the top one will be CWS A.

Now, on the FS9 menu bar, select modules, then FSUIPC. *You must have a registered version of FSUIPC for this step.* Go to the Buttons tab.



Press the button you wish to use for the Autopilot disconnect function.

Check the “Select for key press” box.

Press the Set button – PRESS KEY will appear in the box.

Press the “Z” key, and it will appear in the box.

Make sure the “Key press not to be held” box is checked. – otherwise this will only work for the PMDG aircraft AND livery you’ve got loaded now.

You’ve successfully assigned the button to generate the keystroke. You can now repeat the process with the next button.

Press the button you wish to use to for the CWS A function.

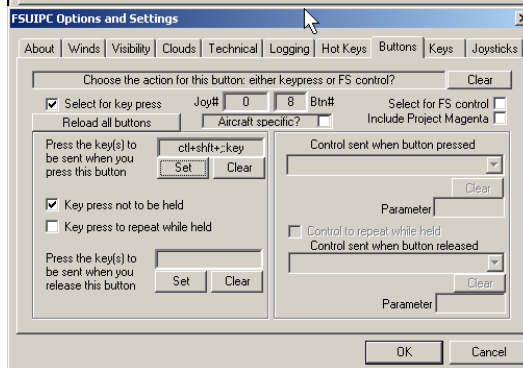
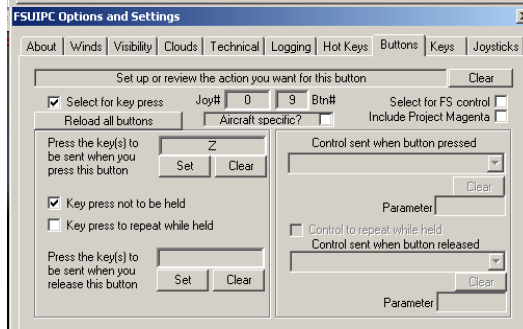
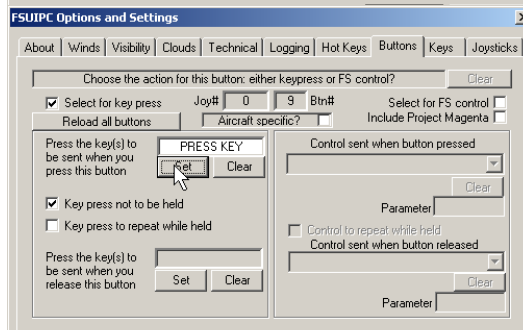
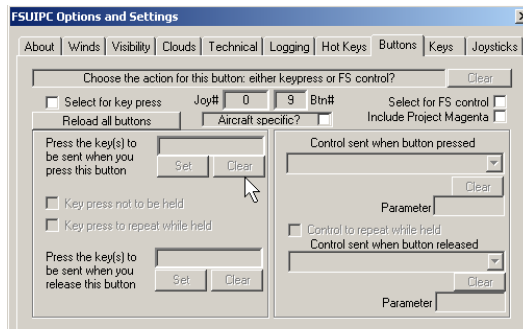
Check the “Select for key press” box.

Press the Set button – PRESS KEY will appear in the box.

Press “Ctrl+Shft+;” and make sure the “Key press not to be held” box is checked. Make sure the “Aircraft specific?” box is cleared.

That’s it – you’ve set your buttons up. The autopilot disconnect button will disconnect the autopilot in PMDG, and will also serve as the autopilot master switch in all other FS9 aircraft. The CWS A button will activate/deactivate the Control Wheel Steering function in the PMDG, and have no effect in other aircraft.

You can repeat this procedure for all the functions that PMDG supports in the keyboard assignments menu, using any device that FSUIPC can recognize as a button press. It’s important to note that if your control device comes with a configuration program (like the Go-Flight devices), you need to tell the config program to NOT assign any functions to the buttons you’re going to use for PMDG functions– or to assign them as generic HID button presses. There’s a good notam at the GoFlight web site on interfacing their devices to the PMDG airplanes.



## A word about GoFlight devices

Speaking of GoFlight - I think it's also necessary to recognize their contributions to the flight sim community. In the past, interfacing hardware controllers to FlightSim required:

- A fair amount of money
- Some programming skills
- Some electronic skills as well

A person would have to build the hardware device, interface it to controller/interface box, and then program the controller software to write the proper values to memory offsets so FSUIPC could recognize it. Some companies that made high-end training devices sold the necessary gear to interface it to Flight Simulator, but it was very expensive - many thousands of dollars for a basic radio panel and throttle. In 2000, GoFlight Inc (<http://www.goflightinc.com>) introduced affordable USB-based modules to simulate things like radios, throttles, and autopilot panels. The beauty of the GoFlight solution is that the modules are relatively inexpensive (hundreds of dollars), they can be added over time as finances permit, and in general they are very flexible - you can assign the various buttons or knobs to whatever function you wish - or set it up to only provide button/axis signals. At the end of this document is my proposed layout for using GoFlight devices with the PMDG - a solution that would cost less than \$1000.00 yet offer a lot of functionality.

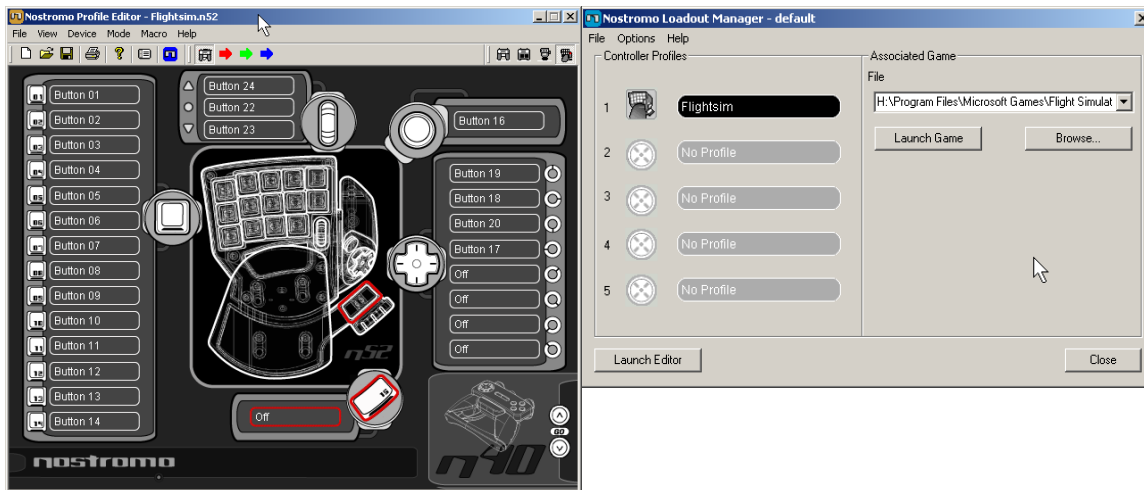
## Using FSUIPC to assign PMDG functions to a different type of controller

For now, I use a pair of GoFlight GF-46 devices to control some FS9 settings - radios, transponder, barometer. The autopilot functions are present in the GF-46 and work well in default aircraft - but they of course don't work with the PMDG Mode Control Panel. So I went and found a cheap solution - I call it the "poor man's MCP".

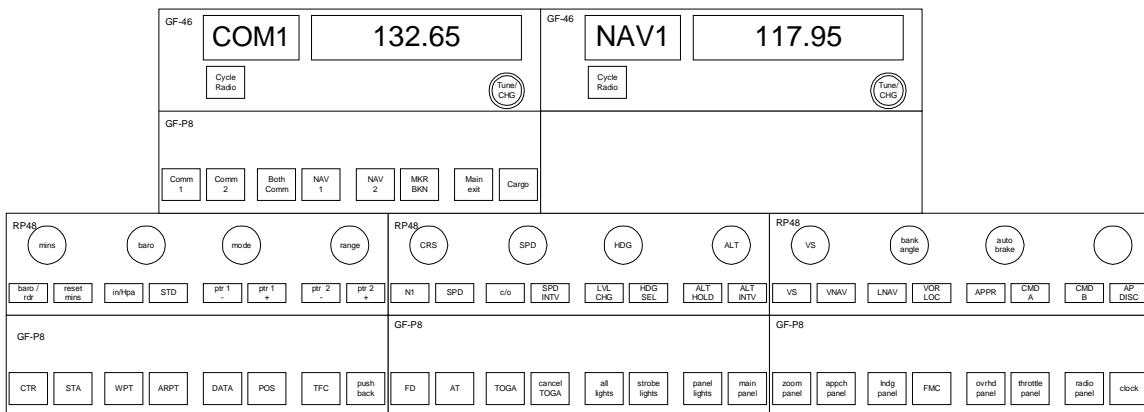
A Belkin Notstromo Speedpad 52 is a controller intended for the PC gamer - to play DOOM and the like. It offers a total of 23 assignable buttons. I used the techniques shown earlier to create most of the MCP buttons, as shown in the picture at right.



The trick to using this device is to set it up to just generate HID button commands, so that they can be assigned in FSUIPC to generate keystrokes. This is done with the Nostromo profile editor, and then the profile is associated with FS9 using the Nostromo Loadout Manager, as shown below. Then it's just a matter of going to FSUIPC and pressing the button and assigning the keystroke.



For your convenience, I've attached the keystroke table I've used for PMDG functions – it works pretty well with the default FS9 keystroke set, with overlap only where I want a button to do the same/similar function in FS9 as it does in the PMDG. I took a fair amount of care to make sure the commands only overlapped with FS9 in situations where it made sense to do so - like the Flight Director on/off switch. Thus as I add controllers I only have to look up the proper keystroke to assign to the button. I've also included the Go-Flight setup I hope to eventually build.



GoFlight Panel  
for PMDG 737NG

### PMDG 737NG - Keyboard Assignment

Num	Command	Key Combination
3	MCP Press APDISCON	Z
4	MCP Press AT	Shft+R
5	MCP Press N1	Ctrl+Shft+N
6	MCP Press SPD	Ctrl+M
7	MCP Press CO	Ctrl+Tab +\
8	MCP Press LVLCHG	Ctrl+I
9	MCP Press VNAV	Ctrl+V
10	MCP Press LNAV	Ctrl+N
11	MCP Press VORLOC	Ctrl+O
12	MCP Press APP	Ctrl+A
13	MCP Press HDGSEL	Ctrl+H
14	MCP Press ALTHLD	Ctrl+Z
15	MCP Press VS	Ctrl+P
23	MCP Press CMD L	A
24	MCP Press CMD R	Tab +A
25	MCP Press CWS L	Ctrl+Shft+;
26	MCP Press CWS R	
27	MCP Press FD L	Ctrl+F
28	MCP Press FD R	
31	MCP Increase Bank Limiter	Ctrl+Tab +'
32	MCP Decrease Bank Limiter	Ctrl+Tab +/
33	MCP Increase Course	Ctrl+Tab +T
34	MCP Decrease Course	Ctrl+Tab +G

**PMDG 737NG - Keyboard Assignment**

Num	Command	Key Combination
35	MCP Increase Altitude	Ctrl+Tab +A
36	MCP Decrease Altitude	Ctrl+Tab +Q
37	MCP Increase Speed	Ctrl+Tab +W
38	MCP Decrease Speed	Ctrl+Tab +S
39	MCP Increase Heading	Ctrl+Tab +E
40	MCP Decrease Heading	Ctrl+Tab +D
41	MCP Increase VS	Ctrl+Tab +R
42	MCP Decrease VS	Ctrl+Tab +F
43	MCP Increase Course Fast	Ctrl+Shft+Tab +T
44	MCP Decrease Course Fast	Ctrl+Shft+Tab +G
45	MCP Increase Altitude Fast	Ctrl+Shft+Tab +A
46	MCP Decrease Altitude Fast	Ctrl+Shft+Tab +Q
47	MCP Increase Speed Fast	Ctrl+Shft+Tab +W
48	MCP Decrease Speed Fast	Ctrl+Shft+Tab +S
49	MCP Increase Hdg Fast	Ctrl+Shft+Tab +E
50	MCP Decrease Hdg Fast	Ctrl+Shft+Tab +D
51	MCP Increase VS Fast	Ctrl+Shft+Tab +R
52	MCP Decrease VS Fast	Ctrl+Shft+Tab +F
53	MCP Set TOGA	Ctrl+Shft+G
54	MCP Reset TOGA	Ctrl+G
55	MCP Press SPD INTV	Ctrl+Tab +Z
56	MCP Press ALT INTV	Ctrl+Tab +X
57	EFIS Press Mins	Ctrl+Tab +C

**PMDG 737NG - Keyboard Assignment**

Num	Command	Key Combination
58	EFIS Increase Mins	Ctrl+Tab +Y
59	EFIS Decrease Mins	Ctrl+Tab +H
61	EFIS Reset Mins	Ctrl+Tab +V
62	EFIS Press Baro	Ctrl+Tab +B
63	EFIS Increase Baro	Ctrl+Tab +U
64	EFIS Decrease Baro	Ctrl+Tab +J
66	EFIS Press Baro STD	Ctrl+Tab +N
67	EFIS Press FPV	Ctrl+Tab +M
68	EFIS Press MTRS	Ctrl+Tab +,
69	EFIS Increase NavL	Ctrl+Tab +I
70	EFIS Decrease NavL	Ctrl+Tab +K
72	EFIS Increase NavR	Ctrl+Tab +O
73	EFIS Decrease NavR	Ctrl+Tab +L
75	EFIS Increase ND Mode	Ctrl+Tab +P
76	EFIS Decrease ND Mode	Ctrl+Tab +;
78	EFIS Press ND Mode CTR	Ctrl+Tab +.
79	EFIS Increase ND Range	Ctrl+Tab +1
80	EFIS Decrease ND Range	Ctrl+Tab +2
82	EFIS Press ND Range TFC	Ctrl+Tab +3
83	EFIS Press WXR	
84	EFIS Press STA	Ctrl+Tab +4
85	EFIS Press WPT	Ctrl+Tab +5
86	EFIS Press ARPT	Ctrl+Tab +6

### PMDG 737NG - Keyboard Assignment

Num	Command	Key Combination
87	EFIS Press DATA	Ctrl+Tab +7
88	EFIS Press POS	Ctrl+Tab +8
89	EFIS Press TERR	
90	Panel Switcher Press M	Ctrl+Shft+Tab +1
91	Panel Switcher Press Z	Ctrl+Shft+Tab +2
92	Panel Switcher Press A	Ctrl+Shft+Tab +3
93	Panel Switcher Press L	Ctrl+Shft+Tab +4
94	Panel Switcher Press F	Ctrl+Shft+Tab +5
95	Panel Switcher Press O	Ctrl+Shft+Tab +6
96	Panel Switcher Press T	Ctrl+Shft+Tab +7
97	Panel Switcher Press R	Ctrl+Shft+Tab +8
98	Panel Switcher Press C	Ctrl+Shft+Tab +9
99	Autobrakes Increase Pos	Ctrl+Shft+Tab +[
100	Autobrakes Decrease Pos	Ctrl+Shft+Tab +]
102	Doors - Open Front Pax	Shft+D
103	Doors - Open Other	Ctrl+Shft+D
104	Pushback - Backwards	Ctrl+Tab +Num 2
105	Pushback - Left	Ctrl+Tab +Num 4
106	Pushback - Right	Ctrl+Tab +Num 6
107	Toggle VC Yoke	
108	Toggle Dome Light	
109	CDU - INIT REF	
110	CDU - RTE	

**PMDG 737NG - Keyboard Assignment**

Num	Command	Key Combination
111	CDU - CLB	
112	CDU - CRZ	
113	CDU - DES	
114	CDU - MENU	
115	CDU - LEGS	
116	CDU - DEP ARR	
117	CDU - HOLD	
118	CDU - PROG	
119	CDU - N1 LIMIT	
120	CDU - FIX	
121	CDU - PREV PAGE	
122	CDU - NEXT PAGE	
123	CDU - EXEC	

