

BAe Jetstream 31 Panel Version 2.0 for MS FS2002

Panel Manual



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[Http://www.baepanelproject.com](http://www.baepanelproject.com)

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1 Some words about the Jetstream 31 panel

"Ever wanted to burn up \$25,000 in six seconds? Here's your chance. If ITT (interstage turbine temperature) exceeds 1,000 degrees Centigrade for more than five seconds during the start sequence, someone gets to pay for a hot section tear-down and inspection." I read this on a special Turboprop website and the only question I had was: „Where is this kick in FS2002?”.

The Jetstream 31 panel based with its gauges and the placing of the gauges exactly on the real aircraft. I had very detailed photos which offers me the possibility to program all gauges as they are and to create a real effigy of the J31 cockpit. For some of the instruments I additionally had information from the manufacturer and from several websites where I found corresponding details of it. Unfortunately photos and posters didn't provide a lot of information about the correct handling of the instruments and the aircraft. For this purpose I had to depend on other sources. I use two AOM's (Beech Kingair 300 and Piper Cheyenne), two type rating handbooks (Cessna 208 and Saab 340) and a couple of further information and handbooks about typical Turboprop operations. For this version 2.0 I've also used a complete Jetstream 41 manual which I've bought a couple of months ago. A lot of procedures and handlings (like the engine start-up for example) are almost the same in both types. Especially the start-up of the TPE 331 engines with it's typical 10% and 60% relays is now exactly as it is in the real J31.

I'm working on the Jetstream 31 panel already since April 2002. If you read the first passage of this introduction again you know why. It was my goal not only to reproduce a real Jetstream 31 cockpit but also to give you the real kick while starting and shutting down the engines as well as the generally feeling of a turboprop engine while handling with this panel. If you've ever concerned with Turboprops you surely heard about hot-starts. Especially the risk of a hot-start excite every Turboprop-Pilot. Normally we're speaking about a discomposure of 20 seconds while starting an engine. If you start the engine this is the period of time a hot-start could happen when making any fault or being careless. In fact the Jetstream 31 has automatic starters which mostly prevents hot-starts nevertheless it's not completely impossible (when trying to start with a battery below 20 Volts for example). This Jetstream 31 panel includes this kick of a hot-start now. I've also programmed wet-starts (a situation in which the fuel-air mixture does not light off initially, but has the capability to ignite) and hung-starts (a situation where the temperature within the turbine section continues to rise, and the compressor RPM stabilizes below normal). Further integrated faults are overtemeperature, overtorque, engine-stall, overcurrent of the generators and reverse current at the battery. Those failures appeared not randomly but only with wrong handlings of the pilot.

I have not included random faults. If you would like to have them you could do it with the realism settings and the system faults of the Flight simulator. All faults I've integrated in this Jetstream 31 panel are not fictitious. They based on real Turboprop faults and every Turboprop-Pilot knows them. But if you follow the checklists and limits of the aircraft precisely you will never be confronted with those failures.

1.1 What's new in Version 2.0?

Since version 2.0 is out, there are two versions of this panel. One is for FS2002 and the other for FS2004. It's not possible to use the FS2004 version in FS2002 and you will still have some problems using the FS2002 version in the new simulator, so please take care that you've downloaded the correct one. Except the antenna bus for Comm 2, both versions have the same functionality in both simulators and you have no disadvantage when still using FS2002.

I could not realize all the things I wrote in the "What's next" chapter of version 1.0. However a couple of things are completely reworked which you may not see when starting this new version for the first time. For version 1.0 users it's very important to keep an eye on the following things and to read the included chapters again:

- Completely new start-up procedure which now matches the real TPE 331 engine start-up (*reworked chapters: complete chapter 4*).
- Completely new radios. The radios based now on the manual of the real Collins radio set including the possibility to store 4 and 6 standby frequencies. The audio panel is also reworked as some flight simmers had problems with the ATC (*reworked chapters: complete chapter 3.3*).
- Version 2. contents now an antenna bus for the radios. This means that if you switch off Nav1 for example you don't have any Nav signal on the DME, RMI, HSI (GS and Loc) or in any other instrument using any antenna signal which passed the radios. Also you don't hear any ATC message when Comm1 is off (*reworked chapters: 3.2.2 - 3.2.4 and the complete chapter 3.3*).
- It's now possible to fly a complete Autopilot ILS approach with Nav1 or Nav2. Nav2 will now hold the localiser and glide sloop signal if the AP and APR is on and the HSI selector is set to Nav2.
- The IEC computer is completely reworked and it's function is now as it is in the real J31. This is also important for the automatic engine start-up (*reworked chapters:3.1.6, 3.1.7, 3.2.8 and 4.1.2*).

2 Installation

Like with all other Flight Simulator Add-ons it's very important, that you exactly follow this Installation description step by step. When you start an Aircraft with this Panel and something didn't work it's mostly the reason of an overlooked part of the installation manual.

Another reason is, that this Panel has a lot of special functions which just could be used when you change some parts also in the Aircraft.cfg. Everything you have to do is precisely described in this section.

Do not install the Panel and all files of this Panel when the Flight Simulator is running. First exit FS2002 and then follow the next steps!

Another very important thing is NOT to use any automatic Flightsim Addon installers or any program which unzips all files automatically to the correct folders!

2.1 Installation of the Panel files

- Unzip all files of the Panel.zip into the panel folder of your Jetstream 31 aircraft. If you already installed version 1.0 please replace all older files!
- Unzip Gauges.zip into the gauges folder of your FS2002.

Take care, that you also unzip the file ML-J31FS02v2.cab into the gauges folder. Do not unzip the cab file itself. The Flight Simulator unzips this cab file automatically when he needs it. Just take care, that the file is in your gauges folder!

I've included the newest version of Dai Griffith's GPWS. If you already have the files dfd_gpws.gau and dfd_yg7500.gau please replace them!

- Unzip Sounds.zip into the main Sound directory of the Flight Simulator. **Do NOT use the Sound folder of the Aircraft!**
- Unzip FSSound.dll into the Modules folder of FS2002

The included FSSound.dll is surely not the newest one but works on my computer without any problems (never change a running system). If you have a newer version of the module file you don't need to replace it.

2.2 Preparing your Aircraft for this Panel

The Jetstream 31 panel is a very complex panel containing a lot of functions which needs an own aircraft.cfg and airfile to bring them all to work. That's why I have included two new FDE sets for the already existing FS2002 Jetstreams of the Historic Jetliners Group (HJG) and Jorge Sánchez. Please take care that you use them. Otherwise the panel will not work correctly.

I have included the files for:

Jorge_Sanchez_Airfiles.zip

Replacement FDE's for all of Jorge Sánchez Jetstream 31.

HJG_Airfiles.zip

Replacement FDE's for all Jetstream 31 of the Historic Jetliners Group (HJG)

Before you install the new flightdynamics take care to make a Backup of the existing files. Files for the backup are Aircraft.cfg and the *****.air file.

For example:

Rename the file Aircraft.cfg into Old_Aircraft.cfg

Rename the file J31.air into Old_J31.air

(The name of the *.air file could be different)

Then unzip all files of the corresponding zipfile into the aircraft folder which contents your Jetstream 31.

Then open your backup Aircraft.cfg with the Microsoft Editor (Notepad) and copy the complete section [fltsim.0] from this file. Now open the new Aircraft.cfg with the Editor (Notepad) and replace the [fltsim.0] with the one you've copied from your Backup file. However it could be that you have more different aircraft in one aircraft folder. Every separate aircraft starts with the entry [fltsim.0] than [fltsim.1] than [fltsim.2] and so on. Of course than you have to copy all of these sections into the new Aircraft.cfg.

For example:

Here is an example of a complete [fltsim.0] section:

```
[fltsim.0]
title=JetStream 31
sim=Jetstream
model=
panel=
sound=
texture=
kb_checklists=
kb_reference=
atc_type=CA
atc_id_enable=1
atc_id=HK8490W
ui_manufacturer=Bae
ui_type=Jetstream 31
ui_variation=Caleña
description=The Jetstream 31 and the Jetstream 32EP .....
atc_flight_number=
atc_airline=Caleña
atc_heavy=0
```

The last thing to do is to give the new Airfile J31.air the same name like the former one had. If your former airfile was named rename the new J31.air into Jetstream31.air.

For example:

Your old Airfile was named Jetstream31.air. Than you have renamed it into Old_Jetstream31.air. After that you've installed the file J31.air from the corresponding zipfile. Now rename the file J31.air into Jetstream31.air.

That's it. Now you can start FS2002 again.

2.3 Using the additional Panel.cfg's

This Jetstream 31 panel package contains a couple of different panel configurations. Those configurations are:

Panel.cfg	This is the standard panel config file. It includes a cold and dark cockpit when starting the panel in the Flight simulator and a complete GPWS system.
CAD_GPWS_panel.cfg	The same as above (just a copy of it).
No_CaD_No_GPWS_panel.cfg	This panel configuration file contains no cold and dark cockpit (if you choose your Jetstream 31 while the engines are running they stay on) and it has no GPWS system.
CaD_No_GPWS_panel.cfg	This panel configuration has a cold and dark cockpit when starting the engines but it includes no GPWS system.
No_CAD_GPWS_panel.cfg	This panel configuration file contains no cold and dark cockpit (if you choose your Jetstream 31 while the engines are running they stay on) but it has the complete GPWS system.

If you would like to change your configuration just make a backup of your panel.cfg (for example: rename it into old_panel.cfg) choose the one you would like to use from the above list and rename this configuration file into panel.cfg. You find the above listed alternative configuration files in the panel folder of your Jetstream 31 aircraft.

Additional Notes

The cold and dark configuration files switch off both engines, the complete electric system and the complete fuel system. It's not possible to switch off the hydraulics at the moment. That's why both hydraulic valves are open with an installed cold and dark version.

As I've used the background images from the GPWS system in the main panel bitmap you will see them if they are installed or not. However if you have chosen a version without GPWS you won't hear it.

2.4 Additionally highly recommended and optional files

Aircraft

There are two very good Jetstream 31, Jetstream 32 and HP-137 available in the web at the moment. The first one is from the Historic Jetliners Group (HJG) and can be found on their own website <http://avsim.com/hjg/> .

Another very good model is from Jorge Sánchez and could be found on a couple of freeware servers, like <http://www.flightsim.com> or <http://avsim.com/> .

At the moment I'm also preparing a complete Aircraft-Sound package for the Jetstream 31 in the colours of the German Filder Air Service and Contactair. The repaints are done by Dan Watkins with Jorge Sánchez' J31. The package will be available within the next weeks.

Sounds

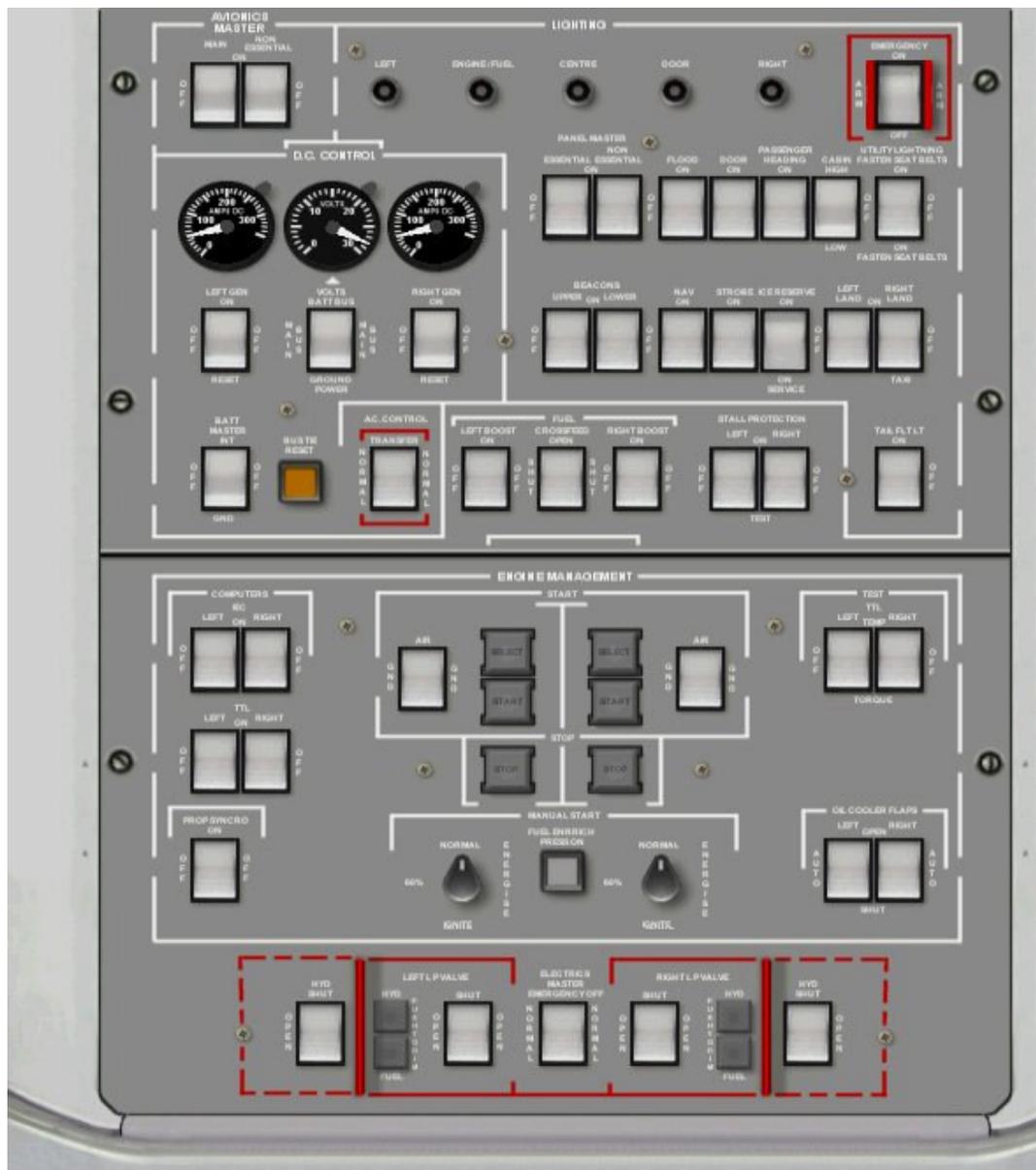
There is a very good soundest available for the Jetstream 31 and 41 from Aaron R. Swindle, Skysong Soundworks based on the recordings from Mike Hambly. You will find this soundest on <http://www.flightsim.com> (j41snz.zip).

Aircraft Operation Manual (AOM)

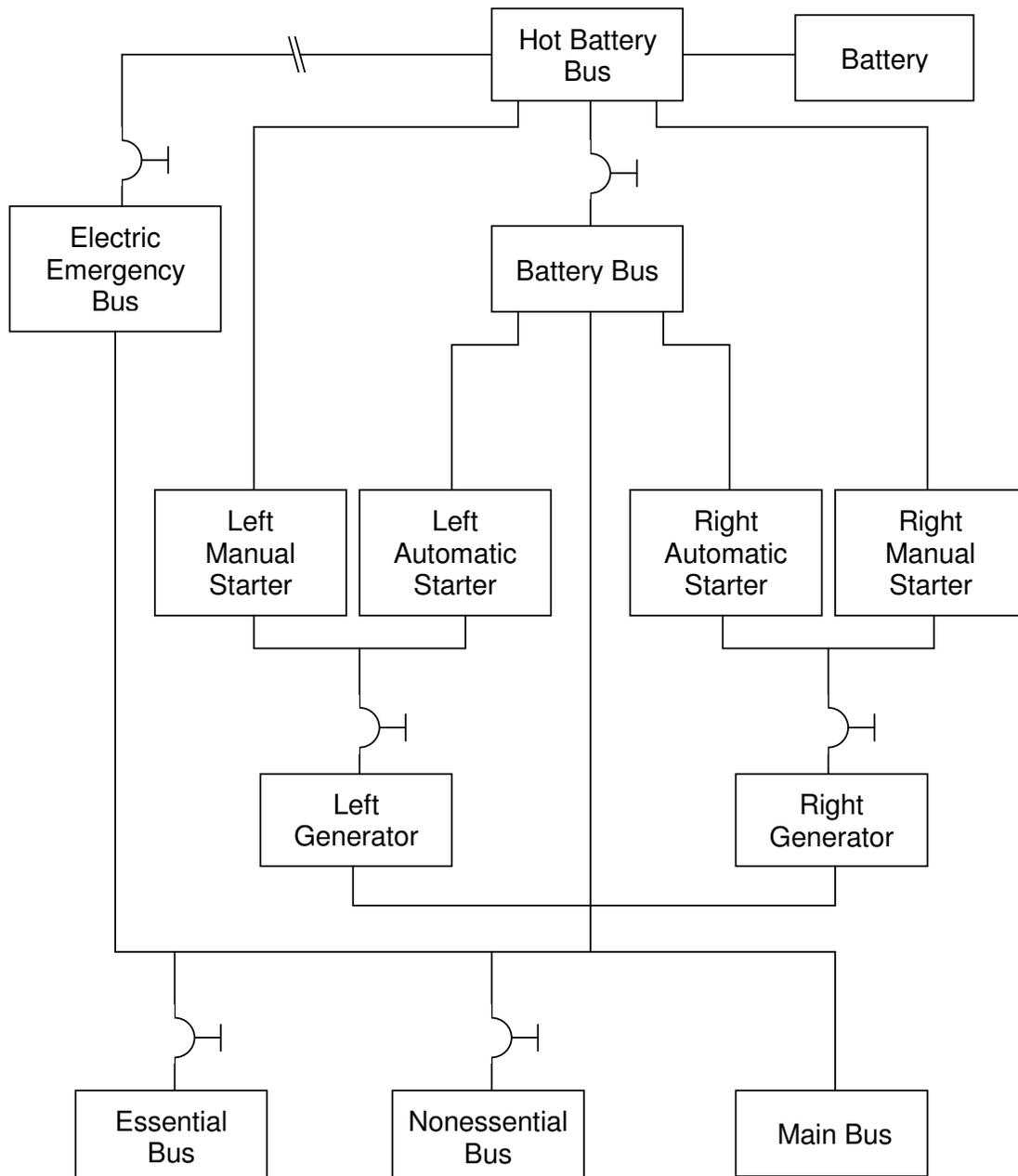
As this manual is just a cockpit manual you may also want to know more about the handling procedures of the Jetstream 31. There is a very good Jetstream 31 manual available in the web and could be found on the website of the Virtual Coast Air <http://www.virtualcoastair.org/> (Aircraft and Scenery – VCA Aircraft – FS2002 STD/Pro). The manual contents all procedures, speed and weight tables and checklists for the Jetstream 31 and based on the real J31 manual (please see also the Credit section of this manual).

3 Panel Description

3.1 The Overhead Panel



3.1.1 The Jetstream 31 Electrical System



3.1.2 Electrical allocation of the Jetstream 31 Gauges

Main Bus Instruments

- Main Attitude
- Generator Ammeter
- Voltmeter
- Torque Indicator
- NG Indicator
- ITT Indicator
- Oil Cooling Flaps
- Oil Indicator
- Fuel Pressure Indicator
- Fuel Flow Indicator
- Fuel Flow Digital Readout
- Fuel Indicator
- Fuel Enrich Pressure
- Main Annunciator
- Warning Lights
- Cabin Altimeter
- Cabin VSI
- Deice System
- Flaps
- Gear
- Lights
- Automatic Engine Starters

Essential Bus Instruments

- Attitude GS and Loc
- Airspeed Indicator
- Altimeter
- Vertical Speed Indicator
- HSI
- RMI
- OMI
- OAT
- IEC / TTL Computer
- IEC / TTL Annunciators
- Hydraulic Indicators
- Flap Indicator
- Acoustic System
- Autopilot
- GPWS
- Audio Panel

Nonessential Bus Instruments

- Standby Attitude
- Radio Altimeter
- DME
- Nav 1
- Nav 2
- Comm 1
- Comm 2
- ADF 1
- ADF 2
- Transponder
- Autopilot Annunciator
- Altitude Selector
- Weather Radar

Hot Battery Bus Instruments

- Clock
- Flood Light
- Manual Engine Starters

Instruments additionally supported by the Electric Emergency Bus

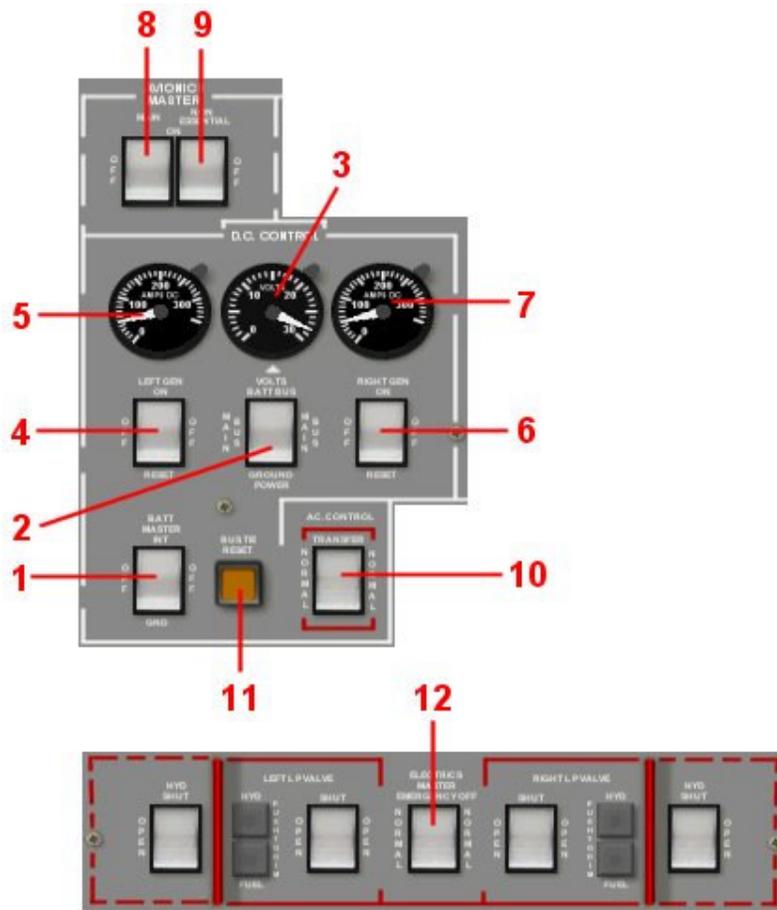
- Attitude
- Airspeed Indicator
- Altimeter
- Vertical Speed Indicator
- Standby Attitude
- OAT
- Torque Indicator
- NG Indicator
- ITT Indicator
- Fuel Flow Indicator
- Fuel Flow Digital Readout
- Fuel Indicator
- Oil Cooling Flaps
- Transponder
- Nav 1
- Nav 2
- Comm 1
- Comm 2
- ADF 1
- ADF 2
- DME
- Altitude Selector
- Weather Radar
- Hydraulic Indicators
- Fuel Enrich Pressure
- Flaps
- Main Annunciator
- Warning Lights

Additional Notes

The electric system graphic and the allocation of the gauges did not base on the real Jetstream 31. The graphic and allocations are just for this panel.

As I didn't know the energy source of the real J31 electrical emergency system I decide to integrate a second emergency battery (not time limited yet) therefore. This battery provides electrical power to the primary and engine instruments. On this way you also could use those instruments even if the battery or main electrical system faults. Using the manual starters it's possible to restart a burnout engine in flight and to have enough electrical power for an emergency landing. The electrical emergency bus did not provide enough power for the automatic starters and navigation instruments.

3.1.3 The Electric Unit



1	Master battery switch.
2	Voltmeter mode switch. Up = Battery Volts, Center = Main Bus Volts, Down = GPU Volts (this panel didn't support a GPU!).
3	Voltmeter. Shows Battery or Main Bus Voltage according to what is selected with the mode switch pos. 2.
4	Left generator switch. Up = Generator On, Center = Generator Off, Down = Generator Reset.
5	Left generator amperemeter.

6	Right generator switch. Up = Generator On, center = generator Off, down = Generator reset.
7	Right generator amperemeter.
8	Main avionic switch.
9	Non essential avionic switch (radios, DME, weather radar, standby attitude and the analog radio altimeter).
10	AC transfer switch. If the switch is in transfer position a running generator will charge the battery.
11	Bus tie lamp and reset switch. This lamp illuminates after starting an engine to remind the pilot for charging the battery. The lamp could and should just switched of (by pressing on it) after the battery is charged with the transfer switch pos. 10.
12	Electric master emergency switch. With the switch in "Normal" position you have enough voltage to run the primary and non essential instruments even if the generators or the battery fault. The emergency power does not provide enough power to start a cold engine!

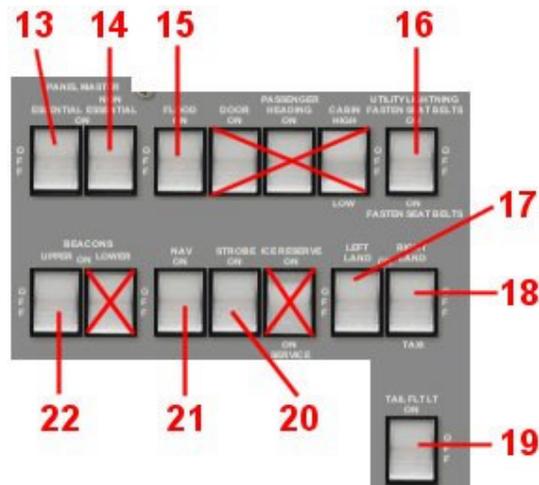
Additional Notes

The bus tie lamp (pos. 11) just works if it has electrical power from the battery, a running generator or from the electrical emergency system.

The function of the bus tie switch/lamp (pos. 11) and the non essential avionic switch (pos. 9) do not base on the real Jetstream 31. The real Jetstream 31 has a main and essential avionic switch here. At the moment I've just realized the hot-battery bus, emergency bus, essential bus and non essential bus for this panel. In a future version I will fragment the essential bus into essential and main busses and integrate also a working bus tie function.

As the panel didn't support a GPU at the moment the voltmeter shows "0" when the voltmeter mode switch is set to "Ground Power".

3.1.4 The Light Switches



13	Essential avionic light switch.
14	Non essential avionic light switch (radios, DME, weather radar, standby attitude and the analog radio altimeter).
15	Cockpit flood light, roof light and spotlight switch.
16	Fasten seatbelts sign and light switch
17	Landing light switch
18	Taxi light switch.
19	Logo light switch
20	Strobe light switch
21	Navigation light switch
22	Rotary beacon light switch

Additional Notes

The red crossed switches have no function yet. There are also no dummies included.

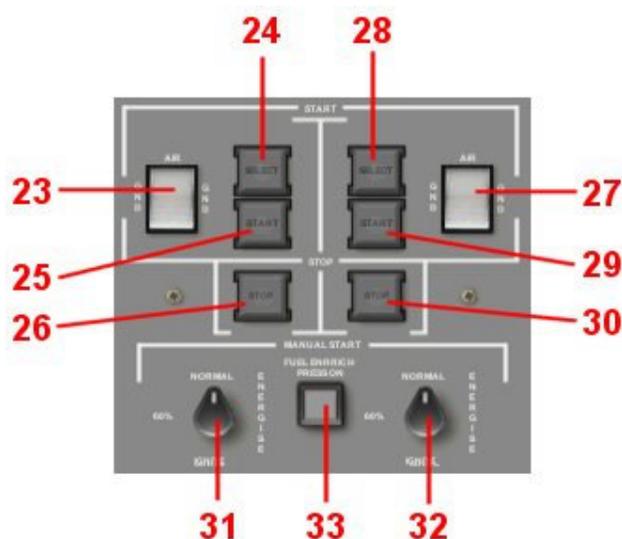
In the real Jetstream 31 you have two separate landing light switches. One of it has also a position for the taxi lights. I did not include this double function of one switch as the Flight simulator also didn't support two separate landing lights (in the 747 this is just a dummy). Take care that the on position of the taxi light switch (pos. 18) is down and the on position of the landing light switch (pos. 17) is up.

The light switches for the essential and non essential avionics are really just light switches. They do not switch on or off the avionics. This means exactly that you just switch on the illumination of the essential avionics (primary and engine gauges) and the non essential avionics (radios, DME, weather radar, standby attitude and the analog radio altimeter).

To illuminate the standby attitude and the radio altimeter it's necessary to switch on both avionic light switches.

After switching on or off the panel flood light (pos. 15) it could be that you see strange values in several instruments. This is because the gauge for the illumination lies below the other gauges of the panel. To solve this just switch on or off the essential avionic lights (pos. 13) after switching on or off the flood light.

3.1.5 The Engine Start Unit



23	Left engine Air/Ground starter selector. Take care that the switch is at the correct position when starting the engine (Air = aircraft flying GND = aircraft on ground). With this switch the starters adjust the necessary power.
24	Left engine starter selector.
25	Left engine starter.
26	Left engine automatic shutdown switch.
27	Right engine Air/Ground starter selector. Take care that the switch is at the correct position when starting the engine (Air = aircraft flying GND = aircraft on ground). With this switch the starters adjust the necessary power.
28	Right engine starter selector.
29	Right engine starter.
30	Right engine automatic shutdown switch.
31	Ignition switch one.
32	Ignition switch two.
33	Fuel enrich switch.

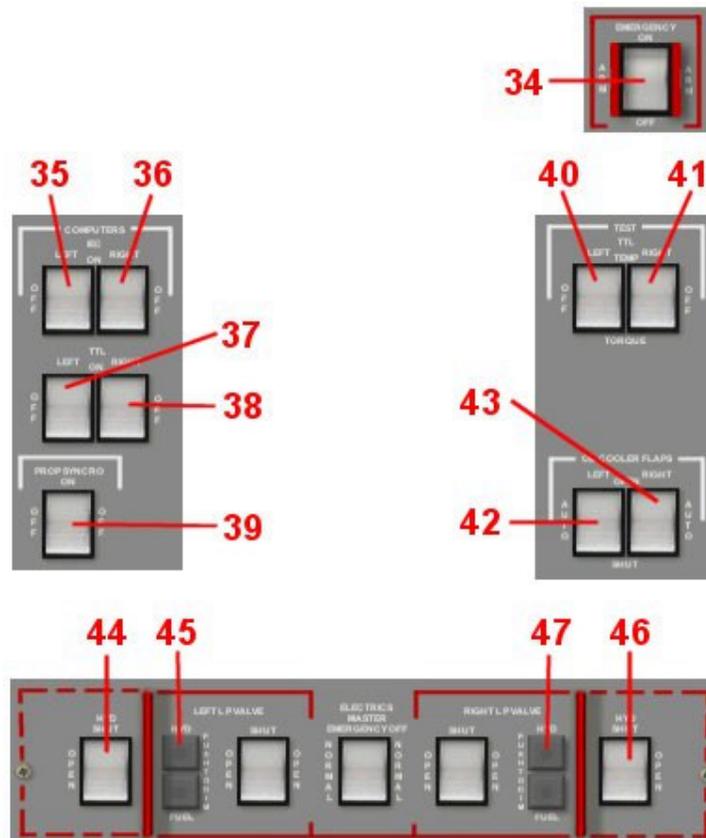
Additional Notes

The lights of the engine selectors, starter switches and automatic engine stop will just illuminate if they have electrical power from the battery, generators or from the electrical emergency system. An automatic start requires at least 20 Volts from the battery or from the cross generator to work.

The Jetstream 31 has two igniter boxes and two igniter plugs per engine. Each of those igniters could be used separately with the two ignition switches (31 or 32) in the overhead panel. This means exactly that you did not select the left engine automatically when using the left ignition switch. Each of the two igniters could be used for both engines. Which engine will be ignited could will be regulated with the starters (pos. 25 and 29).

Please read the start-up procedures of the Jetstream 31 in this manual very carefully to provide hot-, wet- or hung-starts and to know what function every of these switches have. You will find detailed descriptions and useful hints there.

3.1.6 Further Switches in the Overhead Panel



34	This (just painted) switch has two positions. If you click in the upper area of the switch you will reload the aircraft and on this way reload the battery. If you click on the lower area you will reset engine faults and overcurrents (a very unsportsmanlike method after an expensive damage of an engine).
35	Left engine IEC (Integrated Electronic Control) computer (for further descriptions please see next chapter).
36	Right engine IEC (Integrated Electronic Control) computer (for further descriptions please see next chapter).
37	Left Engine TTL computer. This computer limits the maximum thrust for the left engine referring to the maximum allowable torque and temperature.

38	Right Engine TTL computer. This computer limits the maximum thrust for the left engine referring to the maximum allowable torque and temperature.
39	Propeller synchro switch.
40	Left TTL test switch. When pressing on the “Temp” position the left ITT indicator shows the maximum allowable temperature. When pressing the “Torque” position of the switch you can see the maximum allowable torque in the left torque gauge of the engine instruments. It’s not necessary to press the switch all the time. The switch goes back to the “Off” position automatically after a couple of seconds.
41	Right TTL test switch (description see left TTL test switch pos. 40).
42	Switch for the left oil cooling flaps. Shut = Oil cooling flaps are closed, Auto = oil cooling flaps opens when necessary (normally at 40° C), Open = oil cooling flaps are opened.
43	Switch for the right oil cooling flaps. Shut = Oil cooling flaps are closed, Auto = oil cooling flaps opens when necessary (normally at 40° C), Open = oil cooling flaps are opened.
44	Switch for the left hydraulic valve. The left hydraulic system is responsible for the complete brake pressure (brakes and parking brakes). If they are off the hydraulic brakes and parking brakes do not work.
45	Warning light for the left hydraulic system. This lamp illuminates when there is a fault in the left hydraulic system or if the left hydraulic system is off.
46	Switch for the right hydraulic valve. The right hydraulic system is responsible for the remaining hydraulic units. Also the aileron, elevator and rudder will not work correct when the right hydraulic system is off.
47	Warning light for the right hydraulic system. This lamp illuminates when there is a fault in the right hydraulic system or if the right hydraulic system is off.

Additional Notes

The hydraulic warning lights (pos. 45 and 47) will just illuminate if they have electrical power from the battery, generators or from the electrical emergency system.

IMPORTANT: Take care not to change or reload the aircraft when the hydraulic valves are shut. If you do this and load the Jetstream 31 panel a second time you will either have no hydraulic for the controls or the warning lights will show strange values.

3.1.7 Description of the IEC and TTL computers

Modern aircraft have FADEC and EEC systems to control the engine and help the pilot to take care that they will not be overheated or overstressed. The Jetstream 31 is a couple of years older. However this aircraft has two computers which will do something similar.

The IEC (Integrated Electronic Control) is a digital electronic control unit which includes engine control and data record functions. In the Jetstream 31 panel I've included the following operation functions of the IEC computer:

- Automatic start sequence for the Autostarters
- Fuel Enrichment (only for autostarts)
- TTL: (conditioned torque signal and ITT signal send to fuel reducing torque motor)

This means exactly that if the IEC computer is switched off you could not start the engines with the Autostarters (only the manual starters work) and the TTL does not work.

If the TTL computer of the Jetstream 31 is activated it's not possible to overtorque the engine or to reach a too high ITT temperature. This function is especially in dangerous situations, like take offs, very important. Especially during a takeoff it's easy to run the engine with more than 100% torque or more than 650°C ITT. When the TTL computer is on now this computer limits the maximum thrust of the corresponding engine to 100% torque. The IEC computer scans the ITT temperature and then limits the thrust according to the maximum ITT temperature for the corresponding engine.

As against modern FADEC and EEC systems the TTL computers are no automatic engine control to regulate the power. They just limit the thrust to the maximum torque or temperature. When you reach a higher altitude where more power is allowed to reach the maximum torque or temperature the systems don't readjust the throttle or thrust. The pilot has to do this manually with the throttles. So it's anyway important to scan the engine instruments if the computers are on or off.

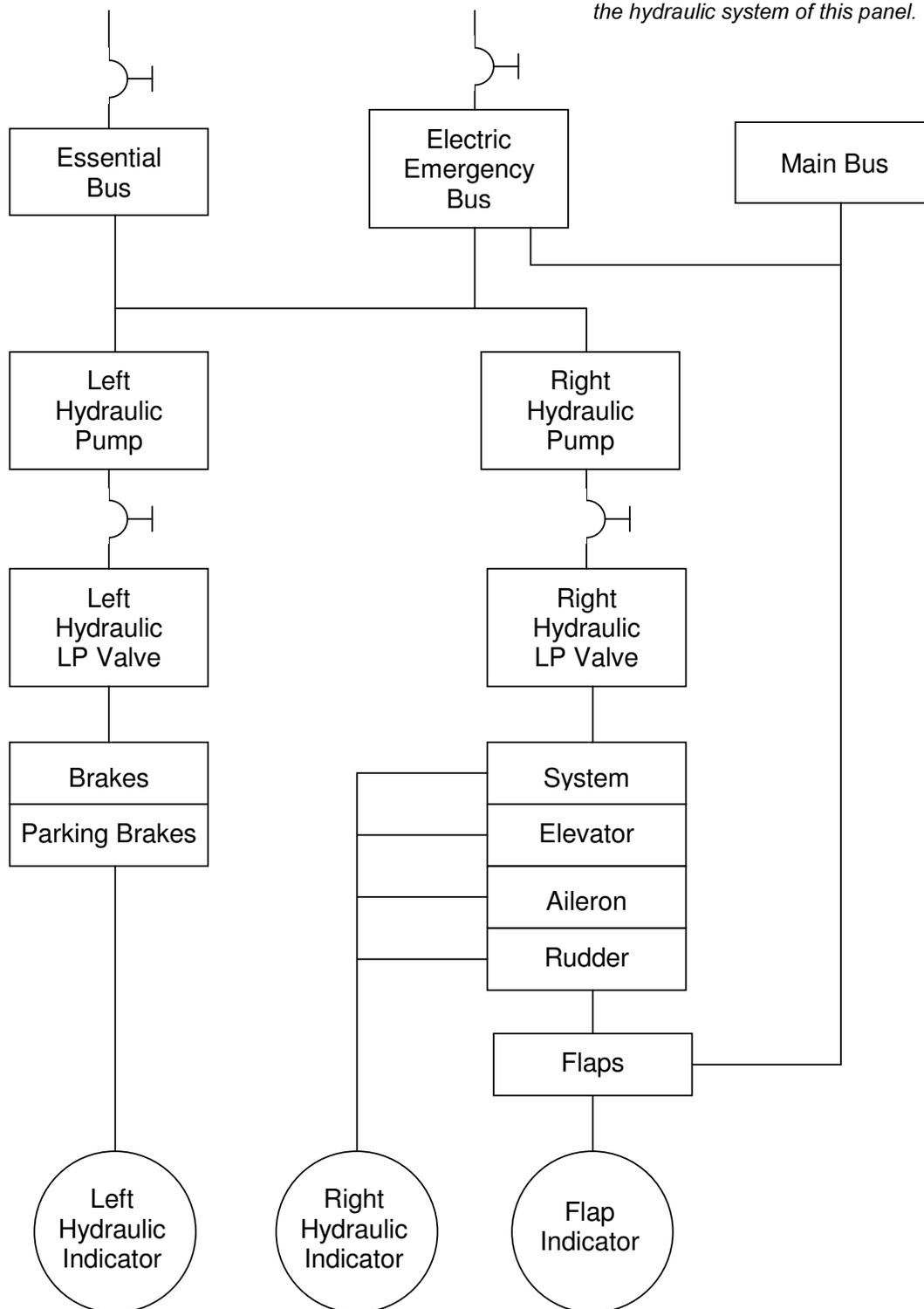
In higher altitudes where you normally do not reach the maximum torque or temperature the TTL computers make no sense and should be switched off (normally at 14000 feet).

The TTL computers should also not be used in abnormal situations, while a go-around or if a short takeoff is necessary. But take care. Especially for short runways it's possible to overtemp and overtorque the engine for a short time. But latest after 2,5 minutes the engines should run with normal and allowed values. Otherwise it's possible to damage the engine.

Both computers are part of the essential avionic bus. If the essential avionic bus or the main electrical system faults the IEC and TTL computers didn't work. As both computers needs a lot of electrical power they are not part of the electrical emergency bus.

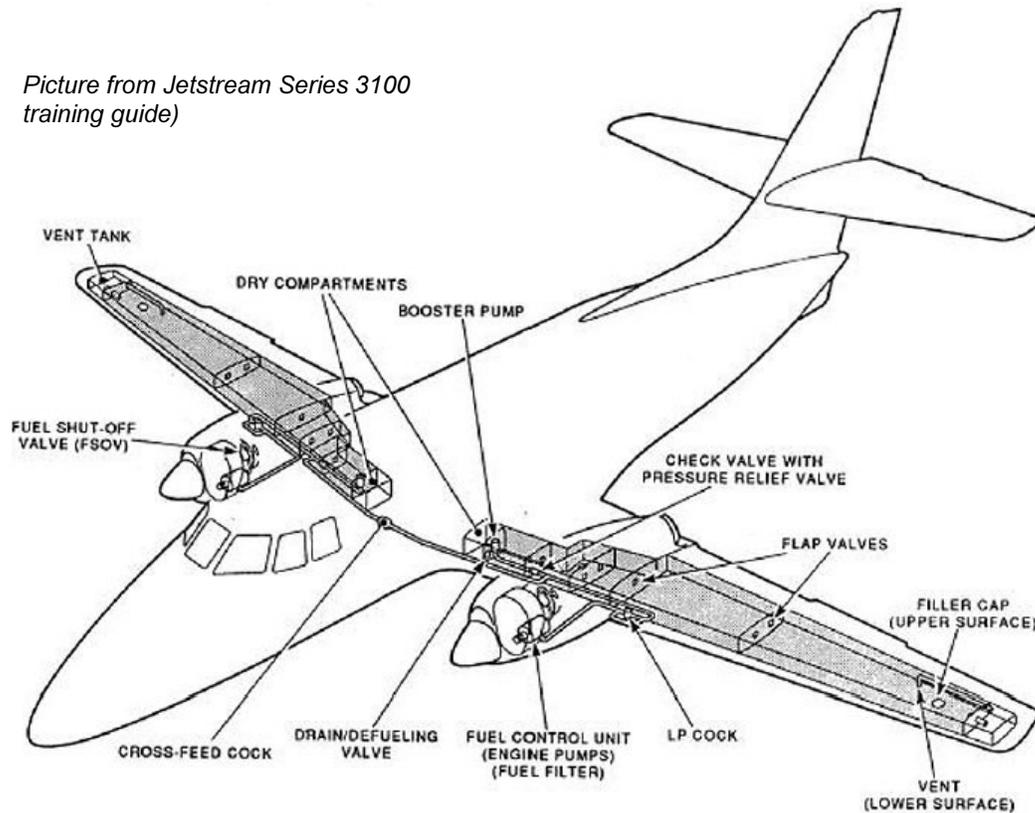
3.1.8 The Jetstream 31 Hydraulic System

This hydraulic diagram did not base on the real J31 diagram. It just shows the hydraulic system of this panel.

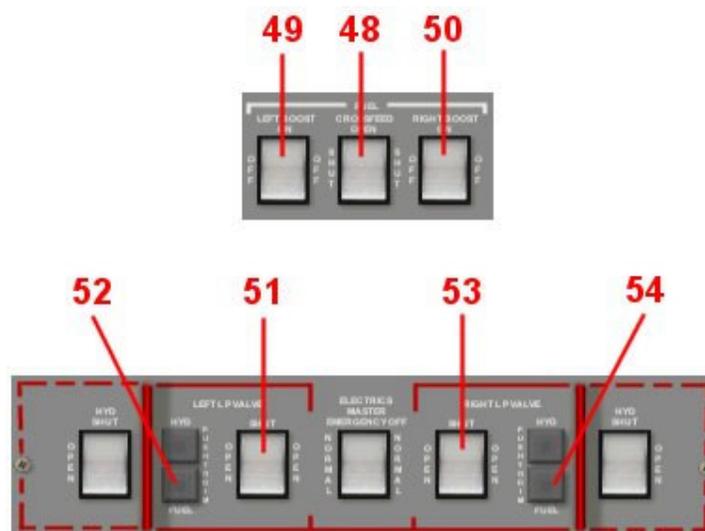


3.1.9 The Jetstream 31 Fuel System

Picture from Jetstream Series 3100 training guide)



3.1.10 Switches for the Fuel System in the Overhead Panel



48	Fuel crossfeed valve switch (X-Feed valve). With an opened fuel crossfeed valve it's possible to provide the left or right engine with fuel from the contrary wing tank. The power of the left or right boost pump is also enough to start an engine just with one boost pump. With an opened crossfeed valve the working boost pump will provide enough fuel to the contrary engine.
49	Left electrical boost pump.
50	Right electrical boost pump.
51	Left low pressure (LP) fuel valve switch. The fuel is pressurized by the boost pumps in the tanks and the flows through the low pressure fuel valve to the engine LP fuel pump inlet. With this switch the low pressure valve could be opened or closed. A closed LP valve will automatically shut down the engine as no fuel flows into the inlet area.
52	Left low pressure fuel valve warning light. This lamp illuminates when the left low pressure fuel valve is closed.
53	Right low pressure fuel valve switch. For description see left side (pos. 51).
54	Right low pressure fuel valve warning light. This lamp illuminates when the right low pressure fuel valve is closed.

Additional Notes

The left and right low pressure fuel valve warning lights (pos. 52 and 54) will just illuminate if they have electrical power from the battery, a running generator or from the electrical emergency system.

For a correct handling of the complete fuel unit it's important to read the detailed start-up part of this manual. A wrong handling of the fuel unit can shut down or damage the engine on ground or in flight.

3.2 Main Panel

3.2.1 HSI Selector Switch

NAV1 set to the pilots attitude and HSI and NAV2 is set to the copilots attitude and HSI



NAV2 set to the pilots attitude and HSI and NAV1 is set to the copilots attitude and HSI

55	HSI selector switch.
56	Warning light for the HSI selector switch (illuminates if Nav2 is set to the pilot's side).

If the HSI selector switch (pos. 55) is in left position the pilot's HSI and Attitude are adjusted for Nav1 and the copilot's HSI and Attitude are adjusted to Nav2. When the switch is in the right position Nav2 is selected for the pilot's panel and the red warning light (pos. 56) illuminates. On this way normally the copilot's HSI and Attitude are adjusted to Nav1. This Jetstream 31 panel didn't include a copilot panel so you just see what's selected for the pilot's HSI and Attitude.

The left position of the above picture shows Nav1 and the right position shows Nav2 (warning light illuminates) adjusted for the pilot's side.

Additional Notes

The warning light for the HSI selector (pos. 56) just works if it has electrical power from the battery, generators or from the electrical emergency system.

3.2.2 The primary Attitude



Attitude provided with electrical power and pressure

Attitude not provided with electrical power and pressure

57	Flight director bars.
58	Flight director off flag. Visible when flight director is switched off.
59	Glide slope indicator.
60	Glide slope indicator off flag. Visible when the selected Nav (with the switch pos. 55) has no Glide slope.
61	Digital radio altimeter.
62	Localizer Indicator.
63	Ball
64	Digital decision height readout.
65	Attitude off flag. Visible if the attitude has a fault or if no power is provided.

Additional Notes

BAe used a couple of different attitudes in the entire construction period. I've decided to use an attitude which was used from BAe in one of the latest Jetstream 31. This attitude is based exactly on the real one.

The glide slope and localizer indicators (pos. 59 and 62) show the glide slope and localizer of Nav1 or Nav2. If Nav1 is selected with the switch pos. 55 (warning lamp pos. 56 is off) both indicators are selected to Nav1. If Nav2 is selected (warning lamp pos. 56 is on) both indicators are selected to the glide slope and localizer of Nav2.

As the Jetstream 31 panel now contains also an antenna bus the glide slope and localizer indicators (pos. 59 and 62) just work if the corresponding Nav1 or Nav2 radio is on. For example: If the HSI selector pos. 55 is set to Nav1 on the pilot's side and Nav1 radio or the non-essential avionics bus is off you have no glide slope or localizer signal in the attitude.

3.2.3 The Horizontal Situation Indicator (HSI)



HSI provided with electrical power.

HSI not provided with electrical power.

66	Digital readout for the current aircraft heading.
67	Localizer needle
68	Digital DME (Nm) for Nav1 or Nav2.
69	Heading bug.
70	To / from flag.
71	Glide sloop indicator for Nav1 or Nav2.
72	Localizer off flag. Visible if Nav1 or Nav2 receives no localizer information.
73	HSI off flag. Visible if the HSI is fault or has no electrical power.
74	Glide sloop off flag. Visible if Nav1 or Nav2 receives no glide sloop information.
75	Setting knob for the course of Nav1 or Nav2.
76	Setting knob for the heading bug (necessary for autopilot HDG hold).

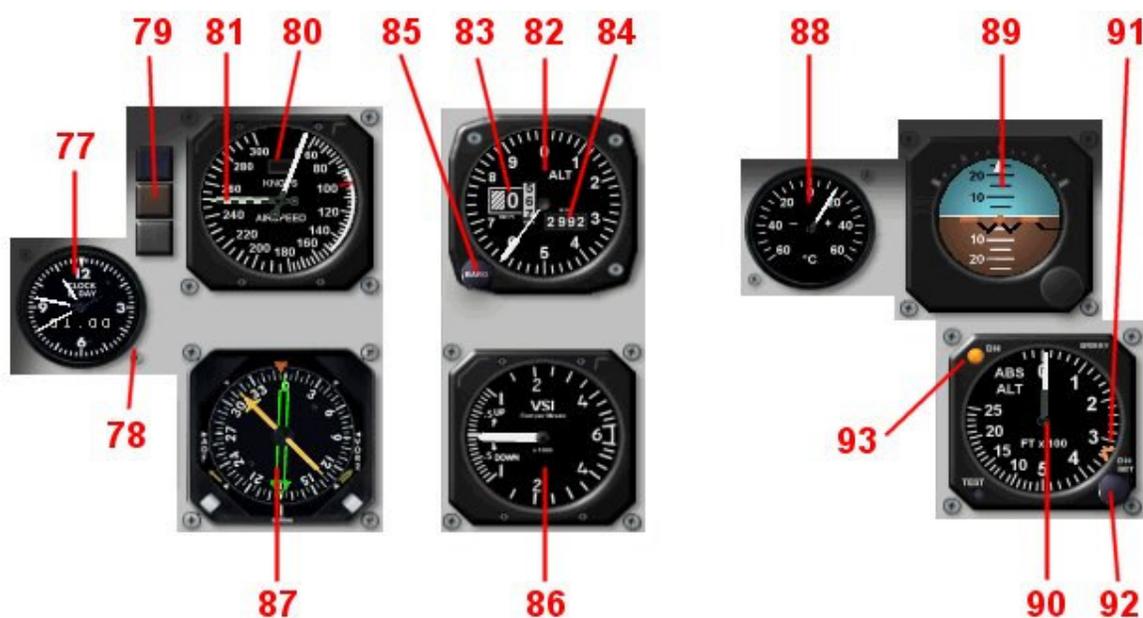
Additional Notes

BAe used a couple of different HSI's in the entire construction period. I've decide to use a HSI which was used from BAe in one of the latest Jetstream 31. This HSI based exactly on the real one.

The HSI could be adjusted for Nav1 or Nav2. When the HSI selector switch pos. 55 is set to Nav1 (warning light pos. 56 is off) the complete HSI shows all information for Nav1 (DME, course glide sloop and localizer). When Nav2 is selected (warning light pos. 56 is on) the HSI shows the information from Nav2 (DME, course, glide sloop and localizer).

As the Jetstream 31 panel now contents also an antenna bus the localizer needle, the glide sloop indicator and the digital DME (pos. 67, 68 and 71) just works if the corresponding Nav1 or Nav2 radio is on. For example: If the HSI selector pos. 55 is set to Nav1 on the pilots side and Nav1 radio or the non essential avionic bus is off you have no signal for the localizer, glide sloop or DME.

3.2.4 The primary and standby Instruments



77	Clock
78	Mouse click area for setting the time.
79	OMI Lights (outer, middle and inner marker lights).
80	Airspeed indicator.
81	Airspeed barber pole needle.
82	Altimeter
83	Altimeter rolling numbers (thousands and hundreds).
84	Barometric pressure
85	Setting knob for barometric pressure.
86	Vertical speed indicator (VSI).
87	RMI (green needle = Nav2, yellow needle = NDB)
88	Outside Air temperature (OAT).
89	Standby Attitude.
90	Analog radio altimeter.
91	Decision height bug.
92	Setting knob for the decision height.
93	Decision height warning light. Illuminates if aircraft is below the selected decision height.

Additional Notes

The positions and equipment of the standby instruments in the centre part of the cockpit could be different in some Jetstream 31. I decide to use an instrument placement and equipment from one of the latest manufactured Jetstream 31.

The analog radio altimeter and the standby attitude are part of the non essential bus. If the non essential avionics are switched off (switch pos. 9 in the overhead panel) the standby attitude and all parts of the analog radio altimeter don't work and you see the off flag in the instruments.

As the Jetstream 31 panel now contents also an antenna bus the needles of the RMI just works if Nav2 (green needle) or ADF (yellow needle) and the corresponding non essential avionic bus is switched on.

The outside air temperature, the needle of the altimeter, the analog radio altimeter and the airspeed indicator show just "0" if the corresponding avionics are switched off. A couple of instruments in the panel have also off flags. If the corresponding avionics are switched off you can see the following off flags:



Those off flags are also visible if one ore more of the instruments are out of order.

3.2.5 The Engine Instruments



94	Left and right torque (percent).
95	Left and right NG (percent)
96	Left and right NG (tenth percent)
97	IEC and TTL computer warning light. The lower lamp light up if the IEC computer is switched on and the upper lamp lights up if the TTL computer is on.
98	Test switch for the IEC and TTL warning lights. If the test switch is pressed the upper and lower warning lights (pos. 97) will light up for a couple of seconds. The test switch goes back to off automatically after a couple of seconds.
99	Left and right engine ITT indicator.
100	Left and right fuel pressure.
101	Left and right oil temperature.

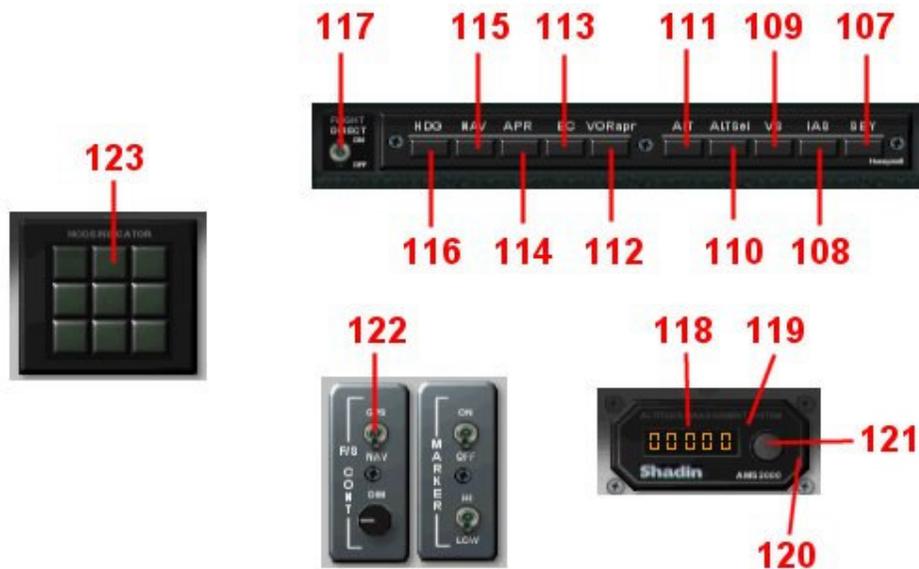
102	Left and right oil pressure.
103	Warning lights for the oil cooling flaps. Those lamps illuminates red when the oil temperature is too high and the oil cooling flaps are closed (flaps could be switched in the overhead panel with switch pos. 42 and 43) and illuminates yellow if the oil cooling flaps are opened.
104	Fuel flow indicator (pounds per hour)
105	Digital fuel flow readout (pounds per hour)
106	Warning light for the left tank. This warning light illuminates if the left tank is below 10%.

Additional Notes

All warning lights in the engine area, the fuel pressure, the oil gauges and the digital readout of the fuel flow just works if they have electrical power from the battery, a running generator or from the electrical emergency system.

The fuel gauges and the warning light for the right tank are in the pedestal panel (see there).

3.2.6 The Honeywell SPZ-200B Autopilot



107	Autopilot master switch
108	Current airspeed hold switch.
109	Selected Vertical speed hold switch.
110	Selected altitude hold switch.
111	Current altitude hold switch.
112	VOR approach hold switch (no function yet).
113	Back course hold switch (BC hold).
114	Approach hold switch (APR hold).
115	NAV hold switch.
116	HDG hold switch.
117	Flight director switch

118	Digital readout for the selected autopilot altitude and vertical speed.
119	Mouse click area for increasing the autopilot altitude in thousands, hundreds or tenth steps or for increasing the autopilot vertical speed in hundreds.
120	Mouse click area for decreasing the autopilot altitude in thousands, hundreds or tenth steps or for decreasing the autopilot vertical speed in hundreds.
121	Button to change the display and mouse click function from altitude to vertical speed and converse.
122	GPS / NAV switch.
123	Autopilot annunciator (see there).

Additional Notes

The Jetstream 31 autopilot did not work as long as the aircraft is on ground. After lift off you can switch it on.

The complete autopilot is part of the essential bus. If the essential avionic bus is off (switch pos. 8) the autopilot will not work. As the Autopilot uses a lot of electrical power its not part of the electrical emergency bus and so it did not work if the electrical system faults.

At the moment the Shadin Altitude Management System did not base on the real Shadin instrument. Unfortunately I get the Manual of this instrument too late (panel was almost finished). The real functionality of this Instrument will be part of an update or of the next version.

The Shadin Altitude Management System is part of the non essential avionic bus. It just works if the system has electrical power (battery, generator or emergency electrical power) and the nonessential avionics are switched on (switch pos. 9). The readout of the altitude selector is not illuminated as long as the non essential avionic lights are off (pos. 14).

The mouse click area left and right beside the digital autopilot altitude selector (pos. 118) has in fact three areas when the display shows the autopilot altitude. Above the Button you can select values in thousand steps, about in the centre of the button you can set the values in hundreds and below the button you can select the value in tenths. This is not possible when the autopilot vertical speed is selected with the button pos. 121. The autopilot vertical speed can always just adjusted in hundreds.

All button lights of the autopilot just works if they have electrical power from the battery, a running generator or from the electrical emergency system and if the essential avionics are on (switch pos. 8).

Most parts of the Jetstream 31 autopilot didn't base on the standard Microsoft AP variables. It's not possible to adjust the altitude with a hardware equipment or to switch on or off some other parts of the J31 autopilot. Please do not use any hardware equipment or key functions for switching anything on or off in the autopilot. If you do so the aircraft will make strange things.

The VOR approach hold switch didn't work at the moment. I'm currently looking for an alternative function to bring it to live.

3.2.7 The Autopilot Annunciator (pos. 123)

The autopilot annunciator lights have the following functions and illuminates if one or more of the following functions are activated:

HDG on	Current ALT on	AP on
NAV on	Selected ALT on	Current IAS on
APR on	VS hold on	BC on

Additional Notes

The annunciator lights just works if they have electrical power from the battery, a running generator or from the electrical emergency system and if the non essential avionic bus is on (switch pos. 9).

3.2.8 The Main Annunciator



124	Master warning light. Lights up in an overspeed or stall situation. The master warning light could be rest by pushing on the lamp.
125	Master caution light. Lights up if you running below 10% Fuel, your sinkrate is more than 7000 t. per minute, radio height is below 250 ft. and your not in landing configuration or if the low pressure fuel valves are closed. The master caution light could be rest by pushing on the lamp.
126	Left engine side warning lights. See below description fur further information about the lamps.
127	Right engine side warning lights. See below description fur further information about the lamps.
128	Annunciator Day / Night switch. The warning lamps are brighter when the switch is in "Night" position (switch down). If the switch is in "Day" position the lamps are just illuminated when the essential avionic lights are on (switch pos. 13). They are not as bright as in "Night" mode.
129	Test button for the annunciator lamps, warning and caution light. When the button is pressed the lamps illuminates for a couple of seconds.

Description of the engine annunciator warning lights

126-1L 127-20R	126-4L 127-16R	126-8L 127-12R	126-12L 127-8R	126-16L 127-4R	126-20L 127-1R
127-21R	126-5L 127-17R	126-9L 127-13R	126-13L 127-9R	126-17L 127-5R	126-21L
126-2L 127-22R	126-6L 127-18R	126-10L 127-14R	126-14L 127-10R	126-18L 127-6R	126-22L 127-2R
126-3L 127-23R	126-7L 127-19L	126-11L 127-15R	126-15L 127-11R	126-19L 127-7R	126-23L 127-3R

Legend:

126-XXL = left annunciator side
127-XXR = right annunciator side

126-1L 127-1R	Left and right engine fire warning light.
126-2L 127-2R	Engine fault warning light. This lamp illuminates if the left (2L) or right (2R) engine is fault.
126-3L 127-3R	Warning light for unfeathered propeller. This lamp illuminates if the left (3L) or right (3R) propeller is not feathered.
126-4L 127-4R	Warning light for the left (4L) and right (4R) wing tank. This lamp illuminates if one of the tanks is below 10% fuel.
126-5L 127-5R	Left (5L) and right (5R) fuel pump parallel light. This lamp illuminates between 2% and 10% NG and indicates when the high pressure fuel pump (controlled with the combustion lever) could increase fuel for the corresponding engine together with the boost pump.
126-6L 127-6R	Left (6L) and right (6R) fuel pressure warning lamp. This lamp illuminates if there is not enough fuel pressure to run or start the corresponding engine.
126-7L 127-7R	Warning light for fuel crossfeed valve. This lamp illuminates on both annunciator sides when the crossfeed valve (switch pos. 48) is opened.
126-8L 127-8R	Warning light for the left (8L) and right (8R) oil temperature. Illuminates if the oil temperature is too high.

126-9L 127-9R	Warning light for the left (9L) and right (9R) oil cooling flaps. Those warning lights illuminates when the oil cooling flaps are opened.
126-10L 127-10R	Warning light for the left (10L) and right (10R) oil pressure. Those warning lights illuminates if the oil pressure is too low or if the engine is not running.
126-11L 127-11R	First (11L) and second (11R) ignition light. This warning light illuminates when the starter ignites with an automatic start or when the ignition is ready for a manual start.
126-12L 127-12R	Warning light for battery below 20 volts. This lamp illuminates on both sides if the battery is below 20 volts. No engine start is possible.
126-13L 127-13R	Left generator (13L) and/or right generator (18R) battery charge warning light. This lamp illuminates when a running generator charge the battery.
126-14L 127-14R	Warning light for left (14L) and right (14R) generator fault. This lamp illuminates if the left and/or right generator faults or if the automatic starters are pressed and the corresponding generator is not reset or switched on. The warning light could be rest by pressing the generator reset (switch pos. 4 and 6 to reset).
126-15L 127-15R	Warning light for a switched off left (15L) and right (15R) generator. Those lamps illuminates if the corresponding generator is off.
126-16L 127-16R	Warning light for the left (16L) and right (16R) ITT temperature. This lamp illuminates if the corresponding ITT temperature is above 660°C.
126-17L 127-17R	Warning light for the left (17L) or right (17R) TTL computer. Those lams illuminates when the left and/or right IEC and TTL computers are on.
126-18L 127-18R	Warning light for left (18L) and right (18R) engine torque. This lamp illuminates if the corresponding engine torque is above 100%.
126-19L 127-19R	Warning lights for propeller synchronisation. Both lights illuminates if the propeller sync is switched on.
126-20L 127-20R	Warning lights for the left (20L) and right (20R) propeller deice. Those lamps illuminates if the outside air temperature is below 10°C and the corresponding propeller deice is off.
126-21L 127-21R	Warning lights for the left (21L) and right (21R) propeller deice. Those lamps illuminates if the corresponding propeller deice is on.
126-22L 127-22R	Warning lights for pitot heating. Both lamps illuminates if the pitot heat is off and the outside air temperature is below 10°C.
126-23L 127-23R	Warning lights for switched on pitot heat. Both lamps illuminates when the pitot heat is switched on.

Additional Notes

The annunciator lights just works if they have electrical power from the battery, a running generator or from the electrical emergency system.

The Jetstream 31 annunciators didn't base on the real J31 annunciators. Unfortunately I have no information about the function of the real lamp. I decide to use typical Turbo-prop warning lights for the Jetstream 31 annunciators of this panel. You will find those warning lights in almost all Turboprop aircraft.

3.2.9 The Jetstream 31 GPWS

The GPWS is just working if you've installed the complete panel. If you have installed the alternative panel.cfg the following descriptions have no validity!



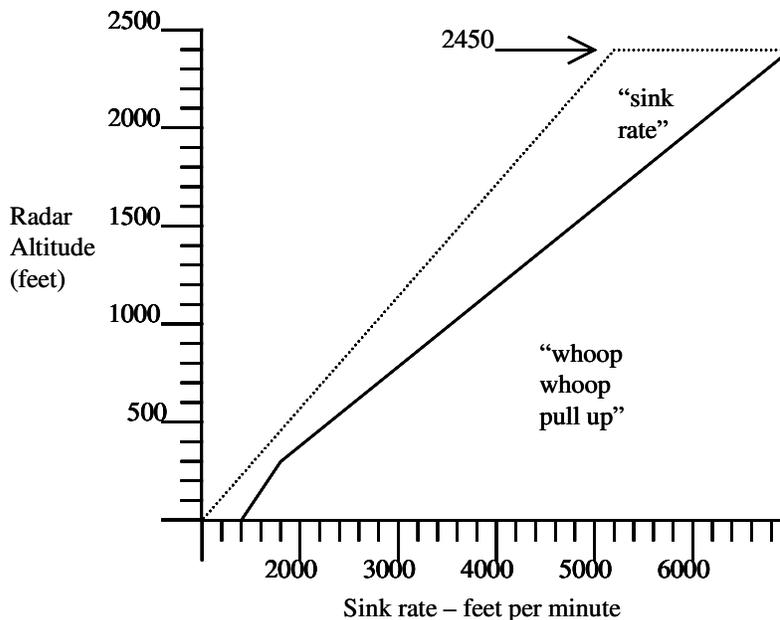
130	GPWS test button.
131	Below glide sloop warning light.
132	GPWS inoperative warning light.
133	Flap inhibit warning light.

Operation of the GPWS (extract from Dai Griffiths Readme file)

GPWS Self-Test

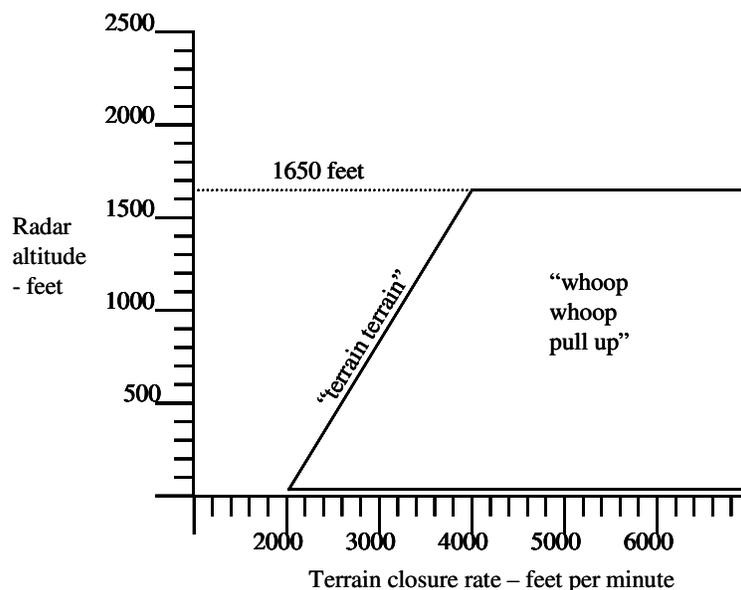
On the ground and above 1000 feet pressing the Test button (Pos. 130) will cause "Glide slope" followed by "Whoop! Whoop! Pull Up!" to sound.

Mode 1 – Excessive Sink Rate



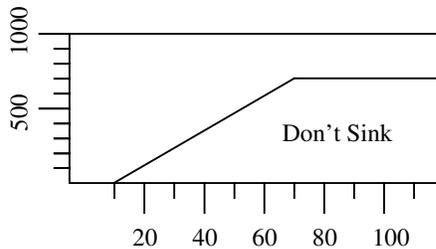
When the aircraft penetrates the outer warning boundary "Sink Rate" sounds. If the inner boundary is penetrated "Whoop! Whoop! Pull Up!" sounds. Mode 1 is reset by returning vertical speed to a positive climb rate. Mode 1 may be over-ridden by a Mode 2 warning but will resume if the condition still exists after the Mode 2 warning is cancelled.

Mode 2 - Excessive Terrain Closure Rate



When the aircraft penetrates the warning boundary, “terrain, terrain” will sound followed by “whoop! whoop! pull up!”. When “pull up” ceases “terrain” will continue to sound until the aircraft has gained 300 feet of pressure altitude.

Mode 3 – Descent After Take-Off



When the aircraft penetrates the warning boundary "Don't Sink" sounds. Mode 3 is reset by a positive climb rate.

Mode 4A – Proximity To Terrain, Gear Not In Landing Position

When the aircraft penetrates the warning boundary (500 feet AGL) with the landing gear not in the down and locked position, "Too Low – Gear" sounds. Mode 4A is reset by climbing above the boundary height. Mode 4A may be over-ridden by a Mode 2 warning but will resume if the condition still exists after the Mode 2 warning is cancelled.

Mode 4B – Proximity To Terrain, Flaps Not Full

When the aircraft penetrates the warning boundary (150 feet AGL) with the landing gear down and flaps not fully down, "Too Low – Flaps" sounds. Mode 4B is reset by climbing above the boundary height. Mode 4B may also be inhibited if you are making a flapless approach by operating the Flap Inhibit switch. Mode 4B may be over-ridden by a Mode 2 warning but will resume if the condition still exists after the Mode 2 warning is cancelled.

Mode 5 – Descent Below Glide slope

Below 1000 feet "Glide slope" will sound if you are one dot or more below the glide slope indicator and will repeat faster and faster as radar altitude decreases. Mode 5 is reset by re-acquiring or rising above the glide slope.

(This is a slight modification of the real Mk11 GPWS – at 400 feet the announcement should increase by 6db).

Mode 6 – Descent Below Preset Radar Altitude

When the aircraft descends below the preset radar altitude (decision height) "Minimums – minimums" sounds. To reset Mode 6 the aircraft must climb 1000 feet above current altitude and the landing gear must be cycled – this may include a landing and subsequent take-off.

Additional Notes

The complete GPWS system could be switched off using one of the alternate panel.cfg's. To change this please read chapter 2.3 of this manual.

3.2.10 The Collins WXR-270 Weather Radar



134	Weather radar main display.
135	Distance circles when in weather radar mode according to the adjusted distance of the buttons pos. 141.
136	Weather radar main switch.
137	Mode selector – standby mode (on but no function).
138	Weather radar test button. When pressing the test button all button lights illuminates for a couple of second. The weather radar afterwards goes back to the former adjusted mode.
139	Mode selector – weather radar display.
140	Mode selector – map display.
141	Weather radar distance buttons. The following distance could be selected (from top to bottom): 250 Nm, 100 Nm, 50 Nm, 25 Nm, 10 Nm. Each selected area could be seen in the distance circle pos. 135 (only when in weather radar display mode).

Weather radar map mode



142	Current aircraft heading readout.
143	Information for Nav1 (Ident code and distance).
144	Information for Nav2 (Ident code and distance).

Additional Notes

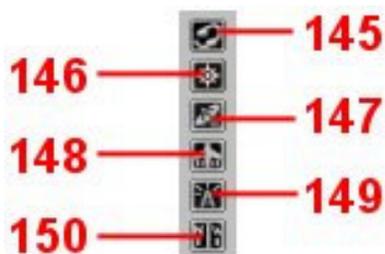
The Jetstream 31 weather radar based exactly on the real Collins WXR-270 weather radar. The Flight simulator didn't support a real weather radar at the moment so the weather display and map display are just dummies at the moment. However every button works as in reality.

The weather radar is part of the non essential avionic bus. If the non essential avionic bus is switched off (switch pos. 9) the weather radar don't work. The illumination of the weather radar could only be switched on with the non essential avionic lights pos. 14. If those avionic lights are off the weather radar is not illuminated at night.

The weather radar will be switched off automatically when no power is provided from the corresponding avionic bus, battery, running generators or from the emergency electrical bus.

As the Jetstream 31 panel now contents an antenna bus the information for Nav1 and Nav2 (pos. 143 and 144) just works if the corresponding radio is switched on.

3.2.11 The Window toggles



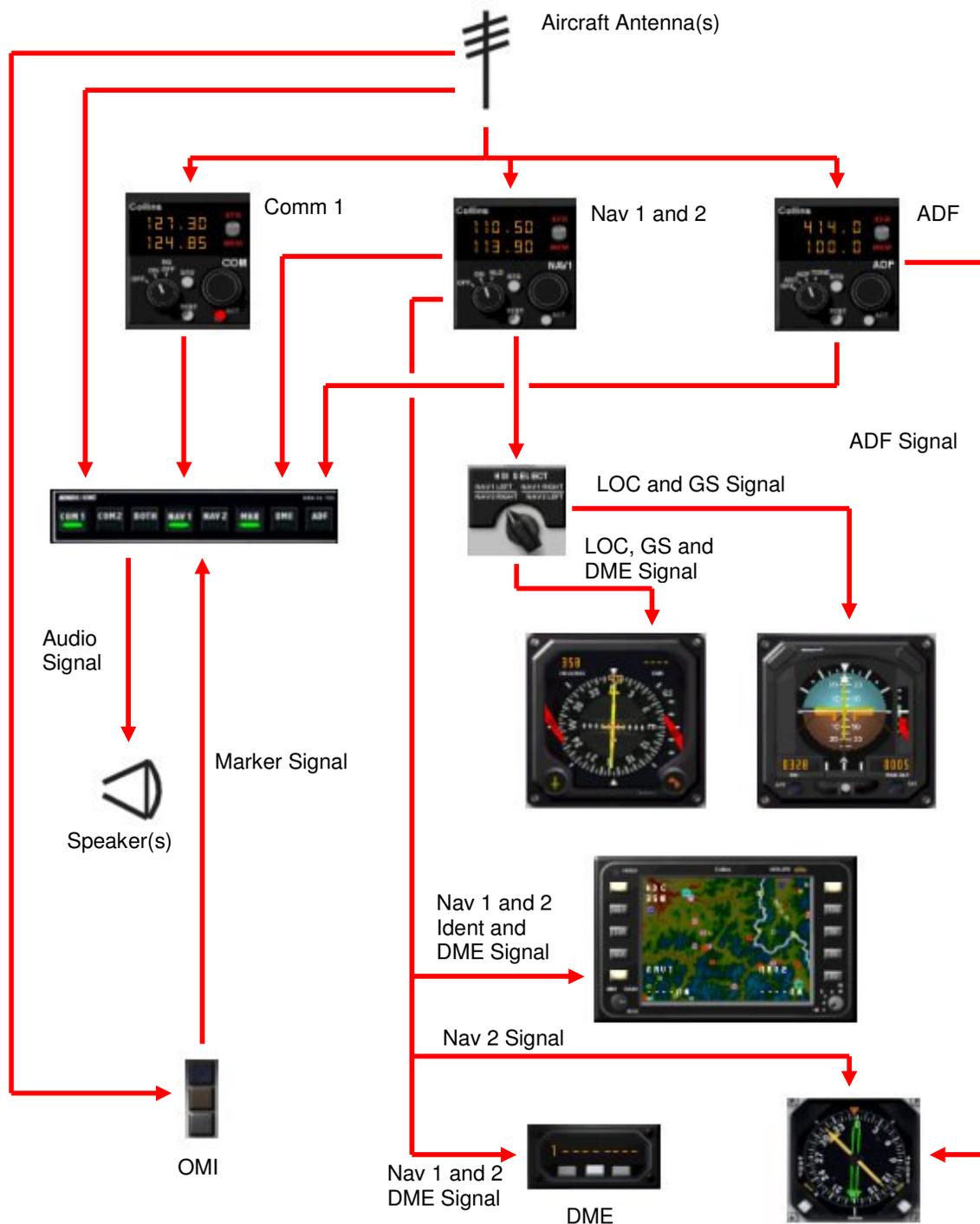
145	Toggle to show the Flight simulator ATC window.
146	Toggle to show the Flight simulator map.
147	Toggle to open the Flight simulator GPS.
148	Toggle to open the pedestal panel.
149	Toggle to open the radios.
150	Toggle to open the overhead panel.

3.3 The Jetstream 31 Radio System



151	Audio panel (part of the radio window).
152	Transponder (part of the main panel)
153	Comm 1 (part of the radio window)
154	Comm 2 (part of the radio window).
155	Nav 1 (part of the radio window).
156	Nav 2 (part of the radio window).
157	ADF 1 (part of the radio window).
158	ADF2 (part of the radio window). ADF 2 is just a dummy at the moment.
159	DME (part of the main panel).

3.3.1 The Antenna Bus

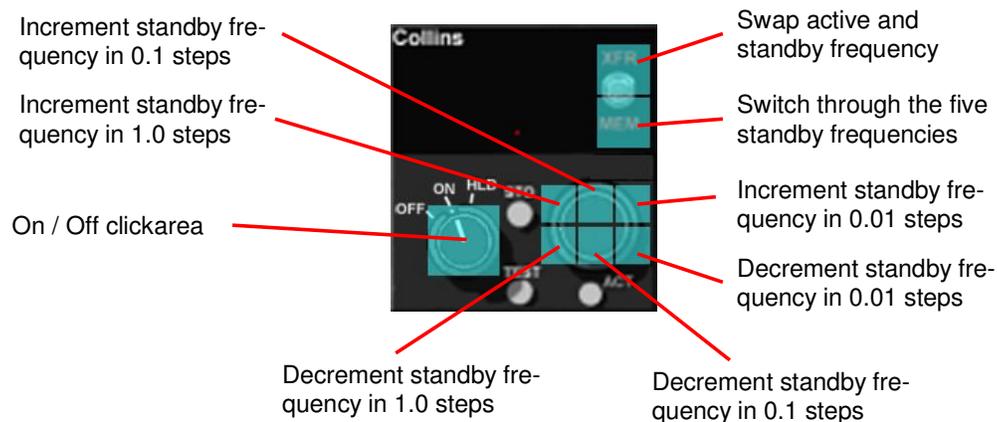


3.3.2 Comm 1 and Comm 2

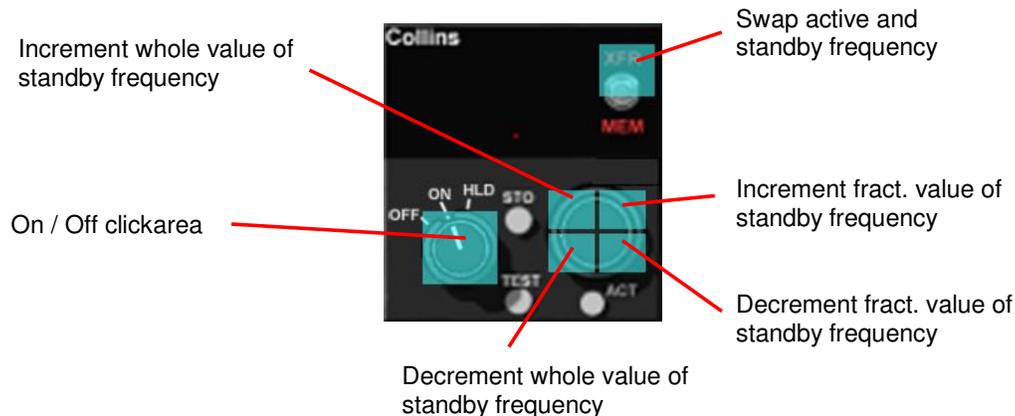


162	Active frequency.
163	Swap button for changing active and standby frequency.
164	Standby frequency (one of the stored five preset frequencies – only Comm 1)
165	Click area to switch through the standby (preset) frequencies.
166	Master switch. At the moment it's just possible to select on or off.

Mouseclickareas for Comm 1



Mouseclickareas for Comm 2



Additional Notes for Comm 1 and Comm 2

Comm 1 has an active frequency and five standby frequencies. The display always shows the active frequency on the upper side and one of the preset frequencies on the lower side. This is like it is in the real Collins radios. It's not possible to use the storage button at the moment. As soon as you change one of the preset frequencies it is automatically changed. At the moment it's also not possible to use the ACT button to tune the active or standby frequency. The included Comm 1 of this Jetstream 31 panel just allows to tune the displayed preset frequency. All other functions based on the real radio.

The VHF Com 1 control panel is part of the antenna bus. This means exactly that if you don't receive any ATC signal on Comm 1 if the radio is switched off. Unfortunately the Flight Simulator works faster than my Gauge. So if you select an ATIS frequency from the ATC menu and Comm 1 is off you will see the ATIS message one time in the FS window. However you won't hear any message. ATC messages will be cancelled as soon as you switch off the Com radio.

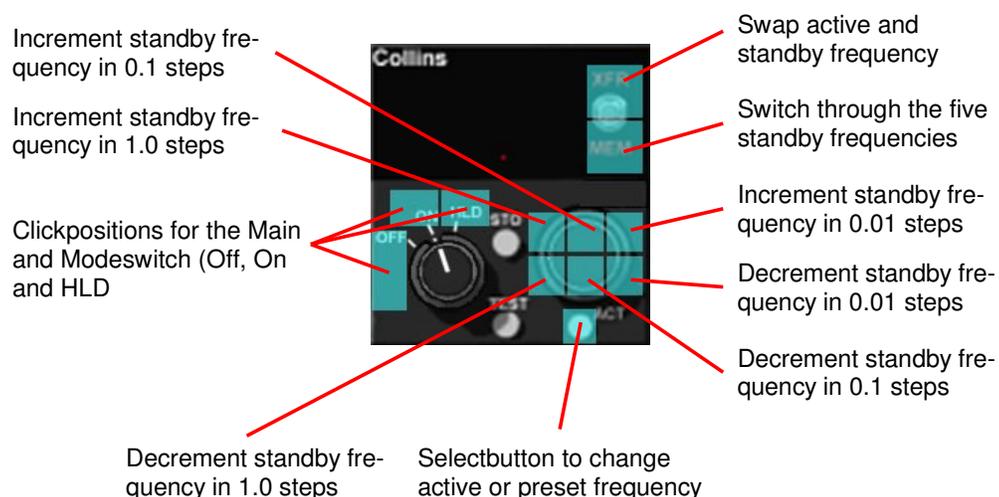
Unfortunately FS2002 does not allow to set the Comm 2 frequency directly with a programmed code. This is just possible with FS2004 (the only difference between both versions at the moment). That's why the Comm 2 radio has still only the functionality of the standard radios using the active and one standby frequency and is not part of the above described antenna bus.

3.3.3 Nav 1 and Nav 2



167	Active frequency.
168	Swap button for changing active and displayed standby Nav frequency.
169	Standby frequency (one of the stored three preset frequencies)
170	Button for tuning active or displayed standby frequency. If the button is pressed and the red light is on you change the active frequency otherwise the preset frequency.
171	Mode switch. Off = Nav is switched off, On = Nav is switched on, HLD = Nav is switched on and DME hold of Nav 1 or Nav2 is active.
224	Click area to switch through the standby (preset) frequencies.

Mouseclickareas for Nav 1 and Nav 2



HLD Mode of Nav 1 and Nav 2

The DME hold function just works if Nav 1 or Nav 2 has signal and receives a DME signal. If the corresponding Nav has no signal the radio could not be switched to HLD.

When activating the HLD mode the DME stores the actual DME value. For example: If the distance to Nav 1 is 100 Nm and now the HLD mode will be activated the DME shows always 100 Nm for Nav 1 no matter how much miles you fly from now on. When switching back to the On mode, the DME shows the actual DME value again and the stored value of the HLD mode is cancelled.

The HLD mode makes sense when you want to calculate a flown distance between two points and so it's mainly interesting for dead reckoning flights and/or to calculate a current position.

Additional Notes for Nav 1 and Nav 2

Both, Nav 1 and Nav 2, have an active frequency and three standby frequencies. The display always shows the active frequency on the upper side and one of the preset frequencies on the lower side. This is like it is in the real Collins radios. It's not possible to use the storage button at the moment. As soon as you change one of the preset frequencies it is automatically changed.

Both Nav radios are part of the antenna bus. This means for example that if you switch off Nav 1 and the HSI selector is set to Nav 1 on the pilots side you don't have any distance information for Nav 1 in the DME and weather radar or GS and LOC information for Nav 1 in the HSI and Attitude. If Nav 2 is switched off also the Nav 2 needle of the RMI is without function.

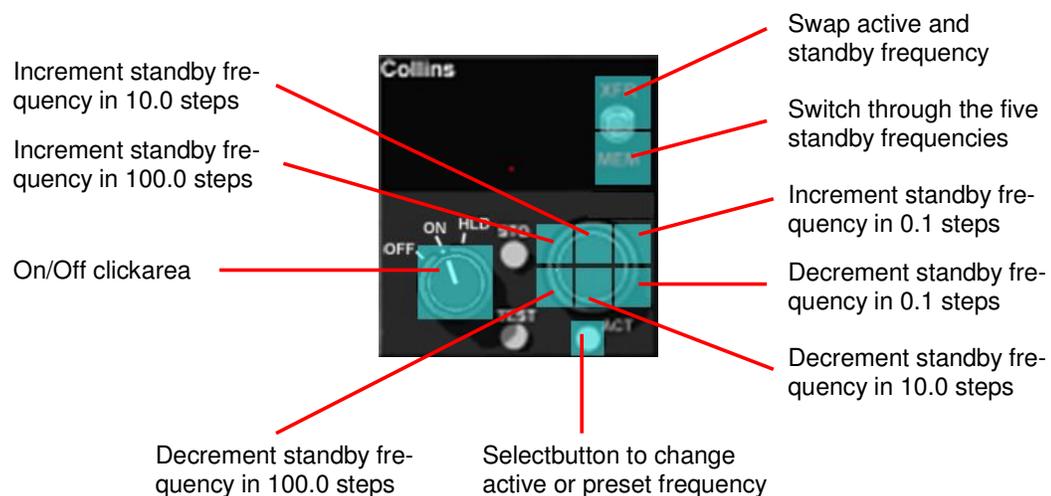
Both Nav radios offers the possibility always to change the active and standby frequency no matter what is selected in the Flightsimulator's aircraft.cfg. If the button (pos. 170) of the Nav radios is pressed you will see a red light on this button which shows you that tuning of the active frequency is selected. In this case you will always change the active frequency. If the red light is off and so the standby mode is active you will change the currently displayed preset frequency. This function based also on the real Collins radio.

3.3.4 ADF



172	Active frequency.
173	Swap button for changing active and displayed standby frequency.
174	Standby frequency (one of the stored three preset frequencies)
175	Button for tuning active or displayed standby frequency. If the button is pressed and the red light is on you change the active frequency otherwise the preset frequency.
176	Master switch. At the moment it's just possible to select on (ADF) or off.
225	Click area to switch through the standby (preset) frequencies.

Mouseclickareas for ADF 1



Additional Notes for ADF 1 and ADF 2

ADF 1 has an active frequency and three standby frequencies. The display always shows the active frequency on the upper side and one of the preset frequencies on the lower side. This is like it is in the real Collins ADF. It's not possible to use the storage button at the moment. As soon as you change one of the preset frequencies it is automatically changed.

ADF 1 is part of the antenna bus. This means exactly that if you switch off ADF 1 you don't have any ADF signal for the corresponding needle in the RMI.

Like Nav 1 and Nav 2 ADF 1 offers also the possibility always to change the active and standby frequency no matter what is selected in the Flightsimulator's aircraft.cfg. If the button (pos. 175) is pressed you will see a red light on it which shows you that tuning of the active frequency is selected. In this case you will always change the active frequency. If the red light is off and so the standby mode is active you will change the currently displayed preset frequency. This function based also on the real Collins ADF.

ADF 2 is just a dummy at the moment as the Flight simulator doesn't support a second ADF. The Mode switch has just the functions for display on and off (you always see "----" in the display).

3.3.5 Transponder



160	Transponder code display
161	Transponder switch. This switch has just the position on and off at the moment.

3.3.6 DME



Picture based on version 1.0!

177	Displays shows adjusted DME (1 or 2)
178	Distance to Nav1 or Nav2 in Nm whichever is adjusted with the button pos. 180.
179	Display shows ground speed in knots or time-to-station in minutes whichever is adjusted with the button pos. 182.
180	DME 1 – DME 2 selector button (display pos. 177 shows the adjusted DME)
181	Mode selector switch. If the button is on display 179 shows the time to the adjusted station. If the button is off display 179 shows the ground speed.
182	DME main switch.

Additional Notes for the DME

The DME contents now also a DME hold function. For example: If you select DME 1 with the button pos. 180 and Nav 1 is set to HLD the DME shows not the actually distance to Nav 1 in pos. 178 but the distance which was stored to the time when the HLD function of Nav 1 was activated. The ground speed display or time-to-station display is deactivated in HLD mode. As soon as the HLD function of Nav 1 is deactivated (Nav 1 is switched back to on) the DME shows the current distance to Nav 1 again and the stored distance of the HLD mode is cancelled. The same thing is also available for Nav 2 of course.

The DME is part of the antenna bus. This means exactly that if you switch off Nav 1 for example the DME did not show any information for Nav 1.

Additional Notes for all Radios

All radios are part of the nonessential avionic bus. If the nonessential avionic bus is switched off (switch pos. 9) they don't work. The illumination of the radio displays could only be switched on with the non essential avionic lights pos. 14. If those avionic lights are off the radio displays are not illuminated at night.

The Transponder is not part of the antenna bus at the moment. Maybe this will be realized in a further version of the Jetstream 31 panel.

3.4 The Pedestal Panel



Most parts of the pedestal panel are equipped with real working functions. The complete air condition and temperature unit have no function at the moment. Also the fire extinguisher below the Throttle and combustion levers are without any function at the moment. The descriptions of all other working systems could be found in the following sections of this manual.

3.4.1 Fuel unit in the Pedestal Panel



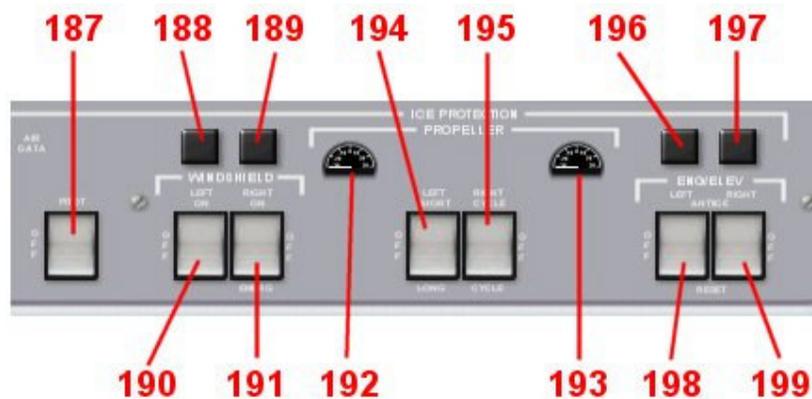
183	Left wing tank fuel indicator (Lbs)
184	Right wing tank fuel indicator (Lbs)
185	Left tank warning light. Illuminates when left wing tank is below 10% fuel.
186	Right tank warning light. Illuminates when right wing tank is below 10% fuel.

Additional Notes

Both fuel indicators are part of the essential avionic bus. If the essential avionic bus is switched off the fuel indicators just shows "0".

The left and right tank warning lights just works if they have electrical power from the battery, a running generator or from the electrical emergency system.

3.4.2 The Deice Unit



187	Pitot heat switch.
188	Warning light for the left windshield deice. The lamp illuminates red if the windshield deice is off and the outside air temperature is below 10 °C and illuminates green when the left windshield deice is on.
189	Warning light for the right windshield deice. The lamp illuminates red if the windshield deice is off and the outside air temperature is below 10 °C and illuminates green when the right windshield deice is on.
190	Left windshield deice switch.
191	Right windshield deice switch (Emerg switch position is without function).
192	Left propeller deice cycle frequency indicator.
193	Right propeller deice cycle frequency indicator.
194	Left propeller deice switch. The switch has the positions off (centre), short cycle deice of the prop (up) and long cycle deice of the prop. The deice frequency of the propeller deice system is shown with the indicator pos. 192.
195	Right propeller deice switch. The switch has the positions off (centre), short cycle deice of the prop (up) and long cycle deice of the prop. The deice frequency of the propeller deice system is shown with the indicator pos. 193.

196	Left engine and elevator ice warning lamp. The lamp illuminates red if the engine and elevator deice is off and the outside air temperature is below 10°C and illuminates green when the left engine and elevator deice is on.
197	Right engine and elevator ice warning lamp. The lamp illuminates red if the engine and elevator deice is off and the outside air temperature is below 10°C and illuminates green when the right engine and elevator deice is on.
198	Left engine and elevator deice switch.
199	Right engine and elevator deice switch.

Additional Notes

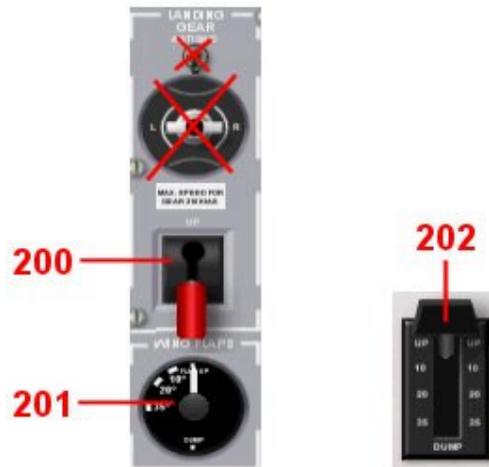
All deice warning lights just works if they have electrical power from the battery, a running generator or from the electrical emergency system.

The pitot heat switch is not placed as it is in the real Jetstream 31. I decide to place this switch here to prevent a new panel window just for the pitot heat switch.

The short and long cycle propeller deice switches based on the real Jetstream 31. If there is a heavy icing you should decide to use the short cycle deice as the delay between the de-icing is shorter. The long cycle has a longer delay and should be used in normal icing situations.

Like in the real Jetstream 31 the complete deice system also works when the engines are off. They just need electrical power from the battery. If the battery is switched off and the engines are not running (generators are off too) the deice system didn't work.

3.4.3 Landing Gear and Flaps Unit



200	Landing gear lever (including mouse click areas).
201	Wing flaps indicator.
202	Wing flaps lever (including mouse click areas).

Additional Notes

The flaps of the Jetstream 31 operates with electrical power. Without any electrical power from the battery or a running generator the flaps don't work. The flaps are not part of the electrical emergency bus!

The gauge light of the flap indicator is part of the essential avionic bus lights. It could be switched on or off with the switch pos. 13 in the overhead panel.

The red crossed switches are without any function yet.

3.4.4 The Hydraulic and Pressurization Unit



203	Left hydraulic system pressure.
204	Right hydraulic system pressure.
205	Right brake pressure (part of the left hydraulic system).
206	Left brake pressure (part of the left hydraulic system).
207	Left engine hydraulic pressure (part of the right hydraulic system).
208	Right engine hydraulic pressure (part of the right hydraulic system).
209	Cabin climb indicator. Indicates actual cabin rate of climb/descent in ft/min.
210	Cabin altimeter and differential pressure indicator. Indicates cabin altitude at the outer scale and diff. pressure at the inner scale.
211	Cabin pressure controller. The cabin altitude selection is done with the cabin rate knob pos. 212.
212	Cabin altitude rate knob to set the desired cabin altitude pressure.
213	Cabin pressure switch. This switch activate the pressure valves of the Jetstream 31.

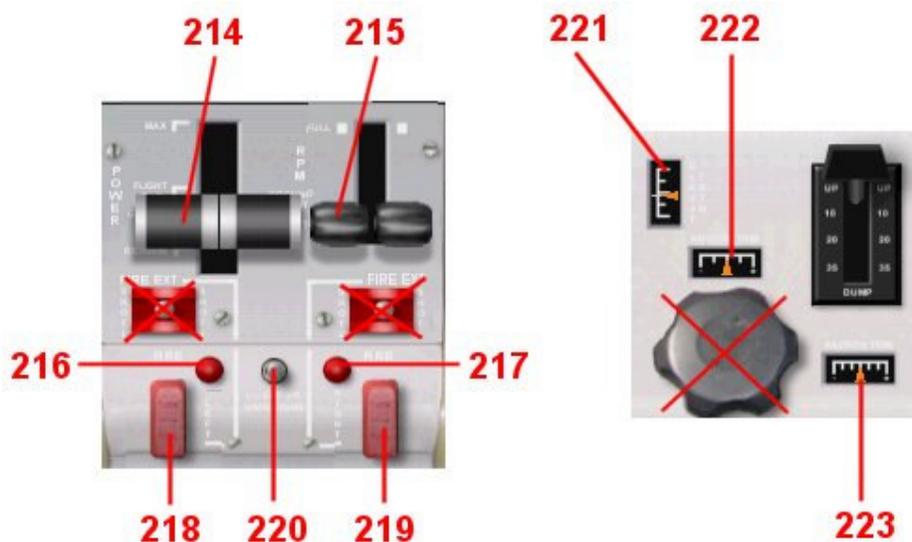
Additional Notes

If the cabin pressure switch is open there's no pressure control from the pressurization system of the Jetstream 31. The cabin altimeter and vertical speed rate is the same as the outside altimeter and vertical speed rate. Take care to move the switch pos. 213 to "Press" (left switch position) before doing flights above 9000 feet.

On ground the cabin altitude should be set 500 feet above fields pressure altitude. For flights above 9000 feet the cabin altitude should be set after takeoff to 3000 feet. This keeps the differential pressure low. The cabin altitude selection could be set with the knob pos. 212. Do never forget to set the altitude rate when planning pressurized flights!

The gauge lights of the pedestal panel are part of the essential avionic bus lights. They could be switched on or off with the switch pos. 13 in the overhead panel.

3.4.5 Other Switches and Levers in the Pedestal Panel



214	Throttle
215	Combustion lever.
216	Left engine fire warning lamp.
217	Right engine fire warning lamp.
218	Left engine firewall shutoff (up / vertical position = off, down / horizontal position = on).
219	Right engine firewall shutoff (up / vertical position = off, down / horizontal position = on).
220	Unfeather switch for left and right propeller. Switch in the left position means that the left propeller is unfeathered (!) and switch in the right position means that right propeller is unfeathered (!).
221	Elevator trim indicator (mouse clicks possible)
222	Aileron trim indicator (mouse clicks possible).
223	Rudder trim indicator (mouse clicks possible).

Additional Notes

The firewall shutoff valves (pos. 218 and 219) close the fuel valve to the corresponding engine. Take care that the fuel crossfeed valve (switch pos. 48 in the overhead panel) is closed before closing the firewall shutoff valve. Otherwise the engine will further be provided with fuel from the contrary pumps.

All trim gauges (elevator, aileron and rudder) could be adjusted with mouse clicks on the corresponding gauge. The trim gauges are just illuminated if the essential avionic lights are switched on (switch pos. 13).

The red crossed switches are without any function yet.

4 The Jetstream 31 Panel Handling and Procedures

4.1 Detailed start up description

The following detailed descriptions are no checklists. They are just a detailed description of the complete start up procedure assisted with a couple of pictures to help you starting the engines. For the complete checklists please see the according section of this manual.

4.1.1 Using the automatic Engine Starters

1. Switch on the main battery (pos. 1)
2. Position the voltmeter switch (pos. 2) to “Battery Volts” (Up)
3. Check the displayed battery volts.

You need at least 24 Volts to start the engines. If you have not enough volts do not start the engines. Otherwise you will run into a hot start. If the battery is empty switch on the left and right hydraulic valve pos. 44 and 46 (warning lights pos 45 and 47 should be off) and then reload the battery with the upper area of the switch pos. 34. After that you should have a recharged battery and you could continue the start up procedure.



4. Switch on the essential avionic bus (switch pos. 8) and check if the primary and engine instruments are working (no off flag should be visible in the primary instruments).
5. Take care that the ignition switches (pos. 31 and 32) are in the position “Normal” (up).
6. Check the position of the Air/Ground switch pos. 23 and 27. The switch must be in the “GND” (centre) position if the aircraft is on ground and in the “AIR” (up) position if the aircraft is airborne.
7. Reset generator 1 (switch pos. 4 to “Reset”).

It's very important to reset the generator before starting the engine to relieve maybe existing tension and to provide an overcurrent.

8. Take care that generator 1 goes to off position after pressing reset. Both generators have to be off when starting the engine. Otherwise you occur an overcurrent.
9. Switch on (open) the low pressure fuel valve (pos. 51 and 53).
10. Take care that the low pressure fuel warning lights pos. 52 and 54 are off.
11. Check the main annunciator. The engine fault, battery volts and generator fault warning lights must not light. Take also care that the main caution light pos. 125 is off after opening the low pressure fuel valves.
12. Take care that the crossfeed switch (pos. 48) is shut (centre position)
13. Switch on the left and right IEC computers (pos. 35 and 36).
14. Lower IEC annunciator light (pos. 97) is on.
15. Move the condition levers (pos. 215) to position Taxi.
16. Switch on the left boost pump (switch pos. 49)
17. Check the left fuel pressure indicator. You need at least 15 PSI (see picture)
18. Take care that the fuel pressure warning light in the left side of the main annunciator is off.
19. Switch on the left engine starter selector (pos. 24)
20. Switch on the left engine automatic starter pos. 25 (it's not necessary to hold the switch).
21. Close the overhead panel window immediately.
22. Check the engine oil pressure pos. 102) for indication
23. Monitor left engine ITT (pos. 99) 660°C maximum.
24. Check left NG 52% minimum.
25. Take care that the left oil pressure warning light in the main annunciator is off.
26. Take care that the left engine selector light (pos. 24) and left engine starter light (pos. 25) are off.



27. Take care that the bus tie light (pos. 11) is on.
28. Switch on the left generator (switch pos. 4)
29. Check the left generator amperemeter (pos. 5)
30. Generator off light in the main annunciator should be off now.
31. Switch on the AC transfer switch pos. 10
32. Switch off left boost pump pos. 49.
33. Switch on left and right hydraulic pumps (pos. 44 and 46).
34. Take care that the LP hydraulic valve warning lights pos. 45 and 47 are off now.
35. Wait until battery charging warning light in the left main annunciator is off until continue starting the second engine.
36. When the battery charging warning light in the main annunciator goes off switch the AC Transfer switch (pos. 10) to position "Normal" (centre position)
37. Press the bus tie light switch pos. 11 to reset. The bus tie light should go off now.
38. Reset generator 2 (switch pos. 6 to "Reset").
39. Take care that generator 2 goes to off position after pressing reset.
40. Check position of the condition lever (pos. 215). Must be set to position Taxi.
41. Fuel Enrich lamp (pos. 33) is off
42. Switch on the right boost pump (switch pos. 50)
43. Check the right fuel pressure indicator. You need at least 15 PSI
44. Take care that the fuel pressure warning light in the right side of the main annunciator is off.
45. Switch on the right engine starter selector (pos. 28)
46. Switch on the right engine automatic starter (pos. 29)
47. Close the overhead panel window immediately.

48. Check the engine oil pressure pos. 102) for indication
49. Monitor right engine ITT (pos. 99) 660 °C maximum.
50. Check right NG 52% minimum.
51. Take care that the right oil pressure warning light in the main annunciator is off.
52. Take care that the right engine selector light (pos. 28) and left engine starter light (pos. 29) are off.
53. Take care that the bus tie light (pos. 11) is on.
54. Switch on the right generator (switch pos. 6)
55. Check the left generator amperemeter (pos. 7)
56. Generator off light in the main annunciator should be off now.
57. Switch on the AC transfer switch pos. 10
58. Switch off right boost pump pos. 50.
59. Wait until battery charging warning light in the left main annunciator is off (should go much faster when both engines and generators are running).
60. When the battery charging warning light in the main annunciator goes off switch the AC Transfer switch (pos. 10) to position "Normal" (centre position)
61. Press the bus tie light switch pos. 11 to reset. The bus tie light should go off now.
62. Position the voltmeter switch (pos. 2) to "Main Bus" (centre position)
63. Fuel Enrich lamp (pos. 33) is off

Important Notes

When you have to cancel a start-up after pressing the starters (pos. 25 or 29) it's important to wait at least 30 seconds before trying another start. Otherwise it could be that you run into a wet-start.

If the engine ITT is moving over 660 °C or if the engine ITT overtemp warning light in the main annunciator goes on while starting shut down the corresponding engine immediately with pressing the engine automatic shutdown switches (pos. 26 or 30) or by closing the high pressure fuel cock with the fuel condition levers pos. 215. Otherwise you run into a hot-start.

4.1.2 Technical Background of the Automatic Starters

When making a manual engine start the pilot controls all relays, the fuel enrichment and other parts of the start-up. Because of the different phases of each procedure and the pettishness of the systems (ignition, fuel, starter motor, ...) the risk of failures while starting is very high. To prevent the risk of hot-, wet- and hung-starts with a wrong handling, the Jetstream 31 contains two computers (IEC computers – for more information please see chapter 3.1.7 of this manual) which controlling the complete start-up sequence when proceeding an automatic start.

The IEC computer controls the following processes:

Cranking

When the start switch is pushed 24V are supplied to the starter motor. As the engine and propeller starts to turn, the RPM gauge shows an increase.

Lightoff at 10%

When the engine reaches 10% there is an sufficient airflow through the power section to sustain combustion. At 10% RPM the IEC computers transmits signal that operate the ignition system and enables the fuel valve in the fuel control. As fuel enters the combustion chamber, combustion occurs. A rise in the ITT shows that the engine has combustion. The engines ITT and acceleration rate must now be monitored by the pilot. If lightoff does not occur within 10 seconds after reaching 10% RPM, the start should be aborted with the stop button.

Acceleration

Because of the combustion in combination with low torque a high temperature occurs in the combustion chamber during this process of the TPE 331 engines. In this phase the engine needs a high temperature to rev. The IEC computers adds now additional fuel to the basic fuel system (fuel enrichment) to assist this process. The fuel enrichment is shown with the illuminating light of the fuel enrich button in the overhead panel. The complete adding and revoking of the fuel enrichment is controlled from the IEC computers so the pilot must not press the fuel enrich button with an automatic start.

60% RPM

The IEC controlled 60% speed switch (60% relay) removes the electrical power from the ignition and starter motor circuits. The fuel flow and RPM will continue to increase. Increased engine speed and airflow causes the ITT to decrease. Fuel enrichment will be reduced after a couple of seconds and the light o the fuel enrichment button goes off.

4.1.3 Using the manual Engine Starters

First (left) engine

1. Switch on the main battery (pos. 1)
2. Position the voltmeter switch (pos. 2) to “Battery Volts” (Up)
3. Check the displayed battery volts.

You need at least 24 Volts to start the engines. If you have not enough volts do not start the engines. Otherwise you will run into a hot start. If the battery is empty switch on the left and right hydraulic valve pos. 44 and 46 (warning lights pos 45 and 47 should be off) and then reload the battery with the upper area of the switch pos. 34. After that you should have a recharged battery and you could continue the start up procedure.



4. Switch on the essential avionic bus (switch pos. 8) and check if the primary and engine instruments are working (no off flag should be visible in the primary instruments).
5. Check the position of the Air/Ground switch pos. 23 and 27. The switch must be in the “GND” (centre) position if the aircraft is on ground and in the “AIR” (up) position if the aircraft is airborne.
6. Reset generator 1 (switch pos. 4 to “Reset”).

It's very important to reset the generator before starting the engine to relieve maybe existing tension and to provide an overcurrent.
7. Take care that generator 1 goes to off position after pressing reset. Both generators have to be off when starting the first engine. Otherwise you occur an overcurrent.
8. Switch on (open) the low pressure fuel valve (pos. 51 and 53).
9. Take care that the low pressure fuel warning lights pos. 52 and 54 are off.
10. Check the main annunciator. The engine fault, battery volts and generator fault warning lights must not light. Take also care that the main caution light pos. 125 is off after opening the low pressure fuel valves.

11. Take care that the crossfeed switch (pos. 48) is shut (centre position)
12. Move the condition levers (pos. 215) to position Taxi.
13. Switch on the left boost pump (switch pos. 49)
14. Switch one of the Ignitions (pos. 31 or 32) to position “Energise”

Some technical Background

The Jetstream 31 has two igniter boxes and two igniter plugs per engine. Each of those igniters could be used separately with the two ignition switches (31 or 32) in the overhead panel. This means exactly that you did not select the left engine automatically when using the left ignition switch. Each of the two igniters could be used for both engines. Which engine will be ignited could will be regulated with the starters (pos. 25 and 29).

15. Wait until the ignition light in the main annunciator comes up (pos. 126-11L or 127-11R)
16. Switch on fuel enrich (button pos. 33)

Some technical background:

Because of the combustion in combination with low torque a high temperature occurs in the combustion chamber during the starting process of the TPE 331 engines. In this phase the engine needs a high temperature to rev. Because of this reason you need additional fuel which will be injected by the fuel enrich button.

17. Check the left fuel pressure indicator. You need at least 15 PSI (see picture)
18. Take care that the fuel pressure warning light in the left side of the main annunciator is off.
19. Press the left engine starter switch (pos. 25). It's not necessary to hold the switch. Just press it one time.
20. Check the engine oil pressure pos. 102) for indication
21. After stabilizing NG (pos. 95) at 12% move the used ignition to position “Ignite”



Do not wait too long with positioning the ignition to “Ignite”. Otherwise you run into the risk of a hot-start. As soon as NG is stable at 12% immediately move the used ignition.

Some technical background:

The ignition position "Ignite" is selected between 10% and 12% RPM and opens the fuel shutdown valve and permits fuel flow to engine. It also energizes the igniters and arms the fuel enrichment system.

22. Monitor left engine ITT (pos. 99) 660 °C maximum.
23. As soon as NG reaches more than 50% switch the used ignition to "60%".

Some technical Background

The 60% position of the ignition switches disconnects the ignition motor and starter motor relays to prevent a hot-start caused by the ignition and starter but provides enough ignition to keep the engine running in the first critical minutes.

24. Check left NG 52% minimum.
25. Switch off fuel enrich (button pos. 33)
26. Take care that the left oil pressure warning light in the main annunciator is off.
27. Take care that the bus tie light (pos. 11) is on.
28. Switch on the left generator (switch pos. 4)
29. Check the left generator amperemeter (pos. 5)
30. Generator off light in the main annunciator should be off now.
31. Switch on the AC transfer switch pos. 10
32. Switch off left boost pump pos. 49.
33. Switch on left and right hydraulic pumps (pos. 44 and 46).
34. Take care that the LP hydraulic valve warning lights pos. 45 and 47 are off now.
35. Wait until battery charging warning light in the left main annunciator is off until continue starting the second engine.
36. When the battery charging warning light in the main annunciator goes off switch the AC Transfer switch (pos. 10) to position "Normal" (centre position)
37. Press the bus tie light switch pos. 11 to reset. The bus tie light should go off now.

38. Reset generator 2 (switch pos. 6 to "Reset").
39. Take care that generator 2 goes to off position after pressing reset.
40. Switch ignition from "60%" to "Normal"

IMPORTANT: Do not switch the Ignition back to "Normal" too soon because otherwise the engine has not enough ignition power and could flameout. After NG has reached more than 50% and the ignition switch was moved to 60% wait at least 60 seconds. Do not use the second ignition while ignition 1 is on "Ignite" or "60%".

Second (right) engine

41. Check the position of the condition levers (pos. 215) They must be in position Taxi.
42. Switch on the right boost pump (switch pos. 50)
43. Switch one of the Ignitions (pos. 31 or 32) to position "Energise"
44. Wait until the ignition light in the main annunciator comes up (pos. 126-11L or 127-11R)
45. Switch on fuel enrich (button pos. 33)
46. Check the right fuel pressure indicator. You need at least 15 PSI
47. Take care that the fuel pressure warning light in the right side of the main annunciator is off.
48. Press the right engine starter switch (pos. 25)
49. Check the engine oil pressure pos. 102) for indication
50. After stabilizing NG (pos. 95) at 12% move the used ignition to position "Ignite"
51. Monitor left engine ITT (pos. 99) 660°C maximum.
52. As soon as NG reaches more than 50% switch the used ignition to "60%"
53. Check left NG 52% minimum.
54. Switch off fuel enrich (button pos. 33)
55. Take care that the right oil pressure warning light in the main annunciator is off.

56. Take care that the bus tie light (pos. 11) is on.
57. Switch on the right generator (switch pos. 6)
58. Check the left generator amperemeter (pos. 7)
59. Generator off light in the main annunciator should be off now.
60. Switch on the AC transfer switch pos. 10
61. Switch off right boost pump pos. 50.
62. Wait until battery charging warning light in the left main annunciator is off (should go much faster when both engines and generators are running).
63. When the battery charging warning light in the main annunciator goes off switch the AC Transfer switch (pos. 10) to position "Normal" (centre position)
64. Press the bus tie light switch pos. 11 to reset. The bus tie light should go off now.
65. Position the voltmeter switch (pos. 2) to "Main Bus" (centre position)
66. Switch ignition from "60%" to "Normal"

IMPORTANT: Do not switch the ignition back to "Normal" too soon because otherwise the engine has not enough ignition power and could flameout. After NG has reached 50% and the ignition switch was moved to 60% wait at least 60 seconds.

Important Notes

When you have to cancel a start-up after ignition it's important to wait at least 30 seconds before trying another start. Otherwise it could be that you run into a wet-start.

If the engine ITT is moving over 660 °C or if the engine ITT overtemp warning light in the main annunciator goes on while starting shut down the corresponding engine immediately with moving the ignitions back to "Normal" or by closing the high pressure fuel cock with the fuel condition levers pos. 215. Otherwise you run into a hot-start.

4.2 Complete Panel Checklist

(Did not based on the real Jetstream 31 checklists.)

4.2.1 Normal Procedure Checklists

Preflight Check

- Parking Brake SET
- All Light Switches OFF
- Deice Switches OFF
- All Circuit Breakers IN
- Doors CLOSED

Before Starting Engine

- Preflight Inspection and check COMPLETE
- Cabin Doors LATCHED
- Parking Brakes SET
- All Light Switches OFF
- Deice Switches OFF
- Essential Avionics OFF
- Nonessential Avionics OFF
- IEC / TTL Computers OFF
- Generator 1 and 2 OFF
- Ignitions NORMAL
- AC Transfer Switch NORMAL
- Electric Master Emergency Switch NORMAL
- Engine Firewall Levers OFF
- Power Lever IDLE
- Fuel Condition Lever CUTOFF
- Fuel Crossfeed SHUT
- Fuel Quantity CHECK
- Oil Cooling Flaps AUTO
- Prop Synchro OFF
- Annunciator Lights PRESS TO TEST
- Annunciator Day/Night Switch SET
- Battery Switch ON
- Voltmeter Mode Switch BATTERY VOLTS
- Essential Avionics ON

Starting Engine with Automatic Starters (Battery Start)

- Battery Switch ON
- Fasten Seat Belts Switch ON
- Voltmeter CHECK (24 Volts Minimum)
- Propeller Area CLEAR
- Air/Ground Switch SET
- Left Generator RESET
- Both Generators OFF
- Ignitions NORMAL
- IEC Computers ON
- IEC Annunciator Light ON
- Low Pressure Fuel Valve OPEN
- Left Boost Pump ON
- Left Fuel Condition Lever TAXI
- Left Fuel Pressure CHECK (15 PSI Minimum)
- Left Fuel Pressure Warning Light OFF
- Left Engine Selector ON
- Left Engine Starter ON
- Left Engine Oil Pressure CHECKED FOR INDICATION
- Left NG STABLE (12% Minimum)
- Left Fuel Flow CHECK
- Left Fuel Pump Parallel Light ON (up to 10% NG)
- Fuel Enrich Lamp ON
- Left ITT MONITOR (660 °C Maximum)
- Left NG 52% Minimum
- Left Oil Pressure Warning Light OFF
- Left Engine Starter Light OFF
- Bus Tie Warning Light ON
- Left Generator ON
- AC Transfer Switch TRANSFER
- Fuel Enrich Lamp OFF
- Left Boost Pump OFF
- Battery Charge Warning Light OFF
- AC Transfer Switch NORMAL
- Bus Tie PRESS TO RESET
- Right Generator RESET
- Right Generator OFF
- Right Boost Pump ON
- Right Fuel Condition Lever TAXI
- Right Fuel Pressure CHECK (15 PSI Minimum)
- Right Fuel Pressure Warning Light OFF
- Right Engine Selector ON

- Right Engine Starter ON
- Right Engine Oil Pressure CHECKED FOR INDICATION
- Right NG STABLE (12% Minimum)
- Right Fuel Condition Lever LOW IDLE AND OBSERVE
- Right Fuel Flow CHECK
- Right Fuel Pump Parallel Light ON (up to 10% NG)
- Fuel Enrich Lamp ON
- Right ITT MONITOR (660°C Maximum)
- Right NG 52% Minimum
- Right Oil Pressure Warning Light OFF
- Right Engine Starter Light OFF
- Bus Tie Warning Light ON
- Right Generator ON
- AC Transfer Switch TRANSFER
- Fuel Enrich Lamp OFF
- Right Boost Pump OFF
- Battery Charge Warning Light OFF
- AC Transfer Switch NORMAL
- Voltmeter Mode Switch MAIN BUS

Starting Engine with Manual Starters (Battery Start)

- Battery Switch ON
- Fasten Seat Belts Switch ON
- Voltmeter CHECK (24 Volts Minimum)
- Propeller Area CLEAR
- Air/Ground Switch SET
- Left Generator RESET
- Both Generators OFF
- Ignitions NORMAL
- Left and right IEC Computer OFF
- Low Pressure Fuel Valve OPEN
- Left Boost Pump ON
- Left Fuel Condition Lever TAXI
- Ignition 1 or 2 ENERGISE
- Ignition Warning Light ON
- Fuel Enrich PRESS ON
- Left Fuel Pressure CHECK (15 PSI Minimum)
- Left Fuel Pressure Warning Light OFF
- Left Engine Starter ON
- Left Engine Oil Pressure CHECKED FOR INDICATION
- Left Fuel Pump Parallel Light ON (up to 10% NG)
- Left NG STABLE (12% Minimum)

After Engine Start

- Left LP Hydraulic Valve OPEN
- Right LP Hydraulic Valve OPEN
- Nonessential Avionics ON
- Navigation Light ON
- Rotary Beacon Lights ON
- Deice Controls AS REQUIRED
- Radios AS REQUIRED
- Trim Controls SET
- Flaps SET
- IEC Computers ON
- TTL Computers AS REQUIRED
- IEC and TTL Computer Annunciators CHECK
- Cabin Pressure Controller AS REQUIRED

Taxi

- Brakes CHECK
- Taxi Lights ON
- Altimeters QNH SET and CHECK
- Nav Aids and Flight Director SET
- Transponder SET CODE
- Speed CHECK

Before Takeoff

- Parking Brakes SET
- Flight Controls FREE and CORRECT
- Flight Instruments CHECK and SET
- Fuel Quantity RECHECK
- Engine Firewall Switches RECHECK OFF
- Trims SET FOR TAKEOFF
- Engine Instruments CHECK
- Power Lever IDLE
- Pitot Heat ON when OAT is below 10°C
- Deice Controls AS REQUIRED
- Avionic and Weather Radar CHECK and SET
- Strobes AS REQUIRED
- Flaps SET FOR TAKEOFF
- TTL Computers AS REQUIRED
- Prop Synchro AS REQUIRED
- Parking Brakes RELEASE
- Fuel Condition Lever HIGH IDLE

Takeoff

- Flaps RECHECK SET FOR TAKEOFF
- Power SET for TAKEOFF
- Annunciators CHECK

After Takeoff

- Gear UP
- Flap Up and INDICATED
- Deice Controls AS REQUIRED
- Pitot Heat ON when OAT is below 10°C
- Taxi Lights OFF

Climb

- Altimeters 1013 SET and CHECK
- Pressurization CHECK
- Lights OFF at FL100
- Fasten Belts AS REQUIRED
- TTL Computers OFF at FL140
- Deice Controls AS REQUIRED
- Pitot Heat ON when OAT is below 10°C
- Cabin Pressure Controller AS REQUIRED
- Cabin Pressure Switch AS REQUIRED

Cruise

- Deice Controls AS REQUIRED
- Pitot Heat ON when OAT is below 10°C
- Pressurization CHECK
- Cabin Pressure Controller AS REQUIRED
- Cabin Pressure Switch AS REQUIRED
- Power SET for CRUISE POWER

Descent

- Deice Controls AS REQUIRED
- Pitot Heat ON when OAT is below 10°C
- Pressurization CHECK
- Fasten Belts AS REQUIRED

10.000 FT

- Altimeter SET
- Fasten Belts ON
- Lights ON
- Pressurization CHECK
- Power AS REQUIRED
- TTL Computers AS REQUIRED

Before Landing

- Altimeters QNH SET and CHECK
- Fuel Condition Lever HIGH IDLE
- Weather Radar STANDBY or OFF
- Autopilot OFF
- IAS Hold OFF
- Flaps AS DESIRED

Landing

- Flaps SET FOR LANDING
- Gear DOWN
- Lights AS REQUIRED

After Landing

- Fuel Condition Lever LOW IDLE
- Flaps UP
- Deice Controls OFF
- Pitot Heat OFF
- Strobes OFF
- Landing and Taxi Lights AS REQUIRED
- Brakes CHECK
- Transponder OFF / STANDBY
- TTL Computers OFF

Shutdown and Securing Aircraft

- Parking Brakes SET
- All Lights OFF
- Fasten Belts OFF
- Radios / Transponder OFF
- Voltmeter Mode Switch BATTERY VOLTS
- Both Generators OFF
- IEC Computers OFF
- Power Lever IDLE
- Fuel Condition Lever CUTOFF
- LP Hydraulic Valves SHUT
- Low Pressure Fuel Cock Valves SHUT

Leaving Aircraft

- Avionic Switches OFF
- Battery OFF
- Electric Master Emergency Switch OFF

4.2.2 Emergency Checklists

Engine failures, fire and malfunctions

Engine flameout (one Engine)

Before restarting the engine try to count out possible faults in the electric and hydraulic system and possible damages in the lubrication circuit (caused by oil overtemperature).

Engine failure warning light and fire warning light in the annunciator are off.

(Unless otherwise mentioned all actions belonging to the failure engine site)

- Fuel Quantity CHECK
- Fuel Warning Lights CHECK

Corresponding Tank has Fuel (Warning Light is off)

- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Fuel Crossfeed SHUT
- Fuel Enrich OFF
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF
- TTL Computers OFF
- TTL Annunciator Light OFF
- Electric Master Emergency Switch NORMAL
- Generator OFF
- Generator Fault Warning Light OFF
- Generator Off Warning Light ON
- Ignition NORMAL

After stabilizing the aircraft refer to airstart checklists for engine restart.

Corresponding Tank has no fuel (Warning light is on)

- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF

- TTL Computers OFF
- TTL Annunciator Light OFF
- Electric Master Emergency Switch NORMAL
- Generator OFF
- Generator fault Warning Light OFF
- Generator Off Warning Light ON
- Ignition NORMAL
- Lo Pressure Fuel Valve SHUT
- Fuel Boost Pump *running engine side* ON
- Fuel Crossfeed OPEN

After stabilizing the aircraft refer to airstart checklists for engine restart. Switch off the fuel boost pump after starting and leave the fuel crossfeed valve open for the rest of the flight. Prepare for a refuel stopover if necessary.

Engine failure and Generator fault warning light is on

(Unless otherwise mentioned all actions belonging to the failure engine site)

- Fuel Quantity CHECK
- Fuel Warning Lights CHECK
- Fuel Enrich OFF
- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Lo Pressure Fuel Valve SHUT
- Fuel Crossfeed AS REQUIRED
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF
- TTL Computers OFF
- TTL Annunciator Light OFF
- Engine Deice OFF
- Propeller Deice AS REQUIRED
- Electric Master Emergency Switch NORMAL
- Generator OFF
- Ignition NORMAL

After stabilizing the aircraft prepare for an emergency landing. Open the fuel crossfeed valve when the tank of the running engine side is out of fuel.

Engine flameout (both Engines)

Before restarting the engines try to count out possible faults in the electric and hydraulic system and possible damages in the lubrication circuit (caused by oil overtemperature).

Engine failure warning lights and fire warning lights in the Annunciator are off.

- Fuel Quantity CHECK
- Fuel Warning Lights CHECK

Corresponding tanks have Fuel (Warning lights are off)

- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Fuel Crossfeed SHUT
- Fuel Enrich OFF
- Wing Flaps UP
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF
- TTL Computers OFF
- TTL Annunciator Light OFF
- Electric Master Emergency Switch NORMAL
- Generators OFF
- Generator Fault Warning Lights OFF
- Generator Off Lights ON
- Voltmeter Mode Switch BATTERY VOLTS
- Nonessential Avionics OFF
- Ignition NORMAL
- Electrical Load REDUCE

After stabilizing the aircraft refer to airstart checklists for engine restart.

Corresponding tanks have no fuel (both warning lights are on)

- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Fuel Boost Pumps OFF
- Fuel Enrich OFF
- Fuel Crossfeed SHUT
- Lo Pressure Fuel Valves SHUT

- Engine Firewall Levers CLOSE
- Wing Flaps AS REQUIRED
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF
- TTL Computers OFF
- IEC Computers OFF
- TTL / IEC Annunciator Lights OFF
- Electric Master Emergency Switch NORMAL
- Generators OFF
- Generator fault Warning Light OFF
- Generator Off Warning Light ON
- Voltmeter Mode Switch BATTERY VOLTS
- Ignition NORMAL
- Electrical Load REDUCE
- Weather Radar OFF
- Battery OFF

After stabilizing the aircraft prepare for an emergency landing. Switch off all not necessarily needed avionics. If Nav 1, Nav 2 or ADF is required for the emergency landing switch on the battery when the landing area or runway is visible to use the lights and navigation systems.

Left and right engine failure and generator fault warning lights are on

(Unless otherwise mentioned all actions belonging to the failure engine site)

- AP Airspeed Hold OFF
- Autopilot OFF
- Condition Lever CUT OFF
- Power Lever IDLE
- Fuel Boost Pumps OFF
- Fuel Crossfeed SHUT
- Lo Pressure Fuel Valves SHUT
- Engine Firewall Levers CLOSE
- Wing Flaps AS REQUIRED
- TTL Computers OFF
- IEC Computers OFF
- TTL / IEC Annunciator Lights OFF
- Electric Master Emergency Switch NORMAL
- Generators OFF
- Generator Fault Warning Light OFF
- Generator Off Warning Light ON

-
- Ignition NORMAL
 - Electrical Load REDUCE
 - Weather Radar OFF
 - Battery OFF

After stabilizing the aircraft prepare for an emergency landing. Switch off all not necessarily needed avionics. If Nav 1, Nav 2 or ADF is required for the emergency landing switch on the Battery when the landing area or runway is visible to use the lights and navigation systems.

Engine Fire (one Engine)

(Unless otherwise mentioned all actions belonging to the burning engine site)

- Power Lever IDLE
- Condition Lever CUT OFF
- Engine Firewall Lever CLOSE
- Fuel Crossfeed SHUT
- Fuel Boost Pump OFF
- Fuel Enrich OFF
- Lo Pressure Fuel Valve SHUT
- Autopilot OFF
- Propeller Sync OFF
- Propeller Sync Annunciator Light OFF
- TTL Computer OFF
- IEC Computer OFF
- IEC / TTL Annunciator Lights OFF
- Engine Deice OFF
- Propeller Deice OFF
- Electric Master Emergency Switch NORMAL
- Generator OFF
- Ignition NORMAL

After stabilizing the aircraft prepare for an emergency landing. Open the fuel crossfeed valve when the tank of the running engine side is out of fuel. Do not try to restart the engine even if the fire is extinguished.

Engine Fire (both Engines)

- Power Lever IDLE
- Condition Lever CUT OFF
- Engine Firewall Levers CLOSE
- Fuel Crossfeed SHUT
- Fuel Boost Pumps OFF
- Fuel Enrich OFF
- Lo Pressure Fuel Valves SHUT
- Autopilot OFF
- TTL Computers OFF
- IEC Computers OFF
- TTL / IEC Annunciator Lights OFF
- Wing Flaps AS REQUIRED
- Engine Deice OFF
- Propeller Deice OFF
- Electric Master Emergency Switch NORMAL
- Generators OFF
- Ignition NORMAL
- Electrical Load REDUCE
- Weather Radar OFF
- Battery OFF

After stabilizing the aircraft prepare for an emergency landing. Switch off all not necessarily needed avionics. If Nav 1, Nav 2 or ADF is required for the emergency landing switch on the Battery when the landing area or runway is visible to use the lights and navigation systems.

Engine Malfunctions

Oil pressure warning light is on

- Oil Pressure Indicator CHECK
- Oil Temperature CHECK

Oil temperature too high (oil temperature warning light is on)

- Oil Cooling Flaps OPEN

If oil temperature remains high and the oil temperature warning light stays on after opening the oil cooling flaps shutdown the corresponding engine, stabilize the aircraft and let the lubrication system cool down. After that try a restart of the engine and check the oil pressure after starting. If the oil pressure warning light comes up again shutdown the engine and prepare an emergency landing.

Electric failures

Before trying to reactivate the generator search for the reason of the fault. Possible reasons could be an airstart with a running generator (overcurrent) or an airstart while the generator charges the battery. This mostly also causes a complete electrical fault of the battery, essential and nonessential busses.

One Generator fault in flight

If the engine failure warning light of the corresponding engine is also on please see the emergency procedures for engine failure.

(Unless otherwise mentioned all actions belonging to the burning engine site)

- Electric Master Emergency Switch NORMAL
- Generator OFF
- Voltmeter Mode Switch MAIN BUS
- Nonessential Avionics OFF
- TTL Computer OFF
- AC Control Switch NORMAL
- Bus Tie RESET
- Bus Tie Warning Light CHECK (OFF)
- Generator RESET
- Generator Fault Warning Light CHECK

Generator fault warning light goes off after resetting the corresponding generator:

- Generator ON
- Nonessential Avionics ON
- Weather Radar ON
- TTL Computer AS REQUIRED

Generator fault warning light stays on after resetting the corresponding generator:

- IEC Computer OFF
- Nonessential Avionics ON
- Electrical Load REDUCE
- Weather Radar OFF

Both Generator fault in flight

If the engine failure warning lights are also on please see the emergency procedures for engine failure.

- Electric Master Emergency Switch NORMAL
- Generators OFF
- Battery ON
- Voltmeter Mode Switch BATTERY VOLTS
- Nonessential Avionics OFF
- TTL Computers OFF
- AC Control Switch NORMAL
- Bus Tie RESET
- Bus Tie Warning Light CHECK (OFF)
- Generators RESET
- Generator Fault Warning Lights CHECK

Generator fault warning lights go off after resetting the generators:

- Generators ON
- Nonessential Avionics ON
- Weather Radar ON
- TTL Computers AS REQUIRED

Generator fault warning lights stays on after resetting the generators:

- IEC Computers OFF
- Nonessential Avionics ON
- Electrical Load REDUCE
- Weather Radar OFF
- Battery OFF

Prepare for visual flight and descend for according altitude. Switch off all not necessarily needed avionics. If Nav 1, Nav 2 or ADF is required for landing switch on the Battery when the landing area or runway is visible to activate flaps, gear, lights and navigation systems.

Complete electrical fault (Battery, essential and nonessential busses)

A complete electrical fault could happen when starting an engine while a generator is running and charging the battery (reverse current).

- Electric Master Emergency Switch NORMAL
- Generators OFF
- Voltmeter Mode Switch MAIN BUS
- Autopilot OFF
- Nonessential Avionics OFF
- TTL Computers OFF
- IEC Computers OFF
- AC Control Switch NORMAL
- Bus Tie RESET
- Bus Tie Warning Light CHECK (Off)
- Generators RESET
- Generator Fault Warning Lights CHECK

One engine is running. Generator fault warning light of this generator stays on after re-setting. Generator warning light of the not running engine is off

Prepare for a manual airstart of the not running engine. Do not use the automatic starter! After this engine is running:

- Generators ON
- Battery OFF
- Nonessential Avionics ON
- Avionics ON
- Weather Radar ON
- Autopilot AS REQUIRED
- IEC Computers ON
- TTL Computers AS REQUIRED

After landing leave the working generator on until the aircraft is prepared for shut-down and leaving.

One engine is running. Generator fault warning light of both engines stays on after re-setting

Prepare for a manual airstart of the not running engine. Do not use the automatic starter!

- Generators OFF
- Electrical Load REDUCE
- Battery OFF
- Nonessential Avionics ON
- Avionics ON
- Weather Radar OFF
- TTL Computers OFF
- IEC Computers OFF
- Autopilot OFF

Prepare for visual flight and descend for according altitude. Switch off all not necessarily needed avionics and deice systems. Apply for an emergency landing with an insufficient electric navigation system and aircraft lighting.

5 Typical turboprop faults and handling errors

As written this panel includes a lot typical turboprop engine faults. Those included faults did not happen accidentally but are the result of a mishandling of the Jetstream 31 functions. The included faults are not imaginary but based on real turboprop faults. A lot of real pilots made already awkward experiences with them.

Engine Flameout / Engine Stall

An engine flameout may result from the engine running out of fuel, severe inclement weather, a volcanic ash encounter, a control system malfunction, or unstable engine operation (such as a compressor or engine stall). Multiple engine flameouts may result in a wide variety of flight deck symptoms as engine inputs are lost from electrical, pneumatic and hydraulic systems. Engine Stall or Surge is a momentary reversal of the compressor airflow such that high-pressure air escapes out of the engine inlet.

A flameout will be accompanied by a drop in ITT, in engine core speed and in engine pressure ratio. After the engine speed drops you can recognize an flameout with other symptoms, such as low oil pressure warnings and electrical generators dropping off line. Engine stalls may be self-correcting, may require the engine to be throttled back, or may require engine shutdown, if the engine can be positively identified and the stall will not clear.

Jetstream 31 annunciator lights which possibly notify an engine flameout:

- Low Oil Pressure (at the appointed time)
- Low Fuel Pressure (after fuel pressure is below minimum limit)
- Generator Fault / Generator off (at the appointed time)
- Low oil temperature (depending on operation time)

Engine fault by overtemperature

An engine ITT overtemperature could happen as a result of a hot-start (see there). If you do not stop the start-up procedure immediately after recognizing a too high ITT temperature the engine faults a couple of seconds after the temperature transcends the absolute maximum limit of the TPE 331 engine. The temperature limit of the combustion could also be exceeds with too much power for the take-off. Do not cross the limit for the temperature too long because otherwise the engine will fault. The IEC and TTL computers limit the maximum thrust to provide an overtemperature.

Jetstream 31 annunciator lights which notify an ITT overtemperature

- ITT overtemperature warning light (at the appointed time)

Engine fault by overtorque

An engine overtorque is always the result of too much power and disregarding the limit of the Torque indicator. When crossing 100% torque it just takes a couple of seconds until the engine faults by an overstress caused by the too high torque of the propeller. The IEC and TTL computers limit the maximum torque of the corresponding propeller to provide an overtorque.

Jetstream 31 annunciator lights which notify an overtorque

- Overtorque warning light (at the appointed time)

Generator Fault by Overcurrent

A generator overcurrent occurs mostly when starting an engine while the corresponding generator is running. Especially when starting an engine a generator could produce more than 1000 amperes for a short time. A lot of engines contains fuses to protect the engine from such a high current. Those fuses are very expensive and mostly completely damaged after releasing. But they are not as expensive as a completely new engine. However you could not use the corresponding generator any longer when the fuse release.

In older turboprop aircraft or turboprops without starter generators you could not start any engine with a running generator. If you have a multiengine aircraft you always had to switch on one generator after starting the first engine to charge the battery and then switch it off for continuing the start-up process for the second engine. The Jetstream 31 contains starter generators. This means that you could use the generator of the opposite engine (if running) for providing electrical power to start the other engine. However it's not that modern type of starter generator which allows to start an engine while its own generator is running. So you always should switch off the generator of the engine you want to start to prevent an overcurrent.

The reset switch of the generators relieve maybe existing high current of the generators to prevent an overload of the fuse when the generator will be switched on after the starting.

Jetstream 31 annunciator lights which notify a generator overcurrent

- Generator fault warning light (at the appointed time)

The generator fault warning light comes also up when using the automatic starters after pressing the engine select button and the corresponding generator is on. The automatic starters will not work them. To reset this warning light it's important to stop the start-up process and reset the generator. If the generator fault warning light stays on after resetting the generator the fuse of the overcurrent protection has already released.

Before an overcurrent occurs the corresponding generator ammeter increases very fast.

Reverse Current

Reverse current is a very dangerous situation because you lost almost all electrical power by damaging a generator (fuse) and the battery at the same time. A reverse current occurs if one engine is running, the corresponding generator is on, currently charging the battery and you try to start the second engine under this conditions. If both generators fault the only energy source you have no is the electric emergency bus which is a standalone circuit and so completely protected. If the battery and one generator is damaged you could not use the automatic starters of the Jetstream 31 to start the second engine and the hopefully not damaged second generator. You have to use the manual starters.

The Jetstream 31 contains no separate warning light for a reverse current. If the reverse current occurs while a generator was running you recognize it by the complete lost of electrical power (if the electrical emergency bus is off) and the generator fault warning light of the corresponding engine is on.

Hot-starts

During engine start, the compressor is very inefficient. If the engine experiences more than the usual difficulty accelerating (due to such problems as early starter cut-out, fuel mis-scheduling, or strong tailwinds), the engine may spend a considerable time at very low RPM (sub-idle). Normal engine cooling flows will not be effective during sub-idle operation, and turbine temperatures may appear relatively high. This is known as a hot start. A hot start may also be the result of a hung start (see there).

When the ITT temperature increase above the limit in the indicator when starting the engine you run into a hot-start. There could be many reasons for a hot-start like starting with a battery below 20 volts, ignite too long, moving the combustion lever to lo idle too late or others. If a hot-start occurs and you did not stop the start-up process the engine will be damaged.

The Jetstream 31 did not have a separate warning light for hot-starts. It will just be indicated by the ITT indicator so scan this instrument while starting very closely.

Wet-starts

A wet start is a situation in which the fuel-air mixture does not light off initially, but has the capability to ignite. The engine starts with excessive quantities of fuel standing in the combustion chamber or exhaust. Some people use the synonym hot-start also for a wet-start but in the strict sense this is not correct as both ignition problems have different reasons.

Wet-starts with the Jetstream 31 could happen when restart an engine within 60 seconds or when closing the lo pressure fuel valve to soon after stopping the engines. There is also no separate warning light for a wet-start. If a wet-start occurs the engine fails within a short time without any premonition. In the last resort an engine fire occurs a wet-start. Wet-starts are very dangerous.

Hung-starts

A hung start describes a situation where the temperature within the turbine section continues to rise, and the compressor RPM stabilizes below normal. The fuel flow is lower than normal which causes N2 to accelerate slower than normal and “hang up” below starter cut-out speed. Another reason for a hung-start could be strong tailwinds. A hung-start mostly involves hot-starts.

5.1 Generally guidelines to prevent typical turboprop faults

- Do never start an engine when the battery is below 20 volts. This will cause a hot-start
- When preparing a manual start do not press the start button before the ignition light in the main annunciator is on.
- After stopping an engine start-up wait at least 30 seconds before trying another start. Otherwise you run into the risk of a wet-start.
- Do never start an engine while a generator charges the battery.
- Do never start an engine while the corresponding generator switch is on. This will cause an overcurrent.
- Take care to move the ignition switch of the manual starter from Energise to Ignite as soon as NG is stable between 10 and 12% NG Otherwise you run into the risk of a hot-start.
- Take care to move the ignition switch of the manual starter to 60% as soon as NG reaches 50%. Otherwise you run into the risk of a hot-start.
- Do not move the ignition switch of the manual starter back to Normal without leaving it on the 60% position for at least 60 seconds. Otherwise it could be that you shut-down the engine. Take also care not to leave the switch on the 60% position for more than 5 minutes. Otherwise you run into the risk of a hot-start.
- Do not ignite when the engine is already running.
- Do never restart an already running engine.
- Before activating a generator take care to reset it.
- Do never forget to switch off fuel enrich.
- Take care to open the oil cooling flaps when the oil temperature grows up or when the oil temperature warning light comes on. Otherwise it could be that the complete lubrication systems starts leaking or the oil pressure drops which could cause an engine failure.
- Do not pass the ITT limit for more than 3 minutes. This could damage the engine
- Do not pass the torque limit for more than 3 minutes. This could damage the engine.

This is by far no complete list but it helps you providing a lot of typical turboprop faults which occurs after operation faults by the pilot.

6 Credits

For the Jetstream 31 panel almost all gauges are programmed by me. Nevertheless for some gauges and functions I've used the very good work from other designers. Those people I would like to thank:

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7 What's next?

The reason for the fast rework to version 2.0 was the releasing of FS2004 just shortly after uploading version 1.0 of this panel. The adaptation to FS9 goes fast as there are not too much differences between those simulators. But I also used this revision to include some things in FS2002 which are advertised in version 1.0. Nevertheless there are a couple of things to do:

- Corrected Shadin Altitude selector (I also have the manual now)
- Ground power unit
- All cockpit inside views
- New, better and more realistic arrangement of the electric busses
- Working bus tie for the electricity
- Cabin temperature controls with integrated sounds
- Further elimination of some still existing dummies

As this panel is now also finished and uploaded for FS2004 I have some now time to realize those things for both simulators. The only thing which is still a little bit more urgent are the cockpit inside views. As soon as they are finished I will upload them as an update to the existing panel.

And now have fun flying the Jetstream 31!