Falcon 7X

Systems

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Electrical System

A complete guide to the electrical system is provided in the handbook *Electrical Systems.pdf*, which can be found in the same folder as this guide. We strongly recommend that you thoroughly review this document.

Controls

Refer to the DC Power Panel on the overhead.

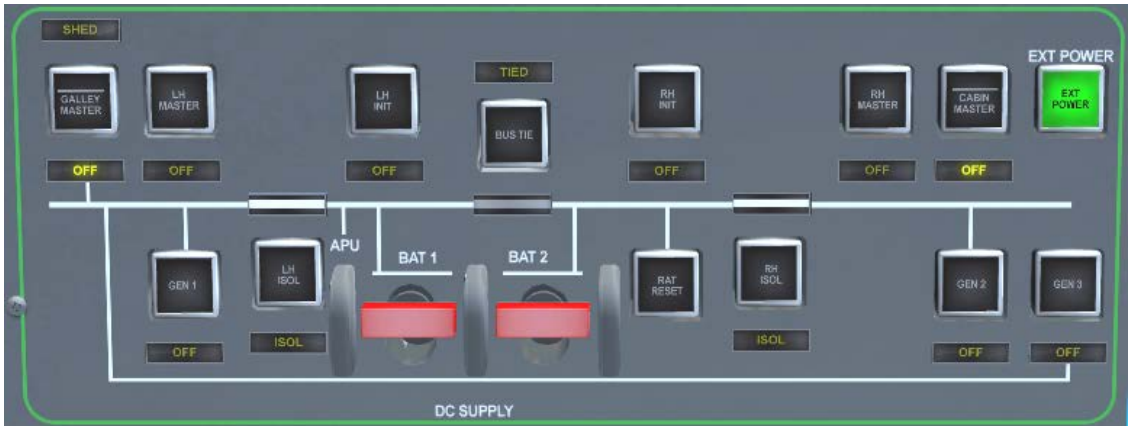


Figure 1 DC SUPPLY SECTION OF THE OVERHEAD PANEL

Providing Power to The Systems

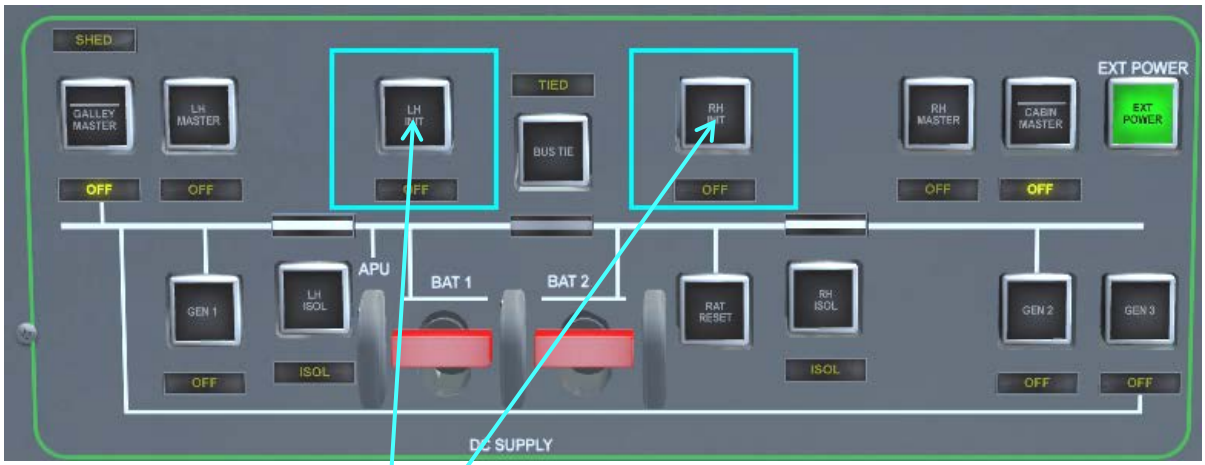
BEFORE GROUND PROCEDURES START

Before performing any electrical system procedures, begin by closing the *Master Battery Busses*.

Turn the switches to the UP position.

Two-position trip magnetic switch

Locate the *Power Panel* on the overhead and, with BATT 1 and BATT2 bus switches in the ON position (UP), press the Left Hand Bus Init (LH INIT) and Right Hand Bus Init (RH INIT) buttons. Each button's OFF indicator will extinguish.



INITIALIZE LEFT AND RIGHT BUS

With the batteries and LH INIT and RH INIT pushbuttons on, the PDU / MDU power configuration is:

Figure 2 TWO-DISPLAY CONFIGURATION

From this point on, the APU should be running.

STARTING APU

The *Auxiliary Power Unit* (APU) is equipped with a starter-generator. As a generator and for ground use only, it provides DC power to airplane systems and batteries charging.

Locate the Engines/APU panel on the overhead.

1. Press the APU Master Button
2. Press the Start/Stop Button

The APU power is needed to start the engines and drive the ECS systems during ground operation.

GPU

An approved 28 VDC Ground Power Unit (GPU) may be used for prolonged periods to power the DC system in order to facilitate maintenance and servicing.

When the aircraft is loaded, and is located at the terminal or gate, a GPU is considered to be available.

Push the EXT Power button ON

The GPU will not provide power to the distribution system simultaneously with APU generator or engine-driven generators. Order of priority is the following:

- The APU generator will provide power to the distribution system only once the GPU is off line.
- The GPU is automatically disconnected from electrical buses when one engine-driven generator comes on line.

INITIALIZE LEFT AND RIGHT MASTER BUS

On the *Power Panel*, select the LH MASTER and RH MASTER buttons. Their OFF indicators will extinguish, indicating that the Left Bus and Right Bus circuits are closed (ON).

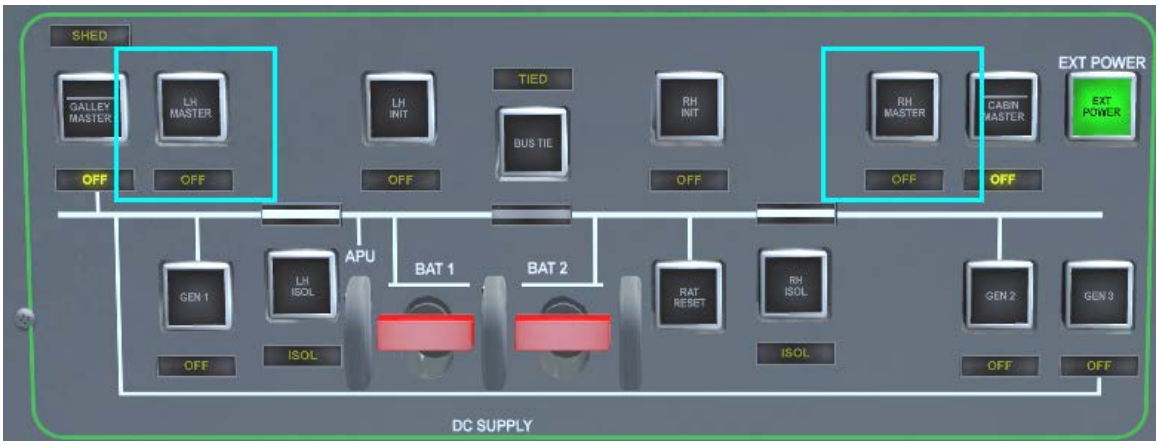


Figure 3 POWER PANEL MASTER BUS CUIRCUITS

The PDU/MDU configuration switches to four displays. The recommended window arrangement is as follows:

Figure 4 FOUR DISPLAY CONFIGURATION

Environmental and Pressurization

A complete guide to the Environmental Control System (ECS) and Pressurization System can be found in the handbook *ECS and Pressurization.pdf*, which can be found in the same folder as this guide. We strongly recommend that you thoroughly review this document.

Control of each of these systems is accomplished doing the following:

1. Providing electrical power to the systems.
2. Providing *Bleed Air* from the running engines to supply. The system uses the hot bleed air sources available on the common bleed air manifold.
3. Setting switches and valves accordingly.

Electrical Power

The power must be supplied by either *Ground Power Unit*, or directly from the generators driven by Engine 1 and/or 2. Power is provided by the RH Essential Bus. See the handbook *Electrical Systems.pdf*, which can be found in the same folder as this guide.

Engine Bleed Air

Hot air bleed must be established to drive the systems. We recommend you thoroughly review the section Bleed Air System on page 21 for expanded instructions on the bleed air system.

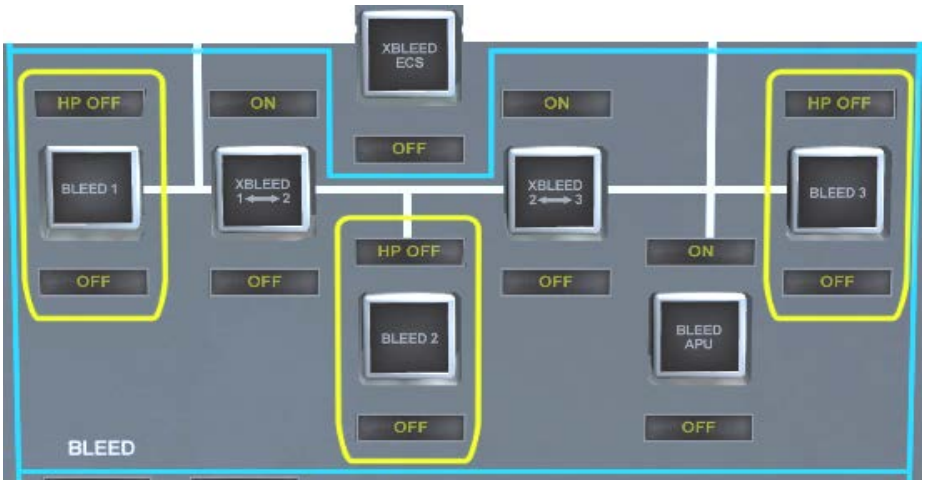


Figure 5 BLEED AIR CONTROLS

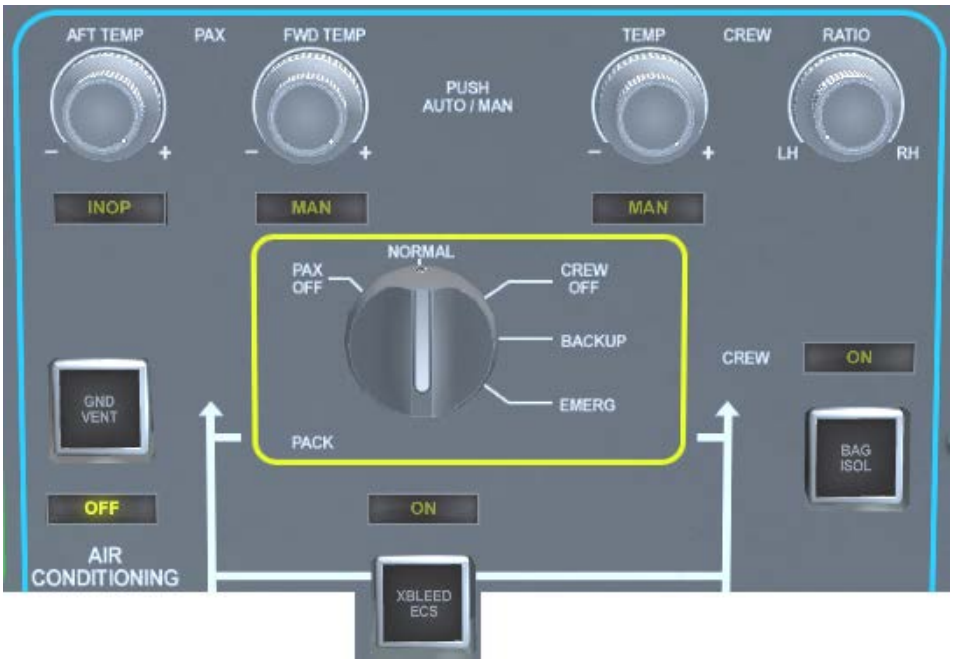


Figure 6 AIR CONDITIONING OVERHEAD PANEL

1. PACK rotary switch: switches between the five ECS control modes:
2. NORMAL: Main pack is used (primary and secondary heat exchanger)
3. PAX OFF or CREW OFF: Main pack is operative. The respective cold and hot valves are closed.
4. BACKUP: The emergency pack is used with AMSAC control.
5. EMERG: The emergency pack is used with AMSEC control.

Rotary temperature controls are used to set cockpit and cabin target between 12 and 32 deg. C.

Proper Configuration – Heat & Air Conditioning

Electrical, bleed air, and Pack Rotary Knob must be set correctly:

- Check to ensure power from generators or APU is available. See Providing Power to The Systems for more details.
- Check to ensure engine bleed air for engines 1, 2 and 3 are available. See Engine Bleed Air for more details.
- Set XBLEED ECS switch to ON or AUTO.
- Set Pack Rotary Knob to NORMAL

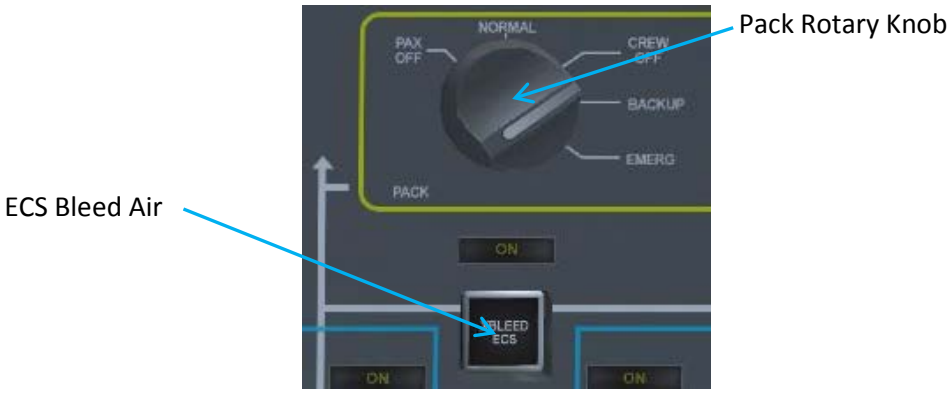


Figure 7 ECS CONTROLS

Pressurization Controls

The controls for the air conditioning system are with:

- The PRESSURIZATION part of the Overhead Panel
- A soft key on the ECS synoptic page for selecting the landing field elevation.

PRESSURIZATION REQUIREMENTS

The following must be established:

1. Bleed air supply for the pressurization system. See the *Engine Bleed Air* section above for complete details.
2. Electrical power via LH Main bus is provided. See the *Initialize Left and Right BUS* on page 5 for more detail.
3. Set pressurization switches as outlined below.

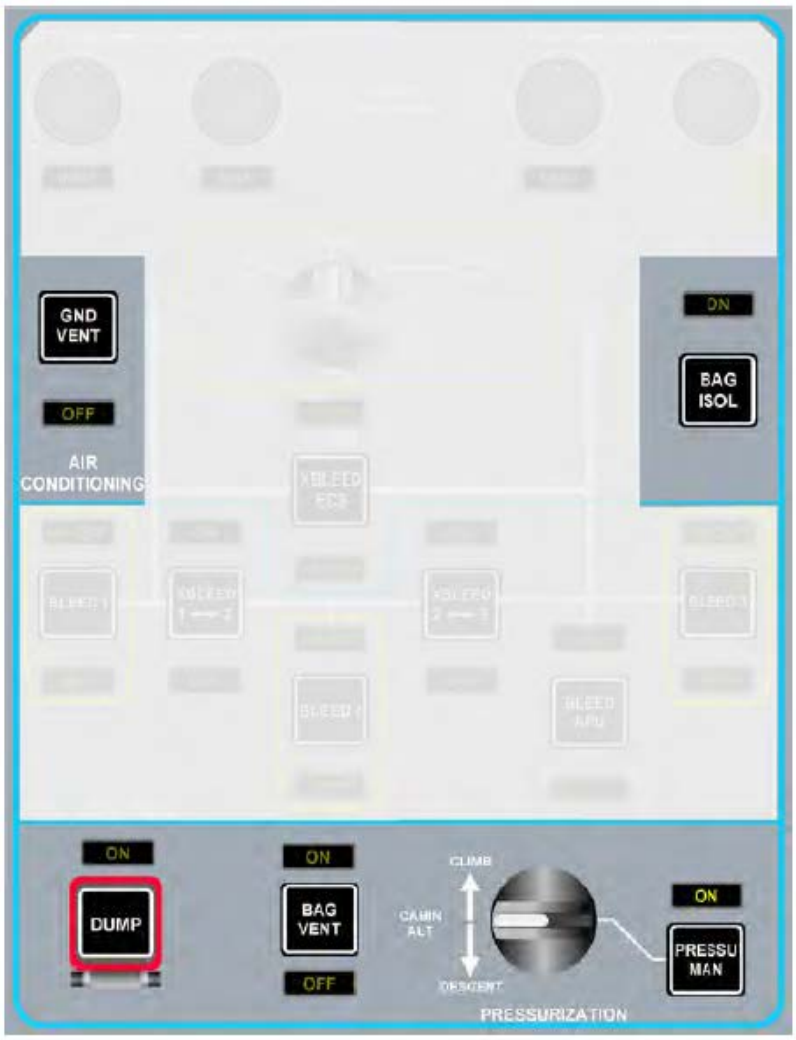


Figure 8 CABIN PRESSURIZATION CONTROLS

SETTING PRESSURIZATION CONTROLS

Once bleed air and electrical power have been provided, the following settings are required to maintain cabin pressurization:

1. CHECK Dump button is OFF.
2. CHECK Bag Vent button is OFF.
3. CHECK BAG ISOL button is ON.
4. CHECK GND VENT button is OFF.

AUTO/MANUAL PRESSURIZATION

In automatic mode the cabin altitude is set at a fixed 6,000 feet. Select the PRESS MAN button to utilize the spring loaded CABIN ALT knob.

Indication

Environmental control and pressurization status are displayed on the MDU 2 ECS Synoptic Page.

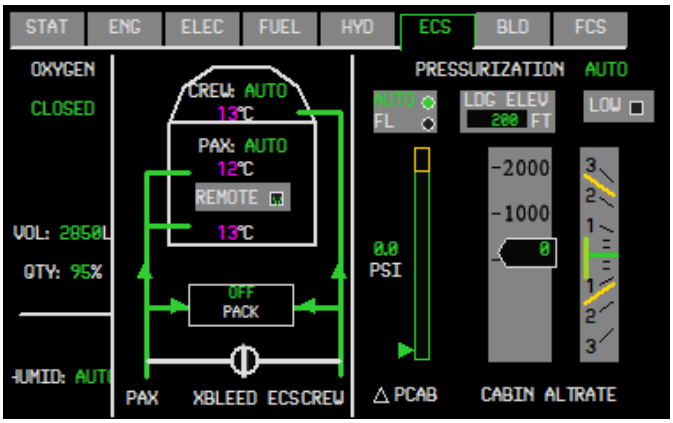


Figure 9 ECS SYNOPTIC PAGE

Fuel System

Control

Crew control of the Fuel system is performed:

- Primarily via the FUEL section of the overhead panel (OP),
- Via the Emergency Control Panel in the very improbable case of engine rotor burst,
- Via the Fire Control Panel in case of engine Fire.

Indication

Crew indications with regard to Fuel system are located in:

- The HSI window of the PDU for recapitulative of Fuel Quantity and Fuel remaining,
- The ENG-TRM window of the PDU for Fuel Used and Fuel Quantity of each TANK
- The FUEL synoptic,
- The ENG-CAS window for CAS messages and white configuration message,
- The STATus synoptic / FAULT tab for fault messages.

General

The Fuel system provides following main functions:

- Refueling and defueling (the airplane may be pressure or gravity refueled or de-fueled),
- Fuel storage and monitoring,
- Fuel tanks pressurization,
- Fuel distribution to the three engines and APU.

FUEL STORAGE

The fuel is contained in three tank "groups", which will be referred to as TANK:

- Group 1 & 3 tanks (TANK1 and TANK 3) are located in the wings and the fuselage,
- Group 2 tanks (TANK2) are wholly located in the fuselage.

All tanks are structural part of the airplane.

More complete information on the Fuel System is available in the handbook *Fuel System.pdf*, which can be found in the same folder as this guide.

Flight Deck Controls and Indications

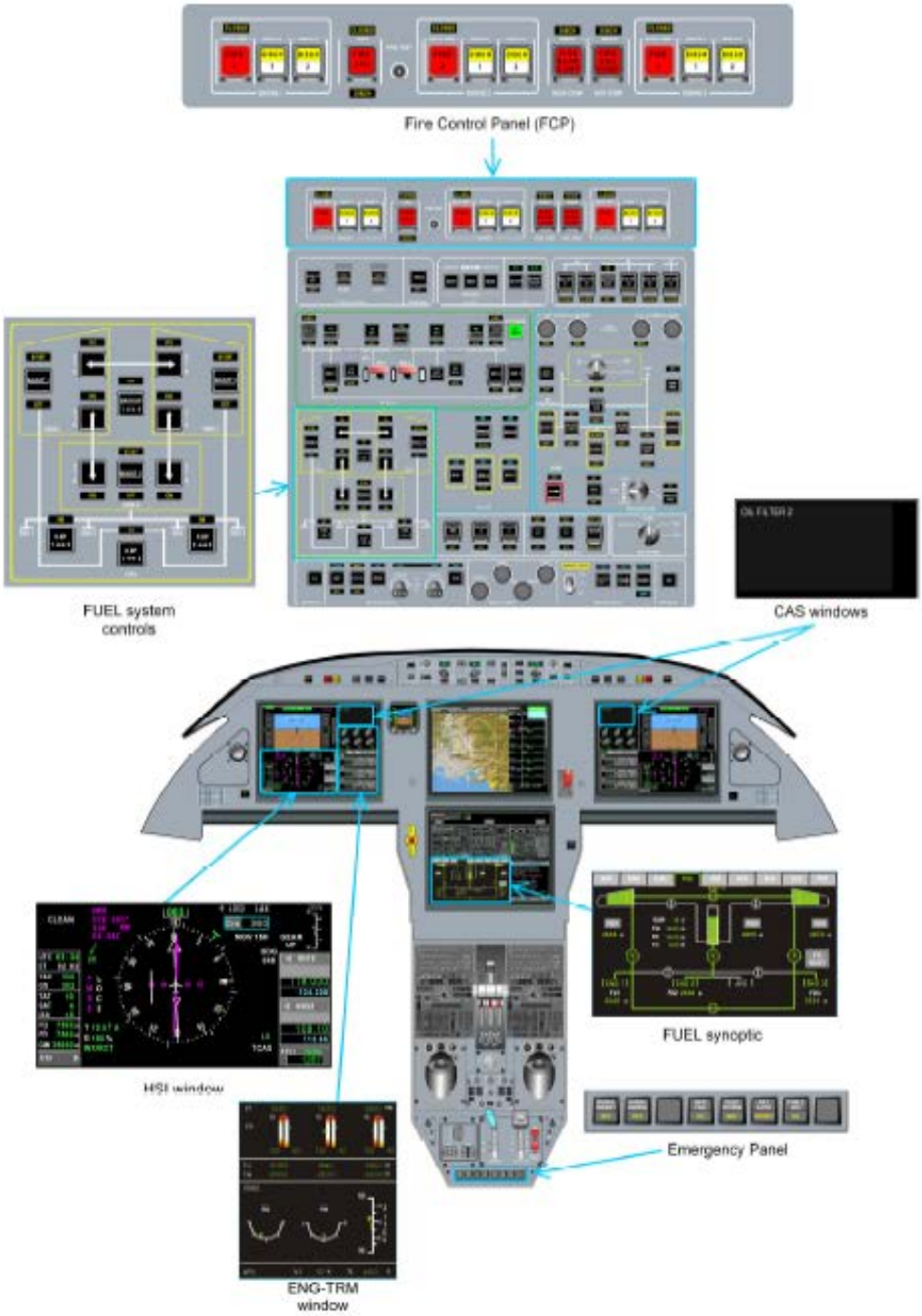


Figure 10 FUEL SYSTEM FLIGHT DECK OVERVIEW

Electrical Power

Power to utilize the fuel system controls and indicators is available through the Left and Right Master Bus circuits. See Providing Power to The Systems on page 4 for more details.

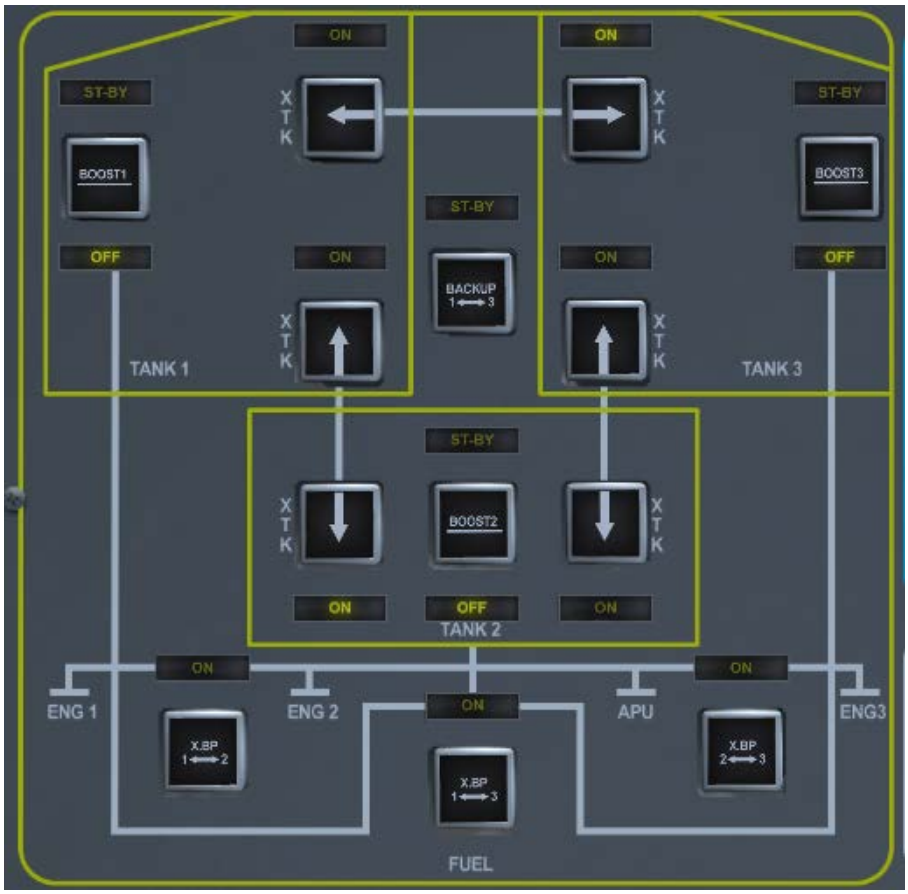


Figure 11 FUEL SECTION OF THE OVERHEAD PANEL

Booster Pumps

Each of the three feeder tanks (or "booster pump" compartment) contains two booster pumps:

- A normal fuel Booster Pump,
- A stand-by fuel Booster Pump, which is identical to the normal booster pump.

Both pumps are used subsequently at engine start in order to ensure they both are functional:

- Engine start is performed with the stand-by pump,
- When the engine is running, the normal pump is switch on and the stand by pump is stopped.

The status of the two Booster Pumps is controlled with the “BOOST” pushbuttons on the overhead panel. Implementation of automation for automatic activation of booster pump when engine start is initiated is controlled by the onboard computer. The crew can override these automatic functions, if necessary.

Fuel Crossfeed

Normal Crossfeed (X-BP)

The purpose of the fuel crossfeed function is to enable feeding of an engine by another TANK than the dedicated one. This is generally used in case of an engine failure. The operating engines can run on the fuel initially dedicated to the dead engine.

It could also be used in case of booster pumps failure.

Backup Crossfeed

For the fuel crossfeed between engines 1&3 and tanks 3&1, in addition to the normal X-BP 1-3 or X-BP 3-1, a backup XBP system is available and commanded by a dedicated “BACKUP 1-3” pushbutton on the overhead panel.

Crossfeed control

For crossfeed function, transfer valves are controlled by a dedicated Circuit Board.

Fuel Section of the Overhead Panel

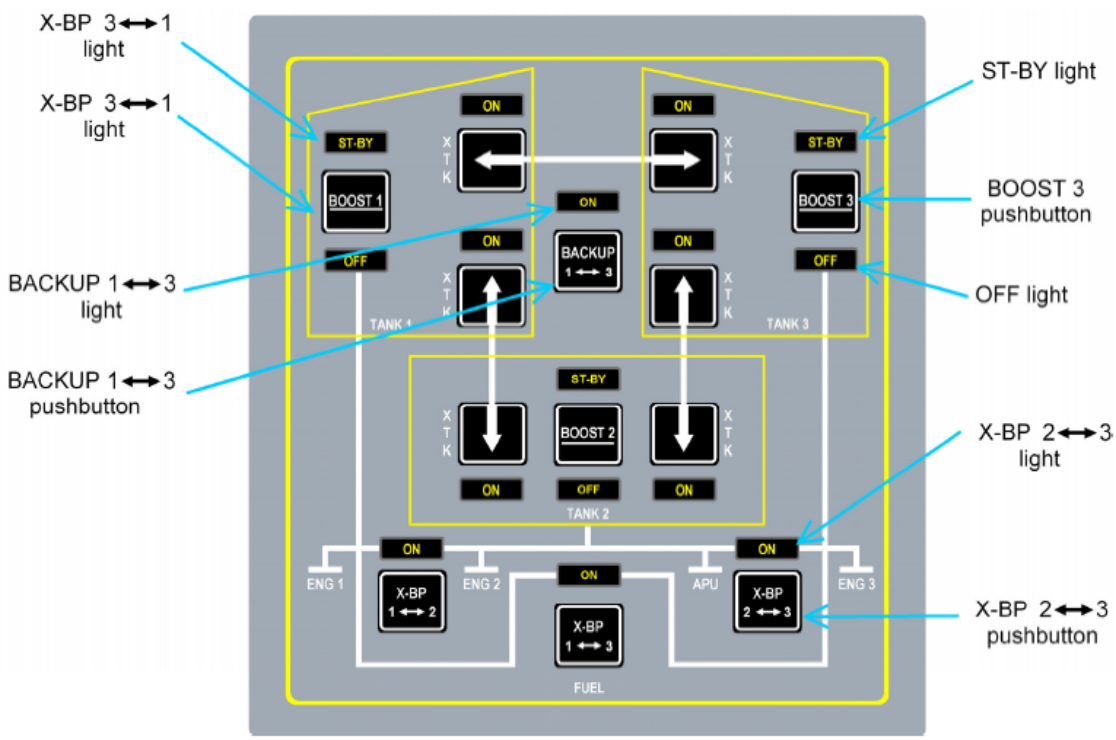


Figure 12 FUEL SYSTEM SECTION OF THE OVERHEAD PANEL

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
   	Manually controls to on or OFF either the Normal or ST-BY BOOST 1, BOOST 2 and BOOST 3 pumps. Pressing the BOOST pushbutton for less than 2 sec. switches between: - Unlighted On - ST-BY Pressing the BOOST pushbutton for more than 2 sec. switches the corresponding pump to: - OFF Automatic operation (on ground only): - When APU is started (APU MASTER pushbutton depressed), the stand-by booster pump 2 is automatically activated. - During engine start, the respective stand-by then normal booster pump are successively activated (when engine reaches idle, the stand-by is set off and the normal booster pump activated). - When APU or engines are stopped, the booster pumps remain on.	Unlighted on	On
		Push ST-BY	ST-BY On
		Push OFF	OFF

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
			Low pressure in fuel line
			Invalid data
No control available for the crew	When one XTK is selected, Both NORMAL and ST-BY BP are operating at the same time to speed up X-TK fuel transfer:	No action	BOTH
	Manually turns ON or off the X-BP in order to feed any engine by any group of tanks.	Push X-BP ON	X-BP valve Open
		X-BP off	X-BP valve Closed
			Invalid data

Fuel Indication

Crew indications with regard to Fuel system are located in:

- The HSI window of the PDU for recapitulative of Fuel Quantity and Fuel Remaining,
- The ENG-TRM window of the PDU for Fuel Used and Fuel Quantity of each TANK,
- The FUEL synoptic,
- The Fuel Synoptic Page,
- The ENG-CAS window for CAS messages.

PDU HSI WINDOW

PDU ENG/TRIM WINDOW

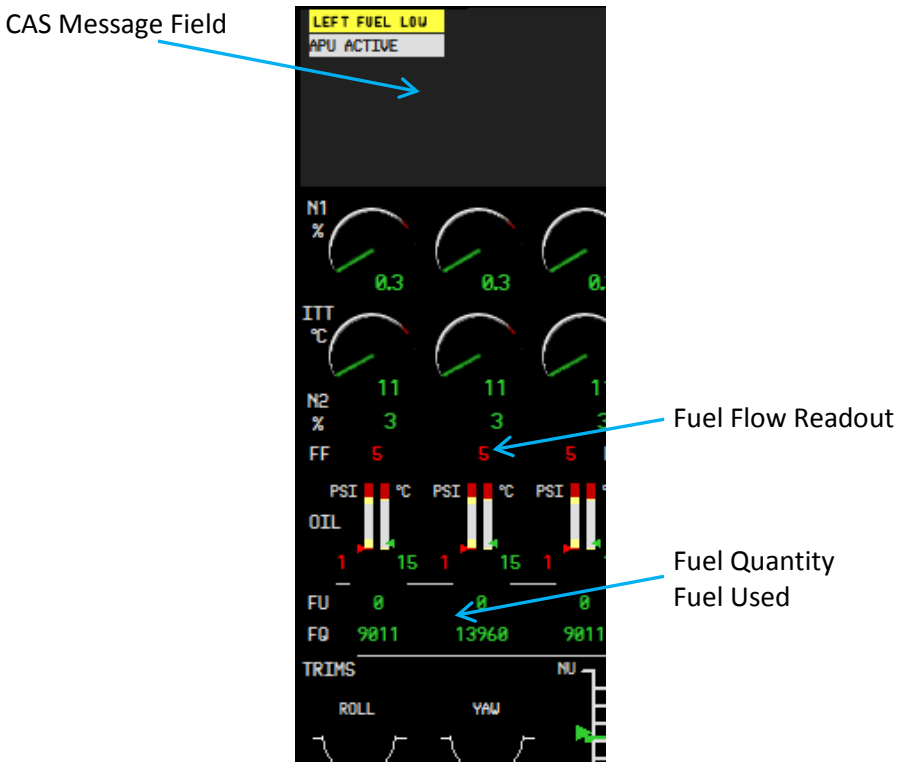


Figure 13 PDU ENG/TRIM WIINDOW

FUEL SYNOPTICS PAGE

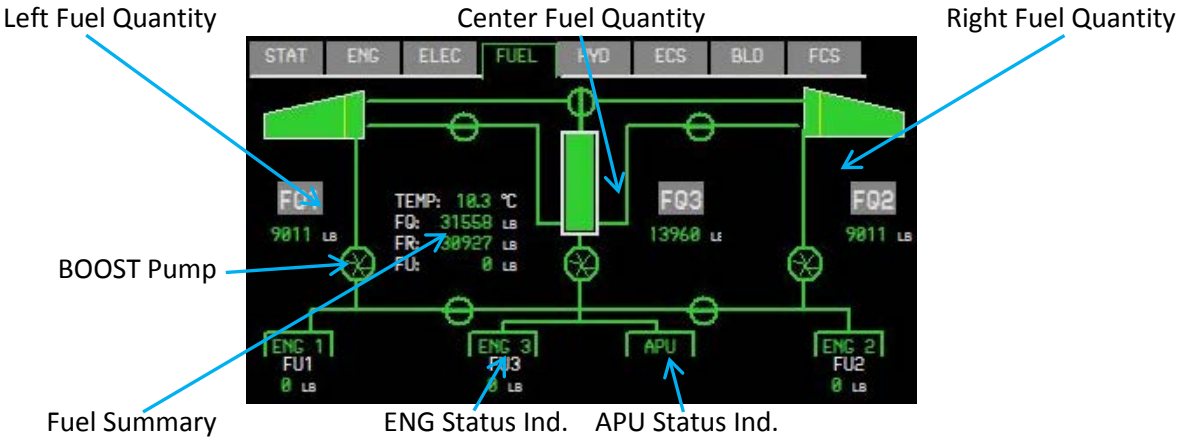


Figure 14 FUEL SYNOPTIC PAGE

Graphic representation of fuel quantity represents tank quantity.

Fuel System Principle

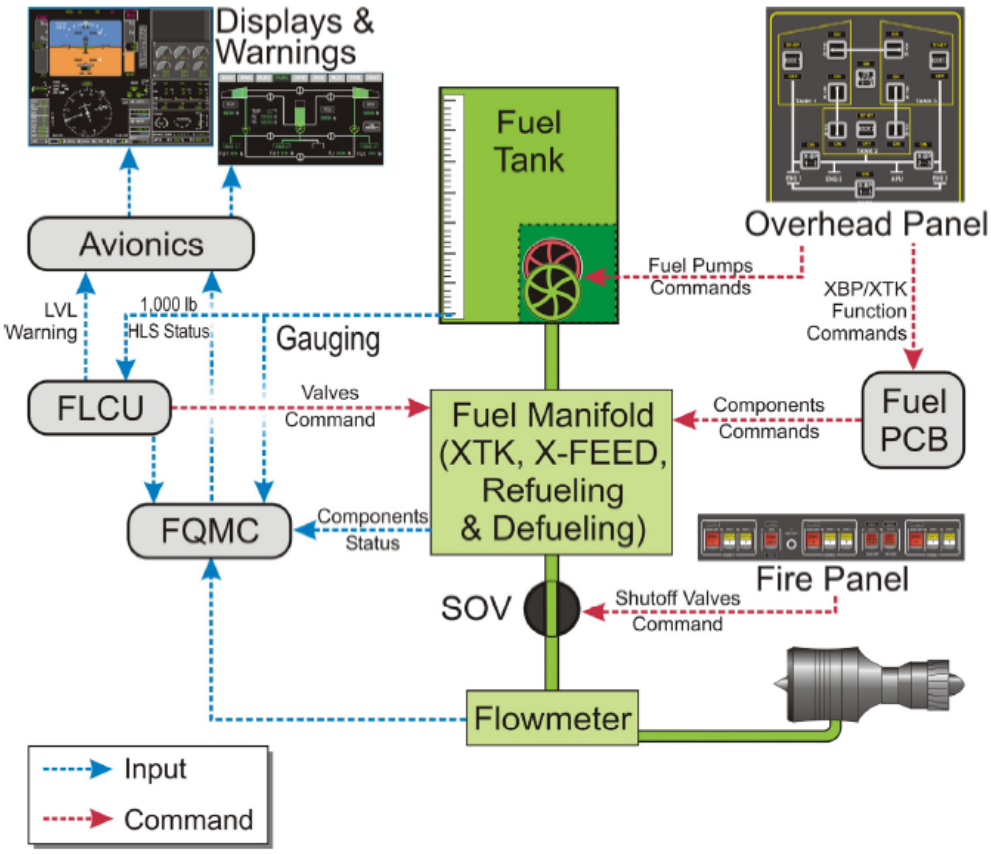


Figure 15 FUEL SYSTEM FLOW CHART

Bleed Air System

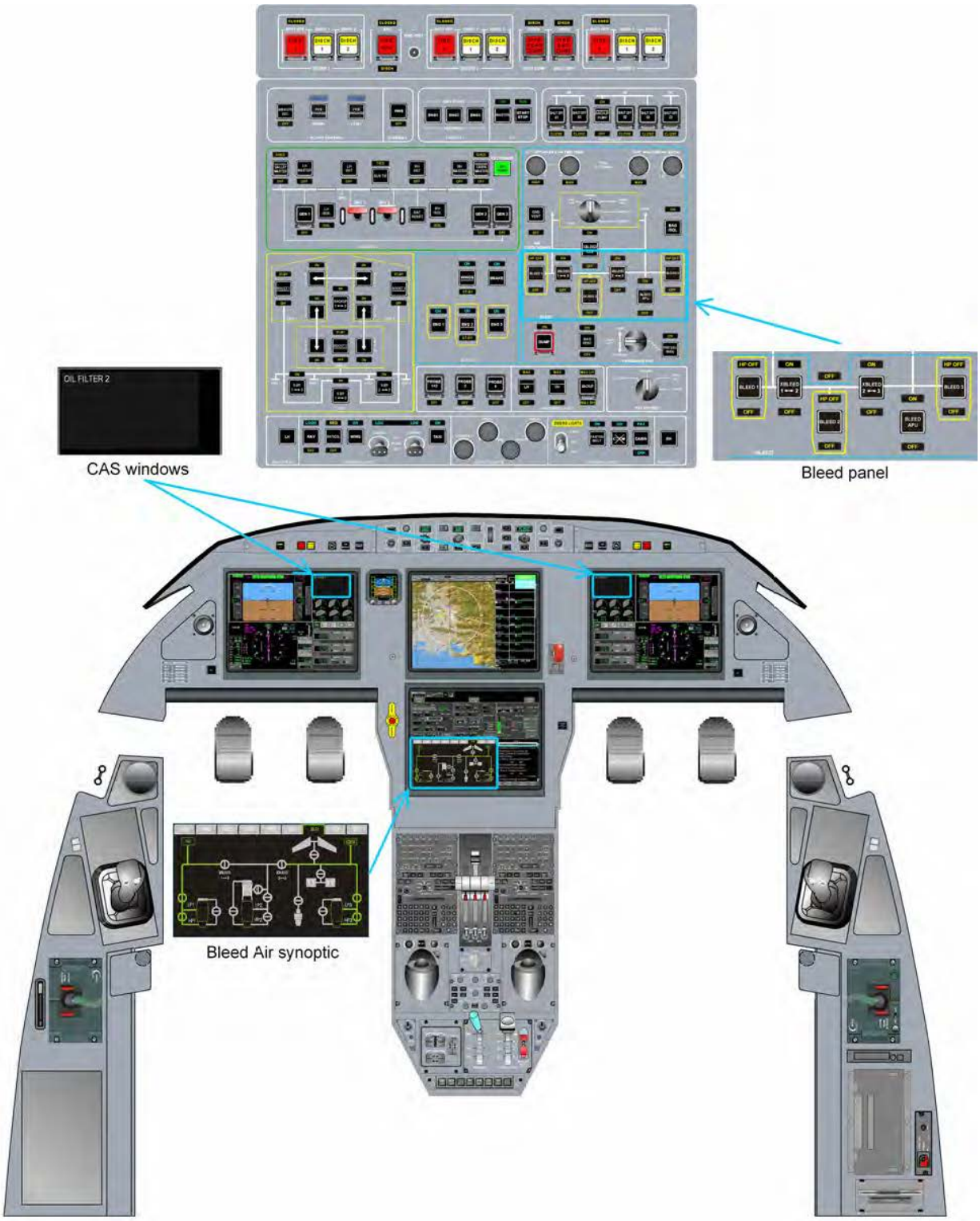


Figure 16 FLIGHT DECK BLEED AIR SYSTEM

Introduction

The Bleed Air System refers to the air distributed to provide following functions:

- Engine start,
- Air conditioning, also referred to as Environmental Control System (ECS),
- Wing and S-Duct anti-icing,
- Wheel well brakes heating.

Other functions such as pressurization of fuel tanks or anti icing of engine air intake are not performed by the airplane Bleed Air System (BAS).

The Bleed Air System (BAS) of the Falcon 7X uses bleed air provided by the 3 engines.

On ground, bleed air can also be provided by the APU.

Controls

Crew control of bleed air system is performed via The BLEED panel on the Overhead Panel (OP). See Figure 16 FLIGHT DECK BLEED AIR SYSTEM.

There is no control available through the synoptic.

Indications

Cockpit indications are displayed:

- On the MDU 2 BLD synoptic page,
- On the ENG CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

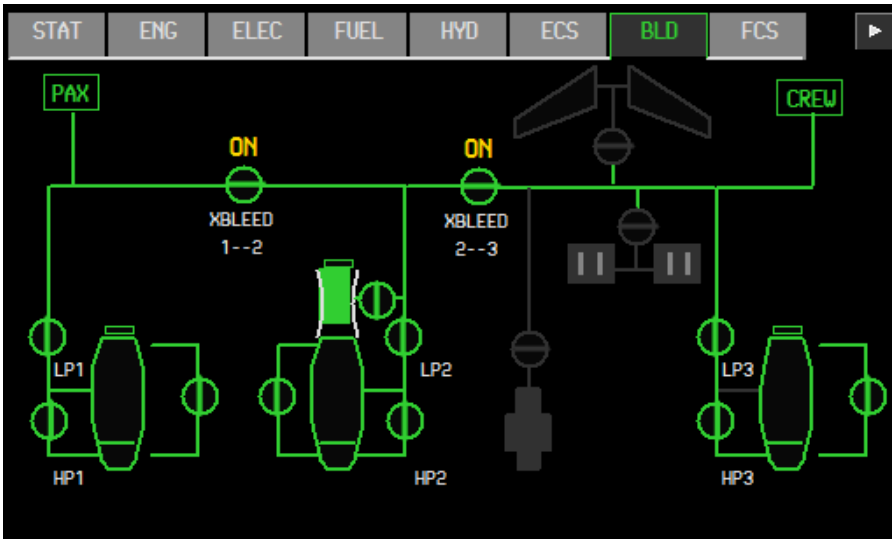


Figure 17 BLEED SYSTEM SYNOPTIC PAGE

Normal ECS Operation

During normal ECS operation, the BAS is managed by the AMSAC (Air Management System Automatic Controller).

The bleed air valves will be automatically configured depending on the bleed sources and downstream bleed consumers (Wing Anti Ice, S Duct Anti Ice). Managed by the AMSAC, the bleed air Take-Off mode minimizes bleed air extraction (closure of bleed air valves) to ensure maximum engine performance during take-off.

Emergency ECS Operation

EMERG ECS operation is managed by the AMSEC, with PACK selector on EMERG position.

The AMSAC is no longer electrically supplied, and stops supplying power to the HP and MPValves. All the HP valves close (HP valves are sprung-loaded closed), and MP 1 and 2 valves are pneumatically controlled.

The AMSAC is installed in the baggage compartment, which is normally pressurized.

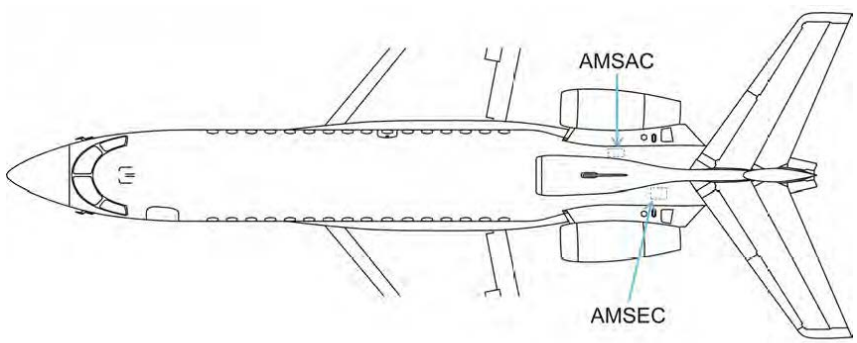


Figure 18 BLEED AIR EQUIPMENT LOCATION

Electrical Power Source

The following paragraph describes the power supply of the different equipment of the Bleed Air System. Electrical protection is provided either:

- By Solid State Power Controllers (SSPC) ,
- By Circuit Breakers (CB).

EQUIPMENT	POWER SUPPLY	TYPE OF PROTECTION
AMSAC AMM1 & AMM3	LH main bus	CB
AMSAC AMM2	RH main bus	SSPC
AMSEC EMM	LH and RH Essential bus	CB
AMSEC BALDS	LH Essential bus	CB

Controls

The crew has control on engine and APU bleed air system through the BLEED section of the Overhead Panel (OP).

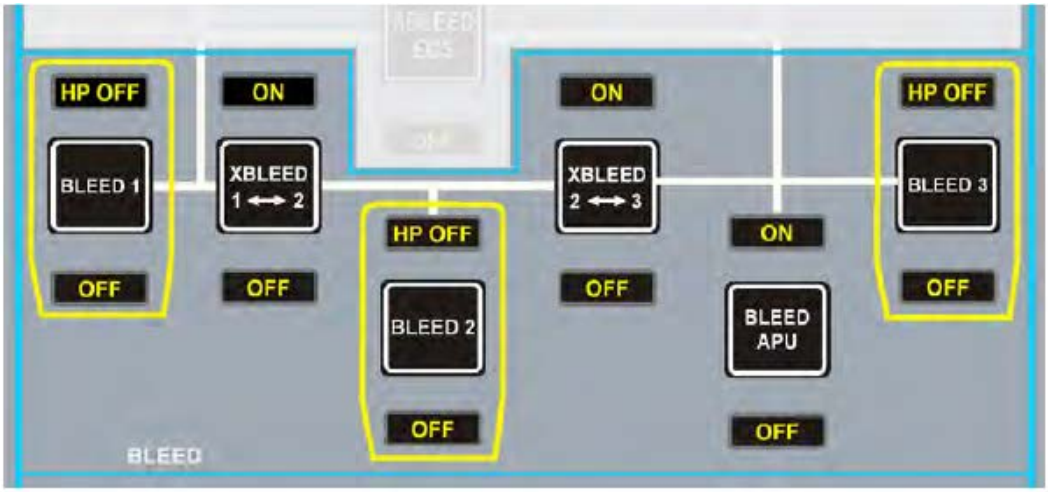
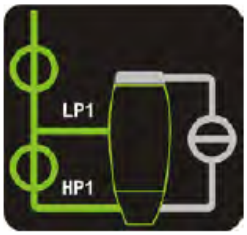
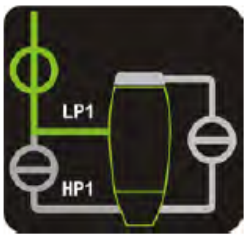
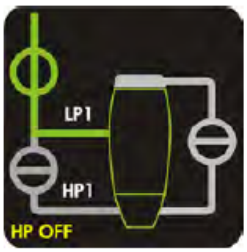
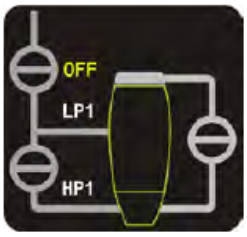
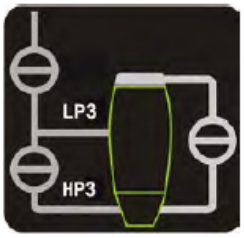
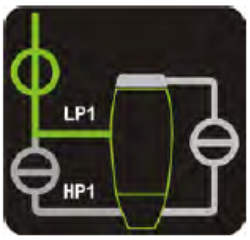
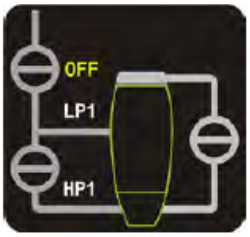


Figure 19 OVERHEAD BLEED AIR CONTROL PANEL

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE		SYNOPTIC
	BLEED 1/2/3 **During ECS standard operation:** When pushed, cycles the corresponding HP/MP valves through the positions: - Unlighted on (HP and LP flow managed by AMSAC): normal Ground / Flight configuration - HP OFF (HP valve closed), - OFF (HP and LP flow) valves closed),	Unlighted on with HP		
		Unlighted on without HP		
		Push HP OFF		
		Push OFF		

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE		SYNOPTIC
	BLEED 1/2/3 **During ECS Emergency operation:** - HP is automatically turned OFF for all three bleed systems - BLEED 1 and 2 remain operative in "on" mode (managed by the AMSEC) or OFF mode - BLEED 3 system is inoperative			
				
				

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE		SYNOPTIC
	BLEED APU When pushed, cycles the APU bleed through the positions: - Unlighted auto (APU bleed valve managed by the APU controller when the APU is in operation): normal Ground/ Flight configuration - ON (APU Bleed valve open) - OFF (APU Bleed valve closed)	Automatic mode		
		Push ON		
		Push OFF		

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE		SYNOPTIC
 	XBLEED 1↔2, 2↔3 **During ECS normal operation:** When pushed, cycles through the positions: - Unlighted auto, (XBLEED valve managed by the AMSAC): normal Ground/ Flight configuration, - ON (XBLEED valve open), - OFF (XBLEED valve closed, allowing isolation of manifolds). **During ECS Emergency operation:** - XBLEED 1↔2 valve remains in auto mode (managed by the AMSEC) or OFF mode, - XBLEED 2↔3 valve is closed.	Normal mode:		
		Push ON		
		Push OFF		

Fire Control System

The fire protection system is designed to warn the crew in case of fire, overheat or smoke in certain aircraft zones.

The system allows the discharge or fire extinguisher in some of these zones.

The following table lists the concerned zones as well as related protection and extinguishing capabilities.

ZONE	FIRE DETECTION / OVERHEAT DETECTION	SMOKE DETECTION	FIRE EXTINGUISHING CAPABILITY
Engine	Yes Yes		Yes
APU	Yes Yes		Yes
Rear compartment	Yes Yes		Yes
Baggage compartment		Yes	Yes
Main Landing Gear wheel wells	Yes		

Controls

Crew control of fire protection system is performed via the Fire Control Panel (FCP) on the Overhead Panel. Aural alerts can be interrupted with the Master warning or SIL pushbuttons.

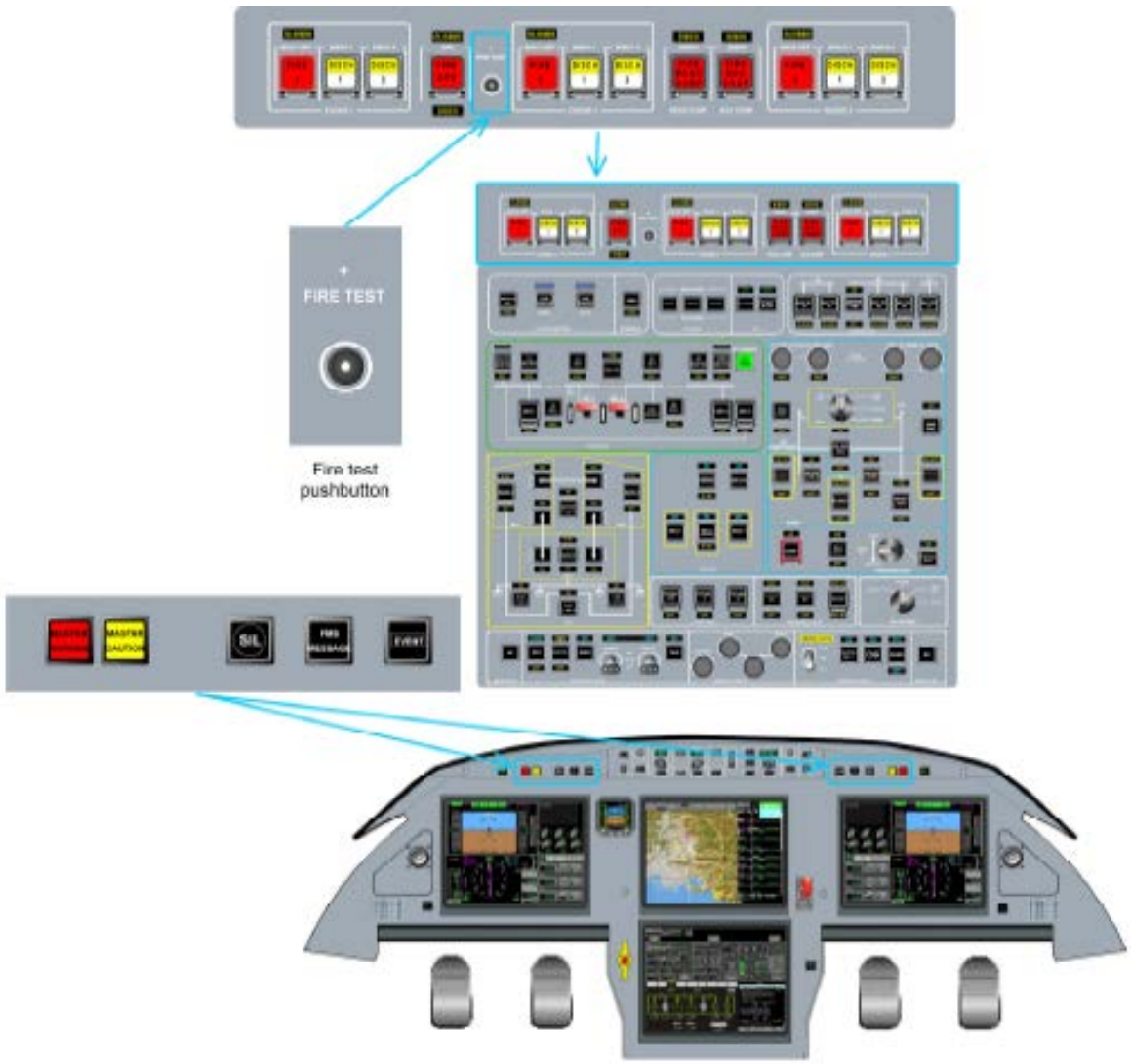


Figure 20 FIRE PROTECTION CONTROLS

Indication

Cockpit indications are displayed:

- On the Fire Control Panel,
- On the throttle repeaters for engines on fire,
- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab synoptic for failure messages.

There is no dedicated synoptic for the Fire Protection System (FPS).

Fire Control Panel

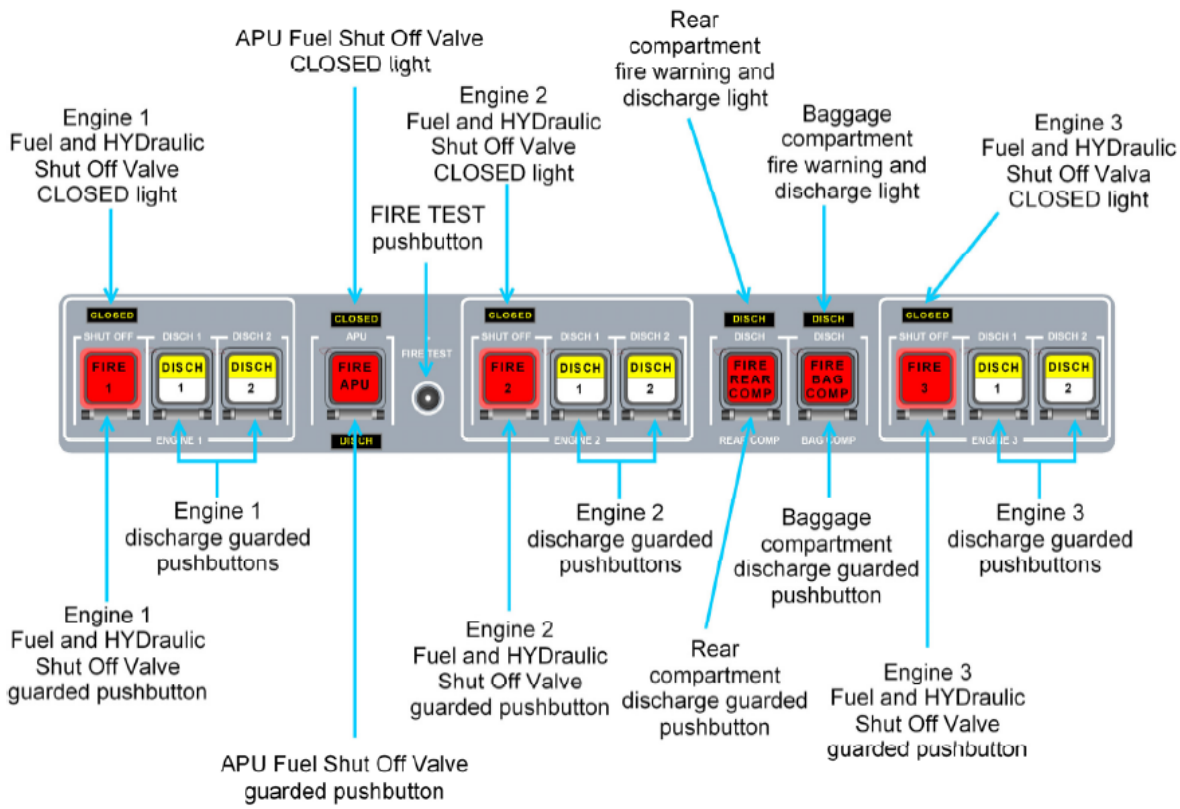


Figure 21 FIRE CONTROL PANEL

The Fire Control Panel located in the upper portion of the overhead panel provides indication as well as controls for Fire, Smoke and overheat protection.

The Fire Control Panel includes:

- "FIRE 1, 2 and 3" guarded pushbuttons which:
  - Indicate the engine for which a fire is detected,
  - Allow controlling the closure of engine Fuel and Hydraulic Shut-Off Valves so that fuel and hydraulic flow is cut off, and the disconnection of generator.
- Amber indicators "closed" above the "FIRE 1, 2, 3" pushbuttons which indicate that the Fuel shut off valve and hydraulic shut off valves of the relevant engine are closed.
- "DISCH 1, 2" guarded pushbuttons which:
  - Provide decision help in case one extinguisher is not available,
  - Allow discharging the relevant engine extinguishers, one at a time,
  - Indicate when and extinguisher is discharged,
- "FIRE APU" guarded pushbutton which:
  - Indicates that a fire is detected in the APU zone,
  - Allows discharging the APU extinguisher,
- Amber indicator "closed" above the "FIRE APU" pushbutton which indicates that the Fuel shut off valve of the APU is closed in case of fire

- "FIRE REAR COMP" guarded pushbutton which:
    - Indicates that a fire is detected in the rear compartment zone,
    - Allows discharging the rear compartment extinguisher,
- "FIRE BAG COMP" guarded pushbutton which:
    - Indicates that smoke is detected in the baggage compartment zone,
- Allows discharging the baggage compartment extinguisher (to be used if the alarm is triggered during a depressurization, Take Off or Landing -otherwise, the portable extinguisher would be used).
- DISCH indicators below the "FIRE APU", and above the "FIRE REAR COMP" and "FIRE BAG COMP" pushbuttons which indicate that the corresponding extinguisher is discharged,
- A FIRE TEST button to trigger the Fire Protection system test.

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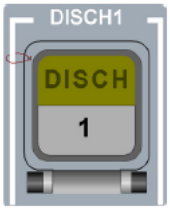
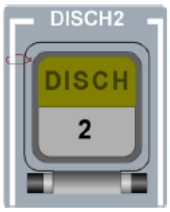
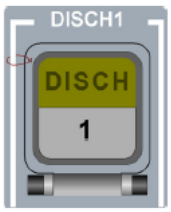
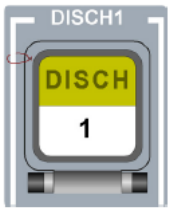
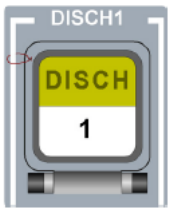
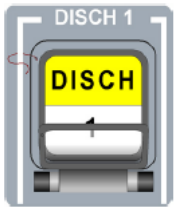
CONTROL & INDICATION	FUNCTION	TO ACTIVATE / TO DEACTIVATE	LOCAL INDICATION
	Indicates fire on one Engine Activates closure of the corresponding engine Fuel and Hydraulic Shut-Off Valves Disconnects contactor of corresponding generator Additionally, for engine 2: Closes the ATSV and inhibits Thrust Reverser after landing	Guarded	
		Engine 1 fire occurs **NOTE** Light goes out when fire is extinguished	
		Guard raised and FIRE 1 pushed to command closure of FSOV and HYD SOV (and disconnection of generator)	The **CLOSED** indication flashes during Shut-Off Valves operation.
		FSOV and HYD SOV are closed	Fuel Shut-Off and Hydraulic Valves are closed when **CLOSED** indication is steadily illuminated.
			If a discrepancy between pushbutton control and Fuel Shut-Off Valves is detected, the **CLOSED** status light flashes

CONTROL & INDICATION	FUNCTION	TO ACTIVATE / TO DEACTIVATE	LOCAL INDICATION
 	Indicates extinguisher available Discharges extinguishing agent from built-in extinguisher(s) to the detected engine fire Indicates extinguisher discharged	Safety guarded, **FIRE** pushbutton not pushed yet 	
		Fire detected and **FIRE** pushbutton pushed on  	1 and 2 illuminate steady white if both extinguishers are available. Otherwise, the light illuminates only for the available extinguisher.
		Guard raised and "DISCH" pushed to discharge Extinguisher 	When discharged, **DISCH** illuminates steady amber **NOTE** **DISCH** is steady when the discharge is not available even if the button has not been depressed

CONTROL & INDICATION	FUNCTION	TO ACTIVATE / TO DEACTIVATE		LOCAL INDICATION
	Indicates fire in the APU fire zone Discharges extinguishing agent from built-in extinguisher in the APU fire zone.	Safety guarded		
		Fire APU occurs	 **NOTE** light goes out when APU fire is extinguished	
		FCP automatically closes the FSOV and disconnection of APU generator		The **CLOSED** light flashes during Shut-Off Valve operation, then remains steady when valve is fully closed.
		Guard raised and "FIRE APU" pushed to discharge the extinguisher		
				When extinguisher is discharged, light is on

CONTROL & INDICATION	FUNCTION	TO ACTIVATE / TO DEACTIVATE	LOCAL INDICATION
	Allows checking the protection system integrity both on ground or in flight.	Push during 1 s to launch the test.	All lights should light on. During the test the CAS message: **FIRE TEST IN PROGRESS** is displayed. The message will disappear when the pushbutton is released. If the test failed, the **FIRE: TEST FAIL** CAS message is displayed and the light of the corresponding function does not light on the FCP.

Hydraulic System

General

The hydraulic power system provides pressure for actuation of:

- Primary Flight Controls System (PFCS: ailerons, elevators, rudder and spoilers),
- Secondary Flight Controls System (SFCS: slats, flaps and airbrakes),
- Landing gear, brakes and nose wheel steering,
- Thrust reverser of engine 2.

Hydraulic Power

Hydraulic power is supplied by:

- The primary hydraulic systems during normal flight operation
- The auxiliary hydraulic supply
    - On ground if primary hydraulic power is not available or for maintenance operations,
    - In flight in case of failure of the primary hydraulic system.

The primary hydraulic power supply features three independent hydraulic systems (referred to as A, B, and C systems), each operating with hydraulic fluid at a nominal pressure of 3000 psi (207 bar). It is powered by five Engine Driven Pumps (EDP).

The auxiliary hydraulic supply, which is provided by the electrical backup pump and selector valve, provide back-up power between 2900 psi (200 bar) and 1500 psi for system B as well as power to systems A or B for ground maintenance activities.

Controls

Crew control of the Hydraulic system is performed:

- Primarily via the HYDRAULIC section of the overhead panel (OP)
- Via the Fire Control Panel in case of engine fire.

Indications

Crew indications with regard to Hydraulic system are located in:

- The HYDraulic synoptic
- The STATus page synoptic for a recapitulative of main parameters concerning the Hydraulic system,
- The STATus synoptic / FAULT tab for fault messages
- The ENG-CAS window for CAS messages.

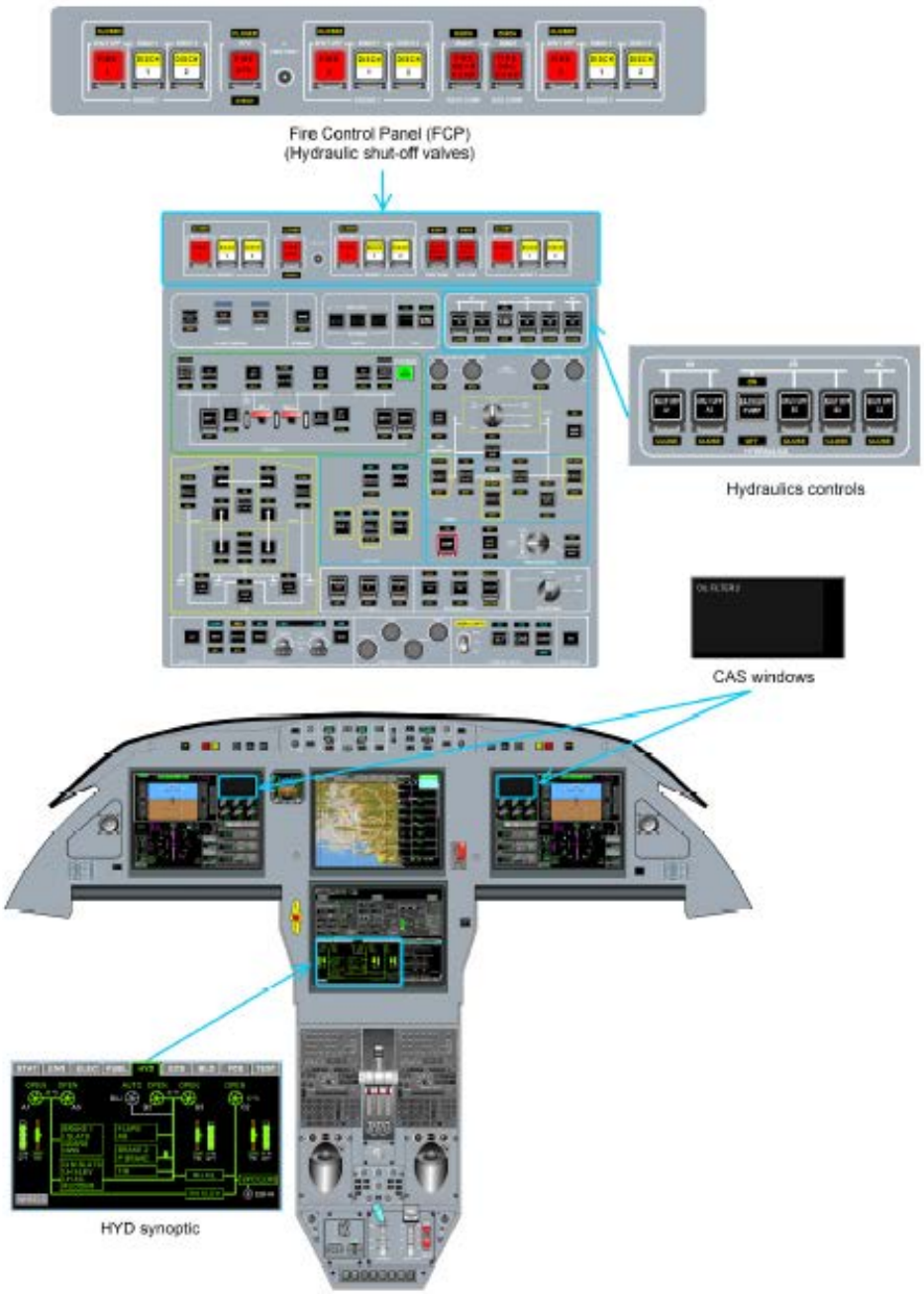


Figure 22 HYDRAULIC SYSTEM FLIGHT DECK OVERVIEW

Generation

The pumps of the hydraulic system are driven mechanically via the accessory gear box for the 5 Engine Driven Pumps (EDP), and electrically for the backup pump.

RESERVOIRS

Each of the three hydraulic systems stores hydraulic fluid in a dedicated reservoir embedding its own accumulator.

Each reservoir is pressurized by its corresponding hydraulic system to avoid pump cavitation and draining. No bleed air is used to pressurize the hydraulic tanks.

Fluid quantity can be visually checked on the reservoir itself or on the hydraulic synoptic.

Fluid temperature for each reservoir is also given on the hydraulic synoptic.

ELECTRICAL BACKUP PUMP

The electrical Backup Pump provides:

- Back-up hydraulic power supply for system B,
  - mainly in case of a triple engine failure,
  - it is designed to allow an emergency descent with all engines out from 51,000ft
- Power for ground maintenance activities on systems A and B:
  - For maintenance on system A, it is manually switched by using the FLIGHT/GROUND selector

Backup Pump Operation

The Backup Pump is activated:

- Automatically: by the HSCB (Hydraulic System Control Board) when the four EDP of systems A and B are (failed) not producing power (A1, A3, B2 and B3), ie. in case of a triple engine failure,
- Manually: by setting the overhead panel BACKUP PUMP pushbutton to ON position.

The backup pump can bet set to OFF, using the same BACKUP PUMP pushbutton of the overhead panel.

Hydraulics Controls

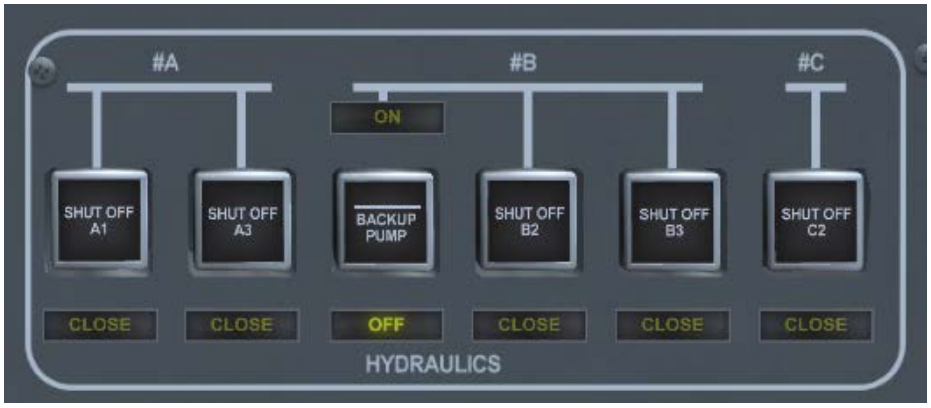


Figure 23 HYDRAULIC SECTION OF OVERHEAD PANEL

The hydraulic system is mainly controlled through the switches of the HYDRAULICS section of the Overhead Panel. The five Hydraulic Shut-Off Valves (HYD SOV) are controlled by SHUT OFF A1, A3, B2, B3 and C2 guarded pushbuttons. The backup pump is controlled by the "BACKUP PUMP" pushbutton.

The five HYD SOV can also be activated through the respective engine FIRE guarded pushbuttons on the Fire Control Panel.

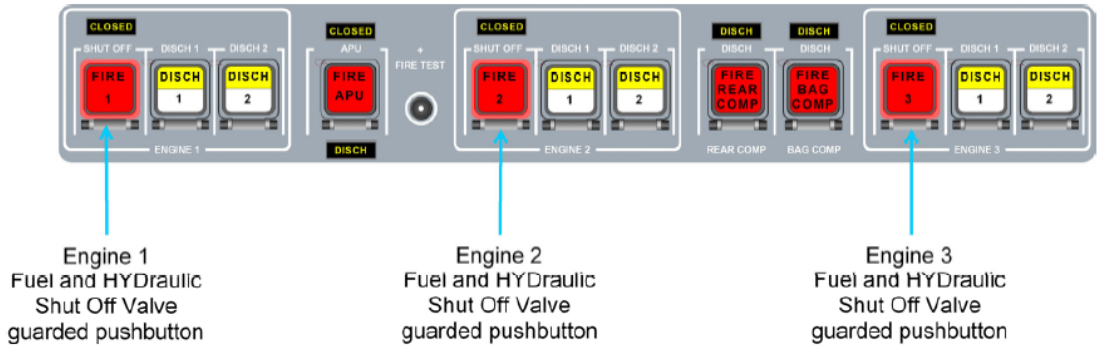


Figure 24 HYDRAULIC FIREWALL SHUT-OFF VALVE CONTROL

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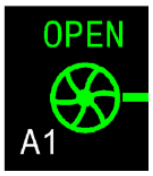
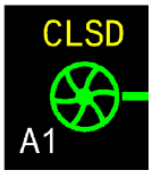
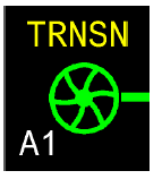
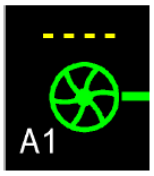
CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	Guarded pushbuttons control the closing of the corresponding HYD SOV: - Unlighted open (normal): HYD SOV is open, - CLOSE: HYD SOV is closed.	OPEN	EDP A1 HYD SOV open 
		CLOSE	EDP A1 HYD SOV closed 
			EDP A1 HYD SOV is not in its commanded position 
			EDP A1 HYD SOV invalid data 

Hydraulics Synoptic Page

Indications related to the Hydraulic system are provided within the HYDraulic synoptic and within the STATus page on MDU 2.

The Hydraulic (HYD) synoptic page displays the three hydraulic systems and the distribution of users between the systems:

- The five EDP, the backup pump and the five Firewall Shutoff Valves status are indicated by color symbols and/or text fields
- The button WHEELS allow to access tire pressure and brake temperature information (these data are described in ATA 32)
- The following indications are available:
    - Pressure of each hydraulic system,
    - Fluid quantity of each hydraulic system,
    - Fluid temperature of each hydraulic system,
    - Shut-Off Valve positions (open, closed, transition),
    - Accumulators pressure (park brake, thrust reverser being not monitored).

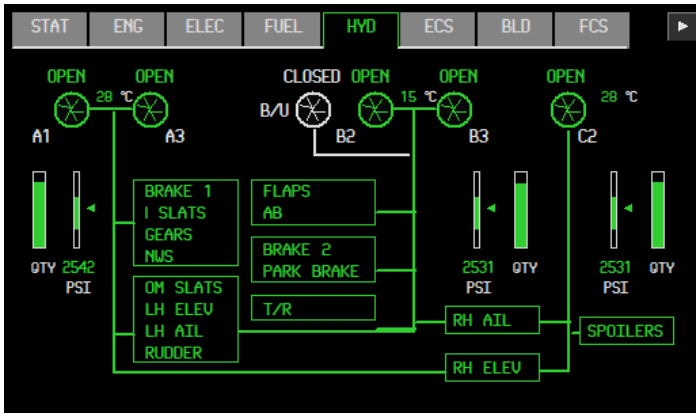
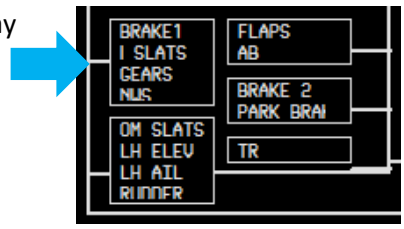


Figure 25 HYDRAULICS SYNOPTIC PAGE

If a system is functioning normally it will display green. Otherwise, white.



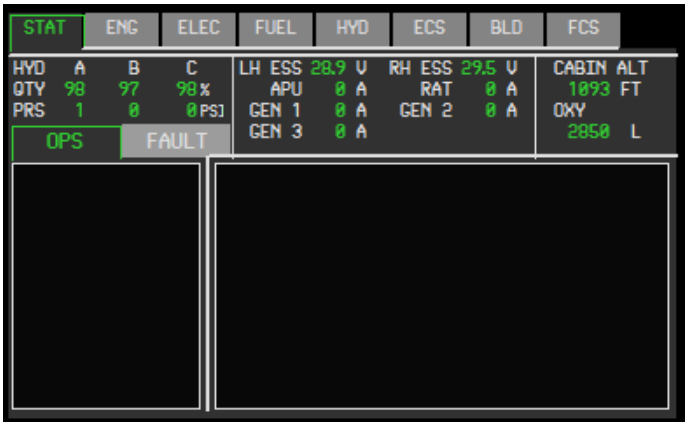


Figure 26 STATUS SYNOPTIC PAGE

At the top of the STATus page, following information on the three Hydraulic systems are summarized:

- Hydraulic quantity,
- Hydraulic pressure,
- Hydraulic Temperature.

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Engine Start and Shutdown

In order to achieve engine start, two conditions must be met:

1. Sufficient power must be available.
2. Fuel must be available to the system.
3. Pressurized air from the *Bleed Air System*.

> *Simulator note:*
> *Common starting procedure in the simulator is to use Ctrl+E keystrokes to invoke the standard simulator "Start All Engines" command. This can only be accomplished in the Falcon if the System Realism selection is OFF on the Info Pad. See page 44 for more details.*

Electrical Power to Start

See the section *Providing Power to The Systems* on page 4 for complete information on providing electrical power. On the ground, power must be available through the APU and/or ground power systems.

In the air, power must be available through the essential bus circuits via engine generators, or the *Ram Air Turbine* (RAT).

Fuel to Start

The fuel pump switch for the respective engine must be in the ON position for the engine to start or run. The fuel pump switches are located directly behind the throttles.

The FADEC will initiate automatic activation of booster pump at when engine start is engaged. See *Booster Pumps* in the *Fuel Section* of this manual, on page 15 for more details.

Pressurized Air

The engine is fitted with an air turbine starter requiring bleed air from:

- The APU,
- Another engine in cross bleed start.

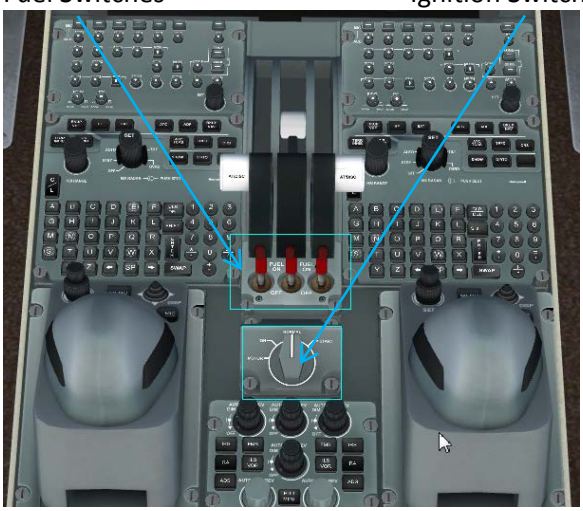
Ground Start

Before starting, the following criteria must be met:

1. LH and RH power must be available. See **Error! Reference source not found.**.
2. APU must be ON. See **Error! Reference source not found.**.
3. APU Bleed Air switch must be ON. See **Error! Reference source not found.**.

Locate the following controls:

Fuel Switches Ignition Switch



FUEL CUT-OFF SWITCHES

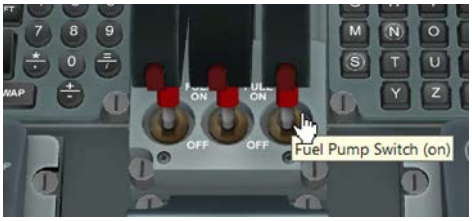


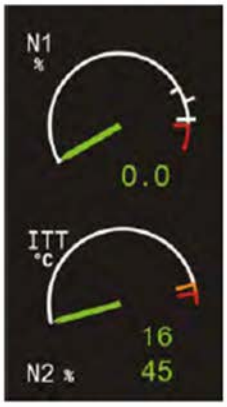
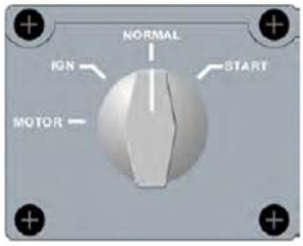
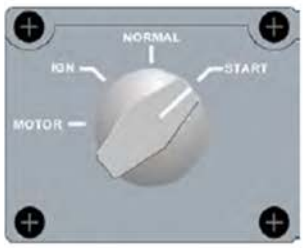
Figure 27 Fuel Switches

Three fuel cut-off switches (one per engine) are located on the pedestal. They have two positions: Fuel ON (Up) / Fuel OFF (Down).

ENGINE START SELECTOR

Figure 28 Pedestal Engine Start Selector

NORMAL: Normal position on ground and in normal flight condition
START: On ground, initiates the starting sequence of the selected engine
IGN: Activates continuous ignition on all engines.
MOTOR: Enable motoring

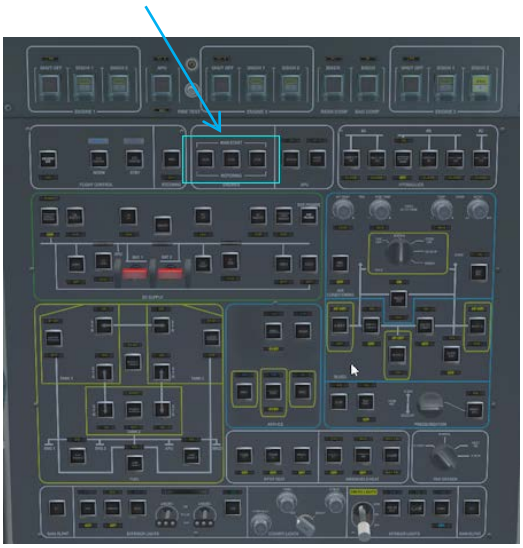
 Engine start selector	MOTOR: enables motoring and stop manually the starting sequence		
	IGN: activates all engine igniters simultaneously		
	NORMAL: normal position in normal flight		
	START: initiates the starting sequence of the selected engine. (spring-loaded position)		

MANUAL START PUSHBUTTONS

Engine MAN START pushbuttons are used for in flight starting or engine motoring.

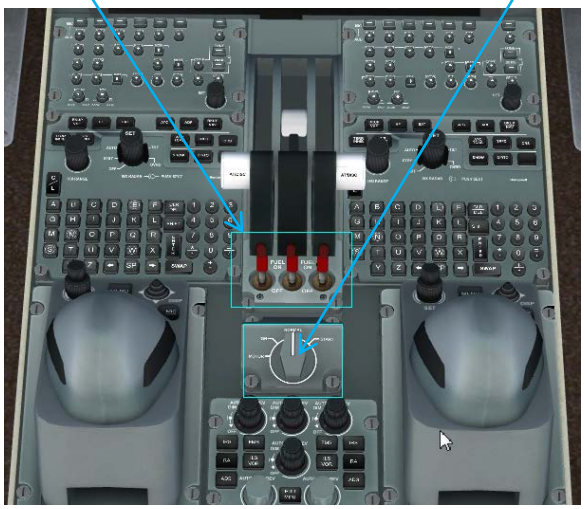
Locate the following controls:

Overhead Start Switches

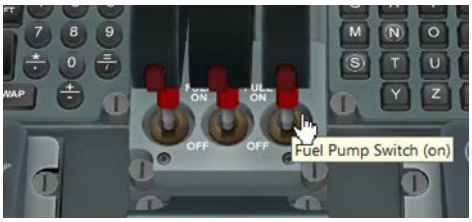


Fuel Switches

Ignition Switch



1. Enable motoring my moving the Ignition Switch to MOTOR.



2. Make sure the fuel switch for the respective engine is in the ON (up) position.

3. With the Ignition Switch in the MOTOR position, and the engine's fuel pumps switch ON, press the manual start for the respective engine on the overhead panel

SIMULTANEOUS SEQUENTIAL START

To start all engines simultaneously, move the switch left (right click) to the IGN position. This will start all engines in sequence (left, right, center). This is the equivalent to pressing Ctrl + E in the simulator.

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Flight Control System

The crew has manual control of the Flight Control System (FCS) via:

- The sidestick,
- The pedals,
- The manual trims available in certain flight or failure conditions,
- The TRIM EMERG pushbutton on emergency panel.

Indications
Cockpit indications related to the FCS are displayed:

- On the PDU for trim positions,
- On the FCS synoptic page for control surface and trim positions,
- In the ENG-CAS window for CAS messages,
- In the FCS synoptic page.

Aural alerts are provided by the FCS in some failure cases.

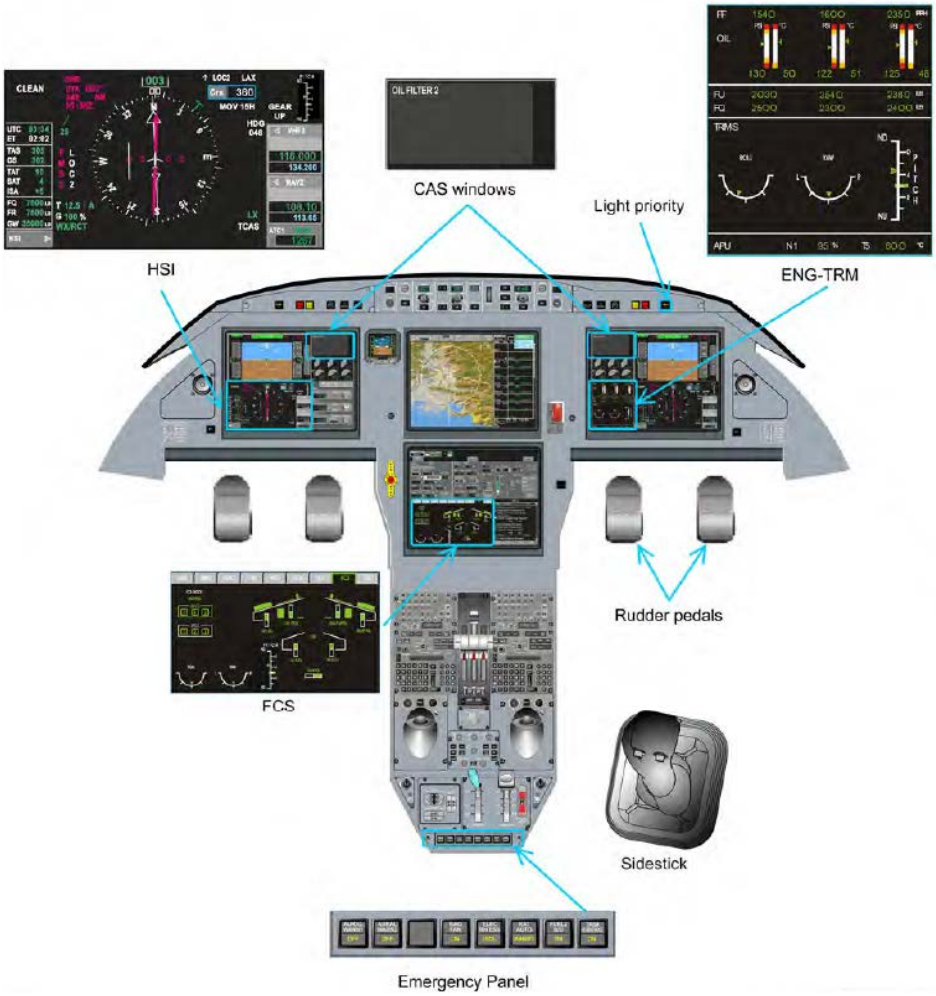


Figure 29 FLIGHT CONTROLS FLIGHT DECK OVERVIEW

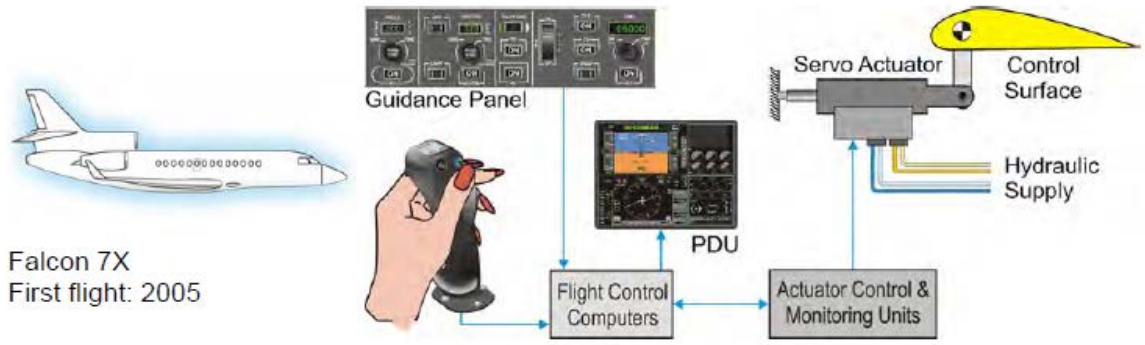
Fly By Wire Technology

Flight controls technology has been evolving for years in order to enable better airplane performance. Slow airplanes only required conventional controls, with direct actuation of the control surfaces by the pilot through bell cranks and pulley.

As of today, bell cranks and pulley have been replaced by digital links between the pilot controls and the servo actuators.

This technology, also referred to as digital Fly By Wire (FBW) technology, not only allows increased airplane speed, but it mainly allows safety improvement.

The Flight controls of the Falcon 7X were therefore designed with digital FBW technology when the autopilot is active. If your simulator is Prepar3D v3 this feature is also available when the autopilot is off as well. Earlier versions of the simulator (Flight Simulator X or Prpar3D v2) are too unstable for Fly By Wire technology when the autopilot is off.

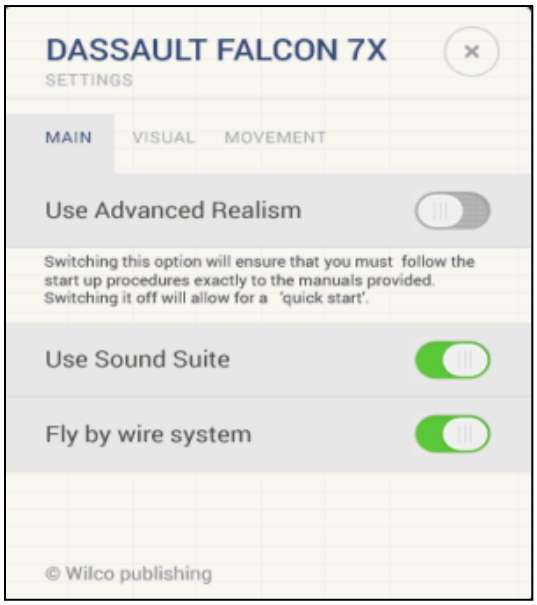


The digital FBW (Fly By Wire) technology allows improved safety by:

- Preventing the airplane from exceeding the safe flight envelope while reaching maximum airplane performance
- Allowing instinctive reaction in emergency situation
- Reduced pilot workload by Simplifying airplane handling characteristics and enhancing airplane stability
- Improved performance.

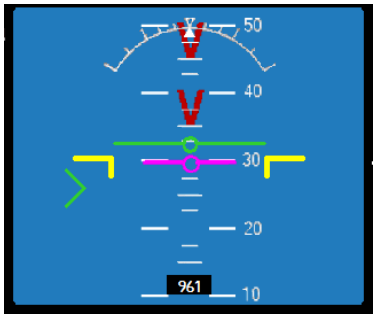
Excessive attitude/Roll protection

The excessive attitude protection function aims to prevent the airplane from exceeding the pitch angle of - 25° to 35° and roll angle of +/- 35° with normal sidestick movement.



FBW flight modeling is incorporated in the Falcon 7X by default. If you want to turn this system off in the simulator you can shut it off by using the Info Pad. You can open the Info Pad by pressing Shift + 2.

Note that many of the indicators on the Primary Flight Display are only available in FBW is left ON.



FBW guidance is provided by:

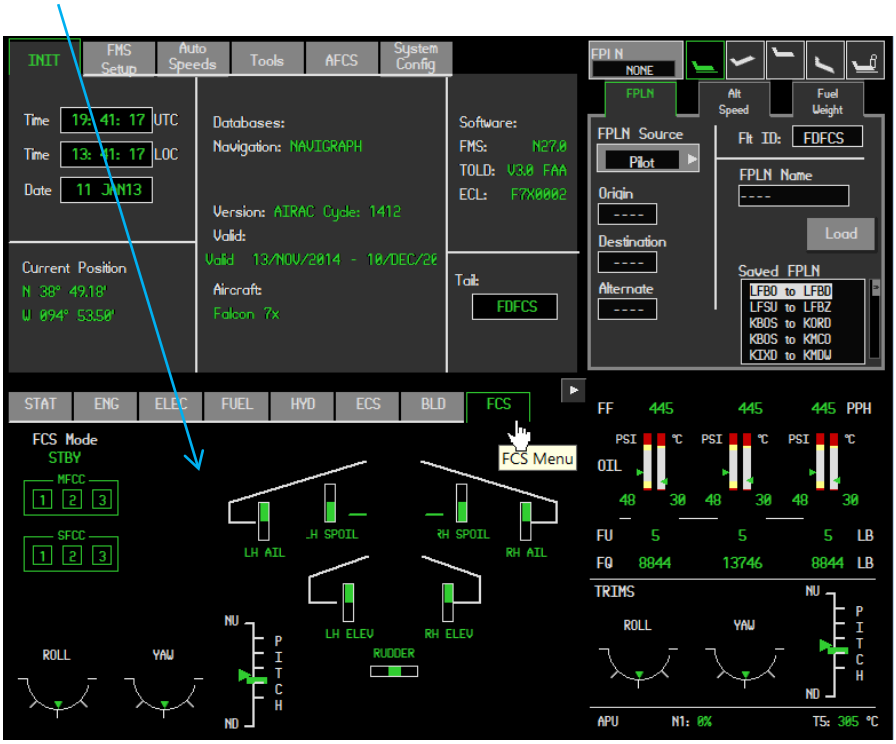
1. Main Computer (Flight Augmentation and Ailerons)
2. SEC Computer (Spoilers and Elevators)

If FBW is switched off the computer disconnect messages will be displayed on the Crew Alerting System (CAS).

Indication

The status of the Main and SEC computers can be found on the MDU 2 FCS Synoptic.

Green indication shows the computers are online. Yellow indicates the computer(s) offline.



Failure of either computer is also indicated on the CAS, and triggers a Master Warning.

Primary Flight Control System

The Primary Flight Control System (PFCS) architecture is based on six main functionalities:

- Data collection:
  - From sensors (IRS, AHRS, RA, ADS, etc.),
  - From pilot controls,
  - From the Flight Director (FD) if the AutoPilot (AP) is engaged,
- Calculation of control surface commands by the main and secondary Flight Control Computers (FCC),
- Selection of FCC for control surface commands and transmission of commands to actuators,
- Actuation of flight control surfaces by the actuators,
- Monitoring of actuators,
- Data exchanges with avionics.

FLIGHT DATA CONCENTRATORS (FDC)
The PFCS includes 5 Flight Data Concentrators. Each FDC collects the data received from the various sensors and pilots controls, and provides these data to the Flight Control Computers.

MAIN AND SECONDARY FLIGHT CONTROL COMPUTERS (MFCC AND SFCC)
The PFCS includes 3 MFCCs and 3 SFCCs. The MFCCs and SFCCs calculate the control surface commands, based on the available Flight Control Laws (FCL).

The FCL require movement of the flight control surfaces to achieve the expected behavior of the airplane according to pilot inputs and airplane movement. The FCL available depend on the status of the airplane sensors and actuators. Three different types of FCL are defined:

"Normal", "Alternate" and "Direct Laws". Non-degraded FCL provide a higher level of safety and comfort and a lower piloting workload when compared with degraded FCL.

- NORMAL laws: full functionality is provided,
- ALTERNATE laws:
  - Handling characteristics similar to NORMAL laws around 1g,
  - As a precautionary measure, all the protections are considered to be lost, even though some of them may still be active,
- This mode is automatically entered when NORMAL laws cannot be supported due to a computation, servo-actuator, sensor or interfacing system failure.
- DIRECT laws:
  - Implementing the functions enabling safe flight and landing (similar to a conventional airplane in the restricted flight envelope),
  - This mode is automatically entered when NORMAL / ALTERNATE laws cannot be supported due to computation, servo-actuator, sensor or interfacing system failures.

FCS Synoptic Page

The FCS synoptic page displays the following information:

- The active FCS mode,
- MFCC and SFCC computer status,
- Trim positions,
- Positions of all control surfaces.

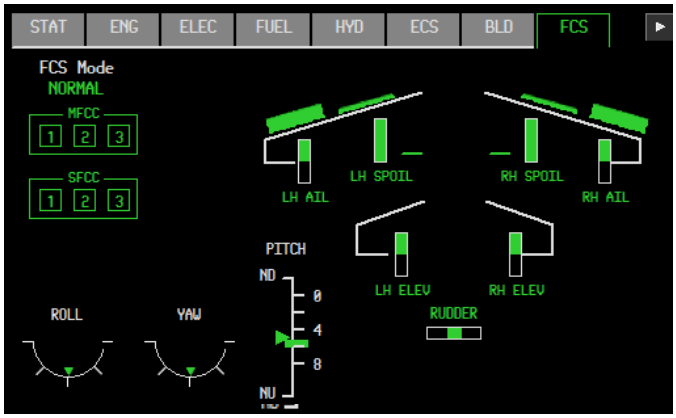


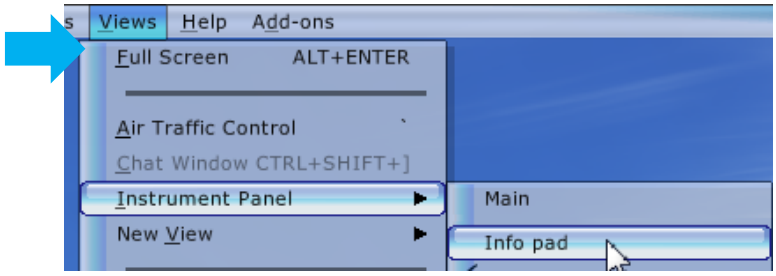
Figure 30 MFD 2 FCS SYNOPTIC PAGE

Info Pad

The Info Pad gives you access to elements of the display, realism and sound options.

You can access the Info Pad from the simulator's Views/Instrument Panel menu.

Or by using the keyboard command:
Shift +2



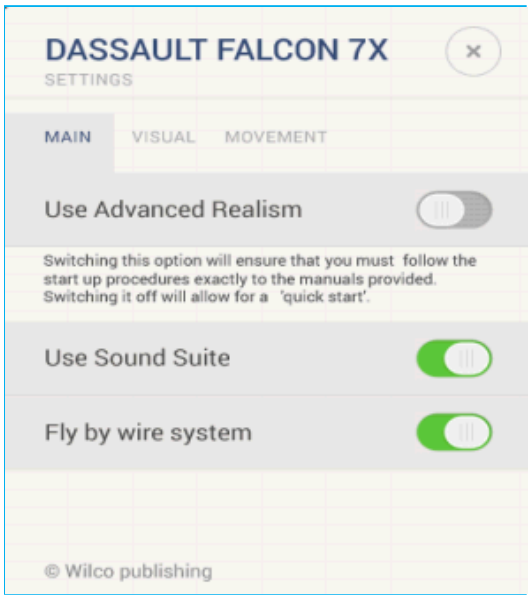


Figure 31 INFO PAD OPTIONS MENU

Info Pad Menus

There are three menus available:

1. Main Menu
2. Visual Menu
3. Movement Menu

MAIN MENU

The following options are available:

- **Use Advanced Realism** – Sets the avionics and systems to behave like the real-world counterpart. To have a more forgiving "FS Style" protocol, unselect this option.
- **Use Sound Suite** – Silences the Direct X sound suite. Also silences all alarms and aural indicators.
- **Use Fly By Wire System** – See page 50 for more details.

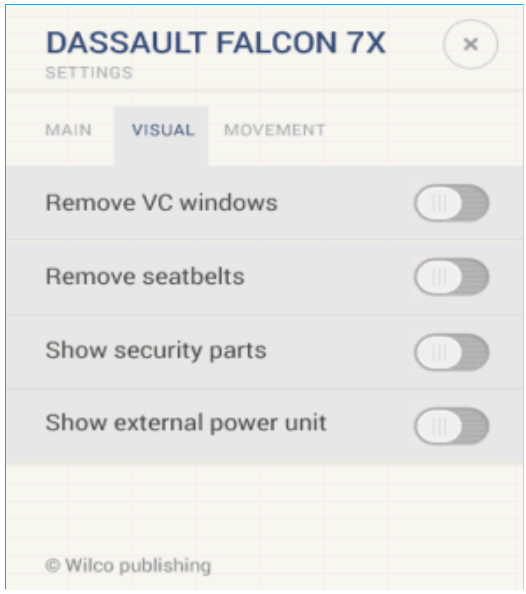


Figure 32 - INFO PAD VISUAL MENU

VISUAL MENU

Remove VC Windows – Removes the reflective surface effects from the windows.

- Remove Seatbelts – When selected the pilot and copilot seatbelts are removed from the VC drawing routine.
- Show Security Parts – See Figure 34 - EXTERNAL VISUAL PARTS
- Show External Power Unit– See Figure 33 - EXTERNAL VISUAL PARTS

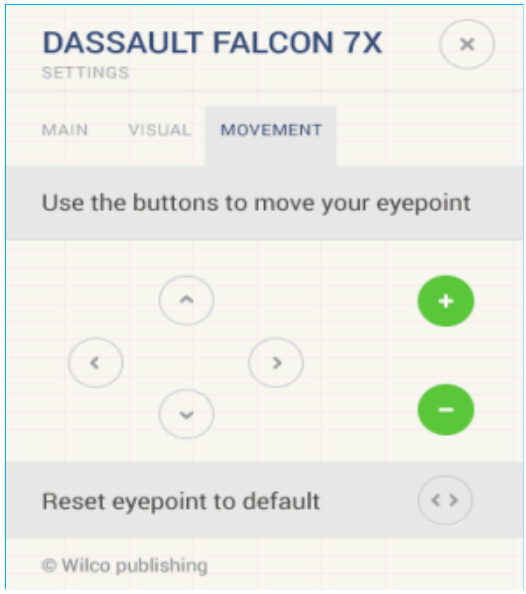


Figure 33 - INFO PAD MOVEMENT MENU

MOVEMENT MENU

Using this menu you can move your eyepoint in the VC left/right, forward/back, and up/down.

Figure 34 - EXTERNAL VISUAL PARTS

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