Falcon 7X

Avionics

Table of Contents

Avionics Layout

DISPLAYS

All flight information such as communication, navigation, or flight management, as well as system status is displayed into four 14.1 inches digital display units:

PRIMARY DISPLAYS

Two Primary Display Units (PDU) (external displays), which provide:

- All necessary information for piloting (Flight Path, Air data, Heading),
- Primary navigation information (VOR, DME, ILS Glideslope/localizer, radio…),
- Primary airplane systems parameters (engines parameters, trims…)
- The CAS messages window

MULTIFUNCTION DISPLAYS

Two Multifunction Display Units (MDU) (central displays), which provide:

- Navigation data,

- System synoptics providing systems and Circuit Breaker status.

Because different types of information are needed depending on the flight phase or operating conditions, the system is characterized by a great versatility and can be modulated at will. All the functions can be accessed by using a cursor, just like on a computer.

Essential flight information is also provided in a SFD, in case of failure of PDU. The following figure shows the different cockpit displays, as well as the ATA chapters in which their description can be found.

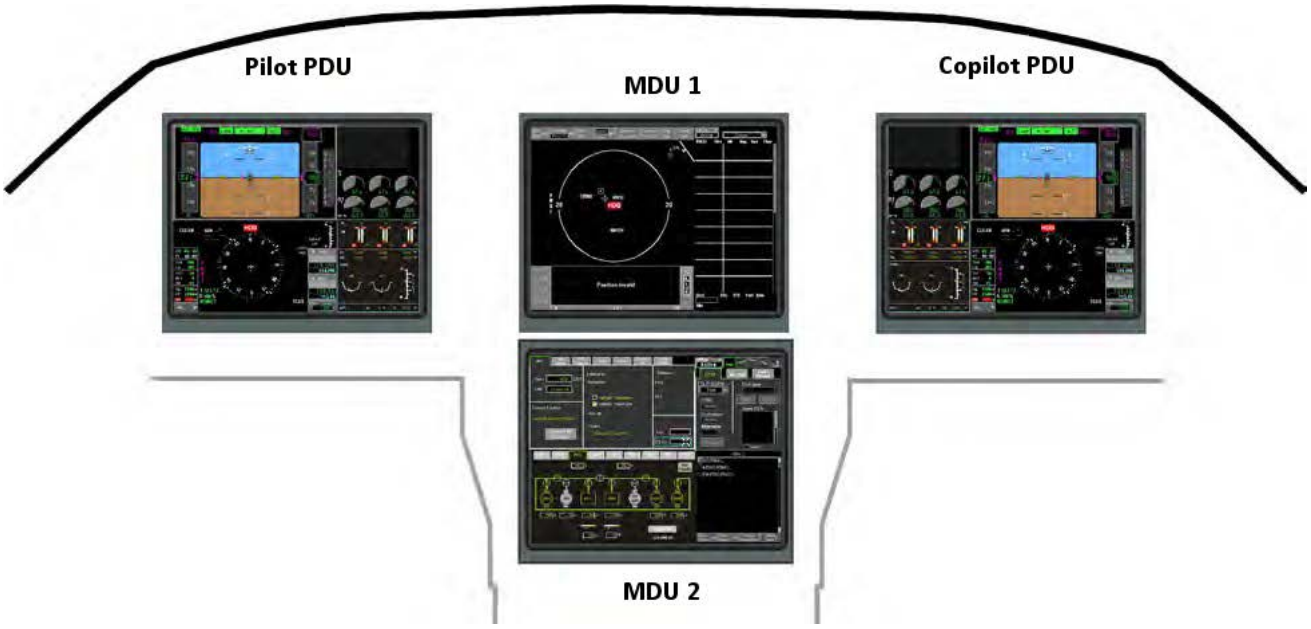


Figure 1 PILOT PDU

Figure 2 COPILOT PDU

Figure 3 MDU 1

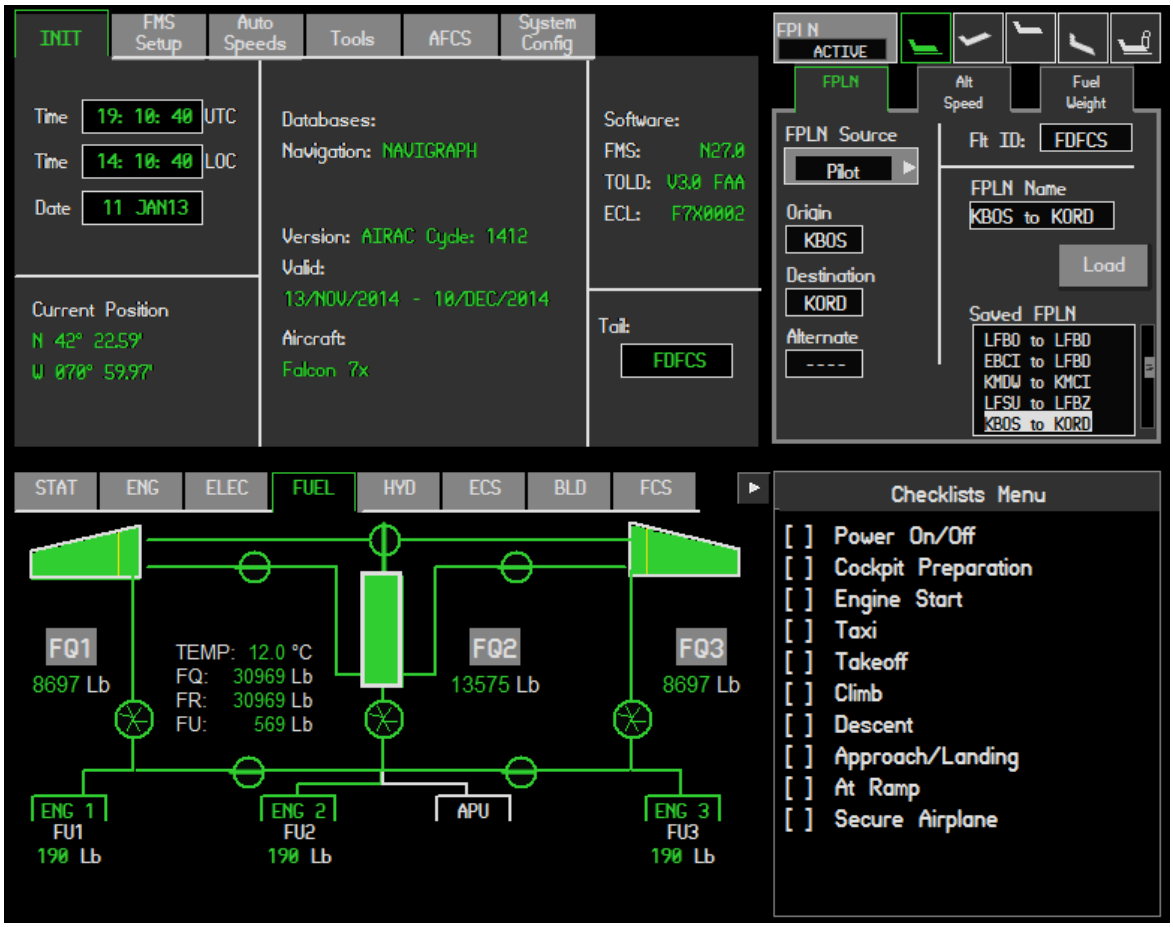


Figure 4 MDU 2

Figure 5 MULTIFUNCTION KEYBOARD

A Multi-Function Keyboard (MKB) a single interface, providing alphabetic and numeric entries available on the flight deck. It is no longer dedicated only to FMS. It gathers shortcuts to frequently used windows, and thus gives the pilot a fast access to many functions.

Avionics Power Up

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

Figure 6 TYPICAL TWO-DISPLAY CONFIGURATION

Locate The ***Power Panel*** on the Overhead.

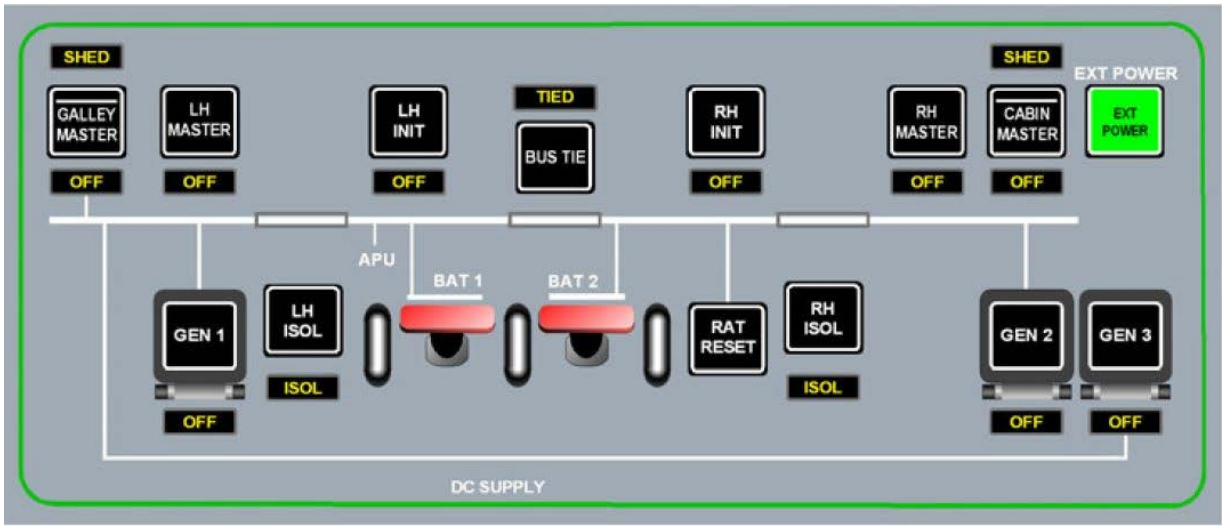


Figure 7 OVERHEAD POWER PANEL

Power up the avionics by:

1. Turning the master battery bus 1 and 2 to the ON (up) position.
2. Press the LH Init and LH master switches ON. The “Off” indicators will darken when the bus is live. This will supply power to the pilot PDU and MDU 1.
3. Press the RH Init and RH Master bus switches ON. The “Off” indicators will darken when the bus is live.

All 4 displays will initialize for a few moments, and then display their menus and data.

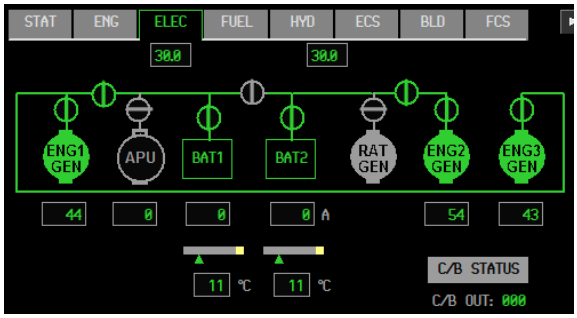
Figure 8 TYPICAL FOUR DISPLAY CONFIGURATION

After Engine Start:

1. Press the GEN1, GEN2 and GEN3 generator bus switches to bring the generators online.

The low voltage warning on the Crew Alerting System (CAS) should extinguish once the generators are brought online.

The status of the entire electrical system is displayed on the ELEC Synoptic Page on MDU 2.



Flight Planning

Loading a Flight Plan

Any Flight Simulator X flight plan is compatible with the Falcon 7x. They may be loaded as usual through the Flight Simulator, or via the FPLN tab on the Ground Procedures menu (recommended) on MDU 2.

Ground Procedures Menu

All of your FS X flight plans will be listed on the menu. Scroll up and down the list using the scroll bar on the right of the list. Press LOAD on the highlighted plan, and it will be loaded into the system.

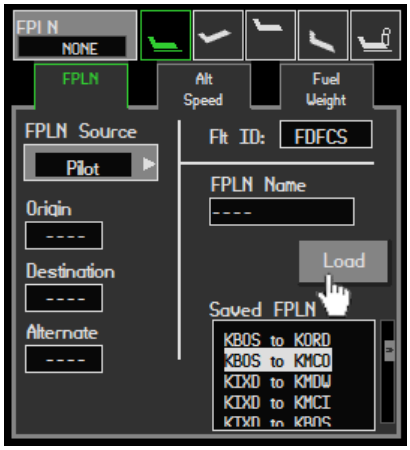


Figure 9 Ground Operations

Details of the flight plan are outlined on MDU 1.

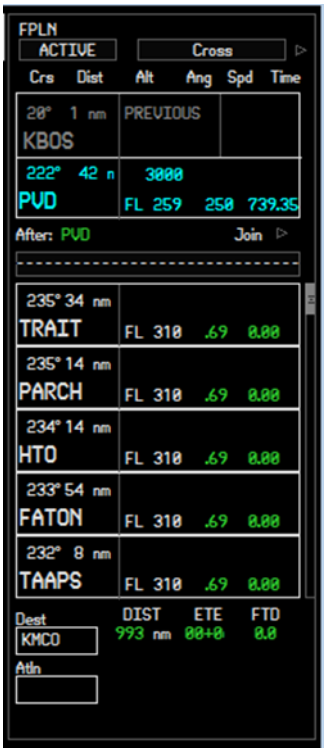
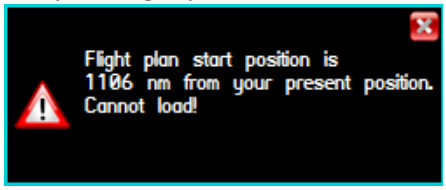


Figure 10 Flight Plan List

The aircraft location must be at the airport specified by the flight plan.



Otherwise the above error dialog will display, indicating that the flight plan cannot load. In this case you will need to change your aircraft location to the airport specified in the flight plan, and then load the flight plan again using the above procedure.

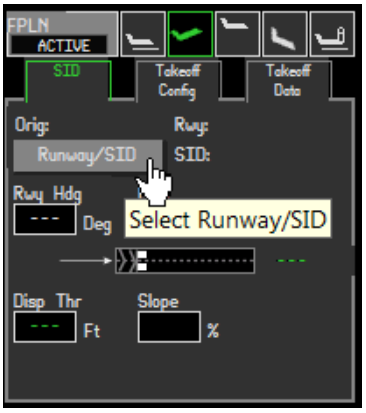
Loading a Standard Instrument Departure (SID)

Select the *Departure Page* on MDU 2.

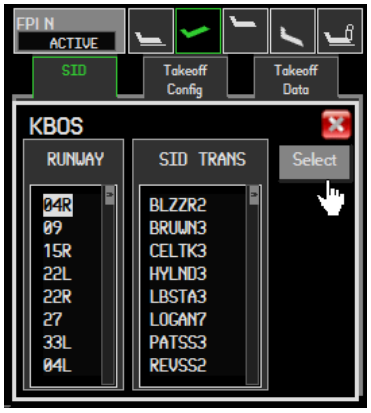
Note: In order to use SIDs and STARs functionality, you will need to have the navigation database from Navigraph installed in your Flight Simulator X\WILCO\Falcon 7x folder. Otherwise these functions will not be available.

Note: A flight plan must be loaded in order to access SIDs data.

1. Select Runway/SID



2. Select the Runway and then the SID. Press Select



3. An outline of the added waypoints is listed. Press Insert.

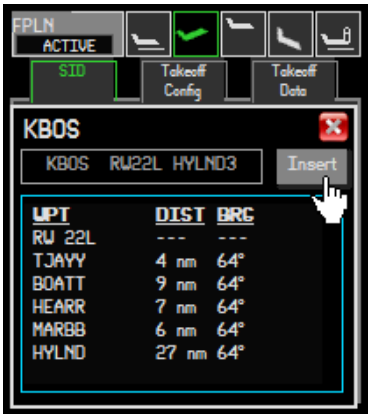


Figure 11 SIDs MENUS

The SIDs waypoints will be inserted into the flight plan.

Takeoff Configuration Tab

In the *Departure Page*, select the *Takeoff Config Tab*.

Take-off tabs provide a method for crew members to input weather and airplane data, and display critical parameters. **Takeoff Config** provides the input format and Takeoff Data provides computed results.

The upper part of the Takeoff Config tab window is used for entry of runway conditions (wind, pressure, temperature).

Except for surface winds, default entries are provided for all fields as per airplane's sensors. Surface winds are required entries.

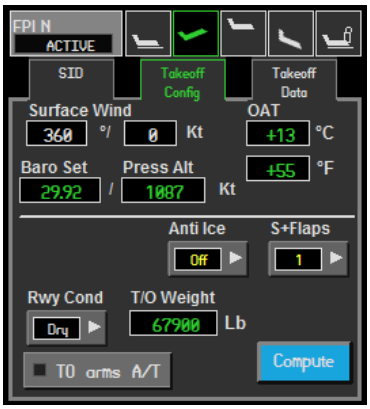


Figure 12 FLT PLAN TAKEOFF CONFIG TAB

The winds provided in the weather reports are usually referenced to true north, the wind provided by the tower or ATIS is usually referenced to Magnetic north (unless otherwise specified e.g. at airfield where magnetic variation is important). The wind direction to be entered in the tab is a magnetic value.

OAT – Displays the current Celsius and Fahrenheit values.

Baro Set – The default altimeter setting is 29.92 in. (The last value used determines the scale).

Press Alt – Pressure altitude is computed from runway altitude and value.

Rwy Cond – Selector provides two possible selections: Dry and Wet. Default is Dry. This field is displayed in white or amber as controlled by the TOLD function.

Anti-Ice - Selector provides two possible selections: On and Off. Default is Off. When selected On, take-off data is computed using "Anti-ice – On" parameters. This field is remains in amber if the airplane's anti-ice system status is not consistent with the TOLD selection.

S + Flaps - selector provides selection of slats and flaps position 1 or 2. Default is position 1. This field is remains in amber if the airplane's actual configuration is not consistent with the TOLD selection.

T/O Weight - defaults to the value computed in the pre-flight POF (Alt/Spd tab), in green, or white boxes if no value is displayed. If a manual entry is made, this field is displayed in white. If manual entry is deleted, this field is restored to its default value.

The **Compute** soft key is used to start TOLD computation. It is enabled once all required fields are filled and whenever a change in one of these fields is detected.

Takeoff Data Tab

Provides a synthesis of take-off data. It can be considered as an electronic take-off card.

Figure 13 Takeoff Data Tab

Origin airport, selected runway, and SID are displayed at the top of the tab once activated within the flight plan.

Take-off weight and wind component are computed and displayed with or without TOLD data.
Wind is given as head-wind or tail-wind, plus cross-wind component.

Wind data display as:
- ↓ = headwind
- ↑ = tailwind
- ← = right crosswind
- → = left crosswind

Pitch Att° is the pitch target at rotation in case of an engine failure at V1.
N1 information corresponds to N1 of the day calculated by the FMS using temperature entered by the crew.

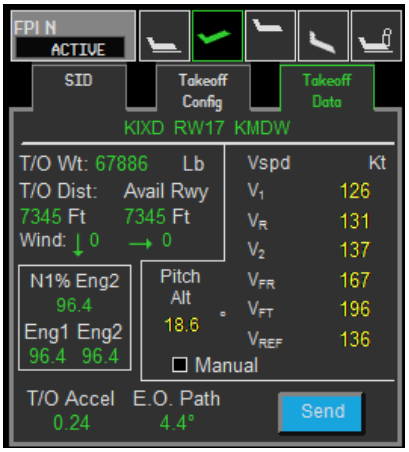
T/O Accel field corresponds to the acceleration expressed in G at brake release.

If **Manual** the checkbox is selected or if the FPLN box is set to Secondary then the "Vspd" fields and field are manual entry field. In this state, "Vspd" fields have no defaulted display values. If switching from TOLD to , the "Vspd" values are kept as default values.

Take-off weight and wind components remain displayed.
Once there is a valid data in at least one of the "Vspd" fields (either by TOLD computation or manual entry) the **Send** soft key becomes selectable. Clicking on this soft key sends Vspeeds to speed tapes and ADI windows on both PDUs.

Send soft key once again becomes selectable if the Vspeeds are recomputed by TOLD function (via selection of the **Compute** soft key on the Takeoff Config tab), or are manually adjusted by the crew (when **Manual** checkbox is selected).

When the plane flaps are the same S+Flaps configuration the VSpeed and Pitch values are displayed in green. Otherwise, the display values are yellow.



Loading a Standard Arrival Route (STAR)

Select the Arrival menu on MDU 2.

Note: A flight plan must be loaded in order to access STARs data.

*Note: Arrival route must be selected **before** the runway approach. Otherwise no STAR selection is possible.*

STAR/APP TAB

STAR/App tab is used to select and display arrival procedures (STAR and Approach) and landing runway parameters. Clicking the soft key drops down the menu to display available runways, approaches and STAR for destination. Select appropriate radio buttons to load data into temporary storage.

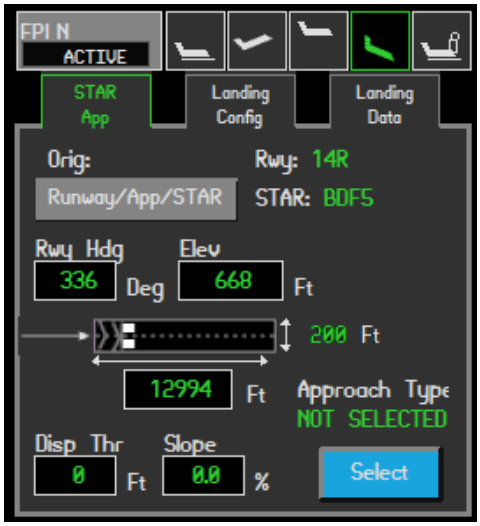
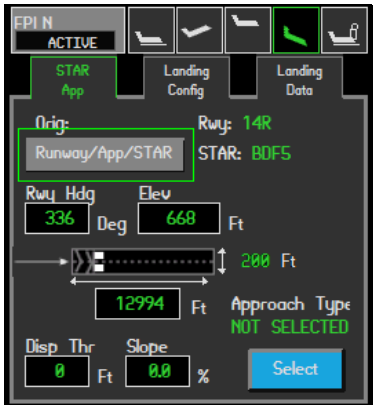


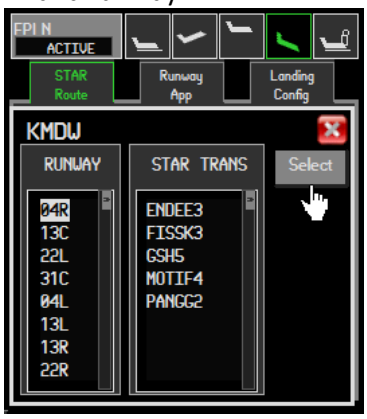
Figure 14 STAR/App Tab

Select soft key becomes active when any data is selected in the menu. Clicking **Select** places

1. Select Runway/STAR button.



2. Select the runway and then the arrival route. Press "Select" to select the route and runway.



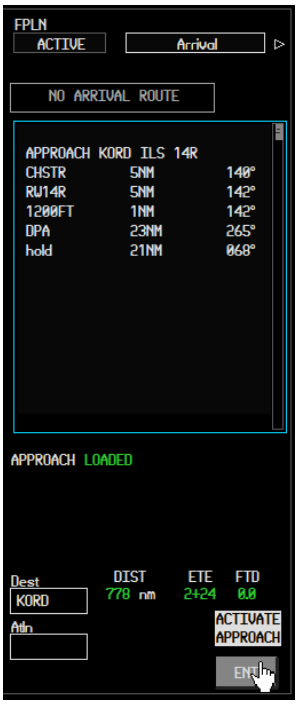
3. An outline of the route will appear in the confirmation dialog. Press "Select" to load the route.

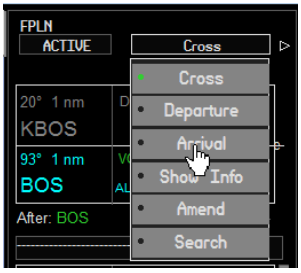
temporary arrival and approach data in the I-NAV window and WPT LIST.

LOADING APPROACHES

The approaches available for that runway can be selected from the menu page that loads.

Press "Load" to add the approach to the flight plan.

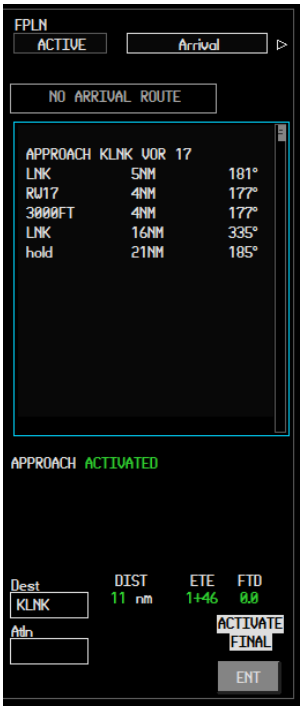




Once the approach is loaded, select the Arrival menu on MDU 1, if it is not already open.

The approach transition will be detailed. The Approach Annunciator should show LOADED.

When nearing the arrival airport, select ACTIVATE APPROACH ENT button to activate the approach.



The Approach Annunciator should show ACTIVATED. To initiate final approach sequence, press the ACTIVATE FINAL ENT Button. This will start the GPS final approach sequence.

Landing Tabs (Config and Data)

Landing tabs provide a method for crews to input airport and airplane data, calculate landing performance, and display critical parameters. Landing Config provides the input format. Landing Data provides computed results.

LANDING CONFIG TAB

Landing Config tab is used to input of airport and airplane data required for TOLD (Take-Off Landing Data) computations.

Figure 15 Landing Config Tab

The upper part of the tab window is used to enter weather conditions (wind, pressure, temperature). Default entries are provided for all fields except for surface winds.

The wind provided in the METAR reports are usually referenced to true north, the wind provided by the tower or ATIS is usually referenced to Magnetic north (unless otherwise specified e.g. at airfield where magnetic variation is important). The wind direction to be entered in the Landing Config tab is a magnetic value.

OAT – enter either a Celsius or Fahrenheit value. The system automatically computes and displays the other parameter.
Baro Set – altimeter setting default is 1013 hPa or 29.92 in. (The last value used determines the scale). This field turns to amber when the entered value is not consistent with the baro setting of the coupled side PDU.
Press Alt – pressure altitude is computed from runway altitude and value.

The lower part of the tab window is used to enter airplane data used in the landing computations and used by the EGPWS and AFCS functions.

Airplane data used in the landing computations:

Ldg Weight - defaults to the value provided by the FMS or TOLD function when prediction are computed and displayed in green. If a manual entry is made, this field is displayed in white. If manual entry is deleted, this field is restored to its default value.

Anti-Ice - provides two selections: On and Off. Default is Off. On selection uses performance tables with Anti-ice.

Ldg Factor - defaults to 1.67 provided by the FMS / TOLD function and displayed in green. This factor is used to compute the Operator's Landing Field Length (LFL) based on the Landing Distance (LD) computed by the TOLD (LFL = LD x LDG FACTOR). If manual entry is deleted, this field is restored to its default value.

NOTE

It is the crew's responsibility to apply appropriate adjustments to computed data for landing runway conditions.

Δ Vref - defaults to 0 kt provided by the FMS or TOLD function and displayed in green. If a manual entry is made, this field is displayed in white. If manual entry is deleted, this field is restored to its default value. This value is used to apply a wind correction to V_{REF} computations:
Δ Vref = half of steady head wind component + full gust value (20 kt maximum):
Do not take into account steady tailwind and/or crosswind components,
Take into account the full gust value, whatever the wind direction is.
V_{APP} is the result of the following computation: $V_{APP} = V_{REF} + \Delta$ Vref.
Once Send softkey (**Landing Data** tab) is pressed, those values are sent to the both PDU and speed tapes (VAP, VRF).

NOTE

Δ Vref is not designed to take into account the VREF corrections due to failure or landing configuration considerations.
In case of failure introducing landing penalties, Vspd must be entered manually with appropriate VREF corrections: refer to QRH1 / Performances / TOLD user guide.

These landing TOLD parameters are removed when manual Vspeeds are selected (on the **Takeoff Data** tab) or Secondary FPLN is selected.

Airplane data used by EGPWS function and AFCS function:

Steep App - checkbox shall be used when the descent to the destination runway requires a steep approach. The default state of the checkbox is un-checked.
When the checkbox is checked, the system automatically:
- Sets GPWS mode 1 to steep approach envelope (increase the threshold of "SINK RATE" alert),
- Sets the default value for the Flight Director and Autopilot ILS steep approach ,

- Inhibits TOLD function and switches to manual entries (in the Landing Data tab Manual checkbox is checked and grayed out to indicate that is not de-selectable).
The crew is alerted by annunciation on the PDU (ADI window).
Steep App is automatically de-selected if any of the following conditions is fulfilled:
- The airplane lands after completion of the steep approach procedure,
- Slats / flaps are set back to SF 0 during the go-around.
Flaps Override - selection is strictly used for EGPWS, inhibits the "TOO LOW FLAPS" aural warning at 250 ft RA when not in SF3 configuration during final approach.
The default state of the checkbox is un-checked.

The crew is alerted by: FLAPS OVRD - annunciation on CAS message.

The Flaps Override checkbox can also be selected from the SENSORS window.
These checkboxes are removed when Secondary FPLN is selected.
The Compute soft key is available and highlighted when:
- All mandatory boxes are completed ,
- A change to the TOLD data are (automatically) detected,
- Clicking on Rwy/App/STAR soft key.
When the “Manual” checkbox is ticked in the Landing Config tab, all configuration data used by the TOLD are removed.

LANDING DATA TAB

The Landing Data tab provides a synthesis of landing data. It can be considered as an electronic TOLD (Take-Off Landing Data) card.

The upper part of the page provides a summary of the selected procedure and contains approach category and minimums information. The lower part provides a synthesis of landing data and can be considered as an electronic landing card. The landing information is displayed after pushbutton has been selected on the Landing Config tab.

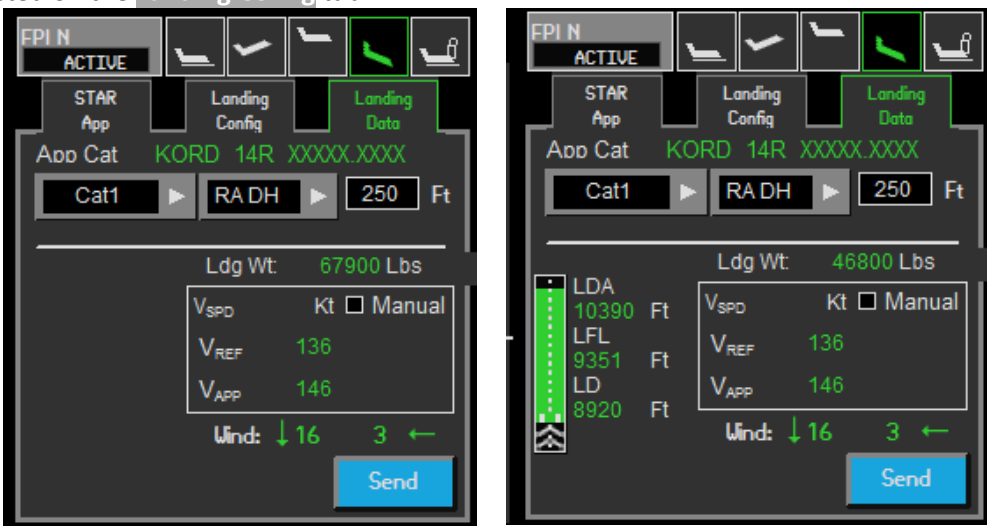
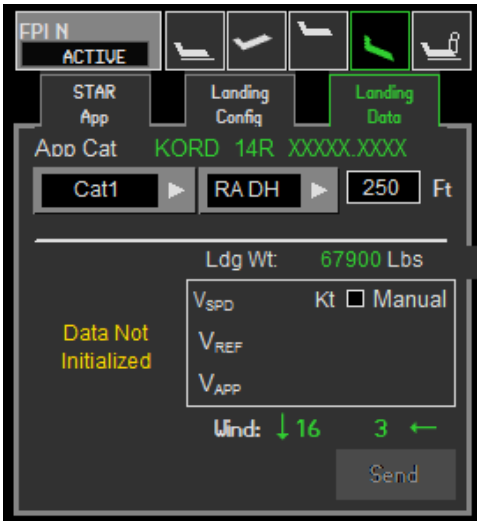


Figure 16 Landing Data Tab

New terminology used for minimums (RA DH and BARO M) allows compliance with new regulations and terminology, especially concerning FMS VNAV approaches, and CAT2 approaches:
RA DH – approach minimums based on Radar Altimeter (RA) (normally precision approaches).
BARO M – approach based on barometric altitude / height (ILS, FMS / VGP , LOC, B/C and all non-precision approaches).
App Cat (Approach Category) is related to all other information in the top half of this tab.
Selection of a particular approach type simultaneously selects a “minimums restriction” (RA DH or BARO M). The default is FMS / VGP approach.



Minimum entry field is set by default to white boxes (mandatory entry). The minimum value possible depends of the type of approach selected. If the minimum value is not filled while on approach and you have Advanced Realism turned ON, an advisory CAS message is displayed (APP: CHECK MINIMUMS SET). Selection of a new approach reset the minimum value (white boxes).

Add a waypoint to the Flight Plan

Once a flight plan is loaded, additional waypoints can be inserted anywhere along the route using the MDU 1 ***Amend Page***.

Select the dropdown box in the upper right corner and select *Amend*.

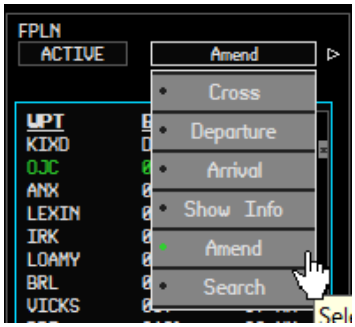


Figure 17 WAYPOINT PAGE DROPDOWN BOX

1. The Amend page will be displayed on MDU 1. Use the scrollbar to select the leg of the flight plan in which to insert the new waypoint.
2. Press the “Add” Button.

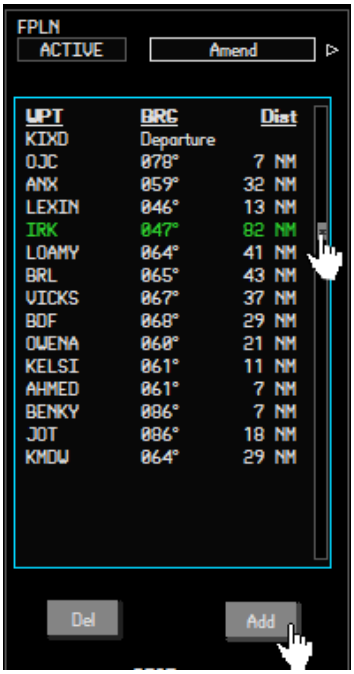


Figure 18 AMEND FLIGHT PLAN PAGE

The *Amend Page* will appear. Follow the protocol as outlined on page 25.

Once the new waypoint is established, press the “Add” button at the bottom of the Search Page.

If the new waypoint is more than 50 nautical miles off course it will be rejected, and an error box will be displayed.

Click “OK” to close the box.

Figure 19 REJECTED WAYPOINT ERROR DIALOG

If the new waypoint is between 2 – 50 miles off course a confirmation dialog box is presented. Select “Yes” to confirm insertion of the waypoint, or “No” to cancel.

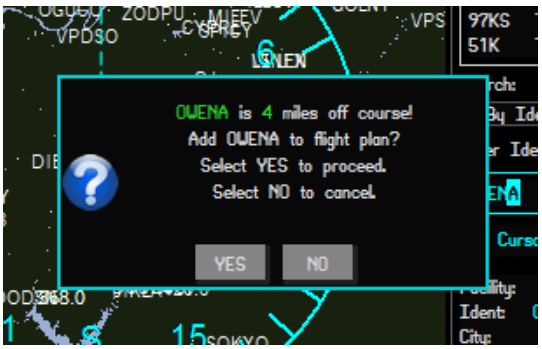


Figure 20 OFF COURSE DIALOG

Otherwise you will simply be prompted to confirm the new waypoint.

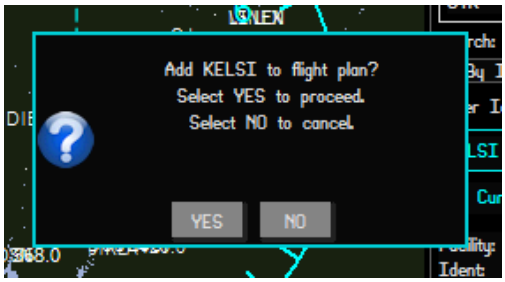


Figure 21 Add WAYPOINT CONFIRMATION

Delete a Waypoint

To delete a waypoint, open the Amend Waypoint Page (Figure 17) and scroll down the list, as shown right.

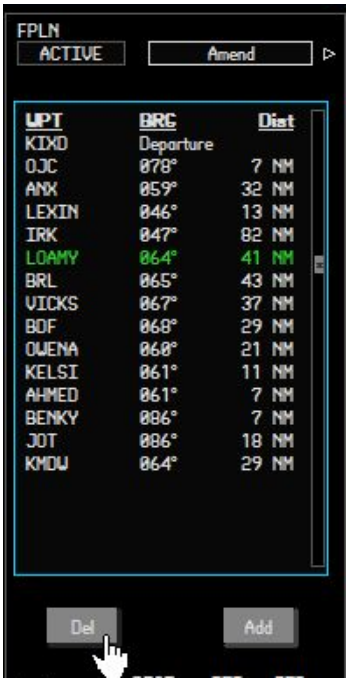


Figure 23 DELETE WAYPOINT

Press “Del” to delete the waypoint.

The Delete Waypoint Dialog will appear.

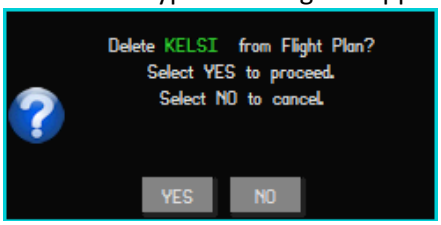


Figure 22 DELETE WAYPOINT DIALOG

Press “Yes” to delete the waypoint or “No” to cancel.

Search for Waypoint Or Facilities

The search functions work with or without a loaded flight plan.

Use the page menu on MDU 1 to pen the *Search Page*.

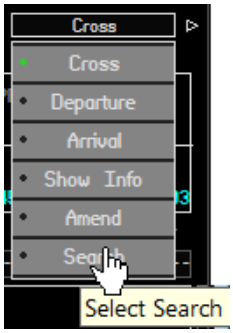


Figure 24 MODE MENU-SEARCH

You can advance the cursor, or the highlighted character by using the designated controls.

Pressing this icon will bring up the MKB (Figure 5) in a popup window, allowing you to enter alphanumeric data directly.

The Search Page will display on MDU 1.

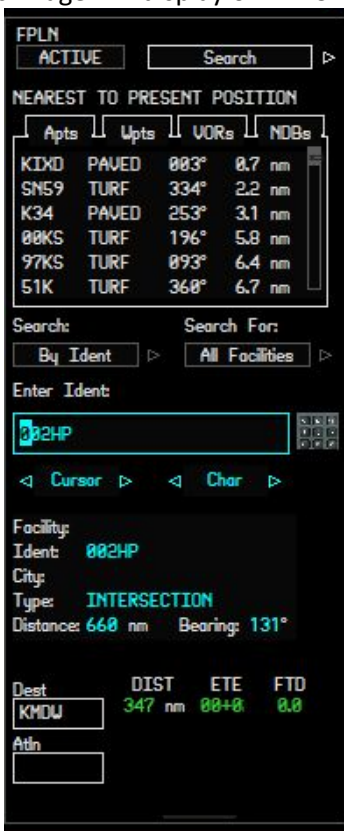


Figure 25 - SEARCH PAGE

NEAREST FACILITY DATA

When on the *Search Page*, by selecting *Search* on the MDU 1 page menu (Figure 24), the *Nearest Facility Menu* is at the top of the page.

Clicking anywhere on the menus will highlight it. When highlighted, the airport, navaid or waypoint on the scroll list is automatically entered into the search engine, for use in the *Direct To/Divert To* or *Add Waypoint* functions.

There are four tabbed menus in the Nearest Facility Menu:

- Airports
- Waypoints (Intersections)
- VOR Navaids
- NDB Navaids

Scroll up and down the lists using the scroll bar at the right of the menus. The currently selected item will be highlighted.

Note that the DTO Button on the bottom of the page is available to initiate a Direct To or Divert To procedure, as outlined on page 30.

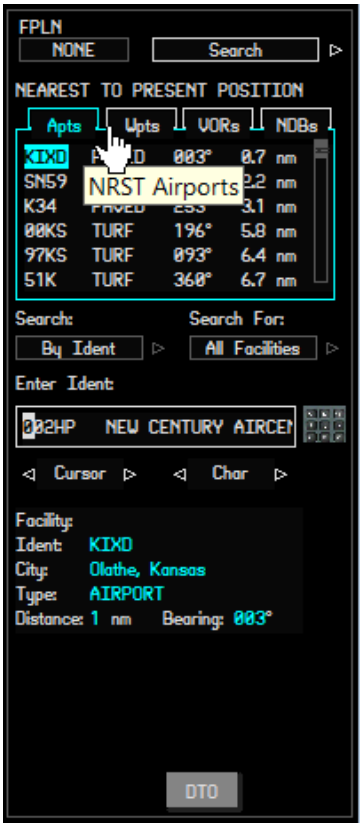
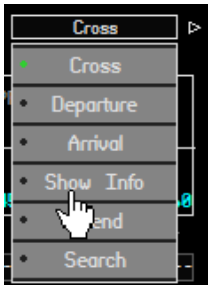


Figure 26 NEAREST FACILITY MENU

FACILITY INFORMATION

Whenever a facility is highlighted in one of the MDU 1 menus, opening the Show Info Page from the MDU 1 Page Menu will bring up a complete information page on that aircraft, navaid, or waypoint.



For example, selecting a waypoint on MDU 1 Cross Mode Page.

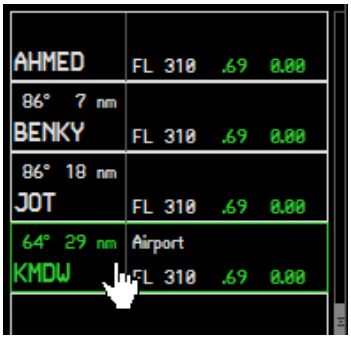


Figure 27 INFORMATION PAGE

Direct To/Divert To

If a waypoint or facility has been selected, the *DTO Button* will be visible at the bottom right of MDU 1.

Selecting any waypoint, navaid or facility on any of the flight plan legs, *Nearest Facility Menus* or *Search Field*, and then pressing the *DTO Button* will instruct the FMS to initiate a new *Direct To* or *Divert To* flight plan.

A confirmation Dialog will appear on MDU 1, asking you to confirm the DTO flight plan.

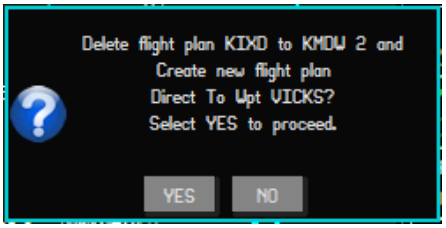


Figure 28 DIRECT TO/DIVERT TO CONFIRMATION DIALOG

If a flight plan is already active on the system you will also specify that the system will dump the present flight plan in favor of the new DTO plan.

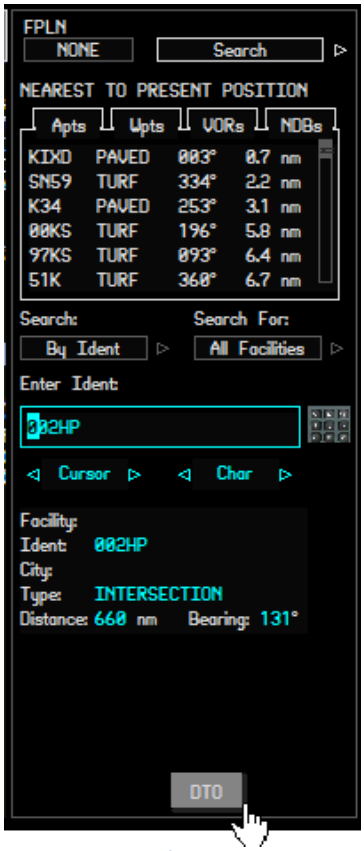


Figure 29 DIRECT/DIVERT TO BUTTON

Post Flight Phase Of Flight

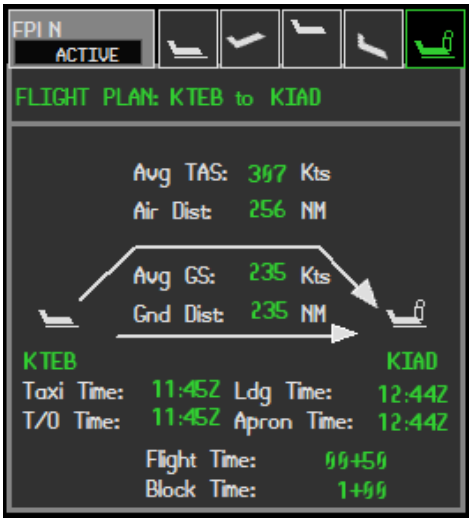


Figure 30 Postflight Page

All associated data for display is provided by the FMS and is based on the values recorded and computed for the Active flight plan. If a particular data item is not available for display, then its associated display field is blank.

Avg TAS displays average airspeed based on flight time and air distance.

Avg GS displays Average Ground Speed based on **Block Time** and ground distance.

Gnd Dist displays total Ground Distance for the flight.

ICAO identifiers for the active flight plan origin and destination are displayed beneath their respective takeoff and landing icons.

Taxi Time displays time recorded from original parking brake release after system power up.
Any subsequent setting and/or releasing of the parking brake does not cause Taxi Time to change. If the system is powered up while the parking brake is already released, power up time is captured for Taxi Time.

T/O Time displays Take-Off time (Zulu) in green.

Ldg Time displays Landing Time (Zulu) in green.

Apron Time displays time recorded when the parking brake was set after flight. If the parking brake is set, and then released and later reset, the latest time is captured.

Flight Time is elapsed time in-flight measured once is displayed.

Block Time is overall duration between Taxi Time and Apron Time. If in-flight or after landing prior to setting parking brake, it is the duration between Taxi Time and current time. Block Time is displayed as soon as is available.

Flying using the FMS and Autopilot

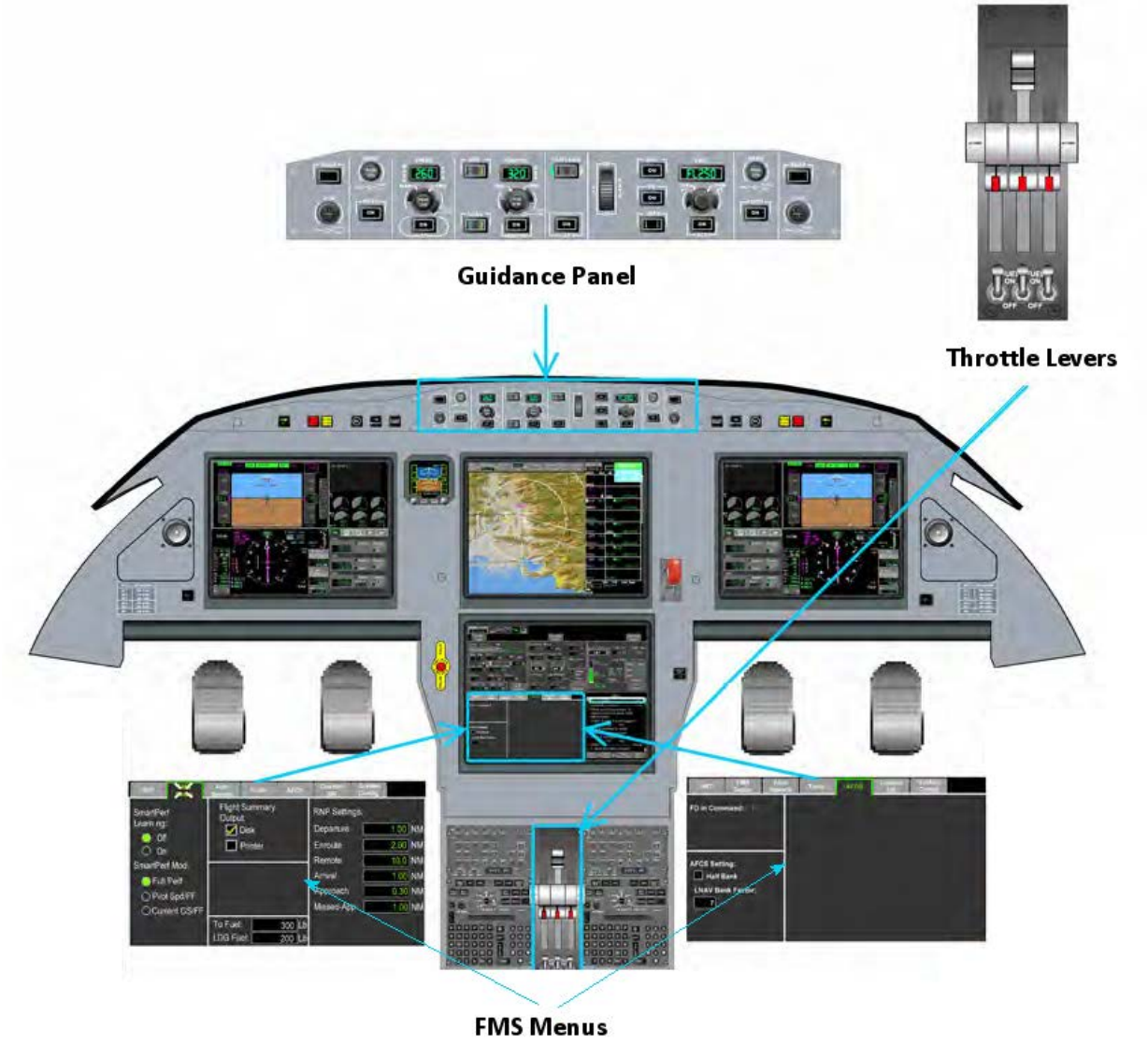


Figure 31 FMS FLIGHT DECK OVERVIEW

The Falcon 7X EASy Automatic Flight Control System (AFCS) is composed of:

- Flight Director (FD) and Autopilot (AP) systems,
- Thrust Director (TD) and Auto-Throttle (AT) systems.

The Flight Director provides flight guidance on path and roll axes. This guidance can be displayed on the ADI or HUD when requested by the crew. It can be followed either manually or automatically by the Flight Control System if the crew engages the Autopilot.

In the same way, the Thrust Director provides Thrust Guidance. This guidance can be displayed on the ADI or HUD when requested by the crew. It can be followed either manually or automatically by the throttle if the crew engages the Auto-Throttle.

The Automatic Flight Control System is split into:

- Autopilot and Flight Director,
- Auto-Throttle and Thrust Director.
- Speed and stall protections.

The speed protections provided by the Primary Flight Control System (PFCS), the Automatic Flight Control System (AFCS) and the Air Data System (ADS), as well as protections provided by the PFCS.

A more detailed description is available on page 50 in the handbook *Systems Quick Start Guide.pdf*, which can be found in the same folder as this guide.

Using the FMS and Guidance Panel

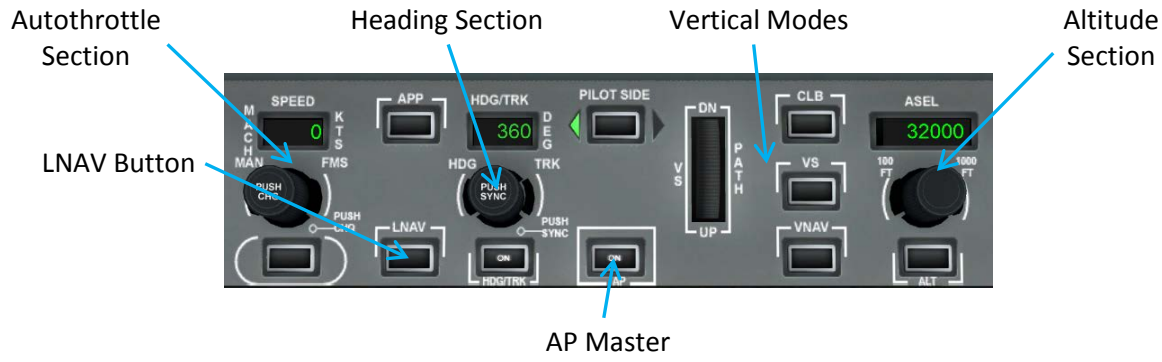


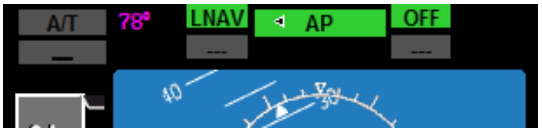
Figure 32 GUIDANCE PANEL

ACTIVATE THE AUTOPILOT SERVOS

Servos are connected by pressing the *AP Master* button. This enables the Guidance Panel to take over the control of the aircraft from the sidestick.

INDICATION

Status and mode indication is available on the left and right PDU displays.



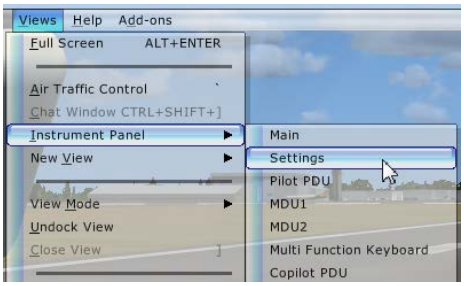
GREEN = Active
Dark = Inactive

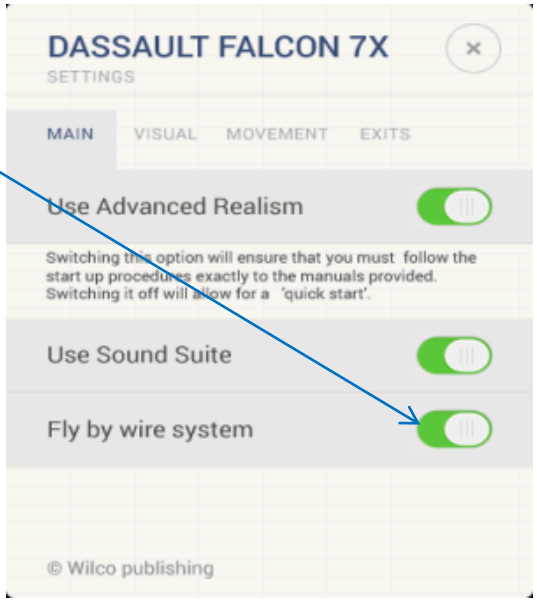
SIDESTICK OVERRIDE

Fly By Wire

Fly-by-wire (FBW) is a system that replaces the conventional manual flight controls of an aircraft with an electronic interface. The movements of flight controls are converted to electronic signals sent to the flight control computers determine how to move the actuators at each control surface to provide the ordered response. The fly-by-wire system also helps stabilize the aircraft, or prevent unsafe operation of the aircraft outside of its performance envelope.

To utilize the Fly-by-wire system, bring up the Settings dialog in the simulator by pressing Shift + 2, or using the simulator's Views menu.





Running with Fly-by-wire off will result in the aircraft operating as a standard simulator aircraft does, where if the autopilot is engaged, the pilot will need to shut the autopilot OFF in order to control the aircraft manually. There are also no stabilization and over control limits invoked.

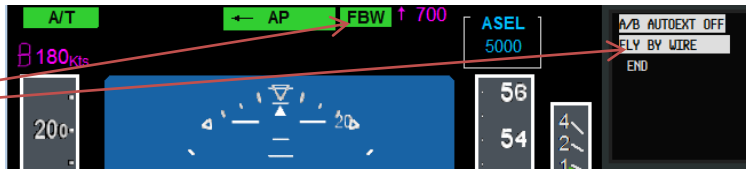
Activating Fly-By-Wire

Sidestick (joystick/yoke) movement of 15% on either the X axis or Y axis will override the autopilot servos, if active, returning primary control of pitch and roll to the pilot.

To return control of the aircraft to the guidance panel, depress the Autopilot Servos button as outlined above, and select lateral and vertical guidance controls again as outlined in this section.

Fly-By_Wire Indication

If the autopilot is engaged, the respective lateral and/or vertical annunciator will light as FBW. A CAS message is also displayed.



If the autopilot is not engaged, no annunciation will occur.

FD/TD DISPLAY MODES

Toggles the Flight Director (FD) display and the Thrust Director display on the PDU Attitude Director Indicator (ADI).

Pilot can select FD and/or TD information by pressing the FD/TD pushbutton on the Guidance Panel In the following sequence:
- FD display
- TD display
- FD and TD display

The displays are part of the Attitude Director Indicator (ADI), which provides in a very accurate and HUD-like picture of all necessary information about airplane trajectory and energy state:

The Flight Path Symbol (FPS):

- Provides airplane trajectory indication,
- Is now a primary flight parameter. The basic Flight Director (FD) mode is the PATH mode.

The acceleration chevron provides the potential acceleration along the airplane flight path. The flight path Acceleration Chevron (AC) is referenced to the Flight Path Symbol (FPS). The acceleration chevron represents zero acceleration along the flight path. When the AC is above the FPS, the airplane is accelerating. When the AC is below the FPS, the airplane is decelerating.

The attitude reference symbol:

- Gives airplane attitude (pitch and roll),
- Is still displayed in the ADI, but is no longer considered basic information to fly the airplane.

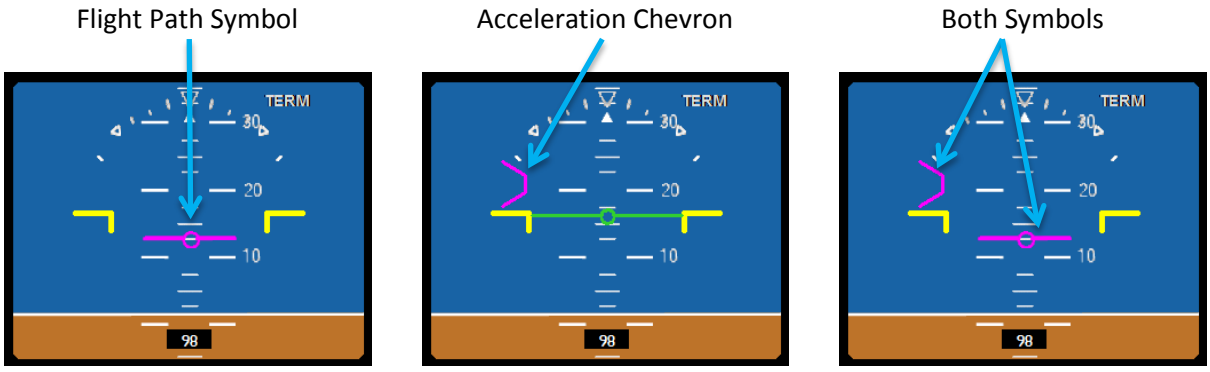


Figure 33 FLIGHT DIRECTOR MODES

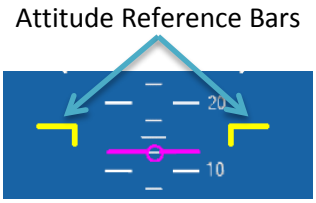


Figure 34 ADI Attitude Reference Bars

LATERAL GUIDANCE

The available lateral modes are:

LATERAL BASIC MODE	LATERAL UPPER MODES
ROL	HDG / TRK (heading / track)
ROL	LNAV: FMS Lateral Navigation

Selected Heading/Track

To enable lateral guidance by a manually selected *Heading/Track* (HDG/TRK), refer to Figure 36. Select the desired course using the selector. The selected course is displayed on the indicator. Once the course is selected, press the HDG Selector.

The HDG / TRK mode captures and holds the heading or track corresponding to the heading / track bug on the HSI. See Figure 35 HDG/TRK ANNUNCIATION.

HDG MODE

The standard Autopilot heading bug used for selecting the aircraft course. The autopilot keeps the nose of the airplane pointed at the magnetic heading bug. A crosswind can cause the aircraft's ground

track to drift. This mode is generally only used when ATC tells you to fly a direction, since they assume you will use a compass and not a GPS to fly this vector.

TRK MODE

The autopilot uses GPS information to keep the ground track of the airplane on a straight line toward the selected direction. In case of a crosswind, the aircraft will not be pointed the same as the heading bug since the autopilot will adjust the heading to maintain a straight line over the ground.

Switching between HDG and TRK modes is accomplished by pushing the HDG/TRK knob. Pressing down on the scroll wheel (mouse center click) changes between the two modes.

MODE ANNUNCIATION

Symbology for the two modes is displayed on the PDU HSI. The indicators will be gray when the autopilot is not engaged in that mode, and lighted when the autopilot is following the HDG or TRK.

HDG Mode

Heading Bug Annunciator

TRK Mode

TRK Ind. Annunciator

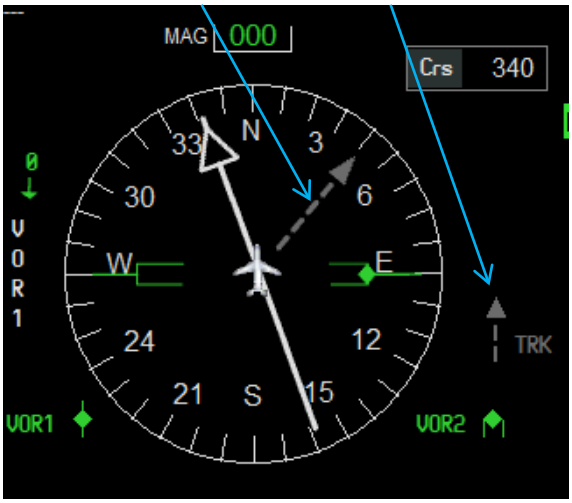


Figure 35 HDG/TRK ANNUNCIATION

Flight Plan LNAV Guidance

Refer to Figure 36. Once the aircraft is airborne, simply press the LNAV Button.

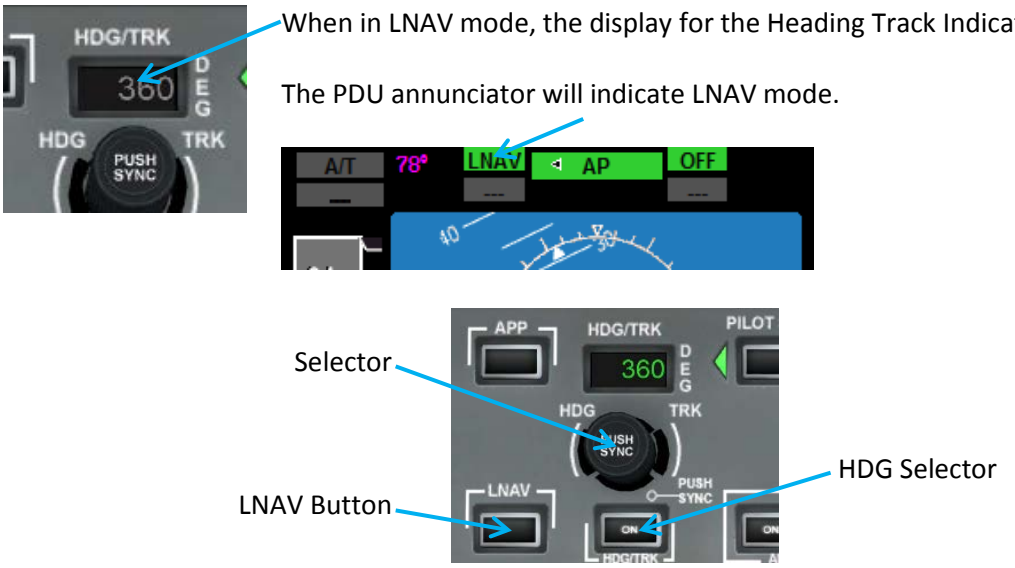


Figure 36 GUIDANCE PANEL LATERAL CONTROLS

VERTICAL GUIDANCE

The available vertical modes are:

VERTICAL BASIC MODE	VERTICAL UPPER MODES
PATH/SPEED	CLB: Climb – Autothrottle Interface
ALTITUDE	ALT: Altitude Hold
CLIMB/DESCEND	VS: Vertical Speed
FLIGHT PLAN ALTITUDE	VNAV: FMS Vertical Navigation

ASEL – ALTITUDE SELECT

By default, the selector knob increments in +/- 100 ft. Left click increases the knob. Right click decreases the knob. The knob can also increment the set altitude +/- 1,000 ft. at a time.

Switching between 100 and 1,000 ft. increments is accomplished by pushing the ASEL knob. Pressing down on the scroll wheel (mouse center click) changes between the two modes.

Figure 37 SELECTING AUTOPILOT ALTITUDE

ASEL is used in association with the other Vertical modes:

- CLB Mode
- VS Mode
- VNAV Mode

The ASEL mode will provide guidance to capture and hold the target altitude with minimized overshoot, depending on airplane climb or descent rate. During climb and descent, the capture phase is initiated when the pre-selected altitude is within 500 ft. of current airplane altitude.

An aural annunciator “chime” sounds when the plane enters capture phase. Once the target altitude is reached, guidance will automatically change from ASEL to ALT mode.

When the aircraft altitude has not captured the selected altitude the indicators are blue. When the altitude has been captured the display will change to highlighted.

When the altitude is within +/- 100 ft. of selected altitude the aural annunciator “3 Beeps” sounds.

SETTING FLIGHT PLAN CRUISE ALTITUDE

When a flight plan is loaded, the FMS automatically selects an altitude based on distance and direction from the destination. This setting can be changed at any time via:

- The ASEL control on the guidance panel
- From the Alt/Speed tab on MDU 2

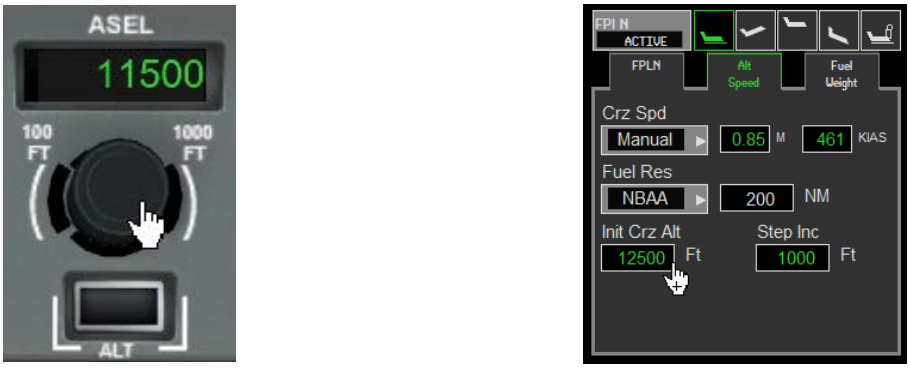


Figure 38 SETTING CRUISE ALTITUDE

ANNUNCIATION

Autopilot altitude is displayed on the PDU. When the FMS is in Capture Phase the altitude bug and digital indicator are highlighted.

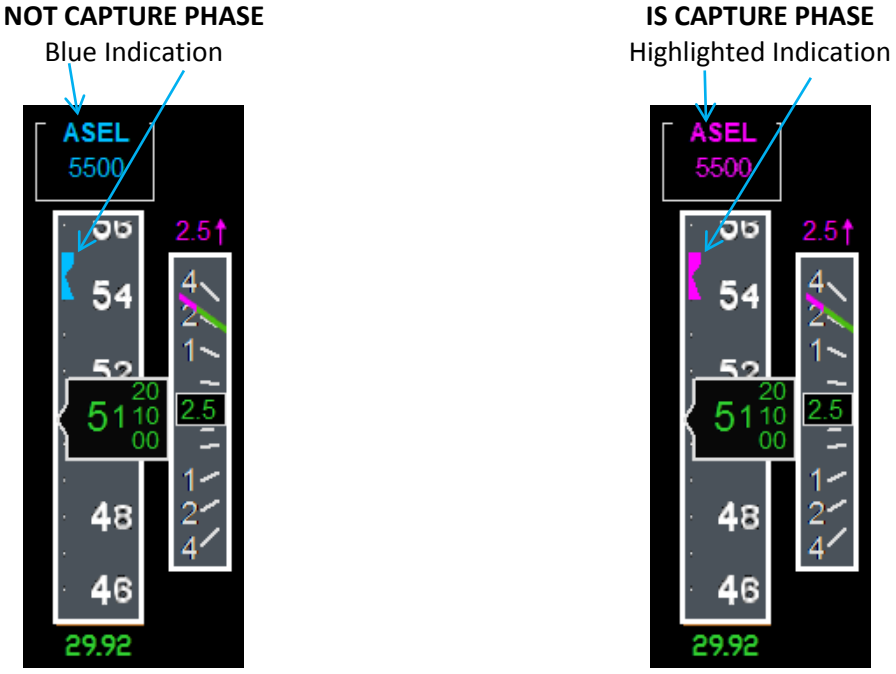


Figure 39 AUTOPILOT ALTITUDE ANNUNCIATION

Climb Mode

The CLB mode sets and adjusts a climb path in order to follow the reference climb speed / Mach profile set manually by the crew (SPEED knob) or automatically by the Flight Management System (if ASEL target is above the current altitude).

The reference speed value is displayed on the readout above the SPEED setting knob and on the FMA in manual speed mode. The readout is replaced by dashes in FMS speed mode.
The CLB mode might result in constant altitude or descent depending on the speed target.
Unless used in conjunction with VS Mode the default climb speed of 2,500 fpm will be used.

By itself Climb Mode defaults to 2,500 fpm cli8mb rate. By also selecting the VS Button Climb Mode can be used in conjunction with Vertical Speed Mode to also control vertical speed of the climb.

When active, indication can be found on the PDU, adjacent to the Vertical Guidance Annunciator.

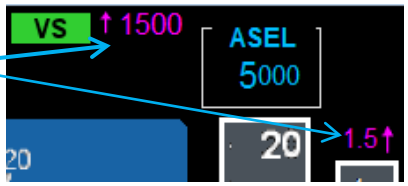
Once the target altitude is captured, the guidance will revert to ALT mode, which becomes the active mode, disconnecting the previously active vertical mode at the same time.

Vertical Speed Mode

The Vertical Speed (VS) mode sets and adjusts a climb path in order to follow the reference vertical speed set by the crew through the use of the VS / PATH thumb-wheel on the guidance panel.

It can be used in conjunction with Climb (CLB) mode to allow adjustment of the vertical speed climb rate.

The target vertical speed is displayed on the PDU



Vertical speed selection is accomplished with the VS rotary knob.

The maximum values of the Vertical Speed command are -4,000 ft/min and +4,000 ft/min.

Altitude Mode

Pressing the ALT button changes the vertical mode to ALT mode. This mode adjusts the path, to capture and hold the altitude of the airplane at the current time of mode selection.

Selection of the ALT mode could lead to a small overshoot or undershoot of the target

altitude before the target altitude is actually captured. Airplane response in ALT mode is limited to ±20° pitch angle.

VNAV: FMS Vertical Navigation

A flight plan must be loaded to use VNAV mode. VNAV mode is selected by pressing the VNAV pushbutton on the GP. The FMS will then send target values to the FD to be used.

If VNAV Button is selected while any other mode is active, the system will defer to FMS/VNAV control.

VNAV MODE

The Flight Management System (FMS) interface with the guidance panel is quite simple, using the following steps:

3. Load a flight plan, as described above
4. Set flaps to takeoff notch
5. Taxi to runway and takeoff
6. Press the AP Master Button
7. Press the VNAV Button
8. Press the A/T (Autothrottle) Button (see AT ENGAMEMENT below)

That's all there is to it. The FADEC computer will control sequencing through waypoints, altitude and speed settings.

VNAV Mode takes control over the altitude and vertical speed of the aircraft. Vertical Speed (VS) control and Autothrottle speed control are slaved to the FMS computer. To take manual control of these flight parameters requires selecting a different Vertical Guidance Mode.

Autothrottle (AT) Control

IAS/MACH MODES

The speed control system has two basic modes of operation. IAS Mode and Mach Mode. In IAS mode the FMC uses the value dialed in to control indicated airspeed. This, of course, will not take altitude and pressure into consideration. In MACH Mode the FMS will maintain speed according to it's actual Mach value.

IAS Mode

Mach Mode

By default, the system is in IAS Mode..

Switching between IAS and MACH Modes is accomplished by pushing the Speed knob. Pressing down on the scroll wheel (mouse center click) changes between the two modes.

AT ENGAGEMENT

AT can be manually or automatically engaged. Manual AT engagement is possible with the AT pushbutton on the Guidance Panel. AT can be engaged for any TD mode.

AT is automatically engaged if the crew has activated the T/O mode and ticked the "TO ARMS A/T" checkbox in the MDU 2 Take-off Configuration Tab.

With this mode activated AT engages automatically at takeoff when the aircraft reaches 400 ft. above the runway.

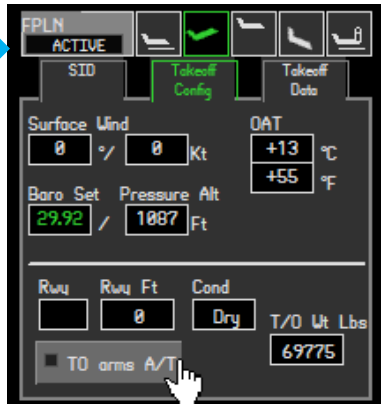


Figure 40 TAKEOFF CONFIGURATION MENU

SPEED SETTING

The Autothrottle speed setting can be controlled two ways:

- Manual Control – Using the speed setting knob on the guidance panel
- Automatic Control – Using the FMS VNAV function, controlled by the FMS speed setting.
    - Speed Mode – uses the FMS speed setting on the Auto Speeds menu (see Figure 44).

- Endurance Mode – Sets speed to minimize fuel usage

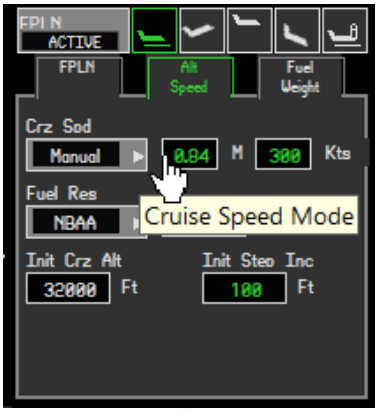
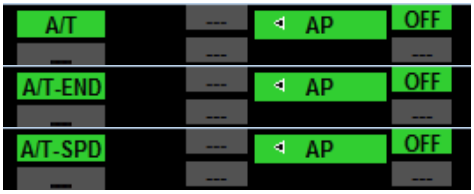


Figure 41 A/T SPEED MENU

Mode selection is accomplished on the MDU 2 A/T Speed menu. Mode indication is on the PDU Annunciator display:



MANUAL SETTING

Accomplished by setting the *Autothrottle Set Knob* on the *Guidance panel*.

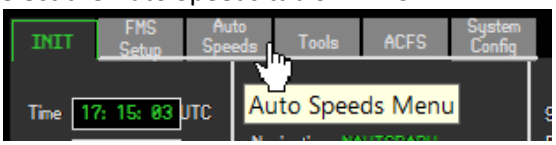
If VNAV mode is engaged, and a manual adjustment is made, the new setting will override the preset value provided by the FADEC.

When the flight plan transitions to the next phase of flight, such as Descent, the FADEC will once again resume control.

Figure 42 AUTOTHROTTLE SETTING KNOB

AUTOMATIC SETTING

With the *VNAV Selector* on the *Guidance Panel* ON, select the Auto Speeds tab on MDU 2.



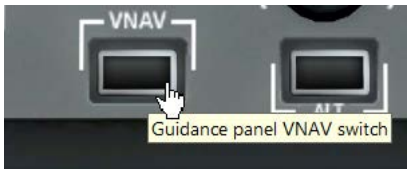


Figure 43 VNAV SELECTOR

Use the *Auto Speeds Menu* to instruct the FADEC computer how to control the Autothrottle settings.

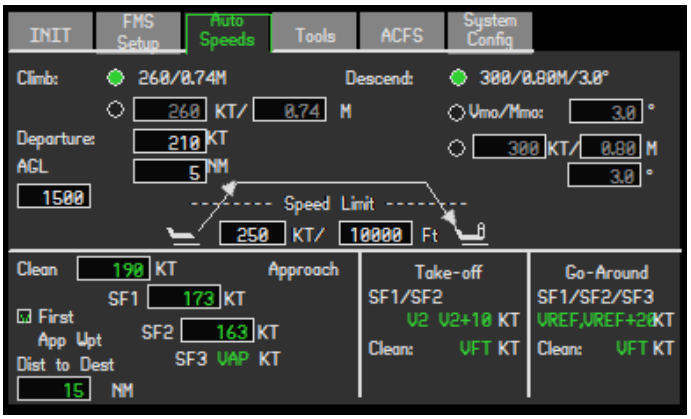


Figure 44 - AUTO SPEEDS MENU

The Auto Speeds tab:

- Depicts the indicated speed schedule used by the FMS for each Phase Of Flight (POF: departure, climb, descent, approach and go-around). In cruise, the FMS uses the speed inserted in Flight Management Window (FMW), Preflight POF, Alt/Spd tab.
- Allows to define the envelopes of departure and approach POF.

By default, the standard climb and descent speeds are selected.

Manual climb speed setting can be accomplished by selecting the radio button and changing the value +/- using mouse control.

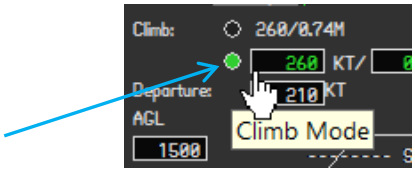


Figure 45 AUTO SPEED CLIMB SELECTION

Departure provides entry of a target airspeed and the altitude and range from origin airport (effective area) for its use. For instance, it can be used to set restrictions for departure airport airspace. Defaults are 2,500 Ft AGL and 4 NM. The speed defaults to the last entered value, the airplane database value, or to 210 kts.

Using mouse control, this speed can be set up to 260 kts.

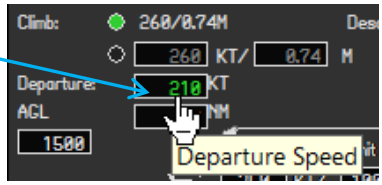


Figure 46 AUTO SPEED DEPARTURE SETTING

Speed Limit defines the maximum airspeed that the FMS will fly below the entered altitude. It can be used to set general speed restrictions for airspace, such as 250 knots below 10,000 ft. It is possible to delete the Speed/Altitude limit (fields are then dashed).

Descent provides three selections:

- The airplane database default
- A Vmo/Mmo and manually entered angle
- A manual combination of airspeed / mach / angle

Pressing the adjacent radio button allows speed values to be manually set using mouse control.

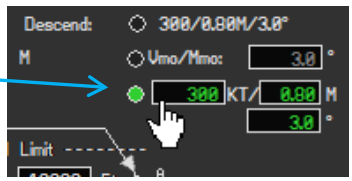


Figure 47 AUTO SPEED DESCENT SELECTION

Approach provides a way to enter a speed for each Slats/Flaps (SF) configuration. These fields are used for performance planning purposes, automatic power control and crew reference. Default values come from the airplane database or the last entered value and are modifiable by the crew unless otherwise stated below. Entry of speeds higher than placard speed limits for a given configuration results in an invalid entry and will not be accepted.

Entries lower than a minimum IAS indicate a delta from Vref and are displayed as “VRF+” plus the entry.

Each field is as follows:

- Clean provides entry for Clean configuration (range = [150 kts; 200 kts]),
- SF1 provides entry for SF1 configuration (range = [140 kt; 190 kt] or in Vref mode: range = [VRF+15; VRF+50]),
- SF2 field is similar in operation to the SF1 (range = [130 kt; 180 kt] or in Vref mode: range = [VRF+5; VRF+40]),
- SF3 displays VAP. VAP is not modifiable.

FMS instructions for transition to approach speeds are provided in this window. The radius of approach area is defined by either **First App Wpt** or **Dist To Dest** :

First App Wpt - check box indicates that approach speed is to be activated 5 NM prior the first waypoint of the approach. Default is the last selection or checked (from airplane database).
Dist To Dest - provides a radius from destination at which approach speeds become active. Default is the last entered value or 15 NM (from airplane database).

YAW DAMPER

The FMS and Automatic Flight Control System incorporate a yaw damper.

Open the AFCS tab on MDU 2 to access this option. When checked the Yaw Damper will be active.

Select LNAV Yaw Damper if you also want the Yaw Damper active in LNAV mode.

Figure 48 YAW DAMPER SELECTION

APPROACH GUIDANCE

Instrument landing approach procedures, with or without vertical guidance (glideslope), and with Localizer or RNAV (WAAS) lateral guidance are accomplished using the APP Button. This will arm Approach Mode.

Requirements

NAV1 ILS or Localizer approaches, and RNAV (WAAS) approaches. The APP system has no effect on other types of approaches. NAV1 ILS or Localizer approaches can use the system with or without a loaded flight plan. RNAV approaches require a flight plan and loaded approach as described in the topics *Loading a Standard Arrival Route (STAR)* on page 17 and *Loading Approaches* on page 18.

Note:
In order to utilize the FMS system effectively we always recommend that a flight plan be loaded into the system. Otherwise options such as this are not fully enabled!

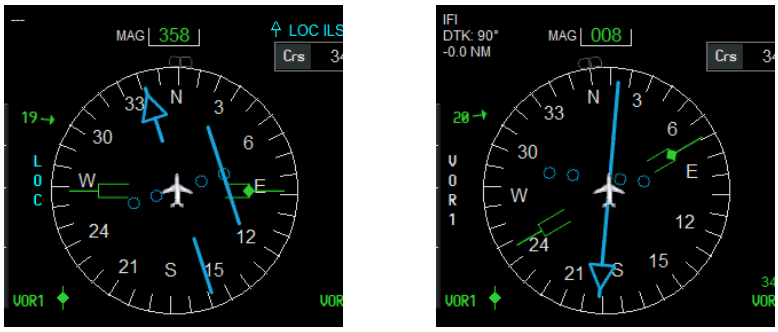
Procedure

While preparing for an ILS or RNAV approach, press the APP Button. This will arm the Approach System.

While the APP System is armed, but not on final approach, the lateral and vertical guidance systems will continue on the modes previously set before arming the system. The Autopilot Annunciator on the PDU will show the system is armed in the secondary light.

HSI Display

If a flight plan is loaded, and the approach runway/type is selected, the HSI needle will turn to blue, and the needle direction will be locked to the assigned runway heading.



ILS/Localizer Approach RNAV Approach

Figure 49 HSI Approach Displays

If a flight plan is not loaded, or if the flight plan approach is not loaded, the display will remain white and will require manually turning the course needle to the runway heading.

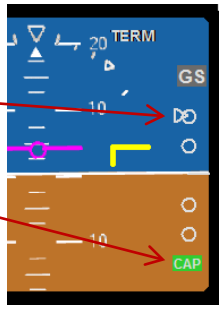
Glideslope

If the runway has an associated glideslope signal, and the localizer frequency is tuned to NAV1, the Glideslope Capture System will be armed. The Autopilot Annunciator on the PDU will illuminate GS on the secondary light.

GLIDESLOPE CAPTURE

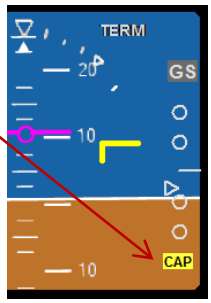
Once the glideslope signal is being received, and the indicator is visible, the system will remain in Armed mode while the aircraft is above the glideslope.

When the system is in Capture Mode and the glideslope hold function is locked the CAP indicator will illuminate.



If the aircraft is above the glideslope the CAP indicator will turn yellow.

If the aircraft remains above the glideslope more than 20 seconds an aural alert is sounded.



ALTIMETER BAROMETRIC SETTING

The altimeter barometric setting knobs are on both the pilot side and copilot side of the Guidance Panel. Clicking left or right on the knob will increase/decrease the setting. The scroll wheel will do the same. Pressing down on the scroll wheel (mouse center click) automatically resets the setting to standard (29.92 Hg or 1013 Mb).

Radio Tuning

Radio tuning is accomplished through either of the PDU displays on the *Flight Deck*.

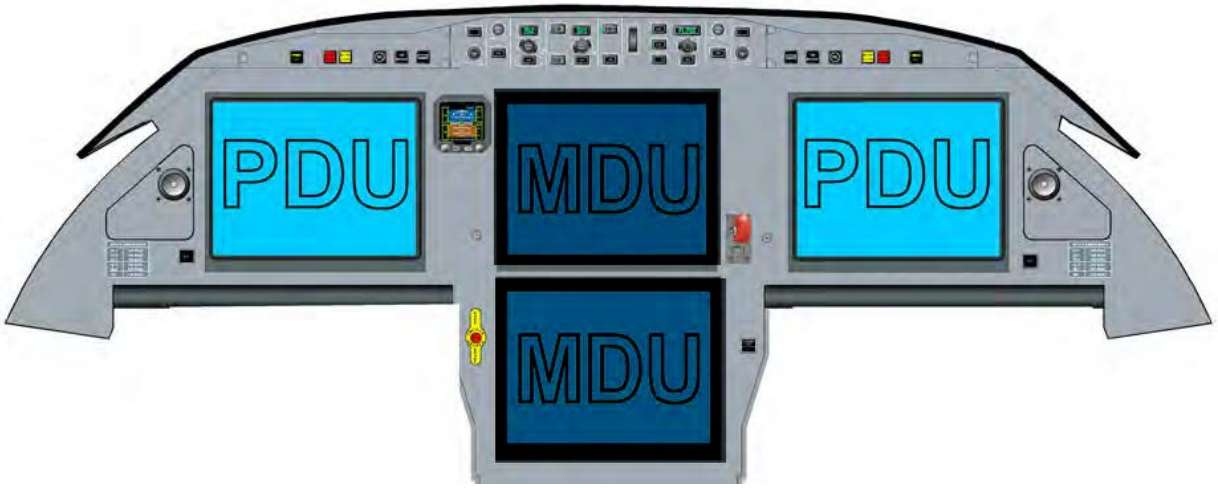


Figure 50 FLIGHT DECK DISPLAYS

Readouts

Digital readouts for the ATC (COM 1), NAV 1 and Transponder (XPDR) settings are displayed at all times on the *Permanent Radio Bar* (PRB).

Figure 51 RADIO FREQUENCY READOUTS

To set frequencies, press the Menu Button to access the *Radios Menus*.

Radio Menus

The full *Radio Menus* are displayed in the *1/6 Window* of the PDU, on the lower right of the display on the pilot side, and the lower left of the Copilot display.

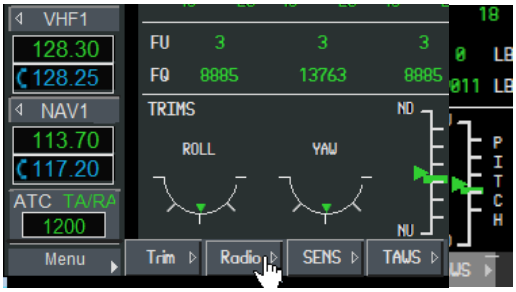


Figure 52 1/6 WINDOW MENUS

There are five menu tabs on the Radios Menu:

- VHF – (COM) Radios (1 and 2)
- NAV/ADF Radios
- XPDR/TCAS Radios
- HF Radios (not part of simulator)
- SAT – Not Installed

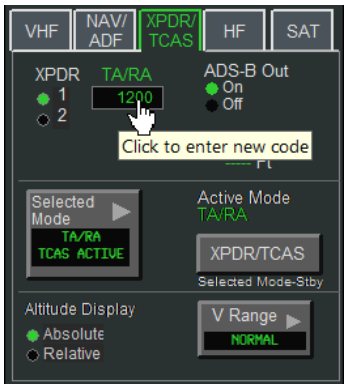
Figure 53 RADIO MENUS

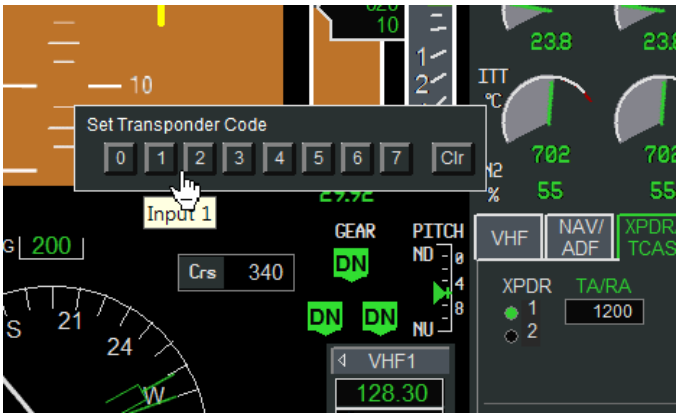
Set the respective frequency using the standby Frequency window on the menu.

Use the Swap Key to swap the standby and active frequencies.

Figure 54 SETTING RADIO FREQUENCIES

To change Transponder frequency, select the XPDR/TCAS tab. Then press the frequency window. This will open the *Transponder Key Window*.





Enter the desired code sequentially. You can go back and erase a digit by selecting the Clr key. When all four digits are entered the Transponder Key Window will close.

You can also open the *Transponder Key Window* By clicking the XPDR readout on the *Permanent Radio Menu*.

Autotune

NAV MENU AUTO TUNE

The AUTO mode enables the FMS to auto-tune the NAV frequency. Manually tuning the frequency deselects the AUTO mode if engaged. The default state is not selected. When auto-tune is activated, the "AUTO" indication is displayed in the permanent radio bar.

Figure 55 Auto Tune Selection

During auto tuning, the FMS tunes both VOR to the next WAYPOINT TO in the Waypoint List (if there is one). During auto tuning, the FMS tunes both ILS, only when a procedure associated with an ILS is selected. Auto tuning automatically (below 20 Nm) selects the VOR CDI with the CRS associated with the published approach.

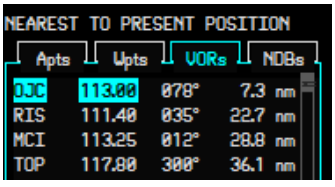
NOTE

The AUTO mode is disconnected when a VOR frequency is manually selected on the Horizontal Situation Indicator (HSI).

TUNING FROM THE FLIGHT PLAN MENUS

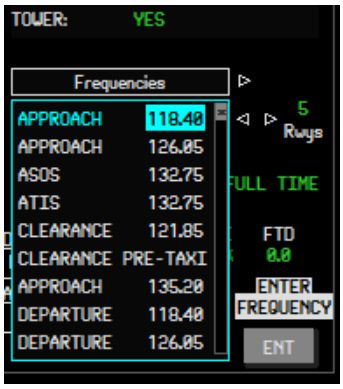
On the Nearest VOR and NDB pages, the relevant frequency will be highlighted and blinking.

The *ENT Button* will be visible, with "Enter Frequency" prompted (flashing). Pressing ENT will enter this frequency directly into your NAV 1, COM 1 or ADF radio. See *Radio Tuning* on page 46 for more details on using the radios.



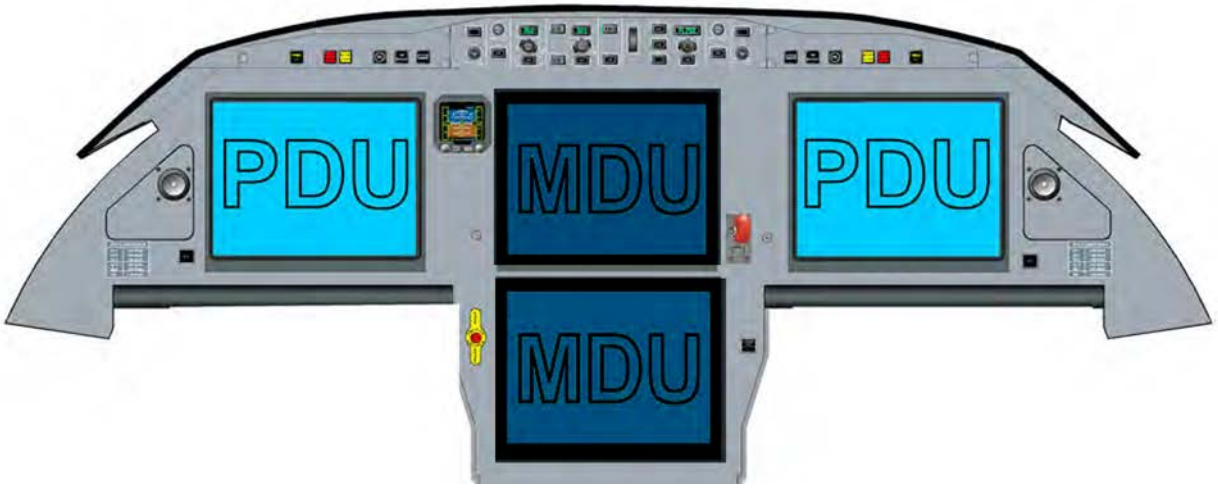
On the *MDU 1 Airport Information page*, the frequencies available for that airport are listed in the dropdown box labelled "Frequencies".

Select the frequency using the scroll bar on the right, and then press the ENT Button. The frequency will be entered into the active NAV 1, COM 1 or ADF radio.



HSI Settings

The Horizontal Situation Indicators (HSI) are located on the two PDU Displays.



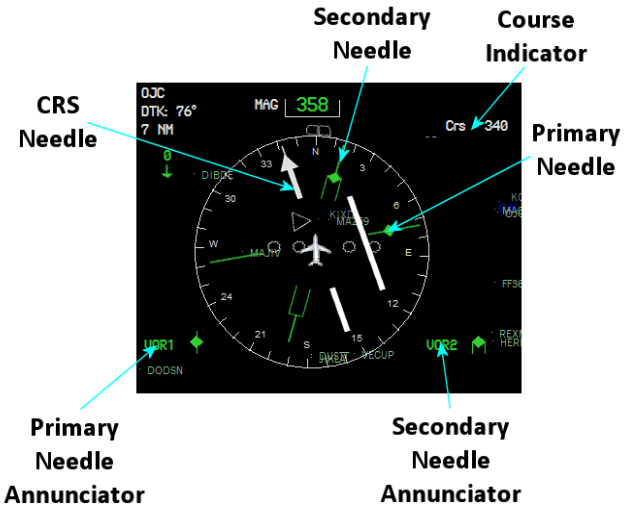


Figure 56 HSI Indicator

HSI Menus

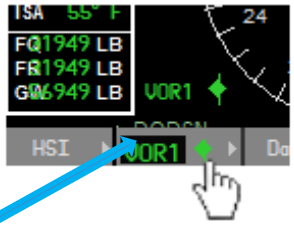
Access to the HSI menus is obtained by clicking the *HSI Button* on the lower left of the HSI Display.

Figure 57 HSI MENU BAR BUTTON

PRIMARY AND SECONDARY NEEDLE SETTINGS

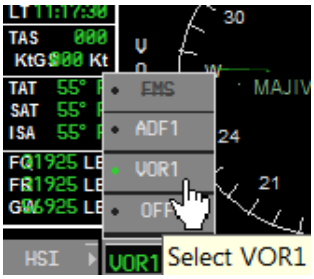
The Primary and Secondary needles can display in 3 modes:

- NAV/VOR Station
- ADF Station
- FMS Course



The mode for the *Primary Needle* is selected by pressing the *Primary Needle Menu Button*.

The popup menu allows you to make your selection.



The *Secondary Needle* operates the same way, from the button on the right of the *HSI Menu Bar*.

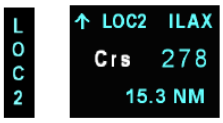
COURSE (CDI) NEEDLE SETTING

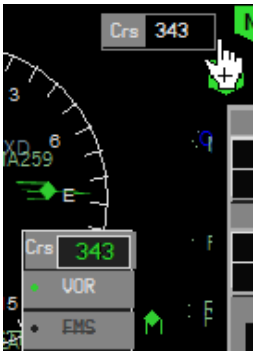
Press the *CDI Button* on the HSI Menu Bar.

Figure 58 CDI MENU

The course can be set from the popup menu, or from the *Course Indicator Display*, which changes to Entry Mode when the *CDI Menu* is open.

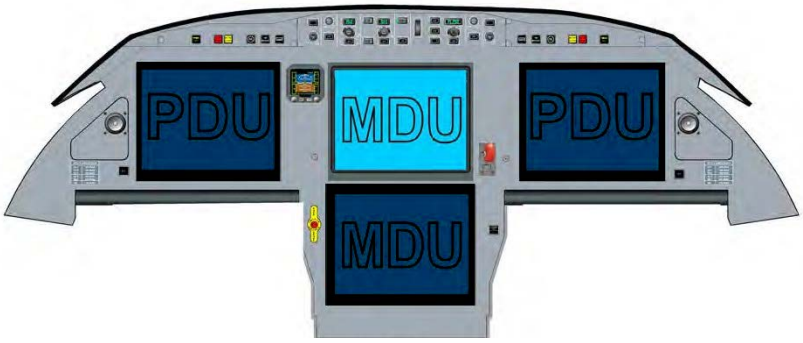
When a localizer signal is being received the Course Indicator Display is modified to show more information.





FMS Map

The Interactive NAVigation (INAV) Display is located on MDU 1.



MDU 1 consists of the *INAV Display*, *INAV Toolbar*, and *Flight Plan Display*.

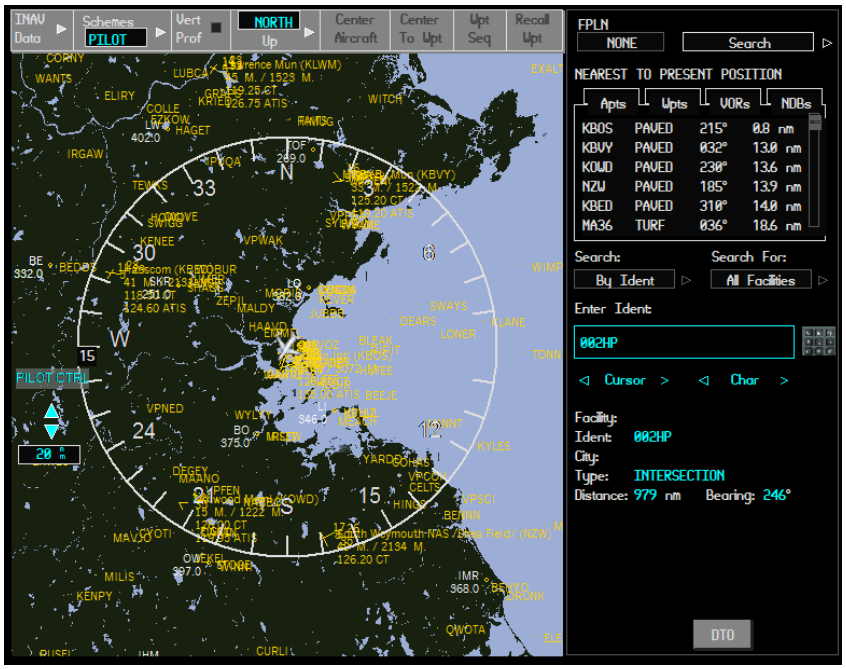


Figure 59 MDU 1

INAV Display

Map Settings and options for the INAV Display are facilitated on the INAV Toolbar.

Figure 60 INAV TOOLBAR

INAV DISPLAY DATA

The type of data displayed is determined by opening the *INAV Data Menu*

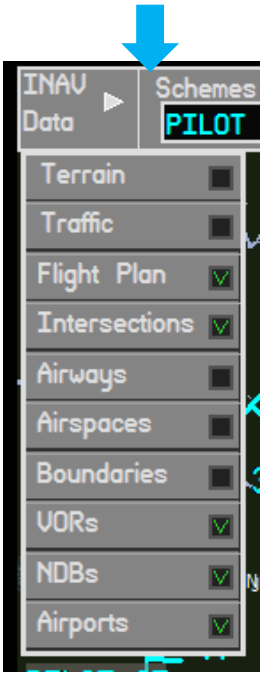


Figure 61 INAV DATA MENU

Map orientation is controlled by the *Map Orientation Selector*.

The orientation options are:

- Magnetic Heading Up
- True Heading Up
- North Up

VERTICAL SITUATION DISPLAY (VSD)

The VSD is selected/deselected by the pilot on the INAV tool bar using the Vert Prof button.

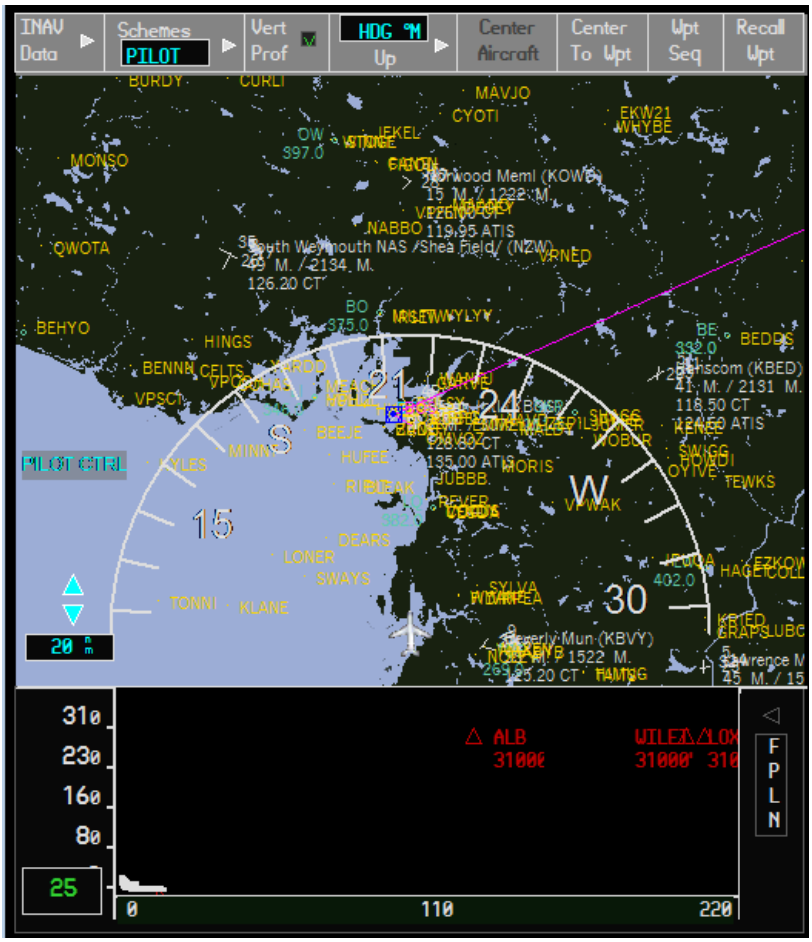


Figure 62 VERTICAL SITUATION DISPLAY

List of Objects Displayed

Airplane

The airplane symbol is allowed to move its position vertically and horizontally on the VSD. The airplane symbol vertical position in the VSD window is computed according to the airplane barometric altitude. A framed label with green text on a black background showing the A/C barometric altitude in feet is displayed at the A/C symbol height on the Y-axis scale.

Flight Plan

Flight plan legs are displayed in VSD if FPL is displayed.

Waypoints are positioned in VSD according to their predicted barometric altitude. Waypoints defined by Flight Level are positioned using the VSD barometric reference setting. The waypoint names are displayed above the waypoint symbol.

Illustrations

Falcon 7X

Displays

Table of Contents

This space left intentionally blank

General

Flight Deck Overview

CONTROLS

Crew has control on the displays and items contained in the displays through:

- Cursor Control via Mouse
- Two Multifunction Key Board (MKB)
- Reversion Panel which gathers all reversion controls and displays dimming knobs

INDICATIONS

Displays are the two Primary Display Unit (PDU) and Multifunction Display Unit (MDU) and the Secondary Flight Display (SFD).

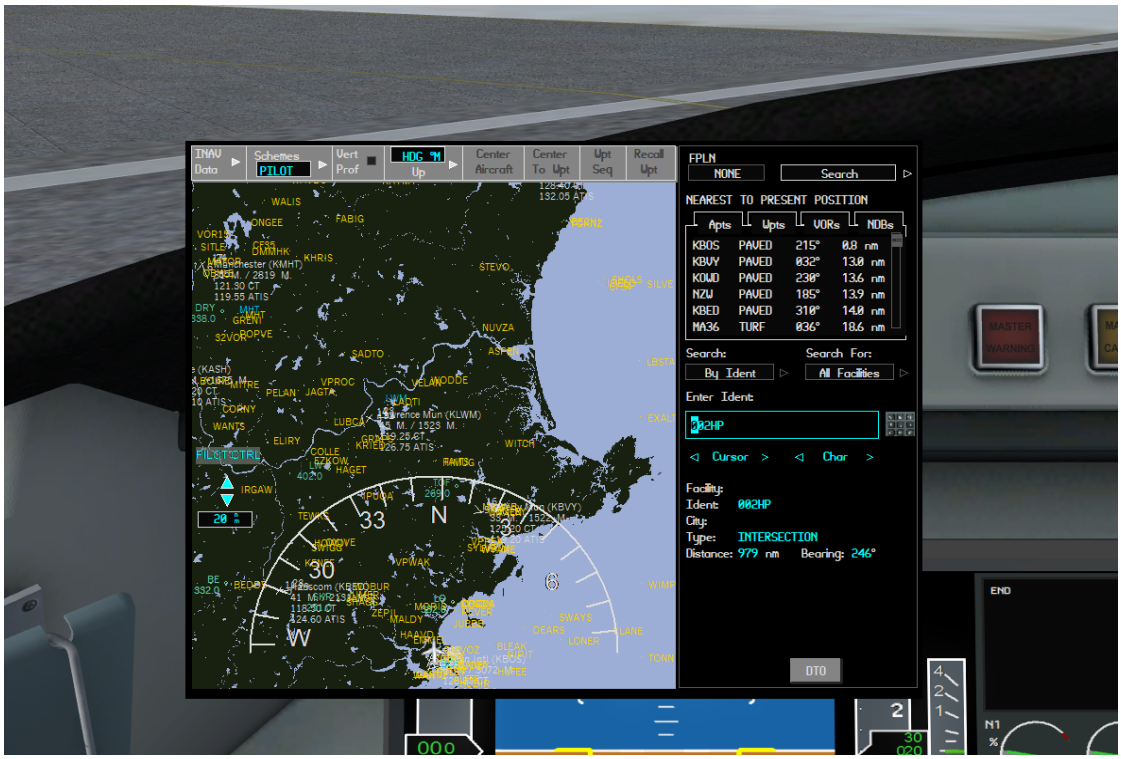
Indications related to displays are provided:

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

POPUP WINDOWS

Each of the four displays is also available in an expanded popup display. Just click the upper left hand corner of the display.

The display will expand in the center of the screen.



You can also open any of the popup windows by the standard simulator keyboard commands:

Key Combination	Window
Shift + 2	Info Pad
Shift + 3	Pilot PDU
Shift + 4	MDU 1
Shift + 5	MDU 2
Shift + 6	Multi-Function Keyboard
Shift + 7	Copilot PDU

DISPLAY UNIT CHARACTERISTICS

The Display Units are 14.1 inch diagonal LCD Displays.

The Primary Display Units (PDU) as well as the Multi-function Display Units (MDU), are divided into 4 windows. Horizontally, these display units are split into 1/3 and 2/3 screen width. Vertically, they are split into two equal parts.

Thus, two windows have the size of 1/6 of the display area and 2 windows have the size of 1/3 of the display area: the windows are then named 1/3 windows and 1/6 windows.

Within a screen, all windows are always displaying information: either data selected by the pilots or default windows (a window cannot be blank within a screen).

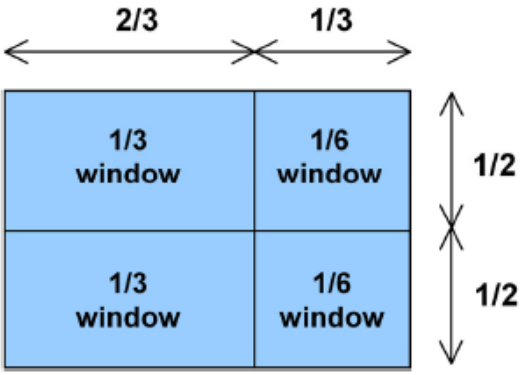


Figure 1 DISPLAY UNIT FORMAT

Even though the screen is split in those four windows, some pages of the Multi-function Display Units (MDU) can be combined in order to be displayed into a vertical 1/3 window, a 1/2 window.

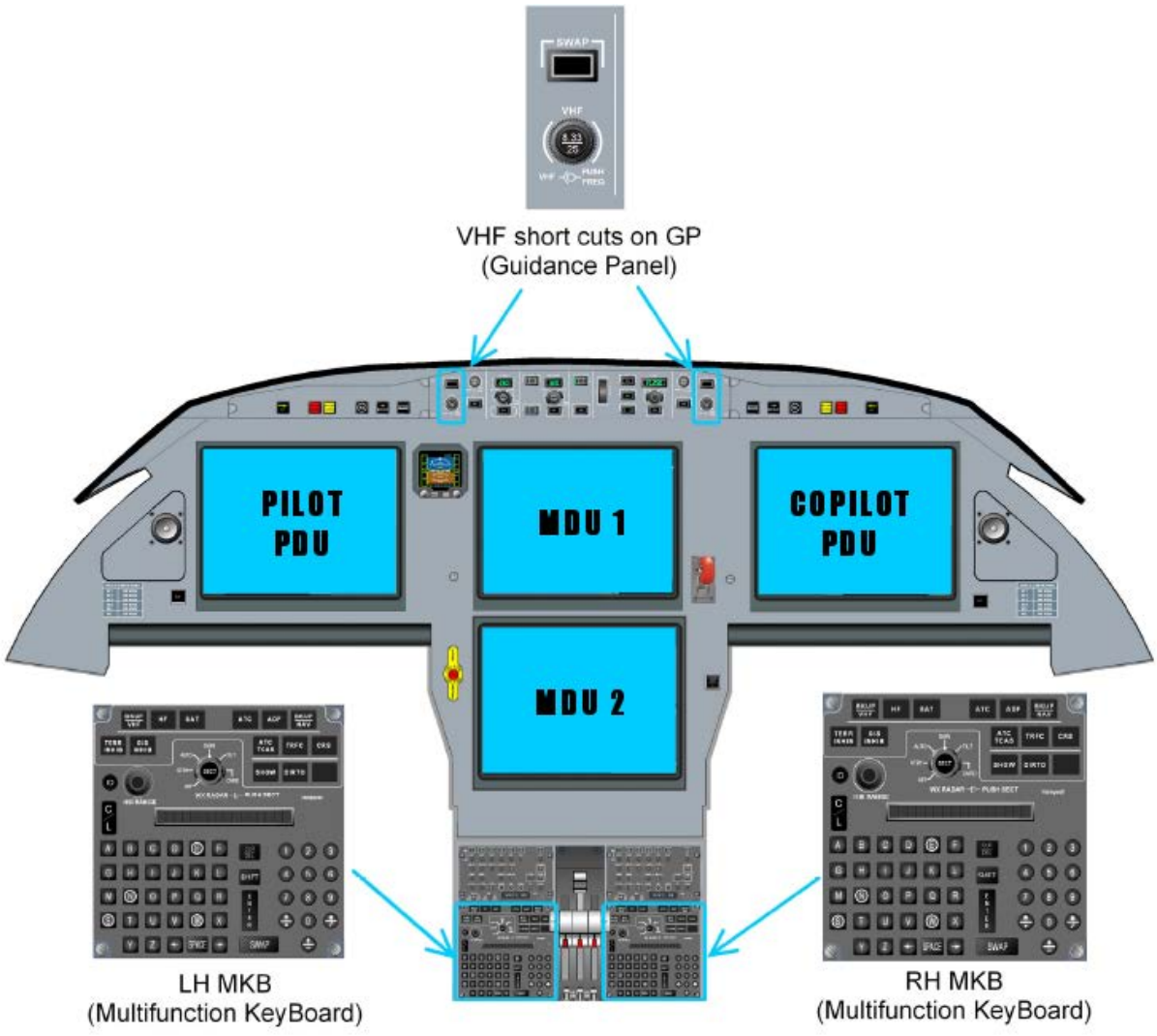


Figure 2 DISPLAY FLIGHT DECK

In case of a system failure, the screen section will be red-crossed.

Figure 3 FAILURE DISPLAY

Reversion Panel

The Reversion Panel (RP) is located in the middle of the pedestal, behind the throttles. It gathers in one place the reversion controls for avionics, for both crew members.

The RP houses:

- Four concentric dual knobs corresponding to each display:
- Two knobs for the Data Acquisition Unit (DAU) channel reversion. The DAU corresponds to generic I/O modules within the Modular Avionics Unit (MAU),
- One MDU PDU pushbutton (not used in 4 display configuration),
- 5 pushbuttons dedicated to the sensors and FMS reversions (LH and RH).

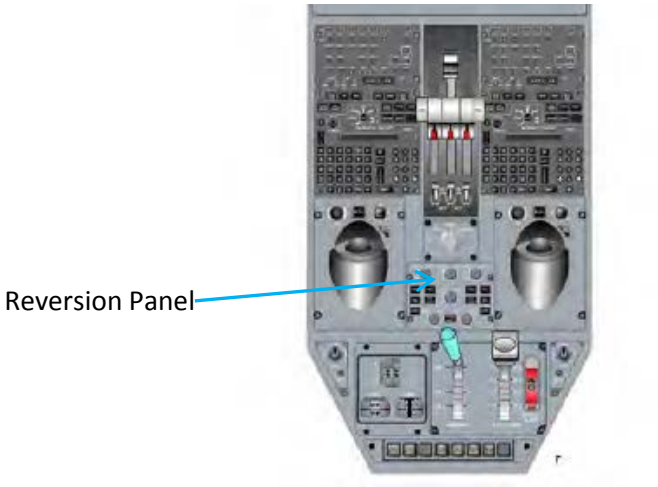


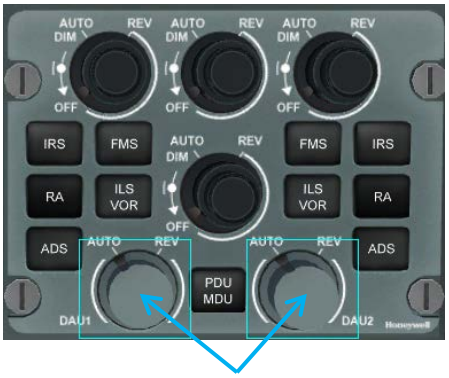
Figure 4 REVERSION PANEL

DISPLAY DIMMING

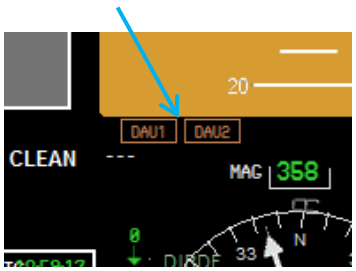
Dimmer switches

Two way switches enable dimming of the four displays.

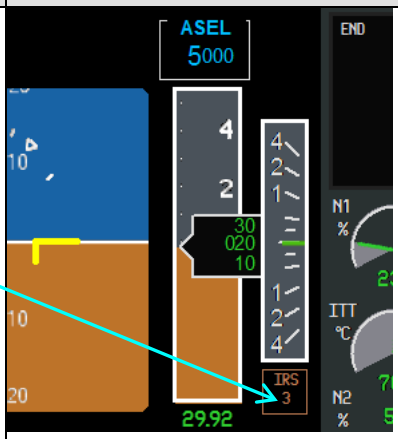
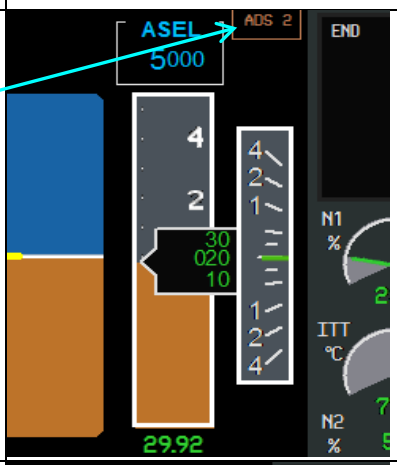
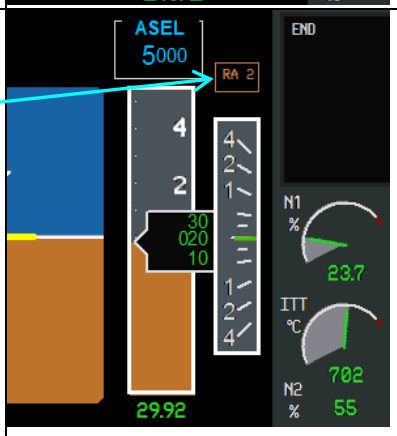
DATA ACQUISITION UNITS

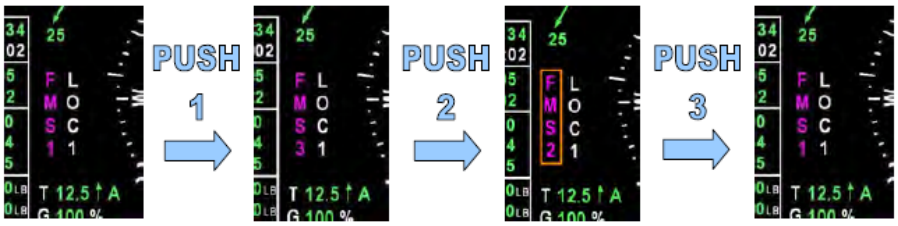


Enables secondary (backup) DAU processors in case of failure of primary source. Indication that backup processors are in use annunciated on the PDU.



FMS REVERSIONS

CONTROL	FUNCTION	LOCAL INDICATION
IRS	Allows selection of Inertial Reference System (IRS) sources for display on the PDU, with the following cycle when the reversion switch is pressed: On the LH side: IRS 1 initially, IRS 3, IRS 2. On the RH side: IRS 2 initially, IRS 3, IRS 1.	
ADS	Enables the other Air Data System (ADS) source to be used for display of air data on the PDU, with the following cycle when the reversion switch is pressed: - On the LH side: ADS 1 initially, ADS3, ADS2 - On the RH side: ADS2 initially, ADS3, ADS1.	
RA	Allows selection of the Radar Altimeter (RA) source for display on the PDU, with the following cycle when the reversion switch is pressed: - On the LH side: RA 1 initially, RA 2. - On the RH side: RA 2 initially, RA1.	

FMS	FMS processor selection. Reversion pushbutton operating sequence: - 1, 3 and 2 

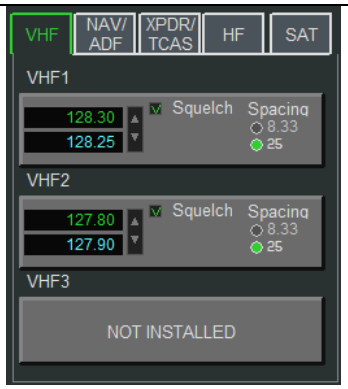
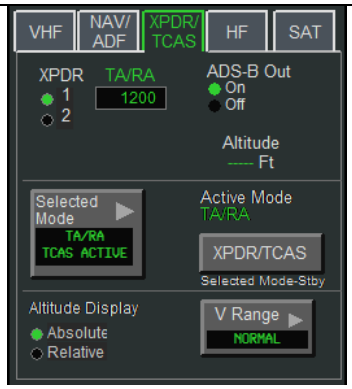
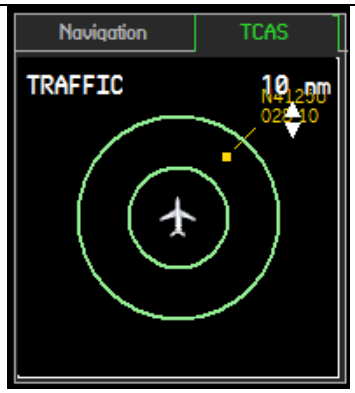
CONTROL	FUNCTION	LOCAL INDICATION
ILS VOR	When an ILS reversion is performed, the source symbol is framed in amber while the color corresponding to the target status remains white, cyan or magenta.	
	For a VOR, the source is still the LOC but the identification is notified as VOR. When a reversion is done, the LOC source caption and the VOR identification caption are boxed in amber. The source remains colored according to the target status.	

MKB - Multi Function Keyboard

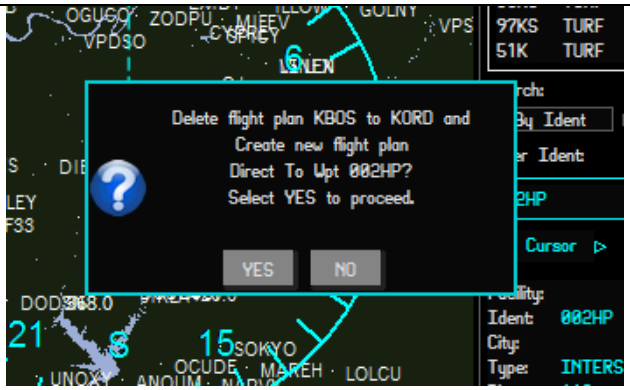
The Multi-Function Keyboard provides alphanumeric keyboard and dedicated controls for flight management, as well as functions shortcuts.

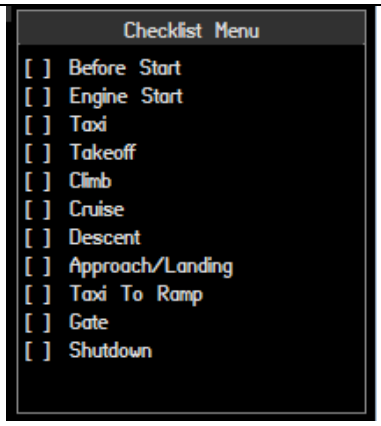
Figure 5 MULTI FUNCTION KEYBOARD

CONTROL	FUNCTION	LOCATION
ADF	Pops up the ADF menu on the 1/6 window of the PDU	

ATC	Pops up the ATC menu in the 1/6 window of the PDU	
ATC TCAS	Pops up TCAS menu on the PDU 1/6 window.	
TRFC	Pops up Traffic Display on the PDU 1/6 window.	
BKUP NAV	At any time, pressing the BKUP / NAV shortcut on the MKB positions the CCD cursor on the on-side Permanent Radio Bar (on NAV1 on the LHDU and on NAV2 on the RHDU).	

CRS	Used to display the VOR / LOC CDI on the on-side PDU	
SHOW	Displays the information page on the next waypoint in the flight plan	

DIRTO	Shortcut key to initiate a Direct To/Divert To flight plan for a waypoint that has been selected, or found in the search engine. A dialog box will appear on MDU 1 asking you to confirm deletion of the present flight plan if one is loaded (Divert To). Select YES to create the new flight plan.	

CONTROL	FUNCTION	DISPLAY
G/S INHIB	Inhibits "GLIDE SLOPE" aural warning.	G/S INHIB white text is displayed in the right lower part of the HSI window
		TAWS: G/S CANCEL Advisory CAS message
TERR INHIB	Deactivates the Terrain Clearance Floor and Terrain and Obstacles Alerts enhanced modes to avoid unwanted alerts.	TERR INHIB white text is displayed in the right lower part of the HSI window
		TAWS: TERR INHIBIT Advisory CAS message
C/L	Pops up the CHECKLIST window on MDU 2 if not yet displayed.	

PDU - Primary Display Unit

General

The PDU is fitted in front of each pilot station (LH Display Unit and RH Display Unit) in a normal display units configuration.

Each PDU contains:

- An Attitude Director Indicator (ADI),
- An Horizontal Situation Indicator (HSI),
- An ENG-CAS page, comprising permanent engine parameters information and the CAS messages display area,
- A 1/6 window, which can be filled at will.

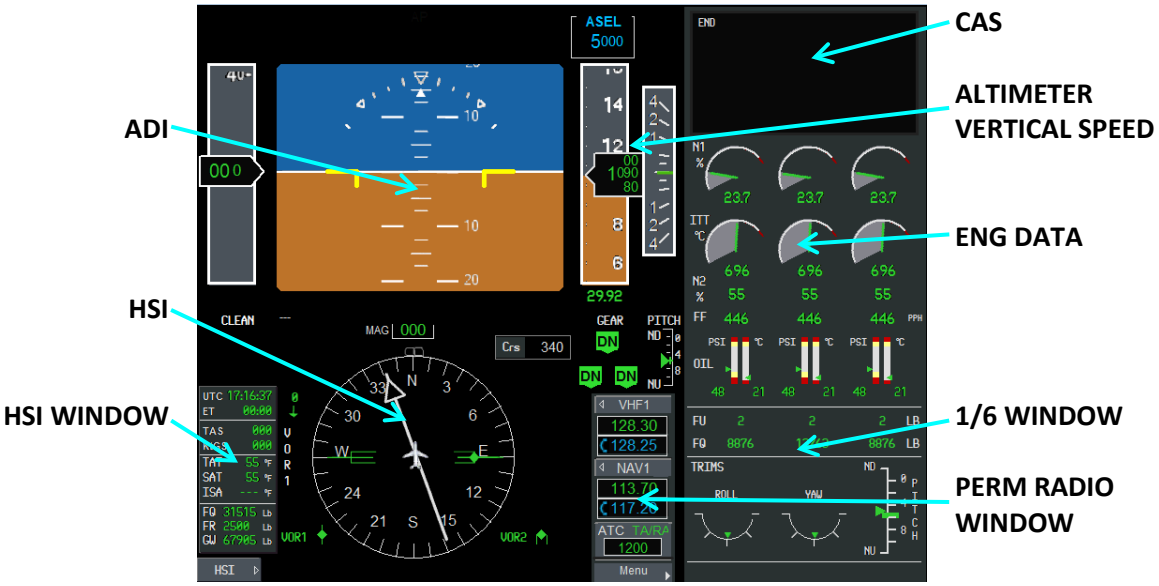


Figure 6 PILOT PRIMARY DISPLAY UNIT

The ADI, the HSI and the ENG-CAS window are fixed and cannot be changed to another window. On the other hand, the 1/6 window can be modulated depending on the number of display units available.

Primary Display Unit Content

The Primary Display Unit (PDU) provides all the basic flight information necessary to aviate, navigate in short term, communicate and supervise airplane status.

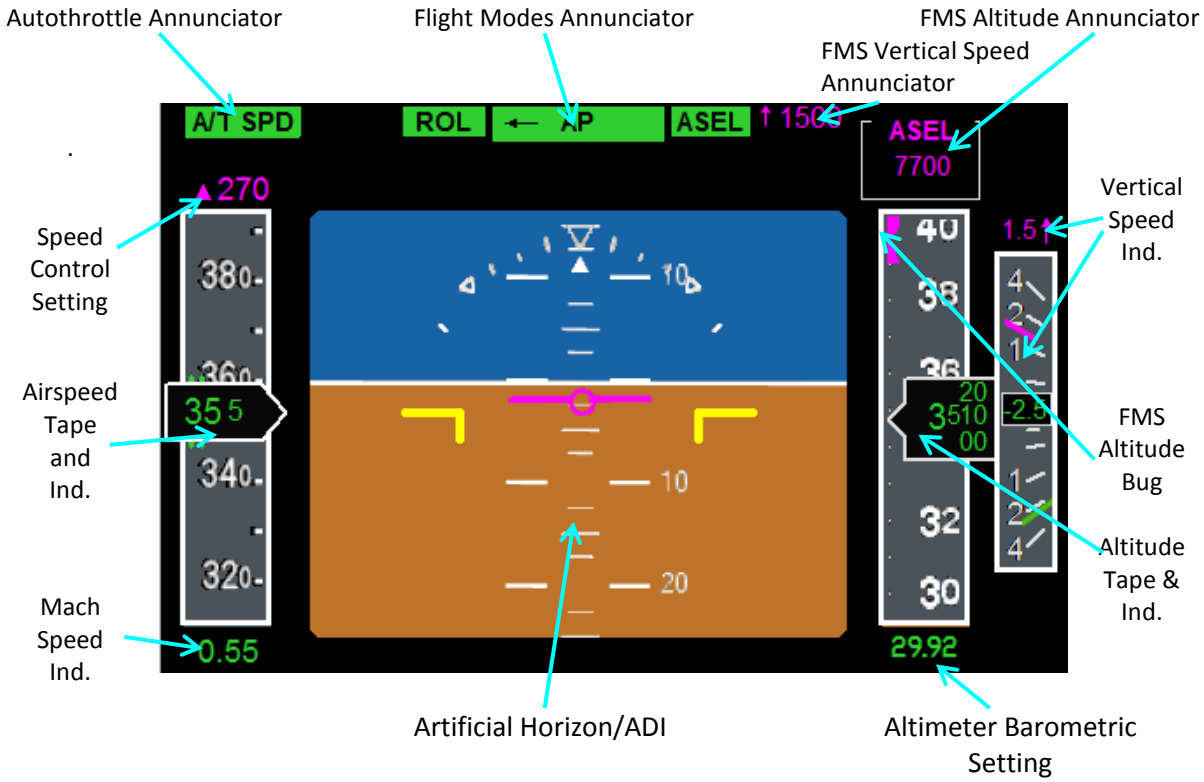


Figure 7 ADI WINDOW

The ADI Window is comprised of:

- An artificial horizon, which provides a reference for path, pitch and roll as well as other information about the airplane attitude,
- A speed tape, graduated in knots,
- Mach speed indicator,
- An altitude tape, graduated in feet,
- A vertical speed tape, graduated in thousand feet per minute,
- Altimeter barometric setting,
- A Flight Mode Annunciator (FMA) area, providing information on Automatic Flight Control System (AFCS).

ALTIMETER BAROMETRIC SETTING

The altimeter barometric setting knobs are on both the pilot side and copilot side of the Guidance Panel (Autopilot). Clicking left or right on the knob will increase/decrease the setting. The scroll wheel will do the same. Pressing down on the scroll wheel (mouse center click) automatically resets the setting to standard (29.92 Hg or 1013 Mb).

FLIGHT DIRECTOR / THRUST DIRECTOR DISPLAY

When a flight plan is loaded, and the Autothrottle setting is made, the Flight Director and Thrust Director are available for use on the ADI.

Acceleration Chevron

The *Acceleration Chevron* (AC) is the green V-shape symbol displayed in the ADI.

When used in relation with the *Flight Path Symbol* (FPS), it gives an immediate and intuitive indication about the airplane ability to stabilize and maintain speed, accelerate or decelerate.
When used in relation with the FPS scale in the ADI, and for smooth maneuvers, it gives an immediate and intuitive indication about the maximum flight path angle that can be instantaneously flown at steady speed, which is valuable information for a pilot in an engine failure situation for instance.

Trend Vector

The Trend Vector (TV) is a green double-line bar which is displayed above (when the airplane is accelerating) or below (when the airplane is decelerating) the speed pointer

in the ADI. On Falcon fitted with EASy, this green double-line bar can be topped by a horizontal line when the acceleration is above the scale limit ( ).

Thrust Director

The *Thrust Director* (TD) is the magenta open box displayed in the ADI. In order to fly the speed selected on the Guidance Panel and displayed on the speed scale (speed bug in magenta), the AC must be set in the TD box.

Rotation Symbol

The *Rotation Symbol* (ROS) is the magenta inverted-T symbol is displayed in the ADI during take-off, from brakes release to 3 seconds after lift-off.

Displayed at the bottom of the ADI at brakes release, it reaches the horizon at the end of the rotation. It provides the pilot with an easy-to-follow vertical means to best control the rotation phase of the airplane.

That is the reason why the ROS was created to provide the pilot with a valid, easy-to-use pitch reference to control the two parts of the rotation phase. In bringing up the ROS from the bottom of the ADI onto the horizon, the pilot actually follows the optimum rate of rotation. Moreover, initially displayed at the bottom of the ADI, the ROS moves upward as the FPS will do when "pushed by the ROS" once the airplane is airborne. This results in a smooth, linear eye pattern from the bottom to the top of the ADI, significantly decreasing the pilot workload.

At rotation speed, the pilot pulls the stick back, making the ROS rise from the bottom of the ADI. Then the pilot controls the rotation by flying the ROS onto the horizon in the ADI. In this way, the pilot flies the optimum rate of rotation to reach the optimum speed and AOA at take-off.

As soon as the airplane is airborne, the FPS rises from the horizon, where it was stuck during the take-off roll and rotation. Three seconds after lift-off, the ROS disappears and FPS naturally becomes the primary means of flight path control.

Flight Director

The *Flight Path Symbol* (FPS) and the Pitch Symbol provide the pilot with both flight path and pitch angle indications.

Flight Path Symbol

Pitch Symbol

It is advisable not to use the FPS during the rotation phase because:

- During the first part of the rotation phase, the FPS remains on the horizon whereas a guidance is necessary to set the appropriate take-off attitude,
- During the second part of the rotation phase, the FPS position permanently changes with the speed.

In addition, flying simultaneously FPS and Pitch Symbol was perceived as possible but not comfortable for the pilot. This would imply non-intuitive and repeated eye pattern in the ADI between the horizon (where the FPS is displayed) and the top (where the Pitch Symbol is ultimately displayed) and this during a flight phase with a heavy workload.

The Flight Path Symbol can be removed, and exchanged for the Thrust Director using the FS/TD button on the *Guidance Panel*.

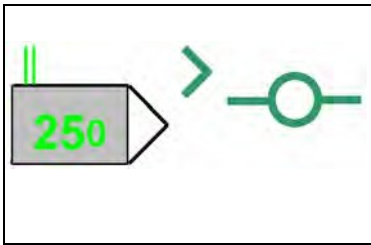
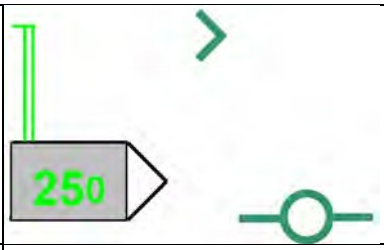
The relative positions of the AC and the FPS provide the pilot with an immediate, direct and intuitive means to assess and precisely control the acceleration along any given flight path, whatever is the instantaneous airplane trajectory (straight level flight, descent, climb):

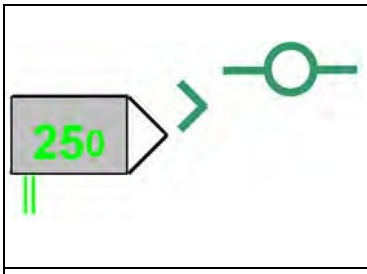
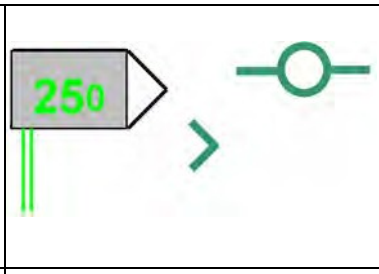
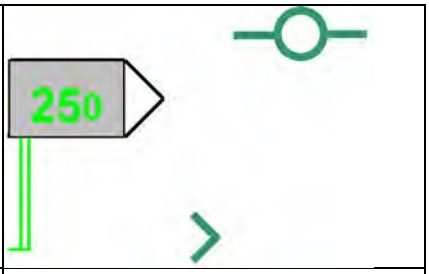
When the AC is above the FPS, the airplane is accelerating	
When the AC is below the FPS, the airplane is decelerating	
When the AC is aligned with the FPS, the airplane is maintaining speed.	

The pilot will control the AC, thus the speed, in moving the thrust levers. The AC position can also vary upon landing gear, airbrakes or slats / flaps activation, due to the consequent variation in drag.

The airplane acceleration or deceleration along the flight path can be cross-checked through the TV position with respect to the speed pointer.

Additionally, the length of the TV, as well as the distance between the AC and the FPS, are proportional to the acceleration (when AC is above FPS) or deceleration (when AC is below FPS):

		
Low acceleration	Medium acceleration without exceeding scale limit	High acceleration exceeding scale limit

		
Low deceleration	Medium deceleration without exceeding scale limit	High deceleration exceeding scale limit

Horizontal Situation Indicator

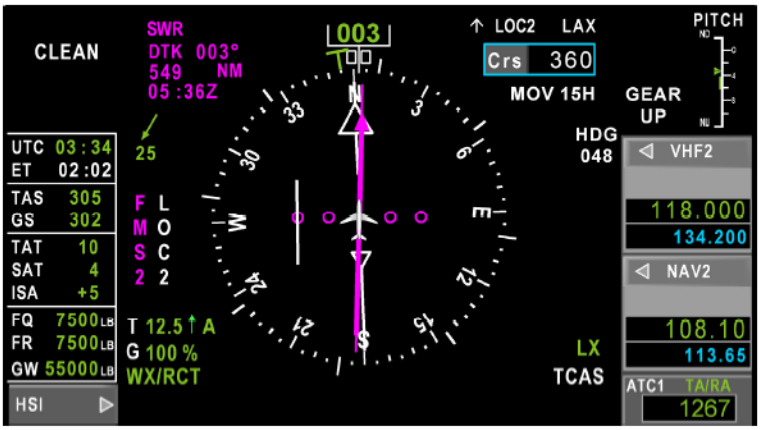


Figure 8 HSI WINDOW

The Horizontal Situation Indicator is comprised of:

- Flaps and airbrakes indicator
- FMS NAV summary,
- VOR / LOC NAV summary,
- Gear and horizontal stabilizer trim indicators,
- HDG / TRK bug readout,
- Permanent Radio Bar (PRB),
- HSI Window,
- Sensors status,
- HSI features menu,
- NAV sources,
- Navigation data bar,
- Wind direction indicator.

HSI WINDOW

HSI Window

The following air data information is provided on the HSI of the PDU:

- Universal (Zulu) Time
- Elapsed Timer
- True Air Speed (TAS),
- Ground Speed
- Total and Static Air Temperature (TAT, SAT),
- Deviation from ISA standard atmosphere temperature.
- Total fuel quantity in Lbs.
- Total fuel reserve, in Lbs.

Elapsed Timer

Use the Elapsed Timer Button to start and reset the elapsed timer.

Elapsed Timer Button

FLAPS AND AIRBRAKES INDICATOR

The flaps and airbrake (spoilers) controls are located on the lower pedestal.

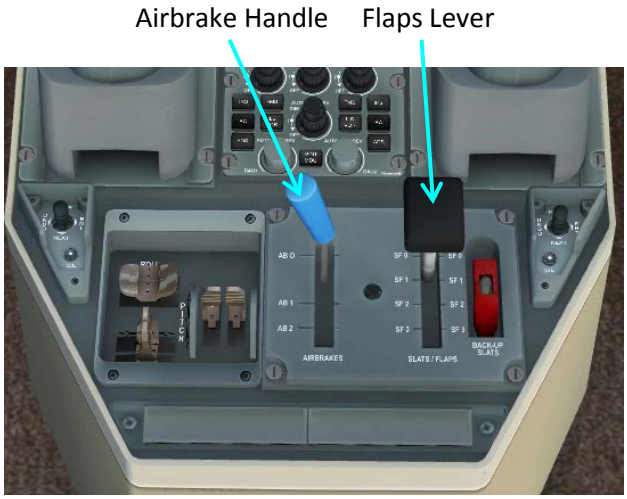
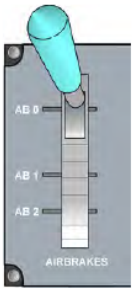
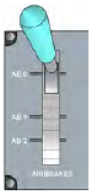
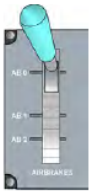
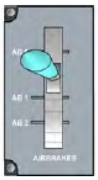
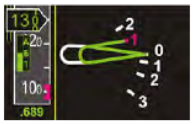
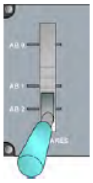
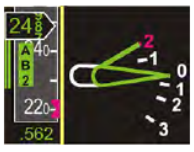
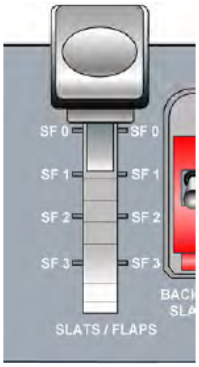
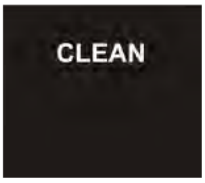


Figure 9 - Flaps-Airbrake Unit

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
	Airbrakes to AB 0 notch: - Airbrake panels, slats and flaps retracted		CLEAN
	Airbrakes to AB 0 notch: - AB and/or spoiler (acting as airbrakes) when automatically commanded		 AUTO EXTENSION
	Between AB 0 and AB 1: - Progressive spoiler deployment (maximum deflection at AB1 depends on airspeed and angle of attack)		
	Set airbrakes to AB 2: - Inboard and outboard airbrake panels deployed		  AUTO RETRACTION

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
	Disarms automatic airbrake extension	 AUTO EXT mode is on	No specific indication
		 AUTO EXT mode is OFF	

When A/B AUTO EXT. is selected OFF in flight, the CAS message A/B AUTO-EXT OFF is displayed.

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
	Sets Slats / Flaps to SF0 notch. (Slats + Flaps retracted)		
	Sets Slats / Flaps to first notch SF1. (Slats + Flaps 9°)		
	Extends the Middle and Outboard slats in backup mode.		

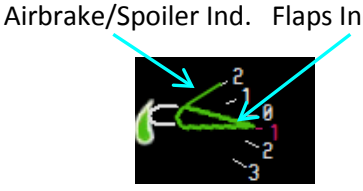
Flaps indications are displayed:
- On the PDU for the slat flap position indicator,
- On the FCS synoptic page (Slat surfaces positions),
- On the placard markings for slats flaps limitations,
- In the ENG-CAS window for CAS messages,
- In the STATus synoptic / FAULT tab for fault messages.

PDU Indication

Flap and airbrake positions are displayed in the top left corner of the HSI window.

Flap / airbrake symbols are displayed as long as:
- There is one slat, one flap or one airbrake panel extended (including untimely or un-commanded surface movement), or
- One of the secondary flight controls is in automatic control (AUTO, A/B AUTO RET, A/B DISARM),

The Flap / airbrake symbols are replaced by a white CLEAN label if the airplane is in CLEAN configuration, and the aircraft is below 18,000 ft. altitude.



FCS Synoptic

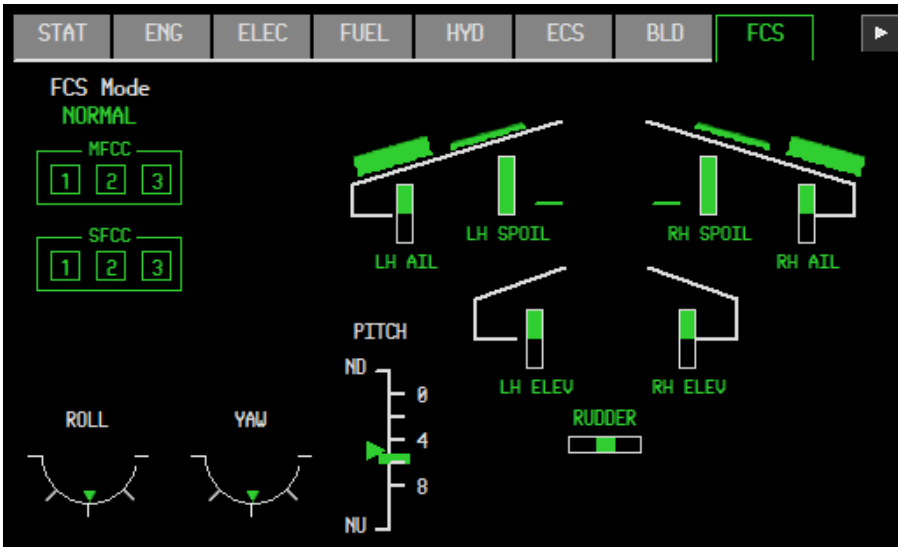
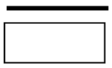


Figure 10 FCS Synoptic Page

The right part of the synoptic gives the positions of all control surfaces except the flaps (removed for clarity).

The positions of all slats are displayed with pictograms:

-  when retracted,
- when extended,
-  when moving.

ENG-CAS Window

ENG-CAS window comprises:

- A dedicated CAS area,
- Primary engine parameters.

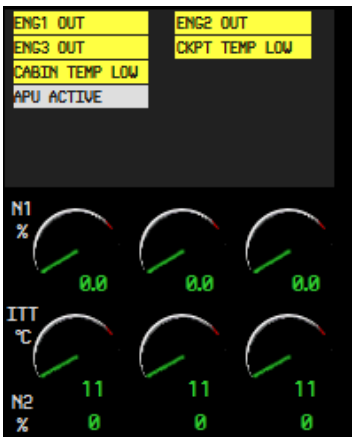


Figure 11 ENG-CAS WINDOW

1/6 Customizable Window

The 1/6 windows can be customized using the 1/6 Window menu.

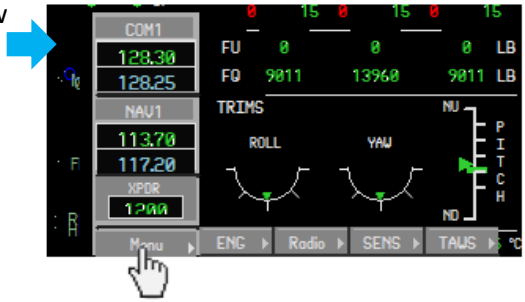


Figure 12 1/6 WINDOW MENU

The 1/6 customizable window can display four types of window:

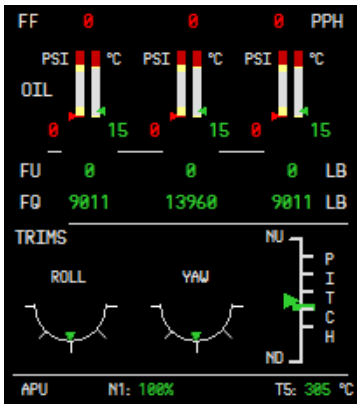


Figure 13 ENG/TRIM WINDOW

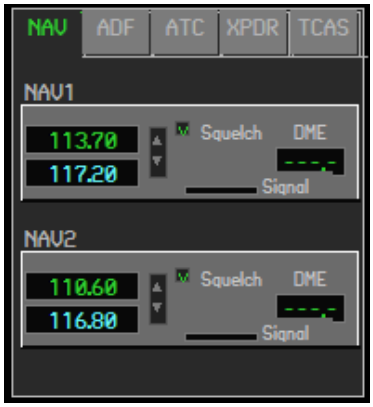


Figure 14 RADIOS WINDOW

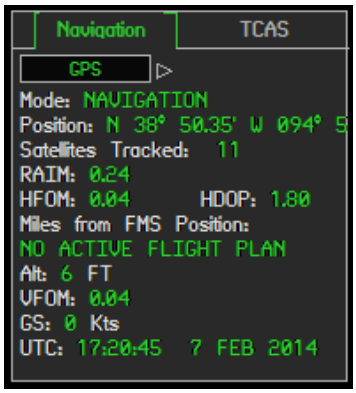


Figure 15 SENSORS WINDOW

Figure 16 TRAFFIC WINDOW

MDU - MultiFunction Display Unit

General

The MDU offers more freedom in the display configuration, as no window is permanent in normal situations.

The available pages are the following:

- An I-NAV (Interactive NAVigation) page,
- A WPT LIST (WayPoinT list) page,
- A FLIGHT MGMT (FLIGHT ManaGeMenT) page,
- An AVIONICS page,
- A SYNOPTICS page, containing the synoptics of all the airplane systems

MDU 1

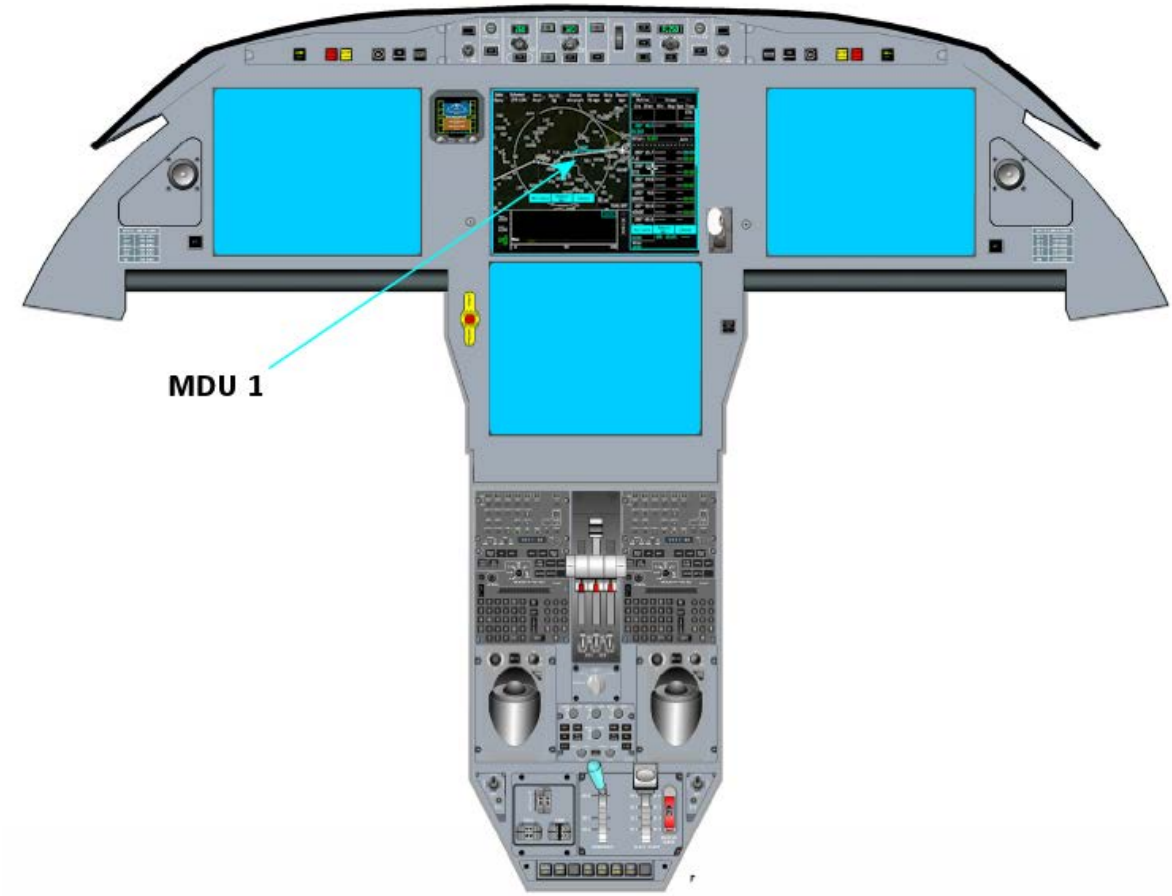


Figure 17 MDU 1 IN FLIGHT DECK

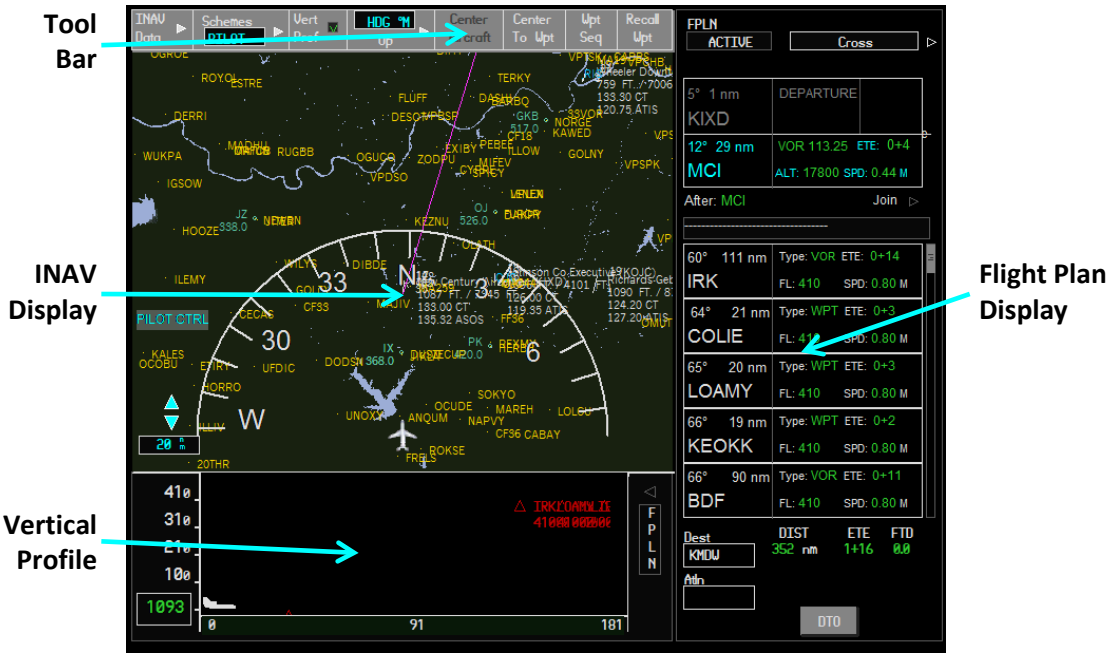


Figure 18 MDU1 WINDOWS

INAV DISPLAY

Display choices for the map are made through the INAV Data Menu.

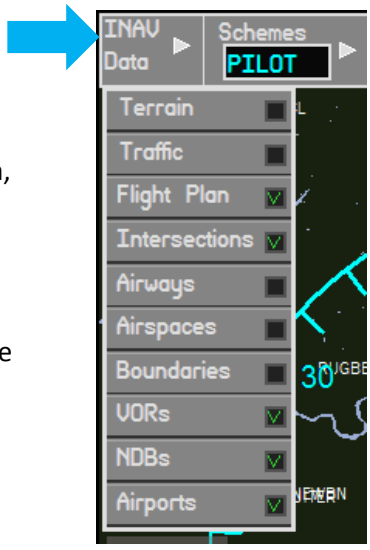


Figure 19 INAV DATA MENU

The I-NAV map display provides a horizontal display of the terrain by merging, at pilot request, information which is gathered by on-board sensors, and from airplane worldwide data bases for aeronautical data, terrain and main geopolitical elements.

This moving map provides a full interactivity to the crew:

- For direct flight plan modification on the map (using the mouse and the cursor),
- For displaying Vertical Situation Display,
- For faster and more intuitive access to data base information.

The crew has a full authority to manage the size (up a full screen size), orientation, content and location of the I-NAV maps in the flight deck.

VERTICAL SITUATION DISPLAY

The Vert Prof selection (Vertical Situation Display, VSD) is available and visible only when the INAV window size is greater than 1/3rd, but for both Secondary and Active flight plans.

The Vert Prof is defaulted to selected at power-up. When selected, VSD is always displayed at the bottom of the INAV window.

The reference setting for all VSD barometric altitudes is the Pilot Flying barometric setting.

Selection

The VSD is selected/deselected by the pilot on the INAV tool bar using the Vert Prof button.

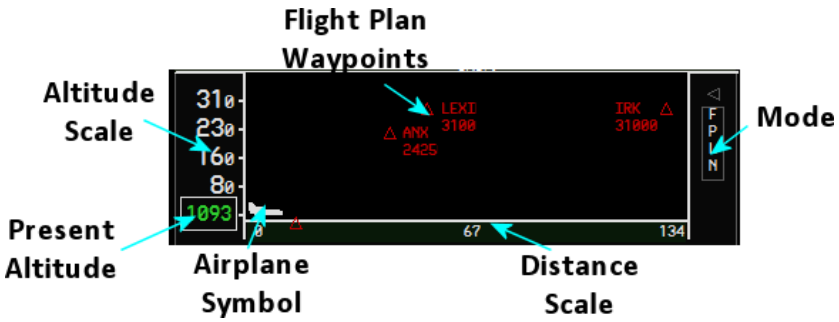


Figure 20 VERTICAL SITUATION DISPLAY

Objects Displayed

AIRPLANE SYMBOL

The airplane symbol is allowed to move its position vertically and horizontally on the VSD.
The airplane symbol vertical position in the VSD window is computed according to the airplane barometric altitude. A framed label with green text on a black background showing the A/C barometric altitude in feet is displayed at the A/C symbol height on the Y-axis scale.

The airplane symbol horizontal position in the VSD window is computed according to INAV modes. The airplane symbol is horizontal, constant in size and always oriented to the right. The default color of the airplane symbol is white.

DISTANCE SCALE

The distance of the profile in nautical miles, from the present aircraft position.

FLIGHT PLAN WAYPOINTS

Flight plan items (Waypoints, Legs) are displayed in at their relative flight plan altitudes.

MODE

FPLN and Track (TRK) modes are available. Track mode adds a reference line indicating flight plan cruising altitude.

Figure 21 VSD TRACK MODE

FLIGHT PLAN DISPLAY

The Flight Plan Display Window is on the right 1/3 of the MDU 1 screen.

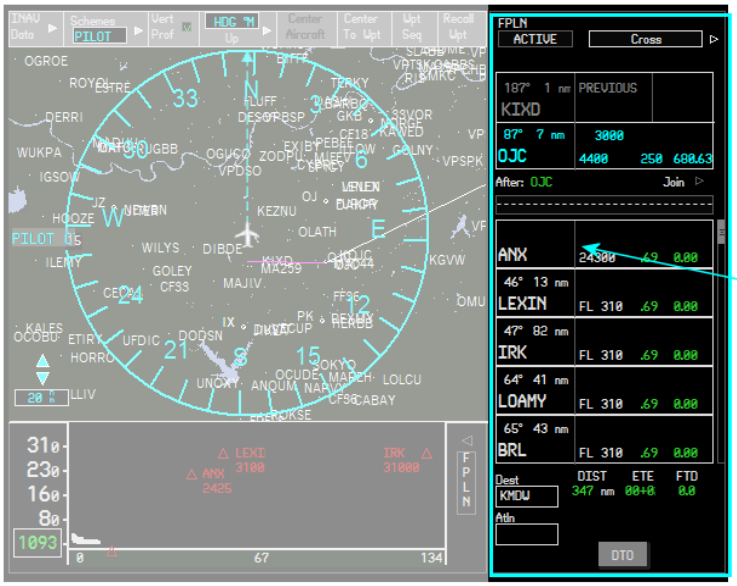


Figure 22 FLIGHT PLAN DISPLAY WINDOW

Mode and Status Display

The mode and status displays are at the top of the Flight Plan Window.

Figure 23 FLT PLN WINDOW MODE AND STATUS

STATUS DISPLAY

Will show ACTIVE when a flight plan is loaded.

MODE DISPLAY SELECTOR

Selects the mode format of the flight planning window. There are six data and display modes.

1. Cross – (Crossing Constraint)
2. Departure
3. Arrival
4. Show Information
5. Amend
6. Search

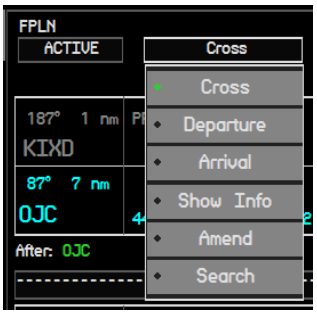


Figure 24 FLT PLAN WINDOW MODE SELECTOR

In all display modes, the flight plan section shows the flight plan data for distance, ETE and fuel to destination. The Flight Plan Data Display is on the bottom of the Flight Plan Display.

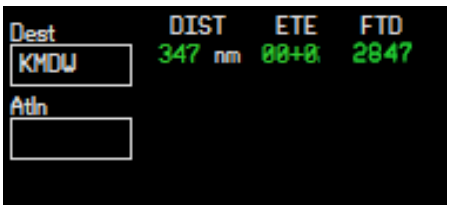


Figure 25 FLT PLN DATA DISPLAY

Cross Constraint Mode

Displays a crossing constraint on each waypoint: altitude (A/B), speed (IAS, Mach), estimated time enroute (ETE) and waypoint type. The display shows the next waypoint at top, colored in cyan. A scrollable display underneath shows the next following 5 waypoints.

This window mode supplements INAV by equivalent text-based flight planning operations and concise view of the active and pending flight plan. All the INAV graphical flight planning modifications can also be done on Waypoint list using the same object-task method and the same dialog box.

The flight plan can be changed to Direct-To/Divert-To any waypoint on the list by mouse clicking on the waypoint and pressing the DTO button.

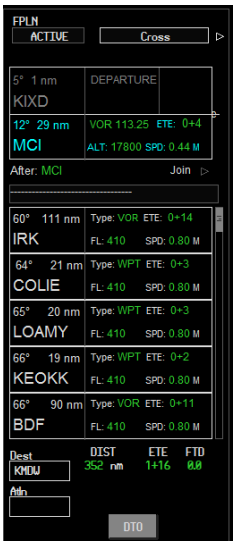


Figure 26 FLT PLN CROSS MODE

Waypoint Data

Information on each waypoint in the flight plan is available in the scrollable *Waypoint Data Display*.

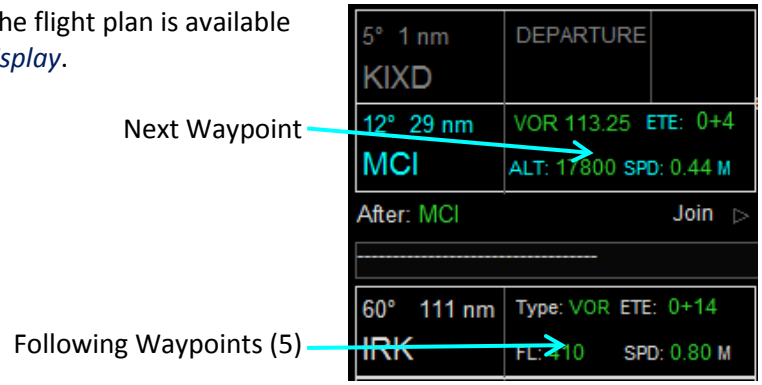
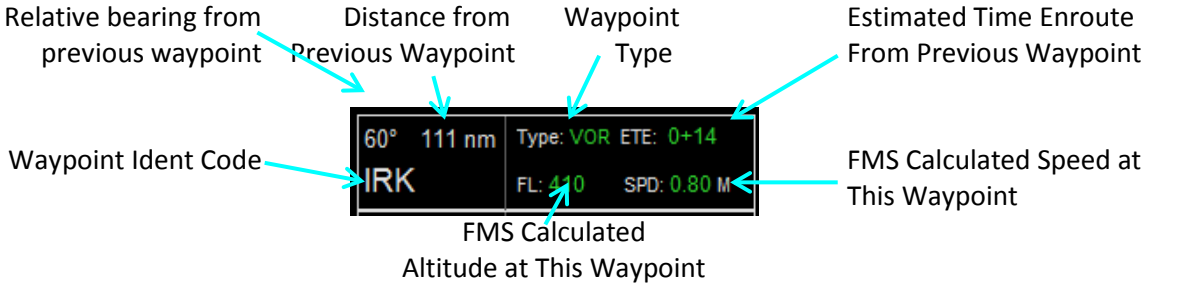
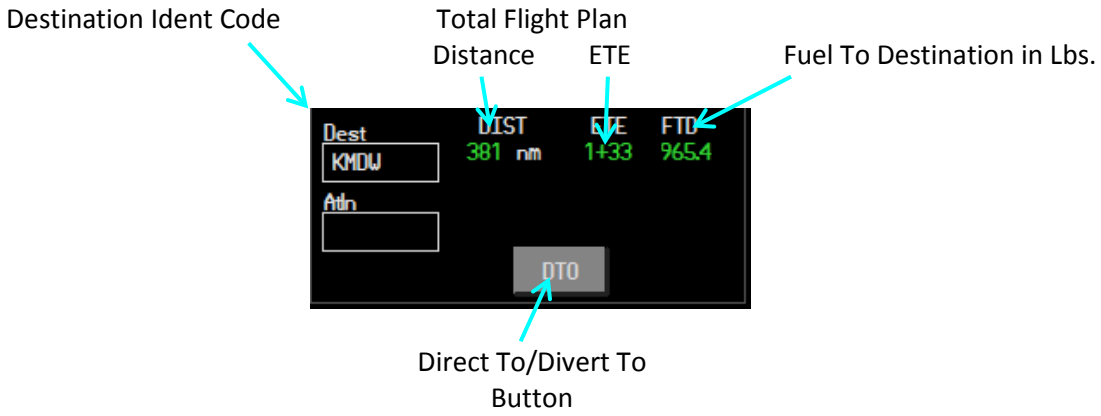


Figure 27 – WAYPOINT DATA WINDOW





Departure Mode

Displays all Standard Instrument Departure (SID) waypoints, along with the following waypoint data.

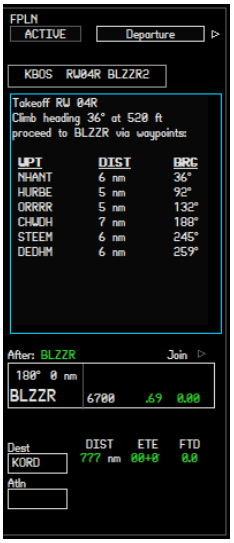
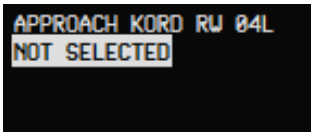


Figure 28 FLT PLN DEPARTURE MODE

Approach Mode

Shows all Standard Terminal Approach (STAR), and final approach waypoints when selected.

The status of the final approach waypoints is also displayed.



See Selecting Final Approach on Page 44 for more details on selecting final approach transition waypoints.

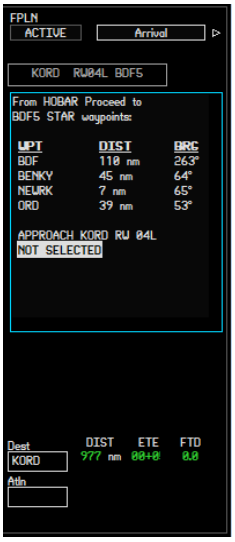


Figure 29 FLT PLAN APPROACH MODE

Amend Mode

The Amend Mode allows you to add or delete waypoints in a loaded flight plan.

The flight plan waypoint list is displayed at the top, with a scroll bar to the right. Use the scroll bar to move up and down the list. The present selection is highlighted in green.

Use the ADD or DEL buttons to make changes to the flight plan.

See the handbook Falcon *Avionics Quick Start.pdf*, pages 14 – 17 on more details on adding or deleting waypoints. The handbook can be found in the same folder as this document.

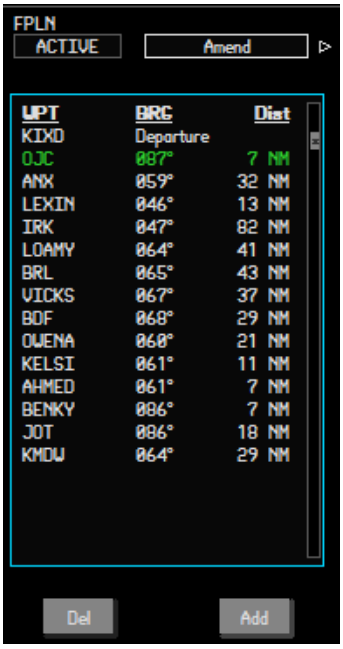


Figure 30 AMEND WAYPOINT MODE

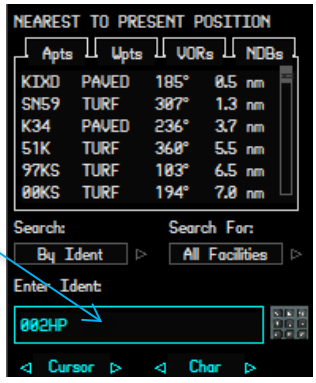
Search Mode

The Search Mode Page is a powerful interface that allows you to search for facilities (waypoints, airports, navigation beacons). You can search the entire database in *Search Facilities Mode*, or by the nearest facilities in *NRST Mode*.

See the handbook *Falcon Avionics Quick Start.pdf* for information on using the search functions to add waypoints or Direct To/Divert To flight plans.

In Search Facilities Mode, the *Search Ident Cursor Box* is highlighted in CYAN. The NRST Facility Box is not.

The cursor/character controls are also highlighted in CYAN.



If you want to search by all facilities, just mouse click within the Cursor Box, or on any of the cursor/character controls. The mode will change to *Search Facilities Mode*.

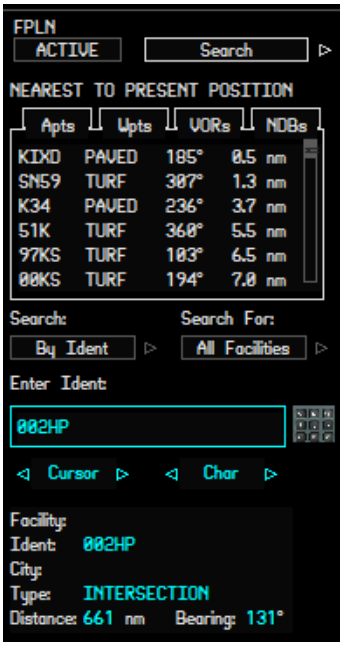


Figure 31 FLT PLN SEARCH MODE

To change to *NRST Mode*, just click anywhere within the *Nearest To Present Position* box.

Mouse click the tabs for the four facility types:

1. Apts – Airports
2. Wpts – Waypoints/Intersections
3. Vors – VOR beacons
4. Ndbs – NDB Beacons

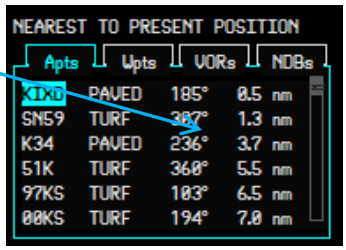


Figure 32 NRST SEARCH MENUS

In the case of NDB and VOR facilities, their respective frequency will be highlighted on the menu. The prompt for the ENT button at the bottom of the Flight Plan Display menu will blink. If pressed the frequency will be set as the active frequency on the respective radio.

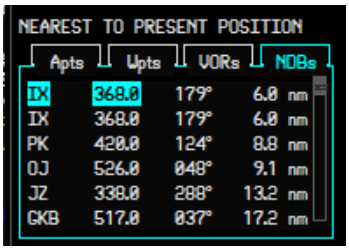


Figure 33 ENTER HIGHLIGHTED FREQUENCY

In Search Facilities Mode, you can elect to search by facility name, or by IDENT code.

The search can also be filtered by facility type as well.

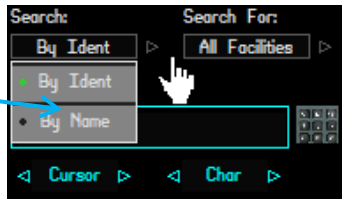


Figure 34 FACILITY SEARCH PARAMETER MENU

Filter by:

1. All facilities
2. Airports
3. Waypoints/Intersections
4. NDB beacons
5. VOR Beacons

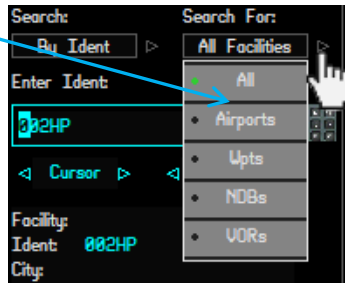
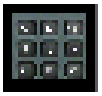


Figure 35 FACILITY SEARCH FILTER

The cursor control will move the highlighted cursor left and right. The Char (Character) control will scroll through the alphanumeric characters 0 – 9 and then A – Z.

The *Keyboard Icon* next to the facility search cursor box, when pressed, will open the MultiFunction Keyboard in a separate popup window.



Search name or IDENT alphanumeric values can be entered directly using the MKB by simply pressing the letters or numbers in sequence.

Figure 36 MULTIFUNCTION KEYBOARD

This space left intentionally blank

MDU 2

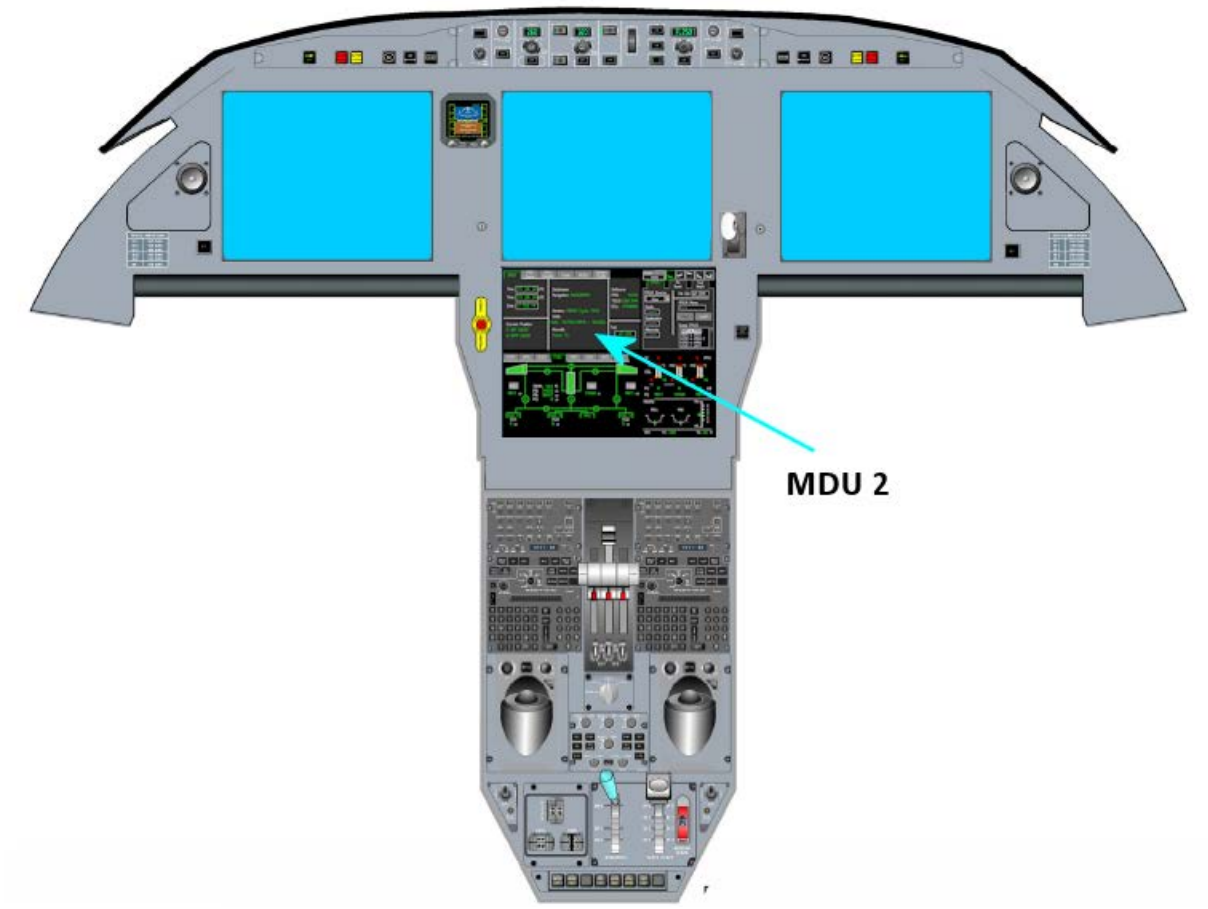


Figure 37 MDU 2 IN FLIGHT DECK

MDU 2 consists of 4 separate windows:

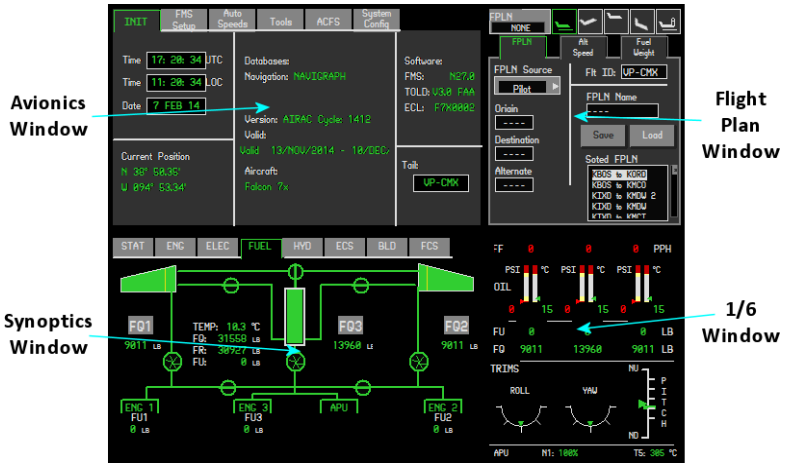


Figure 38 MDU 2 DISPLAY WINDOWS

AVIONICS WINDOW

The Avionics Window consists of six pages of data and settings for:

1. Avionics Initialization
2. FMS Setup
3. Auto Speeds (Autothrottle)
4. Tools
5. Automatic Flight Control System (ACFS)
6. System Confirguration

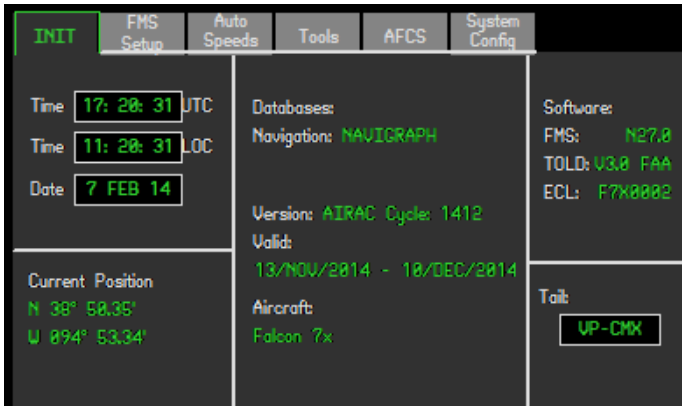


Figure 39 MDU 2 AVIONICS WINDOW

Initialization

See Figure 39 above. The INIT tab provides data relevant to the airplane, FMS software, and database configuration and validity.

The INIT tab also provides the "Current Position" of the master FMS. This position is initialized when the system is powered up..

FMS Setup

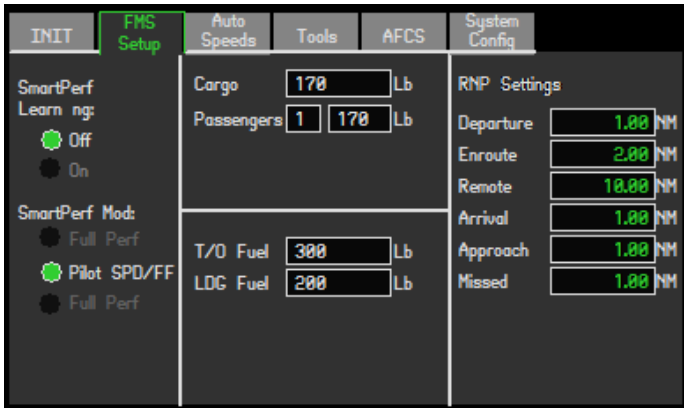


Figure 40 AVIONICS WINDOW FMS SETUP PAGE

The FMS Setup tab allows selection of:

- The type of data and algorithm that will be used by the FMS for performance calculation,
- The type of media used for flight summary data output,
- The estimated Fuel quantity allowances on the ground and to be used by the FMS,
- The RNP (Required Navigation Performance) Settings

SmartPerf Learning shall be set to OFF and *SmartPerf Mode* defaults to **Full Perf**. These are the normal flight selections.

RNP Settings are already filled in, based on certification values. Usually, nothing needs to be changed here. Leave the default settings.

Auto Speeds

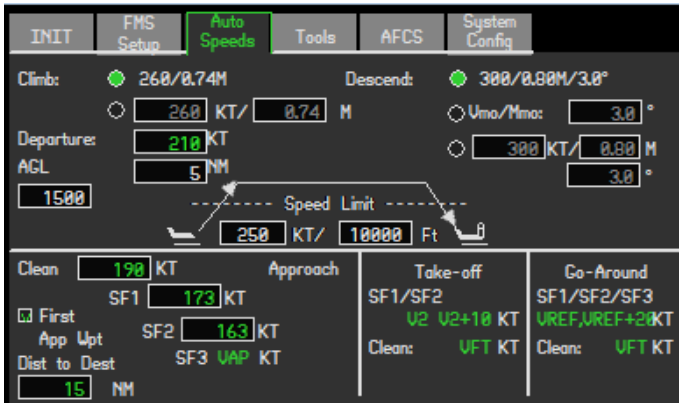


Figure 41 AVIONICS WINDOW AUTO SPEEDS PAGE

This page controls how the Autothrottle will operate while under control of the FMS. This does not apply to manual control of the Autothrottle function on the Guidance Panel.

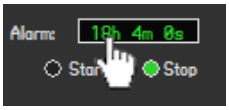
A detailed description and instructions on use can be found in the AUTOTHROTTLE (AT) CONTROL section of the handbook *Falcon Avionics Quick Start.pdf*, which is located in the same folder as this document.

Tools

Figure 42 AVIONICS WINDOW TOOLS PAGE

The Tools tab provides three time functions:

- **Timer and Alarm** displays current UTC in green (non-modifiable). Time is derived from airplane time.
- **Timer** is used to set a time lapse which counts down to zero. The format is XXh YYm ZZs. The default state is inactive with white dashes displayed. When the timer reaches zero, an aural tone sounds and a UTC label flashes in the HSI until the timer is stopped. Selecting the Start radio button starts the timer. Selecting stop suspends it.
- **Alarm** is used to set a reminder alarm to sound at an upcoming UTC. The format of this field is XX:YY. The default state is inactive with white dashes displayed. When current UTC time equals entered alarm time, an aural tone sounds and a UTC label flashes in the HSI until the alarm is turned off. Selecting the On radio button turns the alarm on. Selecting Off deactivates it.



Time settings are by mouse control.

The aural timer and alarm tones may be silenced by pressing the 

pushbutton.

AFCS Tab

Figure 43 AVIONICS WINDOW AFCS TAB

The FMS and Automatic Flight Control System page displays the Command Side and yaw damper settings.

Open the AFCS tab on MDU 2 to access this option. When checked the **Yaw Damper** will be active. Select **LNAV Yaw Damper** if you also want the Yaw Damper active in LNAV mode.

System Configuration Tab

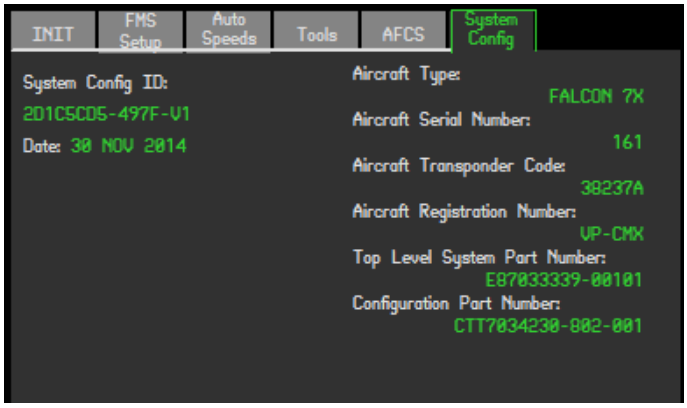


Figure 44 AVIONICS WINDOW SYSTEM CONFIGURATION TAB

The **System Config** tab displays configuration information for all installed software/databases and is used for return to service type operations.

FLIGHT PLAN PAGES

The *Flight Plan Pages* consist of page tabs, representing five phases of flight, selected by mouse.

Figure 45 MDU 2 FLIGHT PLAN PAGE SELECTION

1. Ground/Flight Plan Selection
2. Departure
3. Cruise
4. Descent/Approach
5. After Landing

Flight Plan Selection

Saved flight plans can be loaded using the Load button.

The saved flight plans are listed in the display box, listed by departure IDENT and destination IDENT. Scroll down the list by mouse control on the right hand scrollbar.

See the Loading a Flight Plan section of the handbook *Falcon Avionics Quick Start.pdf* for more details on loading flight plans.

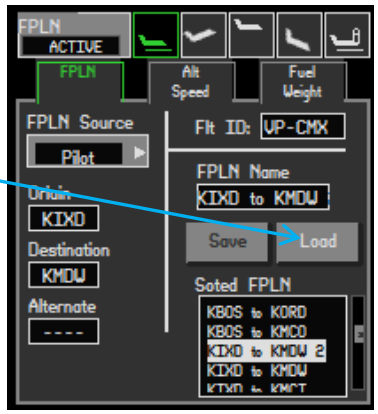


Figure 46 MDU 2 FLIGHT PLAN SELECTION TAB

Departure

The *Departure Page* Consists of three tabs:

1. SID
2. Takeoff Config
3. Takeoff Data

Standard Instrument Departures (SID) can be loaded from the *SID Tab* by pressing the *Runway/Sid Button*. See *Loading A Standard Instrument Departure* in the handbook *Falcon Avionics Quick Start.pdf* for more details on loading SIDs. The sections *Takeoff Configuration* and *Takeoff Data* describe these menu tabs in detail.

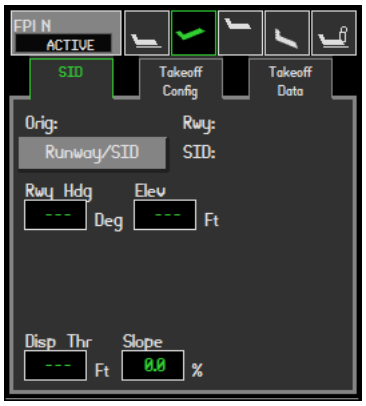


Figure 47 FLIGHT PLAN DEPARTURE PAGE

Cruise

Spd (airspeed), **Crz** (cruise altitude), and **Step** (step climb) are based on inputs from preflight unless updated by the crew. Updates are input using the tab. **Ceil** (Ceiling) and (Optimum altitude) are based on a blend of available information.

The FMS uses manual input predictions, current condition measurements to obtain these figures.

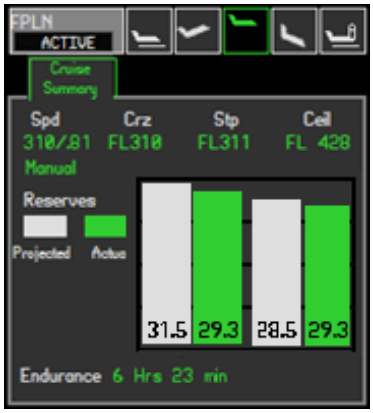


Figure 48 FLT PLN CRUISE TAB

Fuel summary information is displayed digitally and with synthetic bar-graphics to display projected fuel remaining at destination and alternate based on a blend of current mission parameters (speed, cruise altitude, step climbs, atmospheric conditions), current airplane weight and predicted mission conditions (for remainder of flight).

There are two pairs of fuel bar-graphs: the left pair represents destination fuel, the right pair represents alternate fuel. The green bars represent current fuel estimates during flight (labeled “Actual”).

Approach

The *Approach Page* provides an interface for selection of arrival and approach, Landing Configuration, and Landing Data. These are presented in 3 Tabs:

1. Star Route
2. Runway App
3. Landing Config

Figure 49 FLT PLN APPROACH PAGE

SELECTING STAR APPROACH

More detailed information and procedures are available in the *Loading a Standard Arrival Route (STAR)* section of the handbook *Falcon Avionics Quick Start.pdf*.

SELECTING FINAL APPROACH

More detailed information and procedures are available in the *Loading a Runway Approach* section of the handbook *Falcon Avionics Quick Start.pdf*.

LANDING CONFIGURATION

More detailed information and procedures are available in the *Loading a Runway Approach* section of the handbook *Falcon Avionics Quick Start.pdf*.

Post-Flight

The Post-flight POF provides a flight summary. All associated data for display is provided by the FMS and is based on the values recorded and computed for the Active flight plan.

If a particular data item is not available for display, then its associated display will show 
.

Table 1 FLT PLAN POST-FLIGHT PAGE

Avg TAS - displays average airspeed based on flight time and air distance.
Air Dist - displays total Air Distance for the flight. During flight.
Avg GS - displays Average Ground Speed.
Gnd Dist - displays total Ground Distance for the flight.
Taxi Time - displays time recorded from original parking brake release after system powerup.
T/O Time - displays Take-Off time (Zulu).
Ldg Time - displays Landing Time (Zulu).
Apron Time - displays time recorded when the parking brake was set after flight.
Flight Time - is elapsed time in-flight measured once is aircraft is airborne.
Block Time – is overall duration between *Taxi Time* and *Apron Time*.

SYNOPTIC PAGES

The SYNOPTICS window provides a clear and concise illustrated view of the status for each airplane system synoptic. The system is represented graphically with most elements that can be controlled by the crew, and uses a consistent color code to provide an instantaneous awareness of the system status.

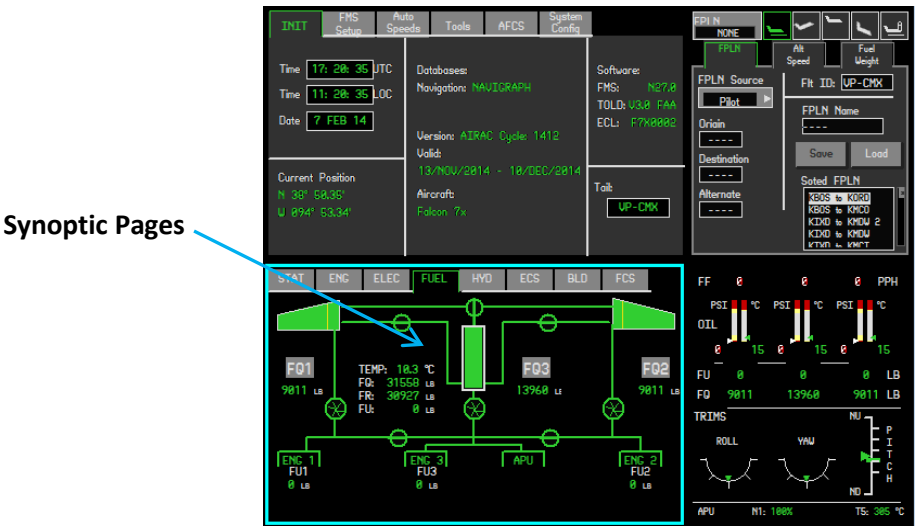


Figure 50 SYNOPTIC PAGES

There are six Synoptic Pages:

1. **STAT** - Status of the airplane
2. **FMS Setup** – Data and algorithms used by the Flight Management System
3. **Auto Speeds** – Autothrottle settings and controls
4. **Tools** – Alarm and timer functions
5. **AFCS** – Automatic Flight Control settings
6. **System Config** – Configuration information on system software

General

Indication of an active system or an inactive or dormant system is indicated by a green display (active) or a white display (inactive).

Faults or failures are indicated by a **RED X**. Overvalue or parameter exceedances are displayed in **RED**.

STAT Page

The **STAT** page of the system window represents the status of the airplane, by displaying current limitations associated with the failures displayed in the CAS.

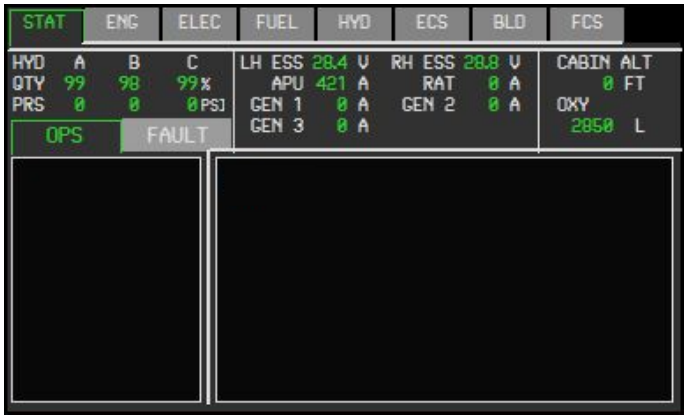


Figure 51 STAT SYNOPTICS PAGE

The STAT tab is designed to provide the complete and concise status of the airplane systems in a single format.

ENG Page

Engine N1, N2, Oil Pressure and Oil Temperature are displayed. Engine Deice status is also displayed. APU Engine parameters are also displayed at the top right hand corner of the ENG Synoptic.

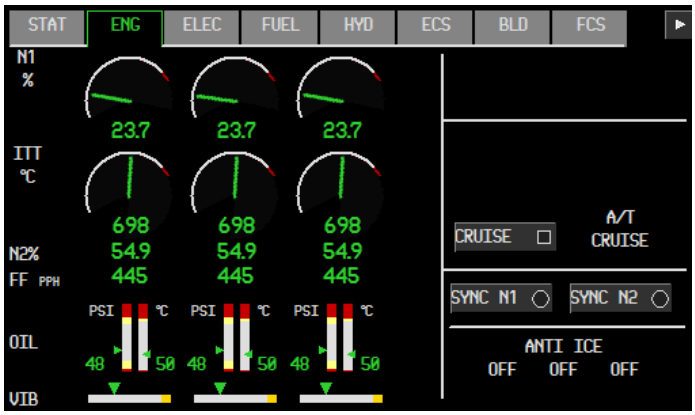


Figure 52 ENG SYNOPTICS Page

The N1 or N2 synchronization will run all engines at the same N1 or N2 actual speed, thus eliminating uncomfortable low frequency tones.

Clicking one of the two soft keys SYN N1 or SYN N2 selects either the N1 or N2 synchronization mode. Engine 2 is the master.

The N1 synchronization should be used in cruise for maximum efficiency with or without A/T and the N2 synchronization should be used in descent with low power setting.

Cruise mode is sets the Autothrottle upper thrust limit to MAX CRUISE rather than MAX CLIMB.
In this sub-mode, the engine power is set to a given thrust up to the MAX CRUISE setting provided by the FADEC, and the Flight Path Angle is modified to reach the target SPEED.

ELEC Page

The ELEC synoptic page displays APU, generator, battery and Ram Air Turbine (RAM) status and ammeter measurement. For more complete details of the electrical systems we recommend you review the handbook *Electrical Systems.pdf*.

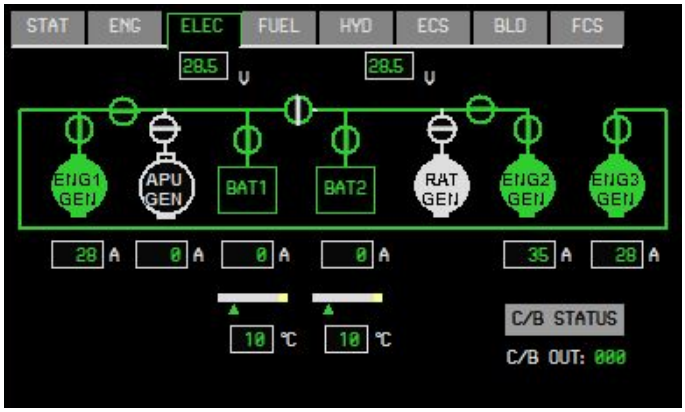


Figure 53 ELECTRICAL SYNOPTICS PAGE

FUEL Page

The Fuel Synoptics Page provides a summary of fuel quantity, status, and booster pump status in one easy to interpret graphic display. See the *Fuel System* section in the handbook *Systems Quick Start.pdf* for more details on the fuel system and this synoptics page.

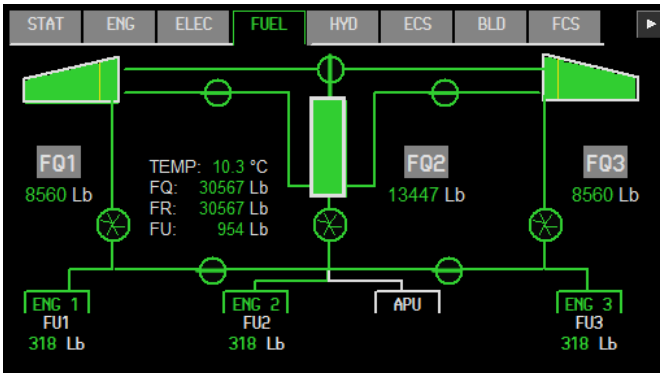


Figure 54 FUEL SYNOPTICS PAGE

HYD Page

The Hydraulic (HYD) synoptic page displays the three hydraulic systems and the distribution of users between the systems, in an easy to interpret graphic display. See the *Hydraulic System* section in the handbook *Systems Quick Start.pdf* for more details on the fuel system and this synoptics page.

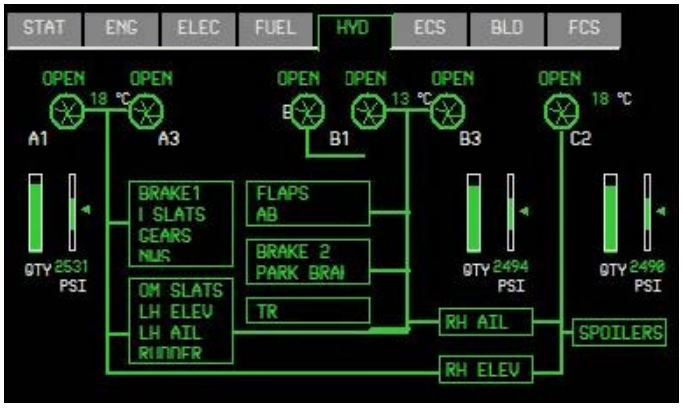


Figure 55 HYD SYNOPTICS PAGE

ECS Page

The Environmental Control System (ECS) page is a graphical representation of the entire ECS system:

- Pressurization
- Oxygen
- Heat/Air Conditioning

For more information on the ECS system see the handbook *ECS and Pressurization.pdf* for more information on the ECS and indications.

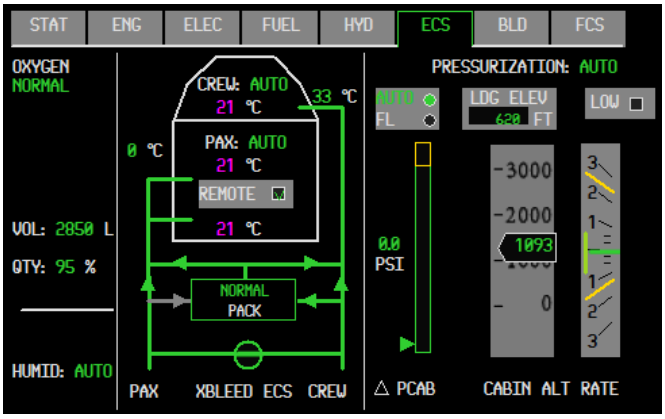


Figure 56 ECS SYNOPTICS PAGE

BLD Page

The *Bleed Air Page* (BLD) is a graphical representation of the *Bleed Air System*. See the *Bleed Air System* section in the handbook *Systems Quick Start.pdf* for more details on the Bleed system and this synoptics page.

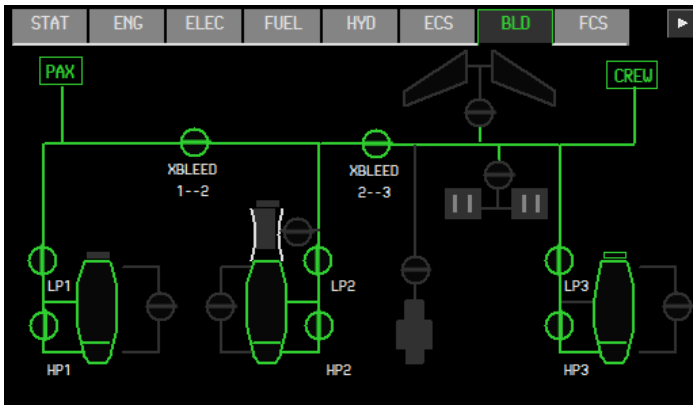


Figure 57 BLD SYNOPTICS PAGE

FCS 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.

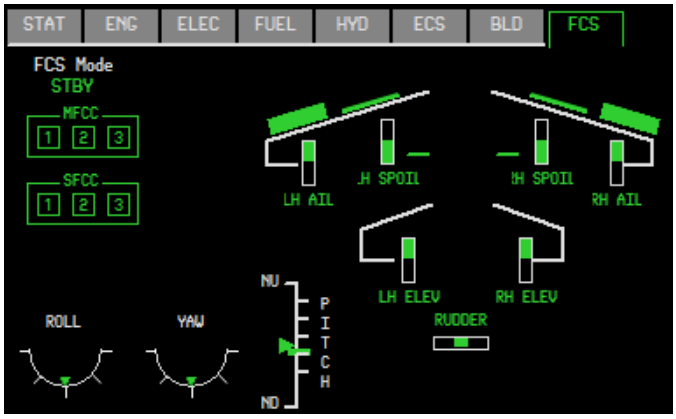
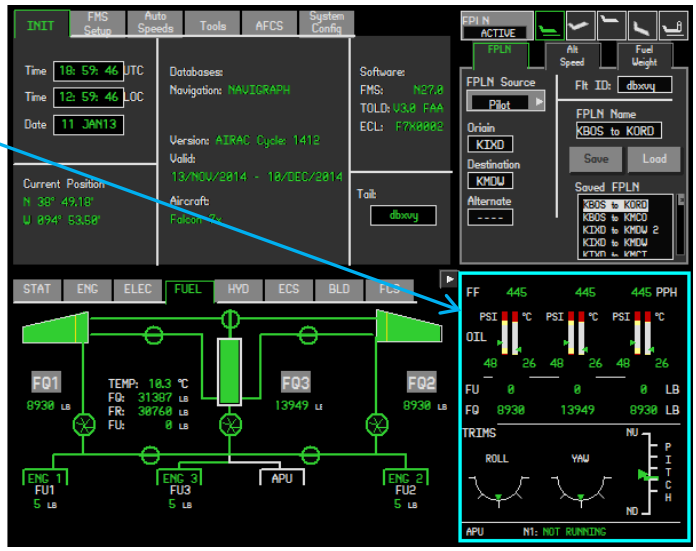


Figure 58 FCS SYNOPTIC PAGE

1/6 WINDOW

The *1/6 Window* can display different FMS components.

These components can be selected via the drop-down menu in the upper left hand corner of the display area.



Window Modes

There are three *Window Modes*:

- Eng/Trim – Engine instruments and trim display
- Checklists – Electronic Checklist display
- TCAS – Traffic display

ENG/TRIM

Identical to PDU Eng/Trim display. See Figure 13.

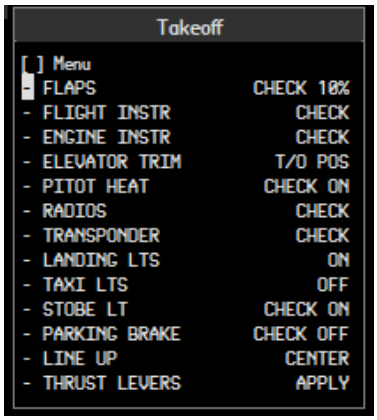
TCAS

Identical to PDU Traffic Display. See Figure 16.

CHECKLISTS

There are 11 checklists available, listed on the *Checklist Menu*.

Each checklist can be scrolled by mouse on the left hand side.
A return link to the main menu is at the top of each list.



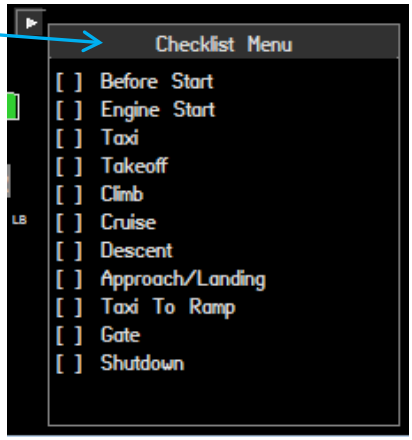


Figure 59 ELECTRONIC CHECLIST MENU

Table of Figures

Falcon 7X

ECS & Pressurization

wilco PUBLISHING

DASSAULT AVIATION

Contents

Introduction

In order to maintain a comfortable area inside the cabin and the cockpit, the Falcon 7X is equipped with an air conditioning system and a pressurization system.
Air conditioning and pressurization system is split into the following sub-chapters:

- Air Conditioning,
- Pressurization.

Acronyms

A/C	Airplane Control
ACM	Air Cycle Machine
AMM	Air Management Module
AMSAC	Air Management System Automatic Controller
AMSEC	Air Management System Emergency Controller
CB	Circuit Breakers
DU	Display Unit
EMM	Emergency Management Module
FBW	Fly By Wire
NPRV	Negative Pressure Relief Valve
OP	Overhead Panel
PDU	Primary Display Unit
PPDB	Primary Power Distribution Box
PPRV	Positive Pressure Relief Valve
PSU	Passenger Supply Unit
SPDB	Secondary Power Distribution Box
SSPC	Solid State Power Controllers
TBPV	Turbine Bypass Valve
WAI	Wing Anti-Icing

Flight Deck

Controls

The controls for the air conditioning system are:
Primarily via the AIR CONDITIONING section of the Overhead Panel

- Via the BAG FAN pushbutton on the Emergency Panel to manually activate the fan located in the baggage compartment
- Via an ECS soft key on the TEST synoptic page to trigger pre-flight testing of the ECS,
- Via a HUMID pushbutton located on the RH console to activate the humidifier (optional).

Additionally, a manual cabin/crew isolation valve handle is used for interconnecting the passenger and crew air supplies.

Indications

The air-conditioning indications are located on:

- The ECS synoptic page,
- The ENG-CAS window for CAS messages,
- The STATus synoptic / FAULT tab for fault messages.

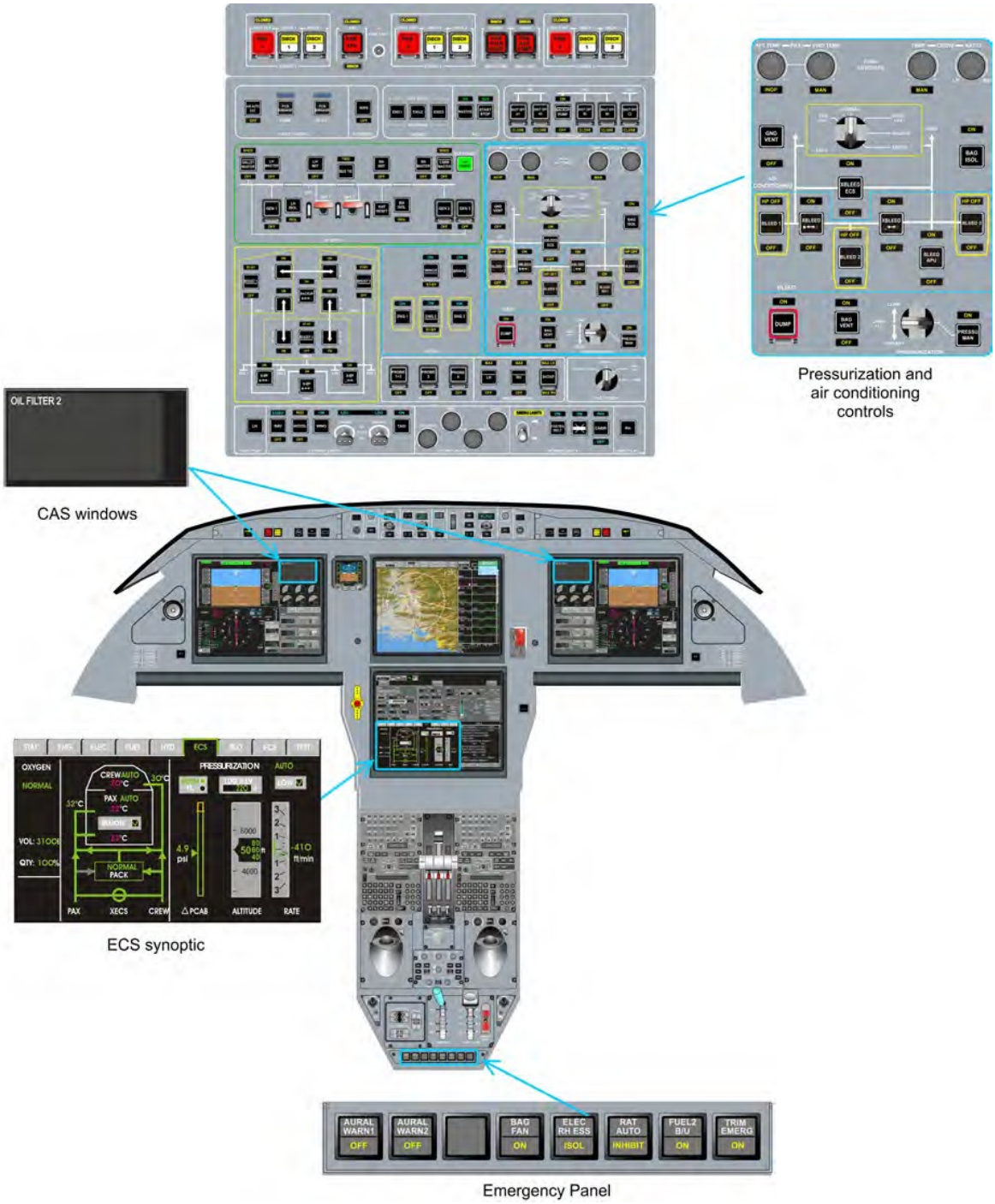


Figure 1 FLIGHT DECK OVERVIEW

General

Hot bleed air from the engines (or APU) is cooled

In normal operation:

- By the main pack,
- Managed by the Air Management System Automatic Controller (AMSAC),

In the event of partial or total failure of the main pack, or AMSAC:

- By the emergency pack,
- Managed by the Air Management System Emergency Controller (AMSEC).

Conditioned air resulting from mixing cold and hot air is then distributed through 2 separate lines for the passenger and crew supplies.

In addition, for equipment cooling purposes, cold air is distributed directly to:

- Gaspers and panel instrument (DU, forward FBW racks),
- Rear FBW racks.

Operating Principle

Sources

The air conditioning system uses the hot bleed air sources available on the common bleed air manifold:

- On the ground: APU or engine bleed air (if both are available, APU bleed air takes
- precedence) or ground cart,
- In flight without Wing Anti-Ice (WAI): engine 1 and 3 bleed air,
- In flight with WAI: all engines bleed air.

The hot bleed air initially goes through the ozone converters, in order to reduce the ozone concentration, and is partly routed:

- In normal ECS operation, to a main pack,
- In emergency ECS operation, to an emergency pack.

Generation

The hot bleed air is cooled by the main pack or emergency pack depending on the ECS operating mode.

MODES

The ECS can operate in 5 modes: NORMAL, PAX OFF, CREW OFF, BACKUP and EMERG modes:

- NORMAL - In NORMAL mode the hot air is cooled by the main pack.
- PAX OFF and CREW OFF - In PAX OFF, CREW OFF modes, the hot air is cooled by the main pack (as in NORMAL mode).
- PAX OFF and CREW OFF are used if there is a supply failure, with no impact on distribution through use of the manual cabin/crew isolation valve. Crew or PAX supply lines are isolated by closing the corresponding cold / hot valves.
- BACKUP - In BACKUP mode, the hot air is cooled by the emergency pack. Emergency pack control is performed by the AMSEC, the rest of the system is managed by the AMSAC.
- EMERG - In EMERG mode, the hot air is cooled by the emergency pack only. The system is managed by the AMSEC.

Air Conditioning

Design Principles

The air conditioning system was designed on the basis of the following design principles:

AIR SUPPLIES

There are 2 independent hot air supplies routed through 2 different zones of the airplane, and 2 independent cold air sources (1 main pack and 1 emergency pack situated in different A/C locations). This segregation ensures that there is always a cold and a hot air supply in the event of a main engine rotor burst or multiple failures.

AIR CONDITIONING REGULATION

- There are 2 separate controllers, AMSAC and AMSEC (situated in different airplane locations) to provide either full automatic regulation of cockpit/cabin temperature or manual positioning of the cockpit/cabin valves.
- Absence of air conditioning during take-off allows maximum engine thrust,
- A recirculation jet pump is used below 14,000 ft to provide optimized cooling capability.

TEMPERATURE REGULATION

In NORMAL (or PAX OFF, CREW OFF and BACKUP) ECS operation, the AMSAC:

- Directly manages the cabin and cockpit target temperatures (if the temperature selectors are in AUTO mode) by varying the amount of hot air through the cabin and cockpit “hot” air valves (also referred to as “trim” valves).
- Ensures that the conditioned airflow is mainly directed to the cabin (60/40 ratio) by means of the cockpit cold valve.
- Manages the cabin cold air valve to maintain a constant gasper pressure.

In EMERG mode, the AMSEC only manages the cabin hot valve position.

HOT AIR GENERATION

The cabin and cockpit hot air supply lines and controls are segregated to ensure that both supplies are not lost in the case of an engine rotor burst.

The cockpit hot air valve is used to regulate the cockpit temperature.

The cabin hot air valve is used to regulate the cabin temperature.

In addition, the cockpit hot air limiting valve enables hot air to be mixed with cooler air exhausted from the primary heat exchanger. The aim is to regulate the cockpit hot air temperature to 200°C on APU bleed only. If the cockpit hot air temperature exceeds 200°C, the AMSAC drives the cockpit hot air valve closed and a CAS message is generated.

COLD AIR GENERATION

Hot air is ducted to the primary heat exchanger where it is cooled by heat transfer to cooler ambient air. The air then passes through the cold flow regulation valve and into the compressor portion of the Air Cycle Machine (ACM). After compression, the air enters the secondary heat exchanger where it is cooled by heat transfer to ambient coolant air.

On the ground and during low altitude flight, the ACM fan induces the airflow used to cool the bleed air in the heat exchangers.

In flight, the cabin air jet pump accelerates the external air (the static air inlet is located behind engine 3 pylon leading edge). The induced airflow is the main source for cooling the heat exchangers and the ACM fan only assists the cabin air jet pump. The cabin air jet pump uses the air evacuated through the baggage outflow valve.

EMERGENCY ECS PACK

In the case of a main pack failure, the emergency pack is used to generate cold air after selection of ECS BACKUP or EMERG modes by the crew.

Hot air is supplied to the emergency heat exchanger via the emergency bleed line. The emergency cold air valve is open and the XBLEED ECS is closed by the AMSEC.

The pneumatic emergency cold air valve acts as a basic flow regulation device by regulating differential pressure across the emergency supply flow and the emergency pack.

Operating Modes

The air conditioning system has 5 operating modes, which ensure air supply in normal and abnormal conditions, and can be seen as 3 main modes with 2 sub-modes:

- NORMAL mode with the CREW OFF and PAX OFF sub-modes. These modes are driven by the AMSAC, with multiple system protections. In this mode, cold air is supplied by the main pack.
- BACKUP mode. This mode is driven by the AMSAC, and is a degraded mode but with the same system protections. In this mode, the cold air is supplied by the emergency pack (the ACM, secondary exchanger and condenser-reheater-water separator of the main pack are bypassed but the primary exchanger is still operating) and comfort can be degraded at low altitude.
- EMERG mode. This mode is driven by the AMSEC. It is a highly degraded mode with only a few parameters monitored. In this mode, the cold air is supplied by the emergency pack.

On the ground, pre-flight testing of the ECS system is required. Its aim is to check the correct operation of the emergency pack.

The EMERG mode is selected in the case of total loss of control of the air conditioning system by the AMSAC.
The AMSEC:

- Closes the engine HP bleed valves and the MP 3 bleed valve,
- Closes the XBLEED 2↔3,
- Opens the XBLEED 1↔2,
- Closes the ECS Crossfeed Valve (XBLEED ECS),
- Opens the emergency cold air valve.

In this case, hot bleed air (LP) is supplied by engines 1 and 2 only. The cold air is supplied by the emergency pack only.

Conditioned air is supplied by the cabin distribution system. The lounge valves are driven fully open by the AMSEC, and the cockpit cold air valve is driven fully closed.

The crew members must open the cabin/crew isolation valve and must manually set the required temperature using the cabin manual control. The LH / RH pilot flow ratio valve remains in its last position.

Controls

The crew has control over the air conditioning system through - The AIR CONDITIONING part of the Overhead Panel (OP).

Figure 2 AIR CONDITIONING OVERHEAD PANEL

This space left intentionally blank

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	PACK rotary switch: switches between the five ECS control modes. NORMAL: Main pack is used (primary and secondary heat exchanger) PAX OFF or CREW OFF: Main pack is operative. The respective cold and hot valves are closed. BACKUP: The emergency pack is used with AMSAC control. EMERG: The emergency pack is used with AMSEC control.	Normal 	
		PAX OFF 	
		CREW OFF	
		BACKUP 	
		EMERG 	

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
	Automatic mode: the AFT TEMP rotary knob, and the FWD TEMP rotary pushbutton are used to set cabin target temperature (between 12°C and 32°C). Push on the FWD TEMP rotary pushbutton to select pax automatic / MAN mode. MAN mode: The crew manages the corresponding hot valve position. **NOTE** In MAN mode: - MAN is displayed under the PAX FWD TEMP rotary knob, - INOP is displayed under the PAX AFT TEMP rotary knob which is disabled.	Automatic mode 	PAX Auto 
		MAN mode 	PAX Manual 

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
	Automatic mode: the CREW TEMP rotary pushbutton is used to set cockpit target temperature (between 12°C and 32°C). CREW RATIO rotary knob allows the crew members to modulate the proportions of hot air supplied to the cockpit floor right-hand and left-hand sides when the PACK mode selector is in the NORMAL, PAX OFF, or BACKUP positions. Push on the TEMP rotary pushbutton to select crew automatic / MAN mode. MAN mode: The crew manages the corresponding hot valve position.	Automatic mode 	CREW Auto 
		MAN mode 	CREW Manual 

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	BAG ISOL pushbutton: when pressed (amber ON lighted) closes the baggage isolation valves and the baggage outflow valve (BAG VENT).	Unlighted (valves opened) 	No synoptic
		ON (valves closed) 	No synoptic
	GND VENT pushbutton: when pressed (amber OFF lighted) closes the ground outflow valve and recirculation valve	Unlighted (valves opened) 	No synoptic
		OFF (valves closed) 	No synoptic
	XBLEED ECS pushbutton: when pressed, cycles through - Unlighted auto (normal) position, - ON: opens the XBLEED ECS valve, - OFF: closes the XBLEED ECS valve.	Unlighted auto 	
		OFF 	
		ON 	

Indications

The ECS synoptic page displays operating modes, system status, cockpit and cabin temperatures, and crew and PAX supply duct temperatures.

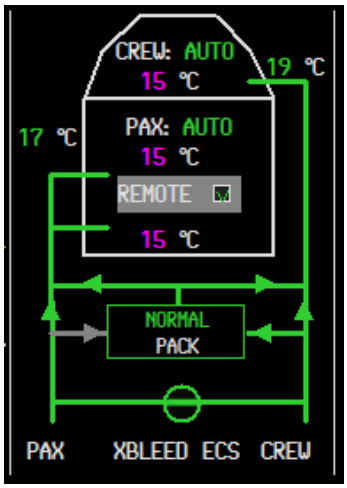


Figure 3 ECS SYNOPTICS PAGE - CONDITIONING SECTION

COCKPIT AND CABIN TEMPERATURES

The cockpit temperature indication is displayed beside the CREW label.

The cabin temperature indication is displayed under the PAX label. Two cabin temperature indications are displayed: forward and aft cabin temperatures.

In AUTO mode, the readouts range from 12 to 32°C and correspond to the desired temperature commanded by the crew members. The temperature readings are displayed in magenta (target value) When the CREW TEMP (or PAX FWD TEMP) rotary pushbutton is in MAN, the corresponding temperature indication is replaced by a percentage, indicating the opening of the cockpit (or cabin) hot air valve (full hot corresponds to an opening of at least 90 %). When the signal is invalid, two amber dashes are displayed in place of the temperature indication.

PACK MODE SELECTOR

The PACK rotary switch located on the overhead panel enables the crew to select one of the five following modes: NORMAL, BACKUP, CREW OFF, PAX OFF and EMERG.
The table summarizes the operational status in all modes.

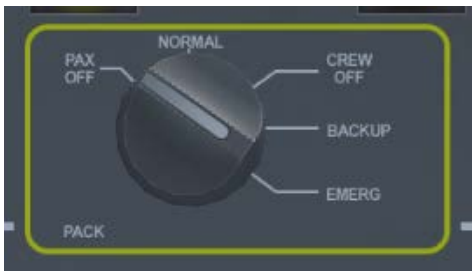


Figure 4 PAX Mode Selector

MODES	CONTROL AND MONITORING	SYSTEM IMPACT	ECS FUNCTIONS LOST
NORMAL	AMSAC	None	None
PAX OFF & CREW OFF	AMSAC	PAX and CREW supplies are to be manually interconnected	None
BACKUP	AMSAC	Main pack isolated	Main pack cooling Rear FBW cooling Recirculation below 14,000 ft
EMERGency	AMSEC	Main pack is isolated (Bleed 3 isolated and XECS open) Emergency Heat Exchanger is fed by engine 1 and 2 bleed air PAX and CREW supplies are to be manually interconnected	Main pack cooling Rear FBW cooling Recirculation below 14,000 ft Automatic temperature regulation

XBLEED ECS PUSHBUTTON

The XBLEED ECS pushbutton enables the crew members to manually open or close the ECS cross-feed valve. The AMSAC drives the valve when the ECS mode selector is in the NORMAL, PAX OFF, CREW OFF or BACKUP position. With the XBLEED ECS pushbutton in the AUTO position and the ECS operating correctly, the AMSAC drives the ECS cross-feed valve open. The AMSAC automatically drives the XBLEED ECS valve closed if there is a main pack overheat or a distribution duct overpressure.

When the PACK rotary switch is in the EMERG position, the AMSEC drives the XBLEED ECS valve closed irrespective of pilot command.

With the XBLEED ECS pushbutton in the OFF position, the XBLEED ECS valve is driven to the closed position.

With the XBLEED ECS pushbutton in the ON position, the XBLEED ECS valve is driven to the open position, except in EMERG mode.

GND VENT PUSHBUTTON

The GND VENT pushbutton enables the crew members to close the recirculation valve and the ground ventilation valve manually.

With the GND VENT pushbutton in the normal position (unlit) the recirculation valve is controlled by the AMSAC and closes at 14,000 ft, (except if the PACK rotary switch is in the EMERG position; the valve remains in the last commanded position).

The ground ventilation valve is controlled by the cabin ventilation valve. With the GND VENT pushbutton in the OFF position, the recirculation valve and the GND VENT Valve are driven to the closed position.

CREW RATIO SELECTOR

The CREW RATIO rotary knob enables the crew members to modulate the proportion of hot air supplied to the cockpit floor right-hand and left-hand sides when the PACK rotary switch is in the NORMAL, PAX OFF, or BACKUP positions.

The AMSAC modulates the crew LH / RH distribution valve to the desired position set point; the central position supplies a 50 / 50 flow split and this can be increased to a maximum flow split of 70 / 30 in either direction.

With the PACK rotary switch in the EMERG position, the valve remains in the last commanded position.

Pressurization

The pressurization system adjusts the cabin pressure by regulating the conditioned air discharged outside the cabin, according to:

- Airplane altitude,
- Airplane vertical speed,
- Maximum differential pressure compatible with the airframe.

In the case of failure (overpressure, negative pressure, maximum altitude), protections ensure that altitude and structural limitations are not exceeded.

The pressurization system has an automatic mode and a manual mode, allowing the crew members to control the pressurization valves directly.

The purpose of pressurization is to maintain a level of pressure inside the fuselage that is comfortable for the passengers and the crew, taking account of the structural limits of the airframe, whatever the flying conditions.
The pressurization system also allows control of:

- Nose cone ventilation and pressurization,
- Baggage compartment isolation, ventilation and main pack heat exchanger cooling,
- Underfloor ventilation air evacuation.

Flight Deck Overview

CONTROLS

The controls for pressurization system are:

- Primarily via the PRESSURIZATION section of the overhead panel,
- Via a LOW soft key on the ECS synoptic to reduce the normal cabin altitude rate by approximately 300 ft/min.

INDICATION

Pressurization indications are located:

- On the ECS synoptic,
- At the bottom of the STATus synoptic for the cabin altitude,
- In the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

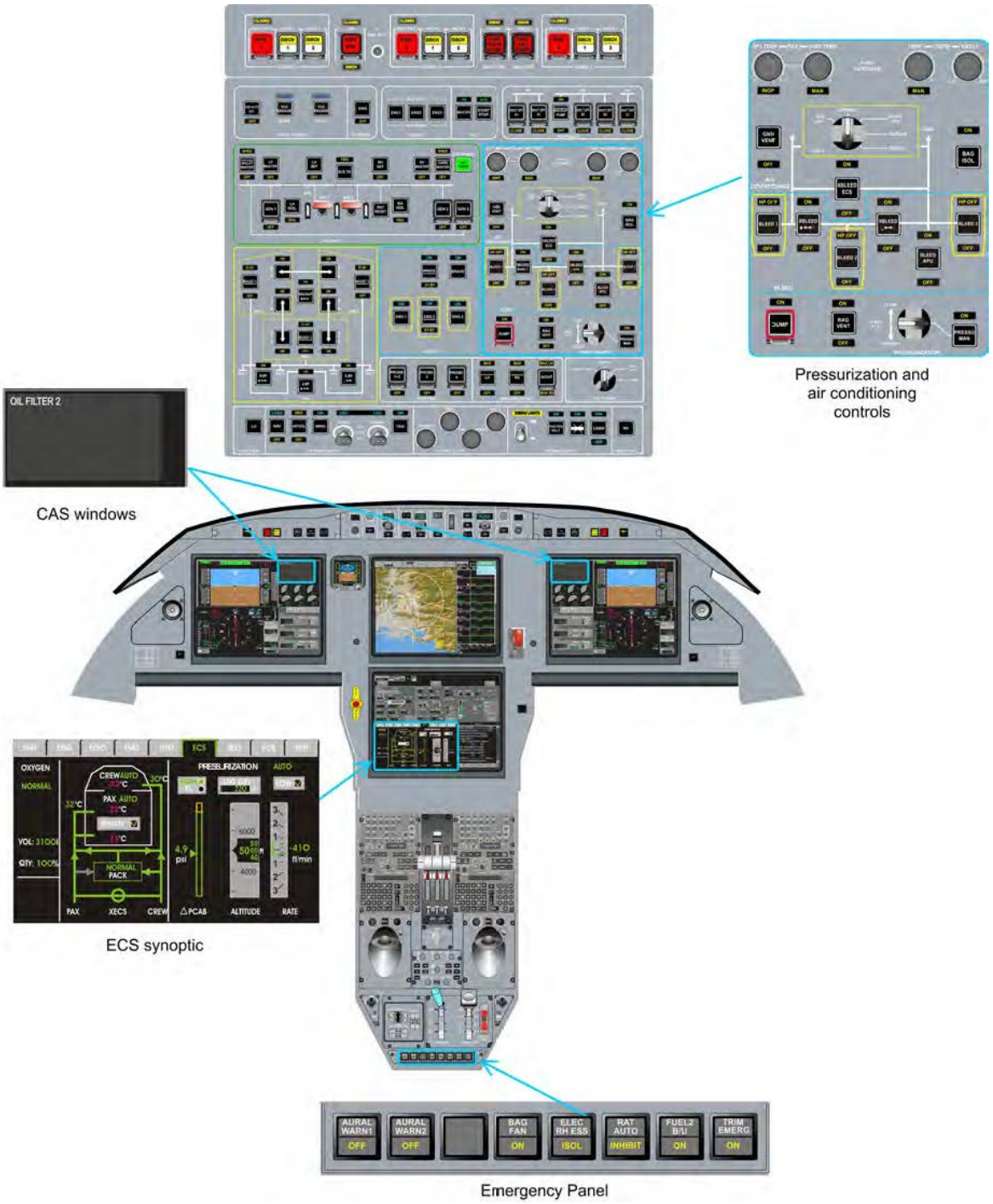


Figure 5PRESSURIZATION FLIGHT DECK OVERVIEW

Pressurized Areas

The airplane comprises three pressurized areas:

- The main cabin, including the cockpit, the forward and aft lounges, and the lavatory
- The baggage compartment,
- The nose cone compartment, which is semi-pressurized and air-cooled for satisfactory operation of the avionics.

The baggage compartment can be isolated in the case of a leak or fire.

The underfloor area is pressurized and ventilated, in order to avoid any build-up of fuel or hydraulic fluid vapors.

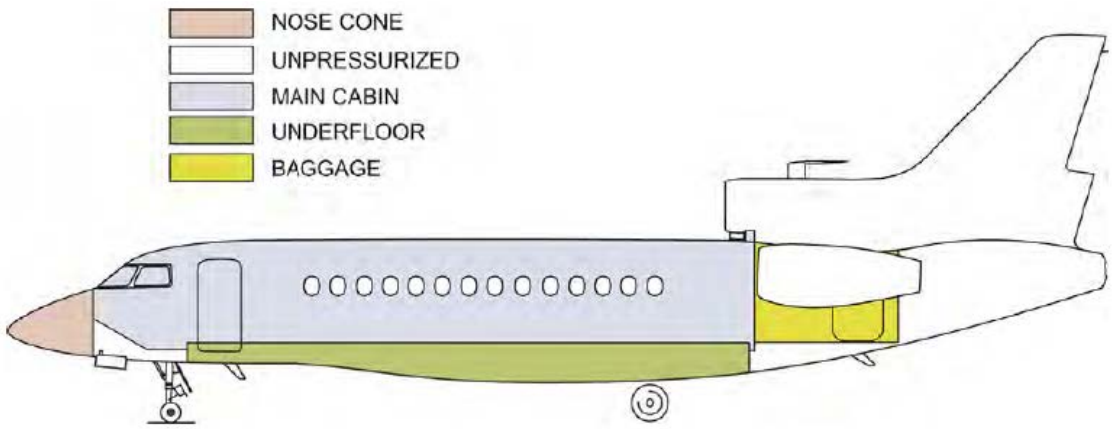


Figure 6 PRESSURIZED AND VENTILATED AREAS

Principle of Operation

Pressurization is automatic or manual by regulating cabin conditioning airflow through two electrically commanded outflow valves located in the fuselage rear bulkhead:

- The cabin outflow valve,
- The baggage outflow valve.

Each valve has its own controller (dual channel, with one channel active at a time).

The cabin outflow controller can be considered the “master” controller as it sends orders to the baggage outflow valve controller.

DESIGN PRINCIPLES

The pressurization system was designed on the basis of the following design principles:

- Pressurization regulation - For passenger comfort, ensure that cabin altitude at the maximum certified ceiling does not exceed 6,000 ft.
- Provide a fully automatic normal operating mode and a manual backup mode.
- Allow high altitude airfield operations up to 14,200 ft, - Pressurization regulation and mechanical protections ensure that delta P will remain within limits that are acceptable for the structure.

Ventilation of the ECS pack is by a pressurization jet pump, to avoid having to use a ram air intake which would induce drag.

A pressurized bulkhead allows isolation of the baggage compartment in the case of rotor burst.

AUTOMATIC MODE

In automatic mode, the pressurization system automatically controls cabin altitude, delta P and cabin vertical speed (pressurization rate of change) according to programmed laws and destination airfield elevation.

In normal operation, the cabin altitude target is 6,000 ft. Inputs for pressurization control are primarily:

- NORM / FL law and LOW rate selection,
- Airplane altitude, vertical speed and baro correction,
- Weight-On-Wheel, T/O power, doors closed,
- LDG ELEV: Destination airfield elevation.

And secondarily, to optimize comfort:

- Init Cruising level,
- Time To Destination.

MANUAL MODE

In manual mode, the crew manually opens or closes the cabin outflow valve to achieve the desired cabin vertical speed by using the CABIN ALT spring-loaded rotary knob.

An impulse of 1 second on the spring loaded rotary knob induce a cabin vertical speed variation of ± 300 ft/mn.

BAGGAGE ISOLATION, VENTILATION AND MAIN PACK HEAT EXCHANGER COOLING

The baggage compartment can be isolated from the cabin by closing the 2 baggage isolation valves:

- Automatically, by the cabin outflow valve controller when it senses cabin depressurization.
- Manually, by the crew through a BAG ISOL pushbutton in the case of fire or smoke in the baggage compartment.

When the baggage compartment is isolated, the “cabin air jet pump” located downstream of the baggage compartment ventilation valve is not fed and cooling of the main pack heat exchangers is left to the ACM (less effective at high altitude).

Electrical Power Supply

The following paragraph describes the power supply to the main equipment of the pressurization system.

Electrical protection is provided either by Solid State Power Controllers (SSPC), or by Circuit Breakers (CB).

EQUIPMENT	POWER SUPPLY	TYPE OF PROTECTION
Cabin valve	LH and RH Essential (one for each computer)	CB
Baggage valve	LH and RH Main (one for each computer)	SSPC
Isolation valves	LH and RH Essential (one for each computer)	CB
Ground vent valve	LH Main	CB
Nose cone fan	LH Main	CB

Pressurization System Components

The cabin outflow valve is located on the main cabin pressure bulkhead, below the S-Duct, allowing cabin air to exit the pressurized cabin.

The cabin outflow valve consists of a valve body assembly, a rotary electromechanical actuator, and a dual-channel digital electronic control with manual control backup.

The valve controller is fitted with two digital and two analog pressure sensors.

BAGGAGE COMPARTMENT PRESSURIZATION AND ISOLATION

The baggage compartment is normally pressurized at approximately the same differential pressure as the main cabin area.

Due to engine layout, the baggage compartment could be a path for fuselage depressurization in the case of a rotor burst, or could be the source of hazardous smoke in the event of a fire. Therefore, if depressurization in the baggage compartment is sensed or if a fire is detected, the baggage compartment can be isolated from the rest of the pressurized cabin.

Baggage compartment isolation is by closing the two baggage isolation valves. Automatically, when the cabin outflow valve senses rapid cabin decompression (cabin altitude exceeding 14,200 ft), or manually, when there is a fire warning or a slow cabin decompression warning, by selecting the BAG ISOL pushbutton on the overhead panel.

Pressurization System Operation

Figure 7 Pressurization Controls

In automatic mode, the pressurization system automatically controls cabin altitude and pressurization rate of change according to programmed laws and airfield elevation.

The automatic mode has two main operating laws:

- The NORMal law (NORM).
- The Flight Level law (FL).

Both automatic mode laws include a cabin altitude LOW rate of change option.
The pressurization system allows high-altitude landing and take-off.

On the ground, it also provides:

- Pre-pressurization of the cabin at an altitude below the runway elevation, in order to avoid cabin pressure surges during take-off.
- An automatic depressurization sequence, by pressurizing the cabin at an altitude below the runway elevation, in order to avoid cabin pressure surges during landing.

NORM LAW

This mode provides the most comfortable pressurization mode by limiting the cabin pressure rate of change during climb and descent based on airplane vertical flight plan data provided by the FMS (time to top of climb, time to destination, cruising level).

FL LAW

This mode is intended to maintain a low cabin altitude of 1,000 ft until the airplane reaches 27,000 ft. Climbing to 51,000 ft is possible in this mode but the cabin pressure variation is less comfortable above 27,000 ft.

LOW CABIN RATE

LOW cabin altitude rate of change can be activated with either NORM or FL laws, to limit the rate of change to lower values: +300 / -300 ft/min instead of +500 / -450 ft/min.

HIGH ALTITUDE LANDING AND TAKE-OFF

When the flight plan includes an airfield elevation above 8,000 ft, the nominal excessive cabin altitude threshold (8,300 ft ± 250 ft) is automatically modified by the pressurization system, while the airplane is in descent or on the ground, to the landing field elevation plus 1,700 ft. This altitude will never be higher than the cabin limit of 14,500 ft. The cabin altitude is regulated at 8,000 ft, until the airplane descends through 25,000 ft, then increases normally to the landing field elevation as per the flight plan.

MANUAL PRESSURIZATION MODE

In case of failure of the automatic pressurization mode, the crew can:

Activate the manual pressurization mode with the PRESSU MAN pushbutton on the overhead panel:

- Cabin and baggage outflow valves remain in their last commanded position.
- A target cabin altitude is displayed in magenta on the ECS synoptic. This altitude is the target cabin altitude corresponding to the current airplane altitude as computed by the pressurization law.

Directly control the cabin altitude rate (cabin vertical speed) using the CABIN ALT spring-loaded rotary knob:

- When actuated, the knob opens or closes the cabin outflow valve (only). When released, the valve remains in its last position.
- The baggage outflow valve is not regulated by the knob. It can be manually closed or opened using the BAG VENT pushbutton. When the baggage outflow valve is closed, the cabin air jet pump, which cools the main air pack, is not fed. Cooling is then only provided by the ACM fan, which is less effective above 40,000 ft.

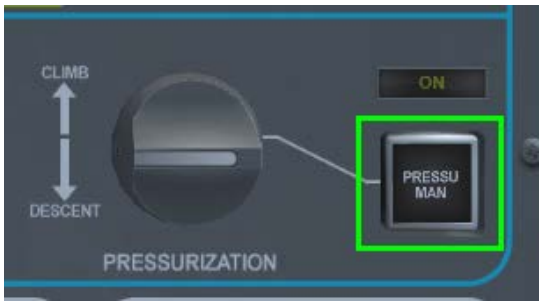


Figure 8 MANUAL PRESSURIZATION BUTTON

DUMP EMERGENCY DEPRESSURIZATION MODE

In DUMP mode, the cabin outflow valve is commanded open. The baggage outflow valve remains in its last commanded position. The cabin altitude limitation overrides the dump command when the cabin exceeds the altitude limit threshold.

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.

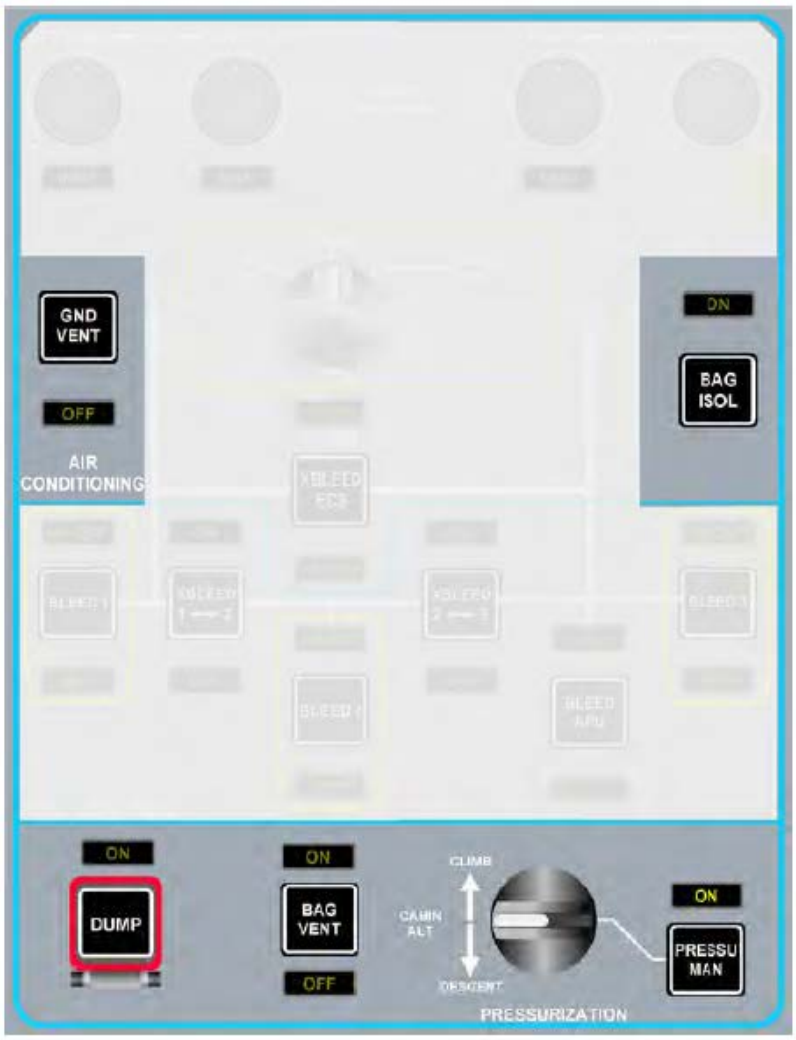


Figure 9 PRESSURIZATION CONTROLS ON THE OVERHEAD PANEL

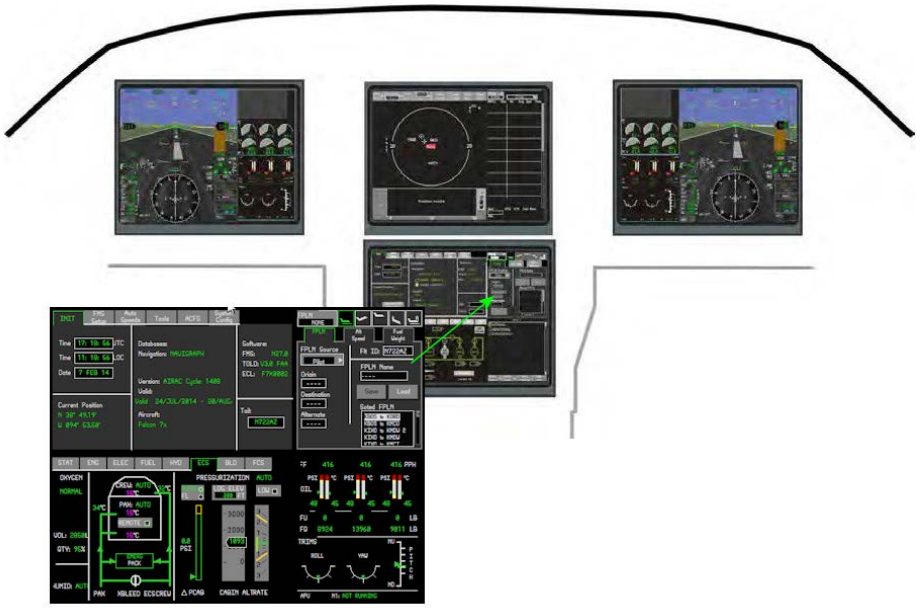
CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	- Selects the pressurization system automatic / MAN mode - In MAN mode, use the manual pressurization control knob	Push out: automatic mode 	AUTO
		Push in: MAN mode 	MAN
	DUMP guarded pushbutton, allows rapid depressurization by forcing the cabin outflow valve to fully open (until the cabin altitude limit is reached)	Guarded: automatic mode 	No synoptic
		Raise the guard and push in: DUMP mode 	DUMP

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	CABIN ALT spring knob: when manual mode is selected, this spring loaded knob allows to control the cabin altitude rate of climb/descent by opening or closing the cabin outflow valve. (The knob is spring loaded to the center position; an impulse of 1 second on the spring knob induces a cabin vertical speed of ± 300 ft/mn. Do not maintain in position more than 3 seconds.)	Rotate clockwise 	Increase the cabin altitude rate of climb Or Decrease the cabin altitude rate of descent
		Rotate counter clockwise 	Increase the cabin altitude rate of descent Or Decrease the cabin altitude rate of climb

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	BAG VENT pushbutton: cycling through, ON, OFF, automatic position enables the baggage outflow valve to be opened, closed or set to automatic	Unlighted (automatic mode) 	No synoptic
		ON (fully opened) 	No synoptic
		OFF (closed) 	No synoptic
	BAG ISOL pushbutton: when pressed (amber ON lighted), closes the baggage isolation valves and the baggage outflow valve (BAG VENT)	Unlighted (valves opened) 	No synoptic
		ON (valves closed) 	No synoptic
	GND VENT pushbutton: when pressed (amber OFF lighted), closes the ground outflow valve and the cabin recirculation valve.	Unlighted (valves opened) 	No synoptic
		OFF (valves closed) 	No synoptic

Indication

Pressurization indication takes place on MDU 2.



PRESSURIZATION SYNOPTIC PAGE

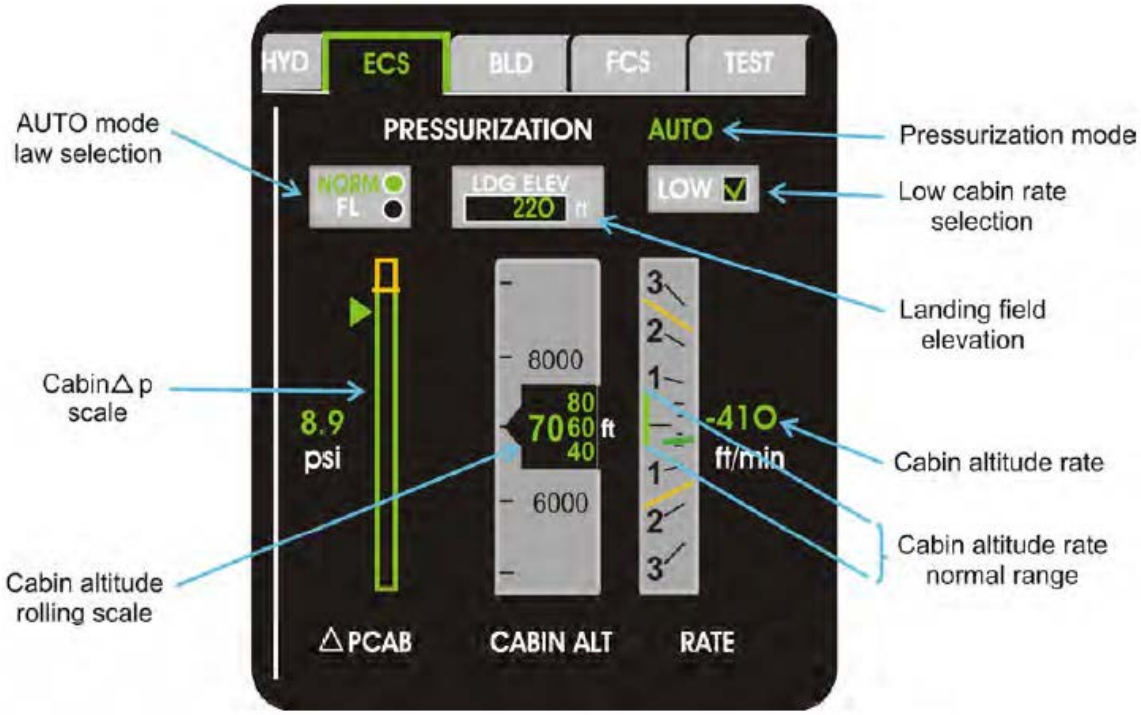


Figure 10 PRESSURIZATION SYNOPTIC IN AUTOMATIC MODE

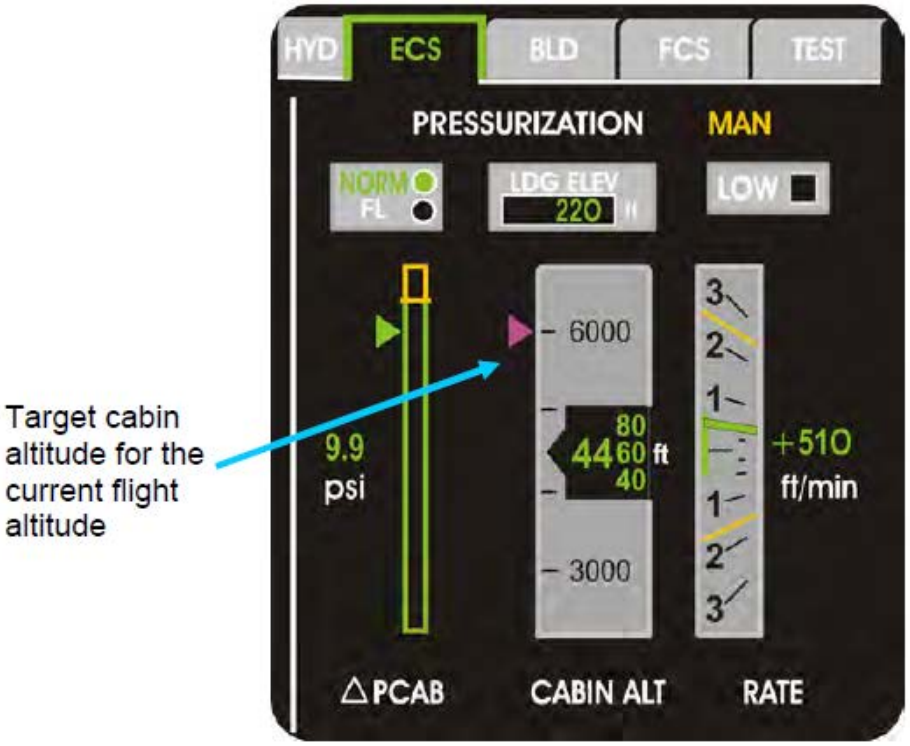


Figure 11 PRESSURIZATION SYNOPTIC IN MANUAL MODE

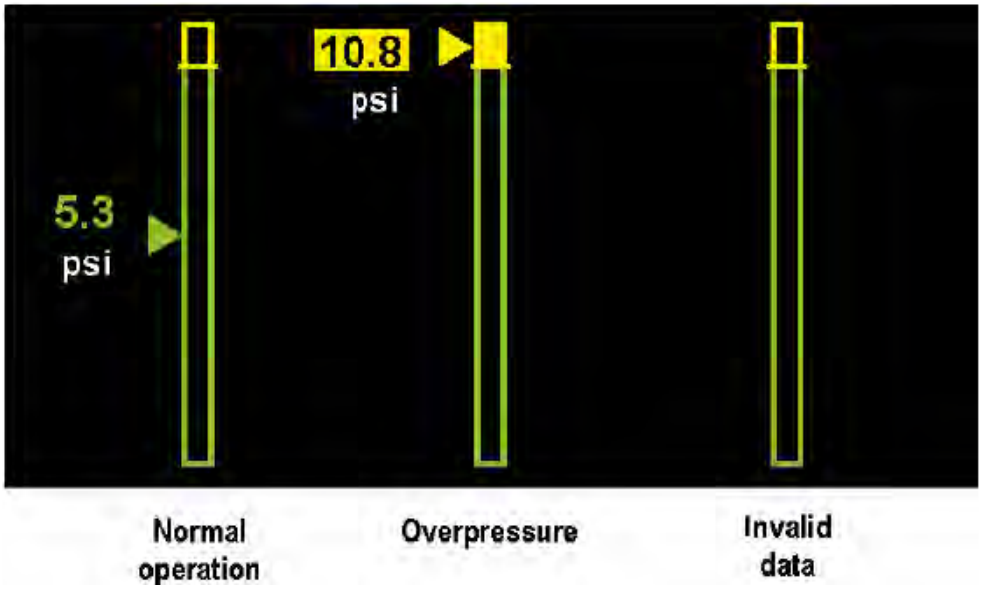


Figure 12 CABIN DIFFERENTIAL PRESSURE INDICATIONS

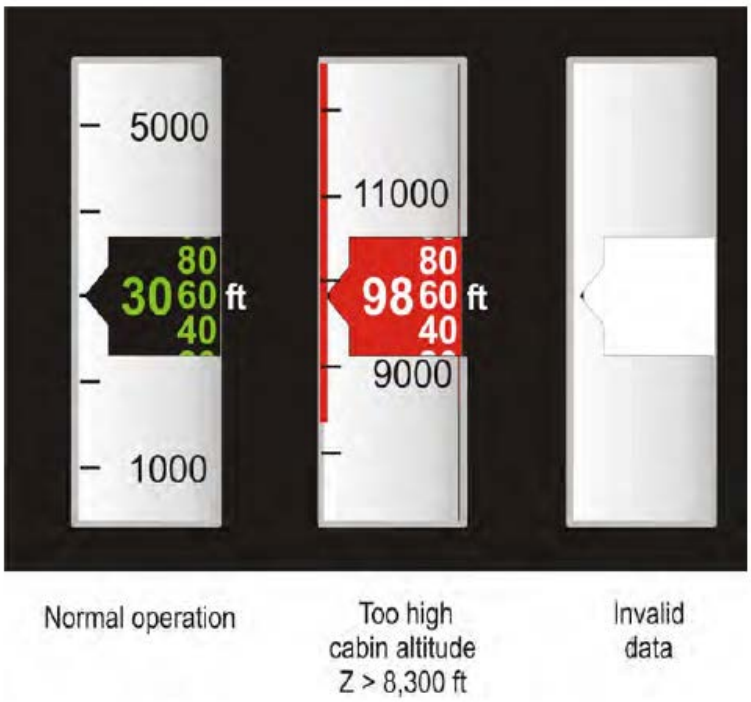


Figure 13 CABIN ALTITUDE INDICATIONS WITH LDG ELEV < 8,000 FT

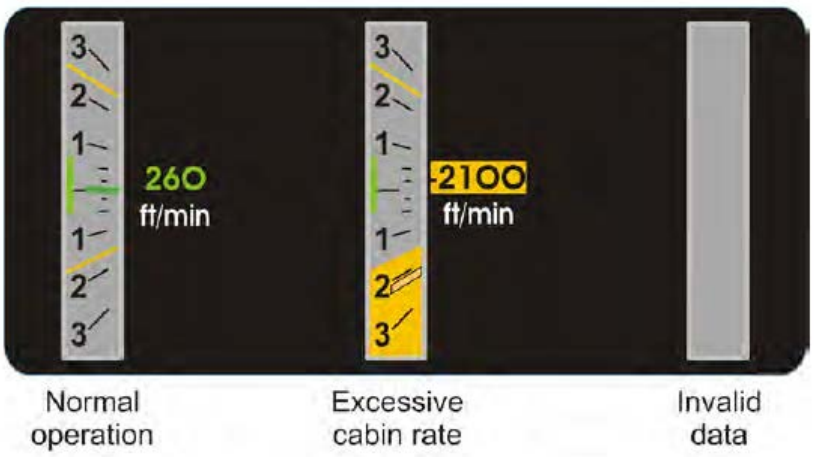


Figure 14 CABIN RATE INDICATION

Illustrations

Falcon 7X

Electrical Systems

wilco PUBLISHING
DASSAULT AVIATION

Contents

Introduction

The Falcon 7X uses 28 Volts DC power for operation of the various systems installed in the airplane.

The electrical system is supplied by:

- Three engine-driven generators,
- Two Batteries,
- A Ram Air Turbine (RAT) in some emergency cases.

The Primary Flight Control System and Engine Electronic Controller are also powered by dedicated Permanent Magnet Alternators.

On ground, the electrical system can also be supplied by:

- An Auxiliary Power Unit (APU) driven generator,
- An external 28 DC GPU (Ground Power Unit).

The different electrical power sources provide power to six buses installed in two Primary Distribution Boxes:

- LH ESSential and LH MAIN buses,
- RH ESSential and RH MAIN buses,
- Batt 1 and Batt 2 buses.

Electrical Power is distributed from the two Primary Power Distribution Boxes (PPDB) toward four Secondary Power Distribution Boxes (SPPD) installed forward and aft of the airplane, on the Right and Left Hand sides.

Protection of equipment, cables, and electrical buses is provided by different control boards, by fuses and by mechanical and electronic Circuit Breakers (CB).

The Emergency lighting system is fitted with dedicated batteries.

Acronyms

AC	Alternative Current
APU	Auxiliary Power Unit
BC	Battery Contactor
BIT	Built In Test
BTC	Bus Tie Contactor
CAS	Crew Alerting System
CB	Circuit Breaker
CLSC	Cabin Load Shed Contactor
CMC	Central Maintenance Computer
DC	Direct Current
ECU	Electronic Control Unit
EEC	Engine Electronic Controller
FADEC	Full Authority Digital Electronic Control
FBW	Fly By Wire
GCU	Generator Control Unit
GLC	Generator Line Contactor
GLSC	Galley Load Shed Contactor
GPC	Ground Power Contactor
GPU	Ground Power Unit
GSB	Ground Service Bus
LFSPDB	Left Front Secondary Power Distribution Box
LH	Left Hand
LPPDB	Left Primary Power Distribution Box
LRSPDB	Left Rear Secondary Power Distribution Box
LS	Load shed
MAU	Modular Avionic Unit
MDU	Multi function Display Unit
MMEL	Master Minimum Equipment List
O/C	OverCurrent
OP	Overhead Panel
OVHT	OVerHeaT
PDCU	Power Distribution Control Unit
PFCS	Primary Flight Control System
PMA	Permanent Magnet Alternator
PPDB	Primary Power Distribution Box
RAT	Ram Air Turbine
RATC	Ram Air Turbine Contactor

Flight Deck Overview

Controls

Crew has control over the electrical system via:

- The “DC SUPPLY" Panel on the overhead panel.
- The ELEC synoptic page on MDU 2.
- Two switches on the Emergency Panel (aft end of the pedestal) for RAT inhibit and "RH ESS ISOL".
- The RAT Manual Release Handle (right side of the pedestal).
- The Fire Control Panel in case of engine fire, to confirm generator disconnection.

Indications

Indications related to the Electrical System configuration and status are displayed in:

- The "DC SUPPLY" Panel (on the overhead panel),
- The ELECtrical System Synoptic and subpage "Circuit Breaker".
- The TEST synoptic page.
- The ENG-CAS window for CAS messages.
- The STATus synoptic / FAULT tab for fault messages.

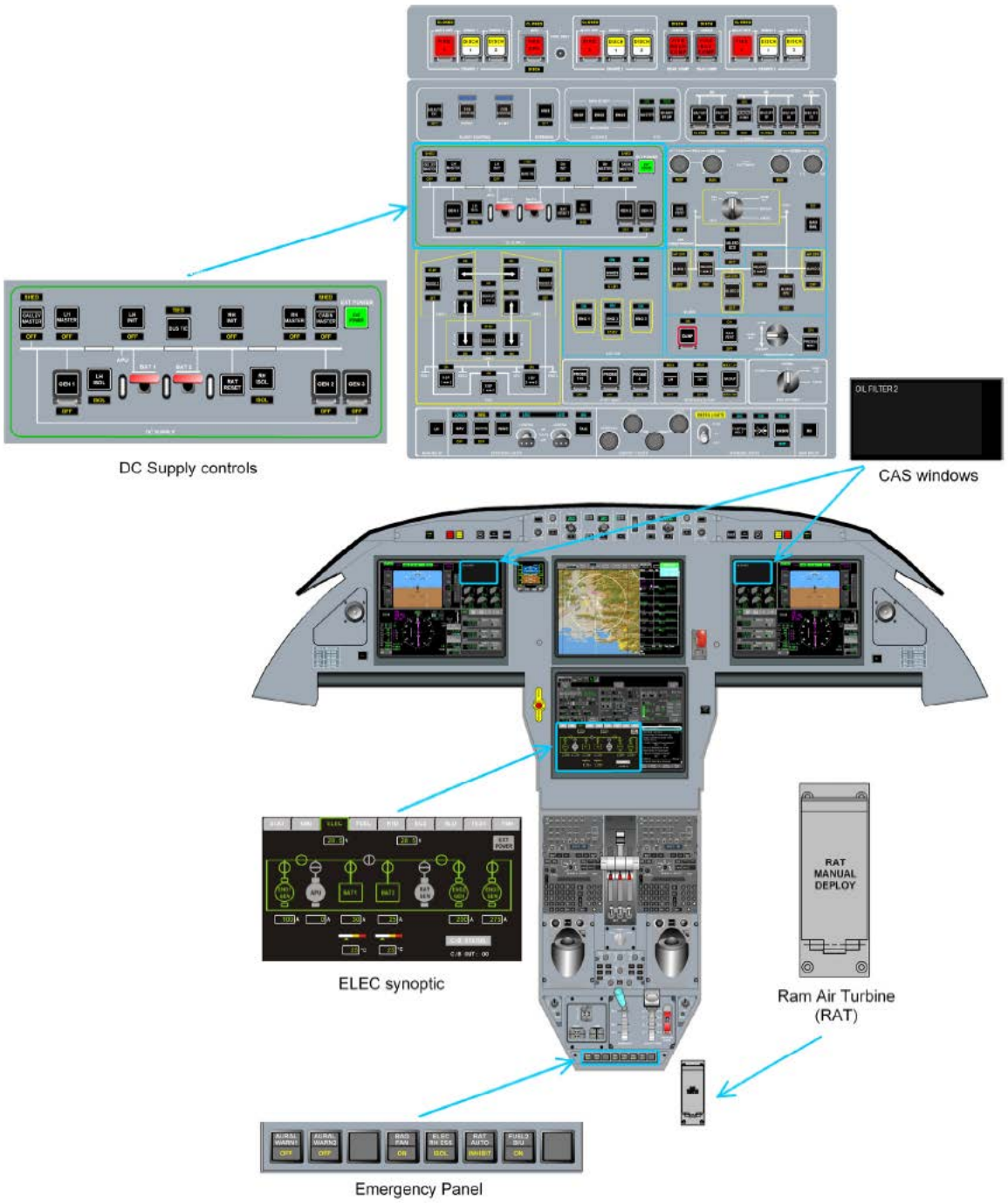


Figure 1 FLIGHT DECK OVERVIEW

Power Generation and Energy Storage

General

In flight, 28Vdc generation is provided by:

- 3 engine driven generators: 12kW (500 A),
- A RAT (Ram Air Turbine) which can provide a non time limited electrical power (9 kW) to LH and RH Essential Buses.

On ground, the 28Vdc generation is provided by:

- An APU starter-generator: 12 kW (400 A),
- A 28Vdc GPU which can be connected to the airplane to energize the entire electrical system.
- Two PMA (Engines 1 and 2) provide an independent source of electrical power for the PFCS.
- Three PMA (Engines 1, 2 and 3) provide an independent source of electrical power to Engine Electronic Controllers EEC.

Electrical energy is stored in two 24 V dc (25 Ah) lead-acid batteries.

Engine-Driven Generators

Engine-driven generators are driven by the accessory gearbox of each engine.

Engine driven generators are rated at 12 kW, but they can provide 15 kW for a limited time in case of a generator failure. They are regulated at 28.5 VDC by a Generator Control Unit (GCU) associated to each engine.

Each GCU provides current and voltage control and protection for its associated generator.

APU Generator

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.

The APU is rated at 12 kW and regulated at 28.5 VDC by its associated GCU.

The APU Generator Control Unit (GCU):

- Provides current and voltage control and protection for its associated generator.
- Controls APU start sequence.

Ram Air Turbine

The Ram Air Turbine (RAT) system provides a non-time limited electrical power source 9kw to the RH and LH ESS bus for continued safe flight and landing in case of:

- Loss of all three engines (automatic deployment).
- Loss of all three engine generators (automatic deployment).
- Loss of engine 2 generator and short on LH ESS bus (manual deployment).
- Loss of engine 2 generator and BUS TIE contactor failed open (manual deployment).

When operative, the RAT will charge the airplane batteries.

When the airplane speed is low (approach and landing), the RAT generator output voltage is reduced, and batteries start providing power. In this manner both the RAT and batteries power all the required airplane loads during this phase.

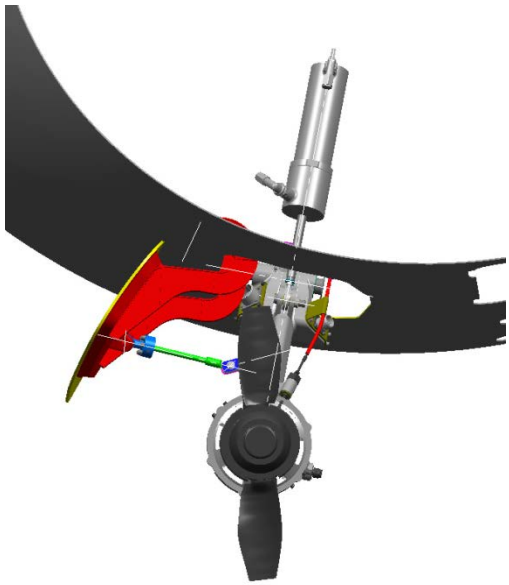


Figure 2 RAT IN THE DEPLOYED POSITION

PMA

Two PMA (Permanent Magnet Alternator) driven by engines 1 and 2 provide an independent source of power to the Primary Flight Control system.

Three PMA driven by each engine provide an independent source of AC power for their respective EEC (Engine Electronic Controller).

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.

The GPU may also be used:

- For APU starting (recommended power is 1,000 A).
- To charge the batteries.

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.

Power Distribution

General

The different electrical power sources provide power to six buses:

- BATT1 bus: powered by battery 1 or APU generator.
- LH MAIN bus: powered by Engines 1 and 3 generators.
- LH ESSential bus: powered by BATT1 bus.
- BATT2 bus: powered by battery 2.
- RH ESSential bus: powered by BATT2 bus, and potentially by the RAT generator.
- RH MAIN bus: powered by Engine 2 generator.

An additional bus is considered for preflight use only: Ground Servicing Bus.

The six buses are gathered in two Primary Distribution Boxes:

LH PPDB contains:

- LH MAIN and ESSential buses,
- BATT1 bus

RH PPDB contains:

- RH MAIN and ESSential buses,
- BATT2 bus

Power is distributed from the two Primary Power Distribution Boxes (PPDB) toward:

- The four Secondary Power Distribution Boxes (SPDB),
- Galley and cabin loads,
- Hot loads,
- Some PFCS loads.

Design Principles

The electrical system was designed considering technology, architecture, safety and maintenance design principles.

Technology

Since a low level of loads is required by airplane equipment, the electrical system circuit is a 28Vdc design. This allows simplification for circuit control and a good level of reliability without significant increase in weight.

Architecture

If the engines are running, the engines controllers and PFCS remain powered by dedicated power sources even if the airplane distribution system is not available.

Non time limited electrical power is available in case of all engines out or all generators failed, by a RAT.

In case of normal generation failure, the RAT system was selected rather than using the APU generator in flight: this way, the electrical system architecture is not affected by fuel contamination.

The galley and cabin load are directly powered from the PPDB in order to facilitate load shedding logic.

Some PFCS loads are directly powered from the PPDB in order to be segregated from other system loads and to allow load shedding of SPDB in case of loss of engine-driven generators.

Control

Crew has control on the electrical system via:

- The DC SUPPLY Panel on the overhead panel,
- Two switches on the Emergency Panel (aft end of the pedestal) for RAT AUTO and ELEC RH ESS,
- The RAT Manual Release Handle (right side of the pedestal),
- TEST synoptic page for the RAT test,
- The Fire Control Panel in case of engine fire, to confirm generator disconnection,
- The Maintenance panel for "ground servicing bus",
- The C/B STATUS sub-page page of the ELECtrical synoptic page, on ground, for changing electronic CB status.

DC Supply Control Panel

Pilots can manually control the Electrical System via the switches in the DC SUPPLY overhead panel.

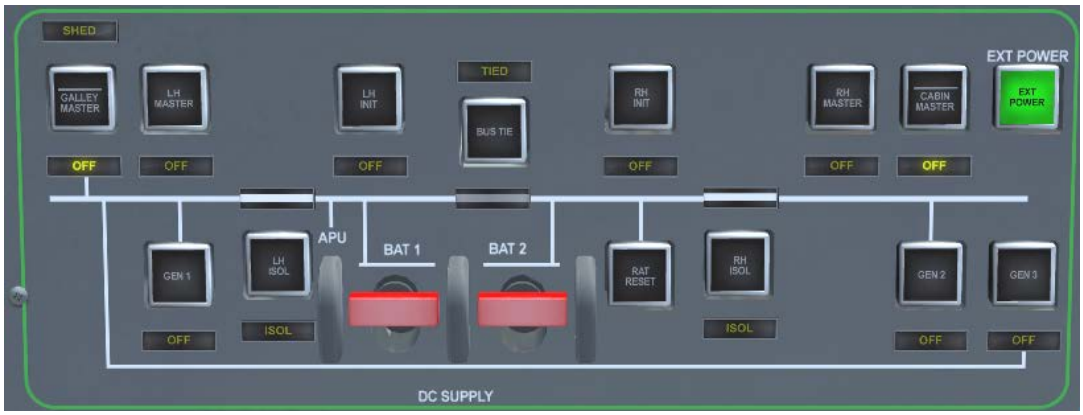


Figure 3 DC SUPPLY SECTION OF THE OVERHEAD PANEL

<table>
<tr><th>CONTROL</th><th>FUNCTION</th><th>TO ACTIVATE
TO DEACTIVATE</th><th>SYNOPTIC</th></tr>
<tr><td rowspan="3"> 


</td><td rowspan="3">- GEN 1 connects generator 1 to the LH MAIN bus
- GEN 2 connects generator 2 to the RH MAIN bus
- GEN 3 connects generator 3 to the LH MAIN bus</td><td rowspan="2"> 

Auto: allow GCU to automatically control the corresponding generator.</td><td>Generator
is connected
 
</td></tr>
<tr><td>Generator is not connected conformaly to normal operation:
- Engine is stopped.
 
</td></tr>
<tr><td rowspan="2"> 

OFF: allow to manually disconnect the corresponding generator</td><td>Generator is disconnected:
- Commanded by the crewmembers.
 
</td></tr>
<tr><td>Generator is not connected due to a malfunction, while engine is running.
 
</td></tr>
</table>

<table>
<tr><th>CONTROL</th><th>FUNCTION</th><th>TO ACTIVATE
TO DEACTIVATE</th><th>SYNOPTIC</th></tr>
<tr><td rowspan="4"> 

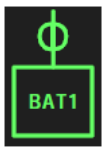
Two-position trip magnetic switch

Two-position trip magnetic switch</td><td rowspan="4">- BAT 1 connects battery 1 bus to the LH ESS bus and contactor is controlled by PDCU

NOTE
Battery 1 supplies the battery bus whatever battery switch position.

- BAT 2 connects battery 2 bus to the RH ESS bus and contactor is controlled by PDCU
- BAT 1 or 2 trips automatically to down position when the system detects an anomaly (high reverse current)
- BAT 1 and 2 act as reset switches when the fault is cleared</td><td rowspan="2"> 

BAT1 Connected and controlled by PDCU</td><td>BAT1 is connected (except APU starting)
 
</td></tr>
<tr><td>BAT1 is disconnected during APU starting
 
</td></tr>
<tr><td>Abnormal situation: BAT1 is disconnected due to a malfunction
 
</td></tr>
<tr><td> 

BAT1 Disconnected</td><td>BAT1 is disconnected
 

Abnormal situation: BAT1 is connected while it should be disconnected
 
</td></tr>
</table>

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
 light pushbutton	On ground only: allows external power to supply LH ESS bus	 Push On (System feedback)	On: airplane powered by external power. 
			Abnormal operation: airplane powered by external power and fault conditions or current < 400 A 
		 Flash	Abnormal operation: extenal power is connected and at least one engine generator is connected. 
		 Push Off	Off: airplane not powered by external power. 

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	Ties up LH ESS and RH ESS buses	 Push unlighted auto	Buses normally untied 
			Buses abnormally tied 
		 Push TIED	Buses tied as commanded 
			Buses abnormally untied 
 	Isolates LH / RH MAIN buses from respective LH / RH ESS buses	 Push unlighted auto	Buses normally tied 
			Buses abnormally isolated 
		 Push ISOL	Buses isolated as commanded 
			Buses abnormally tied 

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	- Sheds cabin optional equipment load from the LH MAIN and RH MAIN buses o Short push: alternates between "Auto" and "OFF" o Long push: SHED - Auto: contactor is connected and controlled by PDCU, closed if condition is acceptable. - OFF: contactor is disconnected and also GALLEY one. - SHED: allows to recover some pre determined loads after automatic shed.	Auto  SHED  OFF 	No specific indication on the ELEC synoptic
	- Sheds galley equipment load from the LH bus: o Short push: alternates between "Auto" and "OFF" o Long push: SHED - Auto: contactor is connected and controlled by PDCU, closed if condition is acceptable. - OFF: contactor is disconnected - SHED: allows to recover some pre determined loads after automatic shed.	Auto  SHED  OFF 	No specific indication on the ELEC synoptic

CONTROL	FUNCTION	TO ACTIVATE / TO DEACTIVATE	SYNOPTIC
	Supplies power to LH MAIN and LH ESS buses avionics equipment	Push on (connected)  Push OFF (not connected) 	No specific indication on the ELEC synoptic
	Supplies power to RH MAIN bus equipment	Push on (connected)  Push OFF (not connected) 	No specific indication on the ELEC synoptic
	Supplies power to LH ESS bus equipment	Push on (connected)  Push OFF (not connected) 	No specific indication on the ELEC synoptic
	Supplies power to RH ESS bus equipment	Push on (connected)  Push OFF (not connected) 	No specific indication on the ELEC synoptic

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
 momentary pushbutton	Resets RAT GEN in case of disconnection due to over-current	No indication	

Emergency Control Panel

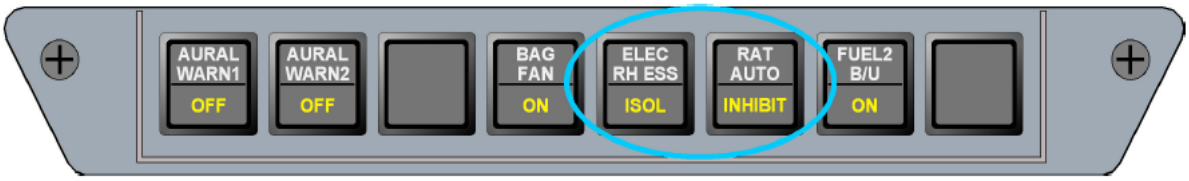
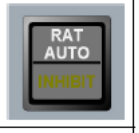
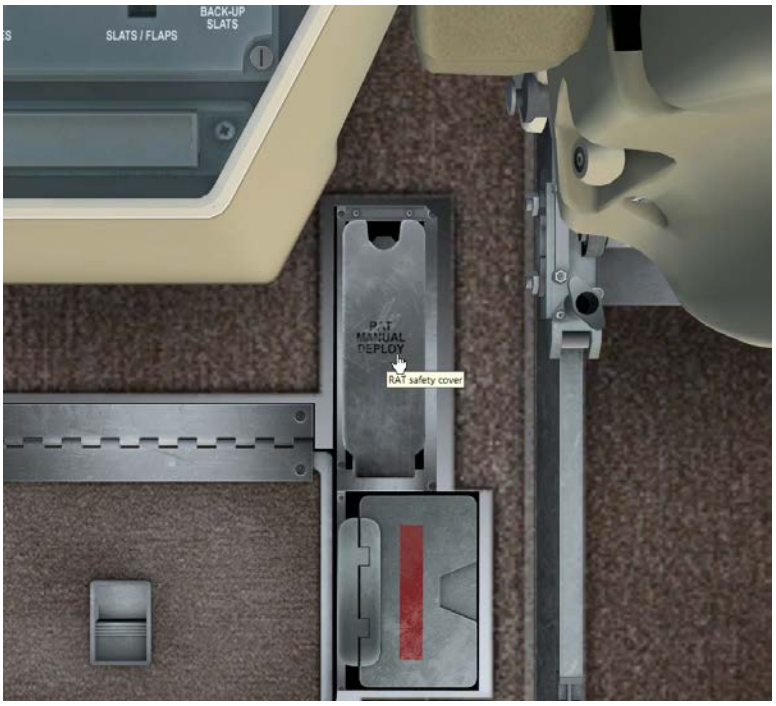


Figure 4 EMERGENCY CONTROL PANEL, ON PEDESTAL

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE	SYNOPTIC
ELEC RH ESS pushbutton on Emergency Panel: 	- Isolates RH ESS bus and forces the connection of BAT 2	Normal off  Push ISOL 	No specific indication on the ELEC synoptic.
RAT AUTO pushbutton on Emergency Panel: 	- prohibites the automatic deployment of RAT	Normal off  Push INHIBIT 	No specific indication on the ELEC synoptic. Advisory CAS message is displayed: **ELEC: RAT AUTO INHIBIT**

RAT Manual Release Handle



The release handle used to manually deploy the RAT is located on the cockpit floor to the left side of the copilot's seat.

Figure 5 MANUAL RELEASE COVER AND MANUAL RELEASE HANDLE

The release handle is protected from inadvertent release by a cover.

Indications

Electrical Synoptic Page

Located on MDU 2.

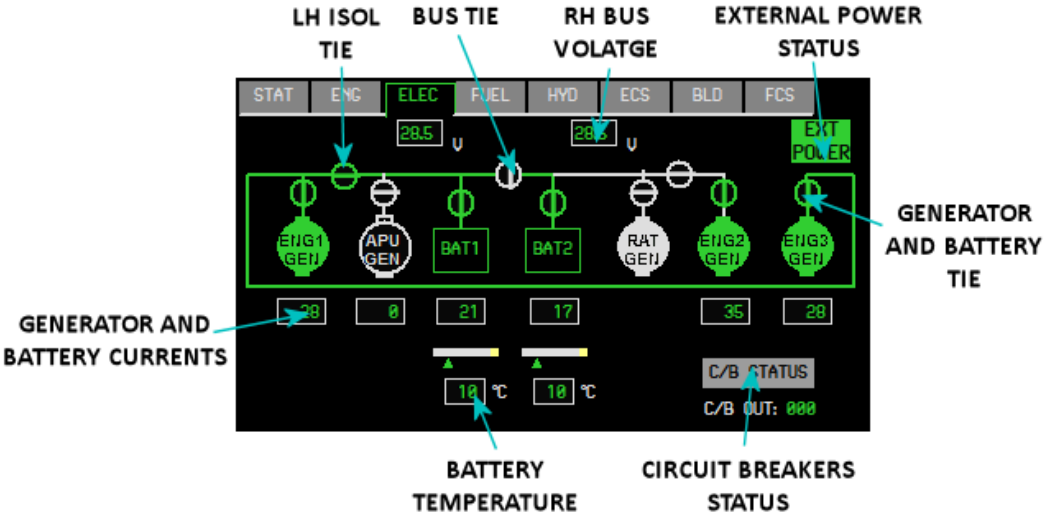


Figure 6 ELEC SYNOPTIC PAGE

Status Synoptic Page

At the top of the STATus page, following information on the electrical system are summarized:

- LH and RH buses voltages,
- Generators and batteries amperage.

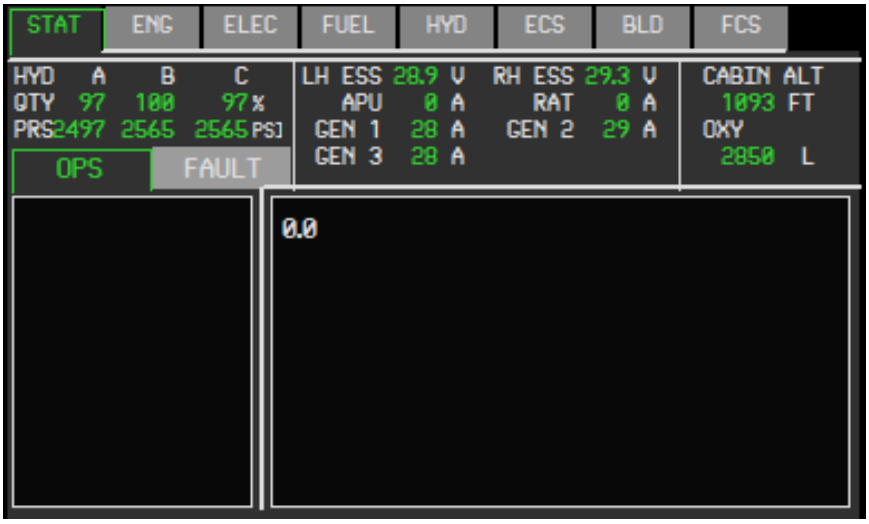


Figure 7 STATUS/ FAULT SYNOPTIC PAGE

Illustrations

Falcon 7X

Getting Started

Contents

Purpose of this Manual

The Falcon 7X is a very complex aircraft and the systems are modelled to high degree of accuracy. As a result, there are over 200 pages of documentation describing the operation and function of the displays, controls and systems. This manual is intended to condense this information to the essentials required to power up, start the engines, and take off in this advanced aircraft.

Installation

During the installation process you should see this utility:

The utility should indicate that your dll.xml file is properly formatted. If this is not the case, or if you encounter an error message, find the Configuration Utility in the Falcon folder in the simulator:

SimObjects\Airplanes\Wilco_Dassault_Falcon_7X

Right click on Falcon Configuration.exe and select “Run as Administrator”. Make sure that it shows that the dll.xml file is formatted. If this critical simulator file is not formatted with an entry for the Falcon FMS driver, the systems and Flight Management System will not work. If you need to format this file manually, you can find it in the following location, depending on the version of the simulator you are using:

Flight Simulator X	C:\Users\[*username*]\AppData\Roaming\Microsoft\FSX\dll.xml
Flight Simulator X Steam	C:\Users\ *username* \AppData\Roaming\Microsoft\FSX-SE\dll.xml

The file must contain this entry, right before the line entry </SimBase.Document> :

```
<Launch.Addon>
   <Name>Falcon7xFMS</Name>
   <Disabled>False</Disabled>
   <Path>SimObjects\Airplanes\Wilco_Dassault_Falcon_7X\panel\Falcon7xFMS.dll</Path>
   <DllStartName>module_init</DllStartName>
   <DllStopName>module_deinit</DllStopName>
 </Launch.Addon>
```

This will command the simulator to load the FMS driver when the simulator starts.

Navigraph Data

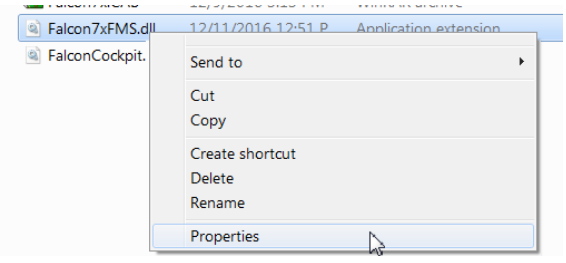
The Falcon FMS is Navigraph compatible. If you subscribe to this service, you will have SIDs departure routing and STARs arrival route capability. If the data is installed correctly this will be indicated on the configuration utility. If it cannot be located on your system the utility will give you the option to browse to it.

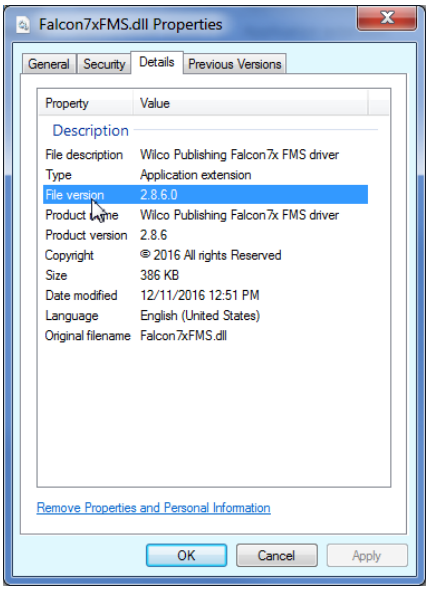
Software Version

The version of the Falcon software you have installed can be determined in the following ways:

Driver Version

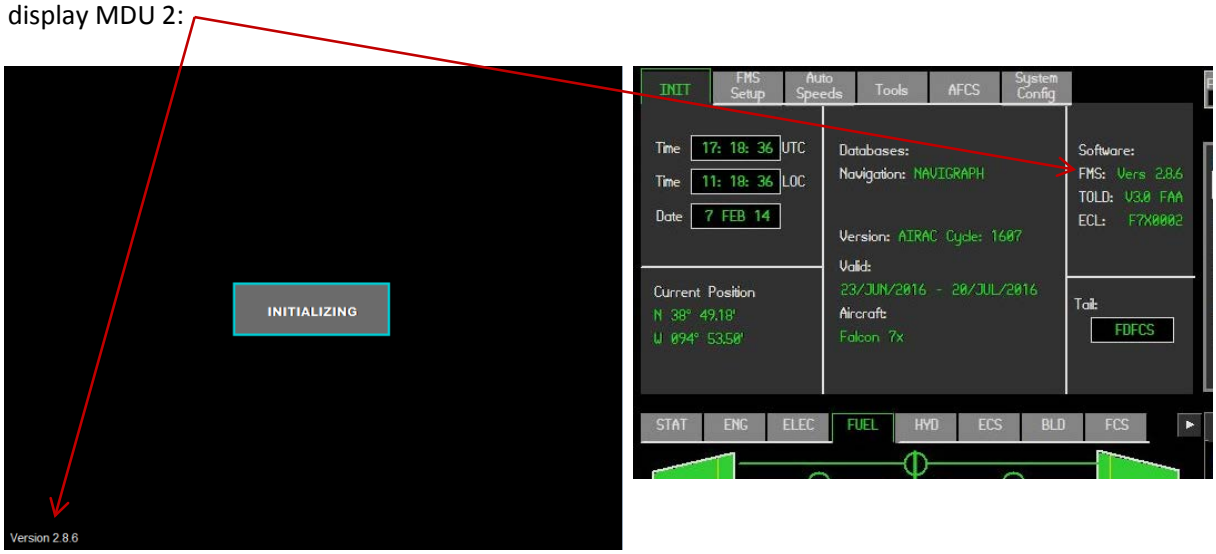
Right click on the drivers Falcon7xFMS.dll and FalconCockpit.dll, which can be found in the aircraft's panel folder.





Falcon Cockpit Displays

The software version is displayed on the initialization screen, and on the Init Synoptics page on the display MDU 2:



Reference Diagrams

The Falcon 7X (here and in real life) utilizes four glass displays and a multifunction keyboard (MKB).

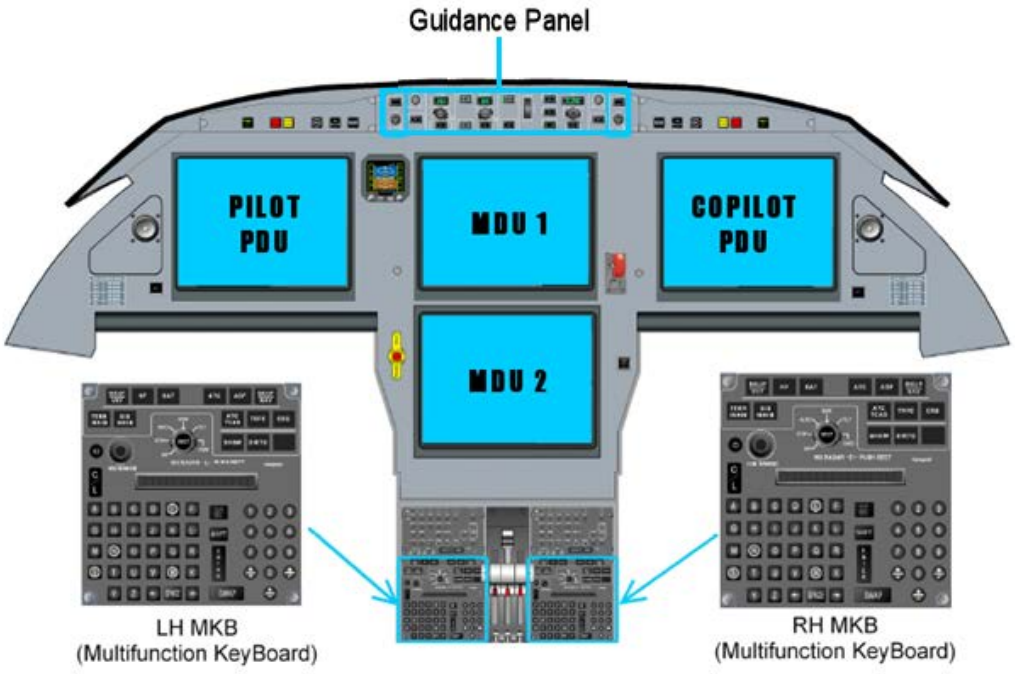


Figure 1 - GLASS DISPLAYS

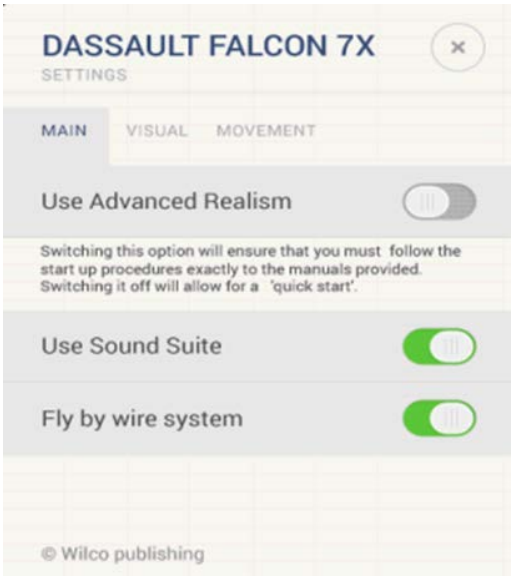
Popups

You can bring up larger popups of all these displays using keyboard commands:

Shift + 2	Configuration Manager (info Pad)
Shift + 3	Pilot PDU
Shift + 4	MDU 1
Shift + 5	MDU 2
Shift + 6	Multifunction Keyboard
Shift + 7	Copilot PDU

In addition, you can popup each glass display by mouse clicking on the very (small) upper left hand of the display screen.

Configuration Utility and System Realism



You can access this utility by pressing Shift + 2 in the cockpit.

Here you will find an option labelled “Use Advanced Realism”. In advanced realism mode, the procedures and controls must be operated exactly according to the checklists and documentation, otherwise things will not work. This, of course, is how the real plane works.

However, we do realize that virtual pilots have not had the benefit of the extensive classroom and systems training as the real world pilots. In order to make things work more like a simulator aircraft, you can switch this mode off.

The differences in operating the controls will be outlined below.

Cockpit Views

OVERHEAD

The bulk of the systems controls for the aircraft are on the Overhead Panel. You can also press the keyboard ‘O’ key for quick access to the overhead, and then press ‘O’ again to return to the previous view. This is particularly useful for switching views between the pilot and overhead.

SHOW PREVIOUS VIEW

Press the ‘V’ key at any time to go back to the previous view. This allows you to go backwards through the cockpit views, instead of continually advancing forward using the ‘A’ key to get back to where you were. In other words, the opposite of the ‘A’ key.

Automatic Settings

Pushbutton switches that have an upper and lower indicator have an AUTO mode, where the system will be automatically available when needed. In normal conditions, operation of these switches is not necessary. Manually pushing the button sequentially will change the system to off (sometimes STBY) and ON.

Off

On

Auto Mode

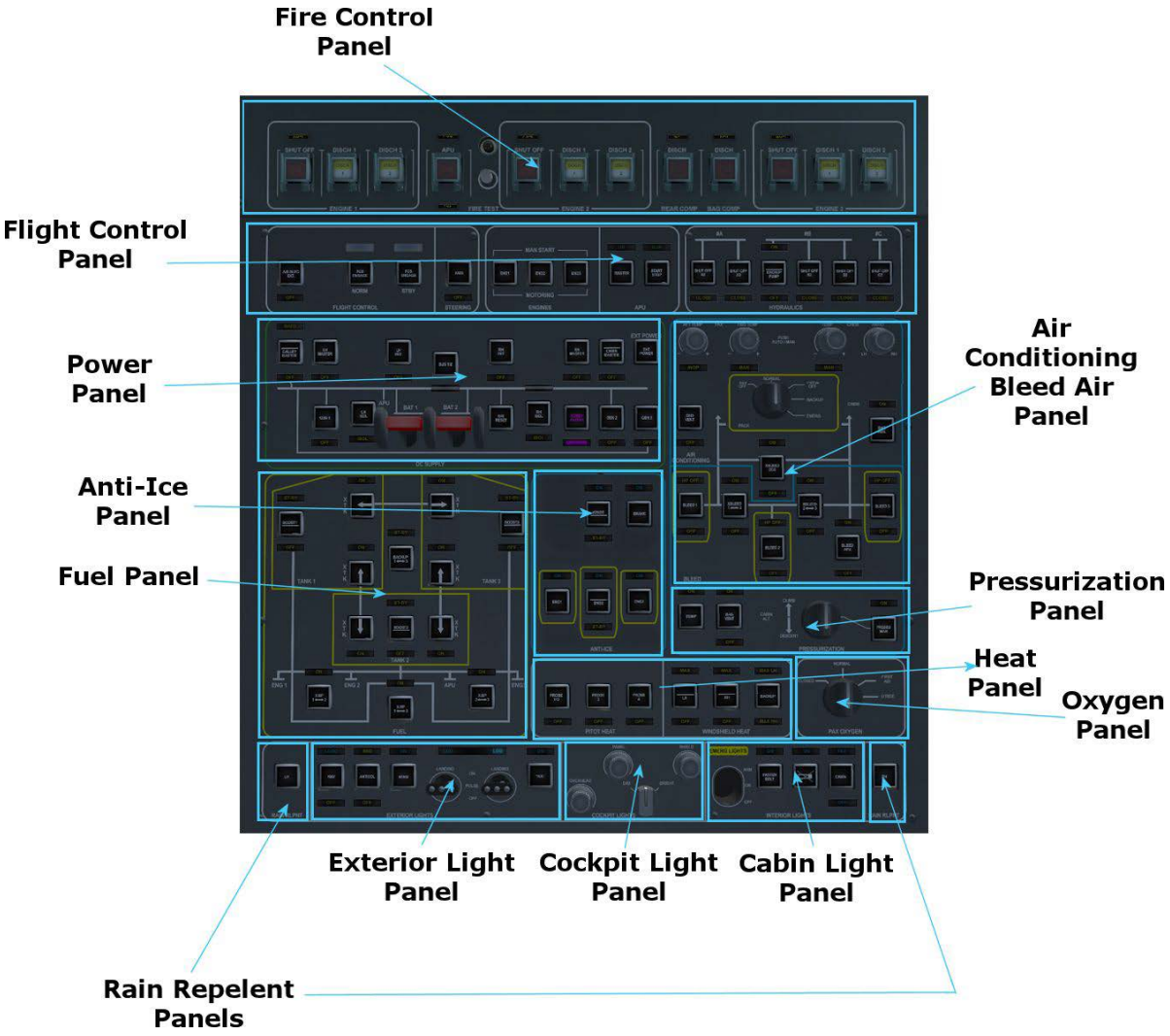


Figure 2 - OVERHEAD PANEL

Establishing Electrical Power

Locate the Power Panel on the *Overhead*.

Advanced Realism ON	Advanced Realism OFF
1. BAT 1 BAT 2 - **ON**	BAT 1 BAT 2 **ON** – Everything else comes online
2. LH INIT – **ON**	
3. LH MASTER – **ON**	
4. RH INIT – **ON**	
5. RH MASTER - **ON**	

Locate the *Flight Control Panel.*

Advanced Realism ON	Advanced Realism OFF
1. APU Master - **ON**	APU already online when battery switches are ON
2. Press the Start/Stop Button	

Note – The APU will only come online automatically during ground procedures, not if the saved Flight begins with the plane in flight.

Display Status

The Pilot PDU and MDU 2 will initialize as soon as the two Battery Switches are ON and the LH Init Switch is ON. MDU 2 and the Copilot PDU will come online when LH Init and LH Master are ON. Obviously, with Advanced Realism OFF all four displays will come online as soon as the Battery Switches are ON.

Note that there is no “Master Avionics” switch in the cockpit, like most conventional simulator aircraft. There is no such thing in the actual Falcon Cockpit. The simulator avionics circuit is controlled by our software driver once the power up procedures above are followed.

Bleed-Air

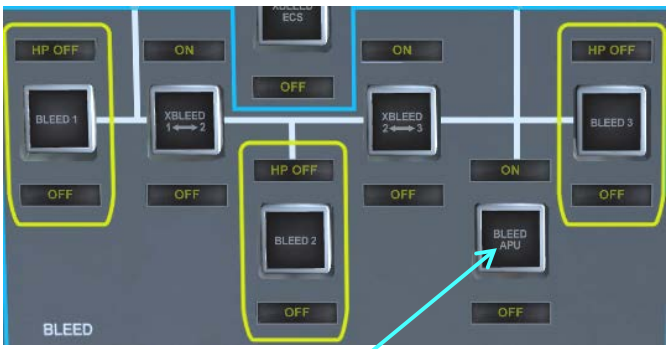
This is not something typically used in simulator aircraft, but in reality it is a very critical aircraft system. It drives the Environmental Control System (ECS), the airplane pneumatic systems, and provides pressure for engine start. As is the case in the real-world, none of these systems will work without bleed-air.

For ground operations and engine start, bleed-air from the APU must be provided.

Once the APU is started, locate the *Air Conditioning/Bleed-Air Panel*.

The BLEED APU switch must be in **ON or AUTO** position.

If *Advanced Realism* is OFF this will have already been done for you automatically.



APU Bleed-Air Valve Switch

Engine Start

If electrical power is established, the APU is started, and APU bleed-air is provided, the engines will have the electrical power and air pressure to start. **If these conditions are not met, the engines will not start!**

If you have *Advanced Realism* is OFF all of this should have been done for you automatically once the battery switches are ON. See Configuration Utility and System Realism.

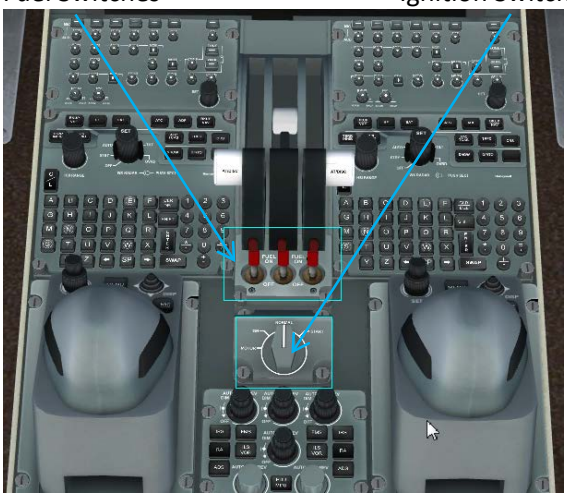
Ground Start

Before starting, the following criteria must be met:

1. LH and RH power must be available. See Establishing Electrical Power.
2. APU must be ON. See Establishing Electrical Power.
3. APU Bleed Air switch must be ON. See Bleed-Air.

Locate the following controls:

Fuel Switches Ignition Switch



FUEL CUT-OFF SWITCHES

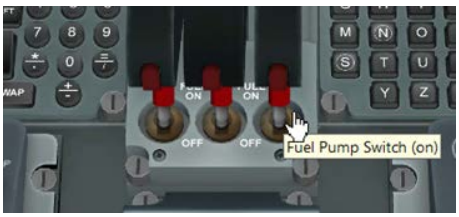


Figure 3 Fuel Switches

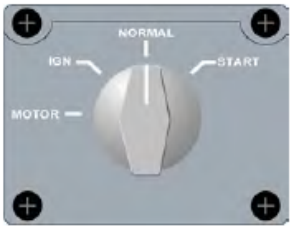
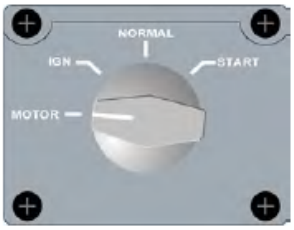
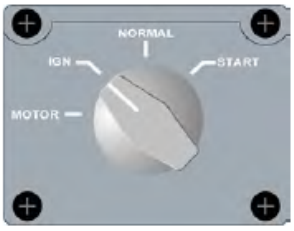
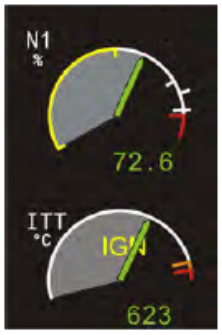
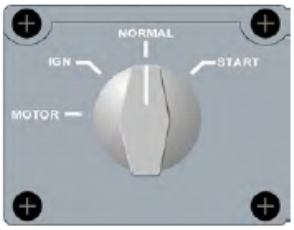
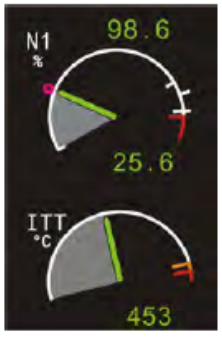
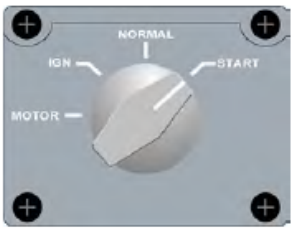
Three fuel cut-off switches (one per engine) are located on the pedestal. They have two positions: Fuel ON (Up) / Fuel OFF (Down).

ENGINE START SELECTOR

Figure 4 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

This space left intentionally blank

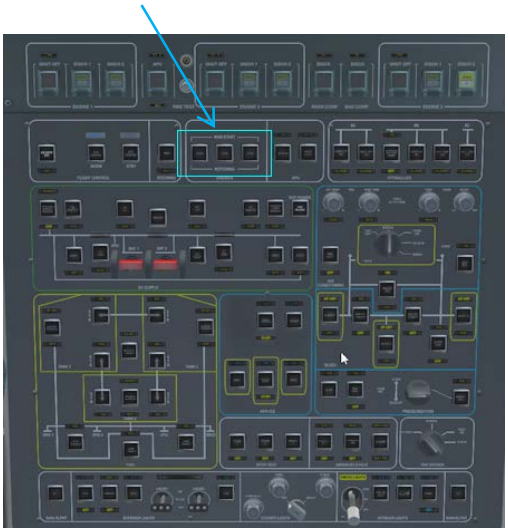
 Engine start selector	MOTOR: enables motoring and stop manually the starting sequence		
	IGN: activates all engine igniters simultaneously		
	NORMAL: normal position in normal flight		
	START: initiates the starting sequence of the selected engine. (spring-loaded position)		

MANUAL START PUSHBUTTONS

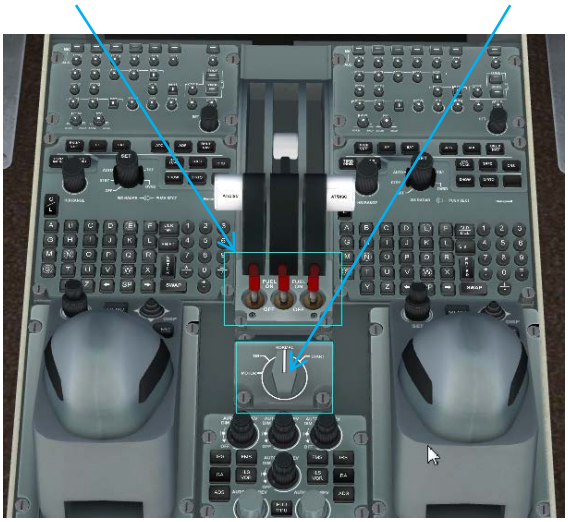
Engine MAN START pushbuttons are used for in flight starting or engine motoring.

Locate the following controls:

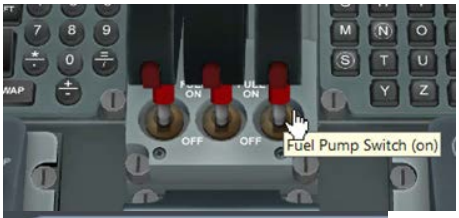
Overhead Start Switches



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.

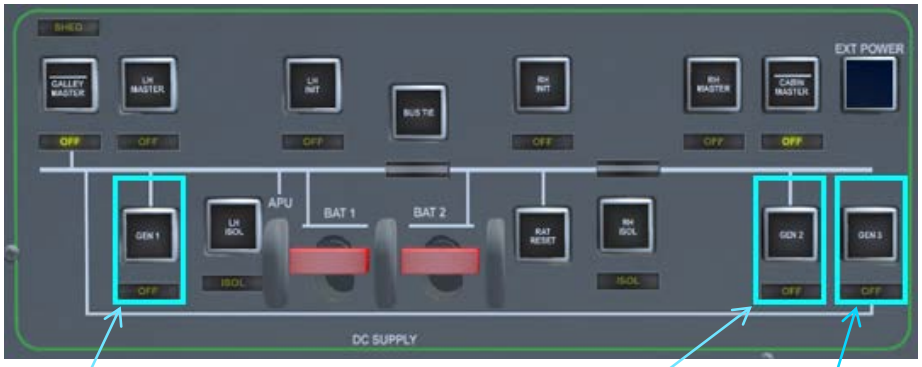
3. With the Ignition Switch in the MOTOR position, and the engine's fuel pumps switch ON, press the manual start for the respective engine on the overhead panel

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.

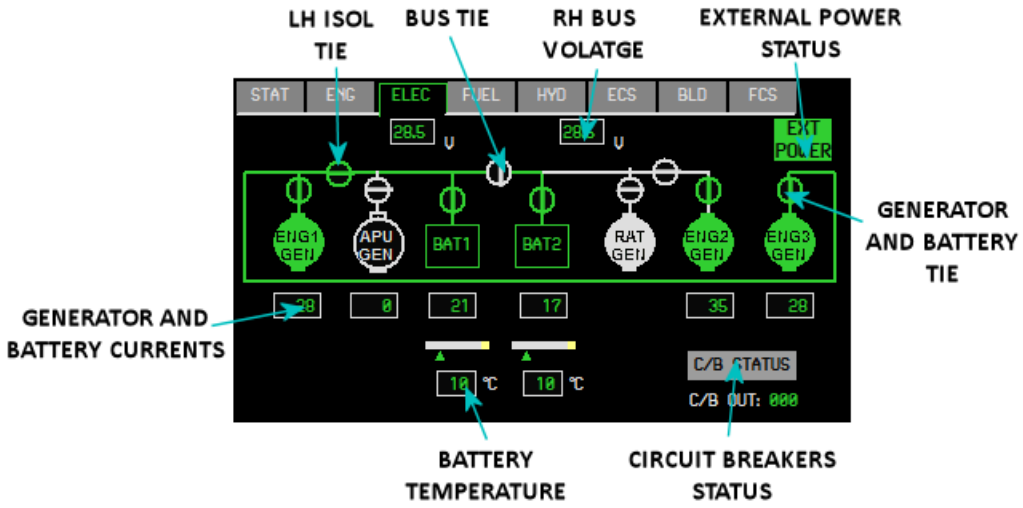
After Engine Start

Locate the Power panel on the overhead. Once an engine is started, press its generator switch (GEN) to bring its electrical generator online, to power the aircraft systems during flight and take the load off of the APU. Once generator power is established you can shut down the APU. All of this will be done automatically if *Use Advanced Realism* is OFF.



GEN 1 (left engine) GEN 3 (center) GEN 3 (right)

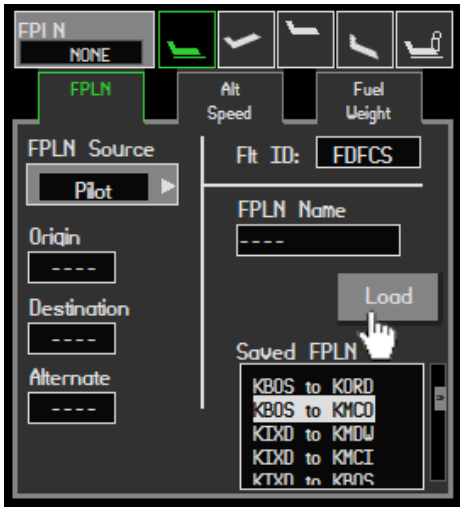
Electrical status is displayed on the MDU 2 ELEC synoptics page. See the handbook *Electrical Systems.pdf* for more details.



Flight Planning

Many of the features of the Flight Management System (FMS) require a flight plan be filed and loaded into the system. See page 14 of the handbook Falcon Avionics Quick Start.pdf for more details on the FMS and flight planning. Below is a simplified step by step to get your flight started.

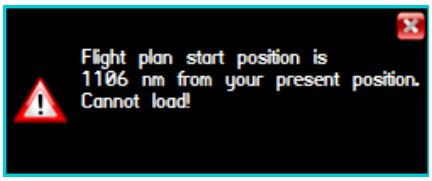
Loading a Flight Plan



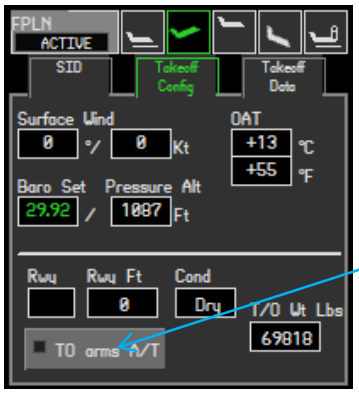
Locate the Flight Planning section on MDU 2. The Falcon utilizes standard simulator flight plans (*.PLN files). The stored flight plans for the simulator will be listed in this box, by airport IDENT (Departure – Destination).

Scroll down the list for the desired flight plan and press **Load**.

Note that the aircraft must be located at the starting point of the flight plan. Otherwise an error message will be displayed and the flight plan will not load.



ARMING THE AUTOTHROTTLE



The FMS provides recommended Autothrottle settings. The values are calculated automatically when the flight plan is loaded. Optionally, you can have the FMS arm and set the Autothrottle automatically when the aircraft takes off, and reaches 400 feet AGL. To engage this features, go to the takeoff configuration page and select **TO Arm A/T**.

Autothrottle settings can always be overridden manually by simply changing the setting manually on the guidance panel.

LNAV and VNAV

The FMS can control all aspects of Lateral Navigation (LNAV) and Vertical Navigation (VNAV). LNAV will direct the aircraft guidance system to follow the waypoints in your flight plan to your final destination. VNAV will control your altitude/vertical profile.

Once takeoff is achieved, and control altitude (400 feet AGL) is reached, LNAV and VNAV can be selected on the Guidance panel.

1. Press the AP Master switch. It will annunciate ON.
2. Press the LNAV switch
3. Press the VNAV switch

Note that there is no "*NAV/GPS*" switch as commonly found on simulator aircraft. This function is controlled by the LNAV function.

Falcon 7X

Limitations

Contents

Passengers and Crew

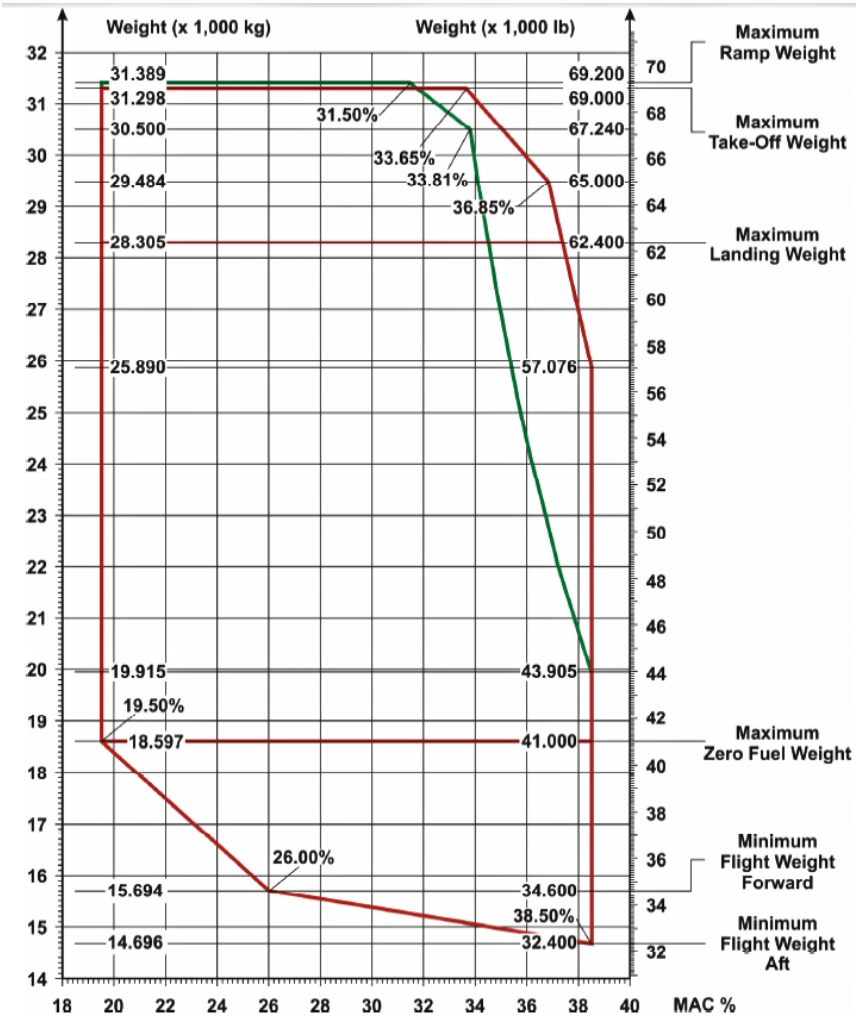
Pilots	2 – PILOT AND COPILOT
Maximum number of passengers	19

Weight and Center of Gravity

STRUCTURAL LIMITATIONS
- Maximum ramp weight ..... 69,200 lb (31,389 kg)
- Maximum take-off weight ..... 69,000 lb (31,298 kg)
- Maximum landing weight ..... 62,400 lb (28,305 kg)
- Maximum zero fuel weight ..... 41,000 lb (18,597 kg)
- Minimum flight weight ..... 32,400 lb (14,696 kg)

Limitations Due to Performance

The maximum take-off weight and the maximum landing weight given as structural limitations may have to be reduced to comply with performance and operating requirements .



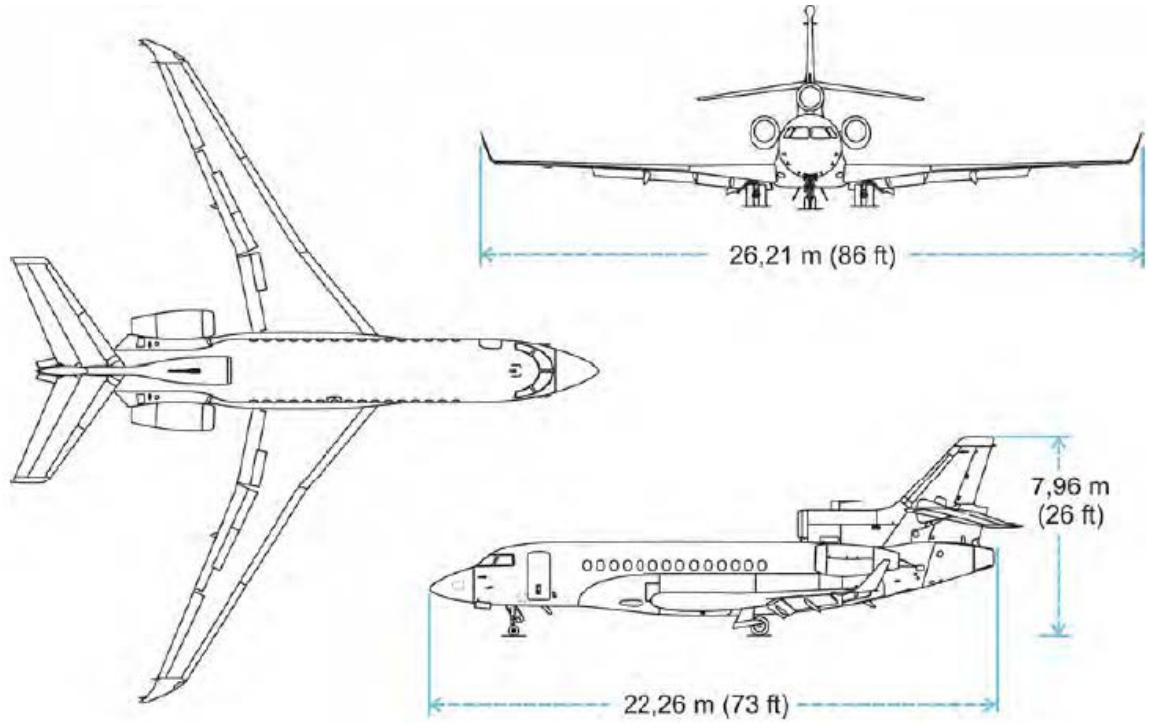
The red line shows the in-flight limits.
The green line shows the on-ground limits.

DATUM
Datum is 25% of mean aerodynamic chord (MAC) which coincides with fuselage station (12,183 mm).
Origin of Fuselage Station is the forward end of the airplane nose cone

MEAN AERODYNAMIC CHORD
Length: 3,347.54 mm.
Zero % MAC is at Fuselage Station + 11,346.1 mm.

Structural Characteristics

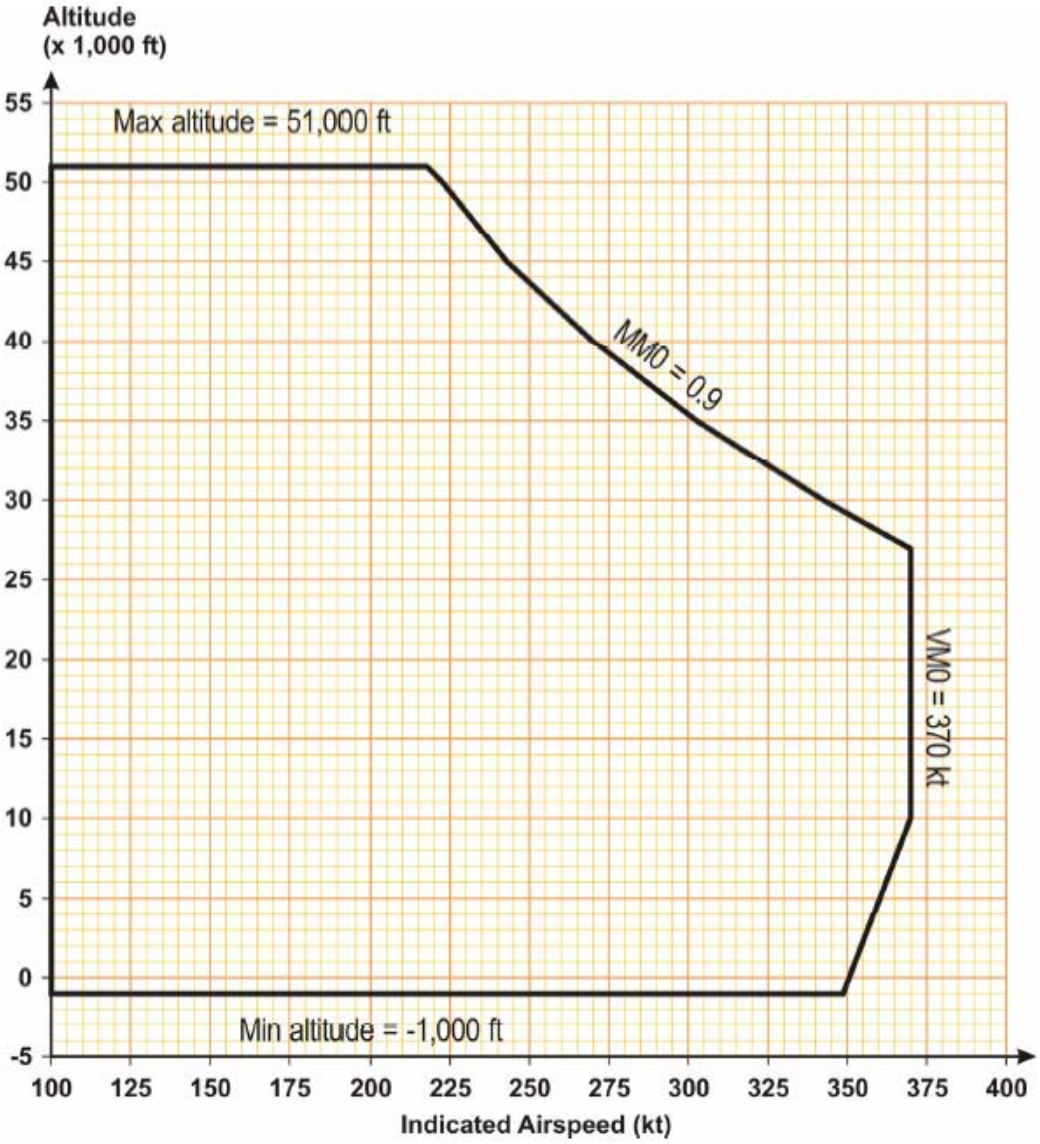
Main structural characteristics of the Falcon 7X are:

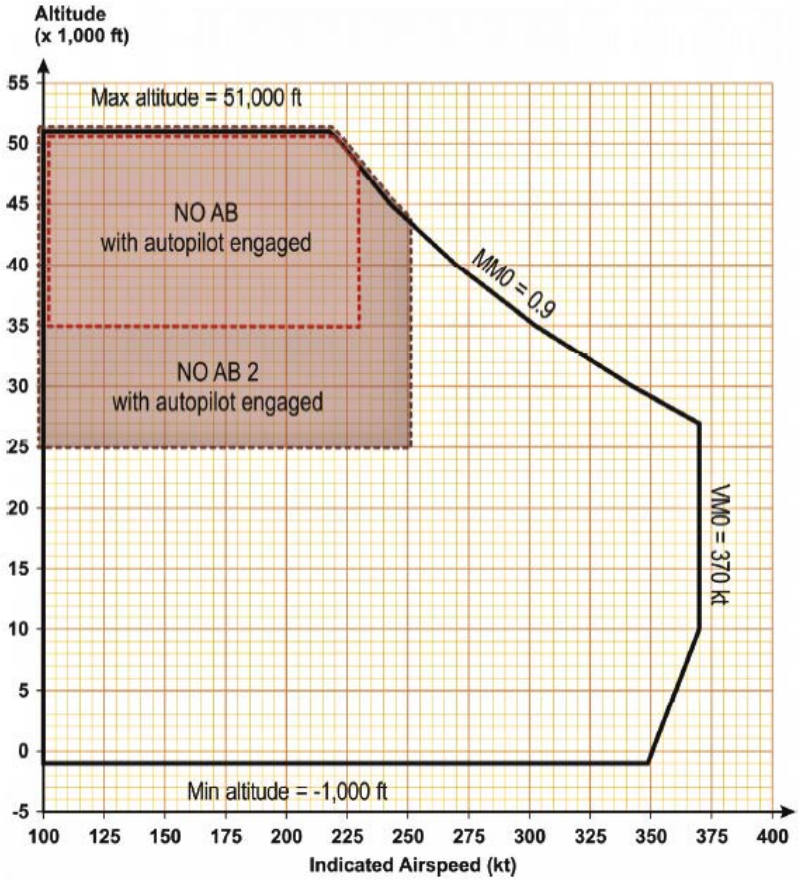


Operating Speed

VMO / MMO ENVELOPE

Unless otherwise specified, limits are expressed in terms of indicated values.
Instrument error is assumed to be zero.





MANEUVERING SPEED

VA (alternate or direct laws) ..... 218 KIAS.

HIGH LIFT DEVICES OPERATING OR EXTENDED LIMIT SPEEDS: VFE

SF 1:..... 200 KIAS
SF 2:..... 190 KIAS
SF 3:..... 180 KIAS

MAXIMUM LANDING GEAR OPERATING SPEED: VLO / MLO

VLO ..... 200 KIAS
MLO..... 0.7

MAXIMUM LANDING GEAR EXTENDED SPEED: VLE / MLE

VLE..... 245 KIAS
MLE 0.75

MINIMUM CONTROL SPEED IN THE AIR: VMCA

VMCA ..... 80 KIAS.

MINIMUM CONTROL SPEED DURING LANDING AN D APPROACH: VMCL

All engines operating..... VMCL = 84 KIAS.

One engine inoperative ..... VMCL-2 = 84 KIAS.

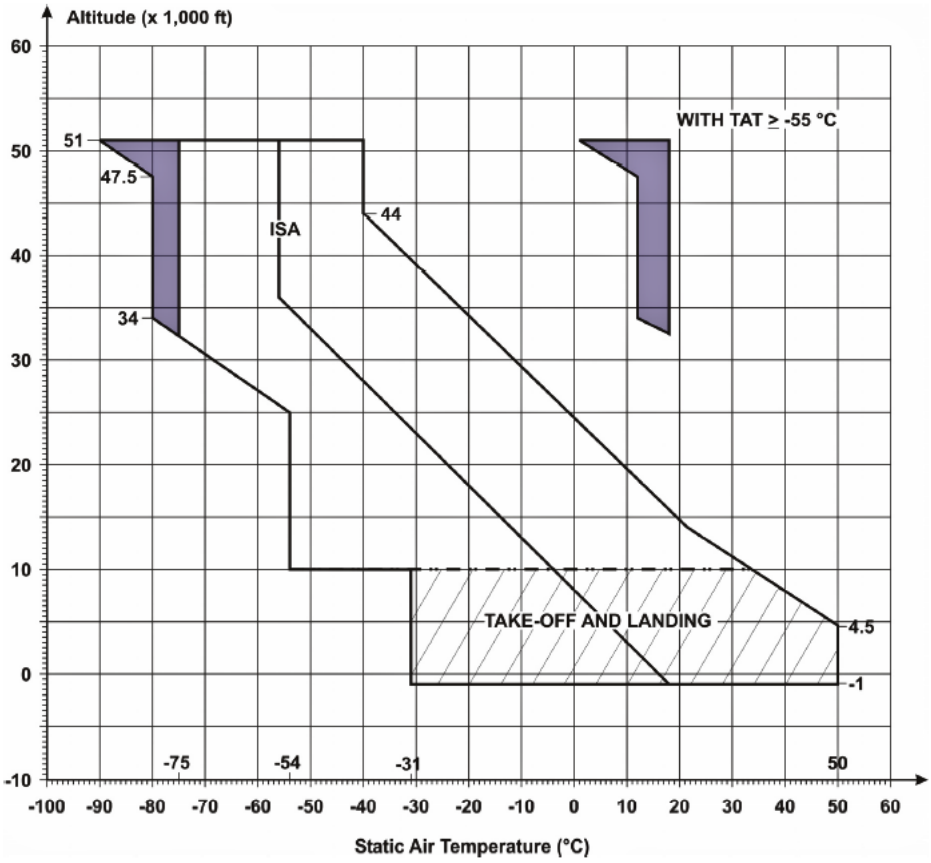
MINIMUM CONTROL SPEED ON THE GROUND: VMCG

VMCG ..... 81.3 KIAS.

MISCELLANEOUS LIMIT SPEEDS

Tire maximum operating speed ..... 195 kt (225 mph), ground speed.

Temperature and Altitude Limits



Engine Limitations

THRUST RATINGS (UNINSTALLED, SEA LEVEL, ISA).

- Take–off .....6405 lb (2849 daN)
- Maximum continuous .....6405 lb (2849 daN)

THRUST SETTING

The engine low pressure rotor speed N1 is used as the thrust setting parameter.

MAXIMUM ENGINE ROTOR SPEEDS: N1 AND N2

Condition of use	N1	N2
Take–off - Maximum continuous	101.0 %	100.0 %
Transient ..... 10 second max. allowable		100.5 %
Transient ..... 15 second max. allowable	101.6 %	

- 100 % N1 = 11000 rpm
- 100 % N2 = 28500 rpm

MAXIMUM INTERSTAGE TURBINE TEMPERATURE: ITT

Ground start		950 °C
Air start		950 °C
Take-off	5 minutes max.	920 °C
Maximum continuous		920 °C

OIL PRESSURE

Thrust setting	Minimum pressure	Maximum pressure
Ground idle	20 psid	145 psid
Flight idle and above	35 psid	145 psid
Transient		200 psid less than 4 minutes

OIL TEMPERATURE

Thrust setting	Minimum temperature	Maximum temperature
Starting	-40°C	
Above ground idle	25°C if SAT < 5°C 16°C if SAT ≥ 5°C	
Steady state		141°C
Transient		146°C less than 5 minutes

Falcon 7X

Normal Checklist

wilco PUBLISHING
DASSAULT AVIATION

POWER OFF

CENTER INSTRUMENT PANEL

PARK BRAKE ..... SET
LANDING GEAR CONTROL ..... DOWN

PEDESTAL

POWER LEVERS (all 3) ..... IDLE
ENG FUEL SWITCHES (all 3) ..... OFF
ENGINE ROTARY SWITCH ..... NORMAL
AIRBRAKES ..... AB 0
STATS / FLAPS ..... SF 0

OVERHEAD PANEL

ELECTRICAL SECTION

BAT 1..... OFF
BAT 2..... OFF

AIR COND'G SECTION

ECS PACK ..... NORMAL

OXYGEN SECTION

OXYGEN ..... NORMAL

LIGHTS

LANDING LIGHTS (both) ..... OFF
EMERG LIGHTS ..... OFF

POWER ON

BATT 1 ..... ON
BATT 2 ..... ON
LH INIT ..... ON
RH INIT ..... ON
ELEC SYNOPTIC..... CHECK
BUS TIE ..... TIED
NWS ..... OFF
FIRE DETECTION ..... TEST

APU START

APU MASTER ..... ON
APU START /STOP ..... START
ELEC SYNOPTIC..... CHECK

GPU START (IF APU IS NOT AVAILABLE)

EXT POWER ..... ON
ELEC SYNOPTIC ..... CHECK

CABIN MASTER ..... OFF
LH ISOL ..... TIE (unlighted)
RH ISOL ..... TIE (unlighted)
LH MASTER ..... ON (unlighted)
RH MASTER ..... ON (unlighted)
PDU DISPLAYS ..... CHECK ON
MFD DISPLAYS ..... CHECK ON
CABIN MASTER ..... ON (unlighted)
GALLEY MASTER ..... ON (unlighted)
NAV LIGHTS ..... LOGO
COCKPIT LIGHTS ..... AS REQ
EMERG LIGHTS ..... TEST and ARM
FASTEN BELT ..... ON
NO SMOKING ..... ON
CABIN LIGHTS ..... ALL (unlighted)

COCKPIT PREPARATION

ATIS ..... COPY
ALTIMETERS / SFD ..... QNH
FLIGHT PLAN ..... LOAD
FMW DEPARTURE ..... SET
TAKE-OFF PERFORMANCE ..... CHECK
T/O ARMS A/T ..... SELECT
GUIDANCE PANEL ..... SET
ATC RADIO ..... SET FREQ
NAV RADIOS ..... SET FREQ
TRANSPONDER ..... SET CODE

BEFORE START

PARK BRAKE ..... SET
DOORS ..... CLOSE
ANTICOL ..... RED

ENGINE START

BLEED APU ..... AUTO

CENTER ENGINE (ENG 2) :
ENG FUEL SW 2 ..... ON
ENG ROTARY SWICH ..... START (1 sec)
FUEL BOOST 2 ..... CHECK AUTO
GEN 2 ..... CHECK ON

RIGHT ENGINE (ENG 3) :
ENG FUEL SW 3 ..... ON
ENG ROTARY SWITCH ..... START (1 sec)
FUEL BOOST 3 ..... CHECK AUTO
GEN 3 ..... CHECK ON

LEFT ENGINE (ENG 1) :
ENG FUEL SW 1 ..... ON
ENG ROTARY SWITCH ..... START (1 sec)
FUEL BOOST 1 ..... CHECK AUTO
GEN 1 ..... CHECK ON

AFTER START

OVERHEAD PANEL
BUS TIE ..... UNTIE (unlighted)
APU START / STOP ..... STOP
APU MASTER ..... OFF
HYD BACKUP PUMP ..... AUTO
ENG ANTI-ICE ..... AS REQ

SFD ..... CHECK
FLIGHT CONTROLS ..... CHECK
TRANSPONDER ..... ALT ON
AIRBRAKES TEST ..... PERFORM
NWS ..... ON (unlighted)
SLATS / FLAPS ..... SF 1 or SF 2

TAXI

TAXI CLEARANCE ..... OBTAIN
AREA ..... CLEAR
TAXI LIGHTS ..... ON
PARK BRAKE ..... FULLY FORWARD
BRAKES ..... TEST
THRUST REVERSER TEST ..... PERFORM

LINE-UP

AREA ..... CLEAR
FLIGHT CONTROLS ..... FREE
ANTICOL ..... ALL (unlighted)
LANDING LIGHTS (both) ..... PULSE
TRANSPONDER ..... TA/RA

WHEN CLEARED FOR TAKE-OFF
LANDING LIGHTS (both) ..... ON

AFTER TAKE OFF

POSITIVE CLIMB
LANDING GEAR ..... UP
TAXI LIGHTS ..... OFF
WINGS ANTI-ICE ..... AS REQ

AT OR ABOVE 400 FT AAL
CLB MODE ..... SET
SPEED ..... SET
AUTOPILOT ..... ON

IF A/T ARMS T/O SELECTED
AUTOTHROTTLE ..... CHECK ON

AT VFR
SLATS / FLAPS ..... SF 0

AT VFT
AUTOTHROTTLE ..... ON

WHEN CLEARED TO A FLIGHT LEVEL
ALTIMETERS / SFD ..... STD

CLIMB AT 10000 FT OR FL100

LANDING LIGHTS (both) ..... OFF
FASTEN BELT ..... AS REQ
ECS SYNOPTIC ..... CHECK

BEFORE DESCENT

ATIS ..... COPY
FMW ARRIVAL ..... SET
LANDING PERFORMANCE ..... CHECK
NAV RADIOS ..... SET FREQ

DESCENT AT 10000 FT OR FL100

LANDING LIGHTS (both) ..... PULSE
FASTEN BELT ..... AS REQ

APPROACH

WHEN CLEARED TO ALTITUDE
ALTIMETERS / SFD ..... QNH

FASTEN BELT ..... ON
APPROACH SETTINGS ..... SET

SLATS / FLAPS ..... SF 1 (max 200 ft)
SPEED ..... VREF + 35
LANDING GEAR ..... DOWN (max 200 ft)
SLATS / FLAPS ..... SF 2 (max 190 ft)
SPEED ..... VREF + 25
SLATS / FLAPS ..... SF 3 (max 180 ft)
SPEED ..... VREF

BEFORE LANDING

LANDING GEAR ..... 3 GREENS
SLATS / FLAPS ..... SF 3

LANDING

ENGINES ..... IDLE
BRAKES ..... APPLY
AIRBRAKES ..... AB2 - CHECK
THRUST REVERSER ..... AS REQ

RUNWAY VACATED

BUS TIE ..... TIED

APU START
APU MASTER ..... ON
APU START / STOP ..... START

WINGS ANTI-ICE ..... OFF
ENG ANTI-ICE ..... AS REQ
ANTICOL ..... RED
LANDING LIGHTS ..... OFF
TRANSPONDER ..... ALT ON
SLATS / FLAPS ..... SF 0

AT RAMP

POWER LEVERS (all 3) ..... IDLE
PARK BRAKE ..... ON
ENG FUEL SW (all 3) ..... CUT OFF
TAXI LIGHTS ..... OFF
HYD BACKUP PUMP ..... OFF
BOOST 1 ..... OFF
BOOST 3 ..... OFF
Note: BOOST 2 still ON for APU
ENG ANTI-ICE ..... OFF

ANTICOL ..... OFF
FASTEN BELT ..... OFF
NO SMOKING ..... OFF
TRANSPONDER ..... STBY

SECURE AIRPLANE

APU START / STOP ..... OFF
APU MASTER ..... OFF
EMERG LIGHTS ..... OFF
BAT 1 ..... OFF
BAT 2 ..... OFF

Falcon 7X

Specifications & Performances

wilco PUBLISHING
DASSAULT AVIATION

Falcon 7X

PERFORMANCE TAKEOFF					
SF1 DRY - 0 ft - 15°C					
TOW (lb)	V1 (kt)	VR (kt)	V2 (kt)	VFR (kt)	VFT (kt)
40000	95	103	109	139	152
42000	96	104	112	142	156
44000	98	107	114	144	160
46000	101	109	116	146	164
48000	104	112	118	148	167
50000	107	114	121	151	171
52000	110	116	123	153	174
54000	112	118	125	155	177
56000	115	120	127	157	180
58000	117	122	129	159	183
60000	119	125	131	161	186
62000	122	127	133	163	190
64000	124	129	135	165	193
66000	126	131	137	167	196
68000	128	132	139	169	199
70000	130	134	140	170	202

VFR = V2+30Kt

Wind (kt) = +0.0 ; Runway Slope (%) = +0.0

Falcon 7X

PERFORMANCE TAKEOFF					
SF2 DRY - 0 ft - 15°C					
TOW (lb)	V1 (kt)	VR (kt)	V2 (kt)	VFR (kt)	VFT (kt)
40000	95	101	107	137	152
42000	94	101	108	138	156
44000	94	102	110	140	160
46000	97	104	112	142	164
48000	100	106	113	143	167
50000	102	108	115	145	171
52000	105	111	117	147	174
54000	107	113	119	149	177
56000	110	115	121	151	180
58000	112	117	122	152	183
60000	114	119	124	154	186
62000	117	121	126	156	190
64000	119	123	128	158	193
66000	121	125	129	159	196
68000	123	126	131	161	199
70000	125	128	133	163	202

VFR = V2+30Kt

Wind (kt) = +0.0 ; Runway Slope (%) = +0.0

Falcon 7X

LANDING PERFORMANCE - SF3					
LANDING WEIGHT (lb)	VREF (kt)	LANDING DISTANCE			
		0 ft	2000 ft	4000 ft	6000 ft
40000	106	2125	2201	2281	2369
42000	109	2189	2270	2356	2449
44000	111	2255	2341	2433	2532
46000	114	2326	2418	2517	2624
48000	116	2397	2496	2602	2716
50000	119	2466	2570	2680	2800
52000	121	2534	2644	2758	2883
54000	123	2603	2718	2836	2966
56000	126	2676	2795	2920	3055
58000	128	2750	2872	3003	3143
60000	130	2824	2949	3086	3232
62000	132	2905	3032	3176	3326
64000	134	2985	3115	3265	3420
66000	136	3065	3198	3354	3514
68000	138	3150	3289	3448	3612
70000	140	3237	3382	3543	3713

Wind (kt) = +0.0

PERFORMANCE	
Range @ .80 Mach cruise (8 pax, 3 crew, NBAA IFR reserves)	5,950 nm / 11,020 km
MMO (Maximum Operating Mach Number)	Mach 0.90
Take Off Distance (SL – ISA, Max Take Off Weight)	5,710 ft / 1,740 m
Landing Distance (Typical) (FAR Part 91, 8 pax, SL, NBAA IFR reserves)	2,070 ft / 630 m
Approach Speed (Typical Landing Weight)	104 kias / 195 km/h
Max. Certified Altitude	51,000 ft / 15,545 m

WEIGHTS/CAPACITIES		
Max. Takeoff Weight	70,000 lb	31,300 kg
Max. Landing Weight	62,400 lb	28,305 kg
Basic Operating Weight	34,272 lb	15,545 kg
Max. Fuel Weight	31,940 lb	14,490 kg
Max. Payload	6,000 lb	2,720 kg

ENGINES & AVIONICS
3 Pratt&Whitney Canada PW307A – 6,402 lb / 28.49 kN (Max Thrust, ISA + 17°C, SL)

EXTERNAL DIMENSIONS			CABIN DIMENSIONS		
Height	25 ft 8 in	7.83 m	Cabin Length	39.1 in	11.91 m
Length Overall	76 ft 1 in	23.19 m	Cabin Height	74 in	1.88 m
Wing Span	86 ft	26.21 m	Cabin Width	92 in	2.34 m
			Cabin Volume	1,552 ft^3	44 m^3
			Baggage Volume	140 ft^3	4 m^3
			Crew / Passengers	2-3 / 8-19	

Falcon 7X

Systems

wilco PUBLISHING
DASSAULT AVIATION

Contents

Quick Reference

Topic	Page
Powering up systems/avionics	4
Starting Engines	44
Setting Environmental Control System	9
Setting Cabin Pressurization	11
Basic Fuel System Configuration	13

This space left intentionally blank

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.

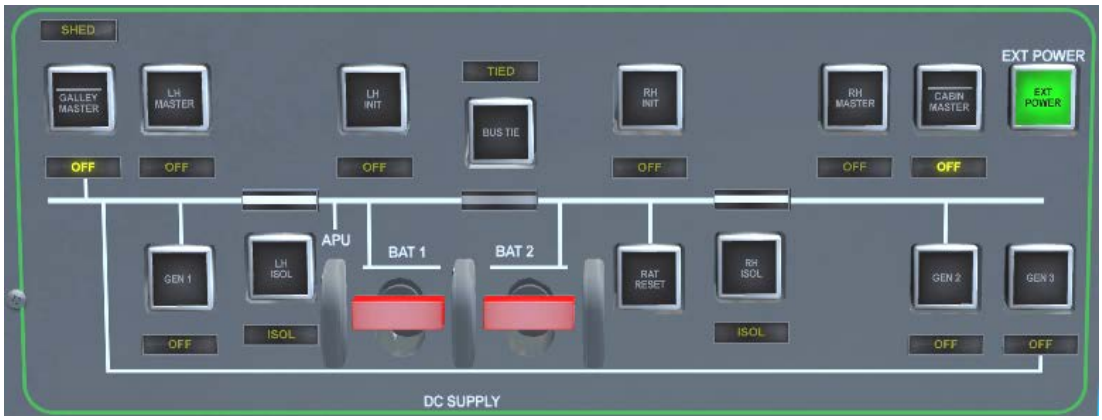


Figure 1 DC SUPPLY SECTION OF THE OVERHEAD PANEL

Providing Power to The Systems

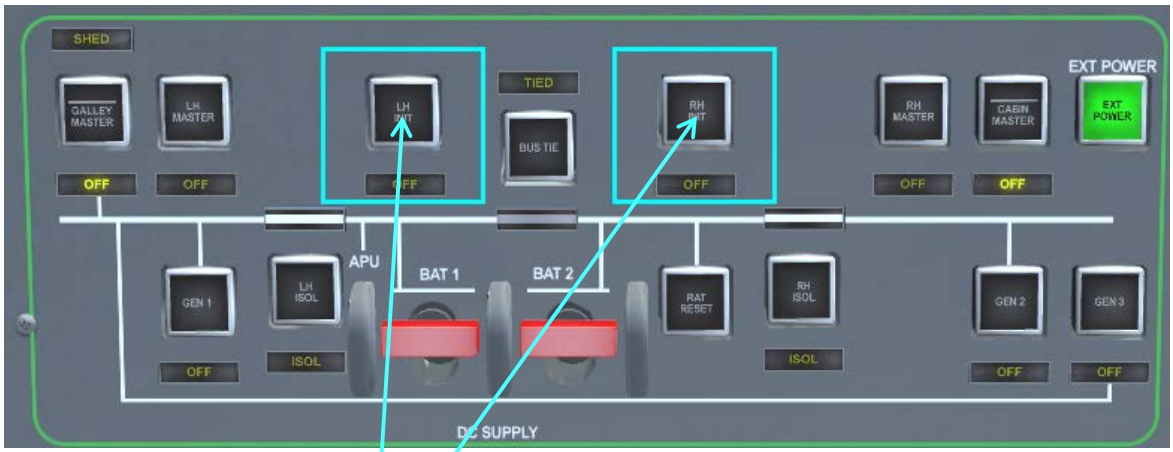
BEFORE GROUND PROCEDURES START

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).

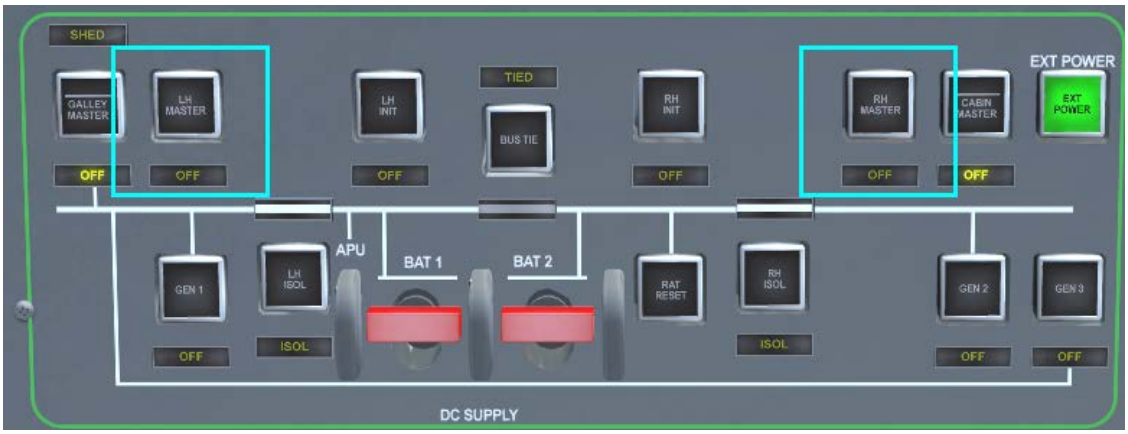


Figure 3 POWER PANEL MASTER BUS CUIRCUITS

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.

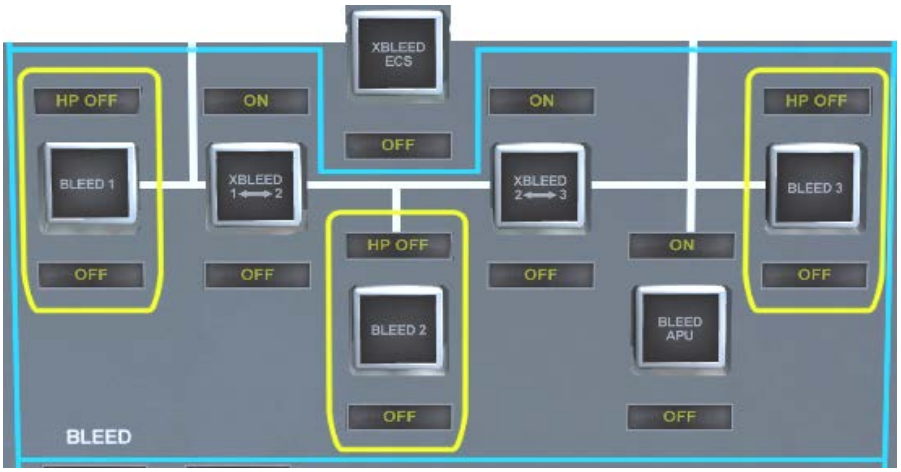


Figure 5 BLEED AIR CONTROLS

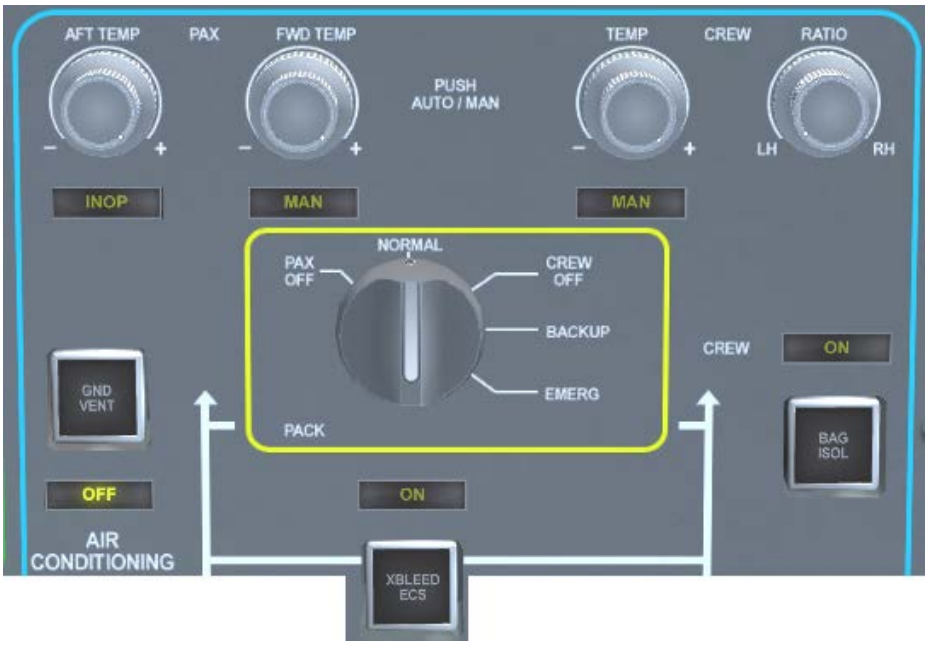


Figure 6 AIR CONDITIONING OVERHEAD PANEL

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

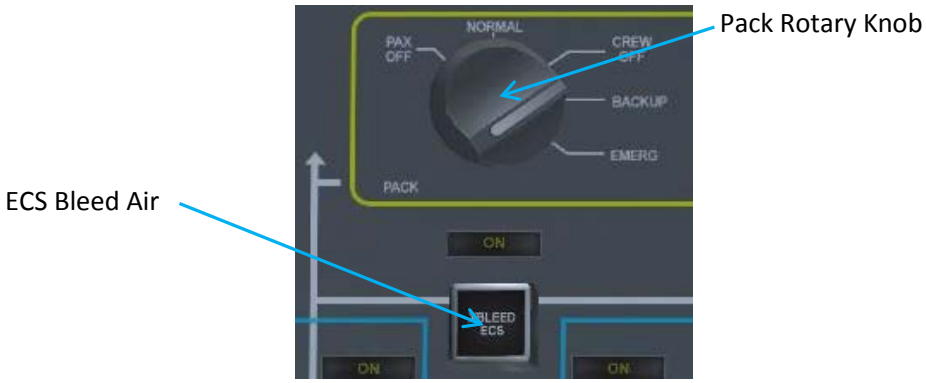


Figure 7 ECS CONTROLS

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.

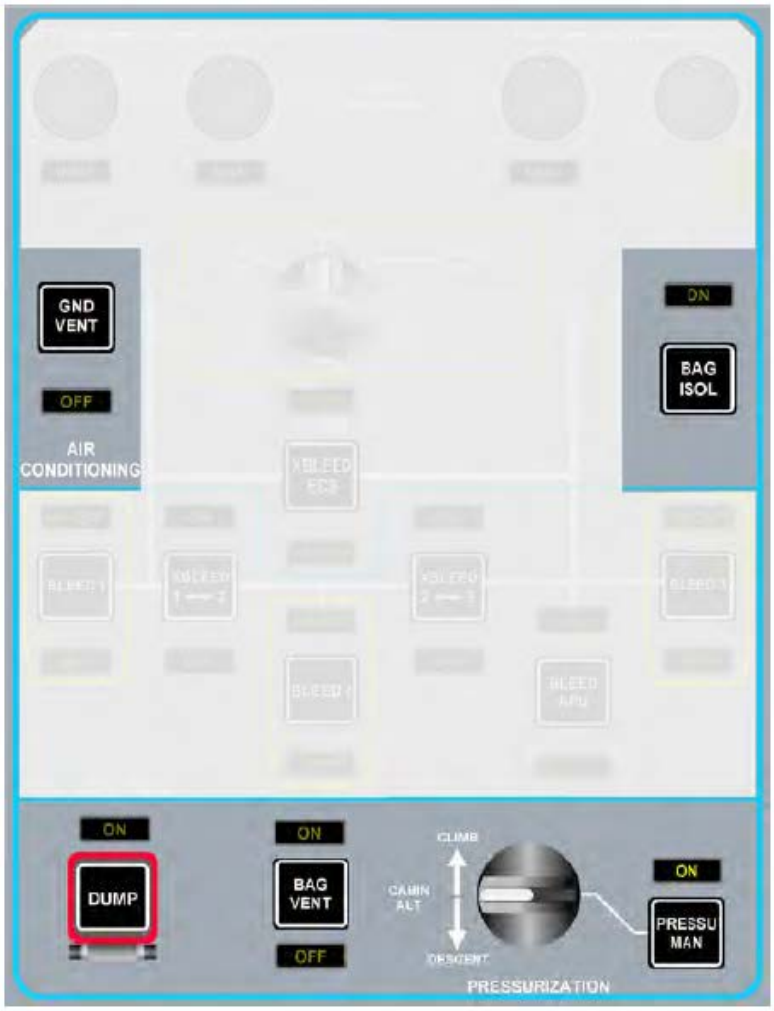


Figure 8 CABIN PRESSURIZATION CONTROLS

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.

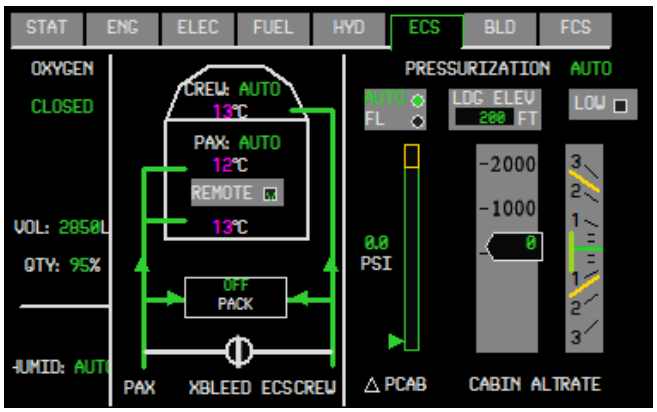


Figure 9 ECS SYNOPTIC PAGE

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

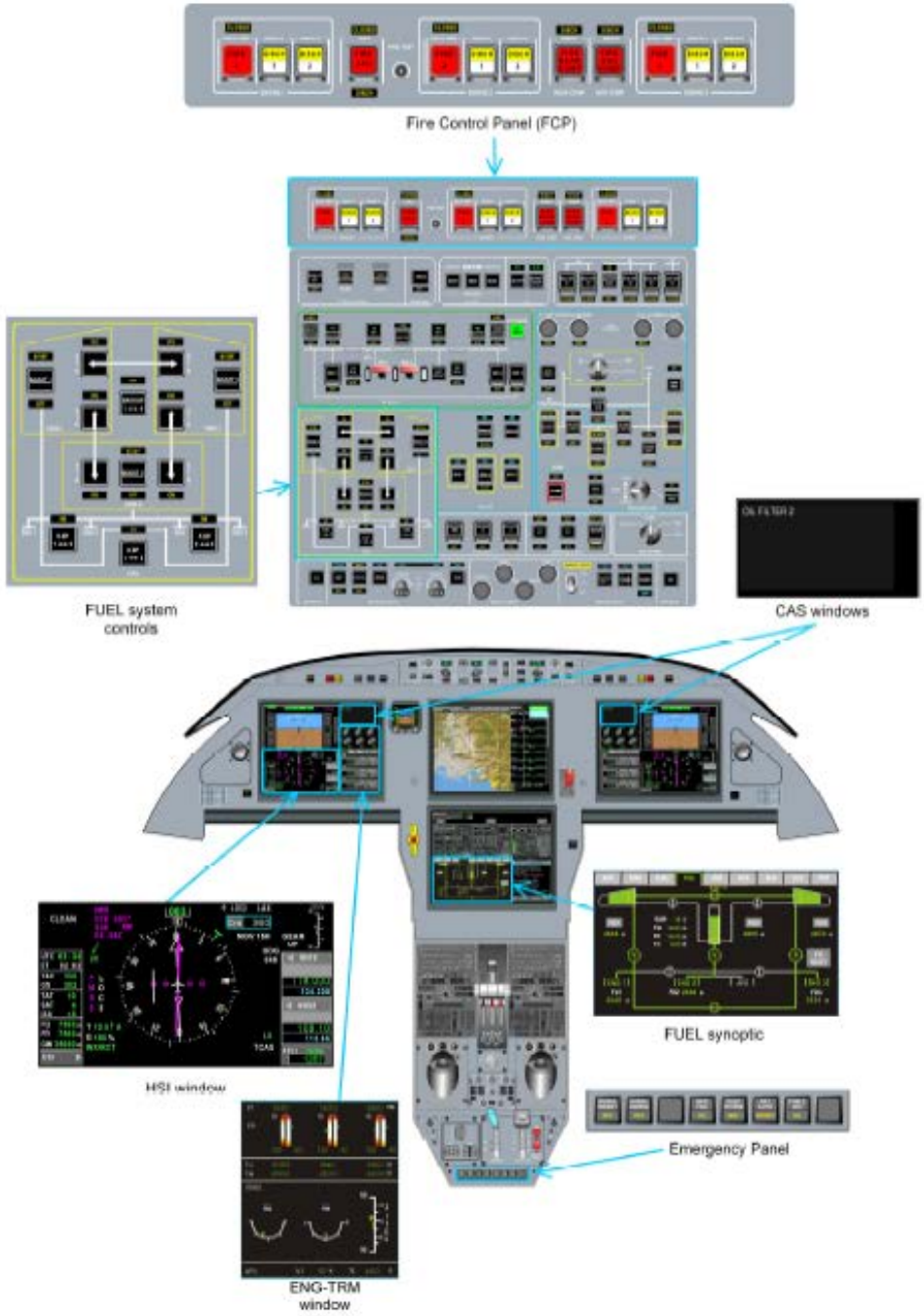


Figure 10 FUEL SYSTEM FLIGHT DECK OVERVIEW

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.

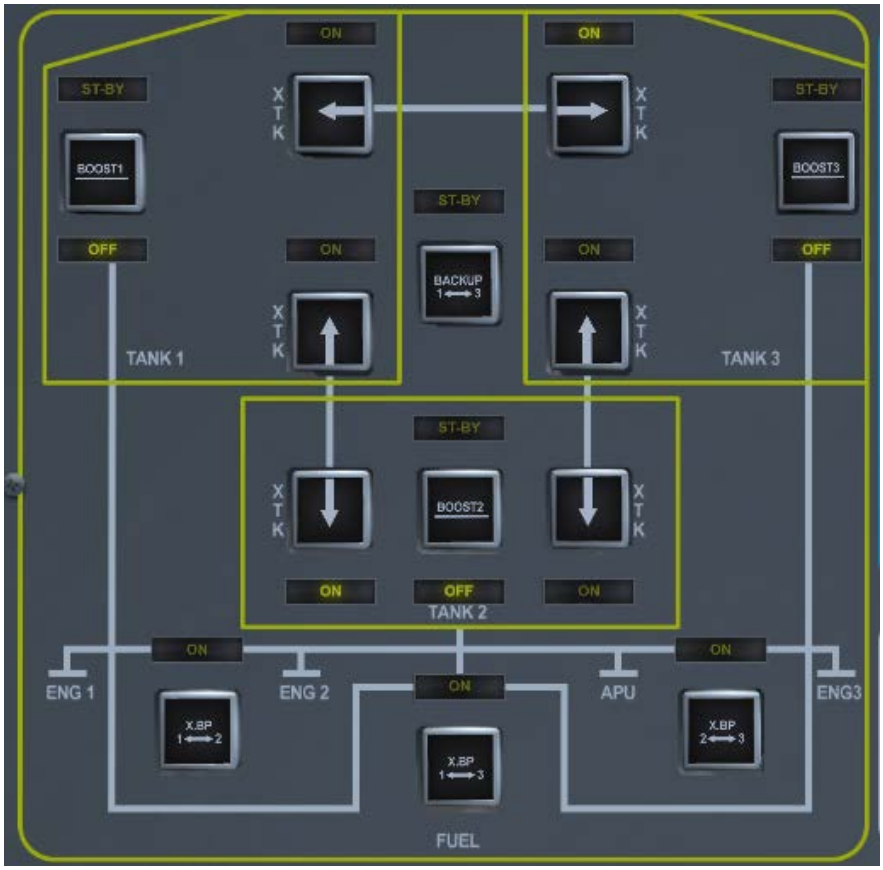


Figure 11 FUEL SECTION OF THE OVERHEAD PANEL

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

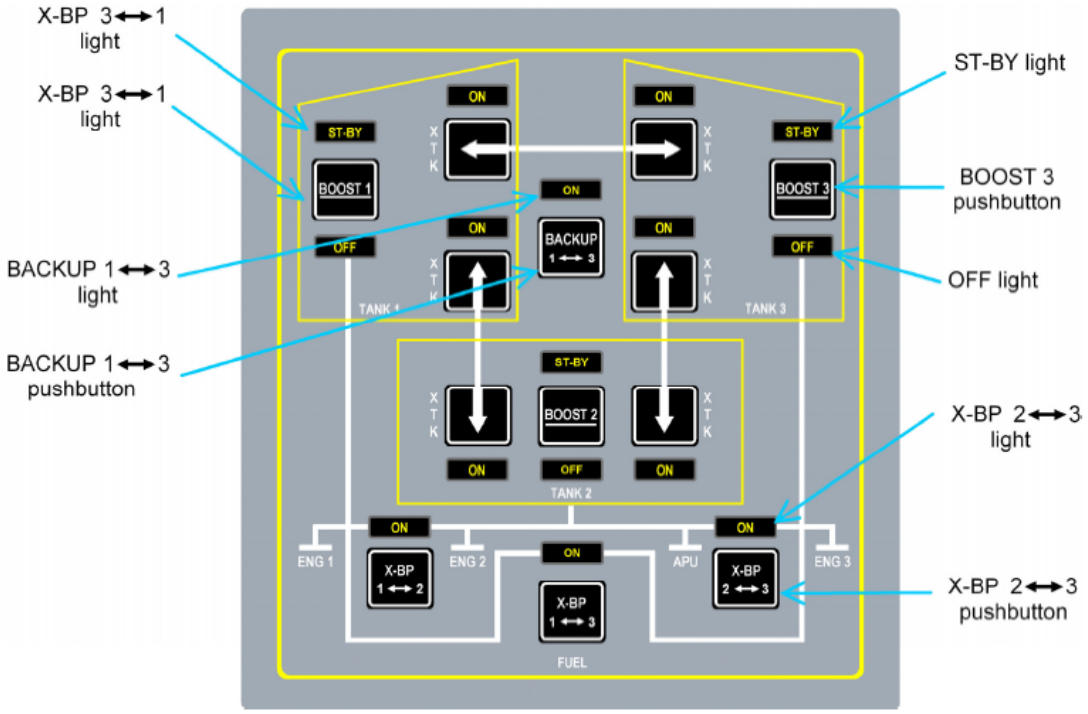


Figure 12 FUEL SYSTEM SECTION OF THE OVERHEAD PANEL

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

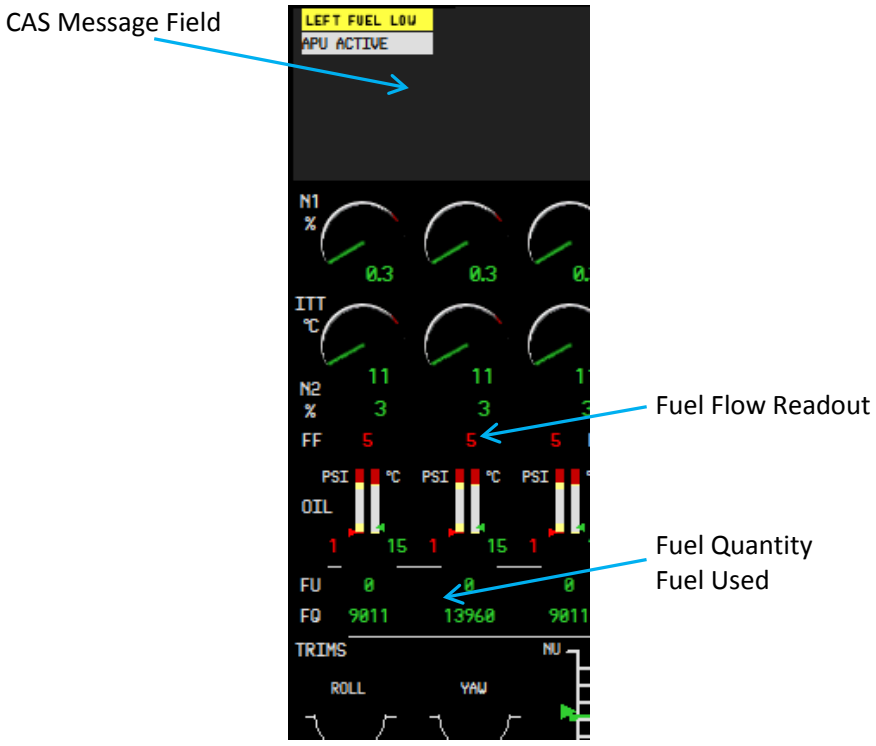


Figure 13 PDU ENG/TRIM WIINDOW

FUEL SYNOPTICS PAGE

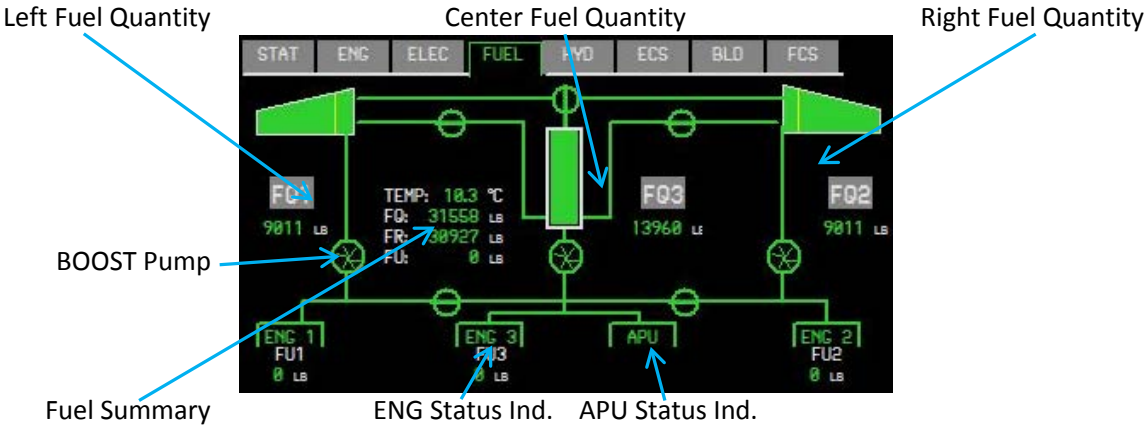


Figure 14 FUEL SYNOPTIC PAGE

Graphic representation of fuel quantity represents tank quantity.

Fuel System Principle

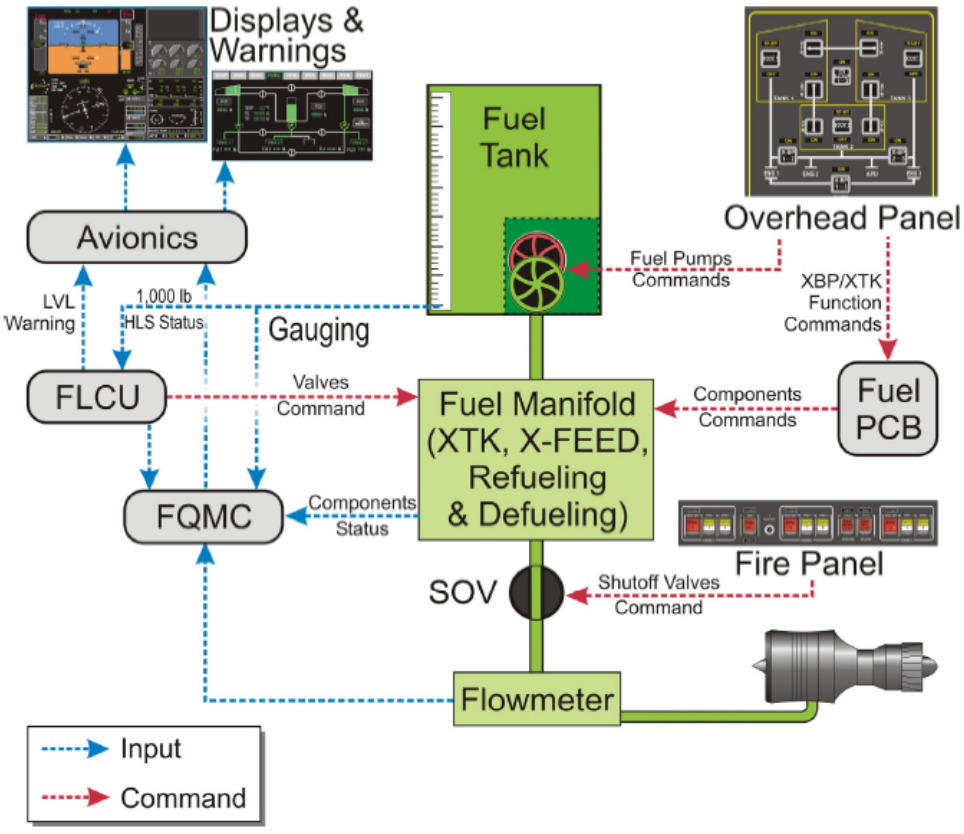


Figure 15 FUEL SYSTEM FLOW CHART

Bleed Air System

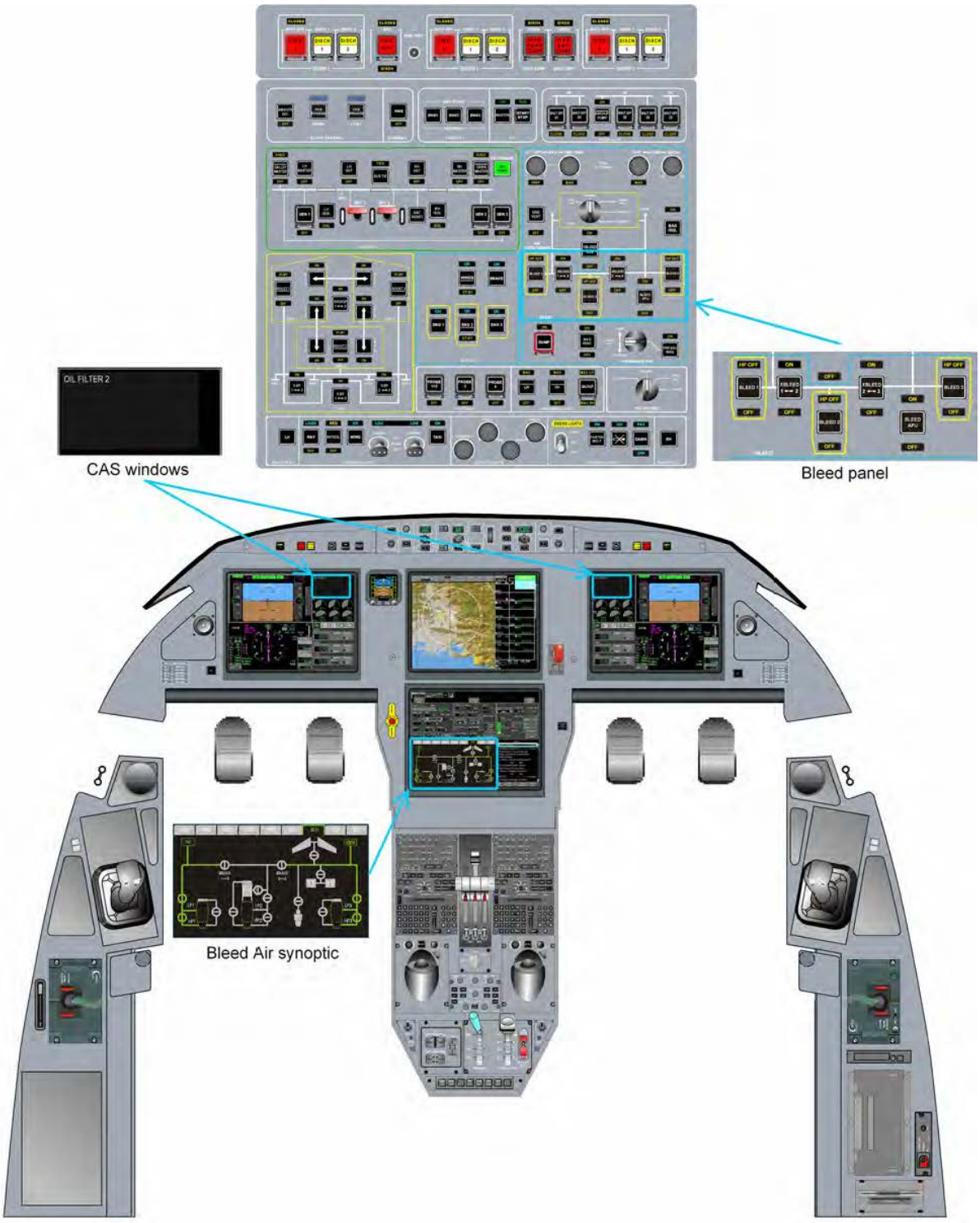


Figure 16 FLIGHT DECK BLEED AIR SYSTEM

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.

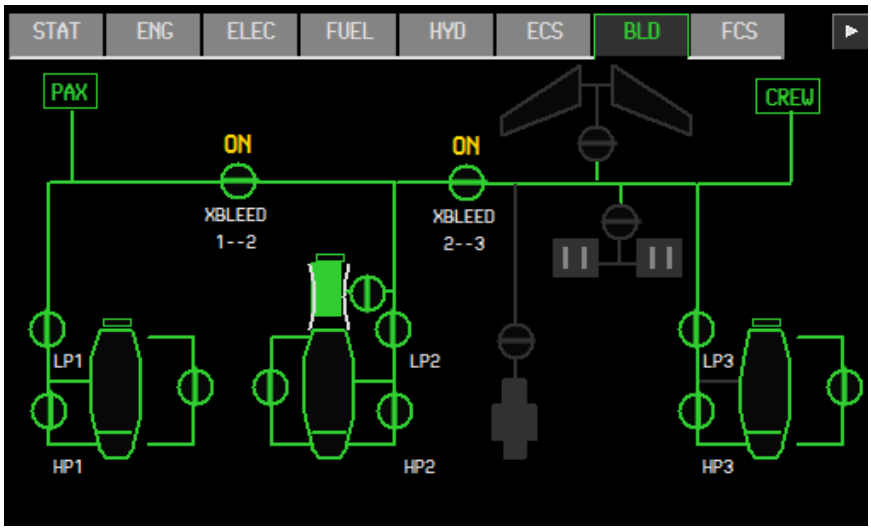


Figure 17 BLEED SYSTEM SYNOPTIC PAGE

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.

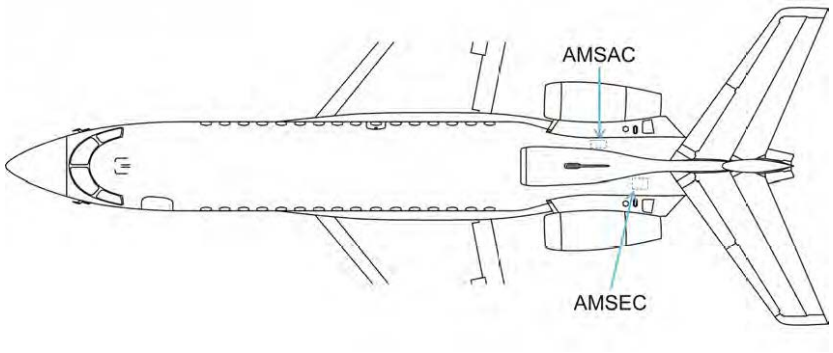


Figure 18 BLEED AIR EQUIPMENT LOCATION

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).

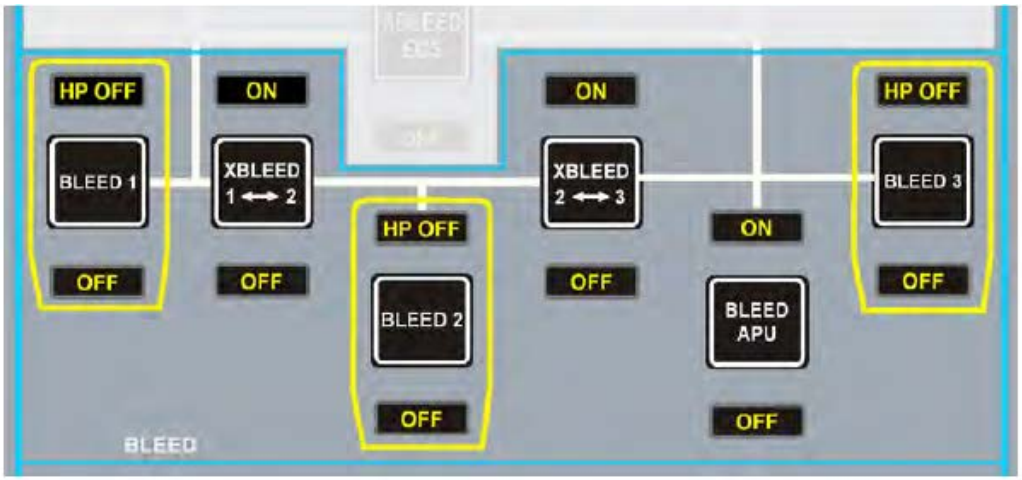
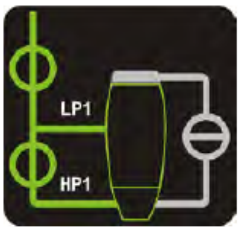
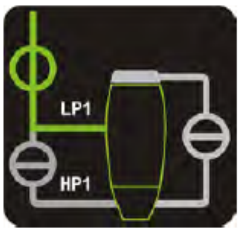
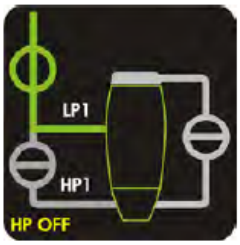
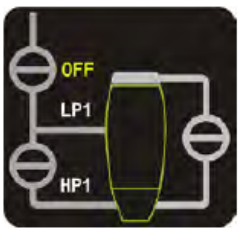
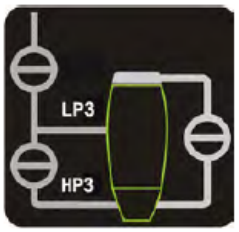
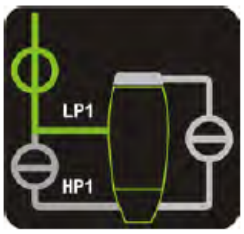
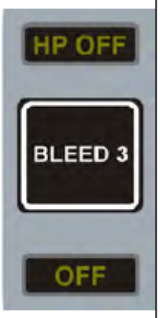
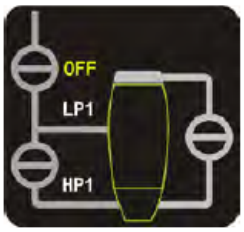


Figure 19 OVERHEAD BLEED AIR CONTROL PANEL

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.

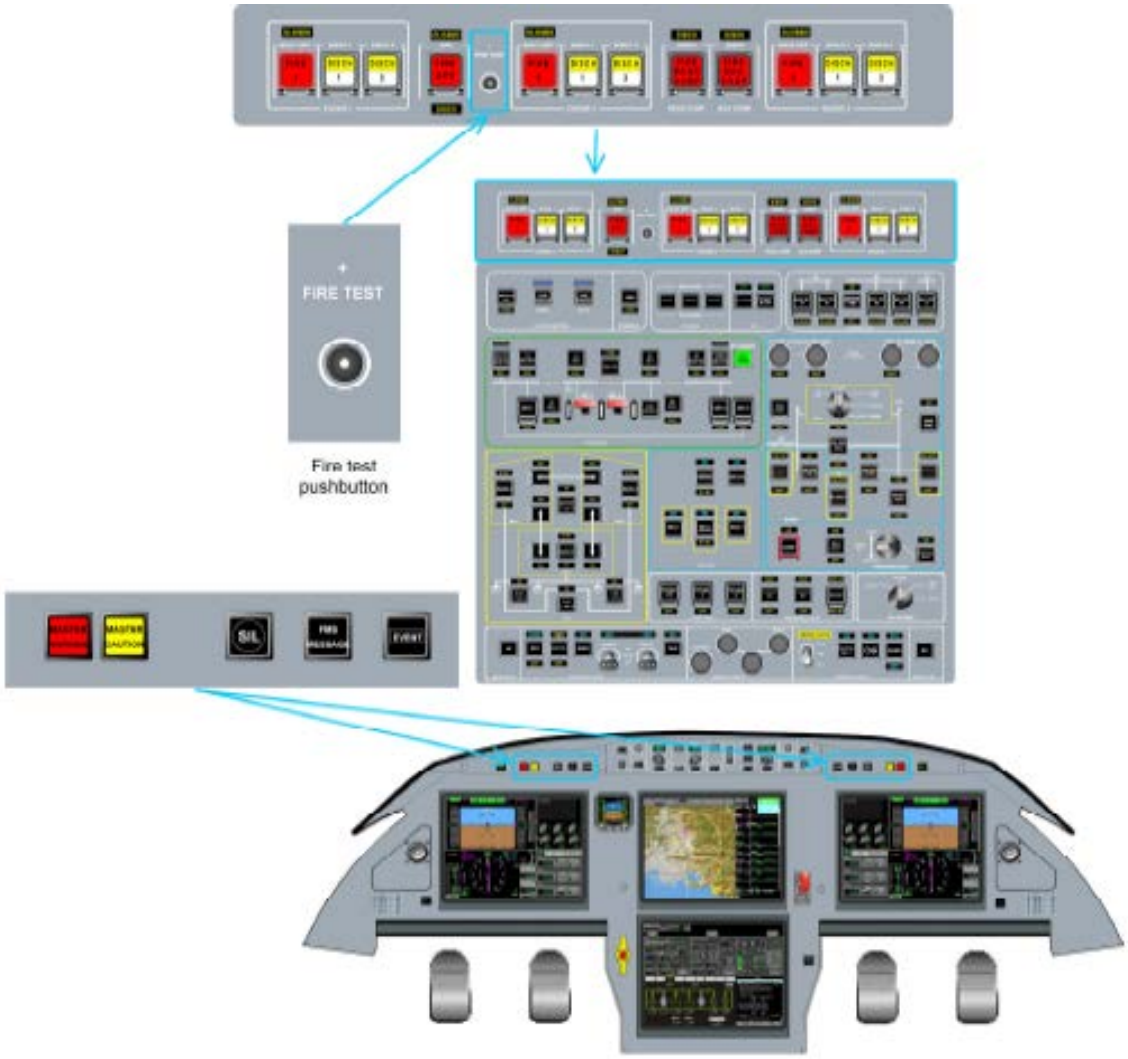


Figure 20 FIRE PROTECTION CONTROLS

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

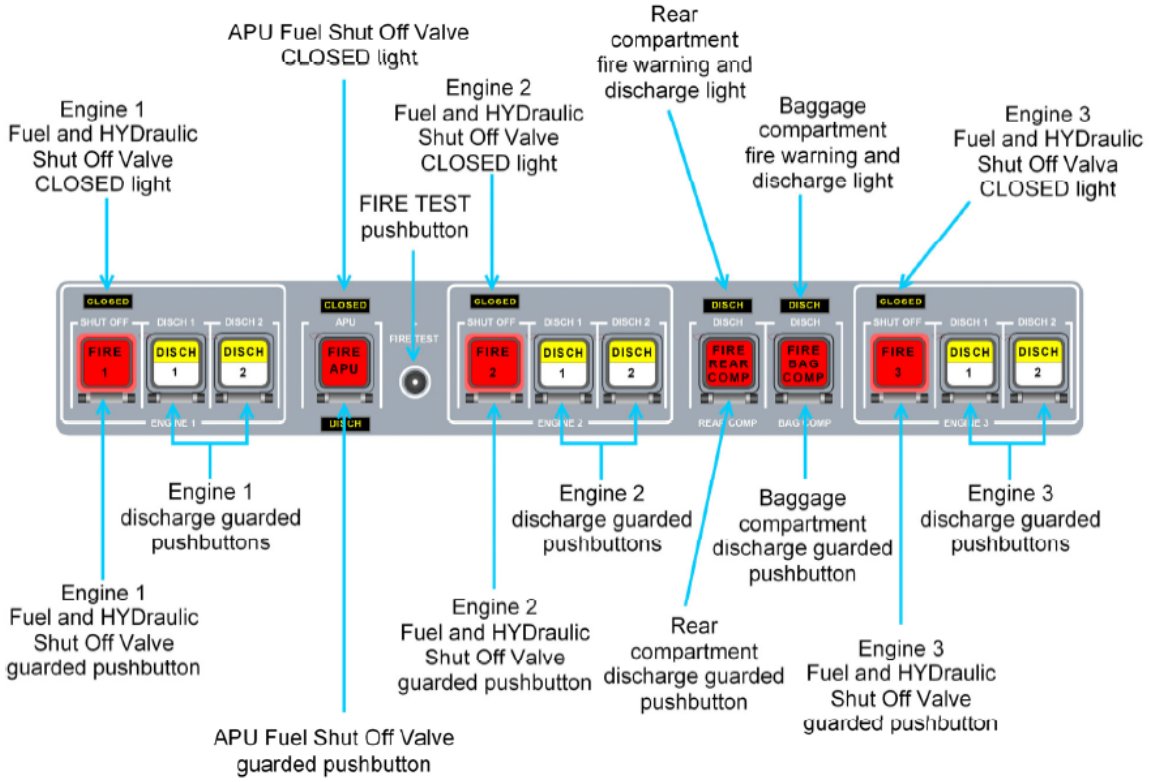


Figure 21 FIRE CONTROL PANEL

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.

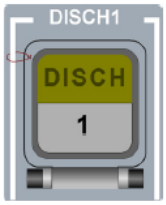
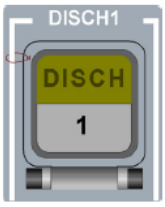
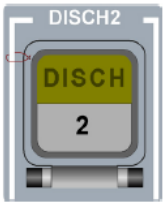
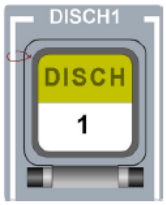
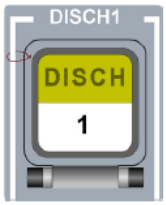
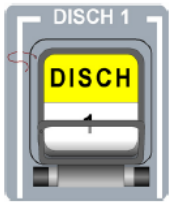
The Fire Control Panel includes:

- "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.

This space left intentionally blank

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
		Safety guarded, **FIRE** pushbutton not pushed yet 	
 	Indicates extinguisher available Discharges extinguishing agent from built-in extinguisher(s) to the detected engine fire	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.
	Indicates extinguisher discharged	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.

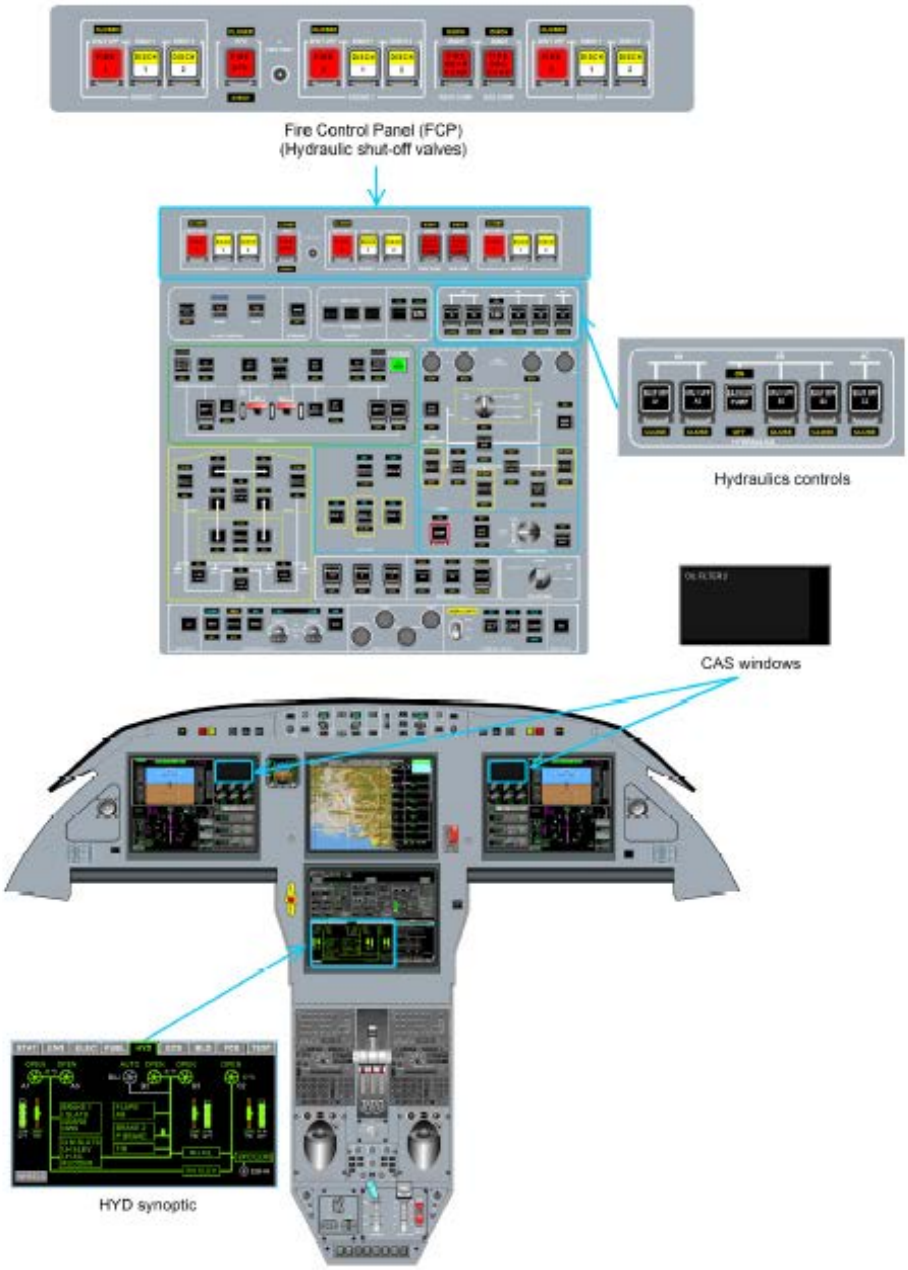


Figure 22 HYDRAULIC SYSTEM FLIGHT DECK OVERVIEW

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

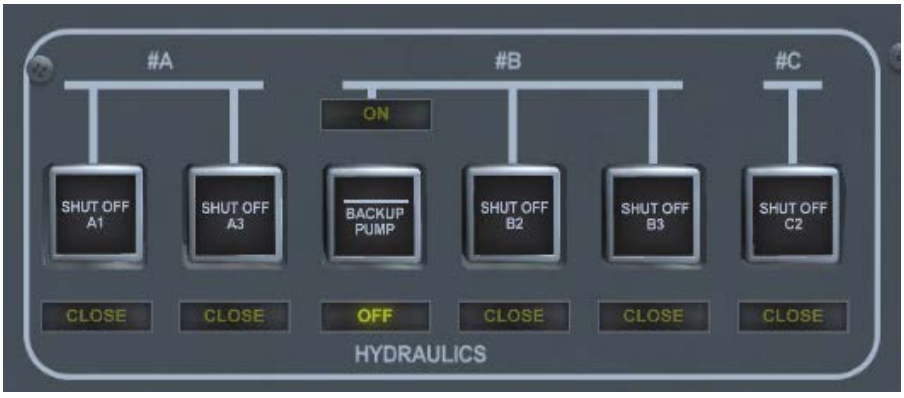
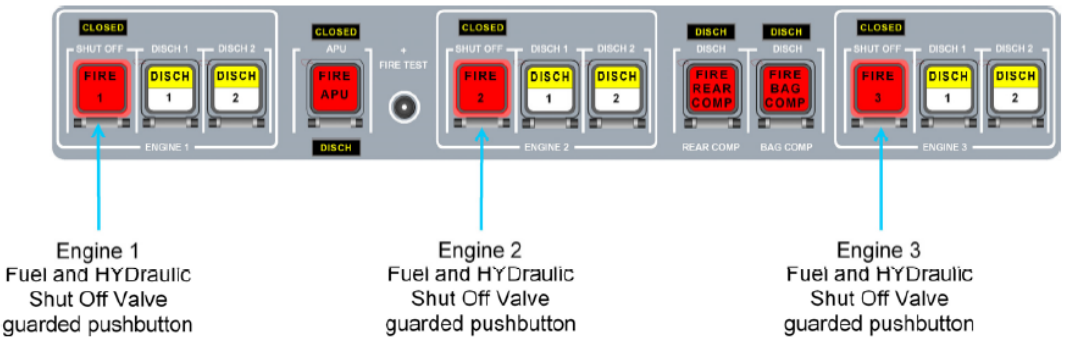


Figure 23 HYDRAULIC SECTION OF OVERHEAD PANEL

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.



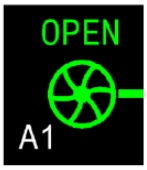
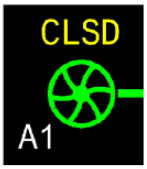
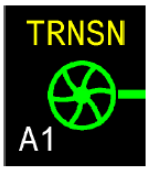
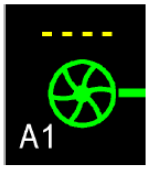
Engine 1
Fuel and HYDraulic
Shut Off Valve
guarded pushbutton

Engine 2
Fuel and HYDraulic
Shut Off Valve
guarded pushbutton

Engine 3
Fuel and HYDraulic
Shut Off Valve
guarded pushbutton

Figure 24 HYDRAULIC FIREWALL SHUT-OFF VALVE CONTROL

This space left intentionally blank

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).

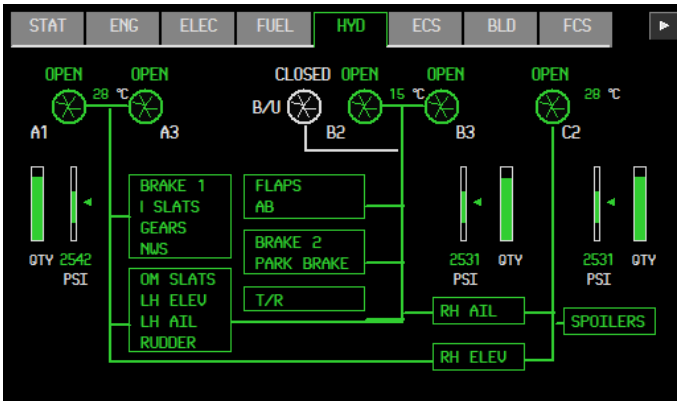
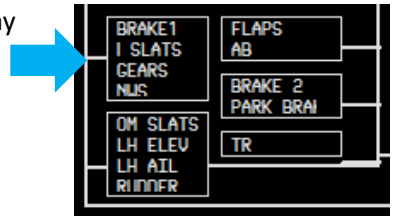


Figure 25 HYDRAULICS SYNOPTIC PAGE

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



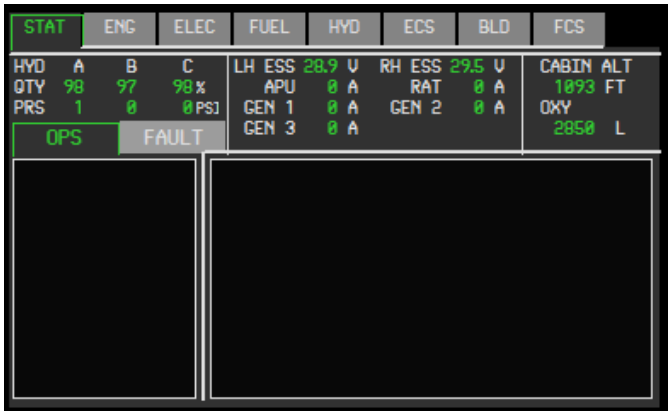


Figure 26 STATUS SYNOPTIC PAGE

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

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

This space left intentionally blank

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*.

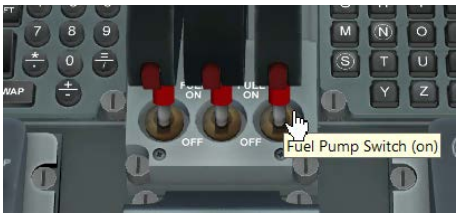
> *Simulator note:*
> *Common starting procedure in the simulator is to use Ctrl+E keystrokes to invoke the standard simulator "Start All Engines" command. This can only be accomplished in the Falcon if the System Realism selection is OFF on the Info Pad. See page 44 for more details.*

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.

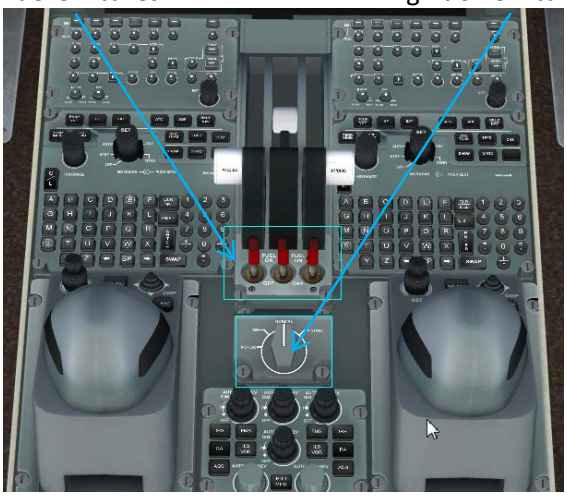
Ground Start

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

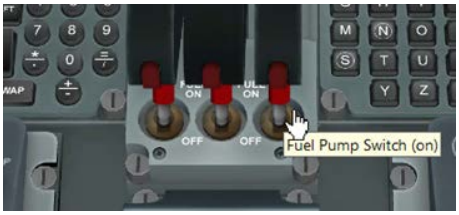


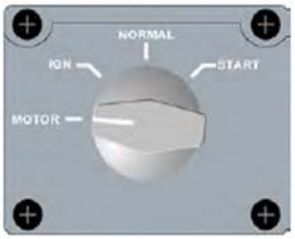
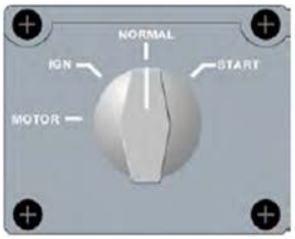
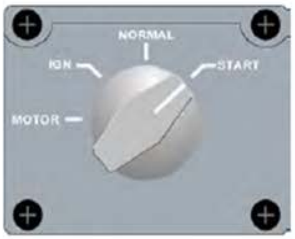
Figure 27 Fuel Switches

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

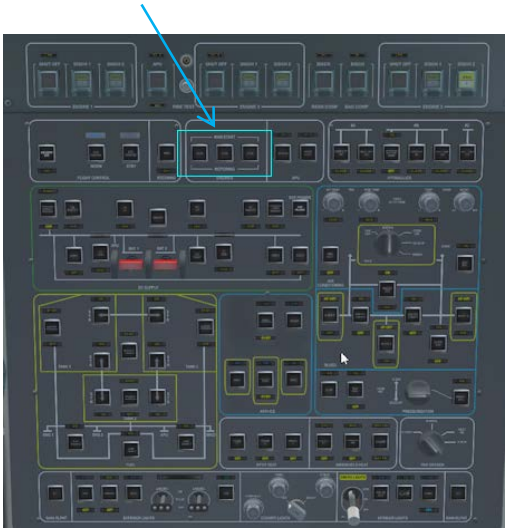
 Engine start selector	MOTOR: enables motoring and stop manually the starting sequence		
	IGN: activates all engine igniters simultaneously		
	NORMAL: normal position in normal flight		
	START: initiates the starting sequence of the selected engine. (spring-loaded position)		

MANUAL START PUSHBUTTONS

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

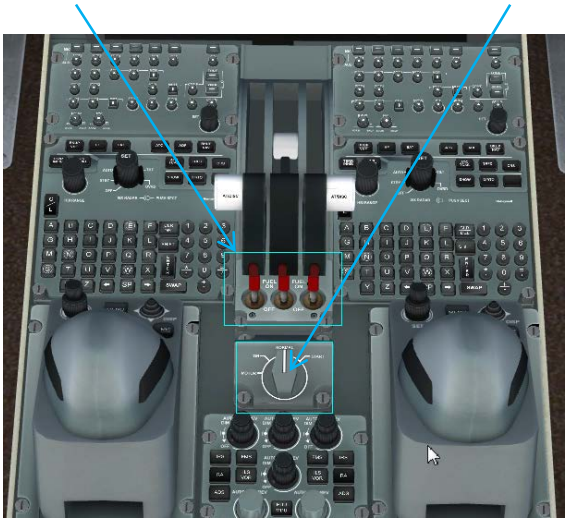
Locate the following controls:

Overhead Start Switches

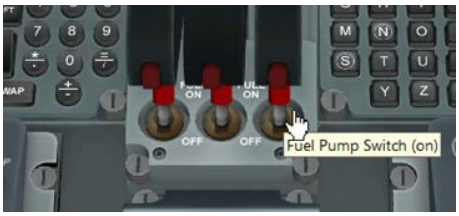


Fuel Switches

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.

This space left intentionally blank

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.

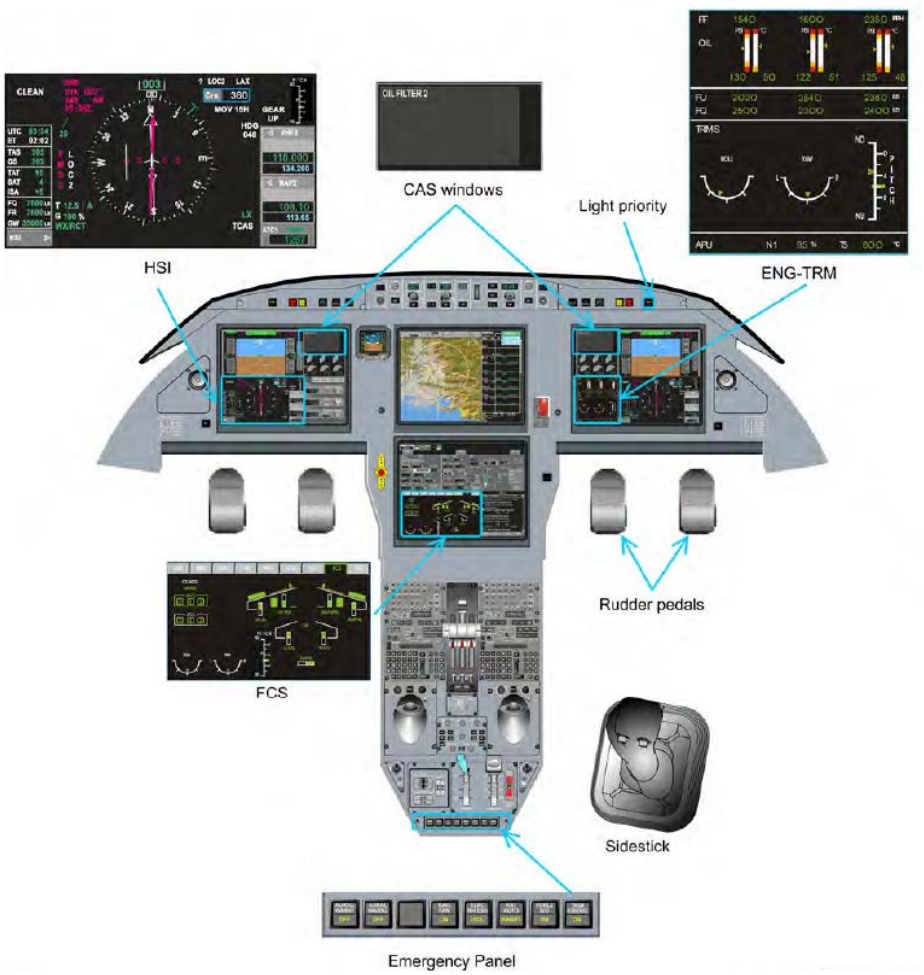


Figure 29 FLIGHT CONTROLS FLIGHT DECK OVERVIEW

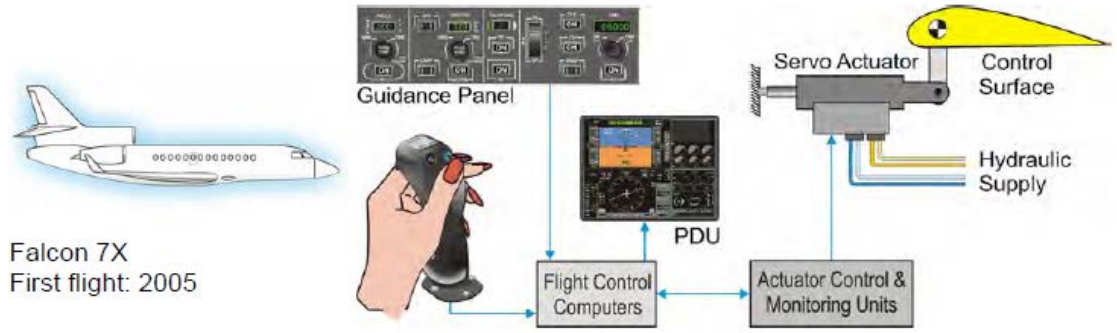
Fly By Wire Technology

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) are too unstable for Fly By Wire technology when the autopilot is off.

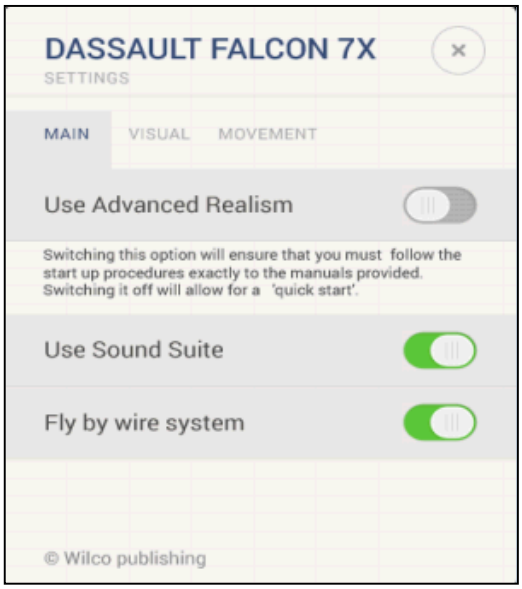


The digital FBW (Fly By Wire) technology allows improved safety by:

- 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.

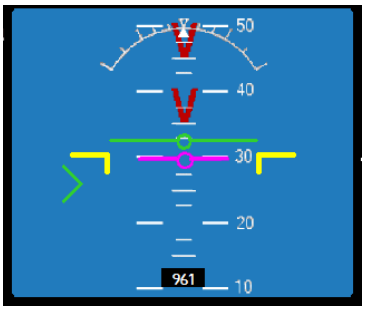
Excessive attitude/Roll protection

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:

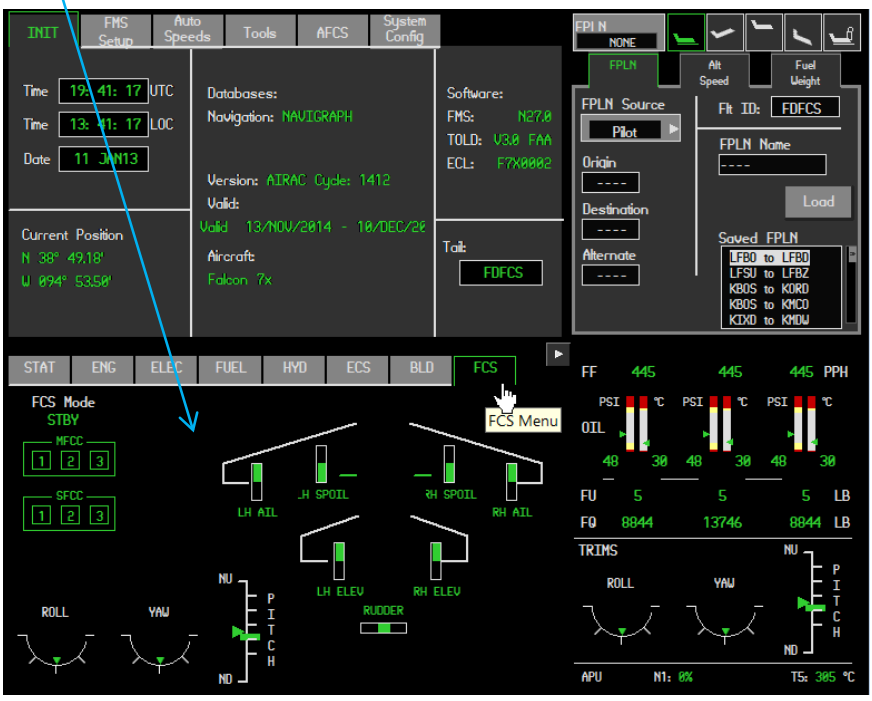
1. Main Computer (Flight Augmentation and Ailerons)
2. SEC Computer (Spoilers and Elevators)

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.

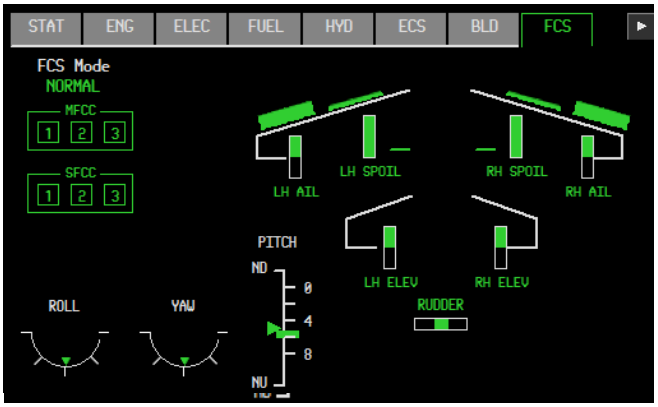


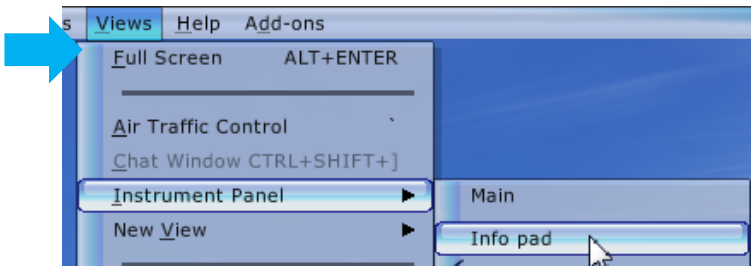
Figure 30 MFD 2 FCS SYNOPTIC PAGE

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



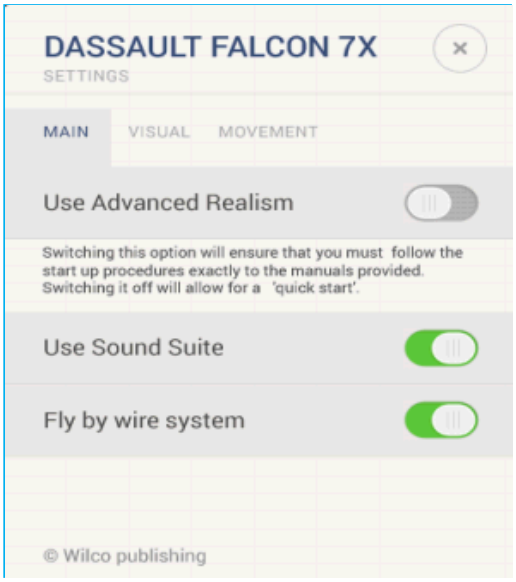


Figure 31 INFO PAD OPTIONS MENU

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.

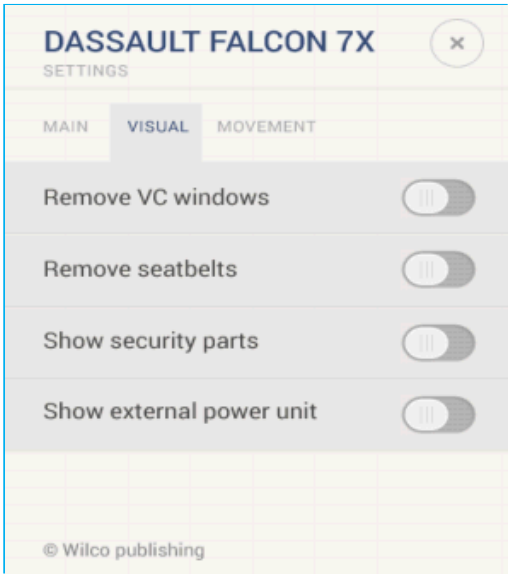


Figure 32 - INFO PAD VISUAL MENU

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

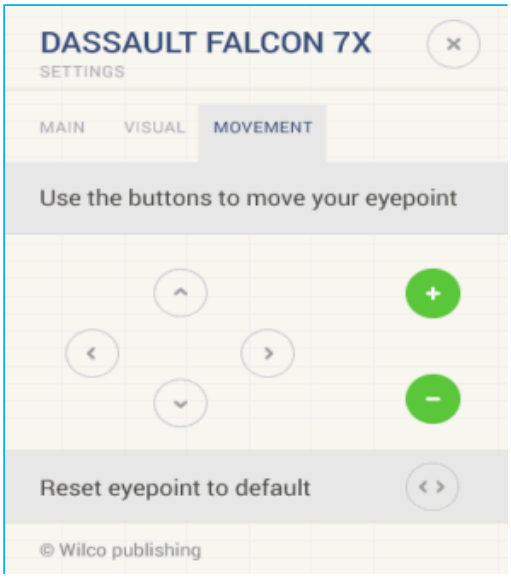


Figure 33 - INFO PAD MOVEMENT MENU

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

Illustrations