# Falcon 7X

# Avionics

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## Quick Start

*How do I…*

**Avionics Power Up**

**Loading a Flight Plan**

Error! Reference source not found.

**Loading a Standard Instrument Departure (SID)**

**Loading a Standard Arrival Route (**STAR)
**Add a waypoint to the Flight Plan**
**Delete a Waypoint**

**Flying using the FMS and Autopilot**
**Autothrottle (AT) Control**
**Setting the Yaw Damper**
**HSI Settings**
**Map Settings**
**Radio Tuning**

# 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

See the handbook *PDU Handbook.pdf* in this folder for a complete description of the PDU and a detailed guide on how to operate all of its features.

### 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.

See the handbook *MDU Handbook.pdf* in this folder for a complete description of both MDUs and a detailed guide on how to operate all of their features.

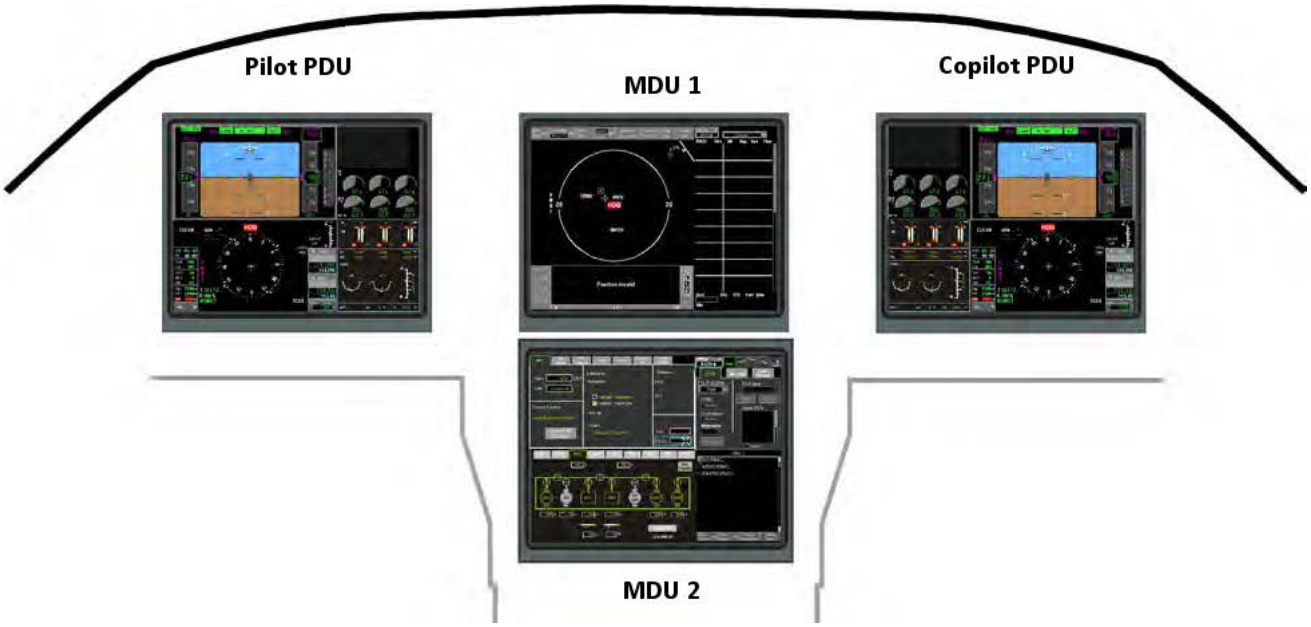


Figure 1 PILOT PDU

Figure 2 COPILOT PDU

Figure 3 MDU 1

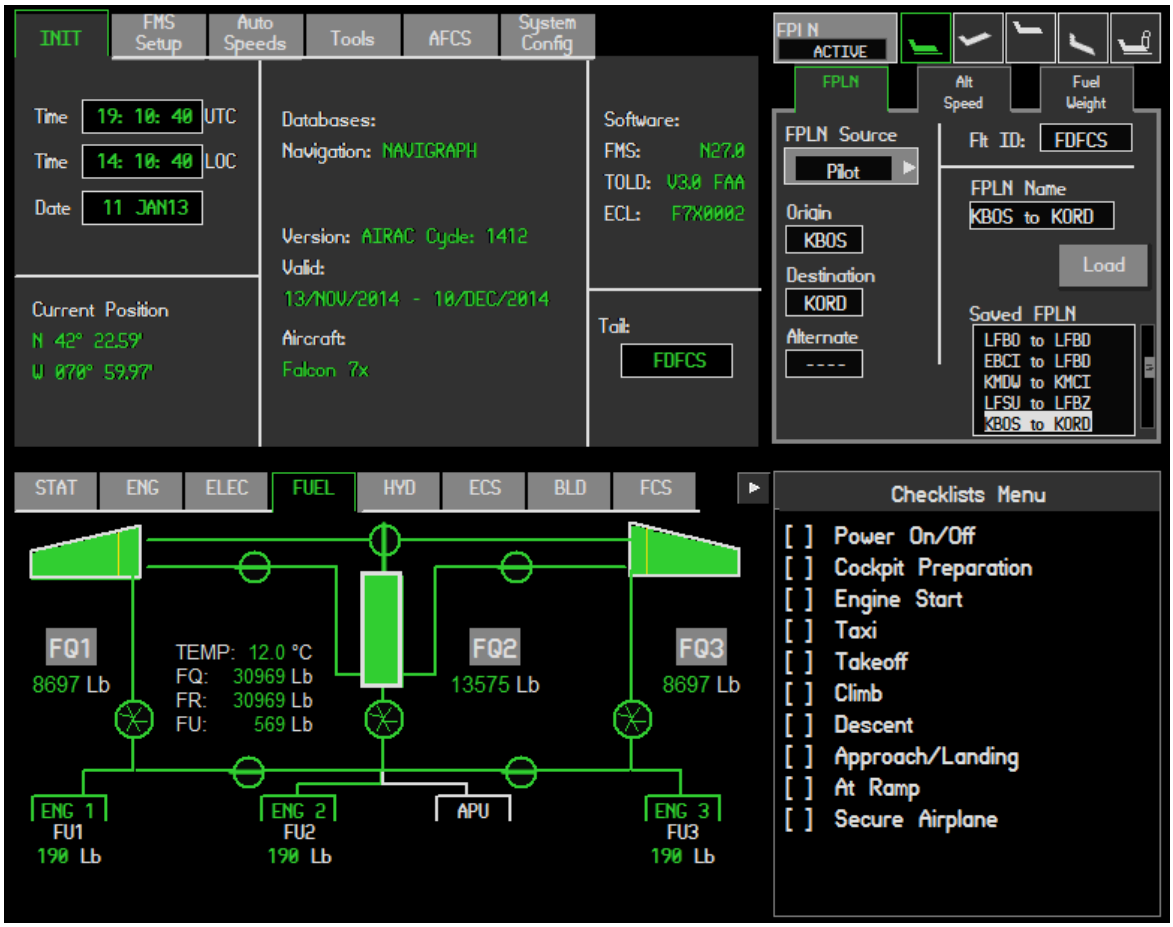



Figure 4 MDU 2

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.

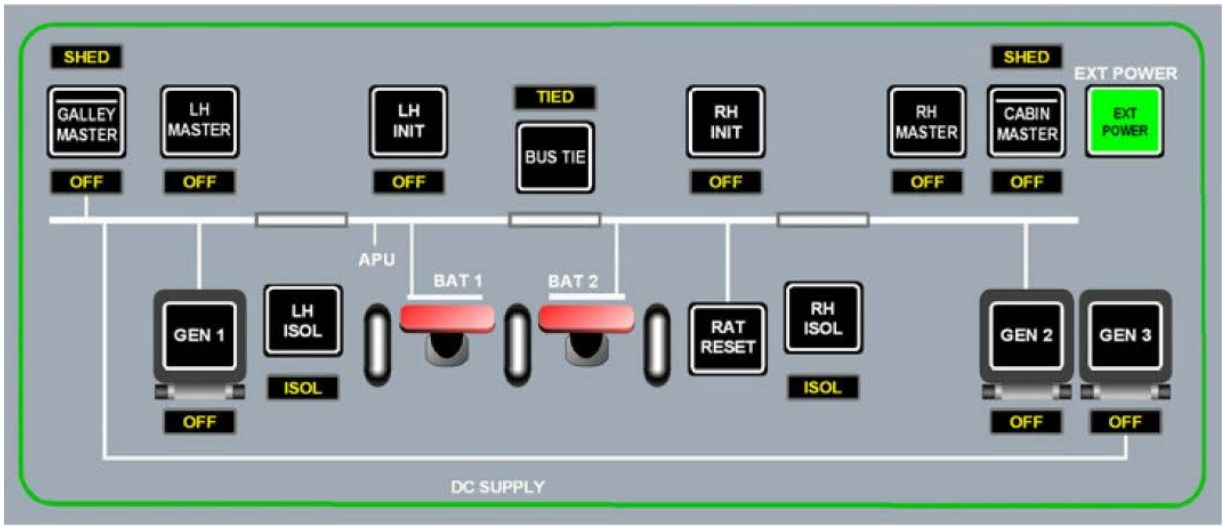



Figure 7 OVERHEAD POWER PANEL

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.

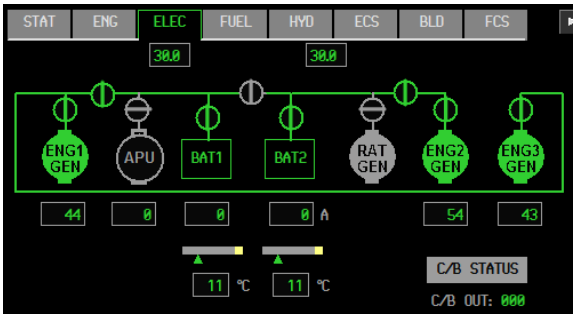
Figure 8 TYPICAL FOUR DISPLAY CONFIGURATION

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.

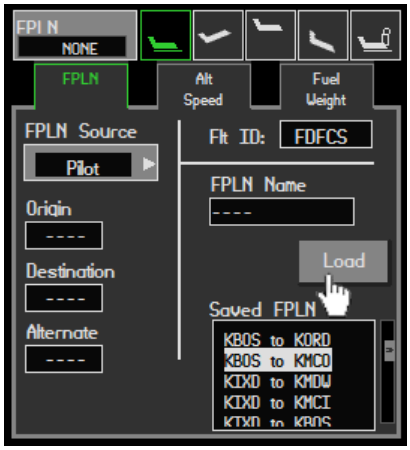



Figure 9 Ground Operations

Details of the flight plan are outlined on MDU 1.

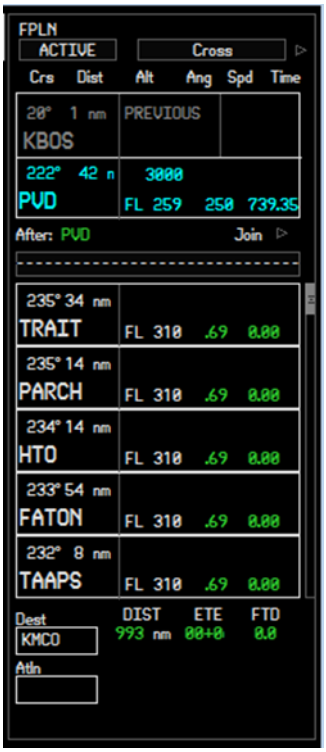
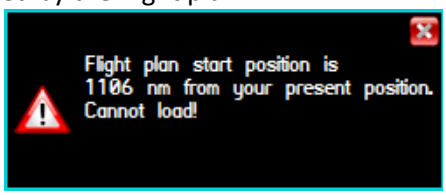



Figure 10 Flight Plan List

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.

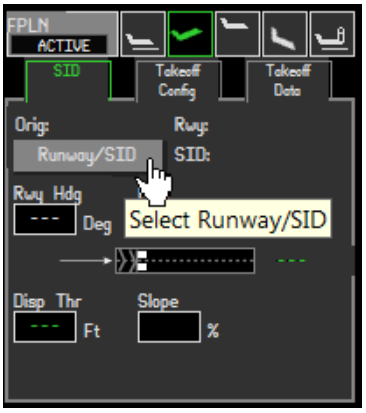
## Loading a Standard Instrument Departure (SID)

Select the *Departure Page* on MDU 2.

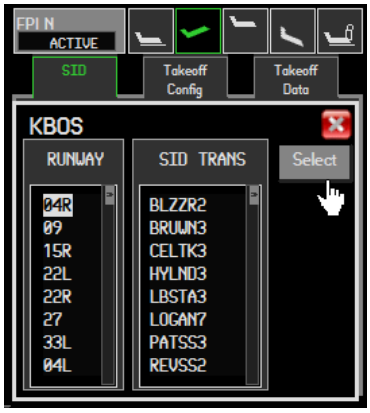
*Note: In order to use SIDs and STARs functionality, you will need to have the navigation database from Navigraph installed in your Flight Simulator X\WILCO\Falcon 7x folder. Otherwise these functions will not be available.*

*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.

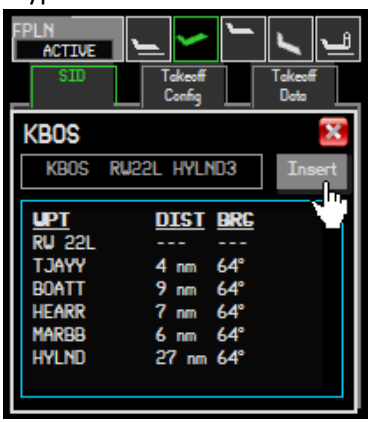



Figure 11 SIDs MENUS

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.

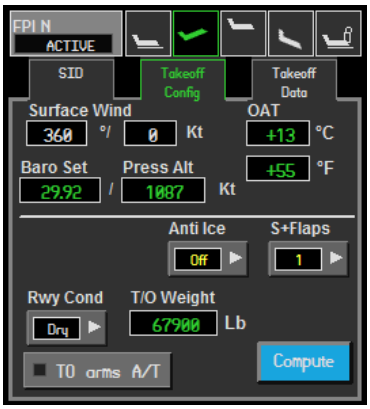



Figure 12 FLT PLAN TAKEOFF CONFIG TAB

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.

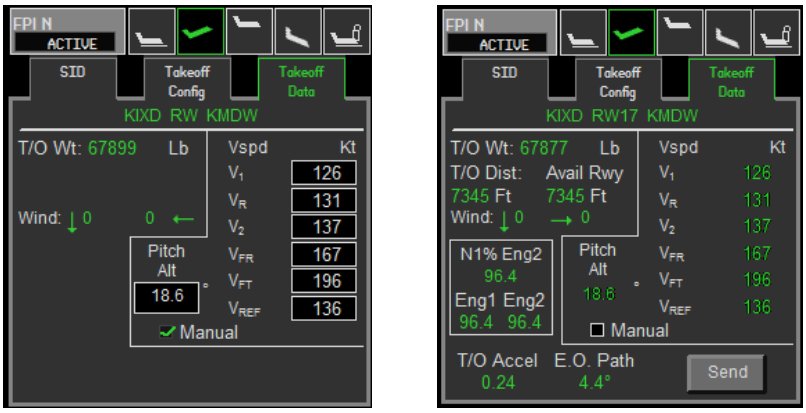



Figure 13 Takeoff Data Tab

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.

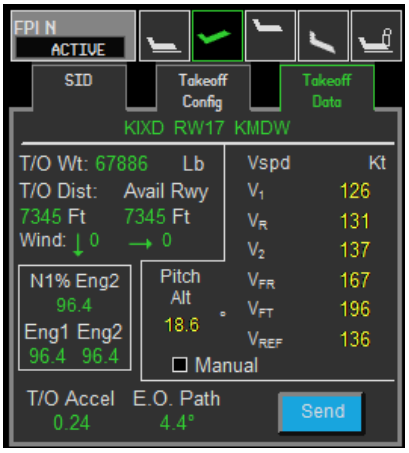
**T/O Accel** field corresponds to the acceleration expressed in G at brake release.

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.

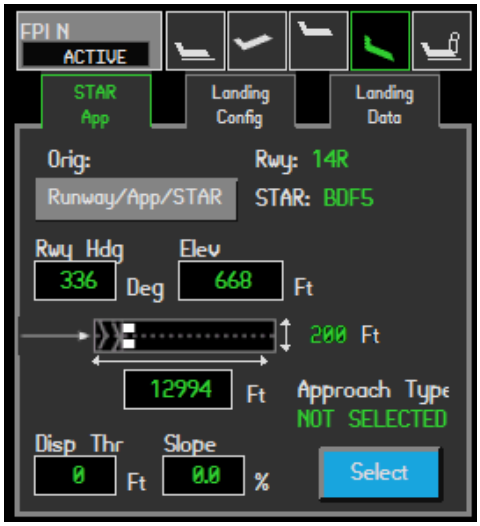
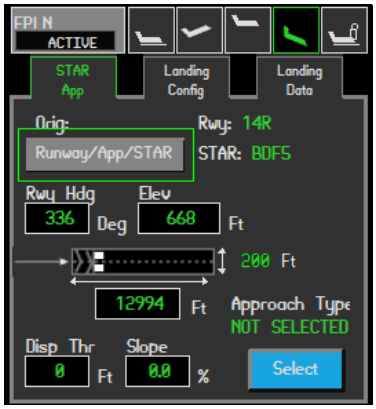


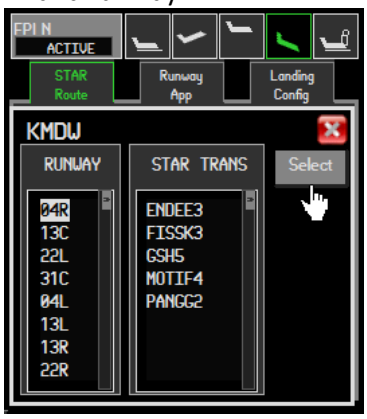

Figure 14 STAR/App Tab

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

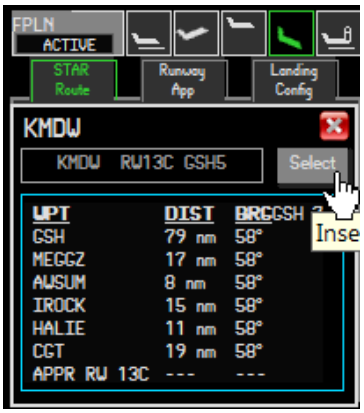
1. Select Runway/STAR button.




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



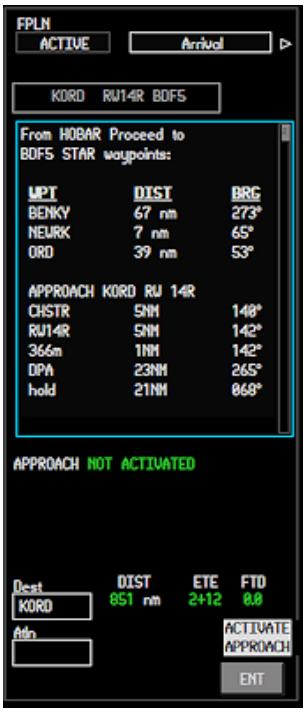

3. An outline of the route will appear in the confirmation dialog. Press "Select" to load the route.




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

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.




After confirming data accuracy, click (available in I-NAV window or WPT list) which inserts the temporary data into the flight plan and causes the menu to disappear (display returns to page). On the page, confirm list contains accurate data. If incorrect, repeat the selection process.

## 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.

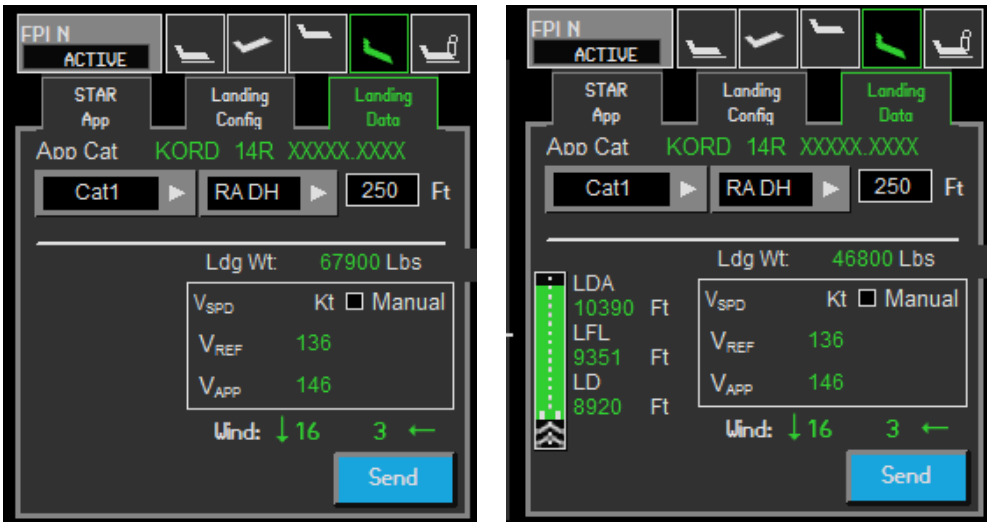
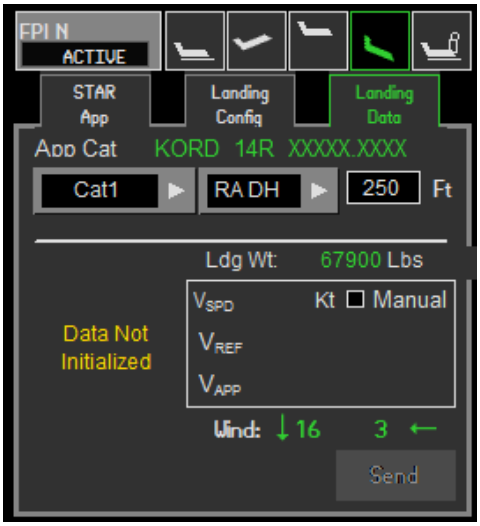



Figure 16 Landing Data Tab

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*.

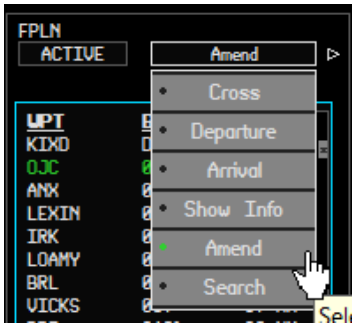



Figure 17 WAYPOINT PAGE DROPDOWN BOX

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.

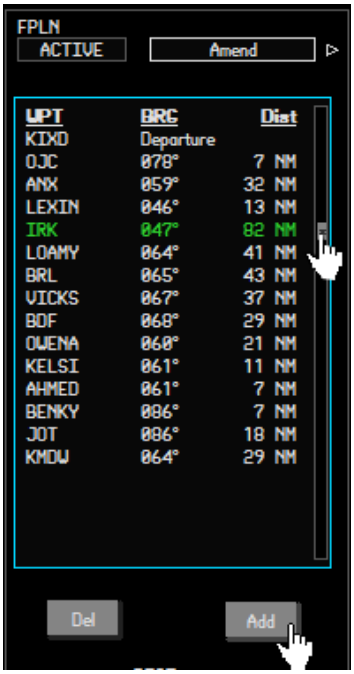



Figure 18 AMEND FLIGHT PLAN PAGE

The *Amend Page* will appear. Follow the protocol as outlined on page 27.

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.

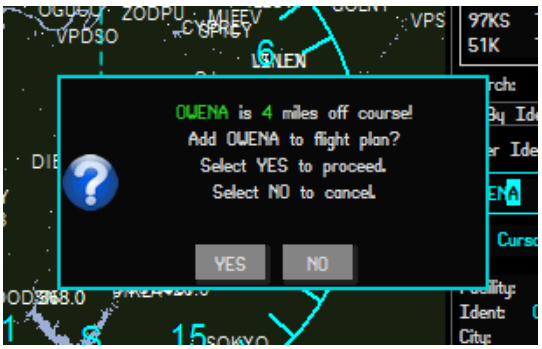


Figure 20 OFF COURSE DIALOG

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

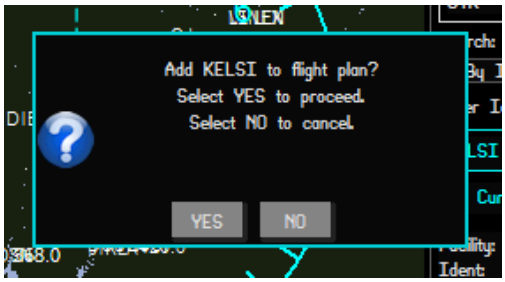


Figure 21 Add WAYPOINT CONFIRMATION

## Delete a Waypoint

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

Press “Del” to delete the waypoint.

The Delete Waypoint Dialog will appear.

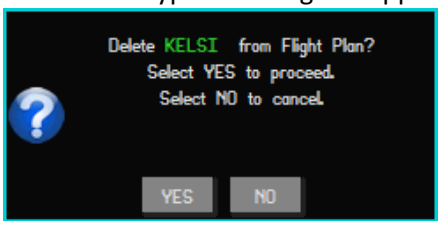



Figure 22 DELETE WAYPOINT DIALOG

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

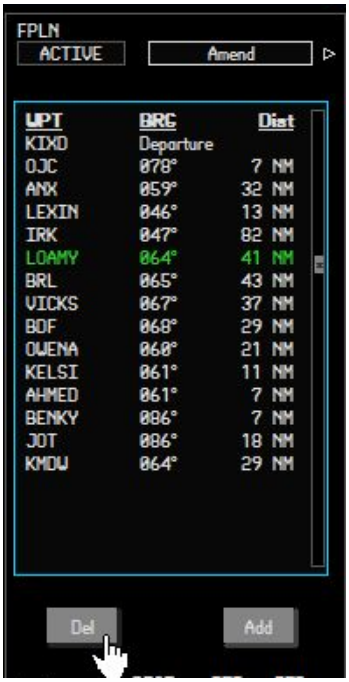



Figure 23 DELETE WAYPOINT

## 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*.

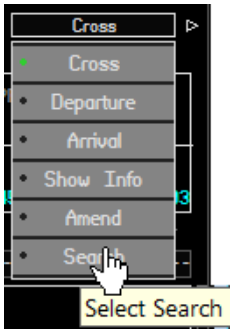



Figure 24 MODE MENU-SEARCH

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.

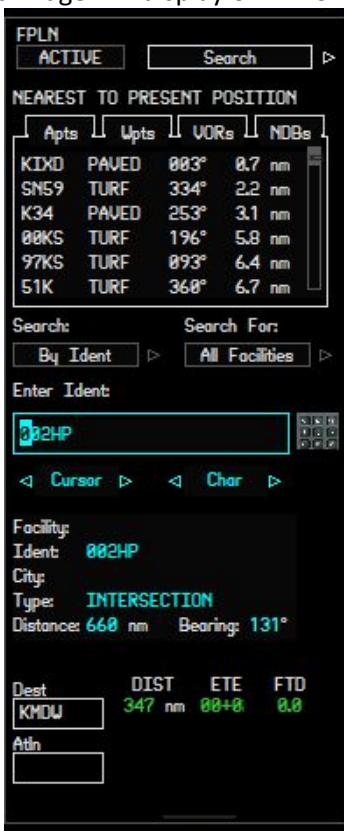



Figure 25 - SEARCH PAGE

**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 32.

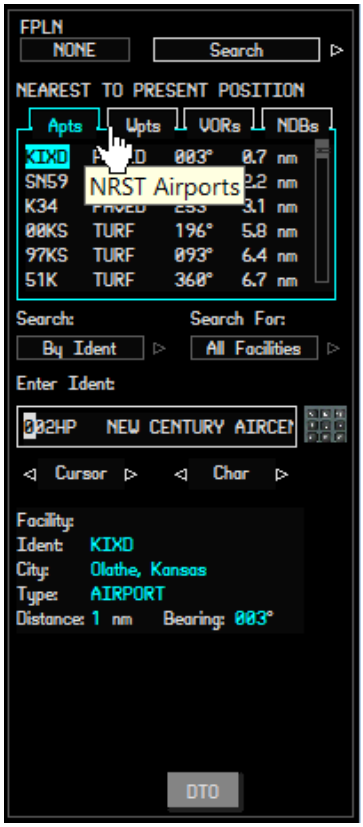
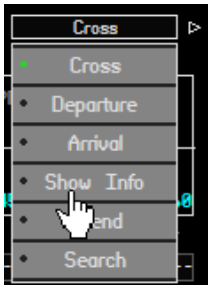


Figure 26 NEAREST FACILITY MENU

## 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.

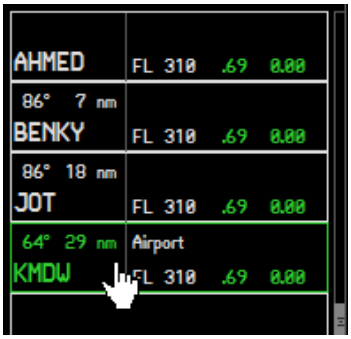


Figure 27 INFORMATION PAGE

## 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.

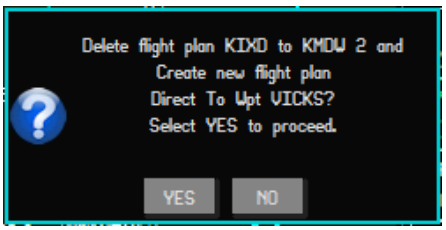



Figure 28 DIRECT TO/DIVERT TO CONFIRMATION DIALOG

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.

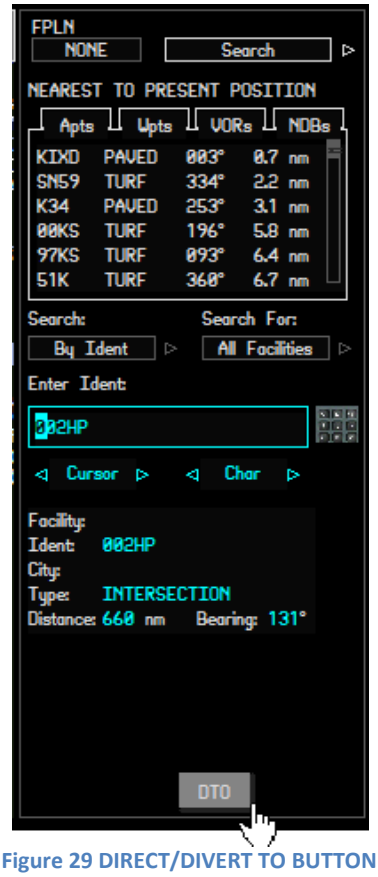



Figure 29 DIRECT/DIVERT TO BUTTON

## Post Flight Phase Of Flight

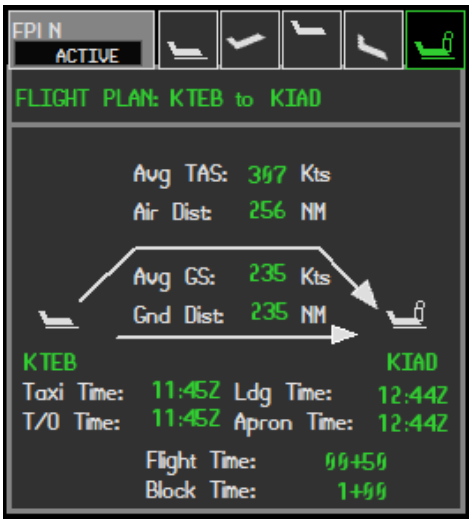



Figure 30 Postflight Page

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

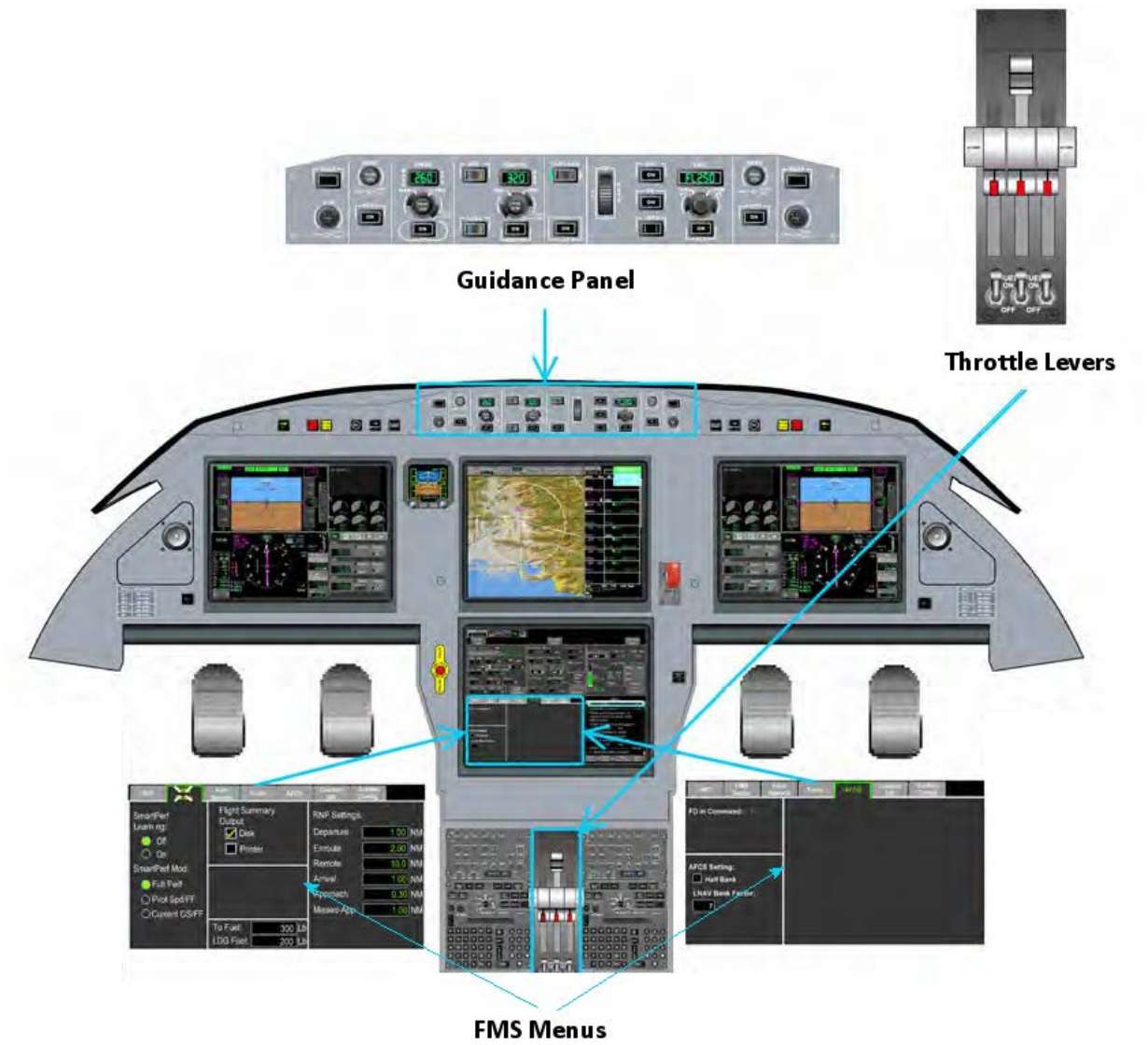



Figure 31 FMS FLIGHT DECK OVERVIEW

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

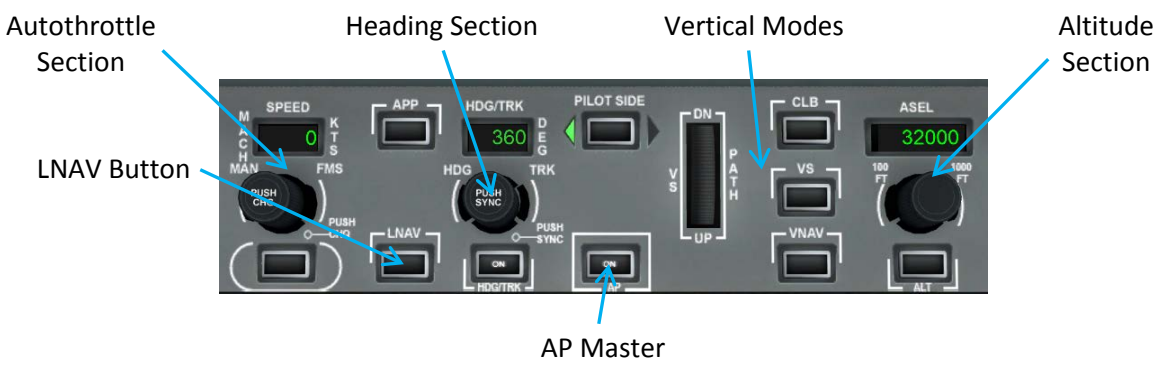



Figure 32 GUIDANCE PANEL

### 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.

## 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).

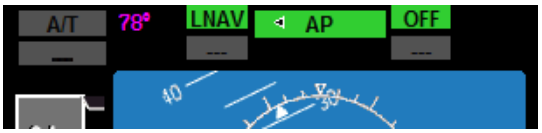
## SIDESTICK OVERRIDE

Sidestick (joystick/yoke) movement of 25% on either the X axis or Y axis will disengage the autopilot servos, 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.

## INDICATION

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




GREEN = Active
Dark = Inactive

### 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

See the PDU - FLIGHT DIRECTOR / THRUST DIRECTOR DISPLAY section of the handbook *Displays.pdf* for more details.

**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 33. Select the desired course using the selector. The selected course is displayed on the indicator. Once the course is selected, press the HDG Selector.

**Flight Plan LNAV Guidance**

Refer to Figure 33. Once the aircraft is airborne, simply press the LNAV Button.

When in LNAV mode, the display for the Heading Track Indicator is gray.

The PDU annunciator will indicate LNAV mode.

Figure 33 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 |

**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.

Climb Mode can be used in conjunction with any other vertical mode, including VNAV. It is an interface between the vertical guidance modes, and the Autothrottle.

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

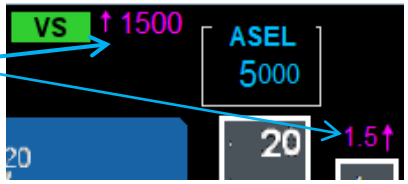
**Note**
Climb mode operates when aircraft is below the selected altitude, and the Speed Control is in the ON position. This function will not work unless the Speed Control (Autothrottle) is active.

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.

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

| | |
|---|---|
| | ALT Mode maintains the aircraft at the present altitude. ALT pushbutton engages ALT mode, at the present aircraft altitude, and disengages previous vertical mode. Pushbutton also allows disengagement of the ALT mode and reversion to basic PATH mode. |

## 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.

## ENGAGING LNAV AND VNAV

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 LNAV Button
9. 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.

## AUTOTHROTTLE (AT) CONTROL

### 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.

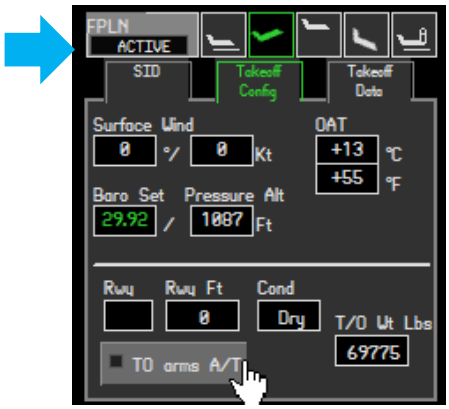


Figure 34 TAKEOFF CONFIGURATION MENU

### 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 38).
    - Endurance Mode – Sets speed to minimize fuel usage

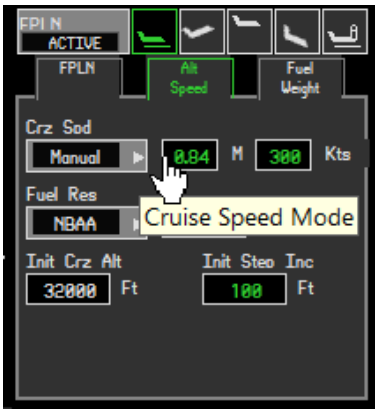
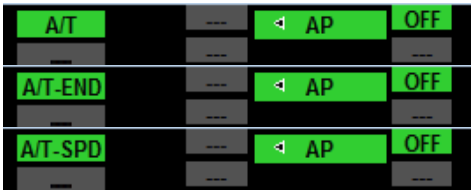



Figure 35 A/T SPEED MENU

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*.

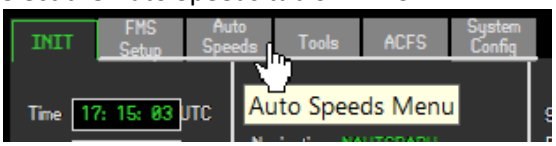
If VNAV mode is engaged, and a manual adjustment is made, the new setting will override the preset value provided by the FADEC.

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

Figure 36 AUTOTHROTTLE SETTING KNOB

### AUTOMATIC SETTING

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



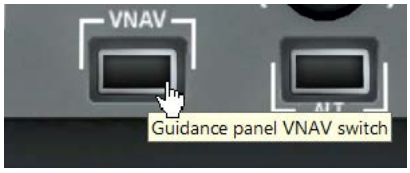




Figure 37 VNAV SELECTOR

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

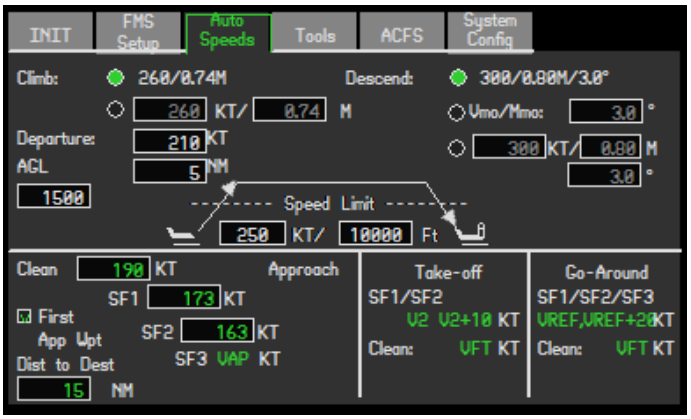



Figure 38 - AUTO SPEEDS MENU

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.

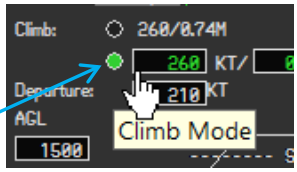



Figure 39 AUTO SPEED CLIMB SELECTION

*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.

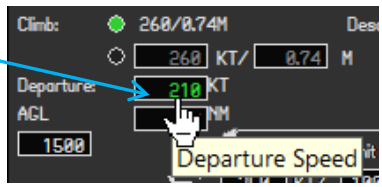



Figure 40 AUTO SPEED DEPARTURE SETTING

*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.

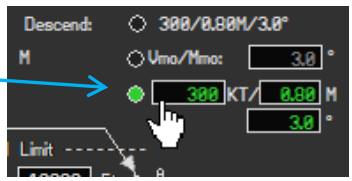


Figure 41 AUTO SPEED DESCENT SELECTION

*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 42 YAW DAMPER SELECTION

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## Radio Tuning

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

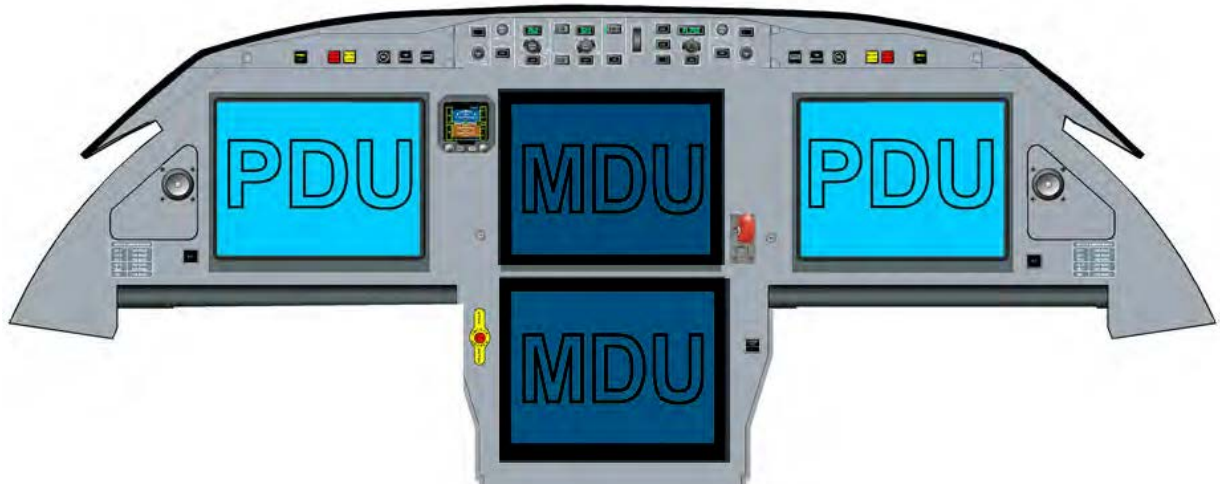



Figure 43 FLIGHT DECK DISPLAYS

### 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 44 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.

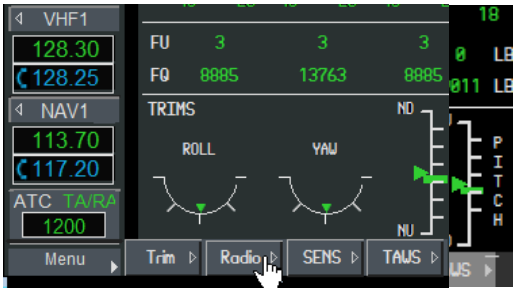



Figure 45 1/6 WINDOW MENUS

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

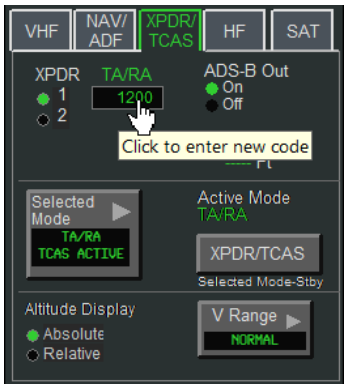
Figure 46 RADIO MENUS

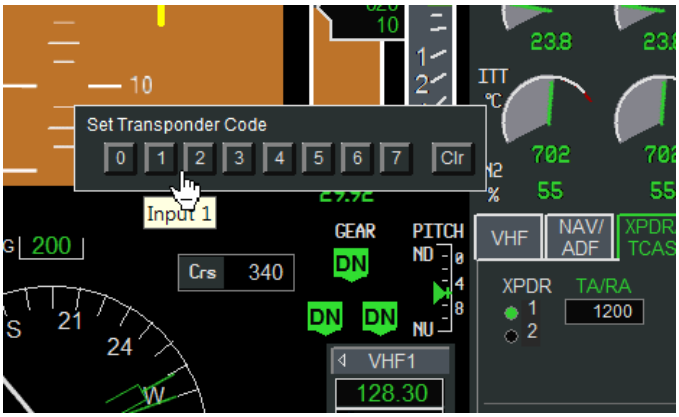
Set the respective frequency using the standby Frequency window on the menu.

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

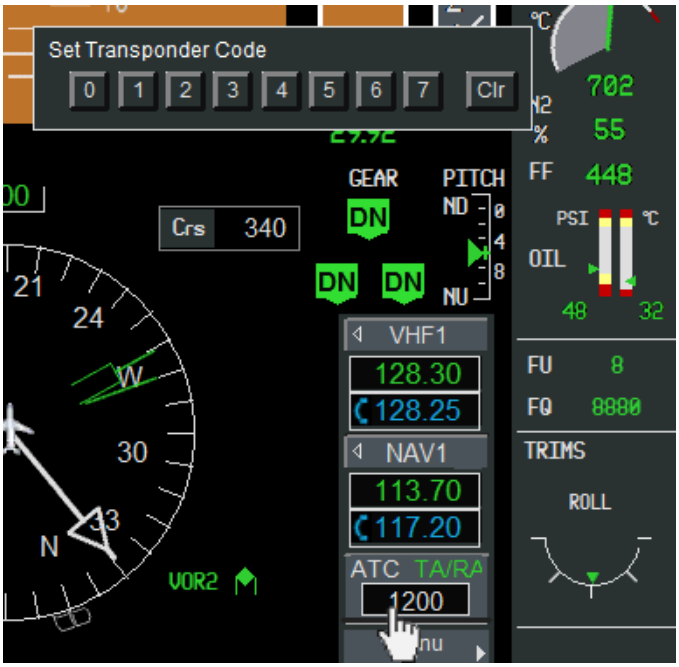
Figure 47 SETTING RADIO FREQUENCIES

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 48 Auto Tune Selection

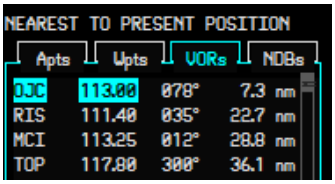
During auto tuning, the FMS tunes both VOR to the next WAYPOINT TO in the Waypoint List (if there is one). During auto tuning, the FMS tunes both ILS, only when a procedure associated with an ILS is selected. Auto tuning automatically (below 20 Nm) selects the VOR CDI with the CRS associated with the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

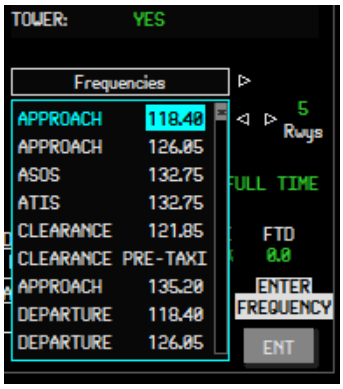
On the Nearest VOR and NDB pages, the relevant frequency will be highlighted and blinking.

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 43 for more details on using the radios.



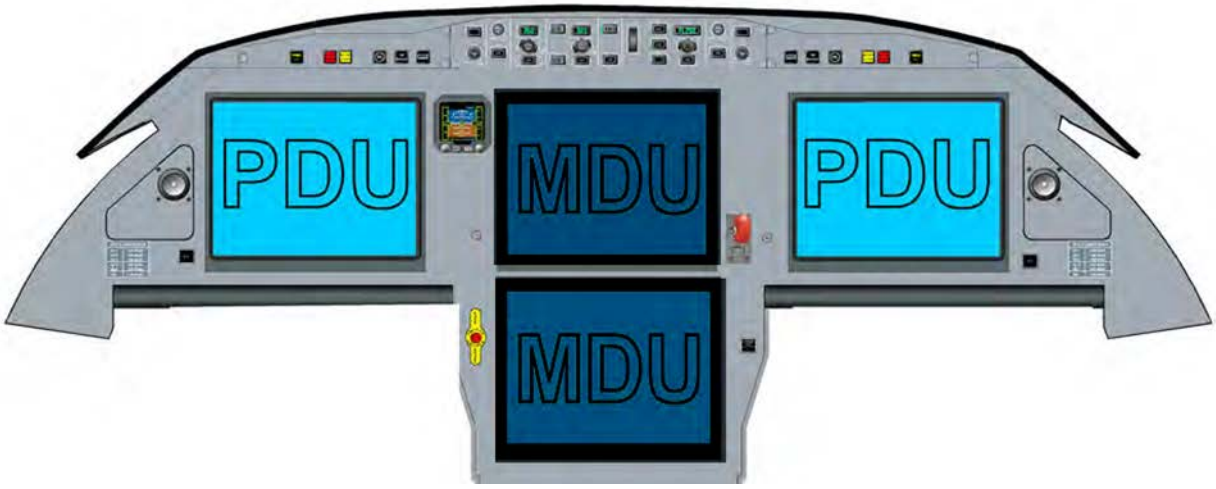
On the *MDU 1 Airport Information page*, the frequencies available for that airport are listed in the dropdown box labelled “Frequencies”.

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.



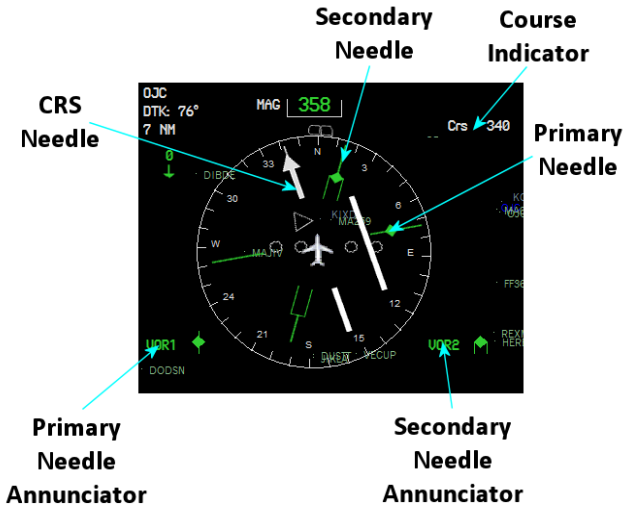



Figure 49 HSI Indicator

## HSI Menus

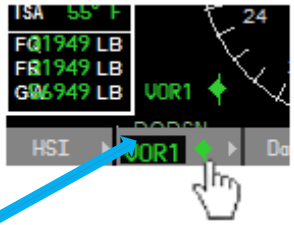
Access to the HSI menus is obtained by clicking the *HSI Button* on the lower left of the HSI Display.

Figure 50 HSI MENU BAR BUTTON

### PRIMARY AND SECONDARY NEEDLE SETTINGS

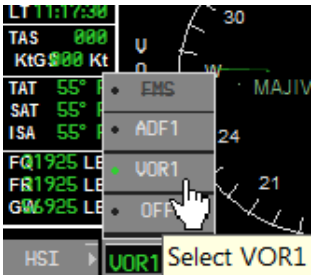
The Primary and Secondary needles can display in 3 modes:

- 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*.

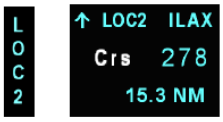
**COURSE (CDI) NEEDLE SETTING**

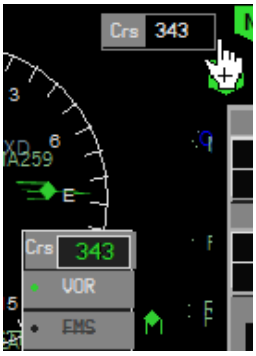
Press the *CDI Button* on the HSI Menu Bar.

Figure 51 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.

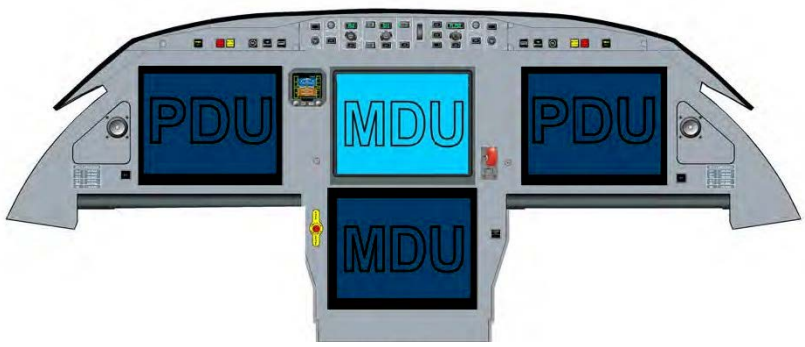
When a localizer signal is being received the Course Indicator Display is modified to show more information.



## 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*.

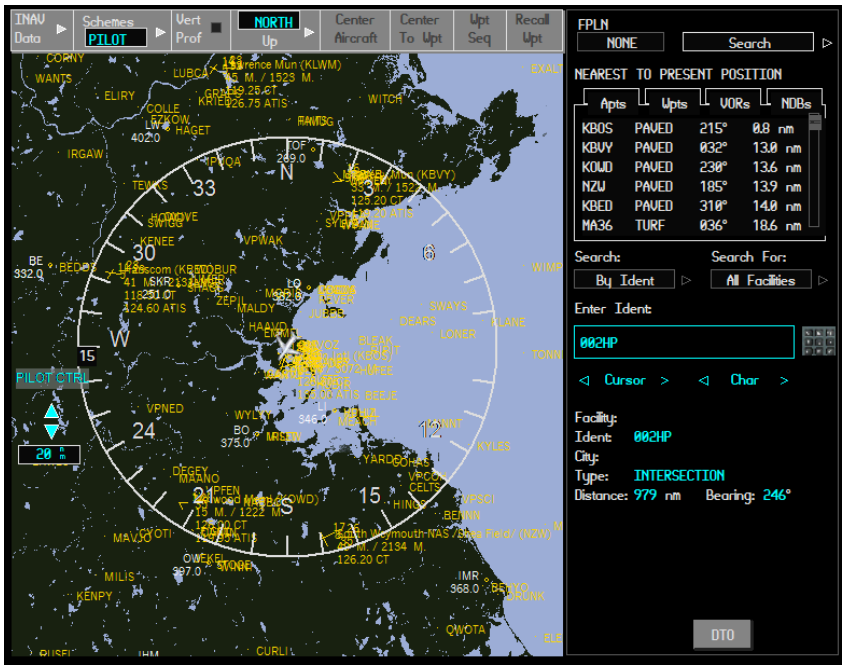



Figure 52 MDU 1

### INAV Display

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

Figure 53 INAV TOOLBAR

## INAV DISPLAY DATA

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

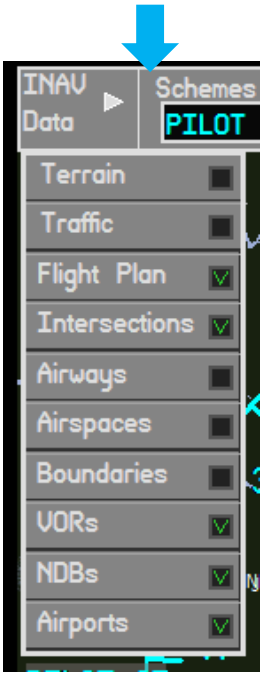



Figure 54 INAV DATA MENU

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.

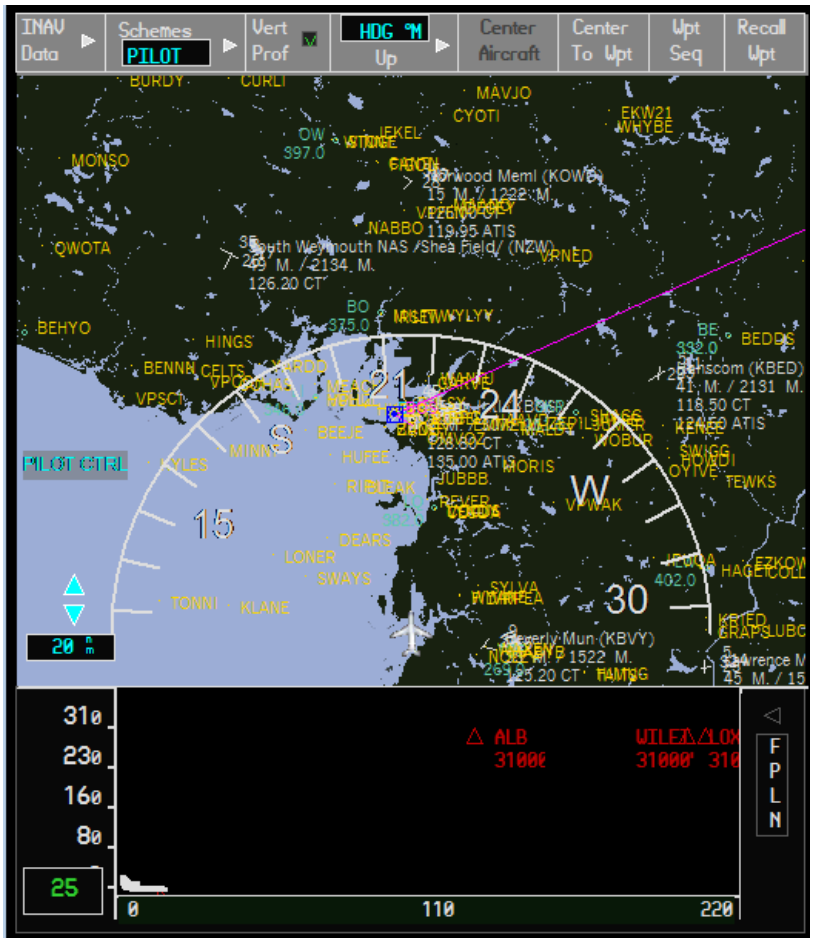



Figure 55 VERTICAL SITUATION DISPLAY

## 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.

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