

feelThere

Embraer E-jets v.2: Embraer 175 and Embraer 195



Addon Aircraft for Microsoft's Flight Simulator 2004: A Century of Flight and Flight Simulator X

OPERATIONS MANUAL



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WHAT THIS MANUAL IS AND ISN'T:

This manual is intended to provide the average flight simulation enthusiast with the information necessary to fly the Embraer E-jet. This includes: basic FMC programming, system prep, taxi, takeoff, flight, descent, approach, landing, taxi and shutdown. This manual is not intended to provide 'all there is to know' about the E-jet. Real world manuals are thousands of pages long and require pilots to attend months of education (not including the thousands of flight hours pilots must collect prior to being accepted by an airline for E-jet training).

There are multiple Internet sources for detailed information on flying the E-jet's. feelThere encourages you to use your favorite search engine to find details about the aircraft not covered in these pages. The feelThere support forums are also available for E-jet pilots (real and simulated) to discuss systems and procedures.

FMC systems are extremely complex and require months of training and practice. Many, not all, of the real FMC systems are simulated. Yes, FMC functions exist in the simulation that are not discussed in this manual. If you are unsure how to use a system, or if a function is simulated, please post your question on the support forum. The flight simulation and feelThere community exists to help others and share knowledge.

READ ME FIRST

Throughout the manual the terms FS, flightsim, and flight simulator are used when referring to Microsoft Flight Simulator. Only in cases where E-jet function(s) is different in Flight Simulator 2004 'a century of flight' (FS9) or FSX (FS10) will the specific version of the simulator be noted.

You must have a fully updated version of FS that includes all service patches released by Microsoft. At the time of E-jetv2's release this is FS9 Service Patch 1 (FS9.1) and FSX SP1 (FSXsp1) and SP2 (FSXsp2). FSX users may also have installed Acceleration (FSA) or the FS Gold (FSG) versions of the simulator. FSA and FSG include service packs one and two.

The absolute minimum computer specifications required to run the E-jetv2 are: Pentium IV 1,4 GHz, 256MB RAM, 128MB Graphics, FS2004 or FSX, Windows 2000, XP, Vista and Windows 7 (only 32 bit systems are supported). To avoid problems with *MAP!* 2GB of RAM are required. Each computer system reacts differently to all software, so the settings required to gain optimum performance must be selected by the user. Review the **Configuration Utility** information outlined below on adjusting the E-jet's gauges to optimize in-game function.

The E-jet v2 is compatible with the GoFlight AP modules, Track IR and Squawkbox 3

You must install the latest freeware version of Peter Dowson's Flight Simulator Universal Inter-Process Communication, better known as FSUIPC, for the weather radar gauge to

function. FSUIPC can be download at: <http://www.schiratti.com/dowson.html>. Be sure to download and install the correct FSUIPC module for your FS version! The payware version is not required.

The E-jet v2 installer will overwrite any pre-existing feelThere Common Database (FCD) AIRAC. If you are using an updated AIRAC backup your custom FCD before installing the E-jet v2! After installing the E-jet v2 re-install your FCD AIRAC.

Run the self extracting installer for the version of flight simulator version on your system to install the E-jets. Be sure to run the correct installer as the FS9 version will not work in FSX, nor the FSX run in FS9. After starting the installer enter the keycode provided for your product. The installer will choose a file path matching a default FS setup. If you have a non-standard file structure for FS you must direct the installer to the correct root FS folder. If you use the VISTA or win7 operating systems be sure UAC is OFF installation.

The first time selecting the E-jets in FSX you must approve all gauges and modules for the aircraft to run correctly.

Our E-jet was built using many custom non standard commands and gauges; so it is imperative you read this documentation before your flight.

Computer Mouse

The E-jet is designed to work with a computer mouse set to the following button and wheel configuration:

- left mouse button
- center scroll wheel that can also be used as a center mouse button
- right mouse button.

Some highly customized pointing devices require adjustment in order to comply with the above interface architecture.



Sub-Panel Windows

There are multiple 2D sub-panels that can be viewed in the E-jet simulation. Some panels are accessed using the **SIMICON BAR** (see picture), others through keyboard commands.



<i>Sub-panel</i>	<i>Simicon Icon</i>	<i>keyboard shortcut</i>
overhead	O	<SHIFT><2>
MCDU	C	<SHIFT><3>
center pedestal	P	<SHIFT><4>
<i>Call!</i>	!	<SHIFT><5>
<i>Map!</i>	M	<SHIFT><6>
simicon bar		<SHIFT><7>
PFD		<SHIFT><8>
MFD		<SHIFT><9>
FS Map	compass	
ATC window	headset	< ` > or <SCROLL LOCK>
HUD		<W>

Panel and Overhead Knobs

The autopilot knobs are adjusted in the following ways:

- with the pointer over the knob the mouse wheel can be used to increase/decrease the set value
- left of knob center left-mouse-click will increase value by one
- left of knob center right-mouse-click will increase value by ten
- right of center left click will decrease value by one
- right of center right click will decrease value by ten
- many knobs will react to a center mouse button click by synchronizing a setting to the aircraft's current orientation, toggling displays, or engaging an function.

Many of the knobs are turned, not 'clicked', when in the VC cockpit. When unable to click a knob use a left-mouse-click and hold the knob; then 'turn' by moving the mouse is a looping motion.

Safety covered buttons and knobs

Many of the E-jet's buttons and knobs have a safety cover and therefore inaccessible. In order to access these controls you must right-mouse-click to open the cover. Once the cover has been opened you can use the shielded knob or button.

Tuning the navigation and communication radios

There is no Radio Management Unit on the the Eets main panel. COM and NAV frequencies are entered into the Flight Management Computer **RADIO** page or on the Primary Flight Display.

Enlarging the main panel displays

Each of the main panel screens (PFD, MFD, EICAS) can be enlarged by placing the mouse pointer over the display and conducting a right-mouse-click. To return the screen to the original size by once again right-mouse-clicking over the screen.

The glareshield guidance panel (GP) controls are enlarged with a left-mouse-click on the hidden clickspot (see picture). Click again to reduce the GP.



Dark and Quiet Cockpit

The panel design philosophy for the E-jet panels is when systems are correctly set there are no illuminated buttons, knobs are in the 12-o'clock position, and there are no aural notifications.

Glareshield Guidance Panel (GP) Backlighting

The GP buttons and knobs are not back-lit when active or armed. This is not a bug! Backlighting of the GP panel is an airline **option** made when ordering an E-jet from Embraer. The backlighting option has been selected by only a few airlines. feelThere modeled the simulation to represent the majority of E-jets in real-world operation. For this reason you must review the Flight Mode Annunciation (FMA) indications along the top of the PFD screen to confirm which autopilot modes are controlling the aircraft (just like a real E-jet pilot).

Cursor Control Device (CCD) simulation

The real-world E-jet has two CCDs located on the center pedestal just below each MCDU. In feelThere's simulation CCD cursor movement is conducted by moving the mouse pointer over the PFD, MFD and EICAS displays. See the display screen descriptions later in this manual for details.

Touch Control Steering (TCS) simulation

When the TCS button is pressed, and held, the pilot may adjust the E-jet to any desired pitch without disengaging the autopilot. At button release the autopilot will hold the new pitch attitude; and lateral control returns to the mode active prior to TCS activation.

The VC yoke is not used to activate TCS. Use the **Configuration Utility** to assign a joystick, or yoke, button for TCS to work.

MCDU (also referred to as the FMC or FMS) keyboard mode

Your computer keyboard can be made to operate the Multifunction Control Display Unit (MCDU) by clicking the unit's 'blank' function key (see picture), or by using the keystroke <CTRL>+<SHIFT>+<K>. When in keyboard mode an orange 'K' will display in the upper left corner of the MCDU screen. All keyboard actions will be captured by the FMC when in keyboard mode.



To press Line Select Keys (LSKs) use the computer keyboard F1-F6 keys for the Left LSKs and F6-F12 for the right.

<Page Up> and <Page Down> keys act as the MCDU's PREV and NEXT function buttons.

Weather Radar

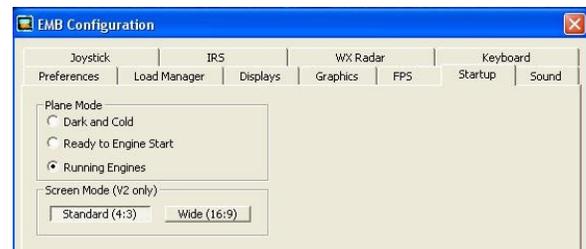
The simulation is fitted with a weather radar function that displays in the Multi-Function Display (MFD) map, and the Primary Flight Display (PFD) arc mode compass. Through the Multi-function Display cursor control device simulation and the MFD **Softkey buttons** the radar system is controlled.

Using cloud and rain data supplied by Flight Simulator the radar gauge displays precipitation and turbulence. Intensity level is displayed in four colors: magenta, red, yellow and green. Magenta represents the heaviest rainfall, where green indicates the lightest. Areas of turbulence are shown in white.

NOTE: Flight Simulator does not provide a direct method for evaluating the weather making potential of the simulated atmosphere. As a result the weather gauge included with the E-jet simulation makes assumptions based on cloud density to predict precipitation and/or turbulence that may be experienced.

Widescreen Panel:

A 16:9 resolution widescreen panel can be selected using the **Configuration Utility**. This panel includes the co-pilot's multifunction display. The clickspot for enlarging the **guidance panel** is just above the co-pilot's BARO SET knob. To reduce the enlarged GP click the sub-panel on the upper-right corner.



*NOTE: decreased FS framerates may be experienced when using the widescreen panel instead of the standard 4:3 resolution. Adjust the gauge refresh rates under the **Configuration Utility display tab** to improve game performance.*

Configuration Utility

The configuration utility can be accessed by way of the Windows START menu:

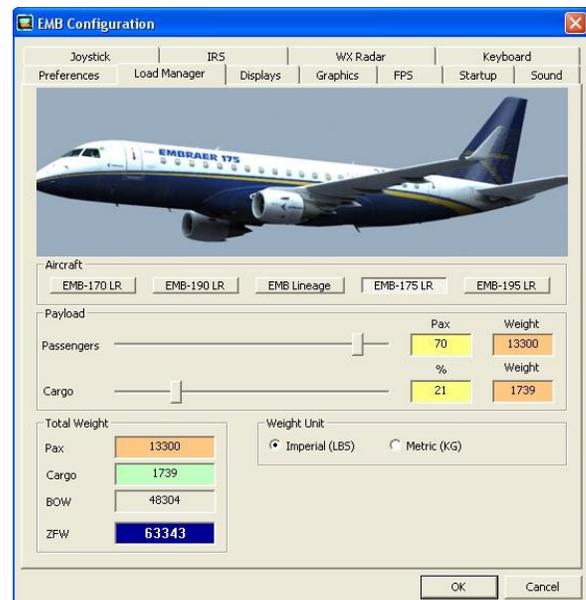
All Programs | FeelThere | E-jet Series / E-jet Series for FSX | Configuration

(NOTE: the FS9 E-jet Series utility ONLY changes setting for the FS9 E-jets, the FSX utility ONLY changes settings for FSX E-jets.)

This utility allows you to adjust the E-jet's performance to your computer, customize panel control to accessory buttons and switches, and load aircraft passenger and cargo weights. For any changes to take effect you must run the configuration utility BEFORE starting FS. If you make a change while FS is running you must close and restart the simulator.

To access the configuration functions left-mouse-click the tabs that run along the top of the utility window:

- Displays – adjusting the sliders on this page increases/decrease the indicated gauge refresh rate. Decreasing refresh rates will result in higher scenery performance within FS. Each computer system is different, so you will need to try different settings to maximize game performance.
- Startup – set the condition of the aircraft when loading into FS: cold & dark, ready to start, engines running and standard or widescreen panel.
- Sound – sets the master volume for the panel's custom gauges.
- Joystick – set the joystick, or yoke, buttons to control Touch Control Steering (TCS), autopilot quick disconnect and TO/GA.
- WX Radar – enables or removes the radar module from the panel display. The simulated radar requires significant CPU resources and some users experience better game performance when the gauge is not active. Simulating a moving radar beam is more demanding of the computer, so choose the 'rotating beam' option only if you already experience high in-simulation performance.
- Keyboard – set keyboard shortcuts for panel functions using this screen.
- Preferences – settings on this screen for GF-MCP peripheral support, top of descent (TOD) pause, joystick v. autopilot interaction, battery life, nose wheel turn limiter, co-pilot callouts, and using FS's default autopilot for altitude hold.
- Load Manager – set passenger and cargo weights on this screen. Click the button for each of the E-jets. The units clickboxes change the measurement system used on the load manager screen, not in FS. Once you have set passenger and cargo loads you must click the OK button for the E-jet's cfg file to be updated. Changes made here are only seen in-game after restating FS.



- Pressure – set the E-jet's default atmospheric pressure system: HPA (hPa) or IN (inHg).
- Weight – set the E-jet's default weight system: pound or kilogram.
- Graphics – set how the main panel graphics are rendered by your computer. Each computer is different, and the user must try different settings to maximize performance.

NOTE: any changes made will not take effect until the OK button is clicked. Changes made will only be seen within flight simulator after restarting the game.

Call! Panel

The feelThere addon *Call!* is included with the simulation. Clicking the simicon panel '!' symbol, or <SHIFT><5>, will open the *Call!* gauge. *Call!* sits on top of the 2D or VC panel and may be re-sized, moved around the screen, un-docked and dragged to a separate monitor should you so desire.

The following checklists are available on the *Call!* Gauge:

- COCKPIT SAFETY INSPECTION
- POWER UP
- PRE FLIGHT
- BEFORE START
- AFTER START
- FLIGHT ATTENDANT SAFETY
- BEFORE TAKEOFF
- AFTER TAKEOFF
- DESCENT
- PARKING
- POWER DOWN



The E-jet checklists in the **NORMAL OPERATIONS CHECKLISTS** section of this manual are based on a real-world airline and include notations on their use with *Call!*

After clicking a checklist the letters turn an orange shade and the virtual co-pilot will recite the first item on the list. After the virtual co-pilot vocalizes each check item the gauge confirms that the panel task/item is correctly set. The next checklist item will not be announced until you have completed the task. NOTE: there are some items that require no panel adjustment and *Call!*, after a pause, will move to the next item. Once all tasks are completed the checklist will become green. Checklists can be restarted and stopped at any time. Only successfully completed lists will display green.

The Safety button will start the Flight Attendant safety announcement. This sequence requires no action on your part. The safety review takes a few minutes to complete; and no other checklists will be audible while it is playing.

The checklists provided are based upon the standard procedures of a real-world airline; and do conform with that airline's protocol. So, if you happen to read that a task is completed in a

different sequence on another published checklist this is not an error; but simply the way the airline feelThere used as a reference directs their flight crews to operate.

For the novice pilot, this is a great way to become familiar with the various flows and procedures that must be accomplished in order to successfully complete a flight. For the experienced sim pilot, it is always good to have the checklists run, just to be certain nothing goes unnoticed. After all, if it's good enough for the real flyboys, it is surely good enough for we simmers!

MAP! Display

The feelThere addon *MAP!* is included with the simulation. Just like the cabin screens in a real airliner's passenger cabin *MAP!* will display the track of your flight. In addition, a sequence of screens shows a variety of flight information such as elapsed and remaining time, distance, altitude, wind information, and temperature (to name just a few).



Clicking the simicon panel 'M' symbol, or <SHIFT><6>, will open the *MAP!* gauge. *MAP!* sits on top of the 2D or VC panel and may be re-sized, moved around the screen, un-docked and dragged to a separate monitor should you so desire.

MAP! uses the flight plan loaded into active FS memory using FS's flightplanner. Only departure and arrival airports are required.

The map display shows zoom levels depending the flight's route distance: Three zoom levels for plans greater than 1500 miles; shorter routes have two zoom levels.

Five background images are provided with *MAP!*. These are chosen at random when *MAP!* is launched. Custom bitmap images can be created and placed into FS's Gauges\EFinfo directory. The images used by *MAP!* are 600 x 450 pixels. To reduce the number of backgrounds available just remove the unwanted screen_X image(s) from EFinfo folder.

NOTE: always make a backup before making any changes to your *MAP!* Installation.
Departing and Arrival Airport Timezones:

Map! uses FS's time engine to display local and Greenwich Mean Time (GMT), also know as Coordinated Universal Time (UTC). FS isn't correct in some situations. If you find that the local time is not correct for an departure or arrival airport there is a user 'override' to correct, airport by airport, the simulator's limitations.

In the FS gauges folder you will find a file called Efinfo.ini. This is a text file that can be opened using NOTEPAD. Locate the [Timezone] entry. The format for airports is ICAO=offset in minutes. For timezone changes to take effect, the edits must be entered in

both on both the host and client computers. Examples:

Seattle-Tacoma International (KSEA) is -8 hours behind UTC (-7 during Daylight Savings Time). *A minus (-) sign is necessary for timezones behind UTC.* To enter this correction into the Efinfo2.ini file type:

KSEA=-480

During daylight savings time the [Timezone] entry will need to be change to read:

KSEA=-420

Frankfurt Airport (EDDF) is +1 hour ahead UTC. *A plus (+) sign is not necessary for timezones ahead of UTC.* To enter this correction into the [Timezone] section of the Efinfo2.ini file:

EDDF=60

NOTES:

- *MAP!* displays distances in kilometers (km) and miles (m) ... not nautical miles (nm).
- *MAP!*'s shown value for flight time and distance are based upon the flight plan loaded into FS's flightplanner. there may be differences between *MAP!*'s display and predictions shown on an aircraft's primary navigation device.
- *MAP!* shows the great circle route between the aircraft icon and destination airport. The sold line following the aircraft icon is the actual route flown.

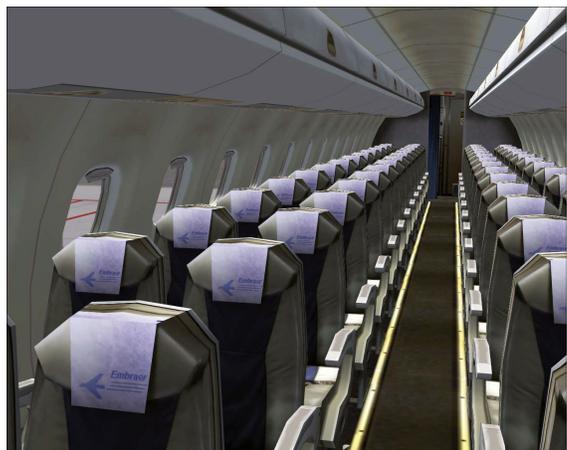
Exploring the VC cabin

FS9 users are encouraged to download Flight1's freeware F1View Utility for FS2004:

This small module installs into FS2004 and supplies simple mouse-based movements, panning, and more, using the center mouse wheel/button. You can also move past the default view limits of FS2004 (good for strolling through virtual cabins). After you download, please make sure you read the full instructions included.

The Flight1 utility is available in the FREE FILE LIBRARY at: <http://www.flight1.com>. Many thanks to Flight1 for making this utility available to the FS community!

FSX users must use FSX's default eyepoint movement keyboard commands to 'walk' from the VC cockpit to the VC cabin. With FSX running choose the event category pull-down menu in *Settings / Controls / Buttons-Keys* to review the key-commands.



Aircraft overview

Based in São José dos Campos, Brazil, Embraer (Empresa Brasileira de Aeronáutica, S. A.; Brazilian Aeronautics Company, Inc.) was founded in 1969 as a government enterprise; and became a privately owned business December 7, 1994.

Announced during the 1999 Paris Air Show, the Embraer series of E-jets are designed to be larger than regional aircraft (50 seats or less) and smaller than larger mainline jets (110 or more seats). Jets in this size range specifically designed for growing airlines wishing to expand their market, or larger carriers wanting to right-size their fleet to fit routes inefficiently served by larger aircraft. Embraer calls this 'The Rule of 70 to 110'.

The E-jets are a new design from nose to tail and wingtip to wingtip, and a significant departure from their successful predecessor aircraft, the ERJs. Operations are 30% more efficient than the previous generation of jets. Two full authority digital engine controlled (FADEC) CF34 General Electric engines hang below the winglet fitted wings. Flight surfaces, excluding the ailerons, are fly-by-wire controlled. Honeywell's Primus Epic Electronic Flight and Information System (EFIS) with five liquid crystal color displays conducts fully automated flight, including both LNAV and VNAV control, and autoland capability. The 170 and 175, as do the 190 and 195, have 95% component commonality to reduce operator costs. The full range of E-jets have 89% commonality. Cockpit commonality allows for pilot cross-certification. Embraer retained their distinctive *ram's horn* yoke design.

All E-jets feature a single aisle cabin with a two-by-two seat arrangement. The cabin has a greater diameter and length than regional aircraft allowing for larger overhead bins, wider seats and an optional two-cabin layout.

The launch customer was Crossair. First flight of an E-jet was February 2002. After an extended certification process the first aircraft delivery occurred in March 2004 to LOT Polish Airlines (an E170). The launch customer of the E-190 was JetBlue. The first flight of the E-190 was in March 2004, with the first flight of the E-195 in December 2004. Flybe launched the E-195. Over 600 aircraft have been built, and are based in 35 countries and over 50 airlines.

On 2 May 2006, Embraer announced plans for the business jet variant of the E-190, the Embraer Lineage 1000. This luxury aircraft with seating for up to 19 passengers, has the same structure as the E-190 with an extended range of up to 4,200 nm. The Lineage was officially launched December 2006 with deliveries beginning in December 2008.

THE SIMULATED E-jet's:

E175 -

Maximum Take Off Weight:	85,517 lb	38,790 kg
Maximum Landing Weight:	74,957 lb	34,000 kg
Maximum Zero Fuel Weight:	69,887 lb	31,700 kg
Basic Operating Weight:	47,664 lb	21,620 kg
Maximum Payload:	22,223 lb	10,080 kg
Maximum Usable Fuel:	20,580 lb	9,335 kg
Wingspan:	85 ft 4 in	26 m
Length Overall:	103 ft 11 in	31.68 m
Height Overall:	31 ft 11 in	9.73 m
Maximum Operating Speed:	M 0.82	
Service Ceiling:	41,000 ft	
Take Off Field Length, ISA, SL, MTOW:	5,656 ft	1,724 m
Landing Field Length, SL, MLW	4,131 ft	1,259 m
Range FULL PAX @ 220lb (100kg), LRC	1,900 nm	3,521 km
Engines: two CF34-8E (GE) turbofans:	14,200 lb of maximum take-off thrust each.	

Cabin Layout: 78 seats, two pilots, three flight attendants, galley and lavatory front and rear (*as simulated*).

First Flight of Variant: June 2003

E195 -

Maximum Take Off Weight:	111,973 lb	50,790 kg
Maximum Landing Weight:	99,208 lb	45,000 kg
Maximum Zero Fuel Weight:	93,696 lb	42,500 kg
Basic Operating Weight:	63,603 lb	28,850 kg
Maximum Payload:	30,093 lb	13,650 kg
Maximum Usable Fuel:	28,596 lb	12,971 kg
Wingspan:	94 ft 3 in	28.72 m
Length Overall:	126 ft 10 in	38.65 m
Height Overall:	34 ft 7 in	10.55 m
Maximum Operating Speed:	M 0.82	
Service Ceiling:	41,000 ft	
Take Off Field Length, ISA, SL, MTOW:	6,536 ft	1,992 m
Landing Field Length, SL, MLW	4,134 ft	1,260 m
Range FULL PAX @ 220lb (100kg), LRC	1,900 nm	3,521 km
Engines: two CF34-10E (GE) turbofans:	18,500 lb of maximum take-off thrust each.	

Cabin Layout: 108 seats, two pilots, four flight attendants, galley and lavatory front and rear (*as simulated*).

First Flight of Variant: December 2004

MAIN PANEL

The E-jets main 2D panel consists of three screens that make up the Electronic Flight Instruments System (EFIS). On the Left is the Primary Flight Display (PFD), middle the Multi-Function Display (MFD), and to the right is the Engine Indication and Crew Alerting System (EICAS). The co-pilot's PFD and MFD can be viewed when in the VC cockpit.



In addition to the main screens multiple sub-panels are present to control the autopilot, landing gear, autobrakes, and screen brightness. You also have a backup artificial horizon, master and caution warning reset buttons, main screen reversionary controls, and a clock/chronometer.

PRIMARY FLIGHT DISPLAY

The upper half of the primary flight display (PFD) provides the pilot with information required to fly the aircraft such as the attitude indication, speed and altitude tapes.

Above the attitude indicator is the Flight Mode Annunciation (FMA). This sub-display indicates the autopilot modes that are active and armed.

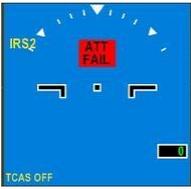
The lower half of the PFD is used for aircraft navigation. Displayed are a compass rose with VOR and DME overlays, navigation source mode indication, heading, VOR and COM radios frequencies, and NAV/FMS data.

The radio frequencies can be changed by using the mouse pointer. Move the mouse over the frequency box so the display shows a blue border. The whole number of a frequency is



changed using the mouse wheel. To change the fractional number hold the computer keyboard <CTRL> key and move the mouse wheel. Switch between the active and standby frequencies with a left-mouse-button click.

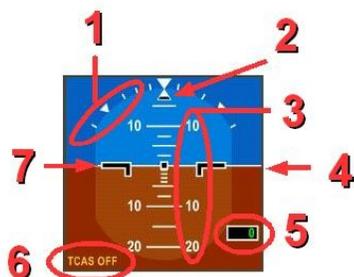
The primary flight display can be enlarged by a right-mouse-button click. To reduce the display click again with a right-mouse-button.



*NOTE: when the aircraft is started 'cold and dark' or the IRS function is lost the PFD will display 'FAIL' notices. When on-ground this indicates that IRS needs to be set and allowed to align (see **MCDU**).*



Attitude Indicator sub-display -



1. Roll scale.
2. The upward pointing triangle is the roll pointer. The black bar below the roll pointer is the slip indicator.
3. Pitch scale ladder. When excessive pitch is detected an AMBER arrowhead will display pointing the direction to the horizon.
4. Artificial horizon that moves according to the aircraft's pitch, yaw and roll.
5. Radar altimeter reading.
6. Traffic Alert and Collision Avoidance System (TCAS) status.

7. White boarded black bars are the airplane symbol and remain centered and stationary.

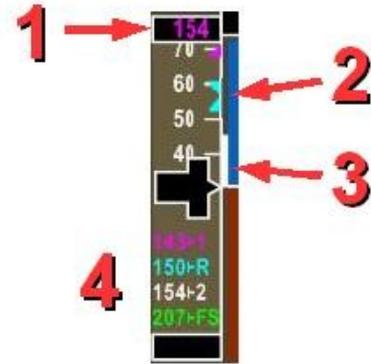
- A. Glideslope and FMS VNAV lateral deviation indications.
- B. Green circle, indicate the aircraft's trended movement in relation to the aircraft symbol (ex., the circle will be centered on the aircraft symbol in strait and level flight).
- C. Radar altimeter minimums setting.
- D. ILS, VOR and FMS LNAV vertical deviation indications.
- E. Flight Director indication AMBER. When in takeoff (TO) mode an AMBER crossbar will replace this indicator.
- F. Flight path vector tape and angle pointer:
 - FPV speed error tape (|) displays the difference between the actual and selected airspeeds. The direction of tape, up/down, indicates if airspeed is greater/less than the selected airspeed.
 - FPA acceleration pointer (>) indicates airspeed acceleration, upward movement, or deceleration, downward movement, along the flight path.



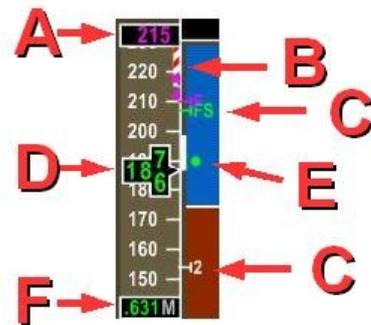
Speedtape sub-display-

To the left of the attitude indicator is the speedtape. The readings are in knots.

1. Airspeed Value: above the tape is the speed set for autopilot speed control. Based on color: MAGENTA is automatically set by the FMS; CYAN has been entered by the pilot; and AMBER DASHED means invalid information present.
2. Airspeed bug: the target speed set for the autopilot. MAGENTA bug is automatically set by the FMS; CYAN has been entered by the pilot.
3. Airspeed Trend Vector: indicates the airspeed of the aircraft in 10 seconds. WHITE indication shows a speed trend in the normal (safe) range; AMBER the the airspeed will be below V_{MO}/M_{MO} .
4. V-speeds are set by the pilot in the FMS PERFORMANCE PAGES. Numerical v-speed values are displayed in color below the speedtape:
 - V_{FS} (GREEN)
 - V_{AP} (CYAN)
 - V_2 (WHITE)
 - V_{REF} (WHITE)
 - V_{AC} (AMBER)
 - V_1 (AMBER)
 - V_R (CYAN)



- A. Selected airspeed. MAGENTA indication is set by the FMC; GREEN indication on the glareshield guidance panel (GP).
- B. V_{MO}/M_{MO} BARBER POLE indicates speeds at or above V_{MO}/M_{MO} .
- C. V-speed indication. Speeds are set by the pilot in the FMS PERFORMANCE PAGES.
- D. Ideal flap select speed (GREEN DOT) indicates the ideal speed to select the next available flap position.
- E. Actual aircraft airspeed
- F. Actual aircraft airspeed in mach number.



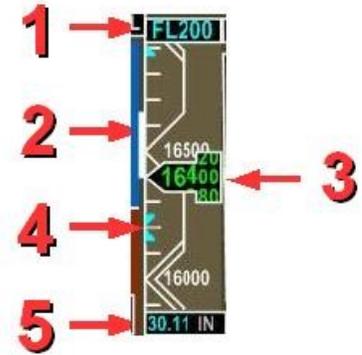
Airspeed indications are: GREEN display is normal range; AMBER is at or below shaker speed and above stall speed; RED INVERSE is at or above overspeed or at or below stall speed.

At slow airspeeds the LOW SPEED AWARENESS TAPE will display a the the bottom of the speedtape. The indications warn the pilot that the aircraft is approaching stall speed. YELLOW is the warning range; AMBER from 1.13 of V_{stall} down to V_{shaker} ; RED is at or below V_{shaker} .

Altitude tape sub-display -

To the immediate right of the attitude indicator is the altitude tape. Indications are in feet or meters.

1. Selected altitude readout based on autopilot setting on the Guidance Panel.
2. Altitude Trend Vector indicates the altitude the plane will reach in 6 seconds based on the current vertical speed.
3. Current altitude digital readout.
4. Altitude bug indicates height set on the guidance panel.
5. Current barometer setting.

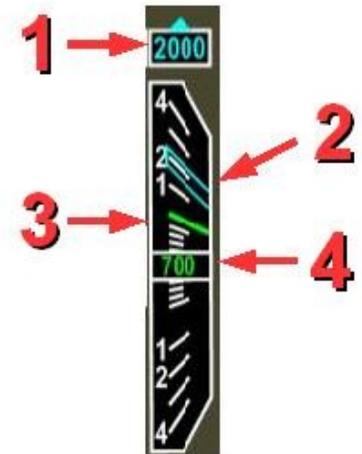


FMS altitude constraints will be shown in MAGENTA along the left edge of the altitude tape (not pictured):

- A line shown below the value is a constraint that requires aircraft to be at or above an altitude.
- A line above the value is a constraint that requires aircraft to be at or below an altitude.
- A line above and below the value is a constraint that requires aircraft to be at a specific altitude.

Vertical speed sub-display -

1. To the right of the altitude tape is the vertical speed readout. The indications are in feet, or meters, per minute.
2. Vertical speed set with the autopilot. The triangle points if the setting is 'up' or 'down'.
3. CYAN bracket is the vertical speed set with the autopilot.
4. GREEN pointer indicates the aircraft actual vertical speed.
5. Actual aircraft climb rate digital readout. When the vertical speed is less than 500' per minute only the vertical speed pointer will display.



The compass rose -

The lower half of the PFD is used for aircraft navigation. Centered in the lower display is the compass rose. Information is color coded depending on the source of the navigation information: GREEN designates data from the aircraft radios (ie, NAV 1 or 2); MAGENTA from the FMC.

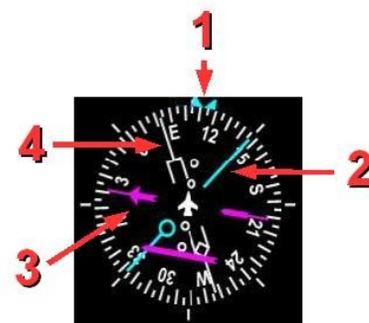
Starting in the upper-left corner, and going clockwise around the compass are:

1. Groundspeed
2. Selected autopilot heading (reflected on the compass by the heading bug)
3. Actual aircraft heading
4. Track course
5. Selected autopilot course as set on the GP using the CRS knob.
6. Wind speed and direction
7. DME radio data
8. FMS course accuracy
9. 'MSG' notification for when there is an FMS announcement (see **MCDU**)
10. NAV1 radio. The radio frequencies can be changed by using the mouse pointer. With the mouse correctly positioned over the radio display a blue boarder will show. The 100th frequencies are changed using the mouse wheel. To change the 100s hold the computer keyboard <CTRL> key and move the mouse wheel. Switch between the active and standby frequencies with a left-mouse-button click.
11. VHF (COM1) radio. The radio frequencies are adjusted as described for the NAV1 radio.
12. Compass rose pointer modes
13. FMS waypoint distance and time
14. navigation source indication: GREEN designates data from the aircraft radios (ie, NAV 1 or 2); MAGENTA from the FMS.



Indicators on the compass rose -

1. CYAN bug shows the heading set on the GP (see also **Guidance Panel**). *When in arch mode a arrow will point the direction to the heading bug if heading bug is not visible.*
2. CYAN pointer showing direction to NAV1 or ADF1 radio locations(see also **Guidance Panel**).
3. Course setting and offset indicator. When MAGENTA the course is set by the FMC, GREEN by the **Guidance Panel**.
4. WHITE pointer showing director to NAV2 or ADF2 radio locations (see also **Guidance Panel**).



The rose can be set as a full circle or 100 degree arch. When in arc mode, and the weather radar is active, precipitation and turbulence information will be displayed. (see **Guidance Panel and Weather Radar**)

Flight Mode Annunciation sub-display -

Along the top of the PFD, above the Attitude Indicator, is the Flight Mode Annunciation (FMA). Indicated are the active, armed and cautionary messages relating to the autopilot modes selected on the glareshield Guidance Panel (GP). *REMINDER: the buttons and knobs on the GP are not back-lit when armed or active; you must review the FMA indications in order to see which autopilot modes are controlling the aircraft.*

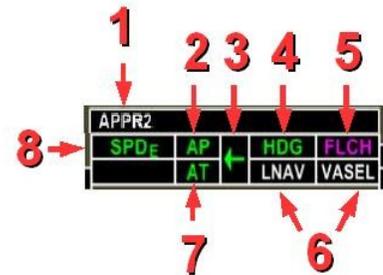
The FMA is divided into six indication fields: autoland, thrust, autopilot/autothrottle, flight director, lateral and vertical. The color of the indication will quickly tell the pilot what function and operating condition of the automated flight systems -

- GREEN: active/engaged, GP controlled
- WHITE: standby/armed
- MAGENTA: active/engaged, FMS controlled
- AMBER: alert/caution, system has failed or compromised function
- RED: system has failed or function terminated

1. Autoland -

The far left indication shows either the armed status (WHITE) or a discrepancy alert (AMBER). An alert message means that not all the conditions have been met for the selected autoland mode. A GREEN indication to the far right (not pictured) states that the autoland system is controlling the aircraft. The autoland mode labels displayed are:

- AUTOLAND 1: fully automated landing controlled by the FMS. Function must be enabled on the MCDU's SETUP page.
- APPR 2: ILS CAT II landing. Will display only in a CAT II landing configuration and autoland is **disabled** on the MCDU's SETUP page.
- APPR 1: ILS CAT I landing



NOTE: for setting and utilizing the automated approach and landing systems see *AUTOLAND*.

2. Autopilot -

Indicates status of the autopilot. If there is no indication the system has not been engaged.

3. Flight Director -

The arrow direction indicates the from where the navigation source information is being directed. Pointing left means the direction is coming from the pilot's instruments, right from the co-pilot's.

4. Lateral -

Indicates the active lateral mode. The lateral mode labels displayed are:

- ROLL: depending on the aircraft's bank status the autopilot will do one of the following -
 - less than 6 degree bank angle the AP will level the winds.

- greater than 35 degree bank the AP will reduce the roll to 35 degrees and hold.
- between 6 and 35 degrees the AP will hold the current roll.

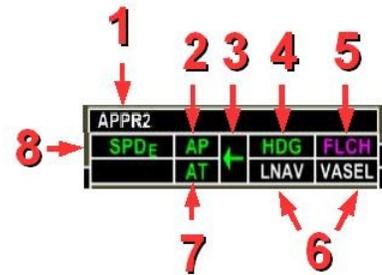
- HDG: heading selected on the GP
- LNAV: lateral navigation controlled by the FMS.
- LOC: radio navigation selected on the GP
- BC: back-course mode
- TRACK: AP will fly the current current aircraft heading (this is a revisionary mode and cannot be selected)

NOTE: there will be an automatic transition from ROLL to TRACK when IAS is greater than 140 kt for TO or greater than 100 kt for GA, and bank angle is at less than three degrees for more than 10 seconds.

5. Vertical -

Indicates the active vertical mode. The vertical mode labels displayed are:

- FPA – flight path angle
- TO - takeoff
- ASEL – altitude select
- FLCH – flight level change
- ALT – altitude hold
- VS – vertical speed
- OVSP – overspeed protection
- GS - glideslope
- GA - go-around



6. Vertical and Lateral armed modes-

Indicates the mode armed. When the aircraft captures the armed path the indications will move to the active mode spaces.

7. Autothrottle -

Indicates the status of autothrottle control. If there is no indication the system has not been engaged.

8. Thrust -

The active thrust mode. An armed mode is shown in the lower field. The AT mode labels displayed are:

- SPD_T: thrust is used to hold the selected speed.
- SPD_E: pitch is used to set selected speed. Throttles are set to a fixed setting based on phase of flight.
- TO: takeoff
- GA: go-around
- HOLD: thrust levers are locked in position during takeoff run and until passing 400 feet AGL.

REMINDER: The color of the FMA indication quickly notifies the pilot if an automated flight system is active, and if the GP or FMS is controlling the aircraft -

- **WHITE:** standby/armed
- **GREEN:** GP controlled with value set by pilot.
- **MAGENTA:** FMS controlled

MULTI-FUNCTION DISPLAY

Like the PFD the multi-function display (MFD) is divided into two halves: upper for lateral and lower for vertical navigation. Along the top and bottom of the MFD you see five 'softkeys'. Using the mouse pointer these can be left-mouse-button clicked to populate and de-populate the MFD display. The Multi-function Display provides the pilot with vertical and lateral flight profile information, system status, Traffic Alert and Collision Avoidance System (TCAS), and weather radar.

The multi-function screen can be enlarged by a right-mouse-button click. To reduce the display click again with a right-mouse-button.



When the aircraft is started 'cold and dark' or the IRS function is lost the MFDI display 'FAIL' notices. When on-ground this indicates that IRS needs to be set and allowed to align (see MCDU).

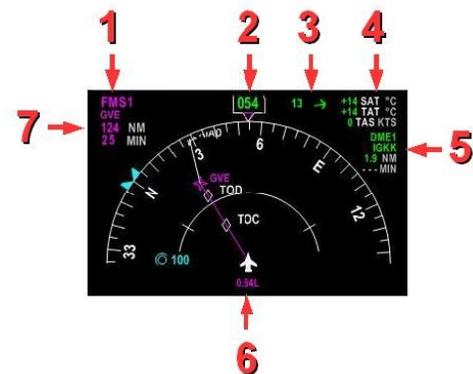
The upper half of the MFD displays the FMC programmed route in Map or PLAN modes. Overlays outlining waypoint data and weather may be selected using the softkeys.

Map display mode -

The MCDU programmed flight plan is shown relative to the aircraft's current direction of travel. Use the **Map softkey** (see below) to select the detail of information displayed on the screen.

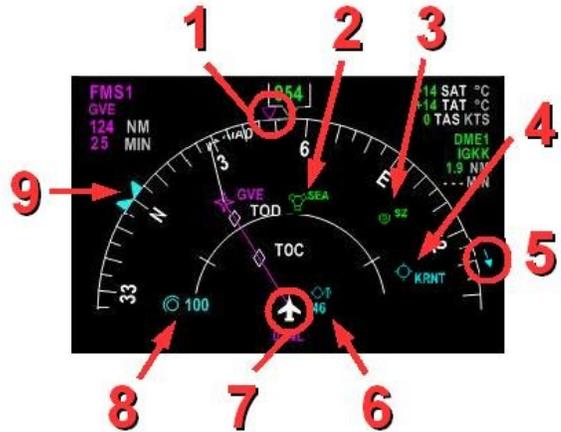
Along the edge of the display are:

1. Controlling navigation system indication. When MAGENTA FMS is show the flight management computer is providing the aircraft navigation information. GREEN NAV indicates the guidance panel settings and navigation radios are the navigation information source.
2. Aircraft heading.
3. Wind speed and direction (shown only when wind speed is greater than five knots)
4. Air temperatures and true airspeed.
5. DME source data: identifier, distance and time to station.
6. FMS course deviation: L (left) or R (right) in nautical miles.
7. FMS waypoint (MAGENTA) or NAV radio (GREEN) data: identifier, distance and time to waypoint/station.



Populating the compass arc are:

1. Heading made good indicator (inverted MAGENTA triangle).
2. VOR radio.
3. Non-directional beacon (NDB)
4. Airport
5. Heading bug direction arrow: indicates the direction to the heading bug when the bug is outside the compass rose 180 degree arc.
6. Traffic Alert and Collision Avoidance System (TCAS) aircraft indication
7. Aircraft icon
8. Map range indication
9. Heading bug

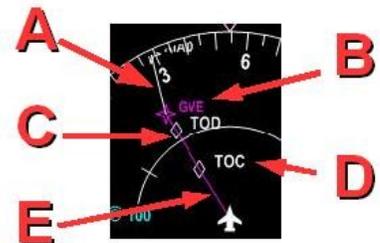


NOTES:

- *airport, radio and beacon indicators only show and identifier when the MAP softkey option **WPT Ident** is selected (see below).*
- *range of the display is adjusted by moving the mouse pointer over the rose. When the range indication is surrounded by square brackets, [], use the mouse scroll wheel to adjust the range.*

Flight plan indications on the compass arc:

- A. WHITE line representing the FMC computed route between two waypoints.
- B. Waypoint: MAGENTA is active fly-to point for the FMS; WHITE are future (non-active) waypoints.
- C. Top Of Descent pseudo waypoint.
- D. Top Of Climb pseudo waypoint.
- E. MAGENTA line representing the active FMC route between two waypoints.



Plan display mode -

The flight plan is shown in a 'north up' orientation. Use the **Plan softkey** (see below) to select the detail of information displayed on the screen. The flight plan and map range indications are the same as those discussed above in **Map display mode**.

Softkeys -

Along the top and bottom of the MFD are five 'softkeys'. To select one of the softkeys move the mouse over the button. When the softkey is outlined in blue 'press' the button using a left-mouse-click. These softkeys access aircraft system and screen display menus. A softkey will close after checking or unchecking a clickbox. If no display selection is made click the 'X' icon to the right of a menu item to close the softkey menu.



The softkeys set the following display options:

- Map – sets the MFD to show the map view and information and detail shown on the flight plan display.
 - Navads: display VOR and DME stations on the flight plan display.
 - Airports: display airports on the flight plan display.
 - WPT Ident: display waypoint names and altitude restrictions on the flight plan and vertical profile displays.
 - Progress: displays the next 'active' waypoint and destination airport distance, time to intercept (ETE) and fuel remaining. ETE and fuel information are predictions.
 - Vert Prof: set the lower half of the MFD to display the vertical flight profile.
 - Missed Appr: display the missed approach routing, if set in the MCDU, on the flight plan display.
 - TCAS: display the Traffic Alert and Collision Avoidance System settings.
 - Weather: display the weather radar settings. The tilt angle of the radar is adjusted by moving the pointer over the WX box and using the mouse scroll wheel.
- Plan – sets the MFD to show the flight plan in a 'north up' orientation and select information and detail shown on the screen.



*NOTE: When in **Plan mode**, and TCAS is checked on the **Plan menu**, a TCAS display will show in the lower half of the MFD. To show the vertical profile in **Plan mode** TCAS must be un-checked.*

- Systems – sets the MFD to show aircraft system information. Options are:
 - Status (doors, brakes, batteries, crew oxygen, engine oil, external temperatures, aircraft gross weight)
 - Elec (electrical)
 - Fuel
 - Hydr (hydraulics)
 - Anti Ice
 - Flt Ctrl (flight controls)
 - ECS (environment control)

NOTE: with the pointer over the system softkey the mouse wheel can be use to quickly change the screen being displayed.

- TCAS – set the information displayed by the Traffic Alert and Collision Avoidance System. Use the mouse wheel to set below, normal or above.



*NOTE: for traffic to display in **Map or Plan modes** the TCAS system must be activated on the MCDU RADIO page 1 AND TCAS selected on the **Map and/or Plan menus**.*

- Weather – set the radar to standby, on, off, or display turbulence information. When the radar is in standby or on the WX indicator and tilt control box will appear on the MFD. The tilt angle of the radar is adjusted by moving the mouse over the WX control box and using the mouse scroll wheel.

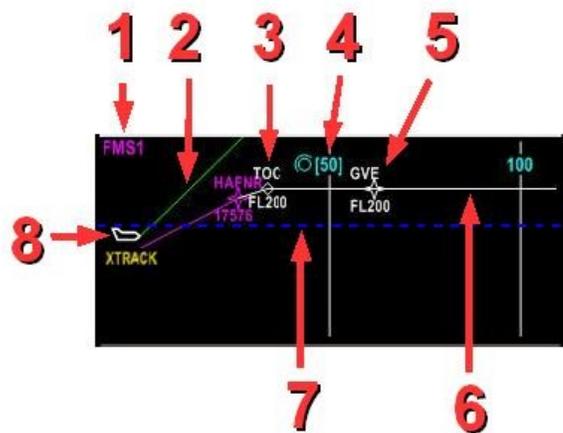


NOTE: for the weather radar to display the gauge must be activated using the E-jet **Configuration utility**.

Vertical profile -

The lower half of the MFD can be selected to display the vertical flight profile using the **Map or Plan softkey**.

1. FMS Navigation Source
2. Aircraft Trajectory Path – GREEN line coming from the aircraft icon nose predicts the plane's flight path based on vertical speed.
3. Top of Climb (TOC) – this pseudo-waypoint will be indicated only on the MFD map and vertical profile displays, not on the MCDU's flight plan. TOD will be indicated at the point where the vertical profile descends to a lower level. TOC and TOD are recalculated if the flight plan or aircraft performance change.
4. Vertical Range Line – the number indicated the range in nautical miles. To change the range move the pointer over the circle icon. When the distance number is square bracketed turn the mouse wheel to select a new value.
5. Waypoint – when selected the the intersection details will display at each waypoint. When programmed into the FMS a HOLD indication will be show on the appropriate waypoint(s).



Altitude constraint information is shown below each waypoint:

- A line shown below the value is a constraint that requires aircraft to be at or above an altitude.
 - A line above the value is a constraint that requires aircraft to be at or below an altitude.
 - A line above and below the value is a constraint that requires aircraft to be at a specific altitude.
 - No lines shown is a FMS predicted crossing altitude that is not a constraint.
6. Vertical Line Track – flight path as computed by the FMC. The active flightplan leg is indicated by a MAGENTA line and waypoint.

7. Selected Altitude Line – when the altitude selected on the glareshield **Guidance Panel** is different than the MCDU's height set for Top Of Climb, when in climb mode, Cruise altitude, when in cruise mode, or Bottom of Climb, when in descent mode, a CYAN dashed line will superimpose over the vertical flight profile.

NOTE: when the GP height is set higher than cruise altitude the MCDU value will automatically be reset to the greater value.

8. Aircraft Icon - will face to the right when plane's direction is along the flight path. If significant deviation from the path is detected 'XTRACK' will appear under the icon. When more than 180 degrees off-track the icon will face to the left.

ENGINE INDICATION AND CREW ALERTING SYSTEM

Like the PFD and MFD the Engine Indication and Crew Alerting System (EICAS) is divided into two halves. The upper screen displays engine thrust and caution/warning alerts. The lower half summaries fuel, secondary engine readouts, APU, cabin pressure, gear, flaps, trim and gear status.

Thirty seconds after the landing gear is raised and the flaps retracted the EICAS screen is de-cluttered. The EICAS FULL button on the center pedestal re-populates the display. If a cautionary condition is detected the screen will display the cleared items. When on final approach all data is restored when the landing gear is extended.

When experiencing a large number of caution/warning indications place the mouse cursor over the EICAS display. When a blue outline borders the altering system use the mouse wheel to scroll through the announcements.

The EICAS screen can be enlarged by a right-mouse-button click. To reduce the display click again with a right-mouse-button.



GUIDANCE PANEL

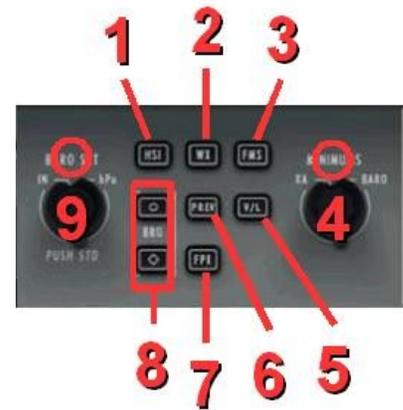
Along the top of the panel glareshield is the guidance panel (GP). The many autopilot modes and functions are engaged using this panel's many buttons and knobs. You must take the time to fully understand how each control effects the E-jet during each phase of flight.



From left to right you have:

Pilot's Display Controller Panel (DCP) -

1. HSI: horizontal situation indicator toggles between full and arc displays for the PFD compass rose.
2. WX: activates the display of weather radar information over the PFD arc compass (see WEATHER RADAR for display information).
3. FMS: sets the flight management system (FMS/FMC) as the primary navigation source controlling the autopilot. PFD and MFD navigation source indications will display magenta.
4. MINIMUMS knob: a left mouse click on the hotspot (red circle) will select either radar or barometer minimum callout. When the mouse pointer is over the knob the mouse left/right buttons and wheel will adjust the minimum altitude.
5. V/L: sets the radios as the primary navigation sources controlling the autopilot. PFD and MFD navigation source indications will display green.
6. PREV: when the FMS is the primary navigation source pressing this key will arm the autopilot for ILS localizer and glide slope capture. A blue arrow indicating the course selected for the localizer will display on the PFD compass.
7. FPR: toggles on and off the PFD flight path reference line and digital readout.
8. BRG Buttons: circle (upper) cycles through VOR1 or FMS1 being displayed on the PFD; diamond (lower) cycles through VOR2 or FMS2 on the PFD.
9. BARO SET knob: a left mouse click on the hotspot (red circle) will select either inches of mercury (IN) or hectopascals (HPA). When the mouse pointer is over the knob the mouse left/right buttons and wheel will adjust the altimeter's pressure setting. A center mouse click over the knob will set pressure to standard.



Pilot's Flight Director (FD) and Course Knob -

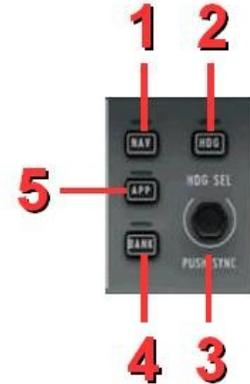
- The FD button toggles the flight director indication on the left (pilot) primary flight display. This button only places, or removes, the PFD's FD overlay. Flight Director function is commanded by the selected vertical and lateral modes.
- Set VOR1 heading course as displayed on the PFD using left or right



mouse button clicks or the mouse wheel. A center mouse click will set the course for direct intercept based on the aircraft's current position.

Lateral Controls -

1. NAV: commands the autopilot to control lateral navigation. The source providing the navigation information, FMS or radios, is dependent on the selection made using the Display Controller Panel (DCP). The Primary Flight Display's Flight Mode Annunciation sub-display (FMA) lateral mode annunciation will display LNAV when FMS is the navigation source; LOC when source are the radios.
2. HDG: autopilot will fly the heading as selected using the HDG knob. FMA lateral mode annunciation displays HDG.
3. HDG SEL knob: left, right and the mouse wheel selects the desired autopilot heading and shown on the PFD and MFD by the heading bug. A center-mouse-click synchronizes the heading bug to the aircraft's current heading.
4. BANK: sets the autopilot bank limit to 17 degrees. A white arc is displayed at the top of the PFD attitude indicator. Bank limiting is only available below 25,000 ft when in HDG mode. Bank limiting is automatically activated above 25,000 ft.
5. APP: activates the radios to control the autopilot for an ILS landing. HDG mode will deactivate when the localizer is captured. The FMA annunciation displays -



LOC
GS

The Autopilot Approach Status Annunciator displays -

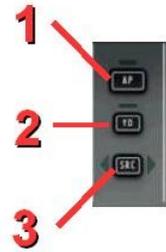
APPR 2 = CAT II ILS approach capable. *(Displayed only if autoland function disabled on MCDU SETUP page.)*
APPR 1 = CAT I ILS approach capable.
APPR 1 ONLY = CAT I ILS approach capable.
Requirements for CAT II ILS approach mode not satisfied.
AUTOLAND = aircraft is set for autoland *(function must be set active on MCDU SETUP page.)*

When approaching a runway that uses a back course pressing the APP button will activate the Localizer Back Course mode. The FMA lateral mode will display -

BC

Autopilot -

1. AP: autopilot ON or OFF
2. YD: yaw damper ON or OFF
3. SRC: navigation source information from pilot's or co-pilot's instruments.



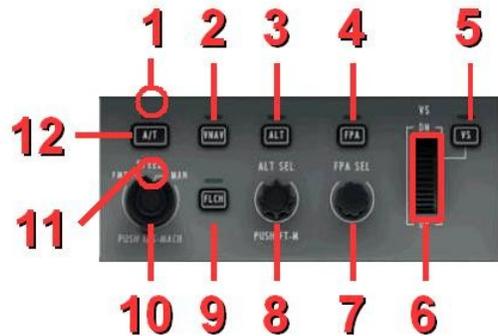
Vertical Controls -

1. TOGA hidden clickspot: a left mouse click here will activate the TO or GA modes. The Primary Flight Display's Flight Mode Annunciation sub-display (FMA) will show the following indications depending on aircraft speed -

- ROLL lateral mode for takeoff up to 100 kts
- TRK lateral mode for takeoff after passing 100 kts. TRK is also displayed when in go-around lateral mode.

FMA will display the following vertical mode indications:

- TO takeoff vertical mode when TOGA engaged on-ground, or five seconds after landing.
 - GA go-around vertical mode when TOGA engaged in-flight, or within five seconds of landing.
2. VNAV: commands the autopilot to follow FMS control for vertical navigation. The FMS will select the appropriate vertical mode to accomplish the programmed profile. The VNAV sub-mode will be displayed on the FMA. The sub-modes are: FLCH, ASEL, ALT, and PTH.
 3. ALT: commands the autopilot to hold the current altitude. This will override a climb or descent as commanded using FLCH, VNAV, VS or FPA. FMA displays ALT.
 4. FPA: selects Flight Path Angle mode to control aircraft climb or descent. NOTE: the vertical speed flown will vary depending on airspeed and angle selections. FMA displays FPA.
 5. VS: selects Vertical Speed mode to control aircraft climb or descent. FMA displays VS.
 6. VS wheel: sets the desired vertical speed using left or right mouse button clicks, or using the mouse wheel. NOTE: VS mode must be active for the wheel to function.
 7. FPA knob: sets the desired flight path angle (FPA) using left or right mouse button clicks, or using the mouse wheel. The angle selected can be no more than +/- 9.9.
 8. ALT knob: use left or right mouse button clicks, or the mouse wheel, to select the desired altitude. A center mouse button click will display altitude information in meters.



9. FLCH: commands the autopilot to climb or descend depending on the selected altitude. When climbing pitch will control airspeed and throttles will set to CLB1 or CLB2 (see **MCDU TRS pages**). For descents the throttles will retard and pitch will control airspeed. FMA vertical mode will display FLCH.
10. SPEED knob: When the mouse pointer is over the knob, and the speed mode selector is set to MAN, airspeed can be selected using left and right mouse button clicks, or the mouse scroll wheel. A center mouse button click over the knob toggles between IAS (knots) and Mach speed indications.
11. SPEED knob hidden clickspot: a left-mouse-click sets the autopilot speed mode to FMS or MAN -
 - FMS selection commands the autopilot to follow the FMS's programmed speed profile (see FMS). When in FMS mode speed indications on the PFD are colored MAGENTA.
 - MAN selection commands the autopilot to follow the speed selected by the pilot. When in MAN mode PFD speed indications are CYAN.
12. A/T: engage and disengages the autothrottle system. When on-ground the autothrottle system is armed. The FD button must be pressed prior to arming the A/T.

Co-pilot's Flight Director -

Same function as pilot's FD.

Co-pilot's Display Controller Panel -

Same function as pilot's DCP.

The GP 2D panel view can be enlarged with a left-mouse-click on the hidden clickspot (see picture). Click again in the same clickspot to reduce the GP.



*You may have noticed that the GP buttons and knobs are not back-lit when active or armed. This is not a bug! Backlighting of the GP panel is an airline **option** made when ordering an E-jet from Embraer. The backlighting option has been selected by only a few airlines. feelThere modeled the simulation to represent the majority of E-jets in real-world operation. For this reason you must review the Flight Mode Annunciation (FMA) indications along the top of the PFD screen to confirm which autopilot modes are controlling the aircraft (just like a real E-jet pilot).*

CAUTION AND WARNING ALARM RESET BUTTONS

Outboard of the DCP are the aural alarm reset buttons. Pressing these buttons will silence an alarm. The details on the caution/warning are displayed in the EICAS screen.

GLARESHIELD LIGHTS CONTROL PANEL

Far left and right on the glare shield are knobs to adjust panel lighting. Only the PFD, MFD and EICAS brightness controls are simulated.

REVERSIONARY PANEL

To the bottom left of the pilot's PFD, and right of the co-pilot's PFD, you can use the revisionary panel's selector knob to change the location of the PFD, MFD or EICAS display in case of a screen failure. The sensory button revert the display data to a secondary source. For the pilot this means from the co-pilot data source, for the co-pilot the pilot data.

INTEGRATED ELECTRONIC STANDBY SYSTEM (IESS)

Between the MFD and EICAS is this backup for the PFD. The IESS layout mimics that of the PFD attitude indicator, though simplified and in a smaller screen. Clockwise around the screen bezel are the following clickspots: STD button to set standard pressure, barometer setting knob, cage button resets attitude, and the + / - buttons control brightness.



CLOCK/CHRONOMETER

To the right of the EICAS screen and above the landing gear lever is the clock/chronometer. Top is the pilot control chronometer (timer). Current UTC time is shown in the center display. The bottom display will automatically track the in-flight time beginning when the mains leave ground and ending on touchdown. Clockwise around the clock bezel are the following clickspots:

- RST – resets the chronometer
- CHR – starts and stops the chronometer
- AUTO/RST – resets the flight chronometer
- SET/DATE – toggles between UTC and DATE displays



CENTER PEDESTAL

1. FLIGHT CONTROL MODE PANEL

The top three guarded buttons toggle the associated flight surface control for direct (lighted) or normal modes.

The bottom two buttons disable the stall warning yoke shaker channels.

2. MULTIFUNCTION CONTROL DISPLAY UNITS (MCDU)

In the 2D view a left-mouse-click will open the 2D MCDU sub-panel.

The VC the MCDUs are fully clickable. A right-mouse-click on the MCDU's screen will open the 2D panel.

3. ENGINE START AND IGNITION KNOBS

The E-jet engine start sequence is fully automated. To open and close the safety covers use a right-mouse click. Turning the engine selector knob to the start position will begin the ignition process.

Standard procedure is for the engine ignition knobs to be set in auto mode.

4. TO CONFIG. BUTTON

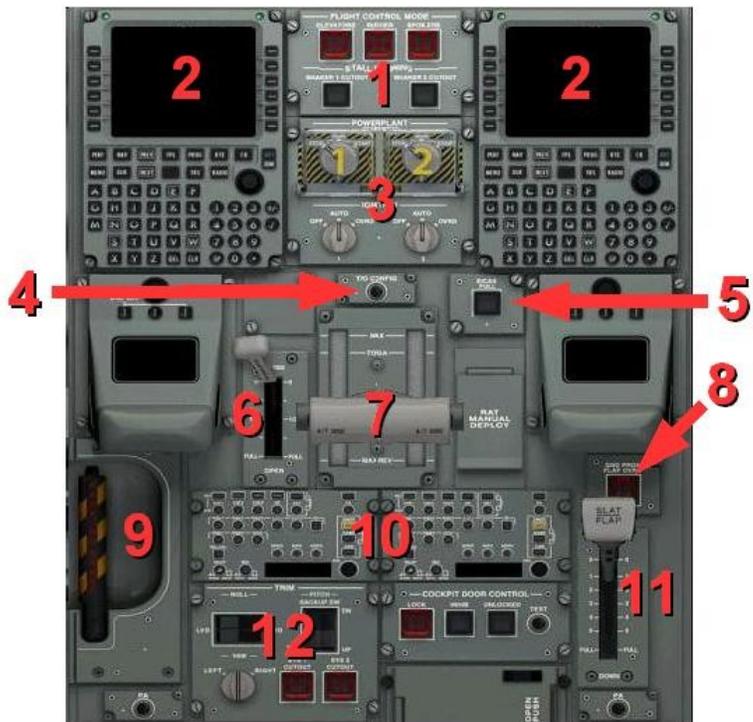
Press this button to confirm that the aircraft is correctly configured for takeoff. When a flight critical setting is incorrect the aural voice will announce the problem, and an error message will display on the EICAS system status screen. After the setting(s) are correct re-press the CONFIG BUTTON to re-check the aircraft. If all settings are in the safe ranges you will hear, "takeoff OK."

5. EICAS FULL PANEL

When pressed (lighted) the EICAS de-clutter logic is suppressed.

6. SPEEDBRAKE

The speedbrake may be moved using left mouse clicks, a left click and hold, or the FS keyboard parking brake command.



7. THROTTLES

The TOGA buttons are not modeled. Use the guidance panel hidden clickspot to activate takeoff and go-around modes.

8. GROUND PROX FLAP OVRD BUTTON

Disables the flap setting warnings when landing configuration is outside normal settings.

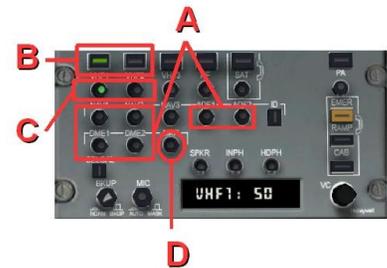
9. PARKING BRAKE

The parking brake may be moved using left mouse clicks, a left click and hold, or the FS keyboard parking brake commands.

10. AUDIO CONTROL PANEL (ACP)

Only the audio function for the aircraft radios is controlled on this panel. The radios frequencies are tuned using the FMS.

- A. Select a NAV, ADF and/or DME radio in order to hear a morse code identifier.
- B. Select the VHF (COM) radio that is transmitting.
- C. Select the VHF (COM) radio that can be heard.
- D. Select if you wish to hear runway marker beacons.



11. FLAPS LEVER

The flaps lever may be moved using left mouse clicks, a left click and hold, or the FS keyboard flaps commands.

12. TRIM PANEL

These rocker switches and knob for manual adjustment of the rudder (yaw), aileron (roll) and pitch trim settings.



OVERHEAD PANEL



1. ELECTRIC

Normal operation is for the APU button to be blank, toggles at AUTO, and knobs in the 12-o'clock position. About 30 seconds after applying the parking brake the Ground Power Unity (GPU) button will illuminate 'AVAIL'. Pressing the button will power aircraft from this 'virtual' power source. If you release the parking brake the GPU will immediately disconnect and de-power the aircraft. Avoid unintentional power loss by having the APU running and connected to the AC power system. **REMEMBER, an unlit button means a system is connected and operating normally ... this is the *Dark and Quiet Cockpit panel* design philosophy.**

2. COCKPIT LIGHTS

Panel lights are either ON or OFF.

3. FUEL

Normal operation is for all buttons to be blank and knobs in the 12-o'clock position.

4. PASSENGER SIGNS

Moving the selector knob controls the function of the passenger cabin emergency lighting system. Normal operation is for the knob to be in the ARMED position. The fasten seatbelt and no smoking sign switches will chime when toggled on or off. The sterile cockpit switch is clickable.

5. APU CONTROL

Control the Auxiliary Power Unit (APU) through this panel.

6. WINDSHIELD WIPER

Control the pilot and co-pilot windshield wipers on this panel. *Movement of the wiper blades are simulated only in VC view).*

7. EXTERNAL, TAXI AND LANDING LIGHTS

Control the E-jet's exterior, taxi and landing lights through this panel. The LOGO switch will not control the lighting on the aircraft's tail (this is controlled by the landing lights). *CALL!'s* POWER UP CHECKLIST requests for the logo lights to be on and therefore this switch is therefore clickable.

NOTE: the external lights will only display when the aircraft is powered by the APU or GPU.

8. HYDRAULIC

Normal flight operations require that all buttons be blank and knobs in the 12-o'clock position. When at the gate, with engines OFF, the SYSTEM 3 ELECTRIC PUMP A will be OFF (follow instruction when using *CALL!*).

9. PRESSURIZATION

Normal operation is for all knobs to be in the 12-o'clock position. Moving the Mode Knob to LFE CTRL (right-hand movement) allows you to use the Landing Field Elevation (LFE) knob to increase or decrease in 100 ft increments the elevation of the landing airport. The elevation readout is on the EICAS screen.

10. WINDSHIELD HEATING AND ICE PROTECTION

Normal operation is for all buttons to be blank and knobs in the 12-o'clock position.

11. AIR COND/PNEUMATIC

All functions of the air conditioning and pneumatic systems are simulated. Normal operations call for all lights to be OFF.



MCDU, FMS and the FMC

Modern jetliner navigation and control is achieved through the flight management system (FMS). This device was a revolution when first introduced by Honeywell on the Lockheed 1011-500 Tristar in the late 70's. Thirty years later the FMS is a navigation computer AND a system to manage most of an aircraft performance characteristics. Because of the FMS's ability to improve economics and assist the flight crew in conducting safe and comfortable flight the system is now the heart of a modern electronic aircraft.

The E-jets are fitted with Honeywell Primus 1000 integrated avionics system. EMBRAER took out all the stops when integrating the FMS with the E-jet navigation systems – full vertical (VNAV) and horizontal (LNAV) control are available.

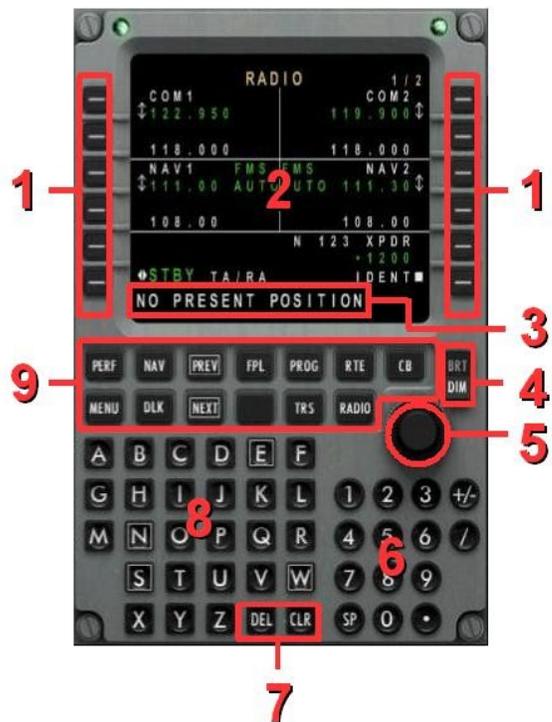
Data entered into the FMS must follow a specific syntax. If the data entered is not recognized the FMS will display an error code in the scratchpad. Permitted syntax are outlined in the 'FMS ENTRY FORMATS' of the **Quick Reference Handbook** at the end of the manual.

This chapter is written to outline the basic functions of the FMS. The E-jets are modern computer managed aircraft that require their pilots to understand how to use the Multifunction Control Display Unit (MCDU). The E-jets can be flown without use of the FMC ... but this generation of aircraft is not designed for such operations. Though not required, it is recommended you read this section of the manual fully before completing your E-jet introduction flight.

Components of the FMS:

The Flight Management System (FMS) technically refers to all the components that control the aircraft's automated flight. The control unit seen in the E-jet cockpit is called the Multifunction Control Display Unit (MCDU). Hidden from view is the Flight Management Computer (FMC), this is the actual brain (multiple redundant computers actually) running the FMS. It is common 'slang' to refer to the MCDU as the FMS or the FMC.

1. Line select keys (LSK): used to select, transfer, retrieve or enter data on the screen in specific lines. When you press one of these keys, you tell the FMS where to enter the data stored in the scratchpad. The keys are referred to as LSK 1-6 and Right or Left. For example, the third key on the right side of the display screen is referenced as LSK 3R.
2. Display screen.
3. Scratchpad: pilot-entered data is first displayed in this area. FMS messages are



also displayed. After data is entered, it is moved to the desired location using the line select keys (LSK).

4. Screen brightness and dimming rocker switch.
5. Rotary knob. The knob is controlled by either left-mouse-clicks or the mouse wheel.
6. Alpha keypad.
7. DEL and CLR keys. The delete key is used to delete items from the FMS. When pressed, *DELETE* is displayed in the scratchpad and you only have to select the line to be deleted. The CLR key removes, character by character, the scratchpad. Holding the CLR key for more than two seconds will clear the scratchpad.
8. Numeric keypad.
9. Function keys : provides access to the major FMS functions: PERF (aircraft performance), NAV (navigation pages), PREV & NEXT (move forward and back between function/menu 'pages'), FPL (flight plan), PROG (progress), RTE (*not modeled*), CB (*not modeled*), MENU, DLK (*not modeled*), 'blank', TRS (engine thrust settings), and RADIO (tuning COM and navigation radios).

Color assignment

A color code is used to display information on the FMS display:

- Vertical atmospheric data and performance – Cyan (Blue)
- Lateral data and mode selection - Green
- FROM waypoint, Warnings and Flight plan names - Yellow
- TO waypoint – Magenta (Purple)
- Prompts, menus and titles - White
- Failures - Red

FMC Programming Preflight Flow:

Before engine start the flight management computer must be programmed with enough information to safety, and efficiently, conducting the aircraft from the takeoff runway to landing runway. The flow below will meet the minimum requirements for conducting a flight -

- Position Initialization.....SET
- Flight Plan.....LOADED or ENTERED
- Flight Plan.....ACTIVATED
- Performance Initialization.....SET
- Departure.....ACTIVATED
- Takeoff v-speeds.....SET

The E-jets are modern computer managed aircraft that are designed to be flown using the FMS. Failure to complete the above preflight flow will reduce aircraft performance and increase pilot in-flight workload.

Position Initialization

The first page shown after powering the MCDU during a 'cold and dark' start is the first RADIO page. Before you are able to program the FMS with flight information you must set the aircraft's location:

1. Press the NAV function key.
2. Press the NEXT function key to go to NAV INDEX page two.
3. Press LSK 1L (line select key one on the top left side of the display screen) to select POS INIT.
4. Choose one of three available locations listed by pressing LSK 1R, 2R or 3R (the GPS 1 POS, LSK 3R, is always correct).



The IRS system will now initialize.

5. Clear the NO PRESENT POSITION message by pressing the MCDU's CLR key.

Until the IRS system has aligned the PFD and MFD will show ATT FAIL and HDG FAIL messages. This error will clear after IRS alignment. The speed of alignment is based on the preference set using the **Configuration Utility**. During alignment the flight plan and performance information can be entered. DO NOT attempt to move the aircraft, or start the engines, during IRS alignment as the plane's starting position will not be correctly initialized.

MCDU Messages

The FMS will display 'MSG' on the PFD when there is a pilot information message shown in the SCRATCHPAD. Once read the message and 'MSG' indication and SCRATCHPAD are removed using the CLR key.

Entering a flight plan

After selecting the initial aircraft position during **Position Initialization** press the FPL key, or LSK 6R on the POSITION INIT page. The ICAO location identifier is displayed on the top left corner of the ACTIVE FLT PLAN screen. Flightplans are entered in the following sequence:

1. destination
2. route waypoints and jetways
3. alternate destination
4. departure runway and standard instrument departure (SID)
5. expected arrival (STAR)

*If you wish to load a FS flight plan, load a FMC save route, or create a route that will be saved see **MCDU FPL pages**.*

To begin enter the flight destination into the scratchpad and press the LSK 2R to the right of the DEST prompt. When a flight plan for the considered route *has been previously stored*

using the FMC, that route will be displayed after the ICAO identifier for the arrival airport is entered into the DEST field. Review and modify the loaded plan and press the line select key adjacent to ACTIVATE FPL. All changes made to the flight plan before pressing ACTIVATE FPL are automatically stored.

If there is no stored flight plan you have the option of loading an Flightsim plan or entering the route manually. The FMC does not directly read Flightsim routes. In order to load a Flightsim route you must first load the plan into the flight simulator's active memory. Once the plan is in active memory press the FMC's FPL button, and then to then press the LSK to the left of the LOAD FPL line. No rwy, SID, STAR or vertical navigation is contained in a FS flight plan. These portions of the flight plan must be entered by using the FMC the in order to complete the route (see below).

To enter a plan by hand type each waypoint identifier in the scratchpad using the alphanumeric keyboard and enter it in the flight plan using the appropriate line select key. When there are duplicate waypoints in the database you will be asked to confirm which location to enter. For waypoints not in the database you are given the option of entering the geographic location. New waypoints will be saved by the FMC as 'pilot waypoints'. Waypoints are entered in the following ways:

- identifier (e.g KARPU or NTS),
- bearing and distance from a reference point (e.g from NTS, on radial 223 for 9 miles is entered NTS/228/9)
- geographic position (e.g N3343,2/W11122,3)
- using two points and two radials (e.g. NTS/228/KAR/180.
- and along-plan waypoints that do not change the route but add an intermediate point (e.g. NTS//20)

When route is complete, type the destination airport (ICAO) identifier into the scratchpad and placed using a left LSK at the end of the flight plan. This will 'close' the flight plan and allow the FMS to compute the vertical flight profile and make predictive calculations such as time to destination and fuel requirements. HINT: if the FMC does not create a vertical profile you have likely not closed the flight plan, or have not cleared any discontinuities (gaps) in the programmed route.

You can add any new waypoint in the flight plan by entering it first in the scratch and then program it in the flight plan using the line select key. PREV and NEXT keys are available to navigate through the flight plan. When your flight plan is complete an ALTN prompt will appear. This is for alternate destination. Enter the alternate field ICAO identifier then the route the same way you entered the flight plan. Be advised that if a stored flight plan exists from destination to alternate the FMS will ask you if you want to use it. If you accept the proposed route **the initial flight plan you have just created will be erased!** When everything is completed, a DEPARTURE prompt will be displayed on the bottom left corner of the screen. Using the line select key, select the departure initialization function.

Entering a departure -

Initializing a departure is always performed the same way. Enter first runway in use by

pressing the adjacent line select key. Choose then the departure and the transition. A REVIEW prompt allows you to check the departure you entered, you cannot modify the departure routing at this time. You may choose to enter departure manually, in that case proceed the same way as entering on waypoint after another as described prior. Sometimes while reviewing a departure you will find *esoteric* waypoints such as D135E. This code is very easy to decode: D135 means radial 135 inbound (from a fix whatever it is) and E means 5 miles as E is the fifth letter of the alphabet... You will find sometimes R135E, R tells you that the fix is a radio fix such as a VOR. That's it!

Performance management

If you follow the preflight flow chart you will be taken to performance initialization page. As you may have noticed, a PERF INIT prompt appeared on the right bottom corner. Press the adjacent line select key to be taken to the first performance initialization page (the PERFORMANCE pages are discussed in detail below).

Before take off

On the ACTIVE FLT PLAN page RW POS prompt will appear after performance initialization on the bottom right corner of the FMS screen. RW POS allow the FMS to reposition at the current runway. Performing this step is only recommended if you are certain you can remain stationary until the IRS has to to realign. If alignment is not complete before you begin moving your position information in the PFD and FMS may be unreliable.

PERF pages -

The PERF INDEX of sub-page options are shown after pressing the PERF key. NEXT or PREV will scroll between pages. The pages accessed here allow the pilot to review current data (predictions and actual) and enter performance preferences for each phase of the flight.



PERF INIT -

Page 1:

- line 1 and 2 are informational.
- lines 3 through 5 speed preferences for climb, cruise and descent are displayed and selected. Pressing the OR right LSK displays the available options for each mode of flight.
- LSK 6L access the departure, approach and go-around speed selection pages -

DEPARTURE SPEED: set the departure limits for speed, AGL and horizontal distance from the airport.

APPROACH SPEEDS: set FMS control speed for approach of destination airport.

To RETURN to the PERF INIT page 1 press LSK R1

Page 2:

- LSKs left 1, 3 and 4 can be edited to pilot's preference.
- LSK 2L can be entered directly by entering a value, OR by using LSK R2 to access the FUEL RESERV preferences.

Page 3:

- Lines 1 through 3 can be left as-is or modified to pilot's preference.
- LSK 4L must contain the aircraft's ZERO FUEL WEIGHT.
- LSK 4R will display the amount of fuel currently in the aircraft tanks.
- Only after all three performance pages are completed, will the aircraft GROSS WEIGHT be calculated, LSK R5, and CONFIRM INIT be displayed at LSK R6. The performance plan must be activated, by pressing LSK R6, for the FMC to compute fuel use, TOC, TOD and altitude predictions.
- Once PERFORMANCE INIT is activated the PERF DATA pages are displayed.

*After the performance information is initialized a fuel loading 'cheat' can be used. Return to PERFORMANCE INIT page 3 and enter 'FUEL' into the **SCRATCHPAD** and press LSK 4R. The FMC will calculate the fuel required for the flight, display the fuel value, and load the plane's tanks.*

PERF DATA -

Only after the performance information is initialized, and the flight plan is closed and activated, will the three PERFORMANCE DATA pages will populate. Only the cruise altitude entry on page one can be changed. All other data on the pages are for pilot review.

PERF PLAN -

Only after the performance information is initialized, and the flight plan closed and activated, will the PERFORMANC PLAN pages will populate. Alternate airport data will only display if an alternate flighplan is entered.

For each flight plan waypoint fuel and estimated time enroute ETE are shown. The data here is for pilot review and cannot be modified. Pressing a right LSK key will open a wind and temperature page for each waypoint. To improve FMC ETE, ETA and fuel use predictions the pilot may enter weather information. To activate pilot entered weather data LSK R6 must be pressed. Pilot entered data can be CLEARed by pressing LSK L6.

The current waypoint weather can be REQUESTed by pressing LSK 3L. The FMC will use the information stored in the current FS weather file.

To RETURN to the PERFORMANCE PLAN page press LSK R1.

TAKEOFF -

The takeoff data will display after the DEPARTURE runway is selected and ACTIVATED.

Page 1:

- Shown are basic runway information and weather conditions. Surface information may be modified using LSK's 2L and 2R. The remaining data is Information only,

Page 2:

- Wind components and density altitude are displayed. This information is required for setting takeoff V-speeds. Information only.

Page 3:

- Enter V-speeds using the takeoff speed tables. The V-speeds will be indicated on the PFD speedtape.

CLIMB -

Only after PERFORMANCE INIT is activated will information be displayed on the CLIMB page. SPD CMD values may be entered (this will modify the flight plan). All other data is information only.

CRUISE -

Only after PERFORMANCE INIT is activated will information be displayed on the CRUISE page. CRZ ALT and SPD values may be entered (this will modify the flight plan). All other data is information only.

DESCENT -

Only after PERFORMANCE INIT is activated will information be displayed on the DESCENT page. SPD values may be entered (this will modify the flight plan). All other data is information only.

LANDING -

Only after a landing runway has been selected selected and ACTIVATED will information be displayed on the LANDING pages.

Page 1:

- Wind and pressure information can be entered.

Page 2:

- All data is information only.

Page 3:

- Enter V-speeds using the landing speed tables. The V-speeds will be indicated on the PFD speedtape.

WHAT IF -

The FMS must be in FULL PERF mode to enter WHAT-IF.

WHAT-IF functions similarly to the PERFORMANCE INIT pages with some exceptions:

- The active performance settings are displayed in small letters and numbers.
- The values entered in WHAT-IF are displayed in large letters and numbers.
- To enter the optimum cruise altitude type OPT or OPTIMUM. Using the DEL key will

revert the WHAT-IF value to the current cruise altitude. The use of the OPT/OPTIMUM function is only allowed on WHAT-IF page 3.

- Unlike when programming the PERFORMANCE INIT pages, using the DEL key will not set default values. In WHAT-IF mode clicking DEL into a line will revert the selecting line to the active value; pilots are required to enter all values.
- For all hypothetical values to be computed choose CONFIRM INIT, button LSK 6R, on WHAT-IFINIT page 3.
- After the changes have been computed all WHAT-IF outputs are displayed in large letters and numbers. No changes can be made until the RESET option is selected, LSK 4L, on WHAT-IF page 4. Resetting WHAT-IF resets all values to those on the active PERFORMANCE INIT pages.

After the four WHAT-IF INIT pages have been programmed, and CONFIRM INIT has been executed, three WHAT-IF DATA pages are displayed. The DATA pages allow the pilot to evaluate the desirability of the proposed flight parameter changes. NOTE:

- Only the cruise altitude value can be changed on WHAT-IF page one.
- No data can be entered on WHAT-IF page three. The values are for reference only after WHAT-IF INITIALIZATION.
- To return to the WHAT-IF INIT pages to change values click LSK 6L, INIT, on any of the three DATA pages.
- To enter the WHAT-IF values into the active flight plan click LSK 6R, SEL, on any of the three DATA pages. On the WHAT-IF SELECT page you will be prompted to confirm moving the proposed changes into the active flight plan.

FUEL MGT -

Fuel use details are displayed. The data here is for pilot review and cannot be modified.

NAV pages -

The NAV INDEX sub-menu pages are shown after pressing the NAV key. NEXT or PREV will scroll between pages.

Page 1:

- NAV IDENT - Displays the current data, UTC and active AIRAC database information.
- WPT LIST - Display all pilot created waypoints. Press the LSK to enter waypoint into SCRATCHPAD and then press LSK 1L (SHOW WAYPOINT) to show fix latitude, longitude and magnetic variation details. The data here is for pilot review and cannot be modified.
- LOAD FS FPL - Pressing the LSK will load the flightplan in active FS memory into the FMC.



- FPL LIST -
This list is of MCDU created and saved flight plans. Press the left LSK to place the plan into the SCRATCHPAD and then press LSK 6R. On the FLT PLAN SELECT page enter the route into FLT PLAN by pressing LSK 1L. Now you can ACTIVATE or INVERT/ACTIVATE (reverse) the plan by pressing LSK 1R or 2R.

If you have saved multiple flight plans FPL LIST will contain many pages. To view the plans on each page use the FMS's NEXT and PREV keys.

You can search saved flight plans by airport by entering the ICAO code into the ORG/DEST line (LSK 1R).

- FLT SUM -
Details on the flight are displayed for as information only.
- POS SENSORS -
The aircraft position as calculated by the FMS, GPS and IRS systems are displayed. The operation status of the GPS and IRS systems may be reviewed by pressing the right LSKs.

Navigation radio information is accessed by pressing LSK 6L (VOR/DME). All information is for pilot review and cannot be modified.

- FIX INFO -
Enter a valid waypoint ID into the SCRATCHPAD and press LSK 1L to display fix information. When fix information is present, and you wish to view a different waypoint's details, enter a valid waypoint ID into the SCRATCHPAD and press LSK 1L.
- HOLD -
Press the LSK and the screen will show the active flight plan with *HOLD* in the SCRATCHPAD. Press the left LSK to place a hold at a waypoint.

The MCDU will now display hold pattern details. The all fields but HOLD FIX may be modified. To INSERT the hold into the flight plan press LSK 6R. Once the hold is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

NOTE:

- *The FMS will command a hold speed of 220 KIAS.*
- *To remove a hold press the DEL key (*DELETE* will display in the SCRATCHPAD) and press the LSK to the left of the waypoint commanding a hold. The 'H' indication will be removed from the fix.*
- *Once the hold is removed the modified flight plan must be ACTIVATED by pressing LSK 6R.*

- DEPARTURE -
Lists the departure airport's available runways. Once a runway is selected, and there is an available departure route, the SID page is shown. To INSERT only the departure runway without a SID press LSK 6R.

When a SID is selected, and there is an available transition, the DEPARTURE TRANS page is shown. To INSERT only the departure runway and SID without a transition press LSK 6R.

When a TRANSITION is selected the PROCEDURE is shown. The routing can be REVIEWed by pressing LSK 6L, or INSERTed by pressing LSK 6R. A departure can be CLEARed during review by pressing LSK 6L.

Once the departure is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

- ARRIVAL -
The arrival page allows the pilot to select the destination airport runway, approach and STAR. Press the left LSK to display the choices available. As with the DEPARTURE pages once a selection is made if there are more options these will be displayed.

The routing can be REVIEWed by pressing LSK 6L, or INSERTed by pressing LSK 6R. A arrival can be CLEARed during review by pressing LSK 6L.

Once the arrival is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

Page 2:

- POS INIT -
The aircraft's current position as calculated by the three position instruments are displayed.

- MAINTENANCE -

Page 1

- The current operation status of the OP are displayed. Information only.

Page 2

- A list of any failed sensors are displayed. Information only.
- SETUP (LSK 6L) is discussed below under MENU page .

Page 3

- Course headings are selected to display on main panel screens and MDCU as 'true' or 'MAGnetic'. When set to TRUE a 'T' will display to the right of the FMC computed course headings.



- PATTERNS -

On this page the pilot begins the process of placing a HOLD, FLYOVER, procedure turn, RADIAL turn or ORBIT procedure at a waypoint.

- HOLD:

- ➔ described above

- FLYOVER:

- ➔ the FMC will fly past the selected waypoint before turning. Press the LSK and the screen will show the active flight plan with *FLYOVER* in the SCRATCHPAD. Press the left LSK to place a hold at a waypoint. 'F' will display above the selected waypoint to the right of the heading course. Once the flyover is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

- ➔ To remove a flyover press the DEL key (*DELETE* will display in the SCRATCHPAD) and press the LSK to the left of the flyover waypoint. The 'F' indication will be removed from the fix. Once the flyover is removed the modified flight plan must be ACTIVATED by pressing LSK 6R.

- PCDR TURN:

- ➔ The FMC will fly a procedure turn beginning at the selected waypoint. Press the LSK and the screen will show the active flight plan with *PCDR TURN* in the SCRATCHPAD. The MCDU will now display procedure turn pattern details. All fields but PT FIX may be modified. To INSERT the procedure into the flight plan press LSK 6R. Once the turn is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

- ➔ To remove a procedure turn press the DEL key (*DELETE* will display in the SCRATCHPAD) and press the LSK to the left of the waypoint commanding a turn. The 'P' indication will be removed from the fix. Once the procedure turn is removed the modified flight plan must be ACTIVATED by pressing LSK 6R.

- RADIAL:

- ➔ The FMC will fly a radial pattern beginning at the selected waypoint. Press the LSK and the screen will show the active flight plan with *RADIAL* in the SCRATCHPAD. The MCDU will now display procedure details. To INSERT the procedure into the flight plan press LSK 6R. Pseudo waypoints for the RADIAL procedure will be entered before and after the selected waypoint. Once the turn is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.

- ➔ To remove a procedure turn press the DEL key (*DELETE* will display in the SCRATCHPAD) and press the LSK to the left of the pseudo waypoint commanding a turn. Once the turn is removed the modified flight plan must be ACTIVATED by pressing LSK 6R.
- ORBIT:
 - ➔ The FMC will fly an orbit beginning at the selected waypoint. Press the LSK and the screen will show the active flight plan with *ORBIT* in the SCRATCHPAD. The MCDU will now display procedure details. To INSERT the procedure into the flight plan press LSK 6R. Once the turn is inserted the modified flight plan must be ACTIVATED by pressing LSK 6R.
 - ➔ To remove the orbit press the DEL key (*DELETE* will display in the SCRATCHPAD) and press the LSK to the left of the waypoint commanding the procedure. The 'O' indication will be removed from the fix. Once the turn is removed the modified flight plan must be ACTIVATED by pressing LSK 6R.

*NOTE: the ORBIT and RADIAL procedures will be options only when SPECIAL MISSION is activated on the **MENU page / MISC MENU / FLT CONFIG / page 2.***

FPL pages -

Pressing the FPL function key will result in one of two pages being displayed. If a flight plan has not been activated you will given the option of loading a FS plan, creating and saving a plan, or entering a destination airport and building a route (see **Entering a flight plan**). Once a flight plan has been activated the pilot is presented with the active flight plan pages.



NOTE: position initialization process must be start before attempted to load or create a flight plan.

Loading FS flight plans:

Pressing LSK 2L will load the flight plan in active FS memory into the FMC. Before loading the flight plan you must first have loaded into the FS flightplanner the route you wish to fly. If a route is not in active FS memory you will MCDU will display 'CAN NOT IMPORT PLAN'. FS flight plans contain only waypoints; not runway, SID, STAR, altitude or performance information. After an FS flight plan is loaded the MOD FLT PLAN screen is opened and the pilot must enter and activate runway, SID, STAR,

altitude and performance information. After modification the plan needs to be ACTIVATED (LSK 6R).

Loading a saved flight plan:

A list of MCDU saved routes can be loaded by entering the name of the plan at LSK 3R, or from the FPL LIST by pressing LSK 6L. If you enter the flight plan name the route will be displayed. Press FPL SEL, LSK 6R, to open the FLT PLAN SELECT screen. Now you can ACTIVATE or INVERT/ACTIVATE (reverse) the plan by pressing LSK 1R or 2R.

After route is loaded the MOD FLT PLAN screen is opened where the pilot must enter and activate runway, SID, STAR, altitude and performance information. After modification the plan needs to be ACTIVATED (LSK 6R).

Saving a flight plan:

Flightplans created using the FMC may be saved and used again. You must instruct the MCDU that you wish to save the flight prior to entering the route waypoints.

To create a flight plan that will be saved:

1. Choose FLT PLAN after initializing the aircraft's position, or press the FPL MCDU button.
2. Enter a flight plan name into the scratchpad. Usual practice is to name a flight using the departure and arrival airports separated by a dot (press the MCDU +/- numeric key). A route between Toledo Express and O'Hare International is named: KTOL●KORD.
3. The flight plan creation screen will appear. The screen will be titled 'flight plan name' FPL (in the example above the screen name will be KTOL●KORD FPL).
4. If a plan with the entered name already exists the FMS will load the prior saved route. If no plan exists the FMS will save flightplan using the route data you now enter.
5. Create the route as outlined earlier in this manual. *NOTE: runways, SIDs and STARs cannot be part of a saved flight plan.*
6. After completing the route entry, and closing the flight plan, press the LSK to the right of FPL SEL.
7. Now ACTIVATE the route.

The flight plan is now saved. To use this plan on a future flight choose the FPL LIST page or enter the flight plan name into the scratchpad and choose RECALL FLIGHTPLAN NAMED on the initial FLT PLAN page.

After ACTIVATING the route the MOD FLT PLAN screen will open. Here you adjust the route as discussed below in **Active Flightplans**. After modification the plan needs to be ACTIVATED (LSK 6R).

Active flight plans:

The first page of the active flight plan is shown after pressing FPL key. NEXT or PREV will scroll between pages. When in-flight only the most recently passed and remaining waypoints are shown.

In LSK 1, in YELLOW, is the most recently passed waypoint.

ORIGIN	ACTIVE FLT PLAN	1 / 3
RW01L KIAD		SPD CMD
		200 / 7000
199°	34.3NM	
HAFNR	00+06	240 / 16567
241°	38.0NM	
GVE	00+05	290 / FL200
217°	90.2NM	
SBV	00+14	290 / 14767
176°	17.1NM	
ALDAN	00+03	240 / 8268
◀DEPARTURE		RW POS▶

Below each waypoint, in GREEN, are the heading and distance to the next waypoint.

The next waypoint to be intercepted is in LSK 2, in MAGENTA.

To the right of each waypoint, in GREEN, are the estimated time to arrival (hours + minutes).

The right column, in CYAN, are the speed and altitude restrictions and assumptions. Additional details will display indicating the aircraft's flight path angle or vertical speed.

All data, but the most recently passed waypoint, may be modified. Changes will be noted on the MFD by a white dashed line. For the FMS to follow modifications the plan must be ACTIVATED (LSK 6R).

Waypoint crossing altitudes will be computed by the FMC based upon the information entered in the PERF pages. Unless a specific altitude is entered for a waypoint the crossing altitude is not a constraint.

Constraints may be inserted by the pilot, or are contained in a selected SID or STAR. Crossing constraints are of three types:

- requires aircraft to be at or above an altitude – A to the right of the value
- requires aircraft to be at or below an altitude – B to the right of the value
- requires aircraft to be at a specific altitude – value in a large type

To make a specific altitude constraint an 'above' or 'below' type enter an 'A' (above) or 'B' (below) into the SCRATCHPAD and press the right-LSK for the altitude. Altitude constraints are removed by pressing the DEL key and the right-LSK. For the FMS to follow modifications the plan must be ACTIVATED (LSK 6R).

In addition to computing crossing altitude the FMC will define the aircraft's flight mode as being climb or descent. At times this assumption will be incorrect. To change the crossing flight mode enter an 'C' (climb) or 'D' (descent) into the SCRATCHPAD and press the right-LSK for the altitude. For the FMS to follow modifications the plan must be ACTIVATED (LSK 6R).

Like waypoint crossing altitudes, the FMC will compute crossing airspeeds based upon the information entered in the PERF pages. Unless a specific speed is entered for a waypoint the airspeed indicated is not a constraint.

Speed restrictions are noted with a value in a large type. If a speed restriction is slower than the aircraft's current IAS, the FMS will slow the aircraft to reach the entered speed prior to crossing the waypoint. If a speed restriction is faster than the aircraft's current IAS, the FMS will accelerate to the higher speed after crossing the waypoint.

When entering a restriction note if the FMC is setting speed values in later waypoints are higher, lower, or the same as what you have entered. If the later speed assignments are not appropriate you must enter the correct values.

PROG pages -

The first page of the flight progress pages is shown after pressing the PROG key. NEXT or PREV will scroll between pages.

Only the NAV 1 and 2 radio frequencies on page 1 can be edited, all other information is for pilot review only. When a NAV radio is tuned by the pilot the 'A' (automatic) will turn to an 'M' (manual). To return to automatic tuning press the DEL key and then the LSK for the radio.

MENU page -

MISC MENU:

FLT CONFIG -

Page 1:

- LSK 1L - change the bank limiter value.
- LSK 2R - set the MCDU to auto-page as the flight plan is entered. When ON the MCDU will automatically open a new page with a waypoint is entered into LSK 5L. When OFF the NEXT or PREV function keys must be pressed to move to the next page in the flightplan.

Page 2:

- LSK 1R – set the FMC for special mission mode. This allows for setting ORBIT and RADIAL flight patterns, on the NAV / PATTERNS page.
- LSK 3R – set the FMC to learn how you fly and adjust performance predictions accordingly. The more times you fly the Ejets the better the FMC will be at predicting flight performance.



THRUST MGT -

- See TRS pages below

SETUP -

- LSK's 1L and 1R set the PFD and MFD wind indicator to display either X/Y coordinates or a vector arrow.
- LSK's 3, 4 and 5 right set the controlling autopilot channel to A or B.
- LSK 4L enables the autoland system (see **AUTOLAND** for details on conduction a FMS controlled landing).

MCDU MAINT:

- See MAINTENANCE under PERF pages above.

'blank' – (keyboard entry mode key)

Set the MCDU for keyboard entry mode by pressing this key, or by using the keystroke sequence <CTRL>+<SHIFT>+<K>. An orange 'K' will display in the upper left corner of the MCDU screen and you can directly type into the FMS using the computer keyboard.



To access Line Select Keys (LSKs) use the F1-F6 for the Left LSKs and F7-F12 for the right.

Page Up and Page Down scrolls between the menus.

TRS pages -

Set the engine thrust ratings though this and the TO DATA SET sub page. The options available on this screen are dependent on the aircraft's flight status: on-ground or in-flight.

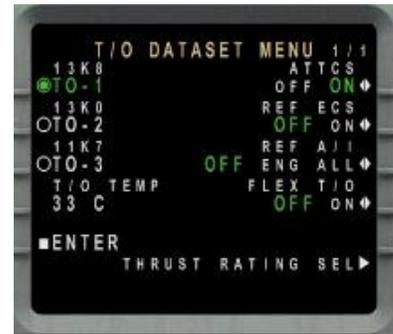
Prior to takeoff THRUST RATING SELECT:

- The default setting for Ejet flight is for thrust management to be in AUTO mode (LSK 1L). the current thrust mode is noted in square brackets (ex, TO is takeoff thrust). The number shown is the percentage of total engine thrust that will be applied.
- Climb thrust is adjusted by pressing LSK 2R. The numbers below the climb thrust mode are percentage of full thrust.
- TLA trim controls Thrust Lever Angle trim functions. TLA assists the pilots by providing small thrust adjustments to hold the current airspeed, reduce engine thrust surges during excessive throttle lever movement, and synchronizing N1 fan speed when the autothrottle is not active. LSK 5R toggles this system ON or OFF.
- For more options in setting thrust press LSK 6R.



T/O DATASET MENU:

- TO-1, -2 and -3:
LSKs L 1-3 select the three available takeoff thrust ratings. The measurement is in pounds of thrust, and noted above the TO rating (ex., 13K8 = 13,800 lb).
- T/O TEMP:
Set the airport temperature by pressing LSK 4L. The value is surrounded by a rectangle and is adjusted using the MCDU tuning knob. The thrust percentage is shown on the EICAS screen above the engine indications and in square brackets in the first line of the THRUST RATING SELECT page.
- ATTCS:
Press LSK 1R to toggle the Automatic Takeoff Thrust Control System system ON or OFF. ATTCS commands maximum engine thrust (RSV) in the event of engine failure during takeoff or go-around, or N1 engine fan speeds differ by more than 15%. When on ATTCS will display above the engine readouts on the EICAS. When active the EICAS will show RSV.
- REF ECS:
Press LSK 2R to toggle the Environmental Control System system ON or OFF. When set off, and APU air is not available, the ECS packs will close during takeoff thrust.
- REF A/I:
Press LSK 3R to toggle the anti-ice system between OFF, ENG or ALL. For automatic anti-ice function set to ALL, and the overhead panel selectors to AUTO.
- FLEX T/O:
Press LSK 4R to toggle the flex takeoff thrust system ON or OFF. When FLEX T/O is ON the assumed airport temperature can be set by pressing LSK 5R. The value is surrounded by a rectangle and is adjusted using the MCDU tuning knob. The thrust percentage is shown on the EICAS screen above the engine indications and in square brackets in the first line of the THRUST RATING SELECT page (see above).



To return to the THRUST RATING SEL page press LSK 6R.

*When a change is made on this page ENTER will highlight, and LSK 5L must be pressed to **activate** the setting(s).*

After takeoff THRUST RATING SELECT:

- The default setting for Ejet flight is for thrust management to be in AUTO mode (LSK 1L). The current thrust mode is noted in square brackets (ex, CLB1 is climb thrust setting one). The number shown is the percentage of total engine thrust that will be applied.
- The thrust mode can be set by pressing left LSK 2 through 5 -
 - TOGA – takeoff/go-around
 - CON – maximum continuous
 - CLB – climb
 - CRZ – cruise



The number shown is the percentage of total engine thrust that will be applied.

- Climb thrust is adjusted by pressing LSK 2R. The numbers below the climb thrust mode are percentage of full thrust.
- TLA trim controls Thrust Lever Angle trim functions. TLA assists the pilots by providing small thrust adjustments to hold the current airspeed, reduce engine thrust surges during excessive throttle lever movement, and synchronizing N1 fan speed when the autothrottle is not active. LSK 5R toggles this system ON or OFF.

RADIO pages -

The first of the two radio pages are shown after pressing the RADIO key. NEXT or PREV will scroll between pages.

RADIO page 1:

- Active radio frequencies are colored green. The white numbers are the standby frequencies.
- To toggle switch the active and standby frequencies press the LSK next the the up/down arrow indications (LSKs 1L, 3L, 1R and 3R). frequencies may be entered in two methods -
 1. type the frequencies into the SCRATCHPAD and press the appropriate radio's standby frequency LSK (2L, 4L, 2R or 4R).
 2. press the appropriate radio's standby frequency LSK (2L, 4L, 2R or 4R). The value is surrounded by a rectangle and is adjusted using the MCDU knob.



REMINDER: COM1 and NAV1 can also be adjusted directly on the PFD.

- Set the TCAS system to active (TA/RA) or standby (STBY) modes by pressing LSK 6L.
- Set the transponder 'squawk' ID by entering the value into the SCRATCHPAD and pressing LSK 5R; or press LSK and set the ID using the MCDU knob.
- For those flying on-line press LSK 6R to IDENT when requested by the ATC controller. *NOTE: you must set the E-jet panel to work with SquawkBox using the **Configuration Utility** (preferences tab).*

RADIO TUNING page 2:

ADF radios one and two are controlled on this page. Frequencies are selected and adjusted as described for the NAV and COM radios above.



'Direct To' function -

When in-flight Air Traffic Control may instruct you to fly directly to a waypoint. To command the FMS to fly the aircraft direct to a waypoint open the active flight plan on the MCDU by pressing the FPL key. Enter the waypoint ID into the SCRATCHPAD. Confirm that page one of the active flight plan is displayed and insert the 'direct to' waypoint by pressing LSK 2L. DO NOT insert the waypoint into LSK 1L. The LSK 1L waypoint represents the aircraft's current location.

Entering a waypoint into the LSK 2L commands the FMC to calculate a course from the plane's current location to the 'direct to' location. When the 'direct to' waypoint is located later in the entered flight plan all intermediate waypoints will be deleted.

The modified routing will be displayed on the MFD as a dashed white line. To accept the changed flight plan press LSK 6R to ACTIVATE.

AUTOLAND

The simulated E-jets are capable of two types of automated approach. When correctly configured the E-jets can autoland. The configuration of the aircraft defines mode initiated by the autopilot. If the configuration doesn't allow for the highest precision landing the system automatically 'degrades' to a lower level of approach authority.

Fully automated landing

For AUTOLAND to arm and engage the following conditions must be met:

- AUTOLAND enabled on MCDU. To allow autoland go to MENU page / MISC MENU / SETUP.
- Both the pilot's and co-pilot's guidance panel MINIMUMS knobs are set to RA (radar) with an altitude greater than 80 feet.
- NAV1 and NAV2 radios are both set the landing runway's ILS frequency.
- Both the pilot's and co-pilot's course (CRS) knobs are set to the landing runway's heading.
- Flaps are set to 5.

When the above standards are met the FMA will show AUTOLAND is armed (WHITE indication in the upper left FMA field). As the aircraft descends the glideslope AUTOLAND will move from armed to active (GREEN indication in the upper right FMA field).

Conducting a fully automated landing:

During approach -

1. Set autobrakes.
2. Set the NAV 1 & 2 radios to the runway ILS frequency.
3. Set the pilot and co-pilot MINIMUMS knob to RA and the altitude greater than 80 feet.
4. Set the pilot and co-pilot CRS knobs to the runway heading. Press the PREV button on both pilots' guidance panel Display Controller Panel (DCP) and turn the CRS knob. The course setting and NAV pointer will show on the PFD's compass rose.
5. If the FMS navigates the aircraft to the outer marker. by pressing the PREV button you have armed the localizer (LOC) and glideslope (GS).
6. If you control the aircraft using the guidance panel HDG and vertical controls (PFD compass rose navigation indications are MAGENTA) arm the autopilot for LOC and GS capture by pressing the APP button.
7. Move your throttle controller into the idle position to allow the autothrottle to retard thrust on landing.

Approaching the outer marker -

1. Set speed for 160 knots using the guidance panel SPD knob.
2. Set Flaps 3.
3. When PFD's GS indicator begins to move down lower the landing gear.

4. As the aircraft approaches the outer marker the LOC and GS will arm (watch the FMA). The aircraft will turn to follow the runway heading and descend along the glideslope.
5. Reduce speed to $V_{APP} + 5$ and set Flaps 5.
6. AUTOLAND indication on the FMA will go from armed to active.

Final approach -

1. As the aircraft passes below 1500 feet ALIGN will arm on the FMA under LOC, and FLAIR will arm on the FMA under GS.
2. As the aircraft passes below 150 feet ALIGN will go from armed to active, and RETD (retard) will arm under SPD.
3. At 50 feet above the runway FLAIR goes active, RLOUT arms (roll out assists in keeping the aircraft aligned with the runway), and D-ROT arms (de-rotation to bring nose wheel down to runway).

Landing -

1. On main gear touchdown RLOUT and D-ROT go active and the autothrottle (AT) sets thrust to idle and disengages. You will hear the aural callout, "throttle."
2. Pilot sets reverse thrust.
3. Five seconds after landing the autopilot will disengage. Pilot now controls aircraft steering.
4. At 80 knots the autobrakes will disengage. You will hear the aural callout, "brakes." Pilot now controls aircraft braking.
5. At 80 knots set idle thrust.
6. Continue braking and exit runway at a safe speed.

NOTE: if autothrust isn't used for landing there will be no RETD or AT indications on the FMA, nor the 'throttle' aural callout.

APPR1 (CAT I) ILS landing

For a APPR1 to arm and engage the following conditions must be met:

- Both the pilot's and co-pilot's guidance panel MINIMUMS knobs are set to BARO (barometer).
- NAV1 radio set to the landing runway's ILS frequency.
- Flaps are set to 5 or FULL.

When the above standards are met the FMA will show APPR1 is armed (WHITE indication in the upper left FMA field). As the aircraft descends the glideslope APPR1 will move from armed to active (GREEN indication in the upper right FMA field).

Conducting a APPR1 landing:

During approach -

1. Set autobrakes.
2. Set the NAV 1 radios to the runway ILS frequency.

3. Set the pilot and co-pilot MINIMUMS knob to BARO and the altitude to the runway chart CAT I decision height.
4. Set the pilot and co-pilot CRS knobs to the runway heading. Press the PREV button on both pilots' guidance panel Display Controller Panel (DCP) and turn the CRS knob. The course setting and NAV pointer will show on the PFD's compass rose.
5. If the FMS navigates the aircraft to the outer marker. by pressing the PREV button you have armed the localizer (LOC) and glideslope (GS).
6. If you control the aircraft using the guidance panel HDG and vertical controls (PFD compass rose navigation indications are GREEN) arm the autopilot for LOC and GS capture by pressing the APP button.
7. Move your throttle controller into the idle position to allow the autothrottle to retard thrust on landing.

Approaching the outer marker -

1. Set speed for 160 knots using the guidance panel SPD knob.
2. Set Flaps 3.
3. When PFD's GS indicator begins to move down lower the landing gear.
4. As the aircraft approaches the outer marker the LOC and GS will arm (watch the FMA). The aircraft will turn to follow the runway heading and descend along the glideslope.
5. Reduce speed to $V_{APP} + 5$ and set flaps.
6. APPR1 indication on the FMA will go from armed to active.

Final approach -

1. As the aircraft passes below decision height make the landing decision.
2. If landing turn OFF the autopilot and fly the aircraft onto the runway.

Landing -

1. On main gear touchdown the autothrottle (AT) sets thrust to idle and disengages. You will hear the aural callout, "throttle."
2. Pilot sets reverse thrust.
3. At 80 knots the autobrakes will disengage. You will hear the aural callout, "brakes." Pilot now controls aircraft braking.
4. At 80 knots set idle thrust.
5. Continue braking and exit runway at a safe speed.

NOTE: if autothrust isn't used for landing there will be no RETD or AT indications on the FMA, nor the 'throttle' aural callout.

APPR1 ONLY indication

When the FMA shows APPR1 ONLY in the armed field the aircraft is not correctly configured for a APPR1 landing. To correctly configure the aircraft:

- Both the pilot's and co-pilot's guidance panel MINIMUMS knobs are set to BARO (barometer).

APPR2 (CAT II) ILS landing

For a APPR2 to arm and engage the following conditions must be met:

- AUTOLAND disabled on MCDU. To turn OFF autoland go to MENU page / MISC MENU / SETUP.
- Both the pilot's and co-pilot's guidance panel MINIMUMS knobs are set to RA (radar) with an altitude greater than 80 feet.
- NAV1 and NAV2 radios are both set the landing runway's ILS frequency.
- Both the pilot's and co-pilot's course (CRS) knobs are set to the landing runway's heading.
- Flaps are set to 5.

When the above standards are met the FMA will show APPR2 is armed (WHITE indication in the upper left FMA field). As the aircraft descends the glideslope APPR2 will move from armed to active (GREEN indication in the upper right FMA field).

Conducting a APPR2 landing:

During approach -

1. Set autobrakes.
2. Set the NAV 1 & 2 radios to the runway ILS frequency.
3. Set the pilot and co-pilot MINIMUMS knob to RA and the altitude greater than 80 feet.
4. Set the pilot and co-pilot CRS knobs to the runway heading. Press the PREV button on both pilots' guidance panel Display Controller Panel (DCP) and turn the CRS knob. The course setting and NAV pointer will show on the PFD's compass rose.
5. If the FMS navigates the aircraft to the outer marker. by pressing the PREV button you have armed the localizer (LOC) and glideslope (GS).
6. If you control the aircraft using the guidance panel HDG and vertical controls (PFD compass rose navigation indications are GREEN) arm the autopilot for LOC and GS capture by pressing the APP button.
7. Move your throttle controller into the idle position to allow the autothrottle to retard thrust on landing.

Approaching the outer marker -

1. Set speed for 160 knots using the guidance panel SPD knob.
2. Set Flaps 3.
3. When PFD's GS indicator begins to move down lower the landing gear.

4. As the aircraft approaches the outer marker the LOC and GS will arm (watch the FMA). The aircraft will turn to follow the runway heading and descend along the glideslope.
5. Reduce speed to $V_{APP} + 5$ and set flaps.
6. APPR2 indication on the FMA will go from armed to active.

Final approach -

1. As the aircraft passes below decision height make the landing decision.
2. If landing turn OFF the autopilot and fly the aircraft onto the runway.

Landing -

1. On main gear touchdown the autothrottle (AT) sets thrust to idle and disengages. You will hear the aural callout, "throttle."
2. Pilot sets reverse thrust.
3. At 80 knots the autobrakes will disengage. You will hear the aural callout, "brakes." Pilot now controls aircraft braking.
4. At 80 knots set idle thrust.
5. Continue braking and exit runway at a safe speed.

NOTE: if autothrust isn't used for landing there will be no RETD or AT indications on the FMA, nor the 'throttle' aural callout.

FULL AUTHORITY DIGITAL ELECTRONIC CONTROL (FADEC)

Each engine is controlled by two FADECs which are designated as FADEC A and B. Based on sensor readings, panel settings and MDCU programming each FADEC controls fuel flow to the engines to reach the required fan speeds.

ENGINE START

Engine start is initiated by turning the associated center pedestal Start/Stop knob to the START position (remember that a right click to open the safety cover is required to access the knob).

The FADEC is responsible for the automatic engine startup and completing the startup cycle.

TAKEOFF AND IN-FLIGHT THRUST

Simulation of the throttle control in-flight by the FADEC and autothrottle systems requires that your joystick/yoke/throttle quadrant thrust lever be in the full-forward position after prior to takeoff engine run-up. Unless the pilot chooses to control thrust, it is normal procedure for throttle control to be managed by the aircraft's computers.

LANDING THRUST

The E-jets autothrottle will retard thrust automatically when landing. For this function simulation your joystick/yoke/throttle quadrant thrust lever be in the full-idle position. There recommends that during short final you move your thrust levers back to their engine idle setting.

ENGINE SHUTDOWN

Engine shutdown is initiated by using the Engine Start/Stop knob with the Thrust Lever positioned at IDLE (users with throttle control, make sure the throttle is calibrated otherwise hit F1 to bring the engines to complete idle).

AUXILIARY POWER UNIT

The APU is also controlled by a FADEC system. APU start and stop is controlled by simply turning the Start/Stop knob on the overhead panel.

HEAD-UP DISPLAY (HUD)

The HUD view is accessed by pressing the <W> key. The subpanel is a 2D view where, in addition to the HUD, much of the glareshield guidance panel (GP) is displayed. Press the <W> key twice to exit the HUD view.

Much of the HUD display is identical to that found in the PFD:

- left is the speed tape;
- right is the altitude tape;
- bottom quarter of the screen are (left to right): radio information, compass rose, and vertical speed.

The center 'attitude indicator' portion of the HUD is similar to the PFD's with some added indicators:

1. Flight Mode Annunciation (FMA).
2. Bank angle scale.
3. Attitude indicator bar.
4. Flight path vector symbol showing the aircraft actual direction of flight.
5. Horizon line showing compass heading numbers and current magnetic heading (inverted triangle) above the line; and the heading made good arrow below the line.
6. Flight director circle.
7. Pitch indicator ladder (arrow pointing to +10 degrees).
8. Bank angle indicator (upper half of the split triangle) and slip/skid indicator (lower half the the split triangle).

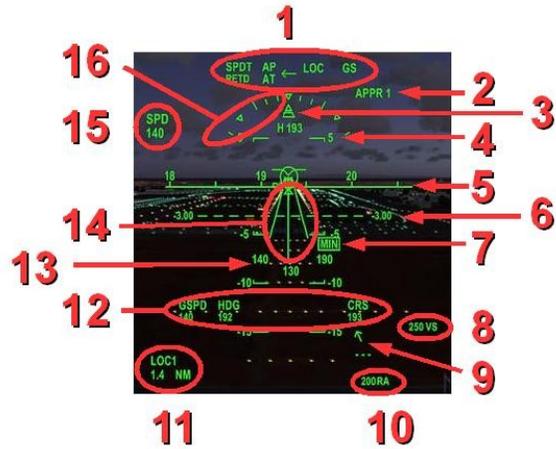


To follow the course set with the autoflight system the flight path vector is flown over the flight director circle.

The HUD may be used during all phases of flight. For low-visibility takeoffs tune both navigation radios to the takeoff runway's ILS frequency, set the glareshield GP heading and course knobs to match the runway heading. When ready for takeoff activate TOGA mode using the GP's hidden clickspot.

When conducting an ILS landing the localizer and glideslope indications, similar to those on the PFD, will be displayed on the HUD. When at short finals (below 1500 feet AGL) the HUD display will simplify in order to clear the pilot's field of vision and indicate only data required for a safe landing. As the aircraft descent continues the HUD will continue to de-clutter the display to improve the pilot's field of vision.

1. FMA indications.
2. Autopilot landing mode.
3. Roll / skid indicators
4. Pitch ladder.
5. Horizon line with magnetic heading numbers.
6. Glideslope reference line (-3.0 degrees)
7. Below minimums annunciator.
8. Vertical speed.
9. Wind vector arrow
10. Altimeter minimums setting.
11. NAV radio information.
12. Groundspeed, heading indications and LOC course setting.
13. Airspeed, radar altitude and barometric altitude.
14. Symbolic runway indications.
15. Airspeed.
16. Roll scale.



Below 1800 feet AGL a symbolic runway display will appear to assist the pilot in aligning the aircraft for landing. The orientation of the runway indication is dependent on correct ILS course setting, aircraft alignment on the LOC, and the plane's heading. Incorrect settings or aircraft orientation will result in the symbolic runway being miss-aligned with the airport runway.

INTRODUCTION FLIGHT

In this section of the manual you will be given the opportunity to familiarize yourself with the E-jet during a short flight. This introduction will take about one hour to complete. Charts for the flight are located in the '*FS root folder*' / FeelThere / 170 / intro_flight_charts. The airport charts included with this software are out-of-date and not to be used for real-world aviation. The MCDU navigation database used is the one provided with the E-jets – AIRAC cycle 0610. The terminal and runway instructions are based on default FS9 and FSX scenery. During this flight do not use FS's ATC as all 'traffic control' will be outlined in the text.

The assigned aircraft is the E175. You will be departing Dulles International Airport (KIAD) for Raleigh-Durham International (KRDU). The assigned route is:

KIAD HAFNR GVE SBV4 KRDU

Cruise altitude for this short flight will be FL220 (22,000 ft). Flight time is expected to be forty-five minutes.

Using the E-jets **Configuration Utility** make the following settings -

- On the 'Preferences' tab select *disable joystick axis when autopilot is on and play callouts*.
- On the 'Weight' tab set the E-jets to display weights in pounds.
- On the 'Pressure' tab set the E-jets to display pressure as IN (inHg).
- You have a full flight of volunteers ... I mean commuters today. Under the 'Load Manger' tap set the 175 passenger number to 70, and the cargo to 20%. The aircraft Zero Fuel Weight (ZFW) will be 63,260 lbs.
- On the 'WX Radar' tab enable the weather radar gauge.
- On the 'Joystick' tab set the *Autopilot disconnect button* for your controller by clicking the 'select' button and pressing the controller button.
- On the 'Startup' tab select *cold and dark* as the aircraft condition when loaded into FS.

Save the above settings by pressing the OK button.

Start FS and create a new flight with these settings -

- Select the default Cessna as the aircraft.
- Confirm there is at least 5% fuel loaded in each of the plane's tanks ... without fuel you will not be able to start the APU when powering up the E-jet.
- Select the departure location for FS9 as KIAD 'GATE D15 – GATE MEDIUM'; for FSX set KIAD 'GATE D16 – GATE SMALL'.
- Set the weather theme to clear and calm.
- Set the time to 12:00 PM local.
- Set AI traffic to zero.

Now open the FS flightplanner. Confirm the departure airport is set to KIAD and arrival to KRDU. Have FS create a direct GPS route. If prompted **DO NOT** let FS reposition the aircraft. If FS asks, it is OK to save the route.

Now start the game.

Once FS has loaded turn OFF the Cessna's engine, and confirm the BATT and AVIONICS masters are ON. Wait 15 or so seconds and use FS's pull-down 'Select Aircraft' menu to select the E175. As Embraer has loaned you their rollout aircraft PP-XJG for this flight, so select the 'Rollout' livery.

Once the E175 has loaded your virtual first officer will say hello. Open the **CALL!** panel by clicking **!** on simicon panel or <SHIFT><5>. Follow the checklists for COCKPIT SAFETY INSPECTION and POWER UP. *During power up the caution alarm can be silenced by pressing the flashing yellow caution button on the glareshield.*

After completing power up set the MFD to show the PLAN page by moving the mouse pointer of the **Plan softkey** and left-mouse-clicking. Click the **Plan softkey** again to set the display to show WPT Ident and Vert Prof. Set the display range to 150 nm by placing the mouse pointer near the range indication. When the square brackets ([]) appear around the range indication scroll the mouse wheel. Remember, the MFD can be enlarge with a right-mouse-click.



Open the MCDU/FMC by clicking on the **C** on the simicon panel, or <SHIFT><3>. You can also use the MCDU/FMC from within the virtual cockpit. The screen will show the RADIO page with a 'NO PRESENT POSITION' in the SCRATCHPAD. Before you are able to program the FMS with flight information you must set the aircraft's location:

1. Press the NAV function key.
2. Press the NEXT function key to go to NAV INDEX page two.
3. Press LSK 1L (line select key one left on the top left side of the display screen) to select POS INIT.
4. Choose LSK 3R (the GPS 1 POS).



The IRS system will now initialize.

5. Clear the 'NO PRESENT POSITION' message by pressing the MCDU's CLR key.

Until the IRS system has aligned the PFD and MFD will show ATT FAIL and HDG FAIL messages. This error will clear after IRS alignment. During alignment the flight plan and performance information can be entered. **DO NOT** attempt to move the aircraft, or start the engines, during IRS alignment as the plane's starting position will not be correctly initialized.



After selecting the initial aircraft position press the FPL key, or LSK 6R on the POSITION INIT

page. The ICAO location identifier, KIAD, is displayed on the upper left corner of the FLT PLAN screen. Flightplans are entered in the following sequence:

1. destination
2. route waypoints and jetways
3. alternate destination
4. departure runway and standard instrument departure (SID)
5. expected arrival (STAR)

The assigned route is: KIAD HAFNR GVE SBV4 KRDU. HAFNR and GVE are the first two waypoints. SBV4 is the arrival procedure (STAR). For this flight there is no departure procedure (SID) nor an alternate airport.

Into the SCRATCHPAD enter KRDU. Press LSK 2R to enter Raleigh-Durham International into the destination field. The MOD FLT PLAN screen will appear.



Enter HAFNR into the SCRATCHPAD and press LSK 2L. The FMC will calculate a heading and distance from the departure airport to this first waypoint.

Now enter GVE into the flight plan after HAFNR (press LSK 3L). As with the airport to first waypoint the FMC calculates the heading and distance between the first and second waypoints.



A developing flight plan will displayed on the MFD.



Entering a Jetway route -

In order to save time jetways and connecting waypoints can be entered on the MOD FLT PLAN page. The format for jetway entry is VIA.TO. This entry 'hint' is displayed above a vacant waypoint ('- - - -') on the MOD FLT PLAN screen. The FMC must have an entry and exit location along the jetway to calculate the route. The entry location is entered into the flight plan first. Once the entry point is set type <jetway ID>.<exit waypoint> into the SCRATCHPAD. Now press the left LSK under the entry waypoint.

Example of entering a jetway route: (*try this experiment later, do not enter this routing into the KIAD – KRDU flight plan.*)

Jetway 70 (J70) goes across the United States from Seattle to New York City. Using jetway syntax you instruct the FMC compute the waypoints between these two cities in 4 steps (11 key strokes):

- Enter SEA (VOR at Seattle International airport) into the SCRATCHPAD.
- Place SEA into the flight plan by pressing a left LSK.
- Enter J70.LGA (LGA is a VOR at LaGuardia Airport) into the SCRATCHPAD.
- Place this jetway.exit syntax into the flight plan after SEA.

The FMC will compile **8 pages** of waypoints that connect SEA to LGA.

Summary – for the FMC to automatically enter a routing between two points along a jetway the entry point to the jetway is first placed into the flight plan. The syntax <jetway ID>.<exit waypont> is entered into the flight plan after the entry waypoint. If the jetway does not contain the entry and/or exit waypoint the MCDU will display 'WAYPOINT NOT FOUND' in the SCRATCHPAD.

The distance between KIAD and KRDU is short, so no jetway routing is required.

Entry of GVR after HAFNR completes the flight plan between KIAD and KRDU. The plan needs to be closed. *All flight plans must be closed in order for the FMC to calculate the PERFORMANCE pages.* Press the LSK to the right of the destination airport. KRDU appears in the SCRATCHPAD. Now press the left LSK below GVE. ACTIVATE the flight plan by pressing LSK 6R.



Once the flight plan is active the MCDU give you the option to set performance information (PERF INT), or departure information. Press LSK 6L to first enter the DEPARTURE information.



The DEPARTURE RUNWAYS screen lists the available runways at KIAD. Ground control is sending all departing traffic to runway 01L. Press the LSK for runway 01L.



Available standard instrument departures are displayed on the SID page. We will not select a SID as Dullas departure control no longer uses the PAYME2 procedure. To enter the departure runway, 01L, into the flight plan with a SID press the LSK next to INSERT.

The MOD FLT PLAN page is once more displayed by the MCDU. Notice how the ORIGIN line now reads RW01L KIAD (depart runway 01L from Dulles International). This modification to the flight plan needs to be activated. Press the LSK by ACTIVATE.



We have been assigned a standard terminal arrival route (STAR) for KRDU by traffic control. To enter this into the flight plan press the NAV key and then the LSK next to ARRIVAL.

At this time we only know the STAR, not the landing runway. Press the LSK by STAR on the ARRIVAL page.



The four available STARs for KRDU are displayed. Our assigned STAR is SBV4. Press the LSK next to this procedure.

The three transitions for SBV4 are displayed on the KRDU STAR TRANS page. Select GVE by pressing LSK 1L.

The ARRIVAL page displays showing the entered STAR as GVE.SBV4 (GVE transition for the South Boston Four arrival).

The STAR can be REVIEWed by pressing LSK 6L.

INSERT the procedure by pressing LSK 6R.



Notice that the MFD shows the modified plan in dashed white lines? The FMC is notifying you a change to the route has been entered and is ready to be activated.

Reduce the MFD display range to 25 nm and scroll through the flight plan using the MCDU's tuning knob. After review ACTIVATE the flight plan.

Reviewing the SBV4 chart you see there is a 9000 foot crossing restriction at the BILLA waypoint. Use the NEXT key to display BELLA on the second page of the flight plan. Enter the height restriction by typing 9000 into the SCRATCHPAD and pressing the LSK to the right of BILLA. At this time we don't know the landing direction at KRDU, so the chart restriction for ALDAN will not be entered.



We have once again changed the flight plan by adding the altitude restriction at BILLA. Press LSK 6R to ACTIVATE the change.

Now we will enter the performance information so the FMC can compute the aircraft vertical profile and flight predictions. Press the LSK to the right of PERF INIT.

On PERFORMANCE INIT page one you can adjust the climb, cruise and descent speeds for the flight. In this case we will set a high-speed cruise in order to complete the flight quickly. Press LSK 4R to open the CRUISE MODES page. Select MAX SPEED by pressing LSK 3L.



The MCDU returns to page one of PERFORMANCE INIT after choosing a cruise mode. Press the NEXT key to view page two.

On PERFORMANCE INIT page 2 minimum fuel requirements are entered. In this case we will set the arrival FUEL RESERVE number by pressing LSK 2R and entering 60 into the minutes line (3L). Once back to PERFORMANCE INIT page 2 press the NEXT key to open page three.

On page three we set the cruise altitude and zero fuel weight. Enter 22000, or 220, into LSK 2L to set the cruise altitude. The ZFW of 63260 is entered into LSK 4L. The FMC computes the aircraft's GROSS WT and displays CONFIRM INIT at LSK 6R. Accept the calculation by pressing LSK 6R.



After you accept the performance information the PERF DATA pages will display. Before we review the performance numbers we will use the 'fuel cheat' to load the proper fuel amount for the flight. Press LSK 6L (PERF INIT) and then the PREV key to return to PERF INIT page 3.

Enter 'FUEL' into the SCRATCHPAD and press LSK 4R. The FMC will calculate the fuel required and automatically load this into the E-jets wing tanks. The MCDU and EICAS screens should show a fuel load of about 7820 lbs, and a GROSS WT of about 71000 lbs.

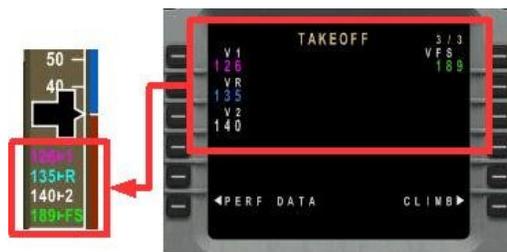


Press the PERF DATA LSK in order to review the FMC's predictions. Page one lists two important data fields: FUEL REM and GROSS WT. Be sure that the amount of fuel is adequate to safely complete the flight, and the aircraft will be below maximum landing weight.

NOTE: If the flight plan was not closed, or the data on the PERFORMANCE INIT pages incomplete no data will show on the PERF DATA pages.

Press LSK 6R to open the TAKEOFF pages. On page one note the outside temperature of 15 degrees C. Go to page two (press the NEXT key) record the density altitude. Now go to page three where we enter the takeoff v-speeds. For takeoff we will use the FLAPS 2 and TO-1 settings.

Start in the upper left corner of the 175 TAKEOFF V-SPEEDS FLAPS 2 TO-1 chart and find the line that corresponds to the local pressure (density) altitude of 300. Round down the value noted from MCDU TAKEOFF page one to the closest thousand feet. In this case the correct line is SL. Go right across the chart to find a temperature range that brackets the local temperature. In this case the local temperature is 14 C, so the range is -40 to 36. Look down until you find the aircraft's weight. For weight round up to the closest value. In this case the aircraft weigh is 71000 and the closest value is 71700. Enter the listed V1, VR V2 and VFS speeds into TAKEOFF page three. In this case the correct values are: 126, 135, 140 and 189 (V_{FS} is in the far right column). Once entered into the MCDU the V-speeds will show on the PFD's speedtape.



The CLIMB, CRUISE, DESCENT and LANDING pages can be accessed by pressing LSK 6R. At this time we will not modify any values. The LANDING page will populate once we receive a landing runway assignment as we approach KRDU.

Press LSK 6R (FLT PLAN) after reviewing the LANDING page to see the completed flight plan. Notice there are now right column numbers in CYAN for SPD and CMD.

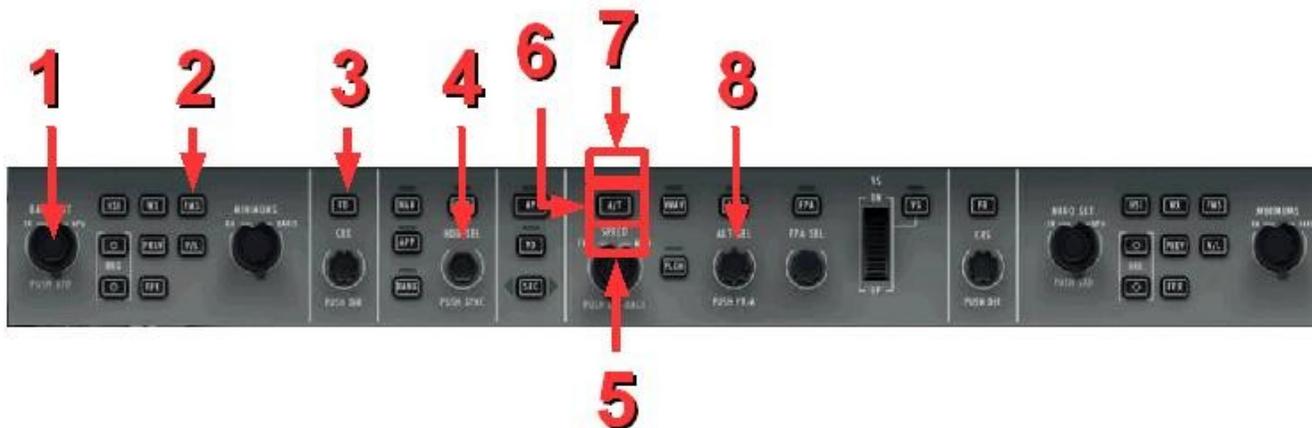


NOTE: If the flight plan was not closed, or the data on the PERFORMANCE INIT pages incomplete no data will show on the ACTIVE FLT PLAN right column.

The FMC is set for the flight.

Now configure the guidance panel (GP) for takeoff. Working left to right:

1. Set local pressure to local pressure (29.92 in this case) using the BARO SET knob, or press the keyboard key.
2. Press FMS to set the flight management system to control the aircraft in-flight. The PFD compass rose indication will be MAGENTA.
3. Activate the pilot's flight director. TRACK and FPA will display as armed modes on the FMA.
4. Set the heading bug to the runway heading of 011 degrees using the HDG knob.
5. Set the speed knob to FMS mode by clicking the hidden clickspot (the text 'speed').
6. Press the AT button to activate the autothrottle system. AT will show as active on the FMA.
7. Press the hidden TO/GO clickspot above the autothrottle button. The FMA will replace FPA vertical mode with TO and TO thrust is armed. The PFD will display the flight director bars with a pitch-up attitude for initial climb.
8. Set the FL220 using the ALT knob. The altitude setting will display above the PFD's altitude tape and ASEL will arm on the FMA.



Now set the MFD for flight by pressing the **Map softkey**. Click the **Map softkey** again to set the display to show WPT Ident, Vert Prof, Progress, Weather and TCAS. Set the display range to 12.5 nm by placing the mouse pointer near the range indication. When the square brackets ([]) appear around the range indication scroll the mouse wheel. Remember, the MFD can be enlarge with a right-mouse-click.

Run through the PRE FLIGHT *CALL!* checklist.

Your passengers have boarded, the crew says the cabin is secure, and the ground crew is ready for pushback.

Set elevator trim to +6. Trim indication is on the lower right corner of the main panel's EICAS screen. Use FS's elevator trim keyboard shortcuts of NUMPAD 1 and NUMPAD 7. It is recommended you set the trim commands to work with buttons on your yoke/joystick.

On the **overhead panel** confirm the WINDSHIELD HEAT is ON (no button backlighting).

On the center pedestal's **audio control panel** (ACP) turn ON the control for the marker beacons.

Run through the BEFORE START checklist, begin pushback and start engine one then engine two. To start an engine open the safety cover and turn the knob to the START position. Release the knob allowing it to return to the RUN setting. As the E-jet is fitted with a FADEC system engine start is entirely automatic. Once the engine has started close the safety cover.

Set Flaps 2 on the pedestal or by pressing <F7> twice.

Run through the AFTER ENGINE START *CALL!* Checklist.

“Embraer PP-XJG, runway 01L, taxi via Y and Y9 and hold short of runway 01L.”

Turn ON the taxi lights and advance the throttles no more than 40% N1 to begin taxi. Little thrust will be required to keep the E-jet moving once you reach taxi speed of 15 to 20 knots. Slow to five to ten knots when making turns greater than 70 degrees.

From the gate head west to taxiway Y. Go south on taxiway Y to Y9. Turn west onto Y9 and hold at runway 01L.

During taxi:

1. Check the takeoff configuration by pressing the TO CONFIG button center pedestal above the throttle levers.
2. and then start the FLIGHT ATTENDANT SAFETY announcement.
3. Set the TCAS to scan for planes above the E-jet using the MFD softkey.
4. Turn ON the weather radar using the FMD softkey.
5. Set Autobakes to TRO (rejected takeoff).

When you arrive at the hold line you are instructed by the tower to, “line up and wait on runway 01L.”

Once aligned on the runway conduct the BEFORE TAKEOFF checklist.

For takeoff and initial climb there are a large number of actions to perform. Review this next section of the introduction flight, read it again, and then try the takeoff in the simulator. Remember, practice makes perfect.

“Embraer PP-XJG, fly runway heading until reaching outer marker make left turn to heading 190. Climb to flight level 220.”

“Embraer PP-XJG, cleared for takeoff.”

While keeping the brakes engaged advance the throttles for an N1 thrust of 45-50%. Allow the

engines to stabilize for a few seconds, release the brakes and then move your throttle controller full forward to activate the autothrottle and engine FADEC logic. *NOTE: you will not be adjusting the throttle levers again until you approach the landing runway at KRDU.*

The virtual first officer will make callouts as the aircraft accelerates along the runway. At V_R pitch the aircraft nose up smoothly to meet the horizontal flight director line on the PFD.

When the first officer calls “positive rate” retract the landing gear.

Fly the runway course and follow the PFD's flight director using the yoke and adjusting the elevator trim. *Again, it is recommended you set the trim commands to work with buttons on your yoke/joystick.* Adjust trim so the yoke is centered as the aircraft climbs the flight director recommended pitch.

When passing 2000 feet AGL, in quick succession press the guidance panel AP, VNAV then HDG buttons. The FMA will indicate these modes as active. AP and HDG will be GREEN, where VNAV will be MAGENTA. The autopilot is flying the aircraft. You can release the yoke.



As the aircraft climbs retract flaps as the aircraft accelerates through the PFD speedtape GREEN DOT speeds.

When you hear the outer marker beacon, and/or see the OM indication on the PFD, set the HDG knob to 190 degrees. The autopilot will begin the turn, continue the climb, and accelerate the aircraft to 240 knots indicated airspeed (KIAS).

On the overhead panel turn OFF the APU.

Conduct the AFTER TAKEOFF checklist.

During initial climb the MCDU will display CHECK RESERVE FUEL in the SCRATCHPAD. This is an advisory message to confirm that there is enough fuel on-board to comply with reserve fuel requirements when arriving at the destination airport. Confirm the FMC's fuel predictions on the PERF DATA pages by checking fuel on-board on the EICAS screen Acknowledge the message by pressing the MCDU's CLR button.

After completing the turn continue south until you see Dulles pass left of the aircraft.

“Embraer PP-XJG, fly direct to HAFNR and follow flight plan as filed.”

You are now going to command the aircraft to follow the complete lateral (LNAV) and vertical (VNAV) flight plan you entered into the FMC. On the MCDU press the LSK to the left of HAFNR. The waypoint appears in the SCRATCHPAD. Now enter HAFNR into LSK 2L (yes,

replace HAFNR with HAFNR). This will command the FMC to compute a new course from the aircraft's current location 'direct to' HAFNR. *The modified route is displayed as a white-dashed line on the MFD.* Activate the modified flight plan by press the LSK to the right of ACTIVATE.

Now command the FMS to control lateral navigation (LNAV) by pressing the guidance panel NAV button (to the left of the HDG button). *NOTE: check that the navigation information on the PFD compass rose are MAGENTA. If the data is GREEN you need to press the GP's FMS button before pressing the NAV button.*

The FMA will replace HDG as the active lateral mode with LNAV. If LNAV only arms (white indication below HDG) the aircraft is not on the flight path to HAFNR. Use the HDG knob to set a intercept course for the path. The FMS will automatically move LNAV to active with the course is intercepted.

The E-jet is now flying the flight plan as entered into the MCDU.

To see the flight progress open the *MAP!* screen by pressing the simicon **M** icon, or <shift><6>.

100 nm before arriving at waypoint GVE ATC announces, "Embraer PP-XJG, your assigned runway at Raleigh-Durham is 23R. Cross ALDAN below 10000 at 250 knots."

On the MCDU press the NAV key and select ARRIVAL. You can see the active STAR is SBV4. Press the LSK to the left of RUNWAY.



The available runway list is displayed for KRDU. Select 23R.

The available approach list is displayed for runway 23R. On page one select ILS 23R.

The available transition list is displayed for ILS 23R. Select PRSTN.

The available STAR list is displayed. SBV4 is already active so you only need to press the LSK for ARRIVAL.

The ARRIVAL page outline the programmed procedure: runway 23R after flying the PRSTN ILS approach after flying the South Boston Four arrival by way of the GVE transition. INSERT the procedure into the flight plan by pressing LSK 6R.



The MFD will be indicate the new routing in dashed white lines. You need to edit the plan because the aircraft will unnecessarily fly to RDU, directly over the Raleigh-Durham Airport. Press the MCDU's NEXT key to display flight plan page two.

Enter PRSTN into the SCRATCHPAD and press the LSK to the left of RDU. RDU will be removed from the flight plan. The route now takes the plane from BILLA to PRSTN without crossing over KRDU.

NOTE: entering PRSTN over RDU also removed the DISCONTINUITY after RDU.



Discontinuities are a break in the flight plan. If a DISCONTINUITY is not cleared the FMS will not know 'how' to fly from the waypoint before the break to waypoint after the break. The DISCONTINUITY is removed by pressing the MCDU's DEL key and then the LSK to the left of the break. Removal of a DISCONTINUITY does modify the flight plan, so activation is required to command the FMS to fly the new route.

If the DISCONTINUITY is not cleared the autopilot will cancel LNAV and VNAV control and revert to flying the direction and path at the moment the aircraft reaches the last waypoint before the break in the flight plan. A caution message will show on the MCDU, 'MSG' on the PFD, and the FMA will display the new lateral and vertical control modes.

Now enter the speed and altitude restrictions at PRSTN, ALDAN and BILLA:

1. Enter 180/ into the SCRATCHPAD. *Syntax for editing speed and altitude constraints is 'speed / altitude'. In this case we only wish to edit the speed so we only enter the first half of the syntax string. To edit only the altitude constraint we would type '<altitude>'. Why 180 knots? You need to slow the aircraft for the turn onto the ILS.*
2. Press the right LSK for PRSTN. *If PRSTN is not on the MCDU's screen press the PREV key to display the page containing the waypoint. 180 will appear above 3.0° and to the right of DES in the speed / altitude column.*
3. Enter 220/9000 into the SCRATCHPAD. *Why 220 knots? You need to slow the aircraft as you enter Raleigh-Durham's airspace.*
4. Press the right LSK for BILLA. *You may need to press the MCDU's PREV key to display the page containing the BILLA waypoint.*



5. Enter 250/10000 into the SCRATCHPAD.
6. Press the right LSK for ALDAN. *You may need to press the MCDU's PREV key to display the page containing the ALDAN waypoint.*

Because of descent profile restrictions the altitudes set at BILLA and ALDAN may not be exactly the altitude entered.



You can how the FMC flight predictions are progressing by pressing the PROG key and reviewing the PROGRESS pages.

In preparation for landing select the PERF key and choose PERF DATA. Note the predicted aircraft gross weight when landing. The number will be around 66.6 (66,600 lbs). On the 175 LANDING V-SPEEDS NO ICING CONDITIONS chart go down the weight column you find the closest match by rounding up. In this case 68300. Looking right the V-speeds are:

- V_{AC} (Flap 2) = 152
- V_{REF} (Flap 5) = 126
- V_{FS} = 184

Enter the above speeds into LANDING page 3. Press the PERF key, choosing LANDING, press the NEXT key to open page three. NOTE: $V_{AP} = V_{REF} + 5 + \text{CROSSWIND} + \text{WIND GUSTS}$. The weather is clear and calm making $V_{AP} = 131$.

As you approach the top of Descent (TOD), set the altitude on the GP for 2200. When the E-jet crosses TOD the FMS will command descent to the next flight plan altitude restriction. For this flight the first descent restriction is at ALDAN. The FMC will also command airspeed to meet waypoint speed restriction.

When you pass through 18000 feet set the BARO knob to KRDU local (29.92), start the APU, and set the autobrakes to MEdium. *The MCDU will display a caution message as a reminder for you to set the altimeter to local pressure when passing through 18000 feet.*

Conduct the DESCENT checklist.

Set the pilot's MINIMUM knob for BARO (hidden clickspot is the word BARO) and set 1200 (the setting will appear on the PFD). This setting will limit the autopilot to an APPR1 (CAT I) landing. You will be landing the aircraft, not the AUTOLAND system.



The plane will conduct the descent as programmed into the MCDU.

For approach and landing there are a large number of actions to perform. Review this next section of the introduction flight, read it again, and then try the approach in the simulator. Remember, practice makes perfect.

As the plane descends through 10000 feet conduct the APPROACH checklist.



On the guidance panel DCP press the PREV button. The GP preview feature displays the NAV1 pointer on the PFD compass rose, allows you to set the runway heading using the CRS knob, and arms the LOC and GS to capture the ILS.

Open the MCDU RADIO page. Enter the ILS feq for runway 23R, 111.7, into the SCRATCHPAD and press the LSK 3L to turn radio NAV1.



The autopilot will command an airspeed of 180 kts after passing BILLA. Extend the speedbrakes, on the center pedestal or by pressing the < / > key, until you slow to 200 knots and extend the flaps on the schedule below:

- FLAP 1 200 knots
- FLAP 2 190 knots
- FLAP 3 170 knots
- FLAP 4 155 knots
- FLAP 5 150 knots

NOTE: FLAP 5 is the standing setting for landing.

Don't forget to stow (close) the speedbrakes after the aircraft reaches 200 knots!

On the guidance panel set the SPEED knob for MAN (pilot) control by pressing the hidden clickspot (the word SPEED). Confirm that the speedbug on the PFD is GREEN. Use the SPEED knob to set airspeed to 180 knots.



Prior to reaching PRSTN the FMS will turn the E-jet to BODLY. During the PRSTN-to-BODLY leg the LOC will become active. The PFD lateral and vertical indicators will also go from MAGENTA to GREEN. This is signaling that the NAV radios are providing guidance, not the MFS.

As the glideslope indicator begins to descend lower the landing gear and set the airspeed for 160 knots. Set FLAP 3 as the aircraft slows below 170 knots.

When the autopilot captures the glideslope GS shows as the active vertical setting on the FMA.

Set the airspeed for V_{AP} (131 knots). There will be a V_{AP} 'bug' on the PFD. The approach speed bugs appear because you set the speeds on the MCDU LANDING page prior to descent.

As the aircraft slows to final approach speed extend FLAP 4 and the FLAP 5.

Move your throttle controller into the idle setting to allow the autothrottle to retard thrust on landing. *Placing the throttle in idle will not reduce thrust as the panel's FADEC/autothrottle logic is controlling thrust to maintain the commanded airspeed.*

Conduct the LANDING checklist.

It is a clear and sunny day. The runway and Precision Approach Path Indicator (PAPI) lights are clearly visible.

When below 1200 feet AGL disconnect the autopilot and fly the aircraft onto the runway.

When the main landing gear touchdown the throttle will go to idle and disconnect.

The brakes will automatically engage.

Once the nose is on the runway set full reverse thrust by pressing the keyboard <F2> key multiple times.

At 80 kts set thrust to idle (press <F1>).

At 60 kts the autobrakes will disconnect. The pilot will need to apply brakes in order to further slow the aircraft.

Exit the runway at the next available taxiway.

Welcome to Raleigh-Durham Airport!



QUICK REFERENCE HANDBOOK

What is a QRH?

Every aircraft has a QRH. This is a small leaflet in which you can find all the checklists plus other useful information. In this section, you will find normal, emergency, abnormal checklist and speeds. For a more convenient use, all sections have been designed to be printer friendly. How to use the QRH? In case of any failure always pay attention first to warning red messages. Then apply the normal procedure and if any caution amber message appears treat it but only after having applied the appropriate normal procedure. Be advised that some checklist could make other caution messages appear. In that case don't treat them! Remember that E-jet is a computerized aircraft reacting sometimes strangely a bit like Windows...

Normal Checklists

Actions are normally performed before reviewing the list. You can use a 'read and do' method with the lists.

Speed Lists

Reference for entering takeoff and landing speeds into the FMS based on the aircraft actual weight.

Structural Airspeeds

These speeds must be followed to avoid damage to the aircraft or unsafe flight.

EICAS Messages and Checklists

When an EICAS message is displayed review the description of the condition and corrective actions.

NORMAL OPERATION CHECKLISTS

To the right of a checklist step requiring action(s) by the pilot there is a reference to the panel(s) where the task is to be completed. Some tasks may be completed and/or confirmed multiple locations. The locations to check and/or complete the checklist action are separated by a backslash.

If no panel is noted, no action is required for *CALL!* to advance through the checklist. The italic text below some of the checks are a 'hint' on how to complete the step.

COCKPIT SAFETY INSPECTION

MAINTENANCE STATUS.....	CHECKED	
COCKPIT EMERGENCY EQUIPMENT.....	CHECKED	
ELECTRIC PANEL.....	CHECKED	
FUEL PANEL.....	CHECKED	
WINDSHIELD WIPER.....	CHECKED	
HYDRAULIC PANEL.....	CHECKED	
AIR COND/PNEUMATICS PANEL.....	CHECKED	
ELT.....	CHECKED	
LANDING GEAR LEVEL.....	CHECKED	
START/STOP SELECTORS.....	STOP	← pedestal
SPEED BRAKE LEVER.....	CLOSED	
RAT MANUAL DEPLOY.....	STOWED	
FLAP LEVER.....	VERIFY POSITION	
CIRCUIT BREAKERS.....	CHECKED	

POWER UP

BATTERY 1.....	ON	← overhead
BATTERY 2.....	AUTO	← overhead
BATTERY VOLTAGE.....	CHECKED	
GPU BUTTON.....	AS REQUIRED	← overhead
<i>(Ground Power Unit ON or OFF as required energize aircraft.)</i>		
FIRE EXTINGUISHER PANEL.....	CHECKED	
EMERGENCY LIGHTS.....	ARMED	← overhead
APU SELECTOR KNOB.....	START	← overhead
NAV LIGHT.....	ON	← overhead
LOGO LIGHT.....	ON	← overhead
HYDRAULIC PANEL.....	CHECKED	
ELECTRONIC CBs.....	CHECKED	
DVDR PANEL.....	CHECKED	
PHOTOLUMINESCENT STRIPS.....	CHEDKED	

PRE FLIGHT

PRESSURIZATION PANEL.....SET ← overhead
(Mode set to AUTO.)
OXYGEN MASKS.....CHECKED
FLIGHT INSTRUMENTS.....SET/CROSS CHECKED ← main panel
(Altimeters set to local.)
THRUST LEVERS.....IDLE ← pedestal
PARKING BRAKE.....ON ← pedestal

BEFORE START

TRIM PANEL.....SET ← pedestal/main panel
(On EICAS display confirm trim set in green band.)
MCDU.....CHECKED/SET ← FMC
(Flight plan, PERF INIT and V-speeds set.)
FUEL QUANTITY.....CHECKED ← main panel
(No less than 2000 pounds.)
TAXI/T.O. BRIEFING.....COMPLETED
PASSENGER SIGNS.....ON ← overhead
(No Smoking and Fasten Belts lights on.)
DOORS AND WINDOWS.....CLOSED
FLIGHT DECK DOOR.....LOCKED
RED BEACON.....ON ← overhead
HYDRAULIC PUMP 3A.....ON ← overhead
OVERHEAD PANEL.....NORMAL

AFTER START

FLAP..... SET ← pedestal
(CALL! will announce the flap setting, must be flaps 1 to 4.)
FLIGHT CONTROLS.....CHECKED
EICAS.....CHECKED
DISPATCH CLEARANCE.....CHECKED

BEFORE TAKEOFF

TAKEOFF CONFIGURATION.....CHECKED ← pedestal
(Click T/O CONFIG button on center pedestal.)
BRAKE TEMP.....CHECKED
EICAS.....CHECKED
LANDING LIGHTS.....ON ← overhead
STROBE LIGHTS.....ON ← overhead
TRANSPONDER.....TA/RA ← FMS
(FMS RADIO page click LSK 6L.)

AFTER TAKEOFF

FLAPS.....ZERO ← pedestal
LANDING GEAR..... UP ← main panel
PRESSURIZATION.....CHECKED

DESCENT *(begin checklist below 18000 feet)*

AUTOBRAKE.....__ SET ← main panel
(Set to LOW, MED or HIGH.)
LANDING DATA.....SET ← FMS
(V-speeds are set.)
ALTIMETERS.....SET/CROSS CHECKED ← main panel
(Altimeters set to local when aircraft below 18000 feet.)

APPROACH *(begin checklist below 10000 feet)*

PASSENGER SIGNS.....ON ← overhead
(No Smoking and Fasten Belts lights on.)
LANDING LIGHTS.....ON ← overhead
ALTIMETERS.....SET/CROSS CHECKED ← main panel
(Altimeters set to local.)

BEFORE LANDING *(begin checklist on short final)*

LANDING GEAR.....DOWN ← main panel
FLAPS.....__ SET ← pedestal
(CALL! will announce the flap setting, must be 5 or FULL.)

PARKING

PARKING BRAKE.....ON/OFF ← pedestal
START/STOP SELECTORS.....STOP ← pedestal
RED BEACON.....OFF ← overhead
HYDRAULIC PUMP 3A.....OFF ← overhead

POWER DOWN

PASSENGER SIGNS.....OFF ← overhead
EMERGENCY LIGHTS.....OFF ← overhead
GPU/APU.....OFF ← overhead
BATTERIES 1 & 2.....OFF ← overhead

175 TAKEOFF V-SPEEDS

FLAPS 1 TAKEOFF MODE: T/O-1

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)												
SL → → → → → → →			-40 to 38	39 to 48	49 to 50										
1000 → → → → → → →			-40 to 36	37 to 47	48 to 48										
2000 → → → → → → →			-40 to 33	34 to 44	45 to 46										
3000 → → → → → → →			-40 to 29	30 to 42	43 to 44										
4000 → → → → → → →				-40 to 39	40 to 42										
5000 → → → → → → →				-40 to 35	36 to 40										
6000 → → → → → → →				-40 to 31	32 to 0.8										
7000 → → → → → → →				-40 to 26	27 to 32	33 to 36									
8000 → → → → → → →					-40 to 19	20 to 34									
			↓	↓	↓	↓									
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}
24000		52900	106	118	125	111	120	125	114	121	125	116	122	125	162
24500		54000	108	120	126	112	122	126	115	123	126	117	124	126	164
25000		55100	110	121	127	114	123	127	117	124	127	119	125	127	165
25500		56200	112	123	128	116	125	128	119	126	128	121	127	129	167
26000		57300	113	124	130	118	126	130	120	127	130	122	128	130	168
26500		58400	115	126	131	119	128	131	122	129	131	124	130	131	170
27000		59500	117	127	132	121	129	132	124	130	132	126	131	132	172
27500		60600	119	129	133	123	130	133	125	131	133	127	132	134	174
28000		61700	120	130	135	124	132	135	127	133	135	129	134	135	175
28500		62800	122	131	136	126	133	136	128	134	136	130	135	136	177
29000		63900	124	133	137	128	134	137	130	135	137	132	136	137	178
29500		65000	126	134	138	129	136	138	132	137	138	133	137	138	180
30000		66100	127	136	139	131	137	139	133	138	139	135	139	140	181
30500		67200	129	137	141	132	138	141	135	139	141	136	140	141	183
31000		68300	130	138	142	134	140	142	136	141	142	137	141	142	184
31500		69400	131	140	143	135	141	143	137	142	143	139	142	143	186
32000		70500	133	141	144	137	142	144	139	143	144	140	144	144	187
32500		71700	134	142	145	138	144	145	140	144	145	141	145	145	189
33000		72800	136	143	146	139	145	146	142	145	146	143	146	146	190
33500		73900	137	145	147	141	146	147	143	147	147	144	147	148	192
34000		75000	139	146	148	142	147	148	144	148	148	145	148	149	193
34500		76100	140	147	149	144	148	149	145	149	149	147	149	150	195
35000		77200	141	148	151	145	150	151	147	150	151	148	151	151	196
35500		78300	143	150	152	146	151	152	148	151	152	149	152	152	197
36000		79400	144	151	153	147	152	153	149	152	153	149	153	153	198
36500		80500	145	152	154	149	153	154	150	153	154	151	154	154	200
37000		81600	147	153	155	150	155	155	152	154	155	153	156	155	201
37500		82700	148	154	156	151	155	156	153	156	156	153	156	156	203
38000		83600	149	155	157	152	156	157	154	157	157	155	158	158	204
38500		84700	150	156	158	154	157	158	155	158	158	156	159	159	205
39000		85800	151	157	159	155	158	160	156	159	159	158	160	160	207

175 TAKEOFF V-SPEEDS

FLAPS 2 TAKEOFF MODE: T/O-1

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)																
SL	→	→	→	→	→	→	→	-40	to	36	37	to	44	45	to	50			
1000	→	→	→	→	→	→	→	-40	to	36	37	to	43	44	to	48			
2000	→	→	→	→	→	→	→	-40	to	33	34	to	40	41	to	46			
3000	→	→	→	→	→	→	→	-40	to	28	29	to	37	36	to	44			
4000	→	→	→	→	→	→	→				-40	to	34	35	to	42			
5000	→	→	→	→	→	→	→				-40	to	30	31	to	40			
6000	→	→	→	→	→	→	→				-40	to	25	26	to	37	38	to	38
7000	→	→	→	→	→	→	→							-40	to	33	34	to	36
8000	→	→	→	→	→	→	→							-40	to	19	20	to	34
											↓			↓					↓
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}	
24000		52900	99	110	121	102	113	121	106	114	121	108	116	121	162				
24500		54000	100	112	122	104	114	122	107	116	122	110	117	122	164				
25000		55100	102	114	123	106	116	123	109	117	123	112	119	123	165				
25500		56200	104	115	124	108	117	124	111	119	124	114	120	124	167				
26000		57300	106	117	125	109	119	125	113	120	125	115	122	126	168				
26500		58400	107	119	127	111	120	127	114	122	127	117	123	127	170				
27000		59500	109	120	128	113	122	128	116	123	128	119	125	128	172				
27500		60600	111	121	129	114	123	129	117	125	129	120	126	129	174				
28000		61700	112	122	130	116	125	130	119	126	130	122	128	130	175				
28500		62800	114	124	131	118	136	131	121	128	131	123	129	131	177				
29000		63900	115	126	132	119	127	132	122	129	132	125	130	133	178				
29500		65000	117	127	134	121	129	134	124	130	134	127	132	134	180				
30000		66100	119	128	135	122	130	135	125	132	135	128	133	135	181				
30500		67200	120	130	136	124	132	136	127	133	136	130	134	136	183				
31000		68300	122	131	137	125	133	137	128	134	137	132	135	137	184				
31500		69400	123	132	138	127	134	138	130	135	138	133	137	138	186				
32000		70500	125	134	139	128	136	139	131	137	139	135	138	139	187				
32500		71700	126	135	140	130	137	140	133	138	140	136	139	140	189				
33000		72800	128	136	141	131	138	141	135	139	141	138	140	141	190				
33500		73900	129	138	142	133	139	142	136	140	142	139	142	143	192				
34000		75000	131	139	143	134	141	143	138	142	143	140	143	144	193				
34500		76100	132	140	144	136	142	144	139	143	144	142	144	145	195				
35000		77200	133	141	146	137	143	146	141	144	146	143	145	146	196				
35500		78300	135	143	147	138	144	147	142	145	147	144	146	147	197				
36000		79400	136	144	148	140	145	148	143	146	148	146	147	148	198				
36500		80500	137	145	149	141	146	149	145	147	149	147	149	149	200				
37000		81600	139	146	150	143	147	150	146	149	150	148	150	150	201				
37500		82700	140	147	151	144	149	151	147	150	151	149	151	151	203				
38000		83600	141	148	152	146	150	152	148	151	151	150	153	153	204				
38500		84700	142	149	153	147	151	153	150	152	152	152	154	154	205				
39000		85800	143	150	154	148	152	154	151	154	154	153	155	155	207				

175 TAKEOFF V-SPEEDS

FLAPS 4 TAKEOFF MODE: T/O-1

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)																		
SL	→	→	→	→	→	→	→	→	-40	to	32	33	to	40	41	to	48	49	to	50	
1000	→	→	→	→	→	→	→	→	-40	to	29	30	to	40	41	to	47	48	to	58	
2000	→	→	→	→	→	→	→	→				-40	to	38	39	to	46	46	to	46	
3000	→	→	→	→	→	→	→	→				-40	to	34	35	to	43	44	to	44	
4000	→	→	→	→	→	→	→	→				-40	to	30	31	to	41	42	to	42	
5000	→	→	→	→	→	→	→	→							-40	to	37	38	to	40	
6000	→	→	→	→	→	→	→	→							-40	to	33	34	to	38	
7000	→	→	→	→	→	→	→	→							-40	to	28	29	to	36	
8000	→	→	→	→	→	→	→	→							-40	to	23	24	to	34	
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}
24000		52900	92	96	110	89	94	104	92	96	104	96	98	104	162						
24500		54000	92	97	109	91	96	105	94	98	105	97	99	105	164						
25000		55100	92	97	107	92	97	106	96	99	106	98	101	106	165						
25500		56200	92	97	108	94	98	107	97	101	107	100	102	107	167						
26000		57300	93	98	108	95	100	108	99	102	108	102	104	108	168						
26500		58400	94	99	109	97	101	109	100	103	109	103	105	109	170						
27000		59500	96	101	110	98	103	110	102	105	110	105	106	110	172						
27500		60600	97	102	111	100	104	111	104	106	111	106	108	111	174						
28000		61700	99	104	112	101	105	112	105	107	112	108	109	112	175						
28500		62800	100	105	113	103	107	113	107	109	113	109	110	113	177						
29000		63900	102	106	114	104	108	114	108	110	114	110	111	114	178						
29500		65000	103	108	115	106	109	115	109	111	115	112	113	115	180						
30000		66100	105	109	116	107	111	116	111	113	116	113	114	116	181						
30500		67200	106	110	117	109	112	117	112	114	117	114	115	117	183						
31000		68300	108	111	118	110	113	118	114	115	118	116	118	118	184						
31500		69400	109	113	119	112	114	119	115	116	119	117	118	119	186						
32000		70500	111	114	120	113	116	120	116	117	120	118	119	120	187						
32500		71700	112	115	121	115	117	121	118	119	121	119	120	121	189						
33000		72800	113	116	122	116	118	122	119	120	122	121	121	122	190						
33500		73900	115	118	123	117	119	123	120	121	123	122	122	123	192						
34000		75000	116	119	124	118	120	124	121	122	124	123	123	124	193						
34500		76100	117	120	125	120	121	125	122	123	125	124	124	125	195						
35000		77200	119	121	125	121	123	125	124	124	125	125	126	126	196						
35500		78300	120	122	126	122	124	126	125	125	126	126	127	127	197						
36000		79400	121	123	127	123	125	127	126	126	127	127	128	128	198						
36500		80500	122	124	128	124	126	128	127	128	128	128	129	129	200						
37000		81600	123	125	129	125	127	129	128	129	129	129	130	130	201						
37500		82700	125	126	130	127	128	130	129	130	130	130	131	131	203						
38000		83600	126	127	131	128	129	131	130	131	131	131	132	132	204						
38500		84700	127	128	132	129	130	132	131	132	132	132	133	133	205						
39000		85800	129	129	133	130	131	133	132	133	133	133	134	134	207						

175 TAKEOFF V-SPEEDS

FLAPS 1 TAKEOFF MODE: T/O-2

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)												
SL	→ → → → → → →		-40	to	39	40	to	50							
1000	→ → → → → → →		-40	to	38	39	to	48							
2000	→ → → → → → →		-40	to	34	35	to	45	46	to	46				
3000	→ → → → → → →		-40	to	29	30	to	41	42	to	44				
4000	→ → → → → → →					-40	to	36	37	to	42				
5000	→ → → → → → →					-40	to	31	32	to	40				
6000	→ → → → → → →					-40	to	27	28	to	36				
7000	→ → → → → → →								-40	to	31	32	to	36	
8000	→ → → → → → →								-40	to	18	19	to	34	
						↓			↓			↓			
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}
24000		52900	109	119	125	112	121	125	116	122	125	118	123	125	162
24500		54000	111	121	126	114	122	126	117	124	126	120	125	126	164
25000		55100	113	122	127	116	124	127	119	125	127	122	126	127	165
25500		56200	114	124	128	118	125	128	121	126	129	123	128	129	167
26000		57300	116	126	130	119	127	130	122	128	130	125	129	130	168
26500		58400	118	127	131	121	128	131	124	129	131	126	130	131	170
27000		59500	120	128	132	123	130	132	125	131	132	128	132	132	172
27500		60600	121	130	133	124	131	133	127	132	133	129	133	134	174
28000		61700	123	131	135	126	132	135	129	133	135	131	134	135	175
28500		62800	124	132	136	128	134	136	130	135	136	132	135	136	177
29000		63900	126	134	137	129	135	137	132	136	137	134	137	137	178
29500		65000	128	135	138	131	136	138	13	137	138	135	138	138	180
30000		66100	129	137	139	132	138	139	135	139	139	137	139	140	181
30500		67200	131	138	141	134	139	141	136	140	141	138	140	141	183
31000		68300	132	139	142	125	140	142	137	414	142	139	142	142	184
31500		69400	134	140	143	136	142	143	139	142	143	141	143	143	186
32000		70500	135	142	144	138	143	144	140	143	144	142	144	144	187
32500		71700	137	143	145	139	144	145	141	145	145	143	145	145	189
33000		72800	138	144	146	141	145	146	143	146	146	144	146	148	190
33500		73900	139	146	147	142	146	147	144	147	147	146	148	148	192
34000		75000	141	147	148	143	148	148	145	148	149	147	149	149	193
34500		76100	142	148	149	145	149	149	147	149	150	148	150	150	195
35000		77200	144	149	151	146	150	151	148	150	151	149	151	151	196
35500		78300	145	150	152	147	151	152	149	151	152	150	152	152	197
36000		79400	146	151	153	148	152	153	150	153	153	150	153	153	198
36500		80500	147	153	154	150	153	154	151	154	154	149	153	154	200
37000		81600	149	154	155	151	154	155	153	155	155	148	155	155	201
37500		82700	150	155	156	152	155	156	154	156	156	147	157	157	203
38000		83600	151	156	157	153	156	157	155	157	157	146	158	158	204
38500		84700	152	157	158	155	157	158	157	158	158	145	159	160	205
39000		85800	153	159	160	156	158	159	158	159	159	144	160	162	207

175 TAKEOFF V-SPEEDS

FLAPS 2 TAKEOFF MODE: T/O-2

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)												
SL → → → → → → →			-40	to	38	39	to	48	49	to	50				
1000 → → → → → → →			-40	to	36	37	to	46	47	to	48				
2000 → → → → → → →			-40	to	31	32	to	42	43	to	46				
3000 → → → → → → →						-40	to	37	38	to	44				
4000 → → → → → → →						-40	to	32	33	to	42				
5000 → → → → → → →						-40	to	25	26	to	38	39	to	40	
6000 → → → → → → →									-40	to	34	35	to	38	
7000 → → → → → → →									-40	to	29	30	to	36	
8000 → → → → → → →									-40	to	25	24	to	34	
						↓			↓			↓			
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}
24000		52900	102	112	121	105	114	121	107	115	121	111	117	121	162
24500		54000	104	114	122	107	116	122	109	117	122	113	119	122	164
25000		55100	105	115	123	109	117	123	111	118	123	115	120	123	165
25500		56200	107	117	124	110	119	124	112	120	124	116	122	124	167
26000		57300	109	118	125	112	120	125	114	121	125	118	123	125	168
26500		58400	110	120	127	114	122	127	116	123	127	119	124	127	170
27000		59500	112	121	128	115	123	128	117	124	128	121	126	128	172
27500		60600	114	123	129	117	124	129	119	125	129	123	127	129	174
28000		61700	115	124	130	119	126	130	121	127	130	125	128	130	175
28500		62800	117	126	131	120	127	131	122	128	131	126	130	131	177
29000		63900	119	127	132	122	129	132	124	130	132	128	131	132	178
29500		65000	120	128	134	123	130	134	125	131	134	130	132	134	180
30000		66100	122	130	135	125	131	135	126	132	135	131	137	135	181
30500		67200	123	131	136	126	133	136	129	133	136	133	135	136	183
31000		68300	125	132	137	128	134	137	130	135	137	134	136	137	184
31500		69400	126	134	138	129	135	138	132	136	138	136	137	138	186
32000		70500	128	135	139	131	136	139	133	137	139	137	139	139	187
32500		71700	129	136	140	132	138	140	135	138	140	139	140	140	189
33000		72800	131	138	141	134	139	141	136	140	141	140	141	141	190
33500		73900	132	139	142	135	140	142	138	141	142	141	142	143	192
34000		75000	134	140	143	137	141	143	139	142	143	143	143	144	193
34500		76100	135	141	144	138	142	144	141	143	144	144	145	145	195
35000		77200	136	143	146	140	144	146	142	144	146	145	146	146	196
35500		78300	138	144	147	141	145	147	143	146	147	146	147	147	197
36000		79400	139	145	148	143	146	148	145	147	148	147	148	148	198
36500		80500	140	146	149	144	147	149	146	148	149	149	149	149	200
37000		81600	142	147	150	145	148	150	147	149	150	150	150	150	201
37500		82700	143	148	151	147	149	151	148	150	151	151	151	151	203
38000		83600	144	149	152	149	150	152	149	151	152	152	152	152	204
38500		84700	145	151	153	150	151	153	150	152	153	153	153	153	205
39000		85800	147	152	154	152	152	154	151	153	154	154	154	154	206

175 TAKEOFF V-SPEEDS

FLAPS 4 TAKEOFF MODE: T/O-2

PRESSURE ALTITUDE (ft)			STATIC AIR TEMPERATURE (C)												
SL	→ → → → → → →		-40 to 37			38 to 46			47 to 50						
1000	→ → → → → → →		-40 to 36			37 to 41			42 to 46						
2000	→ → → → → → →		-40 to 30			31 to 39			40 to 46						
3000	→ → → → → → →					-40 to 35			36 to 44						
4000	→ → → → → → →					-40 to 30			31 to 39			40 to 42			
5000	→ → → → → → →								-40 to 35			36 to 40			
6000	→ → → → → → →								-40 to 30			31 to 38			
7000	→ → → → → → →								-40 to 26			27 to 36			
8000	→ → → → → → →								-40 to 21			22 to 34			
			↓			↓			↓			↓			
WEIGHT (kg)		WEIGHT (lb)	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V ₁	V _R	V ₂	V _{FS}
24000		52900	90	69	104	93	97	104	95	98	104	99	100	104	162
24500		54000	92	69	105	95	98	105	97	99	105	100	102	105	164
25000		55100	94	68	106	96	100	106	99	101	106	102	103	106	165
25500		56200	95	99	107	98	101	107	100	102	107	103	104	107	167
26000		57300	97	101	108	99	102	109	102	104	108	105	106	108	168
26500		58400	98	102	108	101	104	109	103	105	109	106	107	109	170
27000		59500	100	103	110	103	105	110	105	106	110	108	108	110	172
27500		60600	101	105	111	104	106	111	106	108	111	109	110	111	174
28000		61700	103	106	112	106	108	112	108	109	112	110	111	112	175
28500		62800	104	107	113	107	109	113	109	110	113	112	112	113	177
29000		63900	106	109	114	106	110	114	111	112	114	113	113	114	178
29500		65000	107	110	115	110	112	115	112	113	115	114	115	115	180
30000		66100	109	111	116	112	113	116	113	114	116	116	116	116	181
30500		67200	110	112	117	113	114	117	115	115	117	117	117	117	183
31000		68300	112	114	118	114	115	118	116	116	118	118	118	118	184
31500		69400	113	115	119	115	116	119	117	118	119	119	119	119	186
32000		70500	114	116	120	117	118	120	118	119	120	120	121	121	187
32500		71700	116	117	121	118	119	121	119	120	121	122	122	122	189
33000		72800	117	118	122	119	120	122	21	121	122	123	123	123	190
33500		73900	118	120	123	120	121	123	122	120	123	24	124	124	192
34000		75000	119	121	124	122	122	124	123	123	124	125	125	125	193
34500		76100	121	122	125	123	123	125	124	125	125	126	126	126	195
35000		77200	122	123	125	124	125	125	125	126	126	127	127	1227	196
35500		78300	123	124	126	125	126	126	126	127	127	128	128	128	197
36000		79400	124	125	127	126	127	127	127	129	128	129	129	129	198
36500		80500	125	126	128	127	128	129	128	129	129	130	130	130	200
37000		81600	126	127	129	128	129	129	130	130	130	131	132	132	201
37500		82700	127	128	130	129	130	130	131	131	131	132	133	134	203
38000		83600	128	129	131	130	131	131	132	133	133	133	134	135	204
38500		84700	129	130	132	131	132	133	134	134	134	134	135	136	205
39000		85800	130	131	133	132	133	134	135	135	135	135	136	138	206

175 LANDING V-SPEEDS

NO ICING CONDITIONS

Weight (kg)	(lbs)	V _{AC} FLAP 2 (IAS)	V _{AC} FLAP 4 (IAS)	V _{FS} (IAS)	V _{REF} FLAP 5 (IAS)	V _{REF} FLAP FULL (IAS)
21000	46300	126	110	152	106	100
22000	48500	128	113	155	108	102
23000	50700	131	116	158	110	104
24000	53000	134	118	162	112	106
25000	55100	137	120	165	115	108
26000	57300	139	123	168	117	110
27000	59500	142	125	172	119	112
28000	61700	145	127	175	122	114
29000	63900	147	130	178	124	116
30000	66100	150	132	161	126	118
31000	68300	152	134	184	128	120
32000	70500	155	136	187	130	122
33000	72800	157	138	190	132	124
34000	75000	160	141	193	134	126
35000	77200	162	143	196	136	127
36000	79400	164	145	198	138	128
37000	81600	166	147	201	140	129
38000	83800	169	149	204	142	130

NOTES for entering data into FMS **LANDING** PAGE 3:

- Round up to closest weight value.
- V_{REF} for FLAP 5 or FULL into LSK L1. SOP landing configuration is FLAP 5.
- V_{APP} (V_{REF} +5 + wind component) for landing flap setting into LSK L2.
- V_{AC} for for FLAP 2 or 4 into LSK L3. Climb out flap setting depends on company SOP.
- V_{FS} into LSK R1.

175 LANDING V-SPEEDS

ICING CONDITIONS

Weight (kg)	(lbs)	V _{AC} FLAP 2 (IAS)	V _{AC} FLAP 4 (IAS)	V _{FS} (IAS)	V _{REF} FLAP 5 (IAS)	V _{REF} FLAP FULL (IAS)
21000	46300	125	110	151	115	104
22000	48500	128	113	155	117	107
23000	50700	131	116	158	119	110
24000	53000	134	118	162	122	112
25000	55100	137	120	165	124	114
26000	57300	139	123	168	127	116
27000	59500	142	125	172	129	118
28000	61700	145	127	175	132	121
29000	63900	147	130	178	134	123
30000	66100	150	132	181	136	125
31000	68300	142	134	184	139	127
32000	70500	155	136	187	141	129
33000	72800	157	138	190	143	131
34000	75000	160	141	193	145	132
35000	77200	162	143	196	147	134
36000	79400	164	145	198	149	134
37000	81600	165	147	201	152	135
38000	83800	167	149	204	154	136

NOTES for entering data into FMS **LANDING** PAGE 3:

- Round up to closest weight value.
- V_{REF} for FLAP 5 or FULL into LSK L1. SOP landing configuration is FLAP 5.
- V_{APP} (V_{REF} +5 + wind component) for landing flap setting into LSK L2.
- V_{AC} for for FLAP 2 or 4 into LSK L3. Climb out flap setting depends on company SOP.
- V_{FS} into LSK R1.

195 LANDING V-SPEEDS

NO ICING CONDITIONS

Weight (kg)	(lbs)	V _{AC} FLAP 2 (IAS)	V _{AC} FLAP 4 (IAS)	V _{FS} (IAS)	V _{REF} FLAP 5 (IAS)	V _{REF} FLAP FULL (IAS)
28000	61700	130	115	155	106	102
29000	63900	132	117	158	108	103
30000	66100	134	119	161	110	103
31000	68300	137	121	164	112	105
32000	70500	139	123	166	113	106
33000	72800	141	125	169	115	109
34000	75000	143	127	171	117	110
35000	77200	145	129	174	119	112
36000	79400	147	130	176	120	113
37000	81600	149	132	179	122	115
38000	83800	151	134	181	123	116
39000	86000	153	136	184	125	118
40000	88200	155	137	186	127	119
41000	90400	157	139	188	129	121
42000	92600	159	141	190	130	122
43000	94800	161	143	193	132	124
44000	97000	163	144	195	133	125
45000	99200	165	146	197	135	126
46000	101400	166	147	199	136	127
47000	103600	168	149	202	138	129
48000	105800	170	151	204	139	130
49000	108000	172	153	206	141	122
50000	110200	174	154	208	142	133
51000	112400	176	156	210	143	136
52000	114600	177	157	212	144	136

NOTES for entering data into FMS LANDING PAGE 3:

- Round up to closest weight value.
- V_{REF} for FLAP 5 or FULL into LSK L1. SOP landing configuration is FLAP 5.
- V_{APP} (V_{REF} +5 + wind component) for landing flap setting into LSK L2.
- V_{AC} for for FLAP 2 or 4 into LSK L3. Climb out flap setting depends on company SOP.
- V_{FS} into LSK R1.

195 LANDING V-SPEEDS

ICING CONDITIONS

Weight (kg)	(lbs)	V _{AC} FLAP 2 (IAS)	V _{AC} FLAP 4 (IAS)	V _{FS} (IAS)	V _{REF} FLAP 5 (IAS)	V _{REF} FLAP FULL (IAS)
28000	61700	130	115	155	114	105
29000	63900	132	117	158	116	107
30000	66100	134	119	161	118	109
31000	68300	137	121	164	120	111
32000	70500	139	123	166	122	112
33000	72800	141	125	169	124	114
34000	75000	143	127	171	126	116
35000	77200	145	129	174	128	118
36000	79400	147	130	176	129	119
37000	81600	149	132	179	132	122
38000	83800	151	134	181	133	123
39000	86000	153	136	184	135	125
40000	88200	155	137	186	136	126
41000	90400	157	139	188	139	128
42000	92600	159	141	190	140	129
43000	94800	161	143	193	152	131
44000	97000	163	144	195	143	132
45000	99200	165	146	197	145	134
46000	101400	166	147	199	146	135
47000	103600	168	149	202	148	137
48000	105800	170	151	204	150	138
49000	108000	172	153	206	152	140
50000	110200	174	154	208	153	141
51000	112400	176	156	210	156	143
52000	114600	177	157	212	158	144

NOTES for entering data into FMS LANDING PAGE 3:

- Round up to closest weight value.
- V_{REF} for FLAP 5 or FULL into LSK L1. SOP landing configuration is FLAP 5.
- V_{APP} (V_{REF} +5 + wind component) for landing flap setting into LSK L2.
- V_{AC} for for FLAP 2 or 4 into LSK L3. Climb out flap setting depends on company SOP.
- **V_{FS} into LSK R1.**

STRUCTURAL AIRSPEEDS *(for all variants accept where noted)*

MAXIMUM LANDING GEAR OPERATION/EXTENDED SPEEDS

Retraction.....	250 KIAS
Extension.....	250 KIAS
Extended.....	250 KIAS

MANEUVERING SPEED (VA)

VA.....	240 KIAS
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MAXIMUM FLAP POSTION EXTENDED SPEED (VFE)

Flap 1.....	230 KIAS
Flap 2.....	215 KIAS
Flap 3.....	200 KIAS
Flap 4.....	180 KIAS
Flap 5.....	180 KIAS
Flap FULL.....	165 KIAS

MAXIMUM FLAP EXTENDED ALTITUDE

Maximum Altitude for Flap Extension.....	20,000 ft
--	-----------

TAILWIND

Maximum Takeoff and Landing Tailwind Component.....	10 kt
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MAXIMUM RECOMMENDED CROSSWIND

Aerodynamics analysis have resulted in the following maximum recommended crosswinds for takeoff and landing:

Dry runway.....	38 kt
Wet runway.....	31 kt
Runway with Compacted Snow.....	20 kt
Runway with Standing Water/Slush.....	18 kt
Runway with Ice (no melting).....	12 kt

WINDSHIELD WIPER OPERATION *(wiper movement simulated in VC only.)*

Maximum Airspeed for Windshield Wiper Operation.....	250 KIAS
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APPROACH AND LANDING FLAPS

APPR1 / CAT I.....	FLAP 5 or FULL
APPR2 / CAT II.....	FLAP 5
AUTOLAND 1 / CAT IIIA.....	FLAP 5

SERVICE CEILING

Maximum Altitude.....	41,000 ft
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MAXIMUM TAKEOFF AND LANDING ALTITUDES

E175.....	8,000 ft
E195.....	10,000 ft

MAXIMUM TURBULENCE AIRSPEED PENETRATION

Below 10,000 ft.....	250 KIAS
At or above 10,000 ft.....	270 KIAS / M0.70

TIRE GROUND SPEED LIMIT

Maximum Speed.....	195 KIAS
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AIR TEMPERATURE LIMITATIONS

Maximum TO and Landing.....	52 C
Minimum for Takeoff.....	-40 C
Minimum for Operation.....	-54 C

EICAS MESSAGES AND CHECKLISTS

EICAS messages are grouped according to system type. Following the message are a description of the condition and corrective actions.

Crew Awareness Messages and System Status Messages are advisory only and do not result in restricted aircraft operation; nor whether an aircraft may be dispatched; or the flight continuing to the final destination.

Autopilot Related:

AP FAIL

Condition:

Autopilot function is no longer operative.

Correction:

System status message.
Fly aircraft manually.

AT FAIL

Condition:

Both autothrottles have failed.
Selected AT function is unavailable.

Correction:

System status message.
Control thrust manually.

YD FAIL

Condition:

Yaw damper function is no longer operative.

Correction:

Crew awareness message.

YD OFF

Condition:

Yaw damper function is off.

Correction:

Crew awareness message.
Re-engage YD as required.

AP FAULT

Condition:

The AP has one channel failed.

Correction:

Crew awareness message.

AT FAULT

Condition:

The A/T has one channel failed.

Correction:

Crew awareness message.

FD FAULT

Condition:

A single FD channel is no longer available.

Correction:

Crew awareness message.

FD FAIL

Condition:

FD is no longer available.

Correction:

Crew awareness message.

YD FAULT

Condition:

The yaw damper has one channel failed.

Correction:

Crew awareness message.

Aural Warnings:

AURAL WARN FAIL

Condition:

Aural warning system is no longer available.

Correction:

System status message.
Monitor visual indications.

NOTE:

Aural warnings, including EGPWS callouts, are lost.
TCAS aural will be operative.

Electrics:

BATT 1-2 OVERTEMP

Condition:

Associated battery temperature is above 70°C.

Correction:

Confirm EICAS Indication: Battery temperature indication in red band.
Turn associated battery OFF.
Do NOT start APU.
Land immediately.

BATT 1-2 OFF - *during flight*

Condition:

Battery #1 and #2 are isolated from the electrical network.

Correction:

Do NOT start APU.
Land immediately.

BATT DISCHARGING (WARNING) *during flight*

Condition:

Batteries are discharging in an electrical emergency with no RAT assistance, or on ground when the battery is the only power source supplying the airplane.

Correction *during flight:*

Land immediately.

BATT 1(2) DISCHARGING (CAUTION)

Condition:

Associated battery is discharging due to electrical system automation failure, or when battery is the only source supplying the system.

Correction *during flight:*

Land immediately.

ELEC EMERGENCY

Condition:

In flight, AC main buses are de-energized.

Correction:

CHECKLIST:
 Airspeed.....MIN 130 KIAS
 APU.....START
 IDG 1 Selector.....OFF, then AUTO
 IDG 2 Selector.....OFF, then AUTO
 Emergency Lights.....OFF
 TRU 1 Switch.....OFF
 TRU 2 Switch.....OFF
 Icing Conditions.....EXIT/AVOID
 Altitude.....10000 FT or MEA,
WHICHEVER IS HIGHER
 Land.....IMMEDIATELY

NOTE:

Avoid side slipping the airplane.
 On ground, use differential braking and rudder
 to steer the airplane.
 The slats and flaps will operate at low rate.

AC BUS 1-2 OFF

Condition:

Associated AC BUS is de-energized.

Correction when flying in icing conditions:

CHECKLIST:
 Ice Protection Mode Selector.....ON
 Two minutes after exiting icing conditions:
 Ice Protection Mode Selector.....AUTO

NOTE:

The slats will operate at low rate.
 If BUS 1 OFF Fuel Crossfeed Low 2 is not
 available.

AC ESS BUS OFF

Condition:

AC ESS BUS is de-energized.

Correction:

CHECKLIST:
 TRU ESS Switch.....OFF

NOTE:

The flaps and slats will operate at low rate.
 Fuel Crossfeed Low 1 is not available.

AC STBY BUS OFF

Condition:

AC STBY BUS is de-energized.

Correction:

Monitor the electrical system.

NOTE:

Engine start with batteries only is not available.

DC BUS 1 OFF

Condition:

Associated DC BUS 1 is de-energized.

Correction:

CHECKLIST:

Autothrottle.....DISENGAGE
Emergency Lights.....OFF
Altitude.....MAX 31000 FT

Landing Configuration:

Emergency Lights.....ARMED
Slat/Flap.....FULL

NOTE:

The slats will operate at low rate.
Set Normal V Speeds for VREF FULL Landing.

CAUTION:

Landing distance will be increased

DC BUS 2 OFF

Condition:

Associated DC BUS 2 is de-energized.

Correction:

CHECKLIST:

Autothrottle.....DISENGAGE
Altitude.....MAX 31000 FT

Landing Configuration:

Slat/Flap.....FULL

NOTE:

Set Normal V Speeds for VREF FULL Landing.
On ground use differential braking and rudder to
steer the airplane.

CAUTION:

Landing distance will be increased.

DC ESS BUS 1 OFF

Condition:

DC ESS BUS 1 is de-energized.

Correction:

CHECKLIST:

Icing Conditions.....EXIT / AVOID
Battery 1.....OFF
Land.....IMMEDIATELY

Landing Configuration:

Slat/Flap..... FULL

On Ground:

Brakes.....APPLY NORMALLY

If necessary:

Emergency/Parking BrakePULL

NOTE:

Set Normal V Speeds for VREF FULL Landing.
FADEC will set flight idle on ground.
The flaps will operate at low rate.
Thrust Reversers, Wing Anti-Ice and Ground
Idle may not be available.
Expect lower roll rates and lower speedbrake
efficiency.
Do not accomplish the SPOILER FAULT
procedure.

CAUTION:

Landing distance will be increased.

DC ESS BUS 2 OFF

Condition:

DC ESS BUS 2 is de-energized.

Correction:

CHECKLIST:

Icing Conditions.....EXIT / AVOID

Battery 2.....OFF

Land.....IMMEDIATELY

APU.....OFF

Landing Configuration:

Slat/Flap.....FULL

On Ground:

Brakes.....APPLY NORMALLY

If necessary:

Emergency/Parking Brake.....PULL

NOTE:

Set Normal V Speeds for VREF FULL Landing.

The slats will operate at low rate.

FADEC will set flight idle on ground.

Thrust Reversers, Wing Anti-Ice and Ground

Idle may not be available.

Expect lower roll rates and lower speedbrake efficiency.

Do not accomplish the SPOILER FAULT procedure.

CAUTION:

Landing distance will be increased.

DC ESS BUS 3 OFF

Condition:

DC ESS BUS 3 is de-energized.

Correction:

CHECKLIST:

TRU ESS Switch.....OFF

If EICAS message does not clear:

APU.....OFF

NOTE:

If EICAS message does not clear the flaps will operate at low rate.

IDG 1-2 OFF BUS

Condition:

IDG failure or IDG control button pushed out.

Correction:

CHECKLIST:

Affected IDG Selector.....OFF, then AUTO

If EICAS message does not clear:

Affected IDG Selector.....OFF

APU.....AS REQUIRED

LOAD SHED

Condition:

Load shed automatically commanded.

Correction:

Crew awareness message.

APU GEN OFF BUS

Condition:

APU generator failure or APU GEN button is pushed out.

Correction:

CHECKLIST:

APU Gen Button.....PUSH OUT,
.....then IN

If EICAS message does not clear:

APU Gen Button.....PUSH OUT

APU SHUTTING DOWN

Condition:

A normal APU shutdown has been commanded via the APU selector knob.

Correction

System status message.

Engines:

ENG 1-2 OIL LOW PRESS

Condition:

Engine 1 (2) oil pressure is low.

Correction:

Check oil pressure indication on EICAS display.
If abnormal conduct ENGINE 1 (2) FAIL procedure.

ENG 1-2 FAILED

Condition:

Engine 1 (2) shutdown has occurred.

Correction:

CHECKLIST:

Autothrottle.....DISENGAGE

#___ Thrust Lever.....IDLE

#___ Start/Stop Knob.....STOP

APU.....START

Fuel.....BALANCE

AutothrottleAS REQUIRED

Land.....IMMEDIATELY

ESTABLISH AND COMMUNICATE A PLAN

ENG 1-2 REV FAIL

Condition:

Thrust Reverser 1 (2) is not available.

Correction:

Do not takeoff.

ENG 1-2 TLA NOT IDLE

Condition:

Thrust Lever Angle not set to idle position during engine start.

Correction:

System status message.
Move thrust lever 1 (2) into idle position.

Takeoff:

NO TAKEOFF CONFIG

Condition:

Airplane is not in a valid takeoff configuration.

Correction:

Based on aural notice correctly set aircraft for takeoff.

Fuel:

FUEL 1-2 LO LEVEL

Condition:

Low-level sensors indicate that 880 lbs. of fuel remain in the respective tank.

Correction:

CHECKLIST:

Land.....IMMEDIATELY
Associated Fuel AC Pump.....ON
Fuel Xfeed Selector.....AS REQUIRED
Establish and Communicate a Plan

NOTE:

Maintain a clean configuration as long as possible during the descent and approach to conserve fuel. However, initiate configuration change early enough to provide a smooth, slow deceleration to final approach speed to prevent fuel running forward in the tanks.
Runway conditions permitting, avoid heavy braking and high levels of reverse thrust to prevent uncovering all fuel pumps and possible engine flameout during landing roll.

CAUTION:

Avoid pitch above 15 degrees up or down, uncoordinated turns and negative G's.
For a go around, apply thrust slowly and smoothly, maintain minimum nose-up attitude required for safe climb gradient and avoid rapid acceleration.
If any wing tank fuel pump low pressure message is displayed, do not turn fuel pump off.

FUEL AC PUMP 1-2 FAIL

Condition:

Indicates a discrepancy between the commanded and actual associated pump state.

Correction:

Turn Fuel Xfeed Selector OFF

FUEL IMBALANCE

Condition:

Indicates an imbalance of fuel between the two tanks greater than or equal to 800 lbs. It remains displayed until the imbalance is reduced to 100 lbs.

Correction:

CHECKLIST:

Attitude.....WINGS LEVEL

Low level in RH wing:

Fuel Xfeed Selector.....LOW 2

When the desired balance is achieved:

Fuel Xfeed Selector.....OFF

Low level in LH wing:

Fuel Xfeed Selector.....LOW 1

When the desired balance is achieved:

Fuel Xfeed Selector.....OFF

NOTE:

Monitor total fuel indication in EICAS with FMS fuel remaining information.
Compare total fuel quantity indication on EICAS with fuel remaining information indicated on FMS Fuel Management page. If FMS fuel remaining quantity is lower than EICAS total fuel indication, disregard FMS fuel remaining information and monitor fuel quantities.

FUEL XFEED FAIL

Condition:

Indicates a discrepancy between the cockpit control position and either the valve position or the affected pump status.

Correction:

Fuel Xfeed selector in OFF position this is a system status message.
Fuel being equalized move Fuel Xfeed selector to OFF position when appropriate.
Fuel is not being equalized move Fuel Xfeed selection to OFF position and use asymmetric thrust as required.

FUEL DC PUMP FAIL

Condition:

Indicates a discrepancy between the commanded and actual pump state.

Correction:

Turn Fuel DC Pump Selector OFF.

FUEL EQUAL-XFEED OPEN

Condition:

Crossfeed valve commanded open prior to fuel imbalance has reached 800 lb. and the FUEL IMBALANCE message has been triggered or crossfeed valve is still open and fuel imbalance condition is suppressed FUEL IMBALANCE after message has been triggered.

Correction:

Crew awareness message.

FUEL FEED 1 (2) FAULT

Condition:

Respective AC pump is ON due to a failure in the primary engine feed system and the unusable fuel in the affected side is up to *TBD* lbs. The message will not be displayed when the respective N2 is less than idle.

Correction:

When in-flight continue and monitor systems.

On Ground CHECKLIST:
Emergency/Parking Brake.....SET
FUEL AC PUMP 1 (2)..... AUTO
Thrust Lever 1 (2).....ADVANCE to 65% N2
FUEL AC PUMP 1 (2)..... ON
.....Wait 5 seconds.....
FUEL AC PUMP 1 (2)..... AUTO
Thrust Lever 1 (2)..... IDLE
Message does not clear.....DO NOT TAKEOFF

FUEL TANK LO TEMP

Condition:

Temperature sensed in the left collector bay is less than or equal to -37°C.

Correction:

Set airspeed at V_{MO}/M_{MO} and wait 3 minutes.
If message does not clear descend to lower (warmer) altitude.

FUEL XFEED SOV OPEN

Condition:

Crossfeed valve is open and associated AC fuel pump is operating.

Correction:

Crew awareness message.

Hydraulics:

HYD 1-2 LO PRESS

Condition:

Associated hydraulic system pressure is low.

Correction:

CHECKLIST:
Associated Electric Hydraulic
Pump Selector.....ON
Message does not clear:
Associated Electric Hydraulic
Pump Selector.....OFF
Autopilot.....DISENGAGE
Establish and Communicate a Plan.

NOTE:

Expect lower roll rates and lower speedbrake efficiency.
Do not accomplish the SPOILER FAULT procedure.
If HYD 1 OFF do not command the engine 1 reverser.
If HYD 2 OFF do not command the engine 2 reverser.
Plan a long final approach.

HYD 3 LO PRESS

Condition:

Hydraulic system 3 pressure is low.

Correction:

CHECKLIST:
Electric Hydraulic Pump B Selector.....ON
Electric Hydraulic Pump A Selector.....OFF
Message does not clear:
Electric Hydraulic Pump B Selector.....OFF

HYD PTU FAIL

Condition:

PTU is not supplying hydraulic power to hydraulic system 2 or; PTU automatic operation is compromised.

Correction:

CHECKLIST:
PTU Selector.....ON
Message does not clear:
PTU Selector.....OFF

NOTE:

During cruise flight, the PTU Selector may be turned to AUTO.

HYD 1-2 EDP FAIL

Condition:

Associated engine-driven pump is not providing hydraulic power to the system.

Correction:

Crew awareness message.

HYD 1-2 ELEC PUMP FAIL

Condition:

Associated electric pump is not providing hydraulic power to the system.

Correction:

Turn associated pump knob OFF.

HYD3 ELEC PUMP A-B FAIL

Condition:

Associated system 3 electric pump is not providing hydraulic power to the system.

Correction:

Turn associated pump knob OFF.

HYD 1-2 LO QTY
Condition: Fluid level in the associated reservoir is low.
Correction: Crew awareness message.

HYD 3 PUMP A NOT ON
Condition: ACMP 3A is not set to ON position.
Correction: Crew awareness message.

HYD PTU NOT AUTO
Condition: PTU is not in auto position.
Correction: Crew awareness message.

HYD PUMP NOT AUTO
Condition: SYS 1, 2 or 3 electric pump is not in auto position
Correction: Crew awareness message.

HYD 1-2 SOV CLOSED
Condition: Associated SOV closed.
Correction: System status message.

IRS:

IRS 1-2 FAIL
Condition: Associated IRS has failed.
Correction: Press Reversionary Panel IRS button.

IRS EXCESSIVE MOTION
Condition: Excessive motion of aircraft is disturbing associated IRS aligning sequence.
Correction: Stop all aircraft movement. The IRS system will restart the alignment process automatically.

IRS ALIGNING
Condition: Associated IRS is in aligning sequence.
Correction: Crew awareness message.

IRS 1-2 NAV MODE FAIL
Condition: Associated IRS is no longer providing navigation information.
Correction: Press Reversionary Panel IRS button.

Lights:

EMERG LT NOT ARMED
Condition: Emergency lighting system in not armed
Correction: Move Emergency Light knob to ARMED.

EMERG LT ON

Condition:

Emergency lighting system is on

Correction:

Move Emergency Light knob to OFF then ARMED.

Flight Controls:

FLAP FAIL

Condition:

Both flaps electronic control channels are inoperative and the flaps system is no longer available or there is a jam in the mechanical portion that precludes the flaps from moving.

Correction:

CHECKLIST:
Slat/Flap Lever..SET TO PREVIOUS POSITION
.....Wait 10 seconds.....
Slat/Flap Lever.....RESELECT
If message does not clear:
Slat/Flap Lever...SELECT DESIRED POSITION

Based on slat/flap position displayed on EICAS set landing v-speeds according to the FLAP/SLAT FAIL LANDING CONFIGURATION TABLE.

Bank Angle..... 20° MAXIMUM
Gnd Prox Flap Ovr Button.....PUSH IN
If a go around is required:
Slat/Flap.....MAINTAIN

Maintain the VREF presented in the Flap/Slat Fail Landing Table.

NOTE:

If amber dashes are displayed on the EICAS, use the most conservative position to enter the table (e.g. for a failure between 1 and 2, consider 1).

FLAP/SLAT FAIL LANDING CONFIGURATION TABLE

	FLAP↘/SLAT↗	0	3	FULL
VREF (KIAS)	0	VREF FULL +60	VREF FULL +50	VREF FULL +50
VREF (KIAS)	1	VREF FULL +35	VREF FULL +35	VREF FULL +35
VREF (KIAS)	2	VREF FULL +30	VREF FULL +25	VREF FULL +20
VREF (KIAS)	3 to 5	NOT APPROVED	VREF FULL +15	VREF FULL +10
VREF (KIAS)	FULL	NOT APPROVED	VREF FULL +5	VREF FULL

SLAT FAIL

Condition:

Both slats electronic control channels are inoperative and the slats system is no longer available or there is a jam in the mechanical portion that precludes the slats from moving.

Correction:

CHECKLIST:
Slat/Flap Lever..SET TO PREVIOUS POSITION
.....Wait 10 seconds.....
Slat/Flap Lever.....RESELECT
If message does not clear:
Slat/Flap Lever...SELECT DESIRED POSITION

Based on slat/flap position displayed on EICAS set landing v-speeds according to the FLAP/SLAT FAIL LANDING CONFIGURATION TABLE.

Bank Angle..... 20° MAXIMUM
Gnd Prox Flap Ovr Button.....PUSH IN
If a go around is required:
Slat/Flap.....MAINTAIN

Maintain the VREF presented in the Flap/Slap Fail Landing Table.

NOTE:

If amber dashes are displayed on the EICAS, use the most conservative position to enter the table (e.g. for a failure between 1 and 2, consider 1).
Landing distance will be increased.

FLAP/SLAT FAIL LANDING CONFIGURATION TABLE

	FLAP↘/SLAT→	0	3	FULL
VREF (KIAS)	0	VREF FULL +60	VREF FULL +50	VREF FULL +50
VREF (KIAS)	1	VREF FULL +35	VREF FULL +35	VREF FULL +35
VREF (KIAS)	2	VREF FULL +30	VREF FULL +25	VREF FULL +20
VREF (KIAS)	3 to 5	NOT APPROVED	VREF FULL +15	VREF FULL +10
VREF (KIAS)	FULL	NOT APPROVED	VREF FULL +5	VREF FULL

FLAP LO RATE

Condition:

One of the flaps electronic control channels is inoperative and the flap system is still available but running at low speed.

Correction:

Anticipate slow flap movement.

SLAT LO RATE

Condition:

One of the Slats electronic control channels is inoperative. Slat system is still available but in low speed.

Correction:

Anticipate slow slat movement.

SPOILER FAULT

Condition:

Airspeed gain scheduling has failed in one or more pairs of multi-function spoilers, and the system(s) has defaulted to a fixed gain, have extended inadvertently or have failed to extend.

Correction:

Autopilot.....DISENGAGE
Speedbrake.....CLOSE
Flight Controls Mode Spoilers Button...PUSH IN,
.....then OUT
If message does not clear:

If any spoiler panel is failed opened or if it is not possible to determine the spoiler panel position:
Slat/Flap.....5
Set VREF.....FULL + 15 KIAS

If all spoiler panels are closed:
Slat/Flap.....FULL
Set VREF.....FULL

NOTE:

Landing distance will be increased.

SPOILER LVR DISAG

Condition:

A mismatch exists between the speedbrake handle position and the multi-function spoiler surfaces or the ventral speed brake.

Correction:

Return the slat/flap lever to previous position and then use it as required.

BRK OVERHEAT

Condition:

Brake temperature has exceeded the normal operating range.

Correction:

On ground CHECKLIST:

Airplane.....STOP

Chocks.....ON

Emergency/Parking Brake.....OFF

In-flight CHECKLIST:

Landing Gear.....DOWN

After the BRK OVERHEAT message disappears:

.....Wait 5 minutes.....

Landing Gear.....UP

DOOR PAX FWD OPEN

Condition:

Forward passenger door is open or not properly locked either on the ground with any engine running or in flight.

Correction:

Check cabin pressurization.
If pressure is falling land immediately.
Descent to 10,000 ft or MEA, whichever is high.
Establish and Communicate a Plan.

DOOR PAX AFT OPEN

Condition:

Aft passenger door is open or not properly locked either on the ground with any engine running or in flight.

Correction:

Check cabin pressurization.
If pressure is falling land immediately.
Descent to 10,000 ft or MEA, whichever is high.
Establish and Communicate a Plan.

DOOR SERV FWD OPEN

Condition:

Forward service door is open or not properly locked either on the ground with any engine running or in flight.

Correction:

Check cabin pressurization.
If pressure is falling land immediately.
Descent to 10,000 ft or MEA, whichever is high.
Establish and Communicate a Plan.

DOOR SERV AFT OPEN

Condition:

Aft service door is open or not properly locked either on the ground with any engine running or in flight.

Correction:

Check cabin pressurization.
If pressure is falling land immediately.
Descent to 10,000 ft or MEA, whichever is high.
Establish and Communicate a Plan.

FLT CTRL TEST IN PROG

Condition:

Electrical Power Up Built In Test (PBIT) in progress. The Electrical PBIT is automatically performed during power up after the aircraft is powered by any AC source and takes approximately 3 minutes to complete. The Electrical PBIT will be interrupted if any electric hydraulic pump is running or if the FCP switches are cycled or if AC power is interrupted while the test is running.

Correction:

Crew awareness message.

ELEVATOR LH-RH FAIL

Condition:

Left (right) elevator control system is no longer available.

Correction:

CHECKLIST:
Maximum Airspeed.....CURRENT OR 175 KIAS,
.....WHICHEVER IS HIGHER
If a go around is required:
Slat/Flap.....5
Airspeed.....VREF FULL + 15 KIAS

NOTE:

Expect less elevator control authority and slower response, especially during landing flare.

AILERON LH-RH FAIL

Condition:

Indicates that the left (right) aileron is no longer available or there is a mechanical disconnection in the left (right) aileron surface.

Correction:

Avoid abrupt and large aileron movements.
Keep bank angle 25 degrees or less.

RUDDER FAIL

Condition:

Active and standby rudder channels have failed or rudder has jammed.

Correction:

LAND.....IMMEDIATELY
Maximum Airspeed.....CURRENT OR 175 KIAS,
.....WHICHEVER IS HIGHER

Landing configuration:

Slat/Flap.....FULL
Set.....VREF FULL

Establish and Communicate a Plan

CAUTION:

AVOID LANDING WITH CROSSWIND COMPONENTS ABOVE 10 KT.

If a go around is required, proceed as a normal go around limiting the airspeed to 175 KIAS.

NOTE:

As asymmetric thrust may be required to help controlling the airplane, maximum thrust on both engines may not be possible.

STEER OFF

Condition:

Steering is disconnected.

Correction:

System status message.

ELEV NML MODE FAIL

Condition: Normal mode of the associated system is no longer operative.

Correction: PUSH IN Flight Controls Mode Elevators Button. Avoid side slipping the airplane.

RUDDER NML MODE FAIL

Condition: Normal mode of the associated system is no longer operative.

Correction: PUSH IN Flight Controls Mode Rudder Button.

SPOILER NML MODE FAIL

Condition: Normal mode of the associated system is no longer operative.

Correction: CHECKLIST: Speedbrake.....CLOSE Flight Controls Mode Spoilers Button.....PUSH IN

Note: Landing distance will be increased.

Anti-Ice:

A-I LO CAPACITY

Condition: Wing anti-ice bleed air pressure and temperature capacity is low.

Correction: Advance thrust levers

A-I WING FAIL

Condition: A wing anti-ice system failure has been detected.

Correction: CHECKLIST: Ice Protection Wing Button. .PUSH OUT, then IN If message does not clear: Ice Protection Mode Selector.....ON Five minutes after exiting icing conditions: Ice Protection Mode Selector.....AUTO If message does not clear: Ice Protection Wing Button.....PUSH OUT Icing ConditionsEXIT/AVOID

Landing Configuration: Slat/Flap.....5 Set VREF.....FLAP 5 ICE

Note: Landing distance will be increased.

ICE DET 1-2 FAIL

Condition: Associated ice detector has failed.

Correction: When flying in icing conditions turn Ice Protection Mode Knob ON. Two minutes after exiting icing conditions turn Ice Protection Mode Knob to AUTO.

W/S 1-2 HEAT FAIL

Condition: Associated windshield heating system has failed or is overheated.

Correction: Affected Windshield Heating Button PUSH OUT, then IN If message does not clear PUSH OUT Affected Windshield Heating Button.

A-I MODE NOT AUTO

Condition:

Ice protection selector knob is not in the AUTO position.

Correction:

Crew awareness message.

A-I SWITCH OFF

Condition:

Ice protection button for engine and/or wing anti-ice system is pushed out.

Correction:

Crew awareness message.

ICE CONDITION

Condition:

An icing condition has been detected.

Correction:

Crew awareness message.

STALL PROT ICE SPEED

Condition:

Stall Warning function and Stall Protection functions are no longer operative.

Correction:

Set landing reference speed +10 KIAS.
Use landing performance data appropriate to icing conditions.

ENG REF A-I DISAG

Condition:

Ice protection mode selector knob set to the ON position with OFF or ENG in the takeoff data set (TDS) menu.

Correction:

Reconfigure aircraft to match takeoff data entered.
Reenter takeoff data to match aircraft configuration.

A-I ENG 1-2 FAULT

Condition:

Displayed during test if there is loss of the capacity to monitor the adequate functioning of the system.

Correction:

Crew awareness message.

A-I ENG 1-2 VLV OPEN

Condition:

Engine anti-ice valve is open.

Correction:

System status message.

A-I WING VLV OPEN

Condition:

Wing anti-ice valve is open. Also displayed during test after every takeoff (crossing 10,000 ft or 10 minutes after takeoff, whichever occurs first).

Correction:

System status message.

ENG TDS REF A-I ALL

Condition:

REF A-I ALL is selected on takeoff data set page on MCDU.

Correction:

System status message.

ENG TDS REF A-I ENG

Condition:

Ice protection mode selector knob set to the AUTO position and REF A-I ENG is selected on takeoff data set page on MCDU.

Correction:

System status message.

-Bleed air and conditioning

XBLEED FAIL

Condition:

Bleed isolation valve has failed closed. Cross bleed is no longer available.

Correction:

Crew awareness message.

XBLEED SW OFF

Condition:

Bleed isolation button has been pushed out.

Correction:

Crew awareness message.

BLEED 1-2 OFF

Condition:

Associated bleed is turned off

Correction:

Do not exceed an altitude of 31,000 ft.

BLEED APU VLV OPEN

Condition:

APU bleed valve is commanded open.

Correction:

System status message.

PACK 1-2 OFF

Condition:

Associated pack is off in flight.

Correction:

Do not exceed an altitude of 31,000 ft.

CABIN ALTITUDE HI

Condition:

Cabin altitude is equal to higher than 9700 ft.

Correction:

CHECKLIST:

OXYGEN MASKS.....Verify, ON, 100%
 CREW COMM.....ESTABLISH
 ALTITUDE 10,000 FT OR MEA
(whichever is higher)
 THRUST LEVERS.....IDLE
 SPEED BRAKE LEVER.....FULL OPEN
 AIRSPEED.....MAX/APPROPRIATE
 TRANSPONDER.....7700
 ATC.....NOTIFY
 Passenger Oxygen Selector.....OVRD
 Autopilot (if available).....ON
 No Ped/Fstn Belts.....ON
 Cabin Altitude.....Monitor
 When cabin altitude is 14,000 ft. or below:
 Flight Attendants.....Notify & obtain status report
 When approximately 1,000 ft.
 above desired altitude:
 SPEED BRAKE Lever.....CLOSE
 Speed.....Adjust as necessary
 Crew O2 (if required).....Normal

Establish and Communicate a Plan.

NOTE:

Flight crew must use oxygen when cabin altitude is above 10,000 ft.

FMS ENTRY FORMATS

Airport Identifiers

The FMS uses only four-character International Civil Aviation Organization (ICAO) or ICAO-format airport identifiers. If a U.S. airport has a 3-letter identifier it is probably prefixed with a K in the database. Alaskan and Hawaiian airports with a 3-letter identifier are usually prefixed with a P. Canadian airports with 3-letter identifiers are usually prefixed with a C.

Alternate Destination

Refer to WAYPOINT NAME.

Altitude (Any Altitude Entry)

- Entry in feet up to five digits
- Entry in flight levels (FL)
- Negative altitude permitted
- Automatic conversion to flight levels above transition altitude
- Range from FL000 to FL600; -1300 to 60000 feet

Angle

- Entry in degrees and tenths of degrees; decimal required only when entering tenths
- Range from 1.0° to 6.0°

Baro Set

- Entry in millibars or inches of mercury (decimal required)
- Leading zero not required
- Range from 16.00 to 32.00 (in. Hg), 542 to 1083 (millibars)

Basic Operating Weight (BOW)

Refer to WEIGHT

Cargo Weight

Refer to WEIGHT

Destination

Refer to WAYPOINT NAME

Direct-To Waypoint

Refer to WAYPOINT NAME

Flight Plan Name (Any Entry)

- Use six to 10 alphanumeric characters.
- The first character cannot be a dash (-).
- If the following format is used to name a flight plan the FMS automatically enters the origin and destination names after the flight plan name is entered: QABC - QCDF

where QABC and QCDF are the ICAO identifiers for the origin and destination, respectively.

Frequency (ADF)

- The minimum entry is three digits.
- A decimal is not required if tenths position is zero.
- Range is 100.0 to 1799.5 in 0.5 increments.

Frequency (NAV)

- The minimum entry is two digits.
- A decimal is not required if tenths and hundredths are zero.
- Leading digit (1) is not required.
- Range is 108.00 to 117.95

Frequency (TRANSPONDER)

- A four-digit entry is required.
- The range for each digit is 0 to 7.

Frequency (VHF COM)

- The minimum entry is two digits.
- A decimal is not required for all zeros to right of decimal.
- Leading digit (1) is not required.
- Range is 118.000 to 151.975 in 0.025 increments.

Fuel Weight

Refer to WEIGHT

Hold Page Inbound Course/Direction

- Entry of three digits is required for course.
- Entry of L or R is for turn direction.
- Slash (/) is required when making both entries or turn direction only.
- The range of course is 0 to 360 in increments of 1.

Hold Page Leg Distance

- The minimum entry is one digit
- Range is 1.0 to 20.0 in 0.1 increments.

Hold Page Leg Time

- The minimum entry is one digit.
- Range is 0.5 to 3.0 in 0.1 increments.

ILS Identifier

- The minimum entry is one character.
- The maximum entry is four characters.

International Standard Atmosphere Deviation

- Entry is degrees, up to two numbers and negative sign if required
- Range is from -59° to +35° celsius.

Landing Weight

Refer to WEIGHT

Latitude

- The first character must be N or S.
- Degrees range from 0 to 90.
- 0.0 to 59.9 in 0.1 increments.

Example of entries:

Entry Display

N0 N0000.0

N1 N0100.0

N12 N1200.0

N123 N1230.0

N1234 N1234.0

N1234.5 N1234.5

Latitude/Longitude

- Entry of both latitude and longitude is made by combining the latitude and longitude entry with no space between.

Example:

N50W50.

Longitude

- The first character must be E or W.
- Range of degrees is from 0 to 180.
- Range of minutes is from 0 to 59.9 in 0.1 increments.

Example of entries:

Entry Display

W0 W00000.0

W1 W00100.0

W12 W01200.0

W123 W12300.0

W1234 W12340.0

W12345 W12345.0

W12345.6 W12345.6

Nondirectional Beacons

- All nondirectional beacons in the NAV database can be accessed by appending the NB suffix to the beacon identifier.

- The minimum entry is three characters.
- The maximum entry is five characters.

Origin

Refer to WAYPOINT NAME

Outside Air Temperature

- Entry is in degrees up to two numbers and negative sign if required.
- Range is from -42° to 54° Celsius.
- Range is from -43° to 129° Fahrenheit.

Passengers

- The minimum entry is one digit.
- Range is 0 to 999.

Passenger Weigh

- The minimum entry of slash (/) plus three digits
- Range is 100 to 300.

Place/Bearing/Distance (P/B/D)

- Place is any defined waypoint name.
- Bearing entry minimum is one digit.
- Distance minimum entry is one digit
- Bearing range is from 0 to 360 in 0.1 increments (decimal required for tenths).
- Distance range is from 0 to 9999.9 in 0.1 increments (decimal required for tenths).

Place/Bearing/Place/Bearing (P/B/P/B)

- Place is any defined waypoint name.
- Bearing entry minimum is one digit.
- Bearing range is from 0 to 360 in 0.1 increments (decimal required for tenths).

Place//Distance (P//D)

- Place is any defined waypoint name.
- Distance entry minimum is one digit.
- Distance range is from 0 to 9999.9 in 0.1 increments (decimal required for tenths).

Quadrant

- The minimum entry is one alpha character
- Possible entries are N, NE, E, SE, S, SW, W, NW.

Radial

- The minimum entry is one digit.
- Range is from 0 to 360.

Radial Page Distance

- Minimum entry of one digit
- Range from 1.0 to 999.9 in 0.1 increments

Radial Page Inbound and Outbound Radials

- Minimum entry of one digit
- Range from 0.0 to 360.0 in 0.1 increments

Radius

- Entry is in tenths of miles.
- Range is from 1.0 to 99.9.

Reference Waypoint

Refer to WAYPOINT NAME

Reserve Fuel (Minutes)

- Entry is in minutes up to three numbers.
- Range is from 0 to 600 minutes.

Reserve Fuel (Pounds)

Refer to WEIGHT.

Speed (Any CAS/MACH Entry)

- Minimum entry for CAS is two digits.
- Minimum entry for MACH is decimal plus one digit.
- Range of CAS is from 75 to 450.
- Range of MACH is from .30 to .95 in 0.01 increments.

Speed (Any Ground Speed Entry)

- Minimum entry is two digits.
- Range from 75 to 750.

Surface Wind

- Entry is in degrees and knots.
- Range is from 0 to 360 degrees and 0 to 56 knots.

Takeoff Weight

Refer to WEIGHT

Temperature

- Entry is in degrees and negative sign if required.
- Range from -70° to 54° Celsius.

Temporary Waypoint

Temporary waypoints are created when making entries to the flight plan. They are only

displayed on the flight plan page. Some procedures and airways contain temporary waypoints. Also when loading a flight plan from a flight planning service, it may be necessary to create temporary waypoints.

The following is a list of the entries that create a temporary waypoint when made to the active flight plan:

- Coordinates
- Place/Bearing/Distance
- Place/Bearing/Place/Bearing
- Place/Distance
- Intercept Function

Temporary waypoints created by the FMS or through CDU entry are prefixed with an asterisk (*).

VIA.TO

The VIA.TO prompt is used in flight planning. A variety of entries are possible with the prompt. The same entries can be made to the flight plan without the prompt such as when adding waypoints.

The following is a list of possible entries:

- Airway.Waypoint
- Waypoint
- Temporary Waypoint

VOR Identifier

- The minimum entry is one character.
- The maximum entry is three characters.

Waypoint Name

- The name can be from one to five alphanumeric characters.
- The first character cannot be a dash (-).

Weight (any weight entry)

- Entry is 1 to 6 numbers.
- Range is from 0 to 999999.

Wind (Any Wind Entry)

- Entry is made in the form of direction/speed.
- The minimum entry for direction is one digit.
- The minimum entry for speed is one digit.
- The range of direction is 0 to 360.
- The range of speed is 0 to 250.

ABBREVIATIONS AND SOME DEFINITIONS

(ITALICS items are referenced in the manual but not simulated.)

AGL: Above Ground Level

APU: Auxiliary Power Unit

AUTOLAND: fully automated landing of an aircraft by the flight computers with the pilot only supervising the function of the plane's systems. Autoland is usually performed in low visibility situations where the pilot is unable to see the runway.

C: Celsius

CAT I landing: an instrument landing with a decision height not lower than 200 feet (61 meters), and visibility not less than ½ mile (800 meters), or a runway visual range not less than 1,800 feet (550 meters).

CAT II landing: an instrument landing with a decision height lower than 200 feet (61 meters) and higher than 100 feet (30 meters). For the E-jet the visibility cannot be less than ¼ mile (400 meters), or runway visual range less than 1,200 ft (300 meters).

CB(s): Circuit Breaker(s)

*ELECTRONIC CBs: circuit break data access by pressing the FMS **CB** button*

DISPATCH CLEARANCE: paperwork received from airline operations approving aircraft to depart.

DVDR: Digital Voice Data Recorder

EICAS: Engine Indication and Crew Alerting System

ELT: Emergency Locator Transmitter

FMC: Flight Management Computer (see also FMS and MCDU)

FMS: Flight Management System (see also FMC and MCDU)

FT: feet or foot

G: apparent force of gravity felt due to acceleration. One 'G' equals the force of gravity felt while standing at sea-level.

GREEN DOT: indicates an ideal speed to select the next available flap position.

GPU: Ground Power Unit

ICAO: International Civil Aviation Organization (ICAO) is a United Nations agency which assigns a 4-letter identifier code to each airport. ICAO codes are used to identify airports in the E-jet's navigation database.

KG, kg: Kilogram(s)

LB, lb: Pound(s)

MCDU: Multifunction Control Display Unit (see also FMC and FMS)

PHOTOLUMINESCENT STRIPS: light emitting floor marks that outline the cabin aisle to assist passengers in finding the aircraft emergency exits.

PRESSURE ALTITUDE: when the aircraft is on-ground indicated altitude when the altimeter is set to standard pressure. This altitude reading is used when making takeoff performance calculations.

RAT: Ram Air Turbine

TO, T/O, T.O.: Takeoff

UTC: coordinated universal time. UTC is the local time at the Royal Observatory, Greenwich, England.

V-SPEEDS: airspeed limitations for safe flight.

M_{MO} : Maximum Operating Mach

V_1 : Takeoff Decision Speed

V_2 : Takeoff Safety Speed

V_{AC} : Approach climb speed (speed to climb on a single engine or climb during a go around.)

V_{AP} : Approach Speed

V_{FS} : Final Segment Speed (speed for final segment of flight with gear and flaps retracted)

V_{MO} : Maximum Operating Speed

V_R : Takeoff Rotation Speed

V_{ref} : Landing Reference Speed

V_{stall} : stall speed, or minimum steady flight speed at which the airplane is controllable.

V_{shaker} : speed at which the yoke shaker engages warning the pilot that a stall is imminent.

LIVERIES AND REPAINTS

McPhat Studios created the house and airline liveries included with the E-jet v.2 package -

E175:

- Embraer 175 Rollout
- Cirrus Airlines
- Royal Jordanian Airlines
- Trip

E195:

- Embraer 195 Rollout
- Azul
- Royal Jordanian Airlines
- Windrose



Additional McPhat liveries will also be released. See McPhat's web site for details and pricing at: <http://www.mcphatstudios.net>



A user repaint kit will be made available. The manual was finalized before a release date and download link were known. The paintkit release will be announced in the E-jet support forum and on feelThere's www-site.

The painter's kit is provided 'as is' and without support. No warranty is given by feelThere. If you choose to create your own, or install user created, repaints for the E-jet v.2 do so at your own risk.

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