feelThere **ERJ V2**



Addon Aircraft for Microsoft's Flight Simulator Steam Edition

OPERATIONS MANUAL

FOR THE EMBRAER REGIONAL JETS 145XR & 135LR

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WHAT THIS MANUAL IS AND ISN'T:

This manual is intended to provided the average flight simulation enthusiast with the information necessary to fly the Embraer Regional Jet (ERJ). 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 ERJ. 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 ERJ training).

There are multiple Internet sources for detailed information on flying the ERJ'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 ERJ 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.

You must have a fully updated version of FSX SE.

The absolute minimum computer specifications required to run the ERJv2 are: Pentium IV 1,4 GHz, 256MB RAM, 128MB Graphics, FSX SE, Windows 2000, XP and Vista (only 32 bit systems are supported). 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 ERJ's gauges to optimize in-game function.

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

Sub-Panel Windows
There are multiple 2D sub-panels that can be viewed in the ERJ simulation. These panels are accessed used the **SEMICON BAR** (see below); and many can be opened and closed using FS's keyboard shortcuts.

Sub-panel	*FS shortcut*
overhead	<SHIFT><2>
FMC	<SHIFT><3>
center pedestal	<SHIFT><4>
thrust management	<SHIFT><5>
Call!	<SHIFT><6>
semicon bar	<SHIFT><7>
PFD	<SHIFT><8>
MFD	<SHIFT><9>

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
- mouse wheel /center mouse button click the heading knob and the heading bug is set to the aircraft's current direction of flight.
- mouse wheel /center mouse button click the speed knob to toggle between knots and Mach values being used for the speed bug.

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

Safety covered buttons and knobs
Many of the ERJ's buttons and knobs have a safety cover and therefore unaccessible. In order to access these controls when using the 2D panel you must right-mouse-click to open, or close, the cover. In the VC cockpit left-mouse-click to open, or close, the cover. Once the cover has been opened you can use the shielded knob or button.

Center Pedestal
The Gust Lock is located on the center pedestal to prevent control column roll back in case of strong winds; and locking the engine throttle levels when on -ground. Lock and unlock this safety device by clicking to the far right side of the gust lock mechanism.

The Takeoff Config button is used to assure the plane is correctly set for takeoff. When the aircraft is not “OK” for takeoff; the automated voice will list items needing pilot attention.

Exploring the VC cabin

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.

FMS keyboard mode
Your computer keyboard can be made to operate the FMS by clicking the top left screw on the CDU, or by using the keystroke <CTRL>+<SHIFT>+<K>. This being done you can directly type into the FMS using your computer keyboard.

To access Line Select Keys (LSKs) use the F1-F4 for the Left LSKs and F5-F8 for the right.

Page Up and Page Down scrolls between the menus.

Heads Up Display (HUD)
To access the Heads Up Display (HUD) view click the **H** symbol on the semicon panel. To exit the HUD view press the 'W' keyboard key twice to cycle aircraft views.

Autotune
The default setting for the navigation radios is by FMS autotune. Based on the needs of the initial reference unit (IRU) and route flow the FMS will select radio frequencies. Autotune will tune an ILS frequency if entered into the flightplan. The ILS frequency will be tuned as the aircraft approaches the outer marker.

To see if the radios are autotuning go to the FMS radio page. The letter **A** is displayed in each radio line that is under the control of the FMS. To manually tune a radio enter the correct frequency into the scratchpad and then press the appropriate LSK. To return tuning control to the FMS press the DEL key to enter *DELETE* into the scratchpad and press the appropriate LSK.

The radios may also be tuned using the Radio Management Unit (RMU). After frequencies have been changed using the RMU in order to return to re-enable the FMC to autotune follow the procedure outlined above.

Systems Self Test
On the Display Control Panel (DCP) click and hold the RA-TST knob for 30 or seconds to initiate the aircraft's system self test.

Semicon Bar



By left-mouse-clicking on the symbols you can jump between each of the 2D panels. The 2D panels can also be loaded using the previously noted keyboard shortcuts.

From left to right the icons on the semicon bar access the following sub-panels:

- Thrust Rating (**T** icon)
- Center Pedestal (mini-throttle levers icon)
- Overhead (mini-overhead icon)
- FMC (mini-FMC icon)
- HUD (**H** icon)
- Flight Info (**F** icon)
- *Call!* (**C** icon)

The semicon bar may be moved by holding a left-mouse-click on the black space to the right of the *Call!* Icon.

Flight Info window
Similar to the flight information screens seen on many jetliner in-cabin entertainment screens, this windows will display:

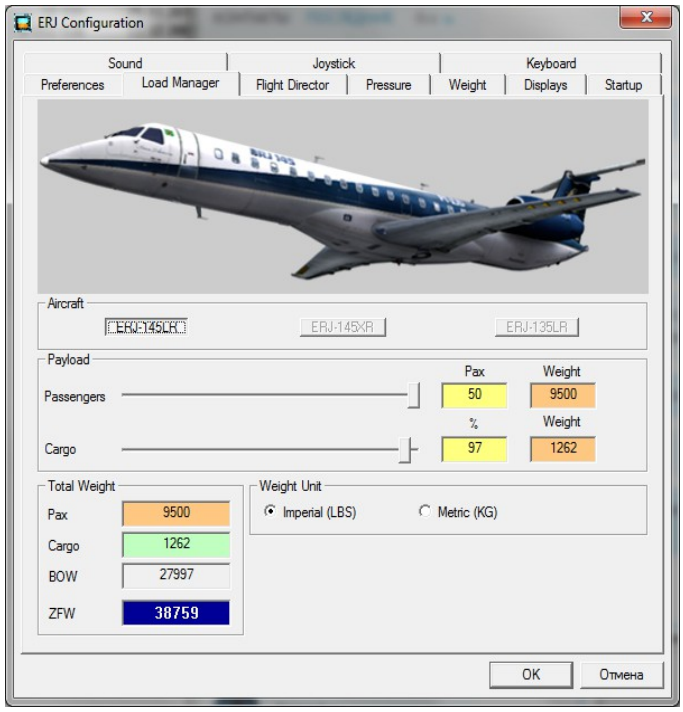
- distance from departure airport
- distance to arrival airport
- estimated time of arrival at destination airport
- temperature at destination

For the Flight Info window to function correctly the FMS must be programmed with a departure and destination airport.

The flight info may be moved by holding a left-mouse-click.

Take-off Go-Around (TOGA) Clickspot
On the glareshield's flight guidance control sub-panel clicking the upper left screw activates the take -off and go-around pitch settings on the PFD; and virtual co-pilot callouts: thrust set, V1, VR, V2, and gear-up. For the v-speed callouts to be vocalized speeds must be set on the MFD (see MFD description in the **Using The Avionic Systems** section of this manual).

Configuration Utility



This utility allows you to adjust the ERJ'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.
- Sound – sets the master volume for the panel's custom gauges.
- Joystick – set the joystick, or yoke, buttons to control Touch Control Steering (TCS) and autopilot quick disconnect.

  When the TCS button is pressed, and held, the pilot may adjust the ERJ 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.
- 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 ERJs simulated: 145XR and 135LR**.** 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 ERJ's cfg file to be updated. Changes made here are only seen in-game after restarting FS.
- Flight Director – choose your preference for the shape of the flight director shown in the PFD.
- Pressure – set the ERJ's default pressure system: HPA (hPa) or IN (inHg).
- Weight – set the ERJ'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.
- HUD - set how the HUD sub-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 been seen within flight simulator after restarting the game.

Call! **Panel**

The feelThere addon *Call!* is included with the simulation. Clicking the semicon panel **C** symbol, or <SHIFT><6>, will open the *Call! g*auge. *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:

- DARK/COLD
- ENG RDY TO START
- ENGINE START UP
- FLIGHT ATTENDANT SAFETY
- BEFORE TAKEOFF
- AFTER TAKEOFF
- BEFORE DESCEND
- APPROACH CHECKLIST
- BEFORE LANDING
- AFTER LANDING
- PARKING
- IF LEAVING AIRCRAFT
- TAXI



The ERJ 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!

Virtual Cockpit Yokes

For those choosing to fly the aircraft from the VC cockpit there are two versions of the aircraft available: yoke and no-yoke. The non-yoke model is for the pilot finding it difficult to clearly see and use the VC panel. When selecting the ERJ from FS's *choose aircraft* menu pick an aircraft with '**noyoke**' in the aircraft name if you DO NOT WANT the yokes present in the cockpit.

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.

The ERJ program was first launched in 1989 as the EMB145. Multiple design changes and lack of airline interest resulted in a second 'launch' in 1994. The aircraft finally offered had a low wing, T tailed, a pressurized cabin, and fitted with a pair of rear mounted Rolls Royce Allison A3007 turbofans. Even though the ERJ is a much more advanced aircraft than her predecessor, the EMB120, she shares much with the Brasilia twin turboprop. One example is both aircraft have the same fuselage diameters.

First flight occurred on August 11, 1995; with first delivery going to Continental Express (now ExpressJet) who was a major Brasilia operator on December 29, 1996. Deliveries followed to Regional Airlines (France) and Air France. The aircraft was renamed the Regional Jet 145, or ERJ145, in October 1997 to reflect its sales market.

Three commercial aviation versions of the aircraft are offered: 135, 140 and the 145. A few of the multiple sub-types have been offered are: standard, extended range (ER); long range (LR) and extra long range (XR). The Legacy business jet is based on the 135. Military variants are based on the 145.

In December of 2002 Embraer came to an agreement with China Aviation Industry Corporation II (AVIC II) to build ERJ 145 aircraft with Harbin Aircraft Manufacturing Corporation (HAMC), in Harbin, China. Harbin Embraer airframes, when added to those built in Brazil, make the total ERJ's delivered at over 1000 as of October 3, 2007.

As of June 2009, 890 Brazilian made commercial aviation ERJ family aircraft have been ordered with 878 delivered. Over 1,100 145 family aircraft have been delivered when including the Chinese built hulls, military variants, and the legacy 600 executive jets.

At the time of this writing the ERJ family of aircraft retains impressive safety and reliability records.
ERJs have an mission completion rate of 99.7%. There are no documented injuries or deaths caused by a mechanical fault with the aircraft; and only three hull losses in over 15 million flight hours while carrying over 450 million passengers. On average over 150,000 passengers fly on an ERJ each day.

THE SIMULATED ERJ's:

ERJ 135 LR -

Maximum Take Off Weight:	44,092lb	20,000kg
Maximum Landing Weight:	40,785lb	18,500kg
Maximum Zero Fuel Weight:	35,274lb	16,000kg
Basic Operating Weight:	26,012lb	11,799kg
Maximum Payload:	9,919lb	4,499kg
Maximum Fuel:	11,322lb	5,136kg
Wingspan:	65ft 9in	20.04m
Length Overall:	86ft 5in	26.33m
Height Overall:	22ft 2in	6.76m
Maximum Operating Speed:	M 0.78	
Take Off Field Length, ISA, SL, MTOW:	5,774ft	1,760m
Landing Field Length, SL, MLW	4,462ft	1,360m
Range 37 PAX @ 200lb (90.7kg), LRC	1,750nm	3,241km
Engines: two Rolls-Royce AE3007 A turbofans:	7,426lb of maximum take-off thrust each.	

Cabin Layout: 37 seats in a one-by-two layout, two pilots, single flight attendant, small galley forward, and single lavatory rear.

First Flight of First Variant: July 4, 1998

ERJ 145 XR -

Maximum Take Off Weight:	53,131lb	24,100kg
Maximum Landing Weight:	44,092lb	20,000kg
Maximum Zero Fuel Weight:	40,785lb	18,500kg
Basic Operating Weight:	28,880lb	13,100kg
Maximum Payload:	13,027lb	5,909kg
Maximum Fuel:	13,166lb	5,973kg
Wingspan (including winglets)	68ft 11in	21.00m
Length:	98ft 0in	29.87m
Height:	22ft 2in	6.76m
Maximum Operating Speed:	M 0.80	
Take Off Field Length, ISA, SL, MTOW:	6,791ft	2,070m
Landing Field Length, SL, MLW:	4,692ft	1,430m
Range 50 PAX @ 200lb (90.7kg), LRC	2,000nm	3,704km
Engines: Two Rolls-Royce AE3700 A1E turbofans:	8,763lbs of maximum take-off thrust each.	

Cabin Layout: 50 seats in a one-by- two layout, two pilots, single flight attendant, small galley forward, and single lavatory rear.

First Flight of an XR: June 29, 2001

QUICK START

In this section you will learn the basic controls needed to operate the airplane from power up to shut down. It is best to read through once, maybe twice, prior to conducting the flight. More detail covering the Flight Management System (FMS), systems details, check lists and control speeds are outlined in the Quick Reference Handbook.

Before launching FS use the ERJ configuration utility to prepare the 135LR aircraft. For this, your first flight, load 35 volunteers that have agreed to be passengers. In addition to passengers load 589 pounds of cargo (30%). Set the ERJs to load 'cold & dark'.

After launching FS choose airport Grant Co. Intl. (KMWH), the starting location as 'S PARKING 8', weather to clear, no AI traffic, and load 50% fuel (5699 pounds total) into each wing tank. During the flight you will not use FS's ATC.

Search the current Aeronautical Information Regulation And Control (AIRAC) cycle by the FAA airport code 'MWH'. The recommended plates are:

- airport diagram
- runway ILS or LOC RWY 32R



MAIN PANEL:

The simulated ERJ's 2D main panel consists of five screens called the Electronic Flight Instruments System (EFIS).



On the far left screen is the primary flight display (PFD). The PFD provides the pilot with:

- speed tape on the left;
- altitude to the right;
- vertical speed indicator lower right;
- attitude indicator center with flight director with overlay of command bar and airplane symbols in the center, and in a yellow rectangle the radar altimeter reading when below 2500 feet;
- autopilot modes along the top;
- compass rose bottom;
- NAV radio course, ID, distance, pointers' modes, and autopilot heading lower right.

Below the PFD screen are, left to right: barometric pressure scale section button, mechanical slip indicator, set barometric pressure to standard button, and the barometric pressure selection knob.

The Multi -Function Display (MFD) is located to the right of the PFD. This screen is used to show the route programmed into the FMC, aircraft system pages, weather radar and Traffic Alert and Avoidance System (TCAS). Use the bezel button along the bottom of the MFD to change the aircraft details and settings shown on the lower third of the screen. The knob in the lower right corner of the bezel will adjust the setting as noted in the MFD screen (as pictured turning the knob will adjust the scale for the map display). *NOTE: Flight checklists are not modeled.*

The large screen on the right is the Engine Indication and Crew Alerting System (EICAS). The upper left portion displays the engines status. The upper right section of the screen

shows alert, caution and warning messages. The bottom quarter shows left to right: cabin pressurization, roll, yaw and pitch trims.

Between MFD and EICAS, are the Integrated Standby Instrument System (ISIS) and the Radio Management Unit (RMU, see RADIO MANAGEMENT UNIT). The ISIS is the upper gauge, the RMU the lower.

Outboard of the PFD is the Audio Control Panel (ACP).

Above the ACP is the Chronometer/Clock.

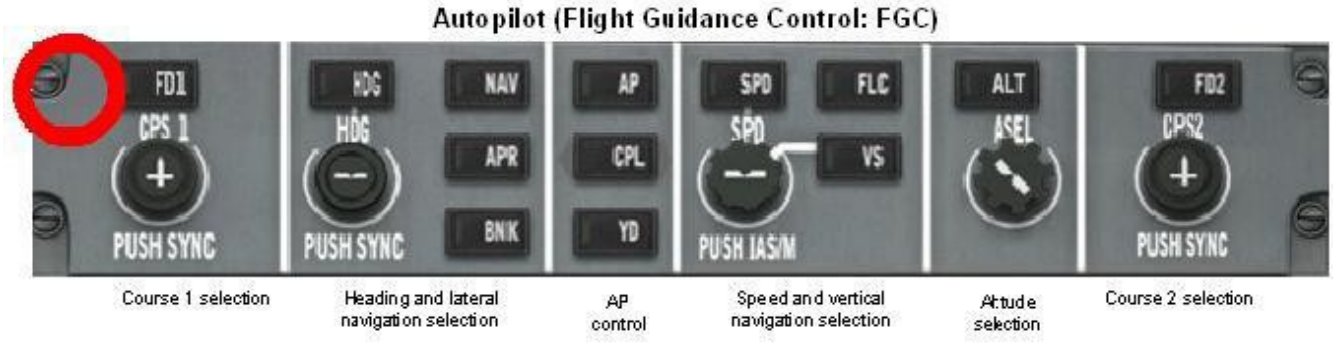
Below the ACP is the Revisionary Panel. Use the sub-panel's selector knob to change the MFD screen to display the PFD or EICAS.

Above the main panel, attached to the windscreen main strut, is the magnetic compass.

NOTES: the VC cockpit allows you to see the co-pilot's DCP, MFD, RMU, PFD, ACP and Chronometer/Clock. The 2D panel does not show the landing gear lever (to the right of the EICAS screen). The lever can be used when flying in the VC; or by pressing FS's default landing gear command (<G>).

AUTOPILOT PANEL:

Autoflight controls are located on the glare shield. The center sub-panel is the Flight Guidance Panel (FGP) -



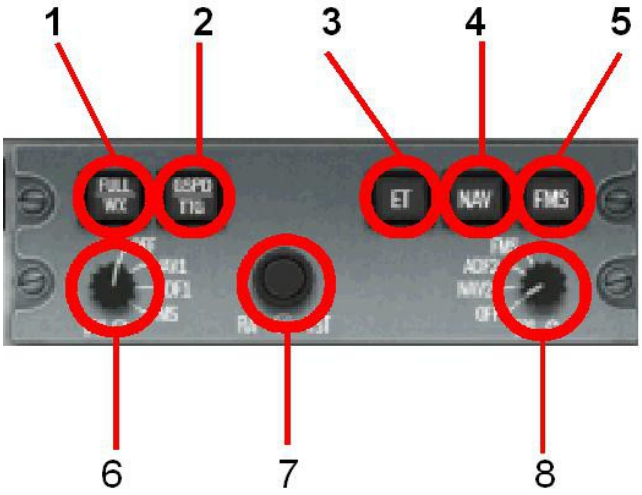
From left to right -

- FD1 button activates flight director one.
- CRS1 knob adjusts NAV1 radio course as displayed on the PFD's compass rose.
- HDG button sets autopilot to follow the heading set using the HDG knob. Click on the HDG knob with the *center mouse button* to synchronize the heading bug with the aircraft's current direction of flight.
- NAV button sets the autopilot to follow the course set for NAV1 radio OR the FMS flightplan (see Display Control Panels below).
- APR button arms the autopilot to capture the ILS localizer and glide-slope.
- BNK button sets the autopilot bank (turn) limiter.
- AP button turns the autopilot on and off.

- CPL button tells the autoflight system which pilot is commanding the autopilot.
- SPD button commands the autopilot to hold, by adjusting pitch, the selected airspeed (see SPD knob below). Airspeed hold **ONLY** works when the ERJ is in climb or descent modes.
- SPD knob will set the indicated airspeed bug in the PFD when the SPD button is active; or the PFD's vertical speed bug when the VS button is active.
- FLC button sets the pre-programmed climb or descent profile. When the aircraft is below the selected altitude (see ALT) FLC will have the ERJ climb; when the plane is above the selected altitude the ERJ will descend.
- VS button commands the autopilot to follow the vertical-speed set using the SPD knob.
- ALT button arms the autopilot to capture the selected altitude (see ASEL knob).
- ASEL knob adjusts the altitude the autopilot will capture when the ALT button is pressed. The selected altitude is displayed in the upper-right corner of the PFD above the altitude tape.
- FD2 button activates flight director two.
- CRS2 knob adjusts NAV2 radio course.

NOTE: the red circle shows the location of the Takeoff/Go Around (TOGA) 'cheat' button.

Left (and right in the VC) of the FGP are the Display Control Panels (DCP). The two DCP's are identical.

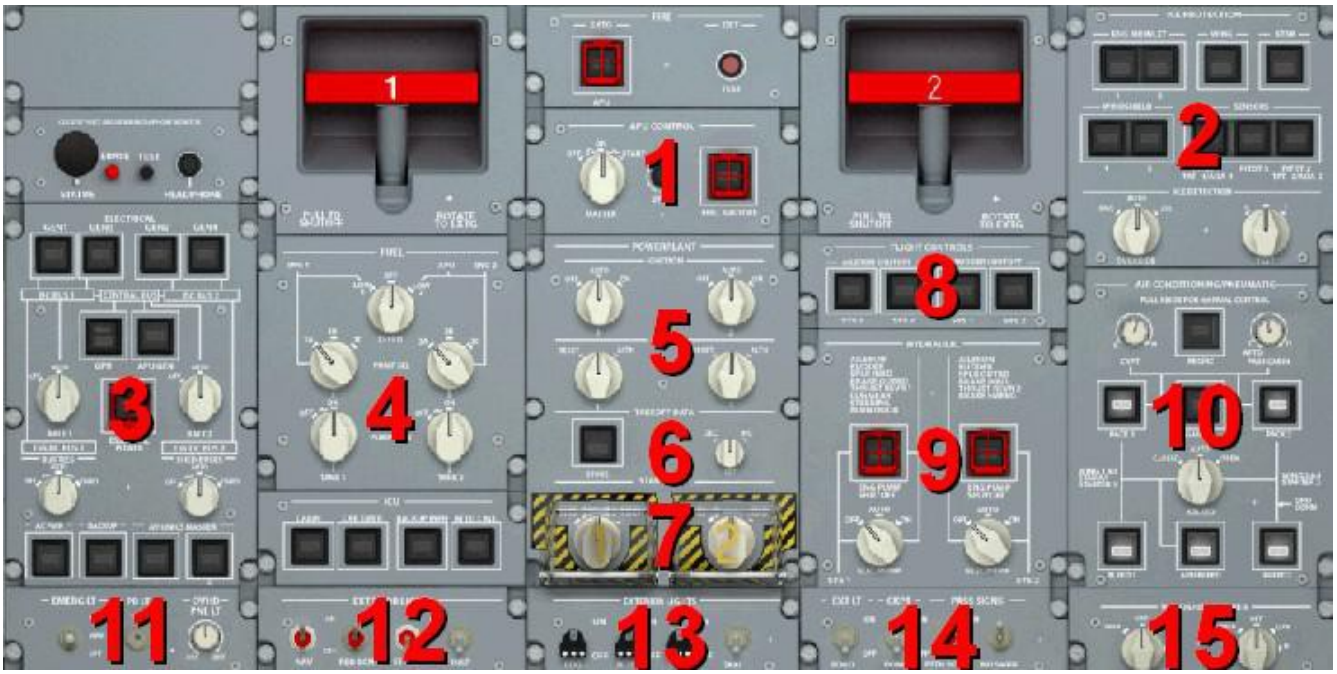


1. Full or arc compass rose in PFD
2. Ground speed or Time To Go till next waypoint in PFD
3. Displays Elapsed Time on the PFD.
4. NAV radios used for autopilot control
5. FMS used for autopilot control
6. Blue bearing needle on PFD compass displays NAV1, ADF1 or FMS
7. Decision height setting knob and system test button
8. White bearing needle on PFD compass displays NAV2, ADF2 or FMS

Outboard of the DCPs are the Master Warning and Master Caution buttons. When a caution or warning situation is detected you will hear an alarm, the warning and/or caution button will flash, and a description of the fault will be displayed on the EICAS screen. The alarm sound is silenced by left-clicking the notifying button. Details on the warning and caution messages displayed are in the EMERGENCY CHECKLISTS section of the manual.

The final items on the glareshield, full left and right, are the cockpit and panel lighting controls.

OVERHEAD PANEL:

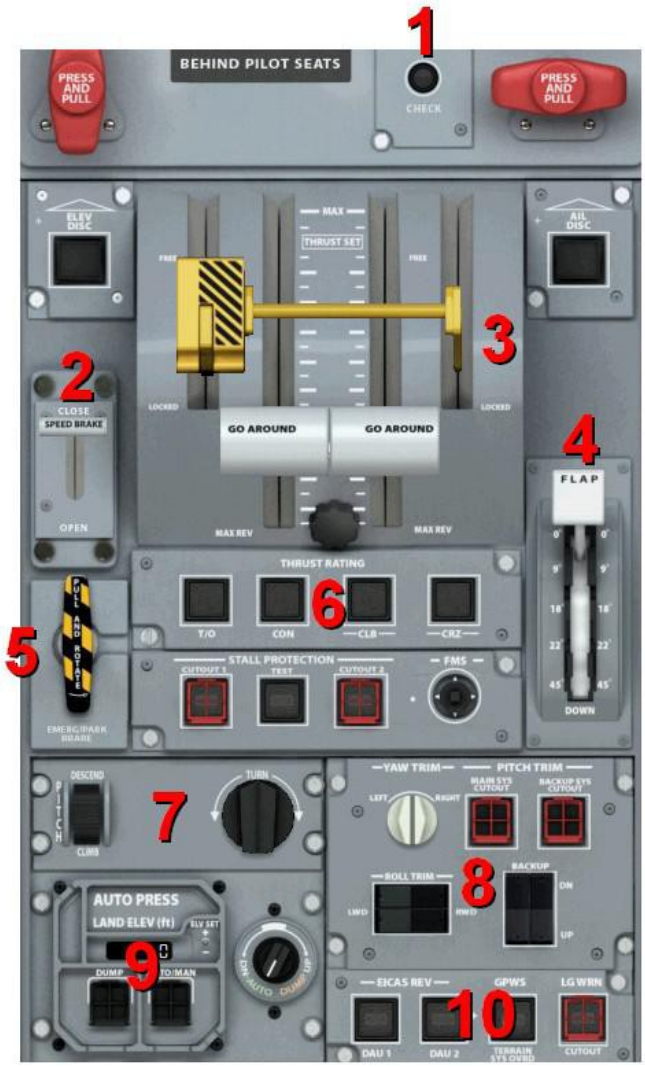


The overhead panel simulates the following functions:

1. APU control
2. Anti-Icing System
3. Electrical
4. Fuel
5. Engine Ignition and FADEC control
6. Engine FADEC Settings
7. Engine Start/Stop Selectors
8. Flight Controls
9. Hydraulics
10. Pneumatics
11. Emergency Lights
12. External Lighting
13. Landing and Taxi Lights
14. Passenger Safety Signs
15. Windshield Wiper Controls *(movement simulated only in VC and External views)*

Note : red toggles, buttons and switches for the fire protection system are not modeled.

CENTER PEDESTAL:



The center pedestal simulates the following functions:

1. Takeoff setting check
2. Speed brake
3. Gust Lock (left-mouse-click to the left of the number '3' to engage/disengage)
4. Flap lever
5. Parking brake
6. Thrust Management Mode Selection
7. Pitch Trim control and Rudder control
8. Yaw, Roll and back up Pitch Trim controls
9. Cabin Pressurization
10. Flight Controls sub-panel

NOTE: the TOGA buttons on the throttles are not simulated. To activate TOGA functions use the 'cheat button' on the FGC.

Now to begin your introduction flight -

Power Up:

To power up the aircraft open the OVERHEAD panel:

1. Position to AUTO the two battery switches on the electrical sub-panel.
2. Wait until you hear the massage "AURAL WARNING OK."
3. If you receive an alarm just silence this buy clicking the caution alarm button.
4. On the fuel sub-panel turn the tank 2 FUEL PUMP POWER knob to the ON position.
5. On APU sub-panel turn the APU knob to the START position (release the knob after turning).
6. Wait for APU start to complete by monitoring in the lower left corner of the main panel's EICAS screen.
7. After APU start, press the two avionic master switches on the electrical sub-panel.

8. Switch the EMER LIGHTS to the ARMED position; and turn on the seat belt, smoking and external navigation lights.
9. EXCLUDING the pneumatics sub-panel, press every lit switch on the overhead panel to ensure all switch are extinguished (this is black panel logic).

The aircraft is powered.

The volunteers have boarded the aircraft, and ground crew has loaded the cargo and fuel.

Start Engines:
First set the barking brake on the center pedestal and then move to the overhead panel:

1. Turn on the RED BEACON.
2. On the Pneumatics sub-panel press the APU BLEED switch. When the APU BLEED opens a stripe bar will appear and the OPEN sign will illuminate.
3. On the engine ignition sub-panel set ignition to AUTO.
4. On the fuel sub-panel set all FUEL PUMP POWER knobs to ON.
5. Start engine number one by turning the engine start selector knob to START. Be sure to open the safety cover first. Release the knob after turning to start.
6. Wait for the engine to start. The sequence is automatic and you only need to monitor engine readouts.
7. If you receive a alarm just silence this by buy clicking the caution alarm button.
8. Start engine number two the same way you did number one.
9. All systems electrical, hydraulic, and pneumatic systems will connect automatically.
10. On the pneumatics sub-panel press the APU BLEED switch. The stripe bar and OPEN light will extinguish (the engines are now providing pneumatic pressure).
11. If any of the pneumatic sub-panel buttons are illuminated they can be pressed at this time (made dark according to black panel logic).
12. On the MAIN PANEL set the Multi-Function Display (MFD) to the Takeoff (TO) page (displays the engine takeoff settings and the open/close status of the aircraft doors).
13. On the OVERHEAD PANEL enter TAKEOFF DATA using the engine FADEC settings sub-panel:
    - press STORE and rotate the SET knob to choose take off mode 'TO-1'. Selection is displayed on the MFD.
    - press STORE and rotate the SET knob to enter outside temperature (if you set FS weather to clear the temp should be 13 degrees C). Selection is displayed on the MFD.
    - press STORE and rotate the SET knob to check if anti-ice is needed. In this case set OFF as it is 13 degrees C outside.
    - press STORE. The information in MFD TAKEOFF DATA display turns blue.
14. Take off N1 and thrust mode will illuminate in blue on the top of the main panel's engine indication and crew alerting system (EICAS).
15. NO TO DATA amber caution message will disappear from the EICAS.
16. On the overhead panel hydraulics sub-panel position HYD ELEC PUMP to the AUTO position.
17. Check that there are no caution or warning messages on the EICAS.

Taxi: (*For this first flight the aircraft's FMS will not be used.)*
On the pedestal:

- set landing elevation to 1200 feet;
- flap lever position in the 9° position (or use FS's default flap setting keyboard shortcut of <F7>).
- set pitch trim to +7 degrees, indicated on the lower right corner of the main panel's EICAS screen, using FS's 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);

You are almost ready to go... to set the reference speeds (v-speeds) click the bezel button under MFD, again for SPDS, and a third time to CALCulate. The speeds will now display in the MFD and on the PFD's speedtape. You can adjust the auto -calculated speeds by clicking the bezel button below the v-speed and then turning the setting knob located on the lower right corner of the bezel.

On the DCP set the NAV as the primary navigation source (the overlays on the PFD's compass rose will be green).

On the FGC:

- Press the FD1 button.
- Press the YD (yaw damper) button.
- Confirm the CPL indication shows an arrow pointing to the left (left seated pilot in command).
- Press the TOGA 'cheat' button to get a FD pitch up command. Climb out pitch will be 14 degrees.
- Set the autopilot capture altitude to 28000' by turning the ASEL knob.
- Set the heading bug to the runway heading of 216 degrees using the HDG knob.
- Set the atmospheric pressure to 29.92 using the knob on the lower right corner of the PFD's bezel.

NOTE: Autopilot can be engaged after passing 1000ft.

Turn on the taxi lights (overhead) and head to the holding point of runway 22. Your speed should be less than 20kts on the straight taxiways, and no faster than 10kts during a turn.

Once at the holding point press the TAKE OFF CONFIG button and listen for the "TAKE OFF OK" aural message. If you do not receive the 'OK', correct the items vocalized and re-press the TAKE OFF CONFIG button.

“Pilot, taxi into position and hold.”

Release the gust lock. Turn off the taxi lights. Turn on the landing lights and strobe beacon. The aircraft is now configured to fly so you may taxi onto the runway and hold.

Takeoff:
"Pilot, you are cleared for takeoff."

Move the throttles at 40% and check that engine indications are OK.

Release the brakes and move the throttles FULL FORWARD. The FADEC system will set TO thrust only if the throttles on your yoke/joystick are full forward.

Your virtual co-pilot will make callouts during the takeoff run.

At VR pull back on the yoke and smoothly rotate to 14 degrees pitch (you should now be watching the PFD, not looking out the windows).

Once airborne the co-pilot will call, "gear up".

Follow the flight director pitch commands.

CLIMB:
At 1000' do the following in quick succession on the FGC:

- press the AP button;
- press the ALT button;
- press the SPD button;
- pres the HDG button.

The autopilot is now in control of the aircraft and you can release the yoke.

As the aircraft accelerates retract flaps to zero at 180 knots.

At 2500' have the FADEC decrease thrust by pressing the CLB button on the Thrust Management Sub-panel (located on the center pedestal or it's own sub-panel).

Press the FLC button on the FGC. Below 10000' the autopilot will accelerate to 250 knots and control climbing airspeed using pitch. Once above 10000' the aircraft will decrease it's rate of climb and accelerate to 270kts IAS. The standard climb speed at higher altitudes is M0.56.

On the overhead panel turn off the APU by pressing the STOP button on the APU sub-panel. When the APU has stopped turn the START KNOB to the OFF position.

For this flight you can continue flying the course of 216 degrees, or do some sightseeing on your own. If you continue west at 216 degrees you will see Mt. Rainier and Mt. Adams.

So you know which direction to fly when returning to KMWH set NAV2 radio to 115.0 (MWH) and the white bearing needle on the PFD compass rose to show NAV2. Unsure how to do this? See **RADIO MANAGEMENT UNIT (RMI)** below; and review **DISPLAY CONTROL PANEL (DCP)** above.

CRUISE:
Once you reach cruise altitude, takes about 12 minutes, select CRZ on the Thrust Management Sub-panel. Set the speedbug using the SPD knob on the FGC for M0.74.

The ERJ does not have autothrottles and the pilot must adjust thrust to maintain the desired speed. Thrust setting will depend from weight of the aircraft and the altitude being flown.

As the ERJ approaches M0.74 pull back on the throttles and adjust thrust to hold the selected speed. After some practice you will learn the approximate N1 setting necessary to hold a given speed. In this case a thrust setting between 85% and 87% N1 should hold M0.74.

DESCENT AND APPROACH:
It is now time to return to Moses Lake.

First, turn the HDG knob on the FGC so you are heading directly for VOR MWH.

Set altitude using the ASEL knob to 5000'.

Press the FLC button on the FGC. The aircraft will pitch down. YOU must control the airspeed by adjusting the throttles. It is recommended to descend at 300kts until 10000'. below 10000' you must fly at 250kts. When 20nm from the airport slow to 200kts.

Set the NAV1 radio to 109.5 (IMWH), the ILS for runway 32R, and set CRS1 to 324 degrees. Press the DME button on the RMI and set 115.0 (MWH). This will provide you with a approximate distance to the airport in the PFD until you are on short final for runway 32R (see *DME hold* in the **RMI** section of this manual).

Set ADF1 to 408 (MW), and the green bearing needle to show ADF1. As MW is the outer marker for runway 32R, this will assist in entering the ILS pattern.

REMINDER: watch your thrust setting to maintain airspeed. There is NO AUTOTHROTTLE on the ERJ!

While approaching the airport set V2 and Vref speeds using the MFD's CALC function.

Turn on the APU and landing lights.

If you don't have the charts for Grant County International you can set the MFD to show local airports and navigation aids. Click the far left bezel button so that the available option above three left buttons are SYS, MFD and CKLST. Choose MFD and then double click the buttons under APT/NAV and DATA. Adjust the map range using the knob in the lower right corner of the bezel in order to have KMWH and the ADF MW visible in the MFD.

If you have the chart for the airport fly the ILS pattern for runway 32R.

If you do not have the chart: when 30nm from KMWH maneuver so as to approach ADF MW (408 freq.) from the south. Approach the ILS beam at an angle no greater than 30 degrees.

An intercept heading for ADF MW that is between 294 to 354 degrees will suffice. 15 nm from KMWH the aircraft needs to be flying at 180kts with zero flaps and at 2800 feet altitude.

As you turn towards the ILS press the FGC's APR button. At the top of the PFD you will see that the LOC lateral and GS vertical modes are ready (white colored text) for ILS capture. A green vertical line will show in the attitude indicator showing the aircraft's deviation from the ILS localizer; to the right of the attitude indicator is the glideslope indicator.

Slow to 160kts and set flaps 9 before capturing the ILS localizer.

When the glideslope indicator begins to move down slow to 140kts and set flaps 22.

When the autopilot captures the ILS, HDG will clear from the PFD and show LOC in green.

As you intercept the glideslope lower the landing gear.

Once the glideslope is captured decrease speed to Vref +5 while extending flaps to 45 (follow flap extension schedule (structural speeds) in the QUICK REFERENCE HANDOOK (QRH).

AGAIN, you control the engine thrust to maintain airspeed.

LANDING:
At 1000' above the runway, note radar altimeter reading below the attitude indicator, disconnect the autopilot.

At 50' smoothly decrease thrust to idle and flare the aircraft for landing.

Once the mains compress the spoilers will deploy automatically.

Once the nose wheels touch apply the brakes and reverse thrust (hit <F2> multiple times) until at 80kts. At 80kts set engines to idle (hit <F1>) and exit the runway at less than 10kts.

As the aircraft decelerates the cabin crew will begin the arrival message.

Congratulations... You have completed your first ERJ flight!

Retract flaps (<F5>), close the spoilers (< / >), set the gust lock and taxi to an parking location of your choice.

Engine Shutdown:

1. Parking brake ON.
2. Position thrust levers to IDLE.
3. Place Gust Lock in closed position (this is *important*).
4. Position engine START STOP selectors to STOP (don't forget to open the safety covers first). *NOTE: if your engines do not stop you haven't placed the thrust levers in IDLE and put the GUST LOCK in the closed position.*
5. Position HYD ELEC PUMP to OFF.
6. Position 1 FUEL PUMP POWER to OFF.
7. Select APU as the pneumatic source to power the AC system.

FMS TRAINING FLIGHT

It is suggested that you review the **FMS GUIDE** in the manual before conducting this training flight.

Now that you have reviewed the basics of programing the FMS, and have flown the non-FMS introduction flight, it is time for you to conduct a commuter flight between Toledo Express Airport (KTOL) and Chicago O'Hare International (KORD). This is a real-world flight flown daily by ERJ operators.

Search the current Aeronautical Information Regulation And Control (AIRAC) cycle by the FAA airport codes 'TOL' and 'ORD'. The recommended plates are:

- airport diagrams for both KTOL and KORD
- KORD's runway ILS 09R

PLEASE READ THE INFORMATION BELOW AS IT IS IMPORTANT!

Now for some FS to real-world translation. FSX is static in their representation of the world. The scenery data for FSX is from 2005. In the flight you are about to conduct the real world has changed: KORD now has an additional runway. THIS NEW RUNWAY IS NOT PRESENT IN FSX nor in the ERJ's navigation database. The real-world chart noted above for runway 09R is actually 09L in FS.

Because the real-world has changed, you need to do the following if you choose to use the real-world charts referenced above:

- Change on the KORD airport chart the runway number for 09R to 09L. CROSS OUT the real-world representation for runway 09L. Change runway 10 to runway 09R. The real-world airport chart is now 'updated' to match the FS world.
- On the real-world chart for runway 09R change the runway number to 09L. The real-world runway chart is now updated to match the FS world.

If you have updated your FS scenery and AIRAC to reflect the current real-world, you must translate the training flight instructions to fit your customized simulator setup.

During this second flight reminders will be added for critical steps in preparing and operating the ERJ's systems. Not all procedures for operating the aircraft will be covered as these non-FMS procedures were outlined in first introduction flight.

Before launching FS use the ERJ configuration utility to prepare the 145LR aircraft. This is a popular flight so load 45 passengers and 2235 pounds of cargo.

After launching FS set location as KTOL at 'GATE G 8 – GATE MEDIUM', weather to clear, with no AI traffic. During the flight you will not use FS's ATC.

After powering the aircraft the FMS will initialize and display the NAV IDENT page. Press the LSK to the right of POS INIT.



On the POSITION INIT screen you are given three options for setting the aircraft's start location: LAST POS, REF WPT and GPS 1 POS. In this training exercise choose GPS by clicking the 3rd LSK to the right of the the LOAD prompt. Note that 'LOADED' is displayed above the GPS line after clicking the LSK.



Begin entering the flightplan by clicking the LSK next to FLT PLAN (red arrow).

The FMS will set the start location of the flight (ORIGIN) as KTOL on the ACTIVE FLT PLAN page. Now enter the destination, KORD, into the scratchpad; and click the LSK to the right of the DEST line (red arrow).



With the beginning and end locations of the flight set you now need to instruct the FMS how the aircraft will depart KTOL.

Click the LSK to the left of DEPARTURE.





First you select the departure runway. For this flight the tower has assigned 07 as the active. Press the LSK to the left of 07 (red arrow).

NOTE: circled are the number of pages that can be viewed. In this case only one. The PREV and NEXT buttons are used to scroll between pages. Clicking these buttons does nothing in this case as there is only one page of runways at KTOL.

Many airports have departure routes (SIDs). These options would be displayed by the FMS. KTOL has no SIDs so none are displayed.

To confirm our selected departure click the LSK to the right of ACTIVATE.





After clicking the LSK by ACTIVATE the FMS returns to the ACTIVE FLT PLAN page. You can now enter the intermediate waypoints between the departure and arrival airports. Waypoints are entered in the VIA.TO location (red circle). See the FMS ENTRY FORMATS for the acceptable syntax.

In this case the flight will immediately join a Standard Terminal Arrival Route (STAR) for KORD. For this reason no intermediate waypoints will be entered.

Left-click the FMS's NAV button (long red arrow).



The NAV INDEX allows you to access pages relating to navigation. As we are setting the STAR for arrival at KORD click the ARRIVAL LSK (red arrow.)



The arrival airport, KORD, is noted in green in the upper right corner of the screen. As ATC has not yet assigned a land runway nor approach; we will only select the appropriate STAR.

Click the STAR LSK (red arrow).

The assigned STAR is OXI3 (KNOX THREE).

Click the appropriate LSK (red arrow).

There are transition options for the OXI3 STAR *(this screen not pictured)*. In our case click the LSK for the VWV transition .



After choosing the VWV transition you are returned to the ARRIVAL screen. In the STAR field you can see VWV.OXI3 has been selected.

To place the selected arrival into the flightplan click the ACTIVATE LSK (red arrow).



The ACTIVE FLT PLAN page is once again shown.

The FMS does not know that the inserted STAR is to be flown directly after departing KTOL's runway 07. for this reason there is a blank entry, '-----'; followed by '>>DISCONTINUITY<<'. To remove this gap in the flightplan click the DEL key on the FMS keyboard and click the LSK just above the DISCONTINUITY.



The VWV waypoint will not be overflown and can be removed from the flightplan. Just as when removing the DISCONTINUITY, click the DEL key and click the LSK to the left of VWV *(this FMS screen situation is not pictured)*.

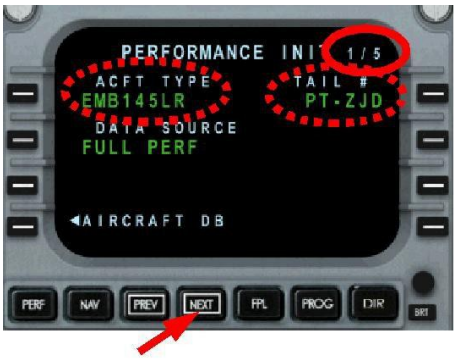
The waypoints for the flight are now complete. Notice that many of the data points in the SPD/CMD column (blue characters) are blank (ie, the many instances of dashes). These points have no constraints defined by the STAR for altitude and/or speed. The FMS cannot compute data for these points. Why? The FMS doesn't yet know the performance characteristics to be used during the flight. Enter the PERFORMANCE INITialization screens by clicking the LSK by PERF INIT (red arrow), or the PERF button (dash-line circle).



Page one of the PERFORMANCE INIT screens is for information only, and identifies the aircraft type and tail number (red dash-lined circles).

The page number being viewed is shown in the upper right corner of the screen (red solid-line circle).

Move to page two by clicking the NEXT button (red arrow).



Page two (*not pictured*) covers speed assumptions for climb, cruise and descent. Will will accept these values for this flight. Moving to page three (*not pictured*) allows you to review step climb preferences, reserve fuel requirements and fuel burn assumptions for takeoff and landing taxi times. Again, we will accept these values for this flight Now move to page four.



Page four allows you to set transition and airspeed restrictions, cruise altitude, ISA temperature and wind aloft details. Each of these provides the FMS with data to better calculate mid-flight performance points and fuel burn.

In this example we will define the cruise altitude to 22000 feet. Enter 22000, or FL220, into the scratchpad (red box); and click the LSK for INIT CRZ ALT (replacing 'OPTIMUM').



Confirm that 'FL220' appears in the INIT CRZ ALT field. FL220 will be displayed even if you typed 22000 into the scratchpad.

Now move to page five by clicking the NEXT button on the FMS keyboard.

Now you will enter the aircraft weights:

NOTE: BOW = basic operating weight (upper left dash-line rectangle).



1. Aircraft fuel load (the number in the brackets is what the FMS is detecting in the tanks). Enter the number your FMC shows (pictured is 5700, but your value may be different) into the scratchpad. press the LSK for FUEL (replacing the '-----').
2. Cargo load in this case is 2235. Enter 2235 in the scratchpad and click the LSK for CARGO.
3. 'PASS/@ LB' means: how may passengers at what assumed weight? For this flight we assume each passenger, including carryon baggage, weights 190 pounds. As selected when you set the configuration utility you have 45 volunteers.. enter 45 in the scratchpad, and click the LSK for PASS/@ LB.

   Once you click the LSK for passengers the FMS calculates the total passenger weight and the aircraft gross weight (two dash-line rectangles middle right of the screen).

4. The performance initialization for the FMS is now complete. Click the LSK for PERF DATA.

The PERF DATA pages provide you with performance expectations, and upon landing summary data. (If you receive an error message in the scratchpad just remove using the CLR button.)

Page one (not pictured) of the PERF DATA pages outlines cruise and ceiling altitudes; time to destination; and fuel use assumptions.



Page two, pictured left, shows distance to destination; calculated fuel remaining at arrival, and the aircraft weight at arrival. ETA to destination is based on airspeed and will be displayed once in-flight.

If an alternate airport is selected the right-hand column data fields will be computed.

Pages three and four (not pictured) outline assumed winds aloft and more fuel use assumptions.

Now, the ERJ may have enough fuel … or not. A 'cheat' exists after you have completed initialization of the FMC to load the necessary fuel as computed by the FMC. Return to PERFORMANCE INIT page number five (hint: start by pressing the PERF button).

Once at page five type FUEL into the scratchpad. Press the LSK to the left of the FUEL (GAUGE) line. Two things will happen: the FMC will update the fuel value to match the calculated requirements for the flight, AND load this amount into the ERJ tanks.

Now press the FPL button.



Because the performance information has been completed the FMS has computed the vertical flight information. This is displayed in the right-hand column of the ACTIVE FLT PLAN pages (dash-line red square).

You can review the route by clicking the PREV and NEXT keypad buttons.

The FMS is now programmed and the necessary amount of fuel loaded into the tanks!

For the flight management computer to control the aircraft you must set the navigation source to FMS on the DCP. The indicators on the PFD compass will be colored magenta if the FMS is 'in control'. If the indicators are green THE FMS IS NOT THE NAVIGATION SOURCE; and the aircraft WILL NOT follow the programmed flightplan.

You are just about ready to depart the gate. Set the altitude on the FGC to 22000. Turn on the flight director, and use the MFD's autocalculate function to calculate the takeoff speeds.

You are now ready for the flight crew to secure the cabin. After pushback start the engines and taxi to runway 07.

“Captain, taxi into position and hold, runway 07.” Once holding set the heading bug to 070 degrees.

“You are cleared for takeoff.”

Once airborne fly the runway heading. After clearing 1000' AGL turn on the autopilot, select ALT, SPD and HDG. At 2500' Reduce thrust to climb and change the autopilot heading to 250 degrees. Change from SPD to FLC and retract flaps according to speed schedule.

Once the aircraft has completed the turn, set the FMS to show the active flightplan (FPL keypad button). Press the DIR button on the FMS; and click the LSK to the left of the KULHY waypoint. Now click the NAV button on the FGC (not the NAV button on the DCP). The FMS is now controlling the aircraft's lateral navigation (LNAV), and will turn to fly direct ro the KULHY waypoint.

Allow the FMS to control the lateral flight. Remember: you need to set the vertical flight (VNAV) using the SPD, FLC and VS buttons (FLC is recommended) … and don't forget that once at cruise altitude you must control the thrust setting in order to hold cruise speed.

The route is displayed on the MFD. Change the display range to view the route's waypoints.

The top of climb will be shown with a white triangle and the letters TOC. Top of descent will be displayed with a white triangle and the letter TOD.

The ERJ's FMS does not control the aircraft vertical flight (VNAV). The FMS only provides advisory information, such as TOC and TOD on the MFD. You must set the FGC to follow the vertical profile of the flight.

As the aircraft approaches the computed TOD five 'dash marks', like those displayed when capturing and ILS glideslope, will appear to the right of the attitude indicator.

As you approach the TOD set the autopilot altitude to 14000, the first altitude restriction on the OXI3 STAR. When the bug crosses the center mark begin descent by clicking the FLC button the the FGC and controlling thrust for a descent of 300kts indicated airspeed (IAS).

As you begin the descent ATC has assigned your arrival runway: 09L with no holds.

On the FMS click the NAV keypad button and choose ARRIVAL. Click the LSK to the left of RUNWAY. On the first KORD RUNWAY screen select 09L.

Now you are in the KORD APPROACH screens. There are multiple approach options and you need to click the NEXT button until you see the option 'ILS 09L' (the third screen of six).

The FMS now displays the KORD APPROACH TRANsition options appropriate to landing by ILS runway 09L. There is only one transition, DEVON, so choose this option.

You are returned to the KORD STAR screen. Click the LSK to the right of ARRIVAL.
Now ACTIVATE the modifications to the flightplan.

The FMS will now display a DISCONTINUITY between the previously entered STAR and the new STAR – APPROACH – RUNWAY route you just created. Use the DEL key to remove the waypoint(s) already passed; AND THEN remove all DISCONTINUITIES.

Notice the '**H**' in a highlight box to the right of waypoints WATSN, OXI and HALIE. These are the expected holds points of the OXI3 STAR. As you have been cleared to approach without holds these procedures can be removed. Click the DEL key (*DELETE* shows in the scratchpad) and click the LSK to the left of HALIE. The '**H**' will be removed, but the waypoint HALIE remains part of the flightplan. Repeat the removal of the holds at OXI and WATSN.

Follow the descent profile as outlined on the FMS and the PFD.

ATC assigns you to cross BEARZ at 11000 feet and then turn a heading of 270 degrees. Turn the HDG knob seting the heading bug to 270 degrees. Do not press the HDG button.

You will not be flying to the ORD VOR, so delete this waypoint from the flightplan.

As you pass over the BEARZ waypoint click the HDG button on the FGC.

The aircraft will turn to 270 degrees.

Set the NAV1 radio to runway 09L's ILS frequency of 110.5 (IJAV), and the NAV2 to 113.9 (ORD). In order to have a bearing needle show the direction to the airport on the PFD compass rose set the right bearing knob on the DCP to NAV2.

Autocalculate the landing speeds using the MFD system menu.

Begin a descent to 4000 feet and slow to 200 knots. Be sure you have slowed to 250 knots before going below 10000 feet altitude.

Watching the MFD, note when you have the DEVON waypoint off your right wing. Set the heading on the autopilot to 350 degrees. Slow the ERJ to 180 knots and confirming you will be at an altitude of 4000 feet before arriving at DEVON.

Press the NAV button on the DCP (not the NAV button on the FGC) . The indications on the PFD compass rose will turn green. This shows that the NAV radios now are being used for primary navigation.

Press the APP button on the FGC. LOC and GS will appear in the white on the PFD. ILS capture and descent are identical to that done during the QUICK START tutorial. Fly the aircraft to intercept the DEVON waypoint at an angle less than 30 degrees. Use the bearing needle in the PFD compass rose and the map on the MFD to assist in intercepting the DEVON waypoint.

The autopilot will capture the ILS for runway 09L.

Follow the final approach procedures as done during the first introduction flight.

After landing taxi to the gate of your choice. Congratulations! You have completed you first FMS controlled flight in an ERJ.

Welcome to Chicago ...



Photo by W. David Scobie

ERJ SYSTEM INFORMATION

AIR CONDITIONING AND PNEUMATICS CONTROL PANEL

GENERAL

The pneumatic system adopts an integrated bleed air philosophy. Either one or both engines, an external pneumatic source or the APU supplies the system. It supplies a high temperature compressed air for air conditioning, ice protection, pressurization and engine starting. An external pneumatic source or the APU supplies the system before the engine start and the engines normally supply the bleed air after startup.

The air conditioning system processes the high temperature compressed air from the pneumatic system to provide environmental control within the passenger cabin. The system includes two Environmental Control Units responsible for the air conditioning. The pressurization system controls the cabin's pressure by regulating the conditioned air from the cabin. The system is designed to maintain 7.8psi that allow a maximum cabin pressure of 8000 feet. Cabin pressure is automatically controlled.

A ventilation system is responsible to cool down the equipment in the rear and forward electronic compartments.

PNEUMATIC SYSTEM

The pneumatic system receives compressed hot air from the following sources:

- 9th compression stage of engines
- 14th compression stage of engines
- APU
- ground source

Pressurized air is needed for engine start, air conditioning, pressurization and ice protection.

Normal flight procedure requires isolating the engine bleed into the left and right system after the engine start.

The APU can provide bleed air on the ground and in-flight. However, the APU is used mostly as a ground pneumatic source for air conditioning and engine start.

The APU bleed valve controls APU airflow. The APU bleed button on the overhead panel controls this valve.

AIR CONDITIONING

- **Cockpit temperature selector knob**
  Controls the left pack on the automatic mode through the digital temperature controller.
- **Recirculation button**
  Turns ON or turns OFF both recirculation fans A stripped bar illuminates to indicate it's released.

- **Passenger cabin temperature selector knob**
  Controls the right pack on the automatic mode through the digital temperature controller. These systems are normally operated in automatic mode.
- **Gasper button**
  Turns ON or turns OFF the gasper fan in-flight only A stripped bar illuminates to indicate that is released On the ground the gasper fan is turned ON as soon as the associated DC Bus is energized.
- **Air conditioning pack button**
  Opens or closes the pressure regulating and shutoff valve of the associated ECU. A stripped bar illuminates to indicate that the valve is closed.
- **Cross bleed knob**
  1. CLOSED - Closes the cross bleed valve
  2. AUTO – Selects the automatic mode of the cross bleed valve
  3. OPEN – Opens the cross bleed valve
- **Bleed air button**
  Opens or closes the associated engine bleed valve. A stripped bar illuminates to indicate that the valve is closed.
- **APU bleed button**
  Opens or closes the APU bleed valve. A stripped bar illuminates to indicate that the valve is closed. An OPEN sign illuminates to indicate that the APU bleed valve is in the OPEN position.

APU CONTROL PANEL

GENERAL

The APU is the source of pneumatic and electrical power when the plane is on the ground or in flight. It is a constant speed gas turbine engine.

The APU controlled by the Electronic Sequence Unit (ESU), which provides automatic control from start to full load operation. The APU is located in the plane's tailcone isolated by a titanium firewall.

The fuel is provided from the right wingtank so it is necessary to start this tank's fuel pump in order to start the APU.

APU STARTING OPERATION

The APU starting cycle is initiated by moving the APU Master Knob to the START position. At this time DC power is applied to the start generator which will drive the APU generator until combustion.

Pressing the APU Stop button will shut down the APU

APU Control Panel

APU master knob

- OFF – De-energizes the ESU, closes the APU fuel shutoff valve and turns the APU

indications and alarms off when APU RPM is below 10%

- ON – Energizes the ESU and opens the fuel shutoff valve, enables the indications and alarms on the EICAS and allows the APU to run after starting.
- START – Initiates the automated APU start cycle.

APU stop button

Turns the APU off.

APU fuel shutoff button (right click to open the guard)

Turns off the fuel flow to the APU. An illuminated stripped bar inside the button indicates when pressed and fuel flow is stopped.

AUTOFLIGHT

GENERAL

The ERJ has a fully integrated three axes flight control system. Autoflight is made up of two systems: Autopilot and the Flight Guidance (FGS). FGS outputs to the PFD position information to the command bars. The command bars are followed by the Autopilot or pilot.

AUTOPILOT SYSTEM

The Autopilot System includes the autopilot servos, three displays, AHRS, radios, ADCs and the radio altimeter.

FLIGHT DIRECTOR

MODES General

Flight Director mode selection is made by the Flight Guidance Controller. Annunciation of active modes is displayed on the PFD and on the selector buttons. These annunciations distinguish between armed and captured modes. The modes can be divided into lateral and vertical modes.

Lateral modes

Lateral modes are related to heading or roll control.

Heading Hold mode

This is the default flight director mode when no other lateral mode is selected. The heading hold mode is a roll command to maintain the current heading at the time of engagement. A ROL label is displayed on the PFD.

Roll Hold mode

Roll hold mode is initiated from hold mode by using the TCS button to fly the plane between 6 and 35 degrees bank angle (AP must be ON).

Turn Knob mode

The turn knob allows the pilot to issue a roll attitude command using the Turn Control Knob. Moving the Turn Control Knob with AP engaged cancels all other lateral modes. When the Turn Control Knob is out of its detent the AP will maintain a roll attitude.

When the knob turned back to its neutral position the AP will switch back to heading mode. The turn submode is announced as ROL on the PFD and by the TN KNB when the Turn Control is out of center.

Wings Level mode

This mode provides a 0 degree roll command. This mode is active during Go Around Mode. The annunciation on the PFD is ROL.

Heading Select mode (HDG)

The Heading Select mode commands the Flight Director to follow the track of the EHSI heading bug set by the Heading Select Knob. The HDG mode is selected by pressing the HDG button or arming the LOC, VOR, VAPP or BC modes. The HDG mode is prohibited in the following condition:

- Turn Control knob is out of detent and AP is

ON This mode is canceled when:

- HDG button is pressed
- Changing the displayed heading source on the PFD
- LOC, VOR, VAPP and BC mode capture
- Engaging the Go Around mode
- Pressing the CPL button on the FGC

Low Bank mode

The Low Bank mode allows the pilot to select limited bank angle for the heading mode from 27 degrees to 14 degrees by pressing the BNK mode on the FGC. The Low Bank Mode is automatically selected when climbing above 25,000 feet and canceled while descending below 24,750 feet.

VOR NAV mode (VOR)

The VOR NAV mode allows automatic capture and tracking of VOR radials by pushing the NAV button on the FGC with VOR selected on the PFD. Selecting VOR NAV mode will automatically select HDG Select mode and arm VOR. The mode will be canceled by:

- Pressing the NAV button
- Selecting APR or HDG modes
- Changing the displayed NAV or heading source on the PFD
- Go Around mode
- Turn Control Knob is out of detent with AP ON

VOR Approach mode (VAPP)

The VOR Approach mode has the same function as the VOR NAV mode with a higher gain for operation close to the station. This mode is selected by pushing the APR button on the FGC with VOR displayed on the PFD

Localizer mode (LOC/BC)

The localizer mode allows automatic capture and tracking of the localizer beam. Both front course (LOC) and back course (BC) are supported. Selecting the LOC mode is

done by pressing the NAV or the APR buttons and selecting ILS as a navigation source. The mode will be canceled by:

- Pressing the NAV or APR button
- Selecting HDG mode
- Changing the displayed NAV source on the PFD
- When the displayed NAV source is invalid for more than 5 seconds
- Pressing the Go Around button
- Turn Control Knob is out of detent with AP engaged

LNAV mode

The LNAV mode allows the FD to capture and track the long-range navigation system's steering signal (FMS/GPS). Selecting the LNAV mode is accomplished by pressing the NAV button with FMS selected on the PFD. Selecting LNAV will capture LNAV is the steering command is valid. The mode will be canceled by:

- Pressing the NAV button
- Selecting HDG mode
- Changing displayed NAV source on PFD
- Pressing the Go Around mode

VERTICAL MODES

Vertical modes are those modes related to pitch control.

Pitch Hold Mode

The Pitch control mode is the default mode when no other FD mode is selected The Pitch Hold Mode synchronizes to the existing pitch attitude. By pressing the Touch Control Button the pilot can change the pitch attitude manually and when the button is released the system resynchronize to the new attitude. The pitch attitude reference can be changed by rotating the Pitch Control Wheel if the AP is engaged and the FD is in Pitch Hold Mode.

Altitude Hold Mode (ALT)

The ALT mode can be selected by pressing the ALT button. The mode will be canceled by:

- Pressing the ALT button
- Selecting VS, FLC or SPD modes
- Glide slope capture
- Pressing the Go Around button
- Pitch control wheel moved with AP on

Altitude Preselect Mode (ASEL)

The ASEL mode makes the aircraft level off at the pre -selected altitude after climbing or descending. Pilot can select ASEL mode by dialing a new altitude on the FGC and displayed on the PFD. Pitch hold, speed hold, FLC mode or vertical speed hold must be used to change altitude toward the preselected altitude. The mode will be canceled by:

- Changing the preselected altitude

- Selecting ALT, VS, FLC or SDP modes
- Glide Slope capture
- Pressing the Go Around button

Flight Level Change Mode (FLC)
The FLC mode means the airplane climb or descend in a pre-programmed airspeed or vertical speed schedule:

- If the FLC mode is selected and the preselected altitude is higher than the current altitude the FD provides a speed command at pre-programed climb speed schedule of 240kts below 10000 feet, 270 kits above 10000' until reaching M.56. M0.56 will be maintained until the pre-selected cruise altitude is reached.
- If it's lower than the present altitude the FD commands the descend at a pre-programmed vertical speed of -2000 ft/m to 10000 feet and then –1000.

FLC mode is canceled by:

- Pressing the FLC button
- Changing the preselected altitude
- Selecting ALT, VS, FLC or SPD modes
- Glide Slope capture
- Pressing the Go Around button

Speed Hold Mode (SPD)
The speed mode maintains airspeed or Mach number while flying to a new altitude. It is designed to provide overspeed and underspeed protections. Pilot can engage the mode by pressing the SPD button. This mode canceled by:

- Pressing the SPD button
- Selecting VS, ALT or FLC modes
- Glide Slope capture
- Pressing the Go Around button

Vertical Speed mode (VS)
The VS mode is used to maintain preselected vertical speed. The VS mode is selected by pressing the VS button and can be changed by turning the Speed Set Knob. The mode will be canceled by:

- Pressing the VS button
- Selecting ALT, SPD or FLC modes
- Preselected altitude capture
- Pressing the Go Around button

Go Around Mode
Although commanding a nose up attitude this mode incorporates both lateral and vertical modes to maintain the wings leveled during engagement. Select the Go Around Mode by pressing the 'cheat' button FGS.

AVIONICS SYSTEMS

PFD: *primary flight display*



The PFD provides basic flight indications. To the left, read the speed, to right read the altitude. In the center, you will see the attitude indicator (ADI) and the compass (DG). On the right bottom you can see the aircrafts rate of climb or descent on the vertical speed indicator (VSI). Along the top are displayed active and standby the autopilot modes.

Below the PFD's display screen, on the bezel, you will find 2 switches and one knob. The knob sets the altimeter pressure setting (inches of mercury (inHg) or hectopascals (hPa)) which is displayed below the altitude tape on the PFD. The left button selects the altimeter units; the right sets the altimeter to standard. Between the two buttons is the mechanical slip/skid indicator.

MFD: *multi function display*



Pictured is the standard in-flight layout used on the MFD. Displayed is the route programed into the FMS and TCAS window below. When activated weather details will be superimposed over the route. TCAS information can be removed to show system information using the bezel push buttons.

Along the bottom of the MFD are screen display options. The six bezel buttons are pressed to select the indicated menu item. Take a moment now to click each button and review the information each menu displays

To set the reference speeds (v-speeds) click the bezel button under MFD, again for SPDS, and a third time to CALCulate. The speeds will now display in the MFD and on the PFD's speedtape. To adjust the auto-calculated speeds click the bezel button below the v-speed and then turn the setting knob located on the lower right corner of the bezel.

ISIS: *Integrated Standby Instrument System*



This is a backup for the PFD. The layout mimics that of the PFD, though simplified and in a smaller screen. Around the screen bezel are: + and – buttons to control brightness; cage button resets attitude, barometer setting knob and STD button altimeter to set standard pressure.

Use of the autoflight

The autopilot (AP) must be used in conjunction with flight director (FD). Ensure the FD light is illuminated green by pressing the adjacent push button on the glareshield. When the FD is off there will be the following EICAS messages: VERTICAL MODE OFF and LATERAL MODE OFF. When the FD is off the AP reverts to basic modes.



Press the CPL key to switch between left and right side tells the autopilot which pilot is controlling the aircraft. Note the arrow telling you who is in command.

Prior to starting the engines the autoflight systems must be configured. First initialize the FMS (refer to the FMS documentation) and then select FMS as primary navigation source by clicking the FMS key on the FGC.

Now click the TOGA 'cheat' button (red circle) and watch the PFD. The top center of the screen ROL and TO will appear. If you want to follow a Standard Instrument Departure (SID) using the FMS you must configure the FD using the heading and lateral navigation section of the FGC. First turn the knob (or push to synchronize it with the current heading) to match the runway heading. The blue heading bug will move on the PFD and MFD. Press the NAV switch and confirm on the PFD that the ROL indication changes to LNAV. Turn the ASEL knob on the altitude selection of the FGC to set the initial climb altitude. The selected initial altitude will will display on the top right of the PFD.

Autoflight is now configured for take off. After take off the pilot flying needs to follow FD indications.

The AP may be engaged after passing 1000ft. With the AP on press SPD on the speed and vertical navigation section of the FGC and set VFS turning the knob. Watch the blue bug on the speed indicator. Aircraft is now climbing out at VFS (check its value in the SPEED section). Once V2 + 15 is reached retract the flaps and press FLC on the FGC and press CLIMB on the pedestal to adjust thrust.. Aircraft will accelerate to enroute climb speed. Select cruise altitude using the ASEL knob and let her fly...

If you don’t like the FLC speed and climb rate schedule; use SPD mode or VS mode to control your climb. Click the SPD or VS button and rotate the knob to display the value you would like to maintain. Using VS or SPD mode is useful when you experience turbulence the as the aircraft will conduct a smoother climb.

When reaching the selected altitude the FMS will display on the PFD's vertical mode side first ASEL then ALT. These indications tell the pilot that selected altitude have been reached and is being maintained.

NOTE: the ERJ does not have autothrottles and the pilot must adjust thrust to maintain the desired cruise speed. Thrust setting will depend from weight of the aircraft and the altitude being flown.

When reaching top of descent (TOD) select descent altitude on the FGC and then press either FLC, SPD or VS (when using SPD or VS you must rotate knob to the desired speed or descent rate value). Again, remember the pilot must reduce the thrust by pulling back the throttle to avoid over- speeding the aircraft. The default setting in the FMC is for airspeed to be reduced to 250kts below 10,000 feet. FLC mode will reduce the rate of descent from 2000ft/min to 1000ft/min when below 10000 feet to assist in slowing the aircraft.

If flying a course set in the FMC, and air traffic control (ATC) requires a heading change you can go into heading mode by clicking HDG button on the FGC. To synchronize the heading bug with current direction being flow the route then press HDG knob. To select specif heading turning the HDG knob.

To perform an ILS approach:

- Being radar vectored selected HDG mode on the FGC
- Select NAV on the FGC
- Confirm the course indicator illuminates in green rather than purple
- Using the course knob on the FGC select approach course on the PFD
- Press APP mode on the FGC when cleared for the approach
- Check LOC and GS illumination in white on the PFD
- When you are flying under 180 knots set flaps to 9 degrees.
- Aircraft will intercept localizer and glide slope.
- REMINDER: pilot must adjust throttles to obtain required airspeeds
- Lower the gear
- When speed is under 160 knots, set flaps to 22 degrees
- When speed is under 145 knots, set flaps to 45 degrees
- Reaching 200 feet height disengage autopilot and flare the aircraft at 50 feet
- Nice landing!
- Apply reverse (until 80 knots) and brakes to a safe speed to exit the runway.

To perform a CATII + ILS approach:

- Radar altimeter must be showing between 2500 and 80 feet.
- Flaps set to 22 degrees.
- NAV 1 on pilot's side and NAV 2 on co-pilot's side both set to same frequency.
- An active approach mode has been selected on the autoflight control panel.
- Both Flight Directors active.
- Both PFDs are displaying valid attitudes and headings.

- Glide slope and localizer indications are within acceptable deviation limits of: no greater than 1/3 dot for localizer; no greater than one dot for glide slope.
- No reversion modes are selected on the PFDs.
- Valid airspeed and barometric altitudes on both PFDs.
- The autoflight computers detect no reading disagreements between both PFDs (such as altitude, heading and airspeed).
- Backcourse mode not selected.
- Autopilot is controlling flight.
- Decision height for both display control panels are between 80 and 200 feet.

Once all conditions are met a green CAT 2 indication will display on both PFDs. Once established if any of the requirements are lost CAT 2 will flash ORANGE for 10 seconds and then go steady.

BLEED AIR THERMAL ANTI-ICING SYSTEM

GENERAL
For safe operation in heavy rain or icing conditions the plane is equipped with Ice and Rain Protection Systems. To protect the plane from Icing, critical areas are heated using electrical power or hot air (taken from the pneumatic system).

Electrical power is used to heat windshields, all Pitot tubes, pressurization static ports and the AOA sensors.

Areas heated with hot bleed air consist of the leading edges of all stabilizers and the Engine air inlet lips.

The ice detection system works automatically activates and configures electrical hot air systems once icing conditions are detected. Angle of attack (AOA) values, as set by the Stall Protection System(SPS), are automatically reduced.

Thermal Bleed Air Anti-Icing System Overview
Both engines provide hot air to the bleed air thermal anti-Icing system. In automatic mode the system is activated by the ice detection system. The system can be turned on manual using the OVERRIDE Knob.

Use the OVERRIDE knob if visible moisture is present and any of the following conditions are met:

- OAT on ground or for takeoff is 10°C or below
- TAT in flight is 10°C or below icing may occur.

Though not simulated in Flight Simulator, in the real world ice accumulation usually starts on the wiper arm and the visible corners of the windshields. Inspection lights installed on wing-to-fuselage fairing allow the crew to check for ice accumulation during night flights.

For the engine air inlet lips, leading edges of the horizontal and wing stabilizers sufficient ice protection is ensured by heating these surfaces with hot air provided by the respective side of the pneumatic system. The hot air is ducted through perforated tubes routed along the surfaces. These tubes are called Piccolo tubes. The air is exhausted through dedicated slots after heating the surfaces.

The hot air for the anti-ice system of the horizontal stabilizers is provided by the left side of the pneumatic system.

The rate of airflow provided by the pneumatic system of the aircraft is limited by an airflow restrictor. Pressure switches monitor the system for indication of abnormal conditions such as high or low air pressure. The subsystems are pressure protected as excessive air may cause structural damage; and insufficient air may allow ice accumulation. Each subsystem is equipped with an anti-icing valve.

Thermostats installed close to any duct connection detect air leakage. Additional protection against a high rates of leakage are provided by low-pressure switches.

Sufficient ice protection for the engine is ensured by heating the engine air inlet lip with hot air supplied directly through a valve upstream of each high stage valve. The air in these systems is not temperature regulated.

Engine anti ice system can be run on ground without limitations as long as the engines are running.

To prevent structural damage caused by overheating surfaces the anti-icing systems for the wings and the horizontal stabilizers are automatically inhibited when the airplane is operated on ground when the wheels are on ground and speed is below 25 knots.

The thermal air anti icing systems can be deactivated at any time using the buttons located on the overhead panel.

Bleed Air provided by the APU is not hot enough to be used for anti-icing purposes. For this reason the use of the APU for anti icing is prohibited.

To automatically compensate a sudden loss of thrust during the takeoff phase when using thermal anti-ice protection an ice compensation logic is incorporated in the engine Full Authority Digital Electronic Control (FADEC). This logic can be activated by selecting (Ref A-Ice: ON) on the takeoff page on the MFD. In addition an automatic logic to guarantee a minimum of thrust during icing conditions is provided by the FADEC.

To improve the airplane rate of glide and descent this logic automatically inhibits when landing gear is down.

Windshield Heating System Overview

To prevent anti-icing and anti-fogging the windshields are electrically heated. For proper

electrical heating of the windshields an electric conductive film, functioning as an electric resistor, is embedded in its interlayer. Using the respective buttons, located on the OVERHEAD panel, heating can be individual controlled for each side of the windshields. Using temperature sensors, heating is interrupted as soon as the upper temperature limit is reached and automatically restored when temperature drops under the lower limit.

Sensor Heating System Overview
Automatic operation for heating of all Pitot/Static pressure tubes, all TAT sensors and AOA a vane is provided by the Sensor Heating System. Heating of all sensors is accomplished by electrical elements and can be controlled using the buttons located on the OVERHEAD panel.

In automatic mode the Sensor Heating System operates using the following rules:

- TAT sensors are heated if the airplane is in flight or either Engine 1 or 2 anti-icing subsystems are used
- ADS Static Ports 1, 2, 3 & 4, Pitot 1 & 2, Static 3 pressure tubes and AOA 1 & 2 vanes are heated whenever an engine is running (N2 >56.4%)
- Heating of Pitot/Static 3 and Pressurization System Static Port 3 in any flight condition is ensured by an additional logic The Heaters are deactivated when the associated button on the OVERHEAD panel is manual releases or when the above conditions are not met.

Ice Detection System Overview
For reliable detection of icing conditions two ice detectors are installed on the left and right side of the plane's nose. They are designed to pick up ice quickly (by a special shape) to ensure icing is detected by the Ice Detection System before the crew does. An ice layer of 0.5 mm thickness on any probe will engage the thermal bleed air anti-icing systems automatic mode and a caution message will appear on the EICAS. This message will remain active for 60 seconds. Within this time the ice detector heater will de-ice the ice detector probe. After the detector has been properly de-iced the heating of the probe is automatically turned off and a new detection cycle starts.

Ice Protection Controls -

Horizontal Stabilizer Anti-Icing Button
If released turns off (or if pressed permits) automatic activation for the anti-icing subsystem respective for the horizontal stabilizer. An illuminated "OPEN" inscription within the button indicates an open anti-icing valve for the horizontal stabilizer. An illuminated striped bar within the button indicates released position of the button

Wing Anti-Icing Button
If released turns off (or if pressed permits) automatic activation for the anti-icing subsystem respective for the Wing. An illuminated striped bar within the button indicates released position of the button. "OPEN" inscription showing within the button indicates:

- one of both valves is open, system not commanded to open
- both valves are open, system commanded to open

Engine Air Inlet Anti-Icing Button
If released turns off (or if pressed permits) automatic activation for the anti-icing subsystem respective for the horizontal stabilizer. An illuminated “OPEN” inscription within the button indicates an open anti-icing valve for the Engine Air Inlet. An illuminated striped bar within the button indicates released position of the button

Sensor Heating Buttons
Pitot/Static tube 3 and pressurization static port 2 are controlled with the central button. Pitot tube 1, TAT probe 1, ADC Static Ports 1 & 3 and AOA vane 1 are controlled with the left button. Pitot tube 2, TAT probe 2, ADC Static Ports 2 & 4 and AOA vane 2 are controlled with the right button. When released the respective sensor heating system is turned off, when pressed the respective sensor heating system operates in automatic mode. An illuminated striped bar within the button indicates released position of the button.

Windshield Heating Button
If released turns off (or if pressed permits) the windshield heating system. An illuminated striped bar within the button indicates released position of the button.

Ice Detection Test Knob
Allows for testing purposes (by simulating an icing condition) all anti -icing subsystems to operate. Illumination of the “OPEN” inscription within the respective buttons confirms operation of the subsystem (and indicates current position of the valve)

NOTE: The following messages will appear on the EICAS during test: “ICE DET 1(2) FAIL”, “BLEED 1(2) TEMP”, “CROSS BLD OPEN” and “ICE CONDITION”

Ice Detection Override Knob
Three modes can be selected:

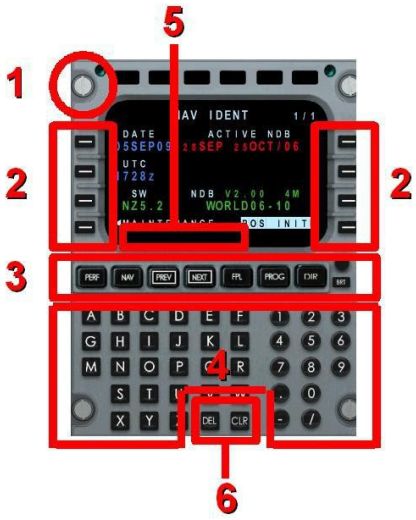
- “ENG” only turns on the engine air inlet anti-icing subsystems. NOTE: If an ice condition is detected and ground speed is >= 25 knots horizontal stabilizers and wing anti-icing subsystems are turned on automatically.
- “AUTO” thermal bleed air anti-icing system will operate in automatic mode. NOTE: If an ice condition is detected and ground speed is >= 25 knots horizontal stabilizers and wing anti-icing subsystems are turned on automatically.
- “ALL” the complete thermal bleed air anti-icing system will be turned on, only the engine anti-icing subsystem will be turned on when the airplane is operated on ground. NOTE: If an ice condition is detected and ground speed is >= 25 knots horizontal stabilizers and wing anti-icing subsystems are turned on automatically.

FMS GUIDE

Modern jetliner navigation is achieved through the flight management system (FMS). This device was a revolution when first introduced by Honeywell on the Loockeed 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 ERJs are fitted with Honeywell Primus 1000 integrated avionics system. EMBRAER took a 'back to basics' approach to designing ERJ145, so the FMS functions use a similar philosophy. An example of this simplification is that the FMS only gives advisory information on a flightplan's vertical path. As there is no connection between the FMS and the autopilot's vertical controls the pilots must set the controls for climb, cruise and descent. For this reason the function of the FMS is not as central to aircraft control as, for example, with the Airbus Industrie A320. Some say the ERJ's FMS is more of a a GNS (global navigation system) than a real FMS.

Data entered into the FMS must follow a specific syntax. If the data entered is not recognized the FMS will display and 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 teach you how to use the basic function of the FMS. At the end of the chapter you will be ready to program your first point to point flight. **Components of the FMS:**

1. Click-spot for enabling your computer keyboard to operate the FMS. A 'K' will show in the upper left corner of the FMS screen when in 'keyboard mode'. When in *keyboard mode* **all** keystrokes are captured by the FMS
2. 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.
3. Function keys : provides access to the major FMS functions: PERF (aircraft performance), NAV (navigation pages), PREV & NEXT (move forward and back between function 'pages'), FPL (flightplan), PROG (progress), and DIR (direct to).
4. Alphanumeric keypad.
5. Scratchpad: pilot-entered data is first displayed in this area. FMS messages are also displayed here. After data is entered, it is moved to the desired location using the line select keys (LSK).
6. 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.

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

- Vertical and atmospheric data - Blue (Cyan)
- Lateral data and Index selection - Green
- FROM waypoint - Yellow
- TO waypoint - Purple (Magenta)
- Prompts and titles - White
- Flight plan names - Orange (Amber)

FMC Programming Preflight Flow:

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

Position initialization
Once the aircraft is powered the FMS will complete a start up sequence. Once started the NAV IDENT page is displayed. The aircraft's geographic position must be set before any flight programming begins. Press the line select key (LSK) adjacent to POS INIT. Review the three positions displayed and select one using the appropriate line select key (adjacent to the LOAD prompt).

Entering a flight plan
After selecting the initial position, the ICAO location identifier is displayed on the top left corner of the screen 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)

To begin enter the flight destination into the scratchpad and press the LSK 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 flightplan before pressing ACTIVATE FPL are automatically stored.

If there is no stored flightplan 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 runway, SID, STAR or vertical navigation is contained in a FS flightplan.

These portions of the flightplan 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 an be 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 flightplan 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 flightplan, 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. Performance management is an entire independent function. You have first to enter the data required for computation.

PERF INIT section consists into five pages. All steps have to be followed in order to take benefit of fuel burn calculations and vertical navigation. First review or enter aircraft type and tail number. Then select data source to FULL PERF. When done, press NEXT key.

On page 2/5, you will find climb, cruise and descent data. ERJ145 is not a race plane... That's why it doesn't climb the same way as a normal jet aircraft. Flight level change autopilot law requires to climb at 270kt until 18000ft are reached then climb is achieved at Mach 0,56. For information, an A320 can climb at 320kt and Mach 0.78...

So you will find 3 fields to enter data and 3 OR prompts. Those provide default settings. So press them and select: 270/.56 for climb, MAX CRZ for cruise and VMO/MMO/3.0 for descent (3,0 is the descent path angle you want to use). Idle descent will result into a 5° FPA! Again ERJ doesn't act as a normal jet aircraft... On pages 3/5 and 4/5, you can enter various meteorological data but if you don't the FMS will compute them in flight so don't change anything. On page 5/5 you enter data regarding payload such as number of passengers, cargo amount and fuel on board. When everything is done, just press INIT PERF prompt. FMS is now completely initialized. Wait for calculation and fly!

Reviewing performances calculations
Once PERF INIT prompt has been selected, performances are computed and displayed.

Pressing the PERF mode select key displays all PERF options. Select the function you need using the adjacent line select key. Use PREV/NEXT keys to navigate through the pages displayed. This section contains 2 pages. PERF INIT accesses the performances initialization sequence. Modifying data in that section is the basic way to change performances such as angle of descent (FPA) or climb schedule. PERF DATA accesses calculations such as climb, cruise and descent schedules. Select the value you want to change using the line select key to check if you can change it. If the data appears in the scratchpad you can modify it, if not, it is calculated using other data.

PERF PLAN centralizes all fuel related calculations. You will find here the estimated time of arrival at destination with the expected fuel remaining but also estimated time of overflight and remaining fuel over each route waypoint.

CLIMB, DESCENT, CRUISE are shortcuts to those data. TAKEOFF and LANDING allow the user to enter wind and temperature.

FUEL MGT are the useful pages for fuel calculations. On page 1, the current fuel quantity, fuel flow, ground speed, true airspeed, ground specific range and air specific range are displayed. Specific range is the amount of fuel you burn each mile. Page 2 shows the individual and total engine fuel flow as well as fuel used. Those pages are read only.

Degraded PERF modes

FULL PERF is the normal FMS operating mode. You can choose between 2 degraded modes :

- PILOT SPD/FF : all computations are made using using pilot entered speed schedules, winds and cruise fuel flow
- CURENT GS/FF : fuel calculations are based on the current fuel flow displayed on the FUEL MGT page

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.

In the lower left corner of the ACTIVE FLT PLAN page DEPARTURE routing can be checked. In the lower right of these screens TAKEOFF is displayed. This is a short cut to access the PERF 1/2 section menu. Prior to taxi, entering take off wind on the TAKEOFF sub menu will be very useful. The FMS can calculate actual wind, but this requires 45 seconds. Strong crosswinds during during takeoff cause the aircraft to drift into other runway patterns. Entering takeoff wind pre-calculates the drift angle applied after take off.

Using the NAV key

All function except performance management functions will be recalled using the NAV key. Pressing that key brings you to the NAV INDEX 1/2 page:

FPL LIST: list of stored flight plans or storage of new flight plans

FPL SEL: allows for activation, inverting and activation, or FPL PERF, on stored flight plans

WPT LIST: list of pilot defined waypoints

DATA BASE: accesses the navigation waypoints data base *DEPARTURE:* access to SID and departure runways (that means you can initialize the FMS that way too)

ARRIVAL: accesses STARS, approaches and landing runways. You may enter your arrival using that key if you wish during initialization process. If not, an ARRIVAL prompt will be displayed on the FPL page when you reach 200NM from your destination.

POS SENSORS: status of navigation position sensors

TUNE: accesses tuning page for navigation or radio equipment (providing FMS is enabled from RMU PGE/ NAV MEMORY appropriate menu). Pressing the NEXT key, you enter NAV INDEX 2/2 page.

NOTAM: allows entry of usable navigation stations such as out of order VOR
PATTERNS: access to menu for holding, flyover and procedure turn patterns (see below)
IDENT: displays date, time, FMS configuration on the power up display *MAINTENANCE:* accesses maintenance status and FMS configuration *POS INIT:* directly accesses position initialization page
DATA LOAD: loads data bases
FLT SUM: take off and landing time and fuel used

Patterns NAV submenu
This menu is the way to enter holds, flyover and all ATC requested maneuvers. It is possible to enter the five patterns:

- HOLDING PATTERN
- ORBIT PATTERN
- RADIAL PATTERN
- PROCEDURE TURN
- FLYOVER PATTERN

Just select the pattern you like to perform and enter it in the flight plan. Let's take a holding definition as an example. Choose HOLD in the pattern menu the select the HOLD FIX in the flight plan, enter inbound course and turn direction the select inbound leg length in time or distance then press ACTIVATE. When the aircraft will reach the HOLD FIX it will enter the holding pattern. You can fly direct to the holding pattern by pressing the line select key adjacent to DTO HOLD. When in the holding pattern pressing EXIT HOLD will allow the aircraft to exit the hold after pattern completion and follow the route. Using the direct to function will do so.

Don't enter the hold too fast, remember that ERJ145 holding speed is 180kt increased to 200kt if icing is encountered...

You can act the same way to program a procedure turn or an orbit.

Using the FMS in flight
In flight FPL or PROG page should be used. FPL page shows the next waypoint with its estimate time of overfly and its vertical navigation limitations (FPA/speed or altitude). Using the right line select keys you can modify this information usually displayed in blue. You can enter new waypoints the same way using left line select key. This assumes that you have entered the appropriate data in the scratchpad.

VNAV calculations are available as soon as performances are initialized. Progress page 2/3 give information about top of climb and top of descent.

Direct to function
If air traffic control gives you any shortcut, don' panic... You won't have to reenter all data again. Just press the DIR key and select the waypoint you are cleared to using the PREV/NEXT key and the adjacent left line select key.

If cleared waypoint is not in the flight plan just type its name in the scratchpad and enter it using the top left line select key. Then select the next waypoint to stay linked to the flight plan. Have a good flight!

Alternate Flight Route
Alternate flight plans can be entered into the FMS. If an alternate plan is entered it is displayed in the route pages after the active flight plan AND missed approach procedure (if programmed). When an alternate flight plan is programmed an ALTERNATE prompt is shown on the ACTIVE FLT PLAN page after MISSED APPROACH has been activated. If no MISSED APPROACH is programmed the ALTERNATE indicator will display when 25 nautical miles of the destination airport

When activating the ALTERNATE route prior to crossing the destination waypoint the aircraft will first fly to the original destination. Use the DIR key and select an alternate route waypoint if you do not wish to fly to the original destination.

What-If
The FMS contains a WHAT-IF' feature allowing the pilot to evaluate proposed adjustments to the active flight plan; and if found desirable, implement the changes.

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 4R, on WHAT-IFINIT page 4.
- 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 4L, INIT, on any of the three DATA pages.
- To enter the WHAT-IF values into the active flight plan click LSL 4R, 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.

Saving a flightplan

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

To create a flightplan that will be saved:

1. Press the FMS NAV button and then press the LSK to the left of FPL LIST.
2. Enter a flightplan name into the scratchpad. Usual practice is to name a flight using the departure and arrival airports separated by a dash. A route between Toledo Express and O'Hare International is named: KTOL-KORD.
3. Press the LSK to the left of SHOW FPL.
4. If a plan with the entered name already exists the FMS will load the route. If no plan exists the FMS will save flighplan using the route data you now enter.
5. Create the route as outlined earlier in this manual.
6. After completing the route data entry press the LSK to the right of FPL SEL.
7. Now ACTIVATE the route.

The flightplan is now saved. To use this plan on a future flight choose the FPL LIST page and enter the flightplan name into the scratchpad.

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

FUEL SYSTEM

Normal function of the fuel system is for all knobs set to ON. Supply fuel to the APU by turning on the right wing tank (FUEL PUMP TWO).

The wing tanks of the ERJ's have three fuel pumps each. Individual pumps are selected using the PUMP SEL knobs.

To supply both engines and the APU from a single wing tank use the XFEED knob. Crossfeeding is normally done when there is a fuel imbalance between the wing tanks. Turning the crossfeed knob to LOW1 or LOW2 will deenergize the fuel pumps in the selected wing (LOW1 for left wing, LOW2 for right wing). The crossfeed valve will open connecting

both engines and APU to the powered wing tank (LOW1 has right wing supplying fuel; LOW2 has left wing supplying fuel). An EICAS advisory message will appear during crossfeed operation.

ERJ 145XR fuel management:

The 145XR has additional fuel tanks necessitating the addition of ventral tank control system.



Only the wing tanks feed the aircraft engines. Fill the ventral tank after the wing tanks contain a full fuel load.

Standard configuration of the 145XR's supplemental fuel tank control is to leave the knob in the AUTO position. When the VTRL TK XFER knob is in AUTO mode the fuel pumps remain on standby until the wing tanks drop below 2500 lbs of fuel. The panel logic will then transfer fuel from ventral tank to wings. Turning the knob to the OVRD position activates the pumps even when wing tanks contain more than 2500 lbs of fuel. Placing the knob in the OFF position will not allow fuel to be moved to the wing tanks.

The ventral tank pumps are selected by pressing the VTRL PUMP SEL button. The active pump, A or B, is lit on the fuel pump button.

FULL AUTHORITY DIGITAL ELECTRONIC CONTROL (FADEC)

Each engine is controlled by two FADECS which are designated as FADEC A and B. Each FADEC receives signals from the Control Pedestal and from the Powerplant Control Panel and sends a signal to the FPMU torque motor which meters the fuel flow to the engines to reach the fan spool speed calculated by the FADEC.

ENGINE START
Engine start is initiated by turning the Start/Stop button to the START position (remember right clicking on the cover to open that allowing access to the knob).

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

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)

THRUST MANAGEMENT

Engine Thrust Rating Mode Selection

The thrust management logic includes five thrust modes selected using the four thrust rating panel buttons on the center pedestal:

- T/O: Maximum Takeoff (T/O-1) or reduced thrust (ALT-T/O-1)
- CON: Maximum Continuous
- CLB: Maximum Climb
- CRZ: Maximum Cruise (the pilot is always responsible of managing the cruise setting as the CRZ mode only limits maximum engine thrust)

*Alternate takeoff mode is selected through **Takeoff Data Setting** procedure (see below).*

If the Thrust Levers are positioned at THRUST SET (F4 or move your throttle to it's maximum position), FADEC will command the maximum N1 associated with the selected mode.

Takeoff Data Setting

This function is provided in order to enable the pilot to input reference data into the FADEC prior to takeoff. This data will be used to calculate N1 TARGET during takeoff. The following data has to be input:

- Takeoff mode: T/O-1 or ALT T/O 1
- Reference takeoff temperature: which corresponds to SAT
- Reference takeoff Anti-Ice: which will allow the FADEC to consider this
- condition to calculate N1 TARGET

The takeoff data setting is performed by the Takeoff Data Setting controls (SET and STORE) on the overhead. The procedure is the following:

- After pressing the STORE button on the MFD an arrow will point to T/O MODE line.
- By using the SET control the takeoff mode can be changed to ALT T/O 1 mode
- By pressing the STORE button again the arrow will point to the REF TO TEMP line which can be adjusted by the SET knob.
- By the third pressing of the STORE button will allow the pilot to select the REF-A-ICE line and adjust it by using the SET knob.
- The forth pressing of the STORE will allow the FADEC to calculate the N1 TARGET value.

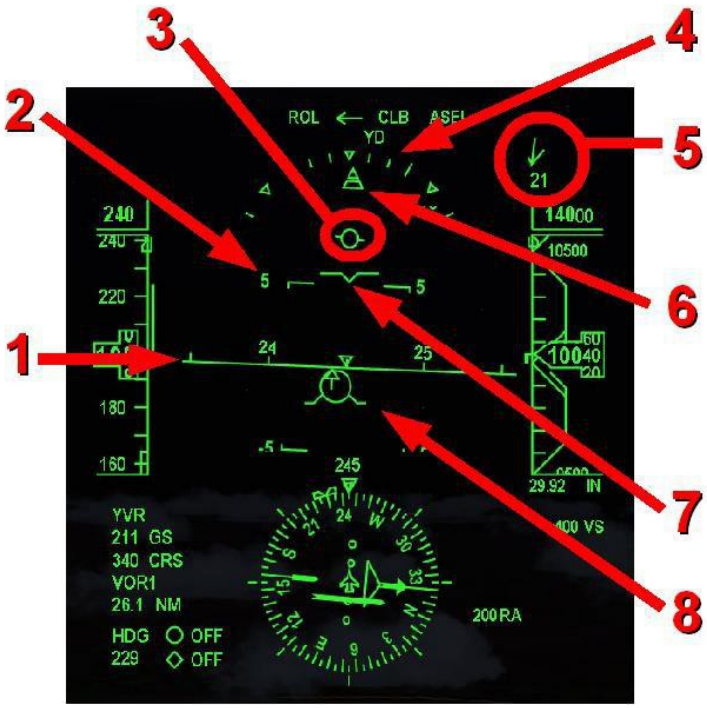
NOTE: until the engines have started the mode display in the MFD will remain amber. Once the engines have started, the color will change to blue. If the color in the MFD remains amber after engine start re-enter the takeoff data.

Automatic Takeoff Thrust Control System (ATTCS)

During a takeoff if an engine fails the ATTCS automatically resets thrust on the remaining engine from alternate takeoff thrust to maximum takeoff thrust.

HEAD-UP DISPLAY (HUD)

All variants of the feelThere ERJ simulation contain a HUD window. The HUD view is accessed by pressing the <W> key or clicking the **H** letter on the semicon panel. The subpanel is a 2D view; and in addition to the HUD much of the glareshield autopilot control panel 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:

- along the top are the autopilot mode annunciations;
- 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 (as numbered in picture):

1. horizon line showing compass heading numbers and current magnetic heading (inverted triangle) above the line; and the heading made good arrow below the line.
2. pitch indicator ladder (arrow pointing to +5 degrees).
3. flight director circle.
4. bank angle scale.
5. wind direction and speed indicator.
6. bank angle indicator (upper half of the split triangle) and slip/skid indicator (lower half the the split triangle).
7. attitude indicator bar.
8. flight path vector symbol showing the aircraft actual direction of flight.

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

When making an ILS landing the same indicators as on the PFD will be displayed on the HUD. These indications will clear on short final to de-clutter the HUD to maximize the pilot's view of the runway.

RADIO MANAGEMENT UNIT (RMU)



Use the RMU to control the ERJ's radios. Press the button next to the line you wish to modify and use the tuning knob to set the needed frequency. The RMU can also be used as a backup for the PFD, MFD and EICAS screens.

At startup and normal operation the RMU's screen is divided into five windows. These five windows allowing control over the COM, NAV, ATC/TCAS and the ADF systems RMU is capable of presenting different other pages selected by the PGE button and the Line Select Button associated with the desired page accessing though the menu. These are the:

Memory pages
The Memory page has two displays called First and Second Memory page. The first page shows the first 6 memory locations the second page show the memory locations 7 through 12. Both COM and NAV Memory pages are functionally identical.

NAV backup page
Includes the HIS, DME, NAV and ADF information

Engine backup page
Displays information normally presented on the EICAS. It is divided into two pages the first showing the engine indications and the second shows system indications and EICAS messages.

Maintenance page
This page shows test results depending upon the kind of the test being carried out.

Cross side operation
The RMU has a feature called cross-side operating mode. In the cross-side operating mode the RMU controls the set of radios of the opposite side. Selecting this mode is accomplished by pressing the ½ button

Dimming
By pressing the DIM button and using the Frequency Control Knobs on the RMU can the display visibility optimized.

COM operation
The COM window has two frequency lines. The upper one displays the active frequency while the lower line displays the preset frequency. Pressing the LSK next to a preset frequency will cause the yellow cursor box to move to that field. Now the preset frequency can be changed by using the Frequency Tuning Knobs. When the Knob is turned the label MEMORY will

change to TEMP label indicating the new frequency is not stored in the memory. Storing the new frequency is accomplished by pushing the STO button. Placing the yellow cursor on the MEMORY label by pressing the LSK second time on the COM window will allow scrolling through the stored memory.

Direct COM tuning
This mode is accomplished by pressing and holding the LSK besides the COM preset frequency line for more than 2 seconds. The yellow cursor box will allow direct COM tuning.

NAV operation
Identical to the COM operation.

Transponder and TCAS operation
The transponder operation is similar to the other radio equipment operation where the yellow cursor box needs to be moved to the desired function. This will allow the Frequency Tuning Knobs to change the ATC display. The outer knob sets the thousands and the hundred digits and the inner sets the tens and ones digits.

Pressing the LSK (third from bottom left) will move the cursor to the ATC/TCAS window allows setting a new transponder mode. The transponder operational modes are:

- ATC ON - Replies on Mode S and A no altitude reporting
- ATC ALL - Replies on Mode A, C and S with altitude reporting
- TA ONLY - TCAS Advisory Mode is selected
- TA/RA - TCAS Traffic Advisory/Resolution Advisory Mode is selected

DME Hold Operation
Pressing the DME Select Button, labeled DME, on the RMU Bezel Panel, will enable the DME to be tuned independently of the VOR active frequency.

Pressing the DME Select Button once. The NAV window will to split to two windows: top display is the active VOR frequency; lower window, with the DME label, will display the active DME frequency with an **H** (DME Hold) label. The **H** indicates that the DME *is not paired* with the active VOR/ILS frequency. The DME hold is also announced on the PFD.

You may now tune the DME frequency directly using the associated Line Select Button beside the DME window and tuning the new DME using the turning knob.

Pressing the DME Select Button again will cause the NAV window to resume its normal mode and slaving the DME to the active VOR frequency.

INTENTIONALY LEFT BLANK

INTENTIONALY LEFT BLANK

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 informations. 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 ERJ145 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
for reference in setting takeoff and landing speeds on the PFD and MFD pending the actual weight. NOTE: reference speeds can be set automatically using the system buttons on the MFD's bezel.

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

Emergency and abnormal checklists
Actions are to be completed by using the 'read and do' method. These checklists have been adapted to work with Flight Simulator's, and the simulated aircraft's, limitations.

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

MAXIMUM LANDING GEAR OPERATION/EXTENDED SPEEDS

retraction..... 200 KIAS
extension..... 250 KIAS
extended..... 250 KIAS

MANEUVERING SPEED (VA)

VA..... 200 KIAS

MAXIMUM FLAP EXTENDED SPEED (VFE) - **For 135 and 145 LR models**

Flaps 9°..... 250 KIAS
Flaps 18°..... 200 KIAS
Flaps 22°..... 200 KIAS
Flaps 45°..... 145 KIAS

MAXIMUM FLAP EXTENDED SPEED (VFE) - **For 145 XR MODEL**

Flaps 9°..... 250 KIAS
Flaps 18°..... 200 KIAS
Flaps 22°..... 200 KIAS
Flaps 45°..... 160 KIAS
Above 10000 ft with Yaw Damper disengaged:
Flaps 22°..... 180 KIAS
Flaps 45°..... 145 KIAS

MAXIMUM FLAP EXTENDED ALTITUDE

Maximum Altitude for Flap Extension..... 20000 ft

PITCH TRIM

Maximum Airspeed after Takeoff/During Climb
without Retrimming.....160 KIAS

TAILWIND

Maximum Takeoff and Landing Tailwind Component..... 10 kt

MAXIMUM RECOMMENDED CROSSWIND (NON-AFM)

Aerodynamics analysis have resulted in the following maximum recommended crosswinds for takeoff and landing:
Dry runway..... 30 kt
Wet runway..... 30 kt
Runway with Compacted Snow..... 25 kt
Runway with Standing Water/Slush..... 20 kt
Runway with Ice (no melting)..... 10 kt

WINDSHIELD WIPER OPERATION *(wiper movement only simulated in VC cockpit and external views)*

Maximum Airspeed for Windshield Wiper Operation..... 170 KIAS

APPROACH AND LANDING FLAPS

CAT II approach and landing must be performed with flaps 22°.

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 Weight

- 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.

NORMAL OPERATION CHECKLISTS

To the right of each checklist step requiring action(s) by the pilot is referenced the panel to complete the task. For those tasks that can be completed and/or confirmed in multiple locations the checklist action(s) are separated by a backslash. The italic text below some of the checks are a 'hint' on how to complete the step.

If no panel is noted, no action is required by the pilot for CALL! to advance through the checklist.

COLD AND DARK

APU.....	ON	← overhead
EMERGENCY LIGHTS.....	ARMED	← overhead
AVIONICS MASTER.....	TWO ON	← overhead
EICAS.....	CHECKED	
FUEL/FMS.....	INITIALIZED	← FMS

(PERFORMANCE and INIT pages completed in FMS)

PFD/MFD.....	LNAV AND TAKEOFF	← main panel
SPS.....	CHECKED	
SPEEDS.....	CHECKED	← main panel

(entered into the MFD)

TRIMS.....	SET	← pedestal/main panel

(on EICAS display confirm trim set within green band and between 4&5)

TAKEOFF DATA.....	ENTERED	← overhead

(must have stored: T/O Mode, Ref-to Temp and Ref A-Ice)

CHECKLIST COMPLETE

ENGINES READY TO START

FASTEN SEATBELT/NO SMOKING.....	ON	← overhead
RED BEACON FUEL PUMP POWER.....	TWO ON	← overhead
PNEUMATIC PANEL.....	CHECKED	
EMERGENCY PARKING BRAKE.....	ON	← pedestal
STEARING.....	INOP	
DOORS.....	CLOSED	← indication on MFD

CHECKLIST COMPLETE

ENGINE STARTUP

ENGINE 1.....	ON	← overhead

(checklist will advance once engine stabilized)

ENGINE 2.....	ON	← overhead

(checklist will advance once engine stabilized)

CHECKLIST COMPLETE

TAXI

HYDRAULIC ELECTRICAL PUMP..... AUTO ← overhead

EICAS..... BLANK
ICE PROTECTION..... AUTO ← overhead
FLAPS..... 9 OR 18 ← pedestal
(CALL will announce the set flap position)
THRUST RATING..... TAKEOFF ← thrust panel/pedestal
CHECKLIST COMPLETE

BEFORE TAKEOFF

TAKEOFF DATA..... ENTERED ← overhead

(must have stored: T/O Mode, Ref-to Temp and Ref A-Ice)
EXTERIOR LIGHTS..... ON ← overhead
(strobe and navigation lights)
TRANSPONDER..... 1 TA/RA ← RMU
FLIGHT CONTROLS..... SET
RADAR..... STANDBY ← glareshield
TAKEOFF CONFIGURATION..... CHECKED ← pedestal
(click TO CONFIG CHECK button on center pedestal)
CHECKLIST COMPLETE

AFTER TAKEOFF

LANDING GEAR..... UP ← VC main panel/EICAS indication
FLAPS..... UP ← pedestal
THRUST RATING..... CLIMB ← thrust panel/pedestal
OVERHEAD PANEL..... CHECK
ALTIMETERS..... SET ← main panel
CHECKLIST COMPLETE

BEFORE DESCENT

FMS/RMS SPEED SETTING..... SET ← main panel

(speeds set on MFD)
CHECKLIST COMPLETE

APPROACH CHECKLIST ALTIMETERS.....

PRESSURIZATION.....	CHECKED	
APU.....	ON	
FASTEN SEATBELT/NO SMOKING.....	ON	← main panel
CHECKLIST COMPLETE		
BEFORE LANDING		← overhead
		← overhead
LANDING GEAR.....	DOWN	
FLAPS.....	22/45	
AUTOPILOT.....	OFF	← VC main panel/EICAS indication
CHECKLIST COMPLETE		
AFTER LANDING		← pedestal
		← glareshield
EXTERIOR LIGHTS.....	OFF	
(Strobe lights off)		
TRANSPONDER.....	STANDBY	
GUST LOCK.....	ON	← overhead
FLAPS/TRIMS.....	ZERO/SEVEN	
(on EICAS display confirm zero on the flaps, seven on the trim)		← RMU
CHECKLIST COMPLETE		← pedestal
		← pedestal

PARKING

(begin checklist <u>after</u> engine shutdown <u>and</u> external power connected)

FASTEN SEATBELT/NO SMOKING.....	ON	
HYDRAULIC ELECTRICAL PUMP.....	OFF	
RED BEACON.....	OFF	
APU.....	OFF	← overhead
(click stop button, then turn knob to OFF)		← overhead
CHECKLIST COMPLETE		← overhead
IF LEAVING AIRCRAFT		← overhead
FUEL PUMP POWER.....	OFF	
EMERGENCY LIGHTS.....	OFF	
BATTERY.....	OFF	
CHECKLIST COMPLETE		← overhead
		← overhead
		← overhead

EMERGENCY CHECKLISTS

Electrical

BATT OVTEMP:

affected battery..... OFF

Fuel

FUEL LO LEVEL:

Thrust levers..... Long Range Cruise
Crossfeed..... As required

Flight Controls

PITCH TRIM INOP:

Pitch trim main system..... OFF
Pitch trim backup system..... OFF
Speed..... REDUCE
Land..... ASAP

Anti Ice

ICE COND AI INOP

Ice detection override knob..... ALL
Ice condition..... GET OUT ASAP

Engine control

E1(2) LOW N1

BEFORE V1..... ABORT TAKEOFF
AFTER V1..... FADEC RESET
FADEC..... ALTN
If engine stops..... LAND ASAP

ABNORMAL CHECKLISTS

Electrical

GEN OVLD

MFD ELEC page..... DISPLAYED
Shed bus..... OFF
Electrical load..... REDUCE
APU..... ON
Electrical load..... CHECK

GEN OFF BUS

MFD ELEC page..... DISPLAYED
Affected generator..... OFF then ON
If generator still off bus
APU..... ON

APU GEN OVLD

MFD ELEC page..... DISPLAYED
Shed bus..... OFF
Electrical load..... REDUCE
Electrical load..... CHECK

APU GEN OFF BUS

MFD ELEC page..... DISPLAYED
Affected generator..... OFF then ON

DC BUS OFF

MFD ELEC page..... DISPLAYED
Bus tie..... OVRD
If message still present
BUS TIE..... AUTO
Affected DC BUS..... LOST

ESS DC BUS OFF or SHED BUS OFF

MFD ELEC page..... DISPLAYED
Check buses

ESS 1-2 BUS OFF

MFD ELEC page..... DISPLAYED
If DC BUS 1..... OK
BATT 1..... OFF
If DC BUS 2..... OK
BATT 2..... OFF

BATT OFF BUS

Associated battery..... ON

BKUP BATT OFF BUS

Backup battery..... ON

115V AC BUS OFF

AC PWR..... OFF then ON
If message still present
AC PWR..... OFF

Fuel

FUEL LO PRESS

MFD FUEL page..... DISPLAYED
Pump PWR..... ON
Altitude..... UNDER 25000ft

FUEL XFEED FAIL

MFD FUEL page..... DISPLAYED
Fuel balance..... CHECK

FUEL TANK LO TEMP

MFD FUEL page..... DISPLAYED
Altitude..... REDUCE

FUEL INBALANCE

MFD FUEL page..... DISPLAYED
XFEED..... ON
FUEL LEAK..... CONSIDER

FUEL SOV CLSD

MFD FUEL page..... DISPLAYED
FIRE EXTG handle..... CHECKED IN
Engine stops ?..... LAND ASAP

APU FUEL SOV CLSD

If persists only..... ADVISE MAINTENANCE

FUEL XFEED OPEN

MFD FUEL page..... DISPLAYED
Fuel balance..... MONITOR

Hydraulics

HYD SYS FAIL

MFD HYD page..... DISPLAYED
Affected HYD ELEC..... PUMP ON
Speed..... 250kt
Autopilot..... OFF
Emergency gear extension..... USE

HYD SYS OVHT

MFD HYD page..... DISPLAYED
Affected ENG PUMP..... SHUTOFF PRESSED OFF
Affected HYD ELEC PUMP..... OFF
Speed..... 250kt

HYD PUMP FAIL

MFD HYD page..... DISPLAYED
HYD ELEC PUMP..... ON
Speed..... 250kt

HYD SOV CLSD

MFD HYD page..... DISPLAYED
Affected ENG PUMP..... SHUTOFF PRESSED ON

HYD LO QTY

MFD HYD page..... DISPLAYED
Hydraulic failure..... CONSIDER
HYD PUMP..... *SELECT OFF*
MFD HYD page..... DISPLAYED
HYD ELEC PUMP 2..... AUTO

Engine control

EOIL LO PRESS

EICAS indication..... CHECK
Engine shut down..... CONSIDER

ENG REF AI DISAGREE

Anti ice override knob..... AUTO

ENG NOTO DATA

Take off data..... ENTERED

Flight controls

AIL SYS INOP

MFD HYD page..... DISPLAYED
Affected HYD ELEC PUMP..... ON
Autopilot..... OFF
Speed..... 250kt

RUD SYS INOP

MFD HYD page..... DISPLAYED
Affected HYD ELEC PUMP..... ON
Autopilot..... OFF
Speed..... 250kt

RUD OVBST

Rudder shutoff sys2..... OFF
RUD SYS 2 INOP message..... CHECK
Under 135kt RUD SYS 2..... ON

RUD HDOV PROT FAIL

Advise maintenance

FLAP FAIL

No flap landing..... PERFORM
Speed..... Vref + 30kt

SPOILER FAIL

Speed brake..... CLOSE
Landing flaps 22..... PERFORM
Approach speed..... VREF + 10kt

SPBK LVR DISAGREE

Speed brake lever..... CLOSE

FLAP LOW SPEED

Flap maneuver..... ANTICIPATE

Landing gear

EMRG BRK LO PRESS

MFD HYD page..... DISPLAYED
Emergency braking performance.....CONSIDER LOW

BRAKE OVHT

MFD HYD page..... DISPLAYED
Speed..... 200kt
Landing gear..... EXTEND
Braking..... USE WITH CAUTION

STEER INOP

No take off allowed
Ground handling..... CONSIDER DIFFICULT
Precautionary landing..... CONSIDER

Air conditioning

BLD LO TEMP

MFD ECS page..... DISPLAYED
Bleed temperature..... MONITOR
If temperature still low..... INCREASE THRUST

CROSSBLD FAIL

If CROSS BLD OPEN is displayed on EICAS
Bleeds 1 and 2..... CLOSE
APU bleed..... CLOSE
Altitude..... Lower than 10000ft

CROSSBLD SW OFF

Cross bleed rotator..... AUTO

BLD VLV CLSD

Associated pack..... OFF then ON
Associated bleed..... ON

CROSSBLD OPEN

Normal status with crossbleed rotator positioned AUTO when:

1. starting engine n°2
2. flying in icing condition with anti ice on

PACK VLV CLSD

Associated pack..... OFF then ON

Anti-ice

AICE SWITCH OFF

Check all anti ice switches..... ON

Crossbleed..... AUTO

Ice detection override knob..... AUTO

ENG A/ICE FAIL

Thrust levers..... ADVANCE

Ice detection override..... ALL

Engine air inlet anti icing switch..... OFF then ON

If message persists..... GET OUT ICE CONDITION

WG A/ICE FAIL

Thrust leversADVANCE

Ice detection override..... ALL

Wing anti icing switch..... OFF then ON

If message persists..... GET OUT ICE CONDITION

Clean speed..... 200kt minimum

STAB A/ICE FAIL

Thrust levers..... ADVANCE

Ice detection override..... ALL

Stab anti icing switch..... OFF then ON

If message persists..... GET OUT ICE CONDITION

Clean speed..... 200kt minimum

WS HEAT FAIL

Windshield heat button..... OFF

If message disappears

Windshield heat button..... ON

PITOT INOP

Associated pitot switch..... OFF then ON

If message persists..... RELY ON STANDBY INSTRUMENTS

AOA HEAT INOP

Associated switch.....	OFF then ON
If message persists	
Approach speed.....	VREF + 20kt

TAT HEAT INOP

Associated switch.....	OFF then ON
TAT and SAT indication.....	DON'T RELY ON

ICE DETECTORS FAIL

Ice detection override.....	ALL
Ice condition.....	GET OUT

ICE CONDITION

CROSSBLD OPEN message.....	CHECKED
SPS ICE SPEED message.....	CHECKED
4 open lights on overhead panel.....	CHECKED
Normal operations.....	PERFORM

Aural warning system

AURAL WARNING FAIL

Check flight instruments

GPWS

GPWS INOP

Check flight path

LIVERIES AND REPAINTS

McPhat Studios created the house and airline liveries included with the ERJv2 package -

CREDITS, RESOURCES AND COPYRIGHTS

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In loving memory of J. Rose.

RESOURCES:

The Embraer Company: http://www.embraer.com

McPhat Studios: http://www.mcphatstudios.net

TSS: http://www.turbinesoundstudios.com/news.php

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