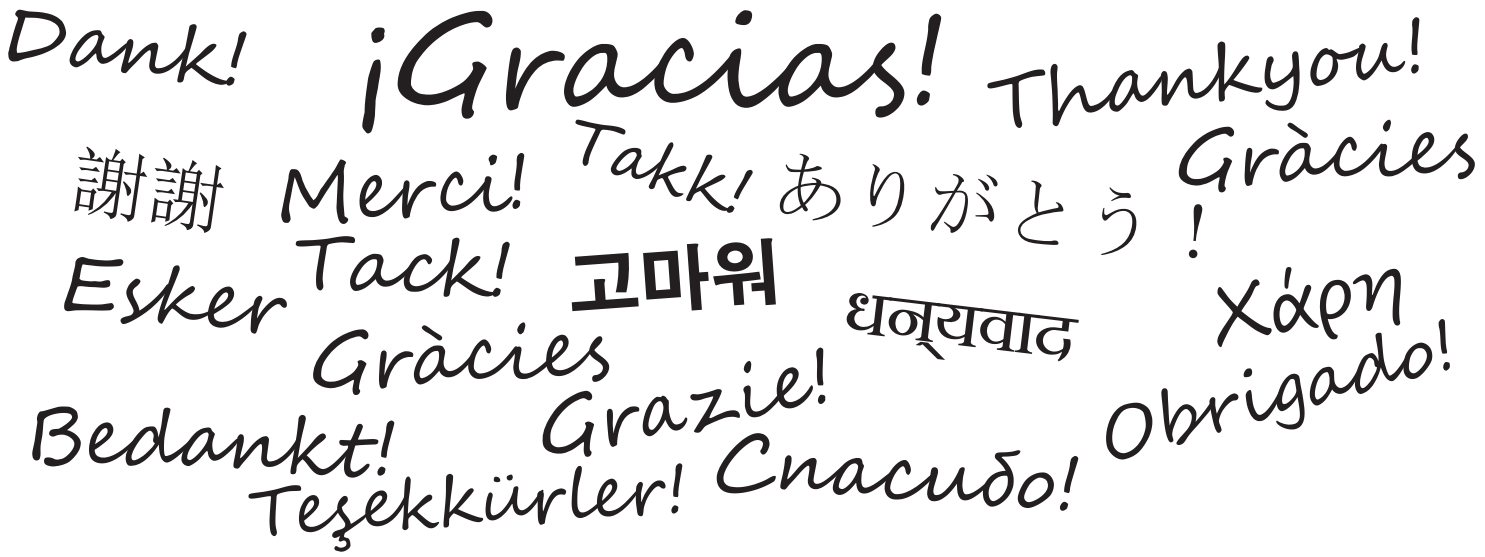
CRJ 200

X-PLANE

Navigation Systems

Display Guide

Cockpit Guide



Thank you, Thank you and one thousand million thanks to you! From any part of the world you live, thank you so much for believing in my work, for following me. For giving me the support I needed when this plane was almost at a close death end.
Gracias a todos que me han seguido y ayudado a continuar en este proyecto en estos tiempos de crisis que vivimos.

Thank you to everyone around the world, because you believed that paying and being legal is a way of supporting the continuity of my projects, my visions of how civil simulation planes should be. Something not only with great systems but good sensations inside. Sensations are the most important to me and in every plane I have made I always tried to search for the most close to reality sensations flying. In systems and visually.

You have just bought the most advanced and complex plane on X-Plane 9 right now. But I have tried to make it the most easy to learn, and with the help of this manual I hope the CRJ-200 will become your favorite plane.

It was 15 on January 2009 when I announced the start of the production of the CRJ-200. Here is the link to follow the process of creation of this incredible plane through these 2 years and 3 months (sorry it is in Spanish):

http://www.x-plane.es/modules/smf/index.php?topic=2452.0

If I knew that was going to take so long maybe I would have never started it, but it took much more than expected because I needed help on systems programming.
Along the production process I found the help from Cameron, Ben Russell, Anton Volkov and finally Philipp Münzel, as well as 4 real pilot support, that let me have real pictures and thousand of real documentation of the plane, and sounds.... etc.

It has been a process of reading and separating what it could be done and what not.
This plane is not going to satisfy everyone, and we don't pretend it. At the end on version 1.0 there are things that still are not simulated on this CRJ version. In this manual you will find on red colour which parts of the CRJ are STILL not simulated. And I must say "still" because my intention is to release future updates that would make this simulated CRJ closer to the real one. But I must say that because of the complexity of the plane this cannot be promised.

For me the CRJ project always has been a plane where with good programming everything could

be made.

The plane, right now on its 1.0 version is fully animated with only a few switches that maybe they are not right now simulated, but are ready to receive a programming code.
Advance failure system is my desire as well as a more complete FMS programming. Time will tell.

So be ready to fly this amazing plane. A none full automatic plane that makes prefect for me, because still the pilot has to pilot it and not take a coffee and just look how the plane flies.
It is your turn!

Javier Rollón Morán

Greetings from Germany!

I'm Philipp Münzel, flight simulation enthusiast since the days of the FS4 and now developer of the CRJ avionics and systems. Since January 2011 I'm part of the CRJ team and I took the plugin from a two year flight into a final approach and hopefully to a successful landing.
Working on the CRJ was a lot of fun for me - I like to push the limits of X-Plane.

What you see as one final product is the result of many people building on the work of each other: Alex Wemmer's vasFMC provides the core navigational functionality, with additions by Anton Volkov to make it work inside X-Plane. Without their preliminary work, I could not have finished the CRJ. Also I want to say thanks to Ben Supnik and Sandy Barbour for their never-ending effort in supporting the X-Plane SDK.

Without the SDK, X-Plane won't be where it is today.
I hope you enjoy flying the CRJ as much as I enjoyed programming it - keep an eye open for some easter eggs I hid in the simulated systems.

Philipp Münzel

Anton:

I'm really glad to take a part in this project and been working with Javier. I tried to put as much as I could in it and the response is grate! It's an awesome experience to work in a team. Which one I failed :) However, that's a good lesson.

I want to say thank you to Javier, who invited me in and keep the development going! Also I want to say thank you to Phillip for joining the project right after me and make it finished! Hope you will enjoy it!

Anton Volkov

SETUP

This is the first plane on X-Plane that supports Navigraph data and with that, and liveries, graphics etc, you have just downloaded maybe the most biggest plane in memory disc size.
The CRJ is not an easy plane to fly and maybe a forget on activating a switch can make you think there is a bug in it, so please read the manual first.

Also I have to say that the performance of this plane is as good as we could. A full system programming working behind a full set of textures in HD, make this plane a frames killer.
But in comparison with other civil simulator software still we can have good frames per second without having the newest computer configuration.

We have tested this plane in different configurations and we can put a little result here. This is a Windows 7 64bits version. The versions of Mac and Linux have better performance. We are still studying why on windows we have lower frame rates:

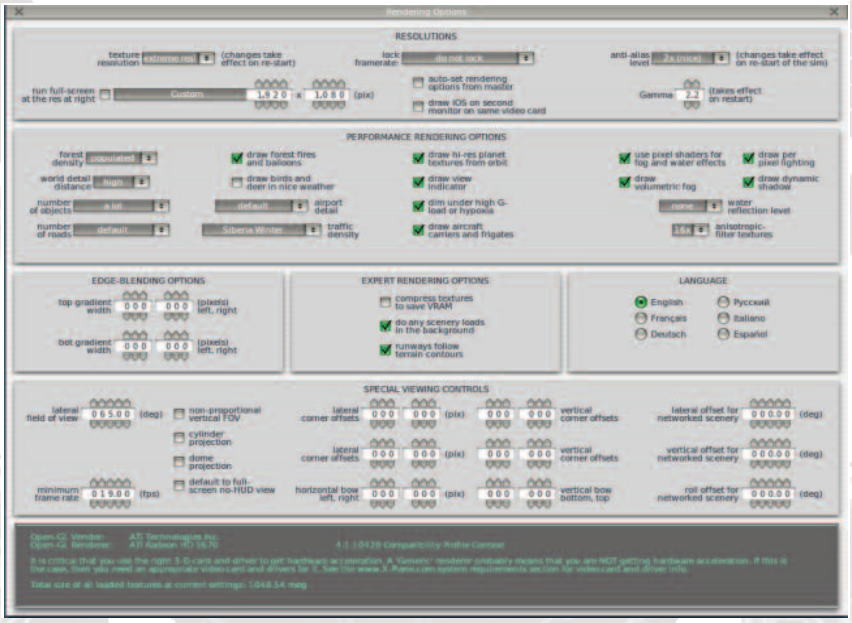
• iMac 21.5" (bootcamp) Radeon HD 5670 ATI 512MB GDDR3 - Normal conditions 35fps - Rain CATIII 22fps

• Intel Q6600 @3.4ghz Nvidia GTX 285 1GBRam 8gb RAM ddr2 - Normal 35fps - Rain CATIII 30fps

• Intel I7 2600k @4.6ghz Nvidia 580 1.5GBRam 8gb RAM ddr3 - Normal 90fps - Rain CATIII 70fps

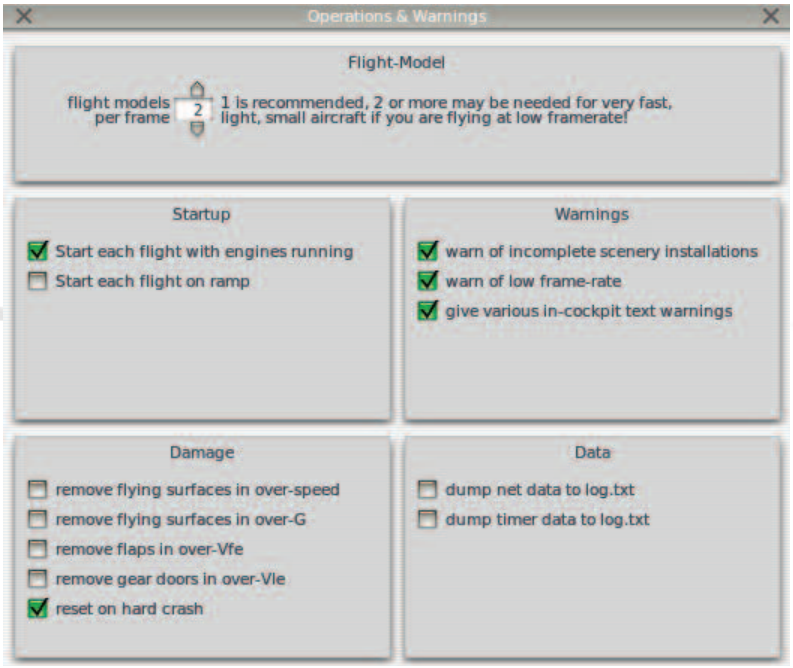
These all with Win7 64bits. On Mac and Linux we have 15 frames more.

So what about if you have not a great performance computer? Well always you could downgrade the visuals on X-Plane and lower the refresh rate of displays inside the CRJ (on a menu inside the FMS). All the performance testings above mentioned were made with this settings:

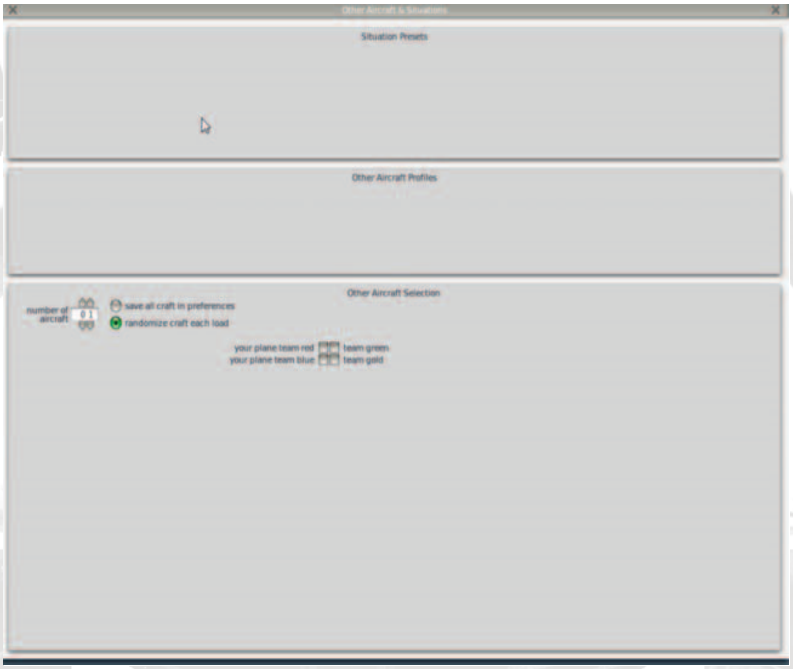


But if you compress textures to save VRAM, put antialiasing to zero and textures not the highest resolution (but be careful because with lower resolution textures are blurred and you cannot see several important details, like text back illumination), then you can gain some fps.

Also you should take in consideration set the flight models per frame to 1 instead of 2 or 3 (the higher the number the better dynamic behaviour has the plane but more CPU calculations, so if you don't have a good computer better leave it on 1. It is good enough, even I flew most of my time on 1)



And set the number of IAs aircrafts to 1 (only you). The IA on x-plane still is not good enough to activate and it is an important hit on performance. I recommend fly this plane on IVAO or VATSIM where you can set this number to 10 if you want because online there is no such big impact on performance (computer is not calculating how other planes fly. They are flown by other users)



Once you have found your desired configuration it is time to set up the plane for flying. I am going to say it first, because it is the most important one.

Important: If you want the CRJ fly correctly with autopilot modes, then don't assign any axis to any trim mode (pitch, roll or heading). To it with button pressing (as the real one)
Also deactivate Random Failures and birds on equipment failures (and rendering for birds) to discart any malfunction on the CRJ if you find any.

If you don't do this, the plane will try to catch the autopilot mode but the first control that is going to obey are the trim axis, and because if they are axis always are making inputs to the plane.

Also I recommend to set a key for toggle reverse thrust, and different axis to throttles if you can. Differential brakes pedals on axis if you have pedals also is very interesting, and as a real simulation pilot you are, load the plane with engines running unmarked!

Liveries

Ok! so you have just activated your copy, read all the manual (do you know how many time did it take me to make this fat manual? Come on read it!), made a good configuration, loaded a cold and dark situation.
What is next? fly your most desired livery on the sets the plane has inside. Well there are not all of the existing liveries but also I have included the templates so you can paint whatever version you want.
Here are the ones included:

Air Dolomiti - Italy

Air Nostrum - Spain

Air Volga - Rusia

Belavia - Belarus

Home Livery

BritAir - France

British Airways - UK

Delta - USA

Air Canada Jazz - Canada

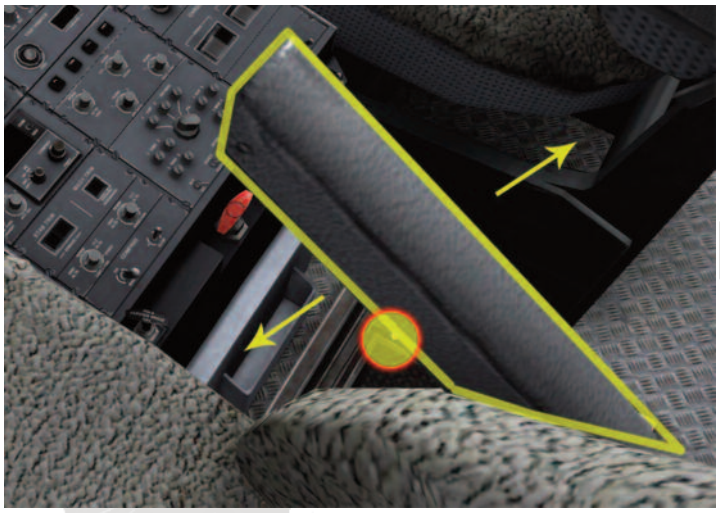
Lufthansa - Germany

United - USA

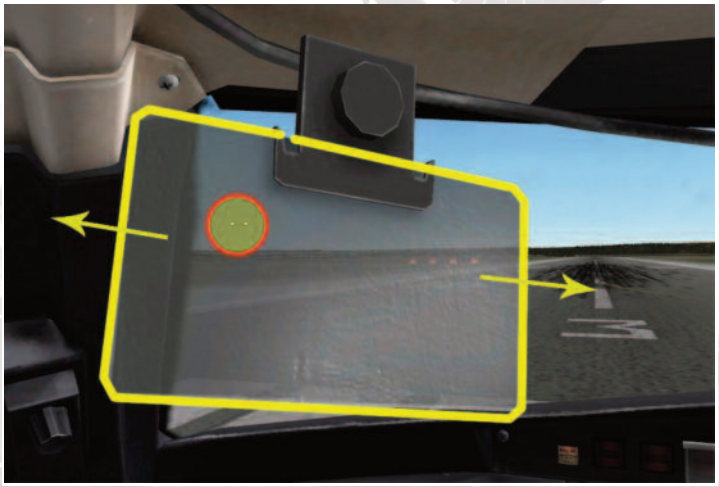
HOTSPOTS

The CRJ has little areas where you can manipulate things. I used manipulator technology in two ways. Dragging and clicking.
Of course almost every switch can be manipulated (maybe won't move but is prepared to do and be programmed).

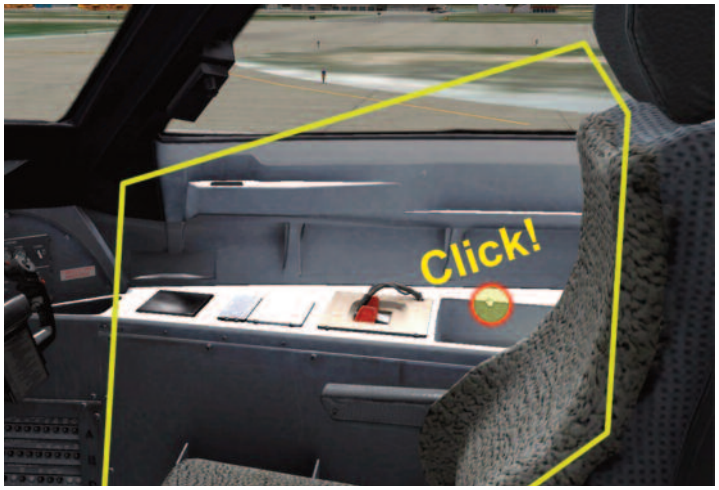
But here I am not talking about those hotspots, but those to make the plane more comfortable to fly.



Armrest is good when you want to rest your arm! but on virtual planes is only a 3D graphic, so why you should move rotate it? Because are instruments behind that you may need to manipulate.

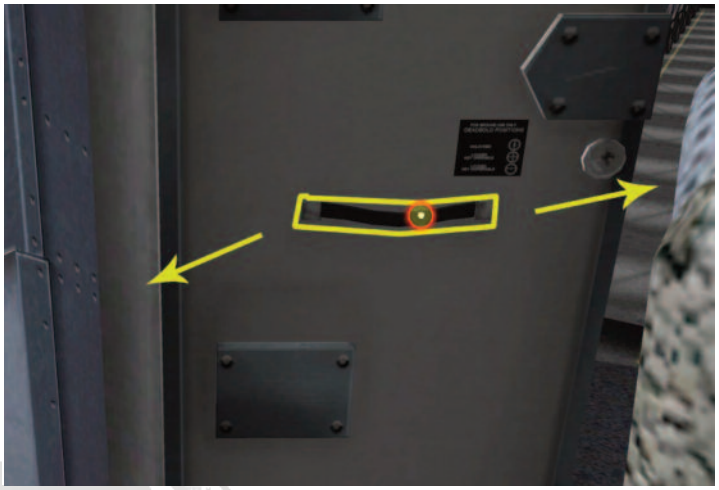


Sun can blind you, so maybe it is a good idea to drag the sunscreen and put it in front of the Sun, to let you see.

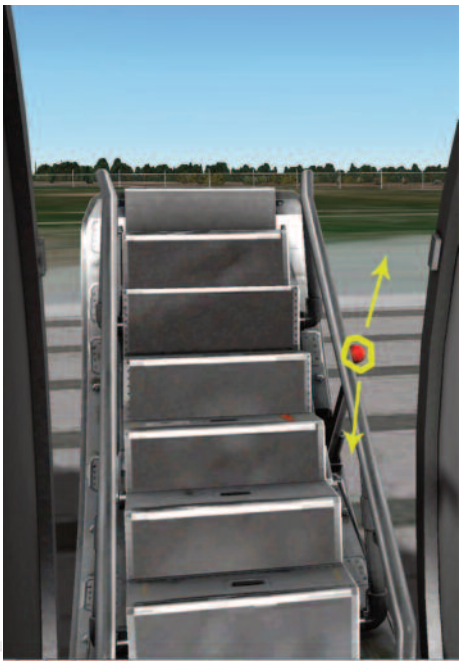


So you let your copilot go to the toilet? Ok.. just snap your fingers!

You want to talk with that beautiful flight attendant? Open the cockpit door!

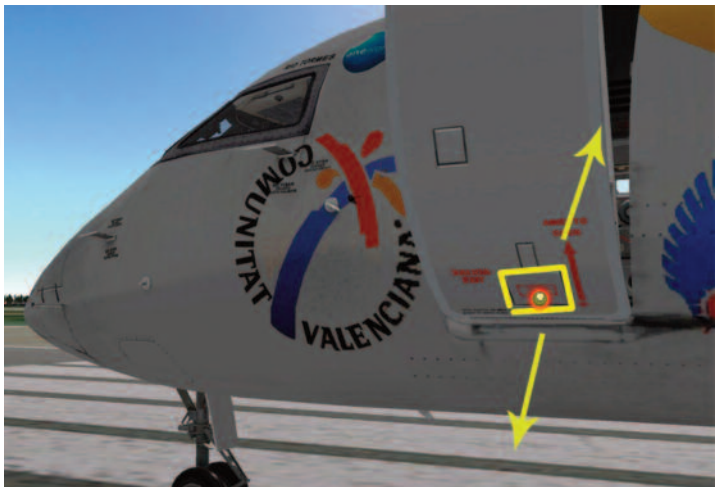


Any problem on the plane and want to make an emergency exit? No problem climb to the exit door!

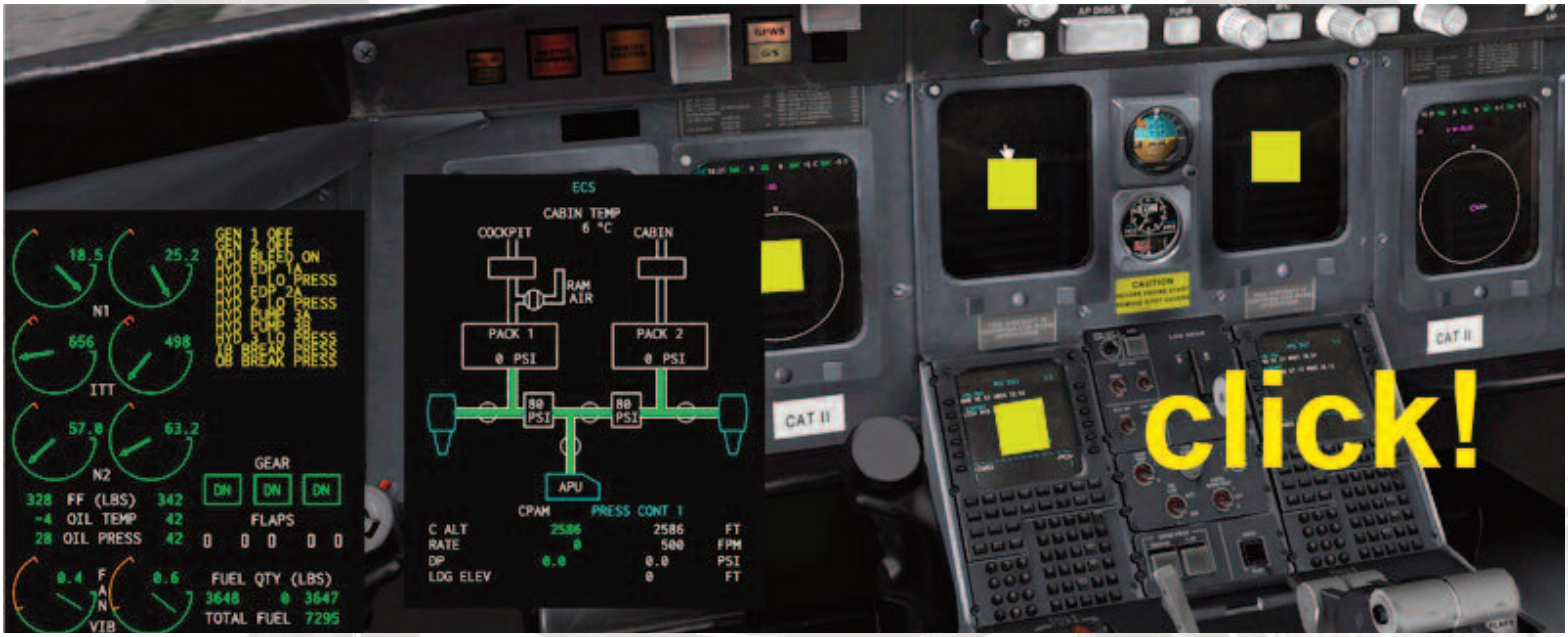


Ok! We also can make a standard exit! Grab the red lever, but I hope you decompression the plane correctly before trying, because if not, it is going to take a little to go out, and passengers can become nervous.

Or you can open the main door from outside to get inside on the first flight of the day!
(This has to be made on the internal view (cockpit view) and moving the camera outside)



But the most desired manipulator for the final users is maybe the pop-ups of displays. To make pop-up you have to click on the center of the screen, and do the same to close them. Once you have the screen pop-up you can pick and drag it wherever you want. All screens appears on the left lower corner of the screen so if you pop-up two screens, both will be on the same position, so one of them will be hidden, move them to have a visual of all.



CANADAIR©
CL-600-2B19. CRJ-200

Canadair Regional Jet (CRJ) is a little commercial plane, based on Canadair Challenger one. A private executive plane.

Fist design studies began on 1987, and first prototype flew May 10th of 1991.
The CRJ-200 is identical to CRJ-100, but the only difference is the model of engines.
Like the -100 the -200 have 50 seats for passengers, place for 2 Flight Crew, and one Cabin Crew member. The normal configuration is 2+2 seats from first row to 12th, and 2+0 on 13th, with a bathroom at the rear of the plane.

Main bombardier web page says: *The Bombardier CRJ200 was designed to provide superior performance and operating efficiencies in the fast-growing regional airline industry. Against the closest competition it flies faster and farther while burning less fuel and having lower operating costs. With over 1,000 units in commercial service it has become the most successful regional airliner program the world has ever known.*

DIMENSIONS (external)		
Length overall	87 ft 10 in	26.77 m
Wingspan	69 ft 7 in	21.21 m
Wing area (net)	520.4 ft^2	48.35 m^2
Height overall	20 ft 5 in	6.22 m
Fuselage maximum diameter	8 ft 10 in	2.69 m
Turning Circle	75 ft	22.86 m

CANADAIR©
CL-600-2B19. CRJ-200

DIMENSIONS (internal)		
Cabin length (excluding cockpit)	40 ft 6 in	12.34 m
Cabin Maximum width (centerline)	8 ft 4 in	2.53 m
Cabin width (floor level)	7 ft 2 in	2.18 m
Maximum height	6 ft 1 in	1.85 m
Cabin Floor area (excluding cockpit)	290.25 ft^2	26.97 m^2
Cabin volume	1,687 ft^3	47.80 m^3
Baggage volume	473 ft^3	13.39 m^3

Weights		
Maximum ramp weight (CRJ200 LR)	53,250 lb	24.154 kg
Maximum take-off weight	53,000 lb	24.041 kg
Maximum landing weight	47,000 lb	21.319 kg
Maximum zero fuel weight	44,000 lb	19.958 kg
Operating weight empty	30,900 lb	13,835 kg
Maximum fuel load	14,305 lb	6.489 kg
Maximum payload	13,100 lb	5.942 kg

Performance

Range (Maximum range (220 lb.pax / 100 kg.pax))

	NM	KM
CRJ200 LR FAA (50 pax)	1,700	3,148

Speeds:	**Mach**	**kts.**	**mph**	**km/h**
High cruise speed	0.81	464	534	860
Normal cruise speed	0.74	424	488	786

CANADAIR©
CL-600-2B19. CRJ-200

Airfield Performance:		
FAR take off field length (SL, ISA) at MTOW	6,290 ft	1.918 m
FAR 121 landing field length (SL) at MLW	4,850 ft	1.479 m
Fuel Consumption per hour (cruise average)	325 U.S. gal 271 Imp. gal	1.230 L
Ceiling:		
Maximum operating altitude	41,000 ft	12,496 m

POWER PLANT

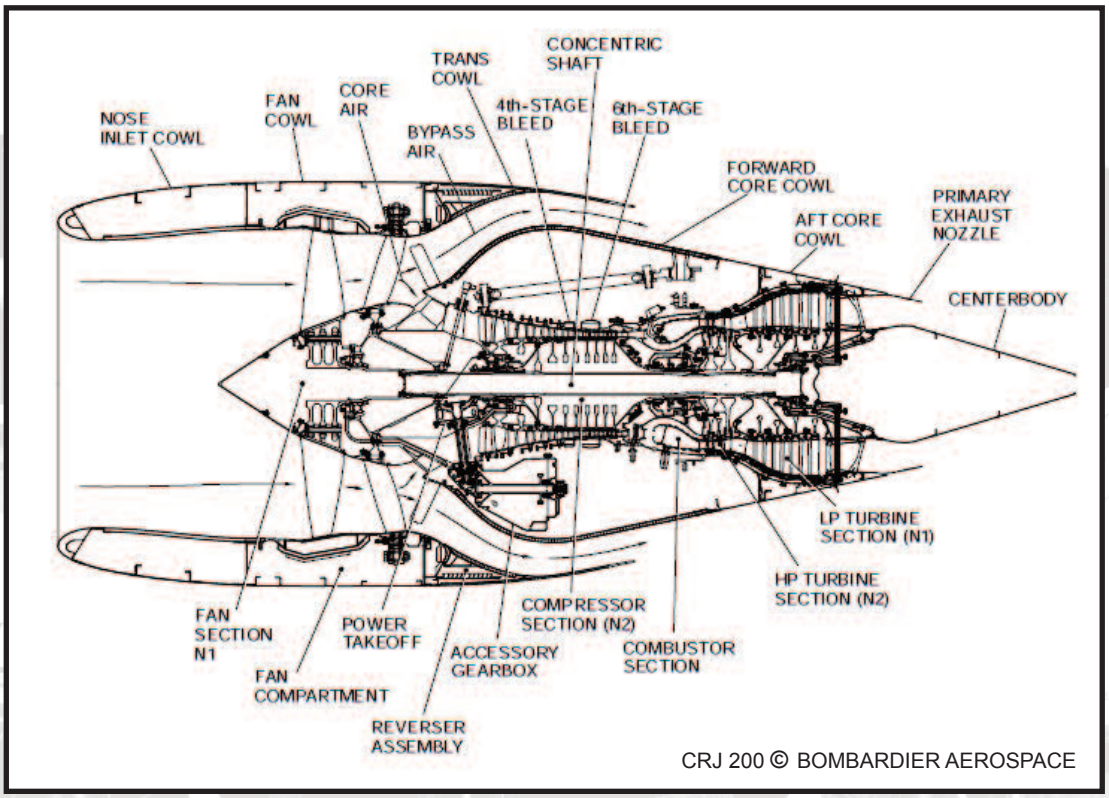
INTRODUCTION

The aircraft is equipped with two General Electric CF34-3B1 high bypass ratio turbofan engines which have a normal take-off thrust rating of 8,729 pounds flat rated at 30_C (86_F). In the event of an engine failure during takeoff, an automatic power reserve (APR) system, will increase the thrust on the remaining engine with 9,220 pounds.

The engine is a dual rotor assembly consisting of a fan rotor (N1) and a compressor rotor (N2). The N1 rotor consists of a single-stage fan connected through a shaft to a 4-stage low pressure turbine. The N2 rotor is a 14-stage axial flow compressor connected through a shaft to a 2-stage high pressure turbine.
For normal engine function, intake airflow is accelerated through the single-stage N1 fan and is divided into two airflow paths:

- **Bypass air**, that is ducted around the engine to produce approximately 85% of the engine thrust. On landing, thrust reversers are used to direct the bypass air forward to assist in braking.

- **Core air**, that enters the engine core section compressed, mixed with fuel and ignited. The expanding hot gases pass through the high pressure turbine which drives the compressor. Air from the high pressure turbine passes through the low pressure turbine which drives the N1 fan. The exhaust gases are then accelerated through the exhaust nozzle to produce a portion of engine thrust.

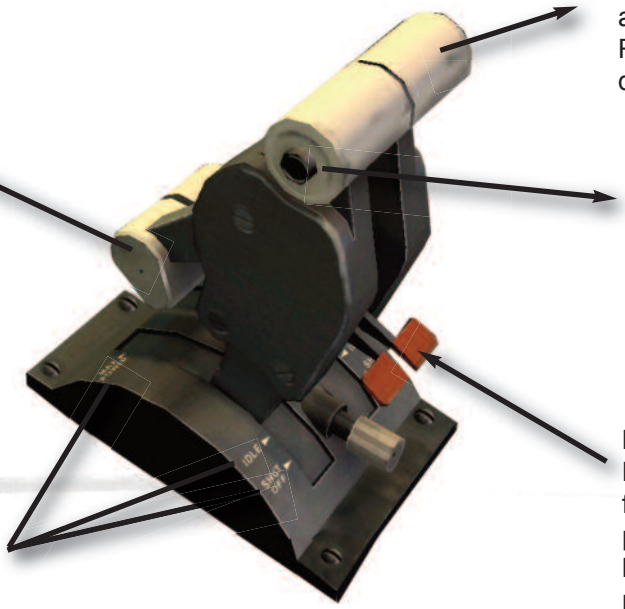


Power Plant - Cross Section

THRUST CONTROL

Thrust Levers
Controls forward thrust and acts as the engine fuel shut-off. Remains locked at IDLE position during thrust reverser operation.

Thrust Reverser Levers
Only possible to use them when thrust levers on idle position.



Take-Off / Go-Around (TOGA) Switches
Momentary pushbutton switches associated with the take-off / go-around mode of the flight director.

Thrust Settings
- SHUTOFF- Shuts off fuel to engine at the FCU. Located at rear thrust lever stop.
- IDLE - Lowest forward thrust setting. Located at idle thrust lever stop.
- MAX POWER - Nominal forward thrust setting. Located at forward thrust lever stop.

Idle / Shutoff Release Latches
Lift to advance thrust levers from SHUTOFF to IDLE positions or to retard throttle levers from IDLE to SHUTOFF positions..

The thrust control system supplies the control signals for engine operation. Consists of two thrust levers, two thrust reverser levers, friction knob and internal locks and stops to control the engines in the forward and reverse thrust ranges.

The thrust levers control the application of power in the forward thrust range and have lever settings of SHUTOFF, IDLE AND MAX POWER. Release latches (painted red) are located behind each thrust lever. The release latches are used to remove the mechanical locks that guard against inadvertent movement of the thrust levers to SHUTOFF.

A mechanical interlock built into the thrust levers, prevents reverse selection by the thrust reverser levers until the throttles are in the idle position.

An auto-retarding thrust mechanism ensures that the throttle lever is at IDLE whenever the thrust reverser is in transit. In flight, if a thrust reverser is inadvertently deployed, the affected throttle lever is automatically retarded to IDLE to minimize asymmetric thrust (not on 1.0 version).

A take-off go-around (TOGA) button, located on each forward thrust lever, can be used by the flight crew to reset the flight director for go-around.

STARTING AND IGNITION SYSTEMS

STARTING SYSTEM

Pressurized air and DC electrical power are required for start operation. The engines can be started using air from the auxiliary power unit (APU) or from a ground air source.
The engines can also be started using 10th stage cross bleed air from a running engine. For cross bleed starting, the running engine N2 must be above 85%. Pneumatic pressure indications are displayed on the EICAS ECS synoptic page.

Engine starting is initiated by the respective START switchlight on the Start/Ignition panel, located on the overhead panel. The start sequence may be terminated at any time by pressing the engine STOP switchlight.

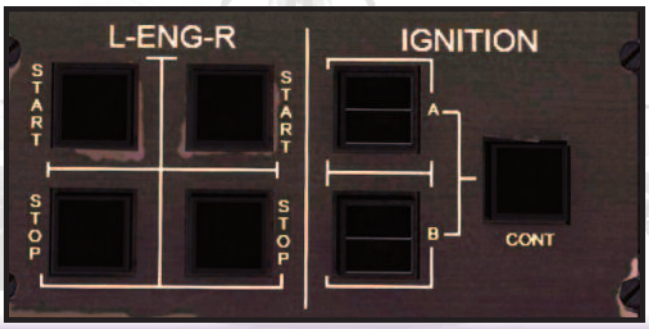
When the engine START switchlight is pressed, the start control valve opens and allows pressure from the 10th stage manifold to rotate the air turbine starter. The starter drives the engine accessory gearbox, which in turn drives the engine N2 core section. When the engine has accelerated to 20% N2 rpm, the thrust levers are advanced to the IDLE position to turn on the fuel, resulting in engine light-off. As the engine accelerates to the on speed condition, the starter will cut-out at 55% N2 rpm.

A hot start can be produced if thrust levers are advanced before reaching the 20% N2 rpm.

IGNITION SYSTEM

The engine ignition system provides high-energy electrical sparking to ignite the fuel/air mixture in the combustion chamber during engine start. The system also provides continuous ignition during icing conditions, in-flight restarts and/or when the aircraft approaches a high angle of attack (stall).
Each engine has two independently controlled AC ignition systems. Each system (A and B) consists of two ignition exciters and two igniter plugs. Ignition system A is powered form the AC essential bus and ignition system B is powered from the battery bus through a static inverter. Each system supplies electrical power to fire a dedicated igniter in both engines. The engines are normally started using only one of the systems as selected by the flight crew (A on even days and B on odd days). The ignitors may be selected on one at a time (either IGN-A or IGN-B) or as a pair. Continuous ignition can be activated manually by selecting the CONT switchlight on the Start/Ignition panel which will activate both ignition systems on both engines. Continuous ignition is used for the following flight conditions:

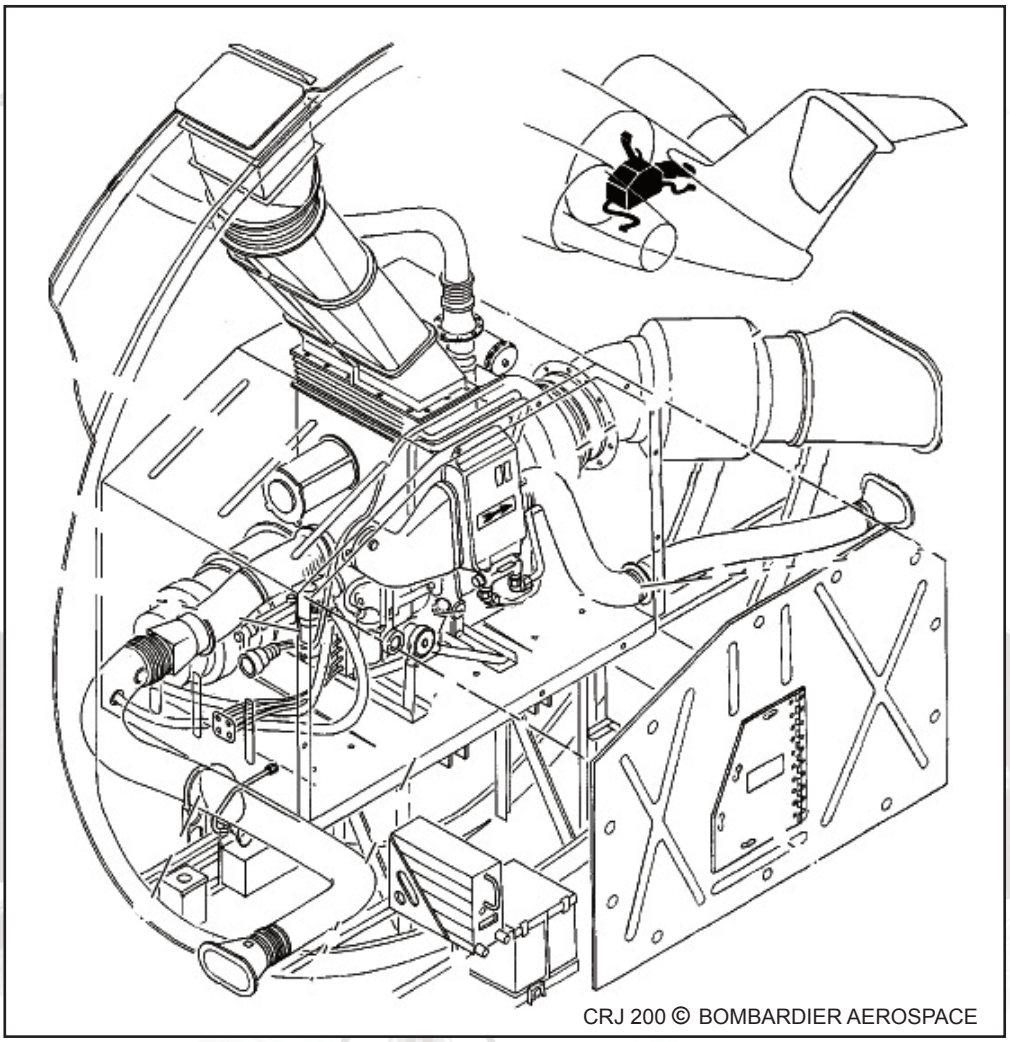
- Takeoff and landing on contaminated runways
- Takeoff with high cross wind components
- Flight through moderate to heavy intensity rain
- Flight through moderate to heavy intensity turbulence
- Flight in the vicinity of thunderstorms.
- Activated automatically by the stall protection computer, when an impending stall is detected.



OIL SYSTEM

Each engine has an independent lubrication supply system consisting of an oil pump and an oil reservoir. The pressure pump draws oil from the reservoir and supplies it to the various engine components for cooling and lubrication.
The engine oil system is monitored for oil temperature and oil pressure. The oil system indications include analog pressure gauges, temperature and pressure digital readouts and low oil pressure warning messages that are displayed on the EICAS primary page.
During engine start, the oil pressure indications on the EICAS primary page are displayed with an analog gauge and a digital readout. When both engines are started and oil pressure is normal, the oil pressure gauges revert to N1 vibration gauges. The digital oil pressure indication remains.

AUXILIARY POWER UNIT



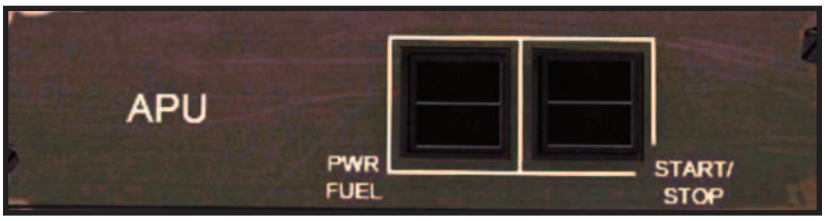
INTRODUCTION

The auxiliary power unit (APU) is installed within a fireproof titanium enclosure in the aft equipment compartment. The APU is a fully automated gas turbine power plant which drives an electrical generator. The generator is rated at 30 kVA and produces 115 VAC electrical power for backup to the main engine generators. The APU also supplies compressed air to the pneumatic system for main engine starting and environmental control.

The maximum operating altitude of the APU is **37,000** feet. The maximum altitude for APU starting is **30,000** feet. The maximum altitude for main engine starting using APU bleed air is **13,000** feet. ECS operation using APU bleed air is **15,000** feet.

An Electronic Control Unit (ECU), located in the aft equipment compartment, controls the APU through all phases of operation. The ECU monitors all sensors and switches, sets up the appropriate fuel acceleration schedules and relays specific operating data to the engine indication and crew alerting system (EICAS). The ECU is powered through selection of a PWR/FUEL switchlight on the APU control panel in the flight compartment.

The APU intake door position is continuously shown on the EICAS status page. APU RPM and exhaust gas temperature (EGT) indications are shown on the EICAS status page, only when the APU PWR/FUEL switchlight on the APU control panel is selected.



1 APU RPM Indicator and Readout
Indicates percent of APU rpm

2 APU EGT Indicator and Readout
Indicates exhaust gas temperature in degrees celcius.

3 APU Inlet Door Status Indicator
Indicates DOOR OPEN or DOOR CLOSED or DOOR MID position

APU POWER PLANT

Consists of a gas turbine engine and a gearbox to reduce rpm's
The speed constant engine, consisting of a compressor, a combustor and a two-stage turbine. The compressor draws large volumes of air in through the inlet door on top of the aft fuselage then delivers it under pressure to the combustor. Fuel from both wing tanks is added to the high pressure air and ignited, increasing the energy of the airflow. The high velocity, high temperature gasses are delivered to the turbine section. The turbine converts the high velocity gasses into mechanical energy to drive the compressor and gearbox. The exhaust gases are ducted overboard through the exhaust pipe on the right aft fuselage.

CONTROL

A. STARTING

When the PWR FUEL switchlight, on the APU panel, is selected:

- The ECU (Electronic control unit of the APU) is powered
- The air inlet door opens (position is displayed on the EICAS status page)
- The APU RPM and EGT gauges are displayed on the EICAS status page
- The fuel pump comes on.

When the START/STOP switchlight, on the APU control panel, is selected:

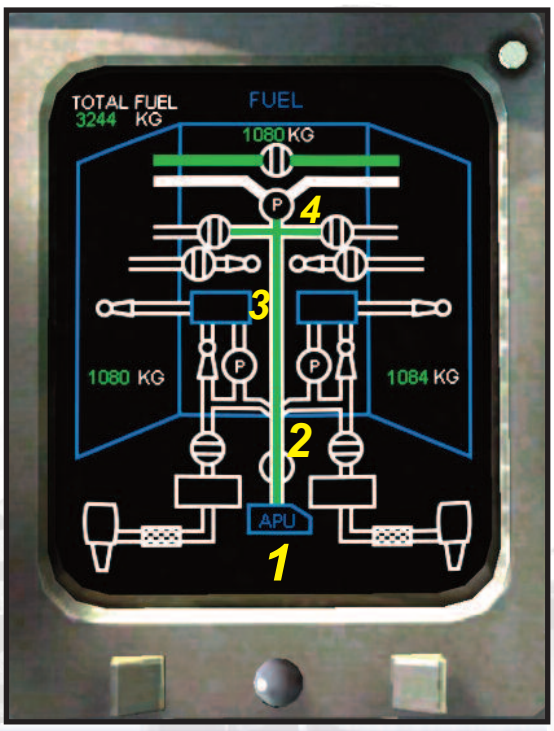
- The ignition is activated
- The starter motor is energized
- The fuel shutoff valve opens
- The START legend on the APU panel comes on
- The APU START status message is displayed.

The starter motor is deactivated at 50% rpm and the START legend goes out. When the APU reaches 99% rpm, ignition is turned off and two seconds later the AVAIL legend, in the START/STOP switchlight, illuminates to notify the crew that the APU is ready to supply electrical power and bleed air.

B. STOPPING

To shutdown the APU, the crew deselects the START/STOP switchlight on the APU panel. The APU will automatically shutdown. The PWR/FUEL switch is deselected to close the fuel shutoff valve and to remove primary electrical power to the ECU.

In the event of an emergency, the flight crew can press the APU FIRE PUSH switchlight on the glareshield. On the ground, the APU can be shut down by pushing an APU emergency stop button located in the aft equipment compartment or by selecting the APU shut-off (cover-guarded) switch on the external services panel on the RH forward fuselage. Either selection sends a signal to the ECU to carry out an immediate shutdown.



1 APU Symbol
- White - APU not running
- Blue - APU Running

2 APU Fuel Feed Shut Off Valve Position Indicator
- White - Open or Closed (rotates in direction of flow)
- Amber - Failed

3 APU Fuel Feed
- Green - Normal Flow
- Red - Fire at APU

4 APU Fuel Pump Symbol
- White - Pump is off
- Green - Pump is on
- Amber - Pump failed

ELECTRICAL

INTRODUCTION

The aircraft uses both 115 Volts AC[1] (Alternating Current) and 28 volts DC[2] (Direct Current) power. AC electrical power is provided by two engine-driven generation systems. Each system includes an integrated drive generator (IDG) and a generator control unit (GCU). An auxiliary power unit (APU) generator is also available as a back AC power source to replace either or both IDGs.

In the event of total AC power loss, emergency AC power is available from an in-flight air-driven generator (ADG). The ADG assembly is stowed in a compartment on the right side of the nose section.

DC power is supplied by five transformer rectifier units (TRU) which rectifies AC input power into DC output power. Another source of DC power is from a main battery and APU battery. The main and APU batteries are connected into the aircraft DC electrical power system and are charged by their respective battery chargers. Power for starting the APU is provided by the APU battery.

Electrical contactors, are used for connecting AC and DC power to the appropriate buses and components. Power connection is dependent on system configuration and health. The following is a list of all the aircraft electrical system buses:

AC BUSSES	DC BUSSES
AC BUS 1	DC BUS 1
AC BUS 2	DC BUS 2
AC ESSENTIAL BUS	DC ESSENTIAL BUS
AC SERVICE BUS	DC SERVICE BUS
ADG BUS	LEFT AND RIGHT BATTERY BUS
AC UTILITY BUS 1	DC EMERGENCY BUS
AC UTILITY BUS 2	DC UTILITY BUS 1
	DC UTILITY BUS 2
	MAIN BATTERY DIRECT BUS
	APU BATTERY DIRECT BUS

On the ground, the aircraft can receive external AC / DC power through a receptacle located on the forward right side of the fuselage.

Electrical system warnings and cautions are displayed on the EICAS primary page. General views of the electrical systems are displayed on the EICAS, AC and DC synoptic pages that are accessed through the EICAS control panel (ECP). One push of the ELEC key on the ECP will display the AC synoptic page. Pushing the ELEC key a second time will display the DC synoptic page.

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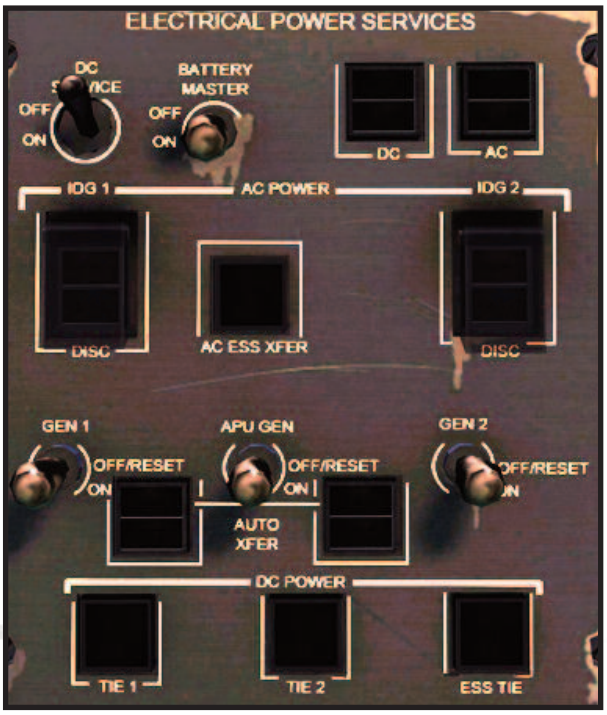
1. AC - the movement (or flow) of electric charge periodically reverses direction. An electric charge would for instance move forward, then backward, then forward, then backward, over and over again. More info: http://en.wikipedia.org/wiki/Alternating_current

2. DC:The unidirectional flow of electric charge. Direct current is produced by such sources as batteries, thermocouples, solar cells, and commutator-type electric machines of the dynamo type. Direct current may flow in a conductor such as a wire, but can also be through semiconductors, insulators, or even through a vacuum as in electron or ion beams. The electric charge flows in a constant direction, distinguishing it from alternating current (AC). Direct current is used to charge batteries, and in nearly all electronic systems as the power supply More info: http://en.wikipedia.org/wiki/Direct_current



Electrical Power Panel. Overhead Panel

AC ELECTRICAL SYSTEM

AC power for the aircraft electrical systems is provided by two engine-driven, integrated drive generators (IDGs) which supply power to all AC buses during normal operations. An APU generator provides a backup AC power source in flight if an IDG is inoperative or when the aircraft is on the ground with the engines off. If all AC power is lost in flight, emergency AC power is provided automatically by a deployable air-driven generator (ADG). The AC distribution system is controlled by the respective IDG and APU generator control units An AC power distribution schematic and system parameters are displayed on the EICAS AC synoptic page.

Integrated Drive Generator (IDG)

Change the variable input speed from the engine accessory gearbox to a constant output speed to the generator to produce 115 volts AC and to maintain a constant frequency of 400 Hz. An oil cooler cools the oil used by the IDG. Each IDG is monitored for low oil pressure or high oil temperature. In the event of low oil pressure or high oil temperature, an (amber) FAULT light (cover-guarded) on the EPSP will illuminate. Lifting the cover-guard and pushing the switchlight will manually disconnect the IDG from the engine gearbox. Once disconnected, either manually or automatically, the IDG cannot be reconnected in flight. If the IDG was disconnected manually, it can only be reset on the ground, with the engine shutdown.

Each generator control unit (GCU) controls and protect the related AC generator system and provides voltage and frequency regulation and fault protection for its respective generator.

APU Generator

The APU generator is driven, directly by the APU gearbox, at a constant speed to maintain a constant frequency output. The generator provides 115 volts, 400 Hz AC power. provides the same regulation and protection functions as the IDG GCUs.

AC Distribution

There are two different configurations of AC power distribution: Full configuration and Service configuration.

• Full configuration

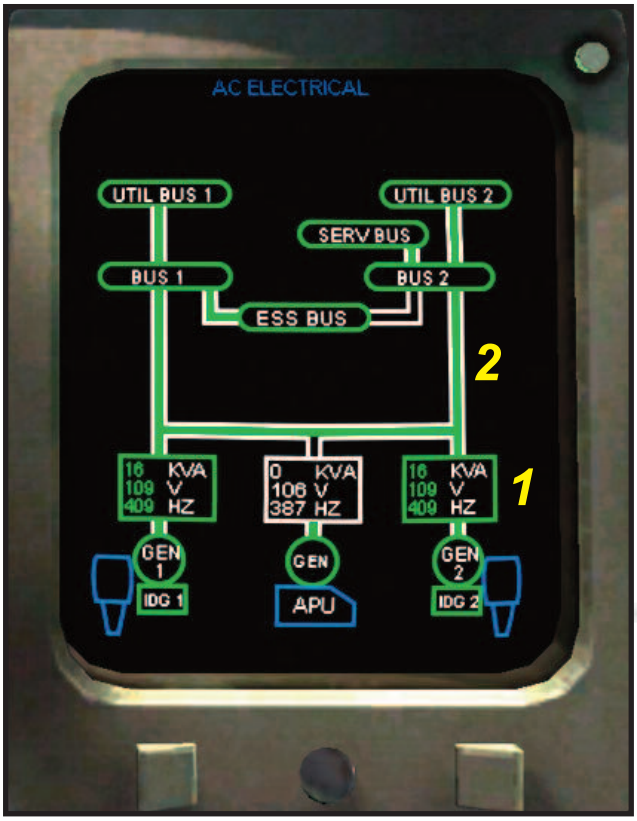
In Full configuration, all the AC buses are powered using either IDG 1, IDG 2, the APU generator or external AC. For normal AC distribution, AC power from IDG 1 and IDG 2 is distributed to all the AC buses.
During normal operation, IDG 1 powers AC bus 1 and IDG 2 powers AC bus 2. The failure of a generator, will automatically transfer the load from the failed IDG to the remaining operative IDG. When the APU generator is available, it can then be used to replace the failed IDG to power the respective AC bus.

On the ground, if the aircraft is being powered with external AC power and either the APU or an IDG is brought on line, the external power will be automatically disconnected and the respective APU or IDG generator will power all the AC buses. When external power is not available, the APU generator provides electrical power to all the AC buses. If an IDG is powering its respective AC bus and the APU generator is powering the other AC bus, when the remaining IDG is brought on line the APU generator will be automatically taken off line.

• Service configuration

either external AC power or the APU generator is used to power specific buses for general servicing of the aircraft on the ground. Only AC Utility bus 1, AC Utility bus 2, the AC service bus and the DC service bus are powered.

IDG 1	APU GENERATOR	IDG 2
Failed	Not available	Both AC Bus 1 and AC Bus 2
Failed	AC Bus 1	AC Bus 2
Both AC Bus 1 and AC Bus 2	Not available	Failed
AC Bus 1	AC Bus 2	Failed
Failed	Both AC Bus 1 and AC Bus 2	Failed



1 Generator Info.

Generator Load. Displays the load of the Generator in KVA.

Generator Voltage. Displays the generator voltage level in volts.

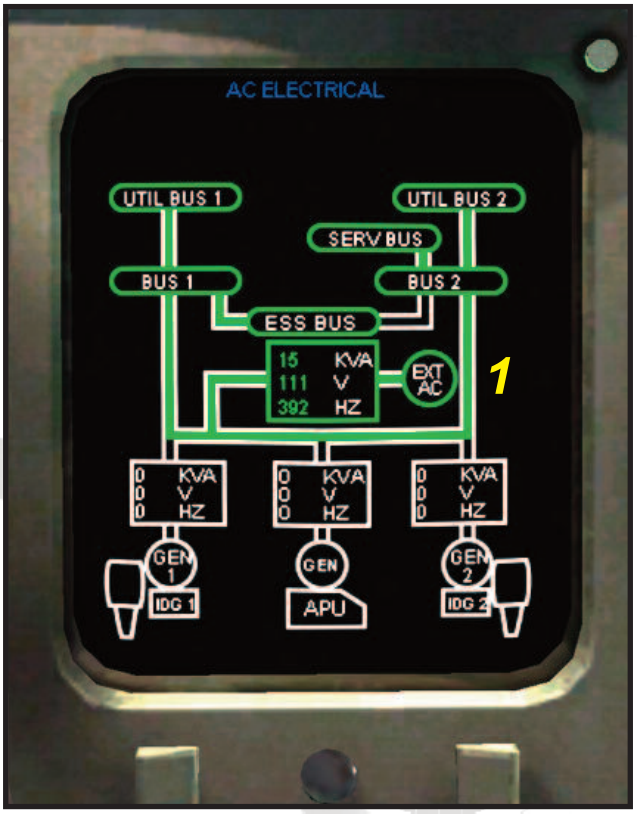
Generator Frequency. Displays the generator frequency level in Hz.

2 Flow Lines

- Green - Bus energized.
- Blank - Bus not energized.

Color of buses:

- Green - Bus energized.
- White - Bus not energized.



1 AC External

- Green - External AC available or in use
- White - Extrnal AC not available and not in use

1 Generators messages on Primary Page

Generators not connected.

The **AC essential bus** is normally powered by AC bus 1. If a fault exists on AC bus 1, the GCU will automatically transfer the power supplied to the AC essential bus, from AC bus 1 to AC bus 2. The crew can also manually transfer the AC essential bus supply power, from AC bus 1 to AC bus 2, using the AC ESS XFER switchlight on the electrical panel. On the ground, it can be powered from the APU generator or from external AC power.

The **AC service bus** supplies power to those circuits necessary for ground servicing operations, without having to power the entire electrical system.

The **AC utility** buses are normally powered by their respective AC bus. In service configuration, the AC utility buses are powered from either the APU generator or from external AC power.

AC Loads Distribution

The services that the busses feeds are:

AC BUS 1	AC BUS 2	AC ESSENTIAL
ADG Deploy Sensor	ADG Deploy Sensor	ARINC Chassis and Display
Enhanced Ground Proximity Warning System (EGPWS)	ARINC Display Fan, Galley and Cabin Fan	Avoidance (TCAS)
Display Cooling Fan	Flap Power Drive Unit	Bleed Leak Controllers (L / R)
Engine Vibration Monitor	HSTA (Ch1)	CB Panel Integral Lights
Exhaust and Cockpit Fan	Hydraulic Pumps 3A and 1B	Cooling Fans (L)
Flap Power Drive Unit	Ice Detector 2	Engine Ignition A
Flight Recorder Power	Inertial Reference System	Essential TRU 1
Ground Proximity Warning System (GPWS)	Instrument Lights (copilot and overhead), Landing and Taxi Lights (R)	Head up Guidance System
Hydraulic Pumps 2B and 3B	Right Window Heater	HSTA
Hydraulic System Fan	Right Windshield Heaters	Ice Detector 1
Left -Navigation, Landing and Taxi Lights	TRU 2, DC Essential bus	Inertial Reference System
Left Windshield Heater		Instrument Lights (Pilot's and Center)
Probe Heaters (R) (AOA and Pitot) and TAT		Left Window Heater
TRU 1, DC essential bus		Probe Heaters (L) (AOA and Pitot)
		Traffic Alert and Collision

AC UTILITY BUS 1	AC UTILITY BUS 2	AC SERVICE BUS	ADG BUS
Galley and Coffee Maker	APU Battery Charger	Service TRU	Flaps
Main Battery Charger	Galley and Water system	Toilet Motor / Pump	Hydrulic Pump 3B
Power Sensing Relay	Power Sensing Relay	Vacuum Cleaner	

Air Driven Generator (ADG)

In the event of a complete AC power failure in flight, the ADG will automatically deploy and supply 115 volts, 400 Hz AC emergency power to the ADG bus. The ADG bus will then supply emergency power to the AC essential bus and the 3B hydraulic pump. The AC essential bus will then power essential TRU 1, which will power the DC essential bus.

If the automatic deploy function fails, the ADG can be deployed manually by pulling the ADG manual release handle on the ADG CONTROL control panel at the rear of the center console.

The ADG will continue to power the critical flight controls and the ADG bus. The flaps will move at half speed when powered from the ADG bus. The ADG generator, voltage, frequency and ADG bus indications on the EICAS, AC ELECTRICAL synoptic page are only displayed when the ADG bus is powered.

The ADG will continue to operate and supply power to the ADG bus until the airspeed decreases below approximately 100 kts. At that point, if the APU generator or IDG has not been restored, the only power available will be from the batteries.

The ADG cannot be restowed in flight. It is restowed manually, on the ground, by maintenance personnel.

DC ELECTRICAL SYSTEM

To have DC electrical power, the aircraft has 5 transformer rectifier units (TRU) and two batteries. Main and APU. Also can be supplied through an external DC receptacle.

Transformer Rectifier Units (TRU)

Five TRU converts 115 VAC input power to 28 VDC output power for powering DC buses. The TRU are rated at 100 amps.

INPUT BUS	TRU	OUTPUT BUS
AC Bus 1	TRU 1	DC Bus 1 and DC Utility Bus 1
AC Bus 2	TRU 2	DC Bus 2 and DC Utility Bus 2
	Essential TRU 2	DC Essential Bus and Battery Bus
AC Service Bus	Service Bus	DC Service Bus
AC Essential Bus	Essential TRU 1	DC Essential Bus and Battery Bus

Batteries

The main and APU Ni-Ca batteries and their battery chargers are located in the aft equipment compartment. The batteries provide DC power to their respective DC battery direct buses.

• **The main battery** provides backup power to the inertial reference system (IRS), proximity sensing electronic unit (PSEU), data concentrator units (DCU's), aircraft clocks, and the APU electronic control unit (ECU). The main battery also provides power to the flight compartment lighting system.

• The **APU battery** provides the power for starting the APU.

Battery chargers maintain the batteries at full charge. The main battery charger is powered from AC Utility bus 1 and the APU battery charger is powered from the AC Utility bus 2. Battery charging is controlled automatically. Each charger monitors the battery voltage and temperature to control the battery charge rate. If a battery reaches the overtemperature set point (as sensed by the charger), the charging will stop to prevent overheating.

External DC Power

The aircraft can be connected to 28 volts DC from an external receptacle located on the right aft fuselage below No. 2 engine. External DC is used for ground operations to save battery power and can be used to start the APU. When external DC is connected to the aircraft, an external DC contactor is energized to provide power to the APU start contactor. At the same time, the AVAIL lamp in the DC switchlight illuminates. Pressing the switchlight closes two contactors to connect the external DC to the Main and APU battery direct buses and the IN USE lamp in the switchlight illuminates.

DC Distribution

DC power is distributed to the DC system by five TRU's.

- DC bus 1 and DC Utility bus 1 are powered from TRU 1.
- DC bus 2 and DC Utility bus 2 are powered from TRU 2.
- DC essential bus and battery buses are powered from the essential TRUs.
- Emergency bus is powered from the battery bus and the APU battery direct bus. The service
- DC Service bus is powered by service TRU

- In the event that an essential TRU fails, the DC essential bus and battery bus will remain powered from the operating essential TRU.
- If both essential TRU's fail, the essential DC bus and battery bus may still be powered from the service TRU by selecting the ESS TIE switchlight on the electrical panel.
- In the event that a main TRU fails, the respective DC tie will close to maintain power to the respective DC bus 1/2 from the service TRU.

DC BUS 1		
Spoiler Electronic Unit	Maintenance Diagnostic	DC Tie Control
Spoiler Electronic Control	Computer	Bus 1 Feed Utility
System (PWR 1)	DME 1	Bus 1 Feed
Heaters, Static (R) and ADS Controller (R)	Radio Altimeter	DC 1 power Sensing
Cockpit Temperature Control	Flight Data Recorder Control	TRU 1 Power Sensing
Left Windshield Heat Controller	Weather Radar (receiver, transmitter and control)	AC Utility Bus Control
14th Stage Bleed Air Isolation and Shutoff Valve (L)	EICAS Primary Display	Left Air Conditioning Unit
10th Stage Bleed Air Isolation and Shutoff Valve (L)	EICAS Secondary Display	DME (1)
Anti ice Automatic NORM (1)	Left Lamp Driver Unit	Smoke detector
Proximity Sensor (Landing Gear Control / Door 1)	Bright/dim Power supply unit	Passenger signs
(Weight on wheels 1)	Data Loader	Overboard shutoff Valve
Lights (cockpit floor, rear	Flap Control (CH 1)	Pilots Wiper (motor and control)
anti collision, wing inspection)	Nose Landing Lights	Anti-Skid
	Brake Temperature Monitor	Hydraulic System (AC pump control 2 and 3B, fan control, Indicator 2)
	FMS (CDU 1)	

DC BUS 2

- Horizontal Stabilizer Trim Control Unit (CH 1)
- Spoiler Electronic Unit (2A)
- Spoiler Electronic Control System (PWR 2)
- Clock 2
- Cabin Temperature Controller and Manual Controller
- Right Windshield and Window Heater Controller
- 14th Stage Bleed Air Isolation and Shutoff Valve (R)
- 10th Stage Bleed Air Isolation and Shutoff Valve (R)
- Ant-ice Automatic NORM (2)
- Fuel Pump Control (R)
- Proximity Sensor (Landing Gear Control/Door 2) (Weight--on--wheels 2)
- Avionics Cooling (controller 2, cockpit shutoff valve, overboard shutoff valve
- IAPS (AFCS) (right fan)
- EFIS Control Panel 2
- DCU 3 (CH A,B)
- Audio Control Panel (observers)
- ADF 2
- DME 2
- VHF Nav radio 2
- VHF Comm radio 2
- PFD 2
- MFD 2
- RTU 2
- Air Data Computer (2)
- ATC Transponder 2
- Brake Pressure Indicator
- Anti-Skid
- Copilots Wiper (motor and control)
- Hydraulic System (AC pump control 1 and 3A, Indicator 1)
- DC Tie Control
- Bus 2 Feed Tie and Utility
- DC 2 power Sensing
- TRU 1 Power Sensing
- AC Utility Bus Control
- Right Air Conditioning Unit
- Flap Control (CH 2)
- Nose Wheel Steering
- Clock 2
- Lights (copilot map and wing anti-collision)

DC ESSENTIAL BUS

- Horizontal Stabilizer Trim Control Unit (CH--2)
- Spoiler Electronic Unit (1A, 2B)
- Spoiler Electronic Control System 1-2 (PWR 3)
- Heater, Static and ADS Heater Control (L)
- Cabin Pressure Controllers (1 and 2) and Control Panel
- Left Window Heater Control
- 10th-stage Bleed air IsolationValve
- Bleed Air Leak Test
- Anti-ice Manual (L) STBY
- Thrust Reverser (Auto, stow, 1 and 2)
- Fuel (Transfer shutoff valve and control)
- Oil Pressure (R)
- Passenger Door Control
- Proximity Sensor (Landing Gear Control)
- Pilot's Floodlights
- Emergency Lights
- EFIS, CRT, Dimming Panel 1
- Avionic Cooling Controller (1)
- Stall Protection (CH-R)
- DCU 1 (CH A, B)
- EFIS Panel 1
- Audio Control Panel (copilot's)
- ADC 1
- ADF 1
- VHF Nav Radio (1)
- Cockpit Voice Recorder
- PFD 1
- MFD 1
- RTU 1
- Clock 1
- ATC Transponder 1
- Head-up Guidance System
- IAPS (AFCS) (left fan)

BATTERY BUS

Passenger Oxygen (manual deploy and left passengers)

Fuel System Control

Left Fuel Pump (Control and Power)

Fuel XFeed Control

Left Engine oil Pressure

Passenger Address

Lights (Standby instrument and compass, map dome,chart holder,overhead and copilot flood)

Fire Detector (A, B, Test)

Passenger Signs

EICAS/RTU Dimming

Stall Protection (stick pusher CH 1)

Audio Control Panel (pilot's)

Air Data Computer(1 and 2) Alternate power supply
VHF Comm Radio 1

Emergency Tuning Unit

IDG Disconnect (1 and 2)

Essential AC Transfer Control

GCU (1, 2 and 3)

DC Emergency bus Feed

Engine Ignition (A & B) Control

Engine Start (L and R)

Transfer/APU (manual x--flow, fuel pump, controller, ECU)

Clock 1

Ram Air Shutoff Valve

CPAM

Crew Oxygen Monitor

Passenger Oxygen (auto deploy and right passengers)
Anti-ice Valves (L and R manual 2)

Proximity Sensor (Landing Gear Control/Door 1 and 2) (Weight-on-wheels 1 and 2)

EICAS Control Panel

DCU 1 and 2 (CH A and B)

Standby Horizon Indicator

EICAS Display 1 (ED1)

EICAS Display 2 (ED2)

Lamp Driver Unit

Bright/Dim Power Supply Unit

Hyd System 3 (Gauges)

ADG Controller (auto and manual)

Essential TRU (power 1 and 2 sensing)

Feed 1 (battery and DC essential)

Feed 2 (battery and DC essential)

Battery Bus (power sensing)

RCCB Control (Main and APU battery)

FMS (CDU 2)

Overheat Detector (Main landing gear bay)

MAIN BATTERY DIRECT BUS	APU BATTERY DIRECT BUS	BATTERY BUS
Main Battery Contactor APU ECU DCU's 1 and 2 Standby Power Controller Attitude Heading Clocks 1 and 2 PSEU Lights (service, boarding and maintenance)	APU Battery Contactor Service Bus Feed Oil Bypass Indicator Engine Oil Replenishment System ADG (auto and manual deploy) External DC Power Essential Power Control Refuel/Defuel Panel Emergency Refuel	Engine Ignition System (B)

DC UTILITY BUS 1	DC UTILITY BUS 2	DC SERVICE BUS
Left Cabin Reading Lights Power sensing	Right Cabin Reading Lights Power sensing	Lights (navigation, toilet and galley dome) Cabin Lighting, Upward and Downward (L and R) Service Bus Feed from CBP-5 Power Sensing (service bus and TRU)

ENVIRONMENTAL CONTROL SYSTEM

INTRODUCTION

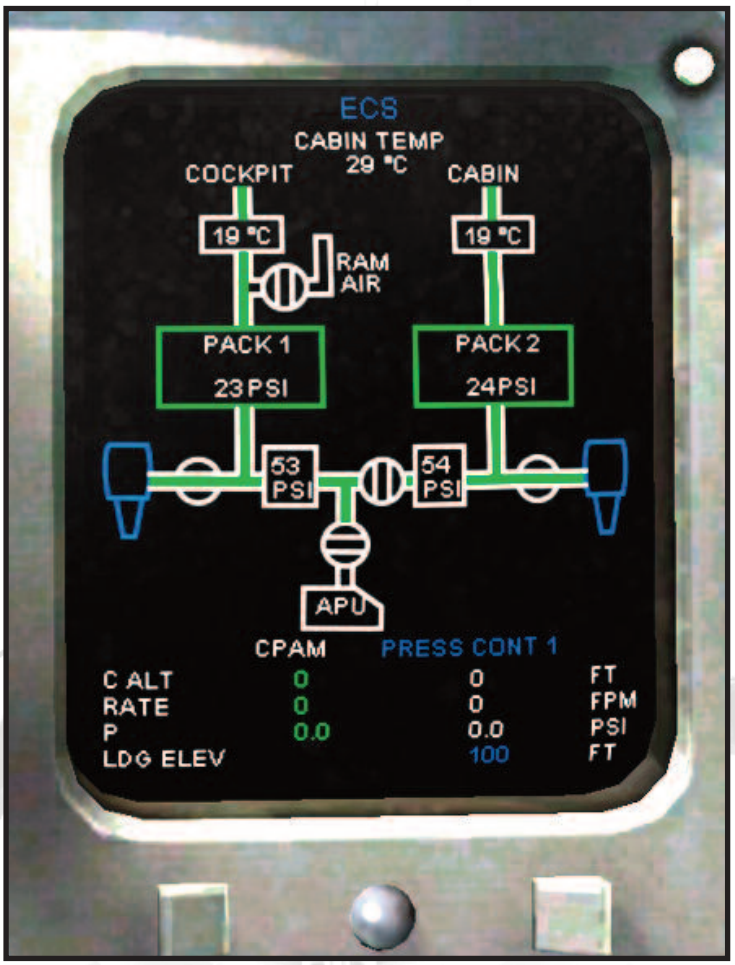
The environmental control system (ECS) provides temperature and pressure regulated air for heating, ventilating and pressurizing the flight and passenger compartments. Exhaust air, from the compartments, is used to ventilate the avionics and cargo compartments, before being dumped overboard through two outflow valves.

For ground operations, pneumatic air to operate the ECS can be obtained from:

- A ground air supply cart connected to the aircraft
- The auxiliary power unit (APU)
- Either or both engines.

During flight, the engines normally supply bleed air for operating the air-conditioning, pressurization, and avionics cooling systems.

ECS warnings and cautions are displayed on the engine indication and crew alerting system (EICAS) primary page. ECS advisory and status messages are displayed on the EICAS status page. Views of the aircraft ECS temperature, pressure, valve positions and system status indications are displayed on the EICAS ECS synoptic page.



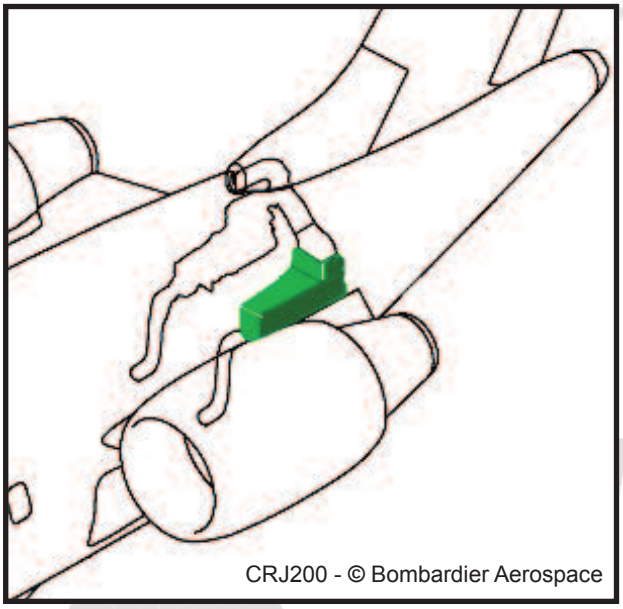
ECS Display on EICAS

AIR-CONDITIONING SYSTEM

There are two air-conditioning systems, which can be operated separately or in parallel, to supply conditioned air to the flight and passenger compartments. Each system consists of an air-conditioning unit or package (PACK), a temperature controller and ducting. Ram air is provided for pack cooling and ventilation. The temperature controllers also control the engine 10th stage bleed air supply to the system.

PACKS

The packs are located in the aft equipment compartment. They provide cooling of the engine or APU bleed air supplies for distribution to the flight and passenger compartments. Bleed air to each pack is regulated by respective pressure regulator and shutoff valves. Each pack consists of an air cycle machine and heat exchanger which are used to decrease the temperature and water content of the bleed air used in the conditioning process. Normally, the right pack supplies the passenger compartment and the left pack supplies the flight compartment. If a pack fails, the remaining pack can supply conditioned air to both compartments.



Position of packs on the plane.

Packs Control on the Air - Conditioning Panel - Overhead.

TEMPERATURE CONTROL

The flight compartment and the passenger compartments have independently-operated temperature control systems. Each controller subsystem is dedicated to an air-conditioning pack.

Temperature control, in automatic mode, is provided by CKPT and CABIN selector knobs on the air conditioning panel. Control in manual mode is provided by left and right pack MAN switchlights and HOT/COLD switches on the same panel. The individual packs can be manually turned OFF by selecting the respective L or R PACK switchlight on the air conditioning panel.

AUTOMATIC MODE - Operating Range	MANUAL MODE - Operating Range
14.0º C to 28º C (57º F to 82º F)	1.6º to 71º C (34º F to 160º F)

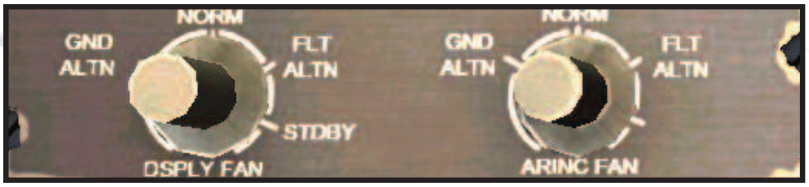
RAM AIR VENTILATION

The cooling air for the left and right heat exchangers is supplied from a ram air intake, located on the upper aft fuselage. After passing over them the ram air is exhausted through an exhaust duct in the lower aft fuselage. Also provides cooling air to the hydraulic systems heat exchanger to cool the hydraulic fluid.

Ram air ventilation is used only when the air conditioning packs fail. Operating the (guarded) RAM AIR, switchlight on the air conditioning panel, opens the normally closed ram air valve. Ram air then enters the left supply system and flows through the distribution manifold to the passenger compartment.

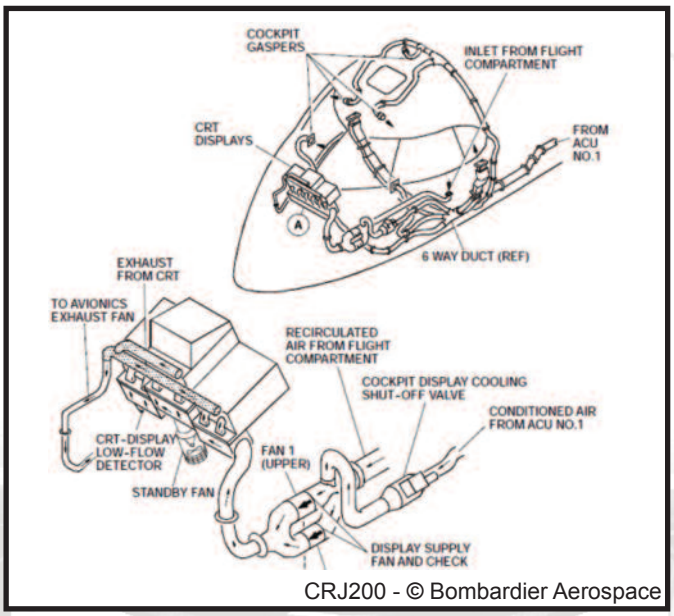
AVIONICS COOLING SYSTEM

The electronic flight instruments and display units are cooled during on ground and flight operations, to prevent overheating and malfunction.



The cockpit displays are cooled with air from two display fans located under the flight compartment floor. Fan control is provided by a DSPLY FAN selector knob on the avionics cooling panel. Normally, only one fan operates at a time. In flight, only fan 1 is powered and on the ground, only fan 2 is powered. Both supplies the air to the backs of each display. In the event of a fan failure, the alternate fan can be powered by selecting the FLT ALTN or GND ALTN position. If both fans fail, selecting STDBY permits conditioned air to ventilate the displays.

Same as the Display fans, the ARINC cooling fans provide recirculated cabin air to the left and right avionics equipment racks. Fan control is provided by an ARINC FAN selector knob on the avionics cooling panel. In the NORM position, only one fan operates at a time. In flight, only fan 1 is powered and on the ground, only fan 2 is powered. In the event of a fan failure, the alternate fan can be powered by selecting the FLT ALTN or GND ALTN position.



CRJ200 - © Bombardier Aerospace

CARGO COMPARTMENT AIR SYSTEM

The cargo compartment conditioned air system allows the flight crew to control the ventilation air and temperature within the cargo compartment. The system consists of a recirculation air shut-off valve, recirculation fan, and an exhaust air shut-off valve.

The system is controlled by a 2-position CARGO, OFF/FAN switch on the air-conditioning panel. In the OFF position, both shut-off valves are closed and the system is disabled. In the FAN position, both shut-off valves open and the fan is powered to blow recirculated cabin air into the cargo compartment to maintain the compartment temperature above freezing.

PRESSURIZATION SYSTEM

The aircraft is pressurized by bleed air supplied by the air-conditioning system. The pressurization is almost totally automatic, the crew only has to set the landing field elevation, on the CABIN PRESS control panel, to program the system for flight. If the normal automatic mode fails, the pressurization can be controlled manually by controls on the CABIN PRESS control panel.

Manual Pressurization Modes

- UP selection, Cabin ascends at selected rate of 50 fpm to 3,000 ±1000 fpm. When the desired cabin altitude is reached, select MAN ALT to mid position.
- DN selection, Cabin descends at selected rate of 50 fpm to 3,000 ±1000 fpm. When the desired cabin altitude is reached, select MAN ALT to mid position.
- Mid selection, Disables all previous MAN ALT selections.

All controls of rate increments can be made with the MAN RATE Knob. -DECR will decrease the vertical velocity and +INCR will increase it. The Ascent and descent rates are indicated on ECS page of EICAS.

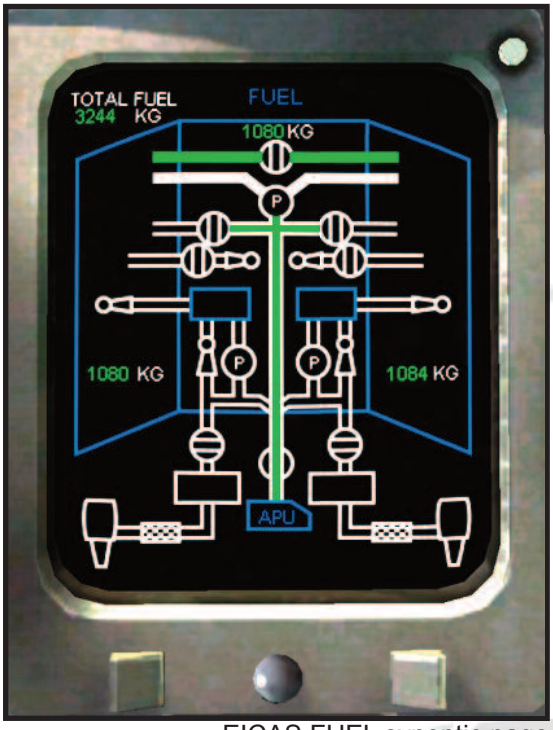
A Emergency Depress button is supplied for matching the external press with internal one to let us open the doors of the plane.
If you don't make a good pressurization of the cabin you won't be able to open the doors when landing. Use this button to have the posibility to open them (main or emergency exit)

FUEL SYSTEM

INTRODUCTION

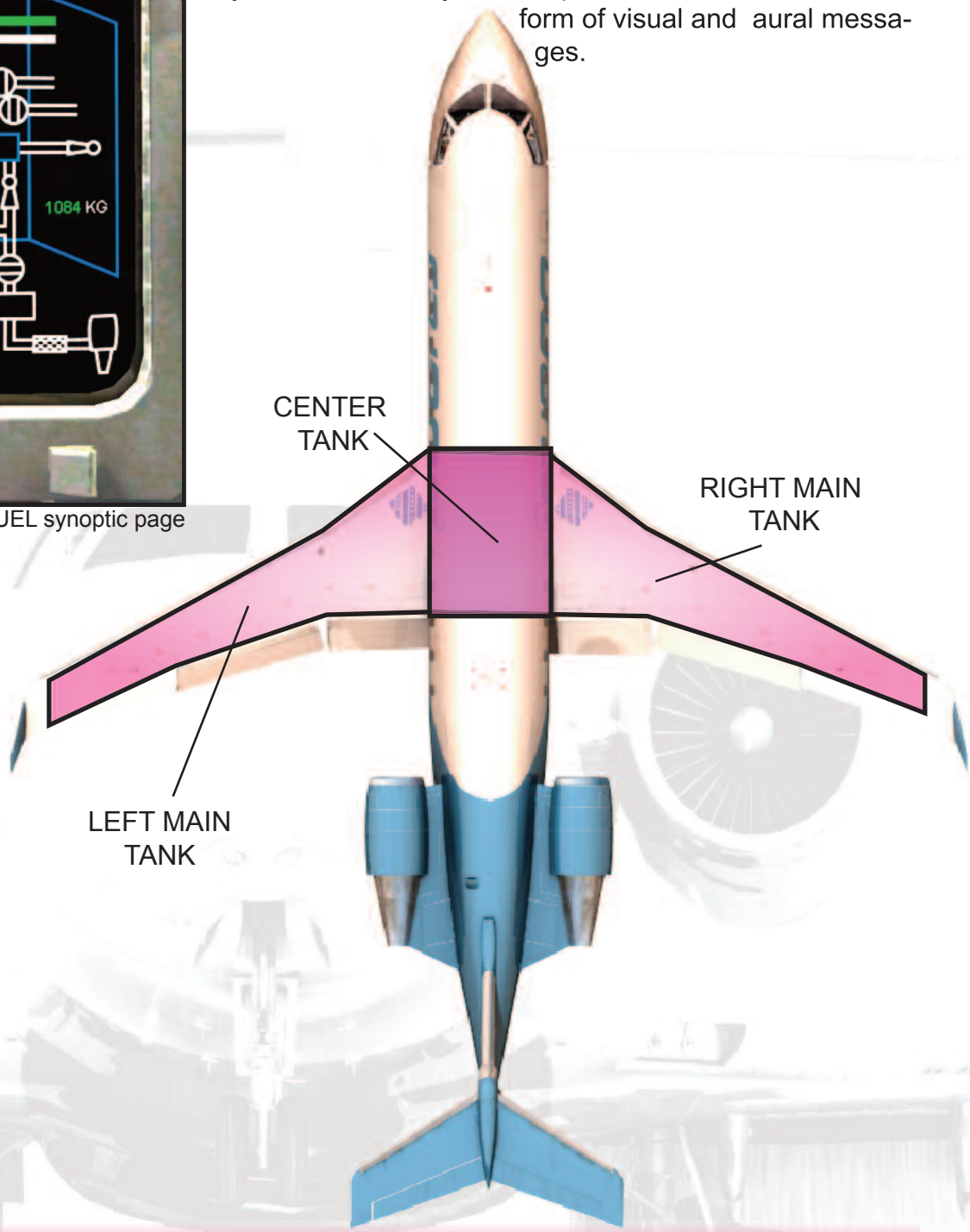
The fuel system consists of three integral tanks within the wing box structure. Ejector pumps and electrical boost pumps supply fuel to each engine. Power and gravity crossflow systems allow fuel transfer between wing tanks and also provides fuel to the auxiliary power unit (APU).

A fuel system computer automatically controls refueling, powered fuel crossflow and fuel transfer. The computer also measures the fuel quantity and temperature for display on the engine indication and EICAS.



EICAS FUEL synoptic page

The EICAS FUEL synoptic page shows a diagram of the fuel distribution system. Operation of the ejectors, pumps and shutoff valves are displayed. Any fault detected by the computer is annunciated in the form of visual and aural messages.



FUEL STORAGE

Is composed of two main wing tanks and one center wing tank. In flight, as the wing tank fuel quantity decreases, the fuel system computer will automatically transfer fuel from the center tank to the wing tanks to maintain lateral balance.

Two collector 10 gallons (38 liters) tanks are located in the forward section of the center wing tank. Fuel from each wing tank is fed under pressure or gravity to its respective collector tank. There is no migration of fuel from the center tank into the collector tanks. A main fuel ejector in each collector tank is immersed in fuel and is used to ensure a positive supply of fuel to the engines. The boost pumps normally supply fuel to the engines for start, from each collector tank.

Left Wing Tank	**-**	**4760lb (2159kg)**
Right Wing Tank	**-**	**4760lb (2159kg)**
Center Tank	**-**	**4998lb (2267kg)**
TOTAL	**-**	**14518lb (6585.2kg)**

To refuel please go to the x-plane menu Aircraft / Weight and Fuel and put your desired amount of fuel in each tank before flight and starting systems.

FUEL MANAGEMENT

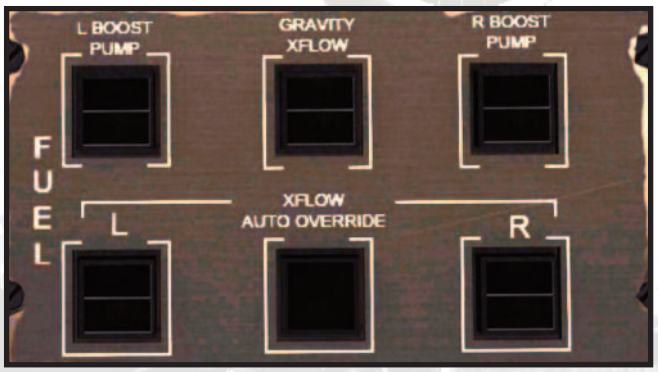
Fuel management is accomplished by fuel transfer from the center tank to the wing tanks and by fuel crossflow from one wing tank to the other wing tank.

Fuel transfer from the centre tank to the wing tanks is provided by transfer ejector pumps to maintain the wing tanks at full capacity as long as possible. This is an automatic function with no manual control. The Fuel System Computer commands the respective transfer shutoff valve to open when the associated wing tank fuel quantity falls below 94% of full, and commands it to close when the tank quantity reaches 97%. It will do this “on and off” process until the center tank is empty.

If the fuel imbalance between the wing tanks exceeds 400 lbs (181 kg), a FUEL IMBALANCE caution message is displayed on the EICAS primary page. If the total fuel quantity is less than 900 lbs (408 kg) the fuel quantity indication on the primary page turns amber.

To correct fuel imbalance and to maintain aircraft lateral stability, the Fuel System Computer automatically initiates **fuel crossflow** upon detecting a fuel imbalance between wing tanks. The crossflow/APU pump located within the center tank provides powered crossflow in either automatic or manual mode.

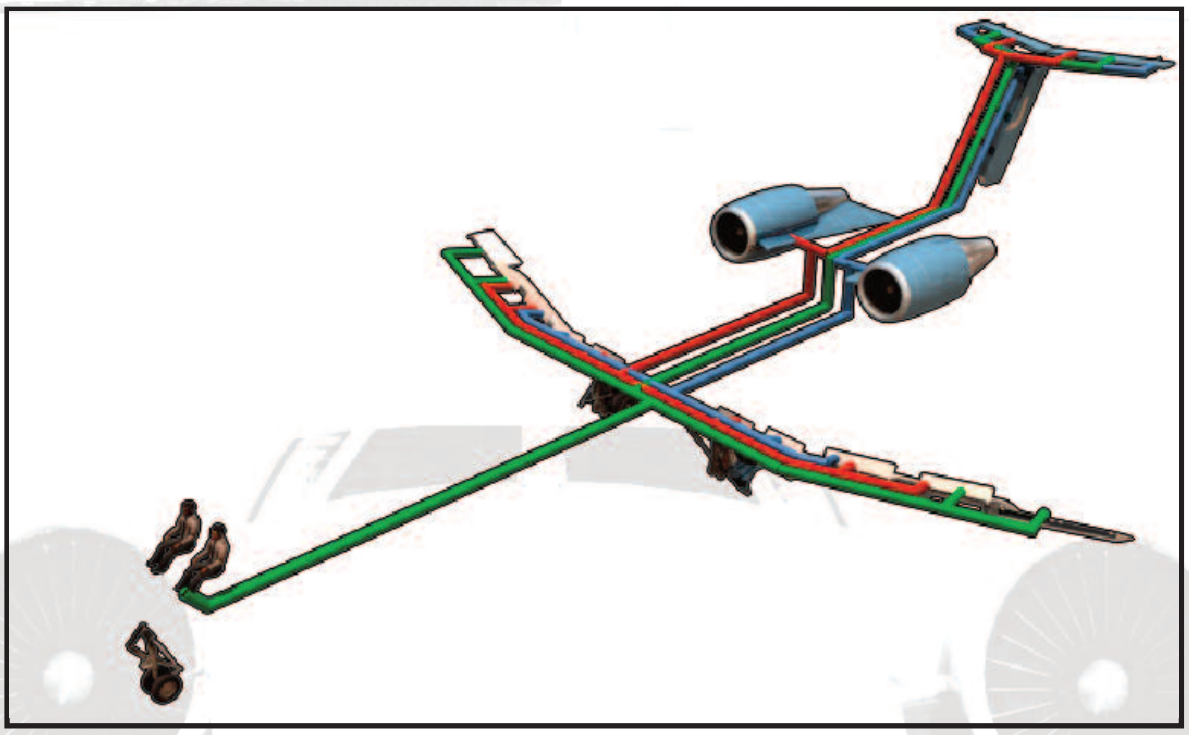
In automatic mode, the computer controls the crossflow operation. If the computer detects a fuel imbalance between the wing tanks of 200 lbs (90 kg), the crossflow pump is activated automatically and the required crossflow shutoff valve is opened to correct the fuel imbalance. Crossflow operations continue until 50 lb (23kg) imbalance is reached.



The flight crew can override the automatic function by selecting the XFLOW, AUTO OVERRIDE switchlight and the required (L or R) XFLOW valve switchlight on the Fuel Control Panel.

If the powered crossflow system fails, the flight crew can select the GRAVITY XFLOW switchlight on the Fuel Control Panel. This will open the gravity shutoff valve to allow fuel transfer by gravity between wing tanks.

HYDRAULIC SYSTEM



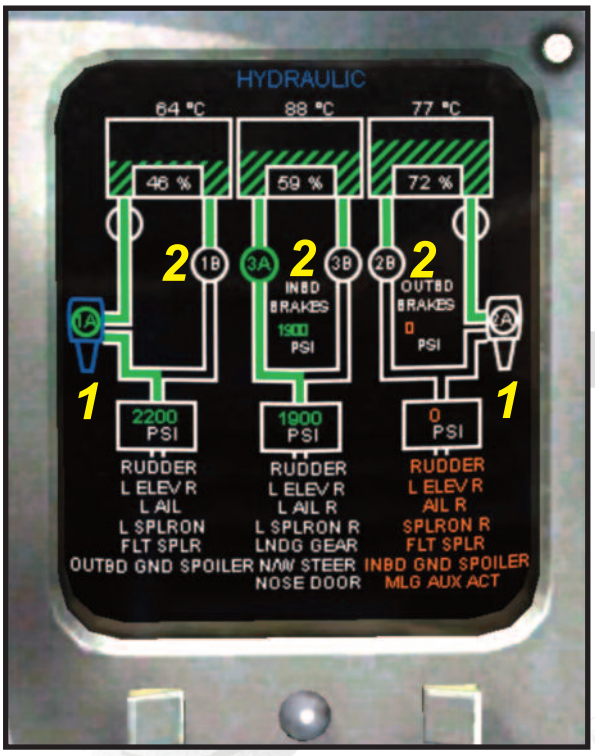
INTRODUCTION

Hydraulic power is provided by three independent systems designated No.1, No.2 and No.3. All systems operate at a nominal pressure of 2990 psi (20,600 kPa) and use synthetic hydraulic fluid “Skydrol” (very corrosive fluid).

Each system has two hydraulic pumps; a main pump (A) for normal power and a backup pump (B) for supplementary power. System No.1 and 2 main pumps are engine driven pumps (EDP’s). System 1 EDP (1A) is driven by the left engine and system 2 EDP (2A) is driven by the right engine. System 1 and 2 backup pumps (1B and 2B) are electrical AC motor pumps (ACM-P’s). Both hydraulic pumps for system No.3 are ACMP’s.

The hydraulic systems supply power to operate the rudder, elevators, ailerons, spoilerons, flight spoilers, ground spoilers, wheel brakes, nosewheel steering and landing gear extension and retraction. The rudder, elevators and ailerons are powered by more than one hydraulic system to prevent loss of critical flight controls.

During a total AC power failure in flight, pump 3B will be automatically powered by the air driven generator (ADG) when it is deployed. This will provide hydraulic pressure to the landing gear, brakes and nosewheel steering and also provides backup hydraulic pressure to the primary flight controls.



Hydraulic Systems Diagram EICAS Page

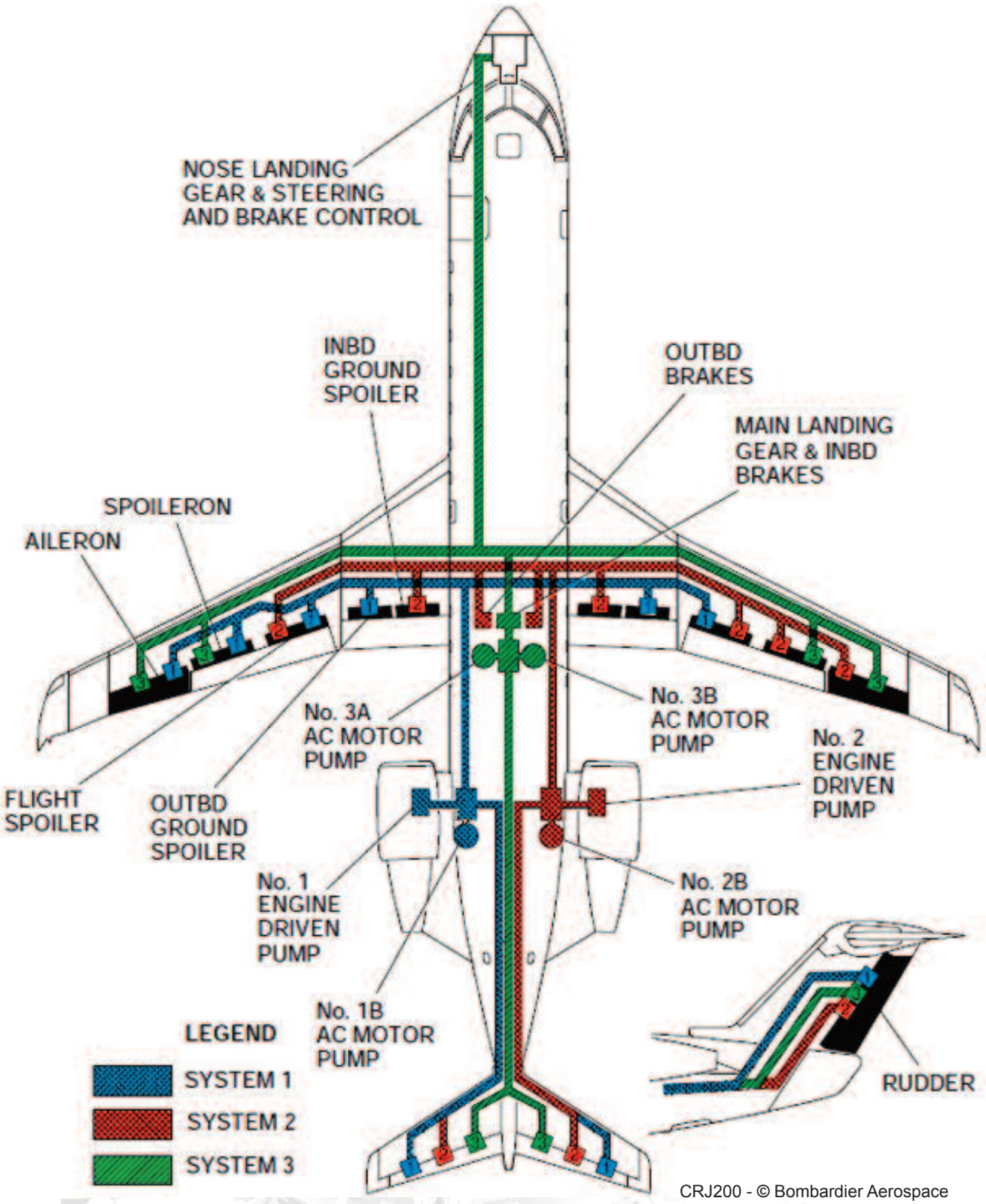
1 Engine Driven Pump symbol.

2 Electrical AC Motor Pump symbol.

Hydraulic Panel. Overhead Panel.

Both **No.1 and No.2** systems share a ram air heat exchanger for fluid cooling. Fluid from each system is not mixed with the other system as it passes through the heat exchanger. A fan within the heat exchanger assists in cooling the hydraulic fluid when the aircraft is on the ground.

Hydraulic system **No.3** has the same components as systems No.1 and No.2, with the exception that No. 3 system has two AC motor pumps (identified as 3A and 3B) and no engine driven pump (EDP). Hydraulic system No.3 provides a nominal 2990 psi pressure to the ailerons, elevators, rudder, spoilerons, landing gear actuators, inboard brakes and the nosewheel steering system. System No.3 hydraulic lines pass through the wings and are cooled by fuel.



Hydraulic Systems Overview

ICE AND RAIN PROTECTION SYSTEM

INTRODUCTION

To prevent Ice formation, ice and rain protection is provided for the wing leading edges, engines cowls, windshields, side windows and air data probes and sensors. An ice detection system alerts the flight crew of impending icing conditions.

Hot,14th stage engine bleed air is used for anti-icing the:

- Wing leading edges
- Engine cowlings.

Electrical power is used to provide anti-icing of the:

- Windshields
- Side windows
- Pitot static probes
- Static ports
- Ice detectors
- Total air temperature probe
- AOA sensors.

Electric windshield wipers provide rain removal for the pilot and copilot's windshields. Independent ice detection probes sense the formation of ice and supply indications to the flight crew
Ice and rain protection system warnings and cautions are displayed on the EICAS primary page.

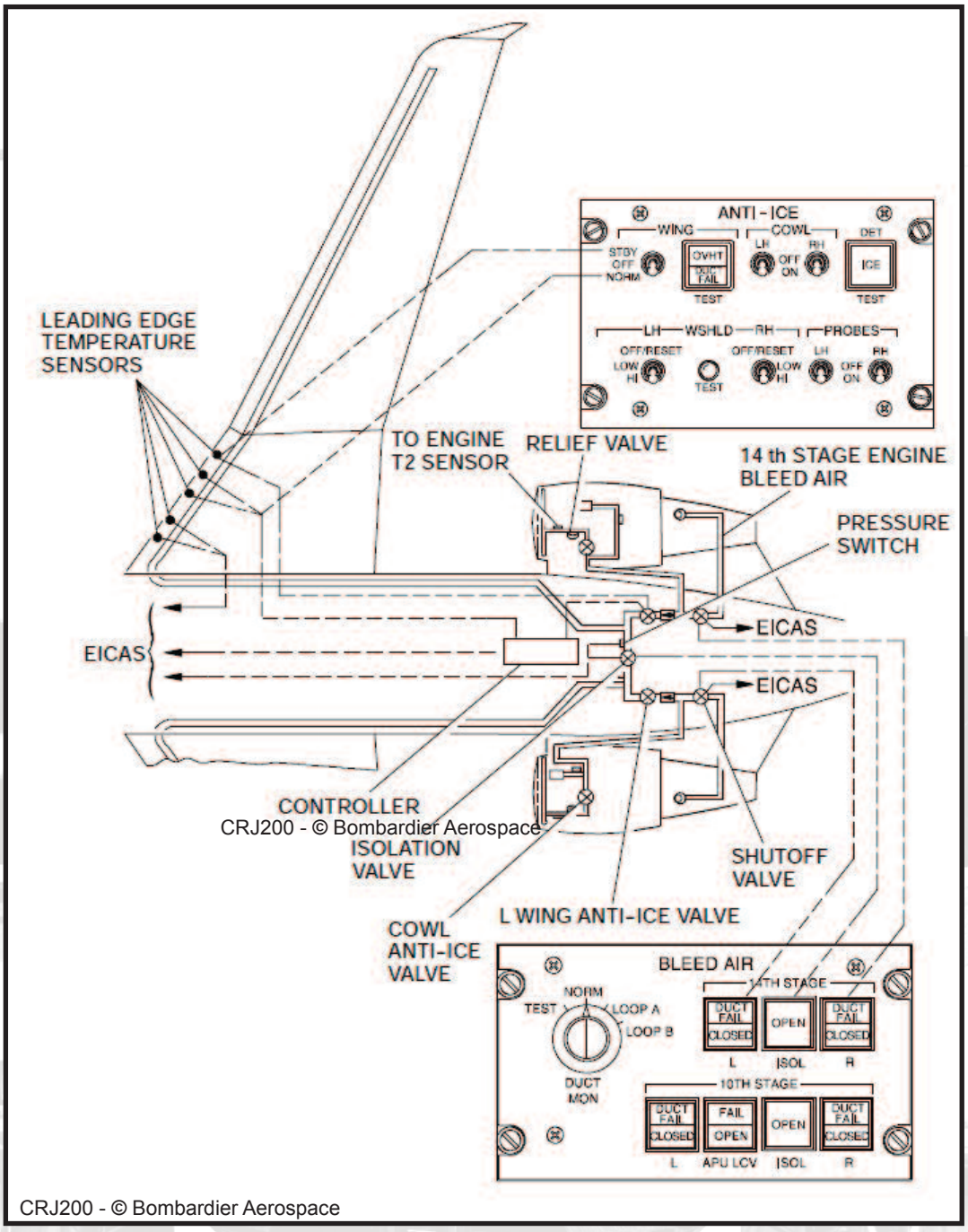
ICE DETECTION SYSTEM

The aircraft is equipped with an ice detection system to alert the flight crew of icing conditions. The ice detection system consists of two ice detector probes located on each side of the forward fuselage. The ice detection system operates continuously when AC power is available. During icing conditions, each detector is electrically deiced to allow continuous detection of ice formation.The ice detectors provide visual and aural indications of icing conditions.

WING ANTI-ICE SYSTEM

This system prevents ice formation on the wing leading edges by heating the surfaces with hot 14th stage engine bleed air. The hot bleed air is supplied to the inner surface of the wing leading edges. When normal anti-icing is selected, the wing leading edges are maintained at a constant temperature to shed ice and to prevent ice accumulation.
The wing anti-ice system is divided into identical left and right systems. In normal operation, each engine supplies hot bleed air to its respective wing anti-ice system. The systems are connected by a, normally closed, 14 stage isolation valve. In the event one system fails, the isolation valve is opened to permit cross bleeding between systems.

The system is manually activated and is automatically controlled by an anti-ice temperature controller located in the aft equipment compartment.



CRJ200 - © Bombardier Aerospace

Wing Anti-ice System

ENGINE COWL ANTI-ICE SYSTEM

The engine cowl anti-ice system prevents ice formation on the engine intake leading edges by heating the surfaces with hot 14th stage engine bleed air.
The hot bleed air is supplied to the intake leading edges through respective L/R cowl anti-ice valves.
The left and right cowl anti-ice valves are manually controlled by the respective LH and RH COWL switches on the ANTI-ICE control panel.
The valves are electrically controlled and pneumatically operated and are failed-safe to the open position. When power is applied to the aircraft, the valves go to close. Crew activation of each system, opens the respective cowl anti-ice valve.
Valve status is displayed on the EICAS, ANTI-ICE synoptic page.

AIR DATA ANTI-ICE SYSTEM

Air data probes and sensors are located on the left and right sides of the forward fuselage and extend into the airstream. The air data probes and sensors are monitored and controlled by three independent and identical air data sensor heater controllers to prevent ice formation that may cause erroneous air data information. The air data sensor heating system is activated automatically on the ground and in flight.
The ground mode has two operational heating modes, automatic and manual. When either engine generator is on and the LH and RH PROBES switches, on the ANTI-ICE control panel, are OFF, the LH and RH pitot probes and the standby pitot probe are heated at half power. The static ports, base heaters, TAT probe, and the AOA vanes are not powered automatically in the ground mode. However, they can be heated by selecting the LH and RH PROBES switches to ON.
In **the flight mode**, the automatic control function is completely independent of the control switches. The controllers automatically supply full power to all the air data probes and sensors, independently of switch position.

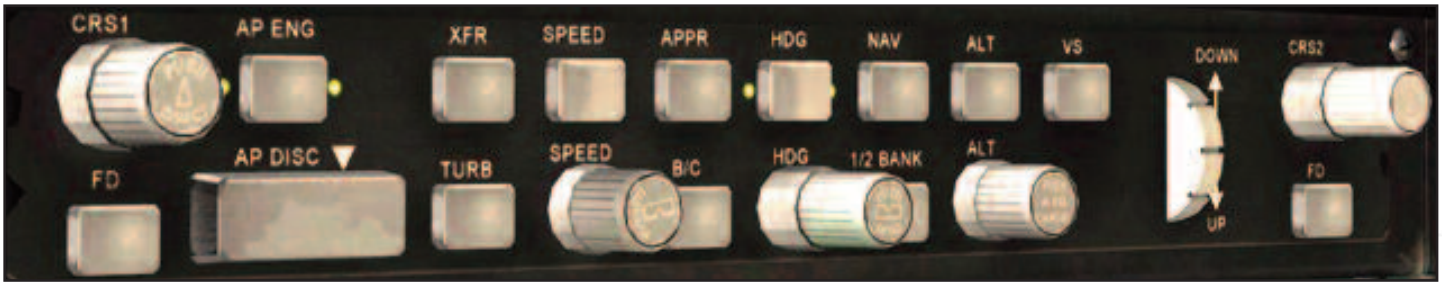
WINDSHIELD SYSTEM

Anti-icing and defogging of the windshields is achieved by electrically heating the windshields. Windshields incorporates an electrical heating element and three temperature sensors. One sensor is used for normal temperature control and another is used for overheat detection. The third sensor is used if one of the other sensors fail.
The amount of heat supplied to the windshields and side windows is controlled by a temperature controller. The controllers automatically regulate power to the heating elements as selected by the LOW/HI WSHLD switches on the ANTI-ICE control panel. When the switches are set to HI, the windshields are heated at a high temperature.
When an overheat condition is detected, the associated controller removes the power to the
heater element and posts a caution message on the EICAS primary page

WINDSHIELD WIPER SYSTEM

The windshield wiper system is designed to remove rain and/or snow from the pilot and co-pilot's windshields.
The windshield wiper system consists of independent pilot and copilot systems. Each system consists of a windshield wiper and motor. Each pilot has a selector, located on the WIPER control panel that actuates both wipers. Under normal operations, both wipers will operate in the same mode when selected from either panel. If each selector is set to a different mode, the last selection made overrides the previous selection. If one wiper system fails, the remaining system will still be functional. The wiper swich has two positions SLOW and FAST.

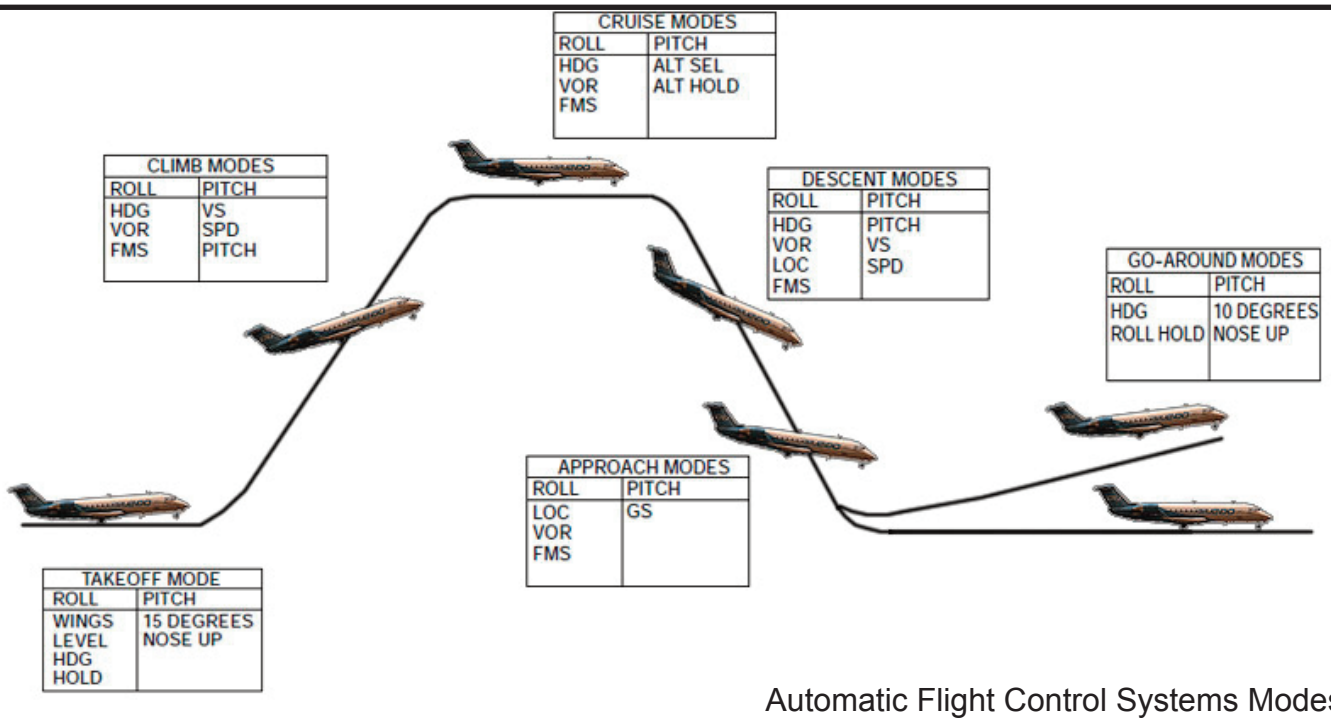
Automatic Flight Control Systems



INTRODUCTION

The automatic flight control systems (AFCS) privides integration between the autopilot and flight director systems. The AFCS consists of two interlinked flight control computers (FCC1 and FCC2), 2 axis autopilot, 2 yaw dampers, an automatic elevator trim control, servos and actuators. The flight director commands the flight crew to follow cues on the primary flight displays (PFD's).

The flight control computers (FCC) receive information from the flight control panel and sensor information from air data, navigation, attitude and heading systems, radio altimeter and surface position sensors.
Then the FCC's commands the plane providing signals to aileron and elevator servos as well as the horizontal trim. The fligth director provides calculated commands using a bar on the attitude director indication portion of the PFD's. these commands provide visual guidance for the pilot to manually fly the aircraft.



Automatic Flight Control Systems Modes

FLIGHT CONTROL AND GUIDANCE

The two flight control computers (FCC's) are the main computers for the AFCS. They control two Flight Directors (FD) that has the Aircraft, that commands the ailerons or elevators servos of the aircraft, or allow the pilots to follow them manually.
To calcule the flight path and control parameters for the AFCS the FCC's use the inertial reference system (IRS)[1] and air data computer (ADC)[2]. Other type of inputs for the FCC's are the selections we make on the Flight Control Panel, FMS and radio system outputs.

Flight Control Panel

Flight Director and Course Selector Panel.
Contains switches to select basic pitch and roll modes and set course on primary flight display

Autopilot Panel.
Contains switches to couple, uncouple, transfer control and reduce gains on the autopilot

Lateral Mode Panel.
Contain switches for lateral modes (Heading select, Bank angle, Approach, Back coruse approach, Navigation (VOR/LOC)

Vertical Mode Panels.
Contain switches for vertical modes (speed, vertical speed, altitude, IAS/Mach

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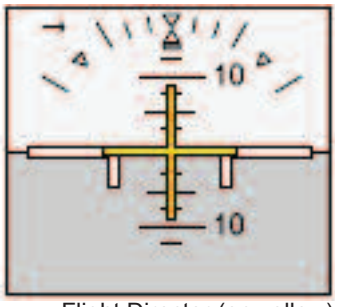
1. (IRS): computer that uses motion and rotation sensors to continuosly calculate the position, orientation, and velocity of the aircraft, without the need of any external references.

2. (ADC): is an essential avionics componet found in modern glass cockpits. This computer can determine the *calibrated airspeed, Match number, altitude* and *altitude trend* data from an aircraft's pitot static system

Flight Director

The flight director is a visual reference of what the FCC's commands the plane, to follow flight path. They are 2 bars. Vertical and horizontal ones on the attitude director indicator (ADI), and let you fly the aircraft manually, or are a visual aid to monitor autopilot response to the guidance commands.

The visual guidance commands (pitch and roll control) are integrated with the AFCS operating modes, selected on the flight control panel, for autopilot operation. These modes can be selected to the flight director with the autopilot disengaged.



Flight Director (on yellow)

The FD system provides commands to perform the following:

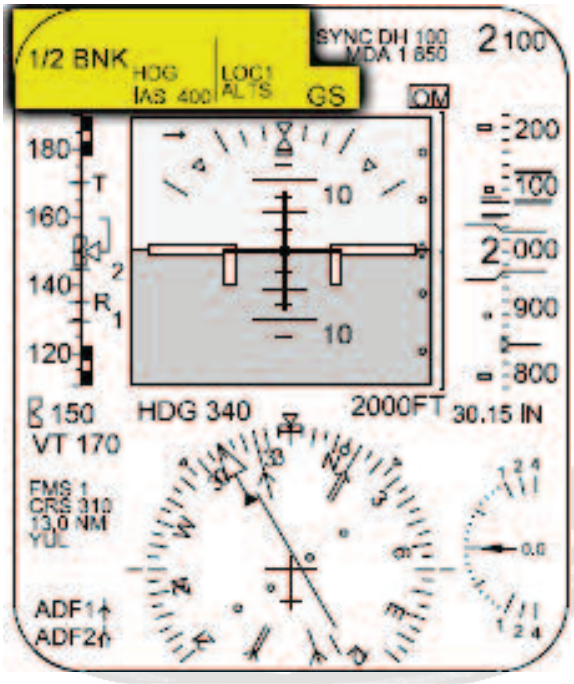
- Hold a desired attitude
- Hold a vertical speed
- Hold an indicated airspeed
- Maintain a pressure altitude
- Capture and maintain a preselected barometric altitude
- Capture and track a preselected heading
- Capture and track a preselected radio course (VOR, LOC, GS)
- Capture and track a localizer and glideslope to establish Category 2 (CAT II)
- Maintain a wings-level, fixed pitch-up attitude for go-around

Flight directors are simultaneously turned on by when selecting a vertical or lateral mode, or just engaging the autopilot.

Flight Mode Annunciator

To announce the pilot which autopilot mode is selected, above the blue (sky) portion of the attitude director indicator, labels of Flight Mode are shown.

It presents flight mode information in two fields separated by a vertical cyan line. To the left of the line is the active or captured field (green) and to the right of the line is the armed field (white). The botton line of those fields contains vertical mode information and the upper line is lateral information.



LATERAL MODES

1. Roll Mode (ROLL)

The Roll Mode commands the plane to hold the heading that exists when the mode is initiated unless the roll angle upon initiation is over 5 degrees. Roll mode reference is reset to the current heading, or current roll angle, upon autopilot engagement.
Roll mode is automatically selected, when no other lateral mode is active, and the FD is on.
Roll mode is creared by the selection of another lateral mode.
Roll mode is annunciated with a green ROLL message in the lateral capture field on the PFD (primary Flight Display).

2. Lateral Take-Off Mode (TO)

Lateral take-off mode generates a wings level command while on the ground. After take-off, it generates a heading hold command, with a 5-degree bank limit, using the heading which existed at take-off. Selecting this mode turns on both FD, disengages the autopilot and clears all other lateral modes.
Lateral Take-Off mode is selected by pushing one of the thrust lever-mounted TOGA switches while on the ground. Is cleared when selecting another lateral mode.
Lateral Take-Off Mode is annunciated with a green TO message in the lateral capture field on the PFD.

3. Heading Select Mode (HDG)

Commands the plane FD to capture and maintain the selected heading readout and heading bug on th PFD. The selected heading can be changed by rotating the HDG knob on the flight control panel. Pushing the HDG knob will syncronize the selected heading with the current heading the aircraft is pointing at.
Heading mode is selected by pushing the HDG button on the flight control panel. This mode is cleared by pushing HDG button again or by selecting another lateral mode.
Heading mode is annunciated with a green HDG message in the lateral capture field.

4. Navigation Mode (NAV)

Capture and track a selected navigation source displayed on the PFD. Navigation mode is armed when selected, but cannot capture if the FCC is not receiving valid navigation data.
To capture the navigation mode the plane must be close to the radial / beam of the source navigation aid. Navigation capture clears the Heading selected. A lacalizer capture clears half bank and turbulence modes.
The CRS1 knob is used to set the course pointer of the pilot's PFD. Push the CRS knob to select the direct course to a station.
Navigation mode is selected by pushing the NAV button on the Flight Control Panel. It is cleared by pushing the NAV button again, selecting another lateral mode or changing the source on the on-side navigation signal.
Navigation mode arming is announciated with two messages on the PFD, a green HDG message in the lateral capture field and a withe navigation source indentifier (VOR1/2, LOC 1/2, or FMS 1/2) in the lateral arm field.
Navigation mode capture/tracking is annunciated with a green message in the lateral cap ture field on the PFD which identifies teh navigation source (VOR 1/2, LOC 1/2, FMS 1/2)

5. Approach Mode (APPR)

Generates commads to caputre and track the selected navigation source displayed on the PFD. Tracking performance is higher than in navigation mode. Approach mode is armed when selected, but cannot capture if the FCC is not receiving valid navigation data. Capture point is a function of closure rate. The plane must be close to the radial / beam of the source navigation aid.

Approach mode may automatically select glideslope mode.

The CRS1 knob is used to set the course pointer on the pilot's PFD. The CRS2 knob is used to set the course pointer on the copilot's PFD. Pushing the button in the course knob will point the course to the direction of the station.

Approach mode is selected by pushing the APPR button on the Flight Control Panel, and is cleared by pushing it again or selecting another lateral mode; or just changing the source of the navigation signal.

Approach mode arming is annunciated with two messages on the PFD. A green HDG message in the lateral capture field, and a white navigation source identifier (VOR 1/2, LOC 1/2, or FMS 1/2) in the lateral arm field. Approach mode capture/tracking is annunciated with a green message in teh lateral capture field of the primary display which identifies the navigation source (VOR 1/2, LOC 1/2, FMS 1/2).

6. Back Course Mode (B/C)

Capture and track the selected back course displayed on the PFD. Back course is armed when selected, but cannot capture if the flight control computer is not receiving valid data.

The capture point is a function of closure rate, with the capture point moving away from the radia/beam for hight closure rates. Back course clears turbulence, half bank and heading modes. The CRS knob is used to select the course displayed on the PFD.

Back course mode is selected by pushing the B/C button on the flight control panel, and cleared by pushing the B/C button again, selecting another lateral mode, or changing the source of the navigation signal to something other than a localizer.

Back course mode arming is annunciated with two messages on the PFD. A green HDG message in the lateral capture field and a white navigation source identifier (B/C 1/2) in the lateral arm field. Back course mode capture/tracking is annunciated with a green message in teh lateral capture field on the PFD which identifies the navigation source (B/C 1/2).

7. Half Bank Mode (1/2)

Reduces the maximum commanded bank angle to 15º. The automatic mode transition will occur at 31,600 ft. Half bank mode has no effect on roll mode operation.

Half bank mode is selected by pushing the 1/2 BANK button on the Flight Control Panel.

Half bank mode is automatically selected when climbing through 31,600 ft (pressure altitude) or if the aircraft is above that altitude when the flight director is turned on.

Selection is inhibited when in the take-off mode, go-around mode, on-side approach mode capture, or any on-side localizer capture.

Half bank mode is manually cleared when pushing the 1/2 BANK button again, and automatically when descending through 31,600 ft

Half bank is annunciated with a white 1/2 BNK message on the primary flight display

8. Lateral Go-Around Mode (GA)

Generates a heading hold command, with a 5 degree bank limit. Selection of lateral go-around mode turns on both flight directors, disengages teh autopilot, and clears all other lateral modes. When lateral go-around causes an autopilot disengage, the resultant autopi lot disengage warning may be cancelled by another push of a TOGA button, or by pushing the AP disconnect button.

Lateral go-around mode is selected by pushing one of the thrust lever TOGA buttons while airborne, and cleared by selecting another lateral mode.

Lateral go-around is annunciated with a green GA message in the lateral capture field on the PFD.

VERTICAL MODES

1. Pitch Mode (PTCH)

When pitch mode is selected, the pitch command on the PFD is set to current pitch angle. Pitch mode generates commands to maintain the pitch reference value.

The pitch value can be changed using the VS pitch wheel. Rotation of the the VS pitch wheel will change the pitch reference by 1/2 degree per click.

When the preselected altitude is captured, rotating the VS pitch wheel also rearms the al titude preselect mode.

Pitch mode is automatically selected when no other vertical mode is active, and the FD is on. Rotating the VS pitch wheel will manually select pitch mode when the FD is on, unless in glideslope capture or VS mode. Pitch mode is cleared by the selection of a vertical hold mode or by a vertical mode capture.

Pitch mode is annunciated with a green PTCH message in the vertical capture field on the primary flight display.

2. Vertical Take-Off mode (TO)

Generates a 15º pitch-up command. Loss of an engine changes the pitch-up command to 10º.

Selecting vertical mode turns on both FD, disengages teh autopilot, clears all other vertical modes and switches.

When Take-off causes an autopilot disengagement, the resultant warning may be cance lled by another push of a TOGA button, or pushing the AP disconnect button.

Vertical take-off mode is selected by pushing one of the thrust lever-mounted TOGA buttons while on the ground, and is cleared by engaging the autopilot, or selecting or capture of another active mode.

Vertical take-off mode is annunciated with a green TO message in the vertical capture field on the PFD

3. Altitude Preselect Mode (ALTS)

Capture and track preselected altitude. The barometric preselected altitude is dis played on the PFD, and controlled via the ALT knob on the flight control panel.

Altitude preselect mode is armed upon selection. The capture point is a function of closure rate, with the capture point moving away from the preselected altitude for hight closure rates.

Capture will not occur if the preselected altitude is slewed through current altitude. At capture, the previously active vertical mode is cleared.
If the preselected altitude is changed, or the VS pitch wheel is rotated during altitude capture, the autopilot or FD continues to capture the original preselected altitude.
If a new preselected altitude is not set, then selection of IAS, MACH, PTCH or VS mode, will result in the current altitude being captured.
After capturing preselected altitude, if preselected altitude is changed, altitude hold is automatically selected and altitude preselect rearmed.
Pushing in the ALT knob will cancel aural and visual alerts associated with the preselected altitude.
Altitude preselect mode is automatically selected upon selection of any vertical mode, except glideslop capture or overspeed, and is cleared by glideslope capture or overspeed.
Altitude preselect is annunciated on the PFD with a white ALTS message in the vertical arm field for arm. Green ALTS CAP message in the vertical capture field for capture, and a green ALTS message in the vertical capture field for track. Altitude captures are annunciated with a yellow ALTS message on the PFD, which will remain for 10 seconds, or until altitude preselect is rearmed.

4. Altitude Hold Mode (ALT)

Capture and maintain the altitude reference. When is selected, the altitude reference is set to the current pressure altitude.
When altitude hold mode is selected by the FMS, the altitude reference is a barometric value from the VNAV, which is converted to pressure altitude upon completion of capture.
There is no display of altitude reference value. Altitude hold mode is selected by pushing the ALT button on the flight control panel, or by changing the altitude preselect setting while in altitude preselected track. In VNAV mode, altitude hold can be selected by the FMS. Selection is inhibited when in glideslope capture or overspeed.
Altitude hold mode is cleared by pushing the ALT button again, by selection of a vertical hold mode, or by vertical mode capture.
Altitude hold mode is annunciated with a green ALT message in the vertical capture field on the PFD.

5. Speed Mode (CLB, DES, IAS)

Maintain the airspeed reference value. When speed mode is selected, the IAS reference (PFD) is set to the current airspeed.
The airspeed reference can be manually set, using the speed knob. The airspeed reference is reset to current airspeed by the selection AP engagement.
Upon altitude capture, speed mode is disabled.
Speed mode is displayed in either IAS or MACH. Selection of the speed readout is accomplished by pushing the SPEED knob on the flight control panel.

6. Vertical Speed Mode (VS)

Makes the aircraft maintain the VS reference value.

When vertical speed mode is selected, the VS reference (FPD) is set to the current vertical speed.

The VS reference value can be changed, throughout a ±12,000 feet/minute range, using the VS pitch wheel on the flight control panel. The VS reference is reset to the current vertical speed by the selection AP engagement.

Vertical speed mode is manually selected by pushing the VS button on the flight control panel. Selection is inhibited when in glideslope capture or overspeed, and cleared by pushing the VS button again, by selecting a vertical hold mode, or by a vertical mode capture.

Vertical speed mode is annunciated with a green VS (number).(number) ↑ or VS (number). (number) ↓ in the vertical capture field on the primary flight display. The (number) is the VS reference value, in thousands of feet/minute (values over 10,000 feet/minute are displayed without a decimal point). The up arrow displays a positive reference and the down arrow displays a negative reference.

Upon glideslope capture, other vertical modes are automatically cleared on the captured side.Climb or descent rate is achieved by moving the rotary wheel on the flight control panel.

7. Glideslope Mode (GS)

Glideslope mode will generate commands to capture and track the glideslope. Captures can be performed from above or below the localizer beam. The capture point is a function of closure rate, with the capture point moving away from the beam for high closure rates.

Glideslope mode is automatically selected when in an approach mode, inbound, with a valid localizer as the lateral navigation source. Glideslope mode is automatically cleared by the loss of approach mode. When armed, glideslope mode is also cleared by turning outbound, or by the loss of a valid localizer as the lateral navigation source.

Glideslope arming is annunciated with a white GS message in the vertical arm field on the PFD. Glideslope capture is annunciated with a green GS message in the vertical capture field on the PFD.

8. Vertical Go-Around Mode (GA)

Go-around mode generates a 10-degree pitch-up command. Selection of vertical go-around mode turns on both flight directors, disengages autopilot, clears all other vertical modes and switches the flight guidance

When a go-around causes the autopilot to disengage, the autopilot warning can be can celled by another push to the TOGA switch, or by pushing the AP disconnect switch.

Vertical go-around mode is selected by pushing either one of the thrust lever-mounted TOGA buttons while airborne. Go-around mode is cleared by engaging the autopilot, by the selection or capture of another active mode.

Go-around mode is annunciated with a green GA message in the vertical capture field on the PFD.

IMPORTANT NOTE: CRJ -200 don't have and Autothrust engine controls. That means that when selecting or on captured Vertical Modes the plane will try to follow them with the pitch of the aircraft, but to maintain speed you have to control the thrust (and the desired pitch) by hand.

ALTITUDE ALERT SYSTEM

The PFD's alert the pilots that the aircraft is approaching the preselected altitude, or that the aircraft is deviating from a previously selected and acquired altitude. Altitude advisories are indicated on the altimeter portion of the PFD's at the preselect altitude digital readouts (above the barometric tape). It is also displayed at the preselect bugs, including the double bars (across the fine and coarse tapes).

The altitude alert system processes data from the air data computers and is independent of autopilot or flight director mode. The ALT knob on the flight control panel is used to set the desired alti tude.

The preselect digital readout and bugs change state and color as follows:

• At the altitude alert threshold, the readout and bugs flash magenta for approximately four se conds, and a one-second aural tone sounds. The threshold is approximately 1,000 feet from the selected altitude.

• When within 200 feet from the selected altitude, the readout and bugs come on steady to indicate altitude capture.

• If the aircraft subsequently deviates more than 200 feet from the selected altitude, the readout and altitude bugs (double bars) will flash amber and a one second tone will be heard. The readout and altitude bugs will continue to flash amber as long as the aircraft is deviated more than 200 feet or cancelled.

• When the airplane is 200 feet below selected altitude the flashing magenta bugs and readout will cancel.

• If the airplane subsequently continues to deviate (±1000 feet) from the selected altitude, a one second tone will be heard.

• When the airplane is again within 200 feet of the selected altitude, the readout and bugs will turn magenta and stop flashing.

Altitude alerts can be cancelled by pushing the ALT switch or selecting a different altitude. Altitude alerts are inhibited if the glideslope is captured.

NAVIGATION SYSTEMS

INTRODUCTION

The aircraft is equipped with the following navigation systems:

- Flight Management System (FMS)
- VHF Navigation
- Automatic Direction Finder (ADF)
- Distance Measuring Equipment (DME)
- Air Traffic Control (ATC) Transponder System
- Traffic Alert and Collision Avoidance System (TCAS)
- Ground Proximity Warning System (GPWS)
- Weather Radar System

Two separate VHF systems are provided for radio navigation and are designed and installed so that the failure of one system does not prevent the operation of the other.
The navigation receivers are tuned by two radio tuning units and navigation data is displayed on the primary flight displays (PFD's) and multifunctional displays (MFD's).
Frequency selection is accomplished through the two radio tuning units. In the event of a failure of one or both radio tuning units, radio communication and navigation can be controlled by the backup tuning unit.
Display control panels permit control over the multifunctional display formats, navigation source and bearing source display. Audio monitoring is provided by three audio control panels.

FLIGHT MANAGEMENT SYSTEM

The flight management system (FMS) is an integrated navigation system that provides worldwide point-to-point and great circle navigation. The FMS can be used for:

- NAV Sensor Control (VOR/DME, IRS and GPS)
- Dead Reckoning (DR)
- N1 Thrust Settings and Computation
- Secondary Radio Tuning
- MFD Control Menus
- Lateral Flight Plan Point-to-Point Navigation
- Flight Parameter Computations
- Fuel and Time Predictions
- Lateral Steering Command Outputs (flight control systems)
- Vertical Steering advisories
- Non-precision approaches

The FMS consists of two flight management computers, located in the avionics compartment, and two control display units located in the center console. The flight management computers collect information from the navigation sensors and perform all computations, control and command functions. The control display units provides the pilot interface for data input and control functions, and provides display of functions, modes and flight data. Graphical data is displayed on the multifunctional displays.

1 LEFT FUNCTION BUTTONS (LFB)
Select the corresponding left row lines on the FMS. They are named from LFB1 the most upper button to LFB6 (botton one).

2 RIGHT FUNCTION BUTTONS (RFB)
Select the corresponding right row lines on the FMS. They are named from RFB1 to RFB6.

3 SCREEN
All non graphical data will appear here. Graphical data on the MFD, or PDF.

4 FUNCTION BUTTONS
Select the different functions and navigates through the different pages on the FMS

5 NUMERIC KEYPAD

6 KEYPAD
Also included a DELETE and CLEAR key.

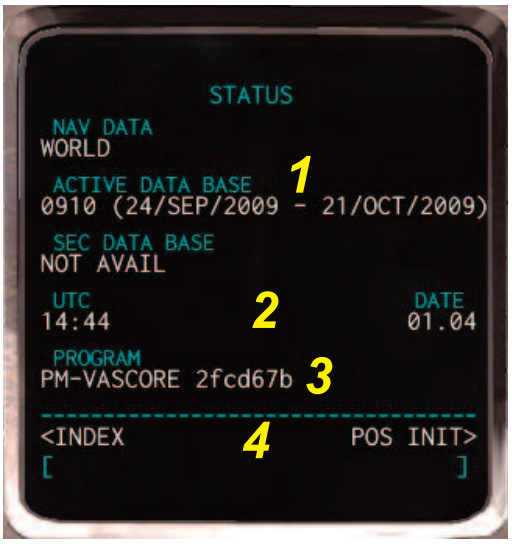
INDEX Page

This is the first page you will find when the FMS is on with electricity power. The number of INDEX pages and functions available is dependent upon the equipment installed in the airplane. Push the INDEX key to see the INDEX page if you are not there. Push PREV PAGE and NEXT PAGE to show any additional INDEX PAGES.

1 On left and right side (if filled all the left side) you want to see the different pages - options installed on the airplane. Each of those pages can be chosen with the lateral key-functions. Left or right ones.

2 On the top right corner of this page (and others) you will be able to see how many pages you can navigate. You can go through them with the NEXT PAGE button and PREV PAGE button.

STATUS Page



On this page you will be able to see information about the systems loaded on the plane. Plugin version and Navigraph database to date. And also date and time in UTC.

1 Here you will see the valid period of time of the Navigraph database, the plane has loaded. You can buy more recent database on Navigraph webpage (http://www.navigraph.com)

2 On this line you can see the actual UTC time and the date you are flying.

3 Here is the info of the plugin version the plane has loaded Important to know if you are updated or not the final CRJ version.

4 Usually on the 6th line near the bottom lateral function keys, there are page links ready to be chosen. Those Pages are the most “natural” sequence to find on programming the routes on the plane.

POSITION INIT Page

You can access this page through the INDEX Page link or the STATUS right lower link.
The FMS and IRS position is initialized via the POS INIT Page.
To initialize the FMS and IRS positions you have to:

1. Set IRS mode to NAV (on both IRS)
2. Push the INDEX or STATUS Page to have access to POS INIT page
3. Press the function key to access the POS INIT Page.
4. Introduce the ICAO airport where the plane is.
5. Press the LEFT FUNCTION KEY (2L) next to AIRPORT on page.
6. below the AIRPORT line a new line with the coordinates of the plane will appear.
7. copy the coordinates to the text area with the RIGHT FUNCTION KEY (R2) next to coordinates.
8. Press the RIGHT FUNCTION KEY (R5) next to the lines and dots below SET POS line (only this will appear if IRS mode is not off.
9. The process of align the IRS will start. On 7 minutes more or less, the FMS will be aligned.

FLIGHT PLAN Page

You can reach this page through the POS INIT Page link or the FPLN key button on the FMS.
On this page you will be able to set the desired route, you want to follow your plane.

1 On the Origin label you can set the departure airport of the flight plan. You have to key the desired ICAO airport code on with the keys on the FMS, and once introduced, just press L1K to introduce below Origin label.
If you introduce the same or other airport origin in the same area pressing again L1K, you will delete all the routes were introduced before. This is a fast way to delete all the routes programmed before.
Once you have set the first airport the ACT FLPLN on the top line will change to MOD FPLN. And the airport symbol named, will appear on the MFD.

2 Here you can introduce the desired arrival airport. You only have to key the ICAO code on it and press 1RK to introduce it. Once you have set the destination airport the distance between both airports will be shown on DIST label.
Introducing again the same airport on 1RK will delete the chosen STAR.
Introducing another airport on 1RK with one already inserted will change the route to that secondary chosen airport.

3 Pilot can save all the route programmed (without SID and STAR) if you press L5K near "Copy Active" label.
Once you do that, the name of the route (8 letters, the first four with the ICAO Departure airport and the last ones with the destination one), will be automatically inserted on the route label. And ROUTE SAVED message will appear in scratchpad.

4 Here you can introduce the flight number. Type it and press 5RK

5 Here is the place where automatically will appear the name of the saved route, but also if nothing is programmed or you already programmed a route, you can load a previous saved route just typing the name of the route (remember first the Departure airport and last the arrival one) on the scratchpad, and copying it to the route field pressing 2LK. Once you do this if the route exists a message telling ROUTE LOADED will appear and will load the route. If inside the route are two points with the exact name in the world the FMS will ask you to choose between them.

Once you have set the departure and arrival airport you can continue choosing the next waypoint on the route. For that you only have to press the NEXT PAGE button and introduce the VIA or the point (to go direct to it). If you first introduce the via (airway) a message saying DISCONTINUITY will appear, and only will be cleared when you introduce the last point of that airway on "TO" area.

Once you have completed the page of FPLN you will have a new page to continue with the programming of the route. You can access it through the NEXT PAGE. PREV PAGE can go backwards on pages or the flight plan.
When you have finished the Flight plan, you have to press the EXEC button to make it active.

LEGS Page

Once you have programmed the FLIGHT PLAN, you can follow the way the plane is following this route on the LEGS Page.
The magenta point will be the next active point on the route, and the point before this (if there is any) still will be visible on cyan on the list, before the active one.
On top of each point you can see the course between that point and the next. And on the right one of each point the pilot can see the distance between points (not the distance between the plane position and that point).
On the right if there is any information from Navigraph, the speed and altitude restriction will be loaded and shown (only when loading SID or STAR).
Here is where you can modify the flight plan on a flight or any moment. Take into consideration that the change will be made once you introduce or delete a waypoint.

- To delete a waypoint on the route. with an empty text area press Delete button. It will appear DEL@. Now you only have to press the left function key of the waypoint you want to delete from the route.

- To insert a new waypoint just type it on the scratchpad and press the Left function key next to waypoint you want to insert (it will be inserted before that chosen waypoint). If the point has 2 or more named with the same label, FMS will make you choose between the possibilities.

To navigate through the pages you can press the PREV PAGE and NEXT PAGE buttons on FMS

DEPARTURE & ARRIVAL PROCEDURES

Once you have set the desired departure airport or just completed the route on the flight plan, you can choose the desired SID and STAR on that route.
When you press the DEP ARR button you access this page.
Pressing several times it changes between Origin and destination airport pages, and the DEP/ARR index.
There you can chose the origin to set the SID (Standard Instrument Departure) or the destination RKey to chose the STAR (Standard Instrument Arrival).
For now there is no way to set an Alternative destination airport while flying to a destination airport (you have to insert the destination as new DEST airport)

SIDs

Pressing the ARR DEP button once you can access the SIDs page. Also you can go directly through the index of DEPARR, pressing the 1LK.
Once pressed automatically, it will load all the possibilities of SIDs that airport has.
First it has to be done is choosing the runway that you are taking off on the right side, and then choose the SID (if there is any of that runway) on the left side.
To select another Departure you only have to press the right key function next to the selected runway. That will let the pilot choose again another different (or the same) runway for take off, and then choose another SID.

STARs

If you press a second time the DEP ARR button on the FMS you can access to the index where pressing the 1RK can choose the desired Arrival procedure.
This time the first that has to be done is choosing the name of the STAR on the left side, and then the desired Approach on the right. After that, if there is any option, you can choose the IAF of that STAR. (a TRANS. label will appear with different points to choose.
To select another STAR once you selected one already, you only have to press again the 1LK on the <SEL> STARS. That way you can again have all the possibilities of STARS of the arrival airport (remember that if you want to change arrival airport, you only have to set it again on the first page of FPLN.
There is need of setting the STAR from the begging of the flight. There can be changes on the route and weather on the destination airport so once you are in flight you can choose the STAR and it will be inserted after last waypoint of the route.

SIDs and STARs are not saved on the routes when you COPY ACTIVE them. You have to reselect again once loaded the route.

PERF INIT

Perf Init can be reached through the PERF button on the FMS.
On the real plane it can manage to calculate Fuel Management, advisory VNAV and Thrust Limit the engines.
Here for now we have simulated the Thrust Limit page only.
You can access it pressing the 4LK.

Thrust Limit is desirable if you want to ensure a longer life on your engines. There is no need to make a full throttle all the time to make the plane fly.
If you introduce the OAT temperature on 4RK a calculation of thrust needed on Take off, climb and Cruise will be calculated on the left side of the page.
Once you have those numbers you have to introduce it (on the phase of the flight you are) on the R1K with all 3 numbers included the point (for example 85.0% has to be introduced as 85.0 and not 85).
Once you make that you will see a little cyan arrow on the inner part of the N1 circle in each engine, and the number with the TGT label between.

- If you want to change the number just introduce another one on 1RK.

- If you just want to delete the limit and give full thrust to the engines just press the Delete button. Will appear DEL@ and then you have to press 1RK. to clear the field.

For calculating the amount of thrust limit needed, different engine bleeding options can be set.

HOLDING PAGE

Once you are in flight, maybe because traffic problems ATC order the pilot to make a holding pattern over a point or just on the place the plane it is.
To do that so, you have to press the HOLD button to access the Holding page, where you can even choose a point where to make a holding pattern or just make the holding right now on the coordinates the plane is.

- To ARM a holding on a desired point, you have to navigate through the points on the HOLD page (they are similar as the LEGs Page), and press the desired next LEFT Function key to copy the point.

Once that, just press the LEFT KEY next the brackets below HOLD AT and the Holding will be armed on that point.
You can choose the turn direction of the Holding pattern on the right side of the FMS Holding Page Screen. By default is set to LEFT.

Once the plane has reached the desired point where the Holding pattern was ARMed, the plane will start flying that pattern for always. So to exit it you have to ARM exit. Just press the Function key next to EXIT, and the plane will continue its route once the plane has completed the turning was making.

- The plane can make a holding patter in the direction chosen just pressing the Left Function key next to “HOLD HERE”. Immediatelly will start the 1 minute 180º turning once pressed. To exit the pattern just have to ARM the exit and wait to complete the turn where the plane was once you armed the exit.

A symbol of the Holding pattern will appear on the MFD at the point you desire to make it, to the left or right of it, depending on the selection chosen on TURN DIR selection.

NAVIGATING THROUGH ROUTE

Once you have programmed the route, or even while you are doing it, you can navigate through the route, centering the view over each point, to verify if everything was programmed was ok, and match what the pilot desires to do.
To do that, you have to be on MFD full circle view (you can select it on the MFD format selector on the left side panel of the pilot) and with the UP and DOWN arrow buttons, you can navigate through all the routes, even you have the plane on the ground or flying. If you see something wrong, you can correct it on LEGs page as described in the LEGs page information.

RADIO TUNING

Radio can be auto-tuned with the FMS AUTO mode inside the Radio page, or also tune the radios just typing the frequency you want on the scratchpad and pressing the desired left or right function key.

If the MODE is set to AUTO (selection is on cyan) then the FMS will tune automatically the radios near the plane. This is done because improve the FMS position determination.
If you try to set a new frequency even on the FMS Radio page or on the Pedestal radios, you cannot do it.

For tuning the radios first you have to turn the MODE to MAN. Do it always because by default the radios are always set to AUTO mode. Both of them.
Once you are on Manual, you can set the desired frequency on the pedestal radio or just typing it on the scratchpad and pasting over the desired radio. Left or right.
You have to type the frequency like it is. If you for example want to set a 122.00 frequency and you input 122 and press 1LK an INVALID ENTRY will appear on Scratchpad. You should type 122.0 at least.
Transponder can be also set by typing the 4 numbers. You don’t have to be on Manual mode to set the ATC.

DISPLAY MENU

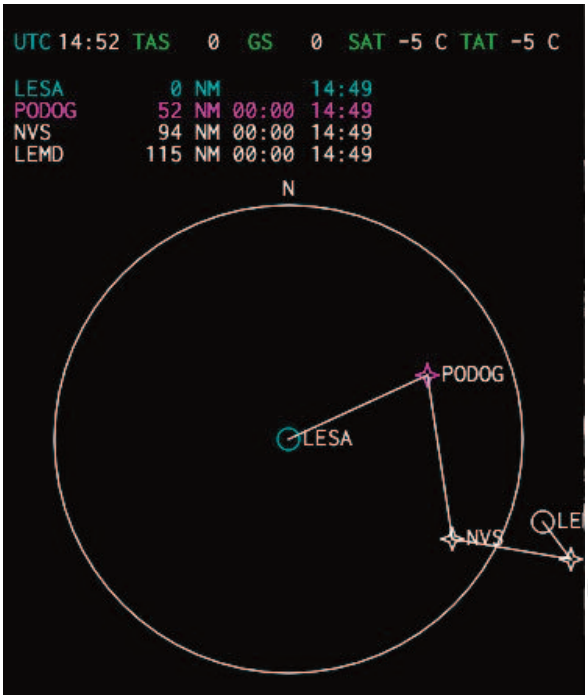
When you have programmed a route, by default the only visible aid is the lines of the route and the points with their names. But you can see if you want other airports around and navaids.
To show them you have to press the MFD MENU button on the FMS and you will be inside the DISPLAY MENU page. Just selecting with the Left function keys what you want to see on the MFD they will be visible (only on medium arc mode map on MFD).
Once the navaid or airport is visible it will be shown as green on this page. White for invisible.

PLANE MENU

This is a menu that doesn't exist on the real plane but we have decided to make here.
If you press MCDU MENU button it will make appear the MCDU MENU, where you can choose go back to the FMS1 and the PLANE MENU.
If you choose 3LK, then you will see the PLANE MENU, where you can connect the external AC Power (parking brakes has to be set on to do it, and once the GPU is connected you cannot release parking brakes until it is switched off (set on white on this menu)).

Also you have a DISPLAY PERFORMANCE selection, by default set on HIGH, where you can choose a lower rate of display the screens inside the plane to maybe gain a few frames per second (on my system I don't see any change, but we left it there in case someone finds it useful)

CONNECTION WITH MFD



When you first load a route or program it into the FMS a visual aid will be drawn on the MFD.
The default map shown on the MFD is the full circle one, that let you see a clear visual description how is going to be your route. You can zoom in - out and can navigate visually through the route, making center each waypoint of the route with the UP and DOWN arrows of the FMS.
But this is a Norh orientation map, and not a visual follow flight plan.

- To have a clear visual where your plane is, you can change to medium arc map MFD view.

This is a moving map with visual zoom references and compass rotation.
Next waypoint will be magenta colour and passed one cyan colour.
In this mode you cannot check the flight plan with UP and DOWN arrows but you can see (only on 3D view. Not Pop-UP view) the rain radar.

- Above the two mode maps there are 4 lines of the loaded route. The magenta line is the next active waypoint. Cyan is the passed one. 3rd line usually is next after active one. And the 4th line is the destination airport.
- On the right of each point we can see the distance from the plane (this time is different than LEGS page) to the point on that line.
- Time to reach that point is next on the right calculated at the ground speed the plane has. If it is showing 00:00 is because we are stopped.
- And the final column is the time UTC when we are going to reach that point at the speed the

DISPLAY GUIDE

To make it easy to the pilot and copilot the task of managing the amount of information the plane produces, there are a set of displays that will show the that information graphically.
These are:

- Primary Flight Display (PFD). 2 of them for pilot and copilot.
- Multi Function Display (MFD). 2 of them for pilot and copilot.
- Eicas primary
- Eicas Secondary
- Radios

PFD

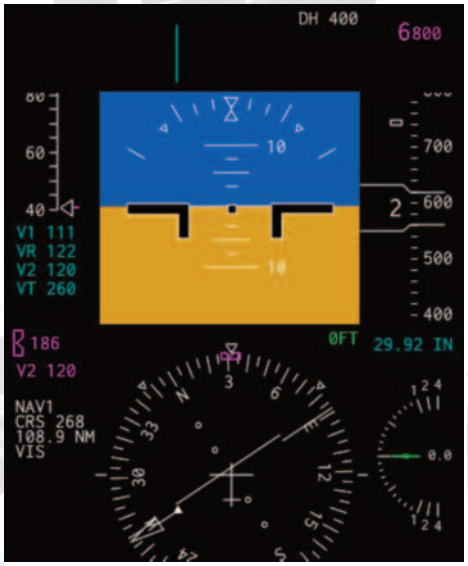
This is the most important display for the pilot. It gives the pilot crucial information that let the pilot manage the plane even in really poor visual conditions.
Here representing all modes of autopilot and FMS information of routes, altitudes and distances to next waypoints.

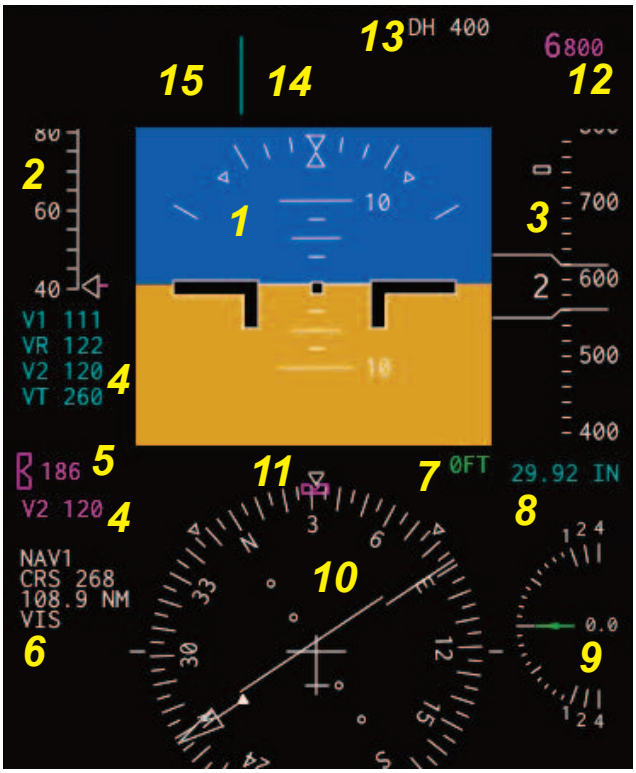
When we start the plane from a Cold and Dark situation we will find that the plane is still not aligned correctly, so the system won't be able to give accurate information of the attitude of the plane.
You will be able only to change some values (bug values and pressure calibration) on this screen but if you move the plane none of the movement will affect the display.

Once you have started the process of aligning the IRS then a message "IRS ALIGN DO NOT TAXI" will appear in the center of the PFD.

A few minutes later Speed and altitude tapes will be activated but still the compass and artificial horizon won't work.

And after more or less, 7 minutes then the IRS align process will be completed with all the functionality on.





Here is the information displayed on an aligned PFD.

1 Artificial Horizon (AH). It is a representation of the attitude of the plane, drawn by the black lines and dot in the center, in a simulated sky-earth horizon with the ground as brown-orange colour and the sky as blue.
There are vertical tapes that measures the pitch angle of the plane being the positive ones on the blue area. And and arc on top of the AH that measures the roll angle of the plane. The first marks are 10º calibration until the first longer one that is 30º, and final one is 60º. The little triangle is the mark for 45º roll. Of course all symmetrical both sides.
The motion of the AH is locked at high pitch and roll angles, but I think you would never put the CRJ up-side down, isn't it? ;)

2 Speed Tape. This tape tells the pilot about what Indicated Air speed the plane is. It is indicated in knots, and it won't start to move until the plane reaches 40 knots. Over the tape sometimes will appear red aligned squares to indicate those areas as dangerous for the plane. If they are coming from downside then those speed range will make the plane stall. If they come from upside, then those speeds could make the plane break flight surfaces (before letting the plane break entering overspeed, it will automatically pitch up the nose to climb and lower the speed).

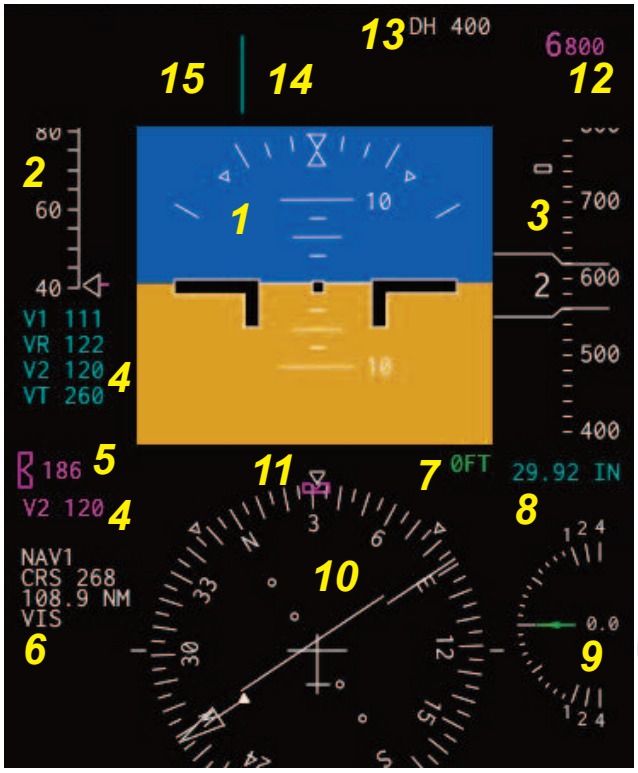
On the right side of the speed tape there is a triangle pointing to the tape that is the indication of the speed. From this triangle a magenta flex arrow will scale up or down to show the trend of speed the plane has when accelerating, and it is very useful to control future speeds.
When the plane reaches 0.4Mach a number with the Mach speed will appear on the top of the SpeedTape.

IAS is taken from pressure over the Pitot tubes. If you see how the speed should be wrong or drop to zero, then please connect the probe heaters!

3 Altitude Tape. This tape will show the barometric altitude. It depends on the calibration you make. It is scaled on feet. The number on the left are the thousands and the numbers on the right the hundreds. When you set a desired attitude on the autopilot, two magenta bugs will be aligned with that altitude in the thousands (little bug) and the hundreds (big bug), and when the plane is 1000 feet distance from that desired altitude a sound alarm will be heard.

When the plane is 1000 feet and below the terrain, a radar altitude tape will appear on the left side of the AltitudeTape.

4 Vspeeds bugs calibration. Here is where you can set the Vspeeds (Vt,V1,V2 and Vr) you want to set for the plane. These are only visual and let know the pilot when reaching those speeds. You will also see marks over the speed tape showing the position of those Vspeeds.
Once you have 40 knots on the plane the Vspeed tuning will disappear, and only the marks will be visible.



5 Speed bug. This is the number you set on speed autopilot mode. The symbol that is on the left of that number is also visible on the Speed tape.

6 Nav Source. Autopilot can follow three different sources. Nav1 radios, Nav2 radios and FMS. here you will see the Nav source selected and any information available if radio is receiving data, such as radio-aid name, distance to the point (DME) and course chosen.
When the radio doesn't receive any information, only the source will appear (NAV1, NAV2 or FMS).

7 Radio altimeter. It will show the altitude between the plane and the ground from 0 to 2500 feet. Once you are above that altitude the info will disappear.

8 Altimeter Calibration. Here you can see the calibration number for the altimeter. The information can be shown in Inches or Hpascals.

9 Vertical Velocity tape. Scale range goes to -+4000 feet. If the plane is climbing or descending more than that numbers, the arrow will stop on the 4 position.
If the plane is descending or climbing dangerously the arrow will change to red colour.
For a more accurate measure also a number will be displayed near the arrow.

10 Compass rose. This will indicate the direction the plane is pointing in. The top inverted triangle is the mark that indicates where the plane is pointing at. The two little triangles mark 45º of that direction and the little horizontal lines indicates the from the nose.
Inside the circle there is a VOR instrument (course angle can be managed on the front panel) and two little solid white arrows indicates if you are flying TO or FROM the radio station.

When the FMS is selected as source and there is no flight plan loaded then the sentence "NO FLIGHTPLANE" will be read at the center, and the VOR arrow will disappear.
On FMS mode the course of the VOR arrow cannot be changed.

11 Heading bug. Around the circle you can change the Heading Bug to command the plane follow that heading route.

12 Commanded altitude. Here you can see the desired altitude for the Altitude mode on the autopilot.

13 Decision Height. You can set the decision height for landing. This is a visual and aural signal to let know the pilot when you have reached that DH altitude. It is a radar one.

14 Armed modes. Here you will see in white label text, which modes are armed that soon will be activated.

15 Active modes. Here you will see in green label text, which autopilot modes are active.

MFD

The second most important display for the pilot is the Multi Function Display. It will show the pilot information regarding navigation of the plane, and other minor information.
Here the plane has 3 screens of the multiple more that the real plane has, but those are enough for the correct visualization of the position of the plane in every moment. (On future updates we will try to make the rest of them. Recently Philipp has added the HSI mode also inside the MFD)

This display was already explained on the FMS area.

1 Here is the schematic representation of the map. Here you can see the navaids and airports around your plane as well as the route the plane is following.
There are two circles (on the medium arc mode. The full arc mode only has one and always is orientated to the north direction). On the right side of the bigger one you can find the distance that circle is from the plane position. You can zoom in and out and then that number will change (5 - 120). The inner circle is the medium of that first number.

2 Here we can see the exact direction the plane is flight to.

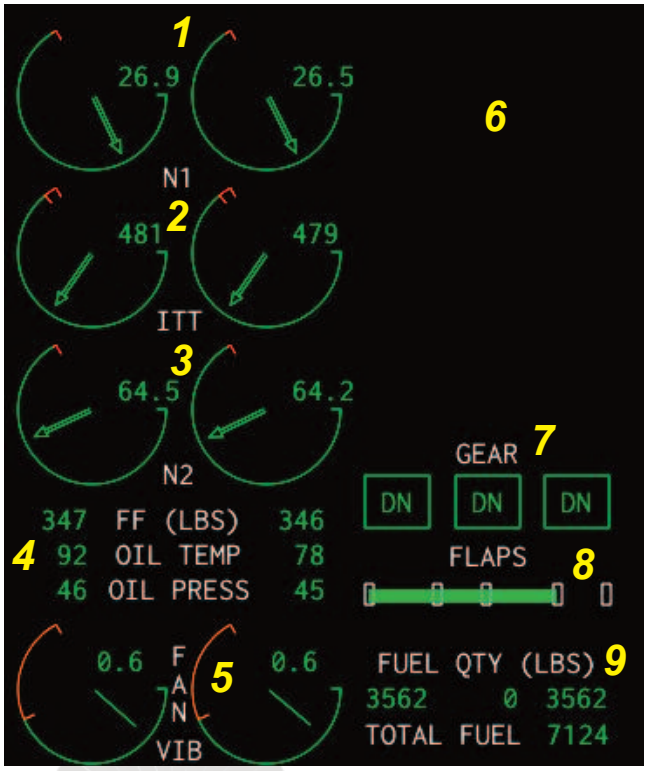
3 If there is a route programmed on the FMS then you will be able to see here 4 points. The first 3 ones are the ones you have already passed and 2 next. The 4th point is the final airport. There is information on the right of each point about distance from the plane to that point, time needed to reach that point at the speed the plane has, and a calculation of the time will be (UTC) when reached.

4 The most top line of the MFD show information also important.
- UTC : shows the time in zulu time.
- TAS : is the True AirSpeed.
- GS : is the Ground Speed
- SAT : is the Static Air Temperature, or the real temperature of air outside the plane
- TAT : is the True Air Temperature, or the temperature the sensors outside record when the air hits with them. So always will be higher than the SAT because friction.

EICAS

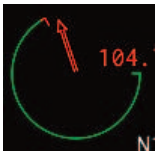
Engines, hydraulics, AC and DC, pressurization, fuel and other systems can be seen on the EICAS pages. There are two of them on the center of the front panel. The primary Eicas is on the left side and always shows engine and warning - caution messages. The secondary Eicas can show up to 10 systems screens (on the first version of the CRJ we have simulated 7 of them). One of them is the same Engines and messages as the primary Eicas one. The rest are: Fuel, AC Electricity, DC Electricity, Hydraulics, Environment, Trim and APU info, Flight Controls, Anti Ice and Doors.

Primary Eicas



This is the third most important screen on the plane (if there is any real order on the plane, because all screens has their importance).
It shows information about the engine, fuel, landing gears, flaps and any warning - caution message.

1 Engines N1 gauges. These gauges shows both engines N1%. It can be read from 0 to 105%. When the engine is pushed hard the green arrow will change to red showing that you must relax the amount of thrust if you don't want break engines.
For ensuring the life of the engines you can apply thrust limit thought the FMS Perf Init page. If you set a Thrust Limit, that will be indicated on the gauges with a cyan mark on the Maximun allowed %, and also a white label with the desired limit number N1 TGT will be shown in the middle of both gauges.

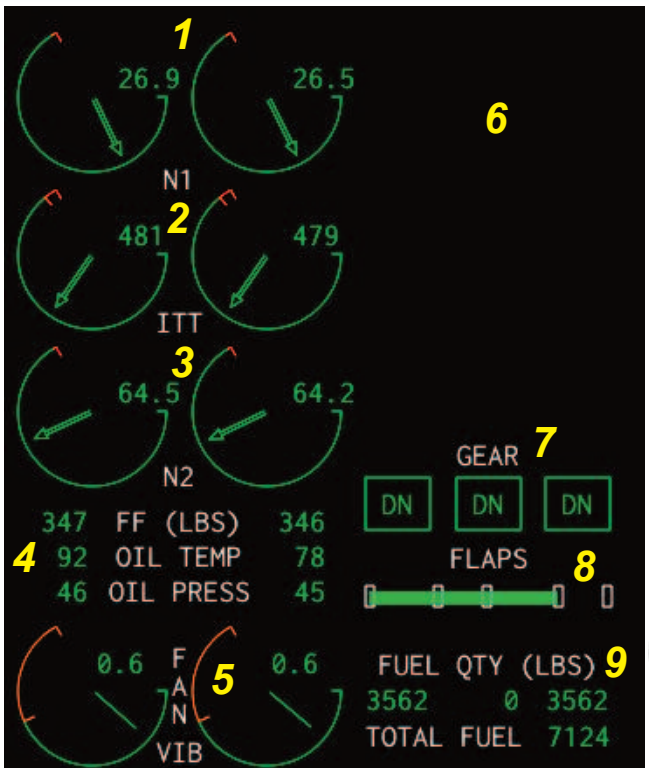


2 Engines ITT gauges. Measures the temperature of exhaust gases in ºC of both engines. If the plane reaches a hot temperature then the green arrow will change to red colour.

3 Engines N2 gauges. These ones will show both engines N2%. If engine exceeds its limit then the arrow will change to red colour.

4 Fuel and Oil. On this line the Eicas shows information about Fuel Flow (FF) in pounds per engine on the first line.
On the second it shows the Oil Temp and on the third the Oil Press. both of them will change to red if high values are reached (low also at Oil Press).

5 Fan Vibration. These gauges only are shown when engines have both reached 55% N2. At engine start the Oil press gauges will be shown before in the same position.



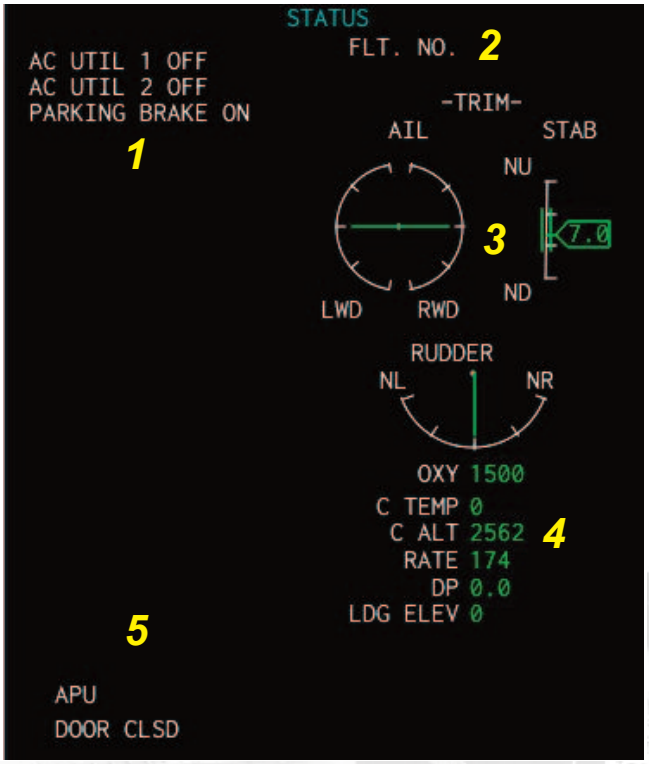
6 Warning - Caution messages area. Here is where you have to take care of every message the plane shows to the pilot.
Red ones are more important than yellow. Take them into consideration first.

7 Gear position. Here you will see the Gear position. DN (down) UP (up) and when in transit there will be striped boxes.

8 Flap position. A green bar will show the actual flaps position. Zero is on left side.

9 Fuel Quantity. They are separated in 3 positions. Left wing, center and Right one.
The sides ones will be changed amber colour if below 900lbs
Center will be white if below 10lbs.
There is also a total fuel that will show the total amount of fuel the plane has on board.

STAT EICAS



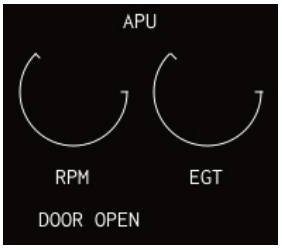
This is the default secondary Eicas on the right display when you switch on the battery.
But if you wish to show it again once you have put another system display on right Eicas, then just pressing the STAT button on pedestal, will bring this screen back to you.

1 In this area notifying messages will be shown. These ones are less important than the ones shown on the primary EICAS display.

2 Here you can see the flight number you have set on the FPLN page of the FMS. Good to remember it.

3 Trim area. You have a visual reference of the trims. AIL is to roll trim, RUDDER is the rudder (of course) and the vertical tape is the pitch trim. This one is very important to take off procedures, and go around.

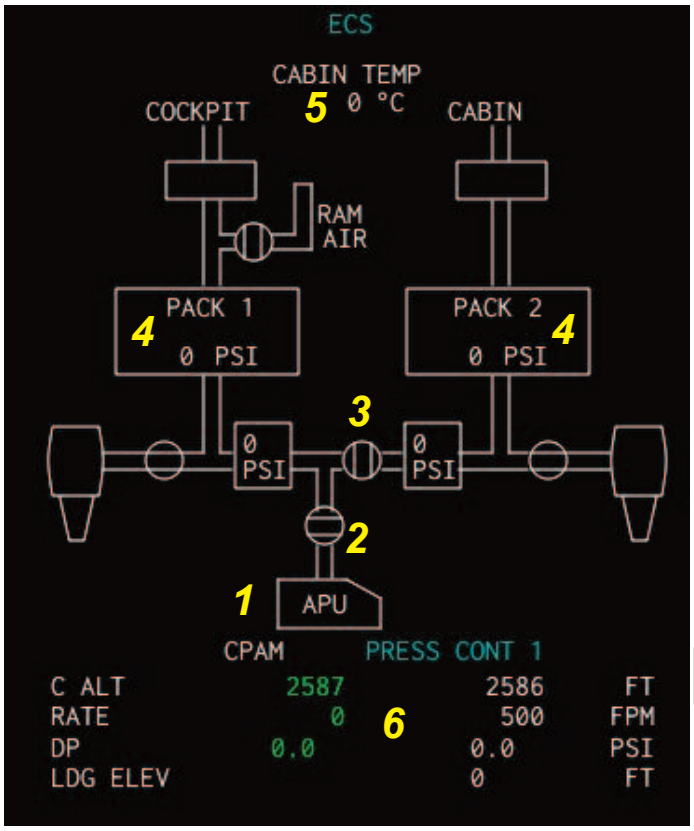
4 Pressurization information. Here you can find the amount of oxygen for passengers, The cabin Temperature in ºC, The Cabil Altitude set (pressurized), the rate of pressurization, the difference of pressure between the cabin and outside, and the programmed Landing Elevation.



5 APU gauges. Here when you start the APU, first you will see how the message “DOOR OPEN” is shown. Latter appear two RPM and EGT gauges. Once the APU it is started those RPM and EGT values will be increased,and once they reach the 100% RPM value then the ligth of AVAIL will be illuminated on the overhead.

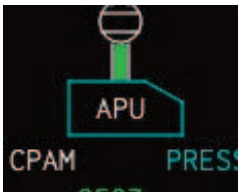
If you stop the APU then all will be back to normal hiding the gauges.

ECS EICAS

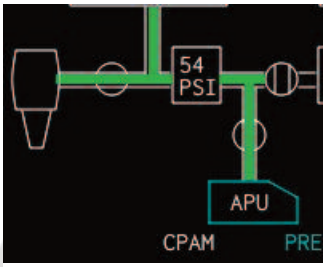


Once you have started the APU, you have bleed air that will start the engines. To monitorize all the pressurization system you can turn on the ECS Eicas page pressing the ECS button on the pedestal.

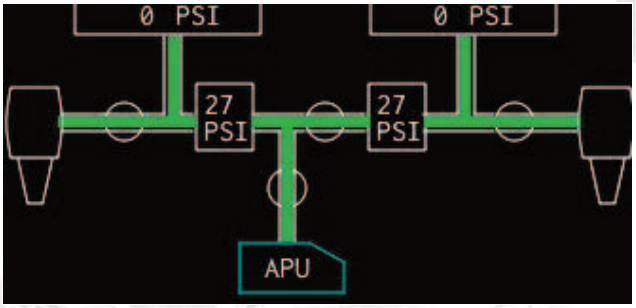
1 When the APU is turned off it will be showed on white, but once you turn it on a blue colour line will be shown. and a green line showing the flood of bleed air also will appear.



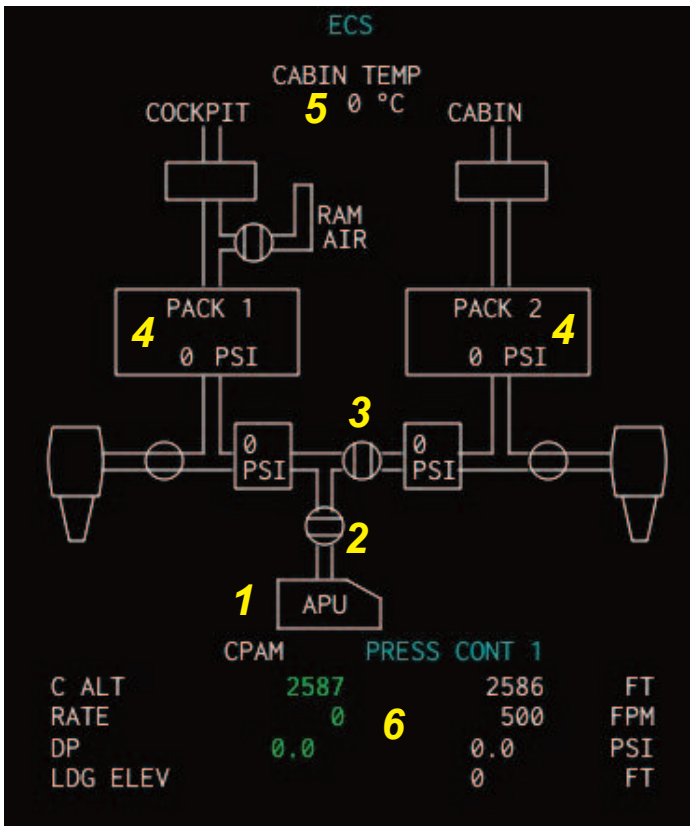
2 Once you have bleed air you can open the 10th stage valves to let that air move the turbines of each engine. To open this valve you have to press the APU LCV button in the overhead panel. That way all the bleed air can impulse the blades of the left engine.



3 The other valve to open to let the bleed air push the right engine blades is the 10th stage Isolation valve. You can find it next to the APU LCV in the overhead panel.

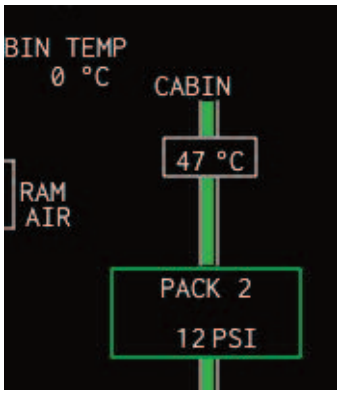


4 Packs. These two packs take the bleed air and change the temperature to refresh or warm the temperature on cabin and cockpit. The button to open packs can be found on Airconditioning part on the overhead.

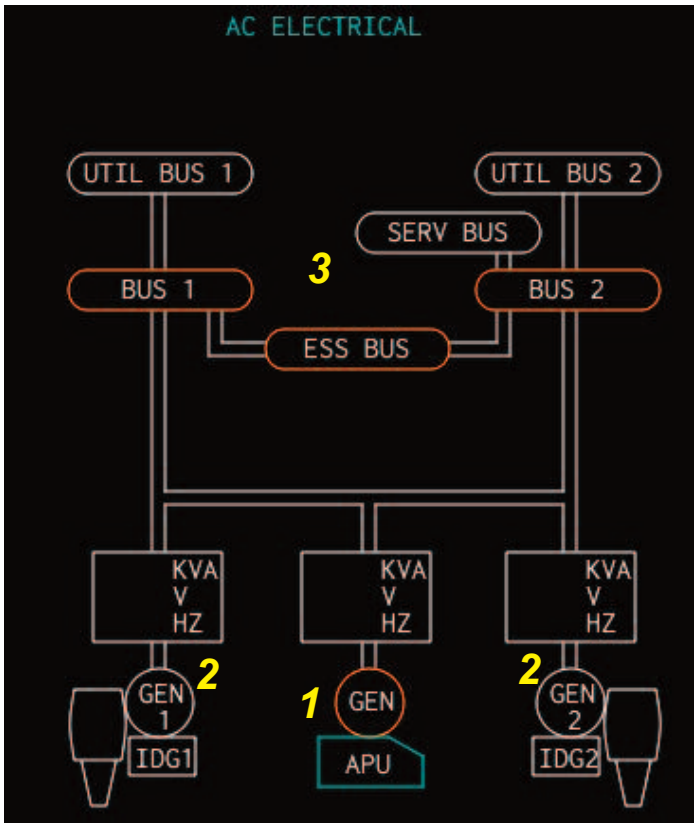


5 This is the final temperature the cabin has. This temperature is controlled automatically but if you prefer to change it manually, you can do it on the overhead panel.

6 On the bottom line you can find information about pressurization. That information is the same you will find on the STAT Eicas page, with an extra little more. Be careful making pressurization the plane before take off because maybe you could not open the main door at destination airport!!

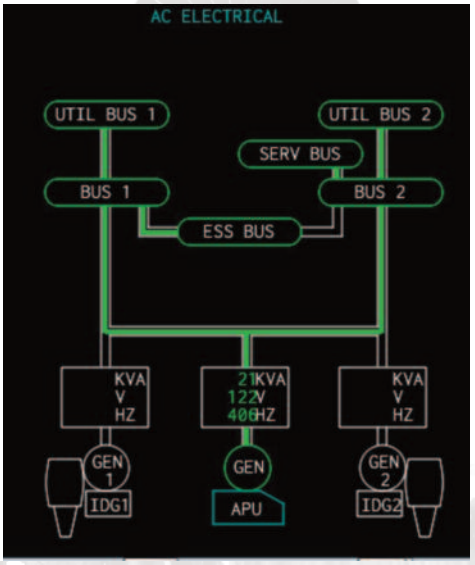


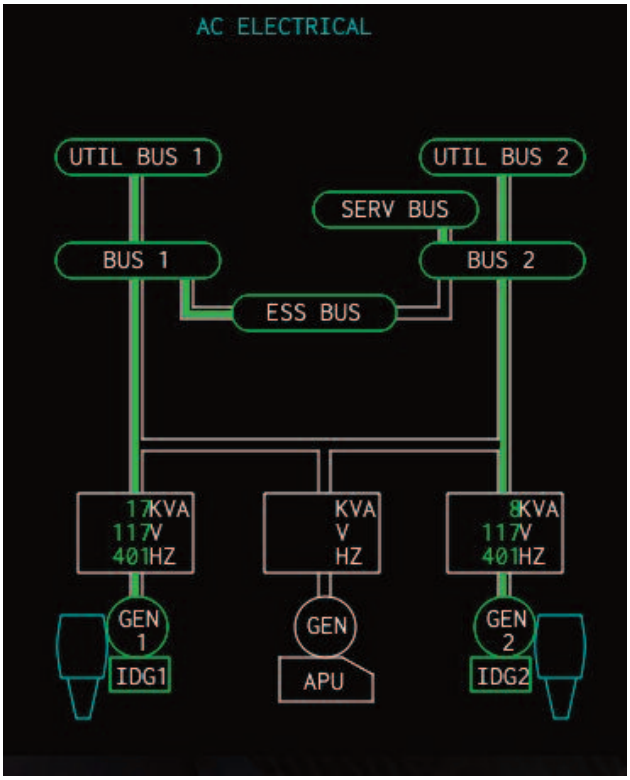
AC EICAS



On this page you can see information regarding the AC electricity system. You can access this page just pressing once the ELEC button.

1 When you run the APU the symbol will be shown in blue line, and the GEN circle on brown telling the pilot that is available. Once you turn on the APU Gen (or any other gen) that circle will change to green colour, and green lines will come from the generator to feed all Buses.

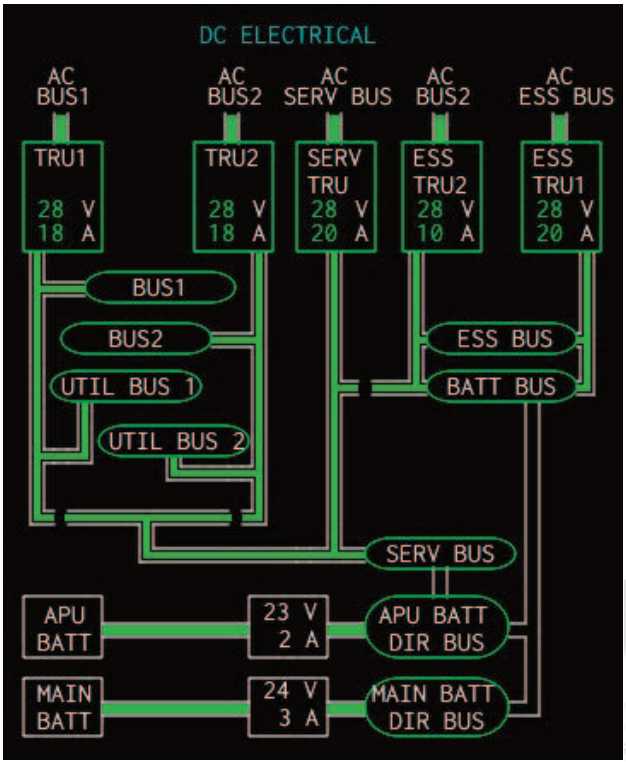




2 Once the engines are started they are shown in cyan. The Gen circles are shown on brown and IDGs in green.
Once you turn on the generators the circles are on green, and green lines feed the buses from engines generators.
If one of the generators is off then the other will feed the opposite buses.
You can disconnect IDGs on the overhead panel.

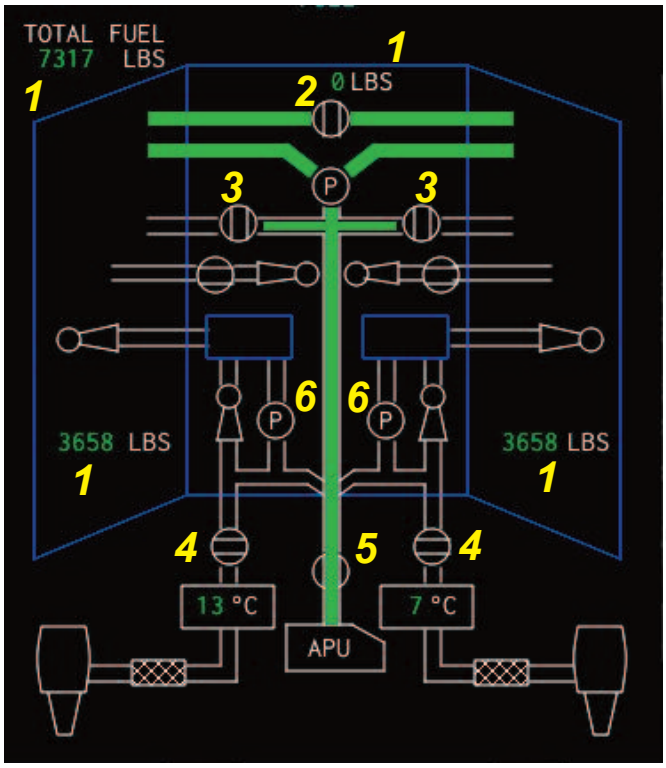
3 The buses when are fed with AC electricity they will be shown in green.

DC EICAS



Same as the AC Page you can access the DC page pressing twice the ELEC button on the Pedestal.
Once you connect every generator (APU or Engine) the AC buses converts the energy to DC so you can have all the information showed here on the DC Eicas Page.

FUEL EICAS



On this page you will be able to see the fuel configuration, not only the amount left on the three tanks but also xflow configurations, open valves and temperatures.

1 Fuel Tanks Quantity. In this schematic view of the plane you can see the three fuel depots with the amount of fuel remaining of them. Also on the top left corner a total fuel left number can be found.

2 This is the Gravity XFlow valve and if it is opened (on the overhead panel) fuel will start changing from one wing to another by gravity forces. Take into consideration that G-forces will influence over the xflow process (be careful sliding your plane!).

3 Here are the pump XFlow valves. If you want to equilibrate the fuel quantity between wings faster, you have to open these valves. Please notice to open then you have to put in manual the AUTO OVERRIDE button.

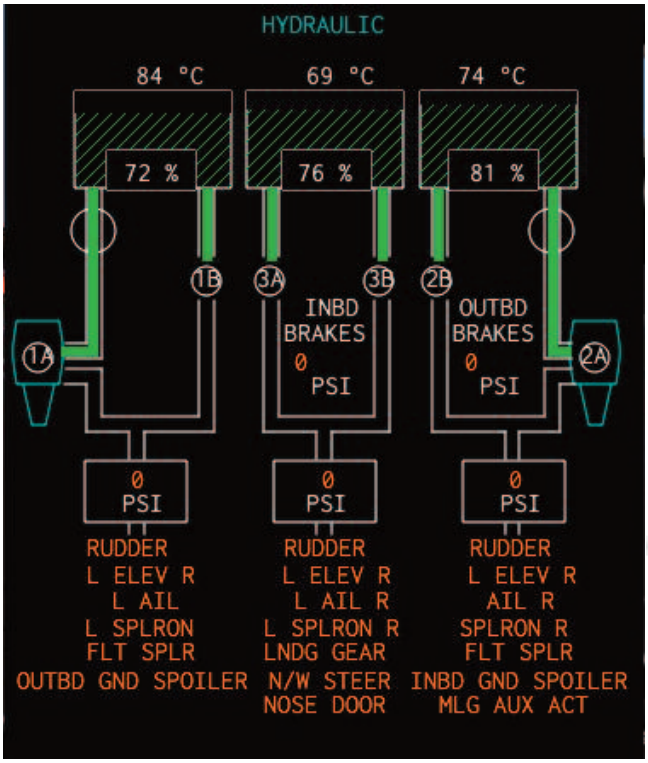
4 These valves are the fuel cutoff valves that you can find on the red lever of the engines. If you cut that valve then the engines will shutdown. You could then restart them if you open again the valves in a short period of time (but better hurry up!)

5 The APU valve can be opened through the PWR FUEL button. Once it is opened you can start the APU, but once started the valve won't be closed until the APU is not closed.

6 These are the pump fuel engines. If you find necessary to pump fuel from the tanks to the engines then you have to press the pump fuel buttons on the overhead panel.

When there is fuel on the central tank, and the wing tanks are not full, the fuel system will start an automatic process of transferring fuel from the center to the wings. That way it is ensured the wings have the most time possible the tanks filled up.

HYDRAULICS EICAS



To control the hydraulics on the plane you can see them on the Hydraulics page, accessible pressing the HYD button on the pedestal.
Brown colours will be inactive and green ones active.
With the hydraulic switches you can open the valves to start controlling the flight controls.

COCKPIT GUIDE

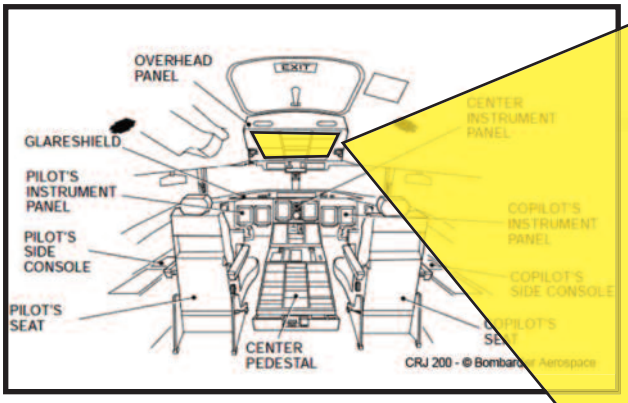
The CRJ-200 has a very complex cockpit. Even though this aircraft is not as large as other commercial airliners, it is among one of the more advanced systems to date. All of the systematic functions and instruments found on a 737 or Airbus 320 can also be found here, but in a different configuration. As such, this guide will help you familiarize with the CRJ-200 operating environment.

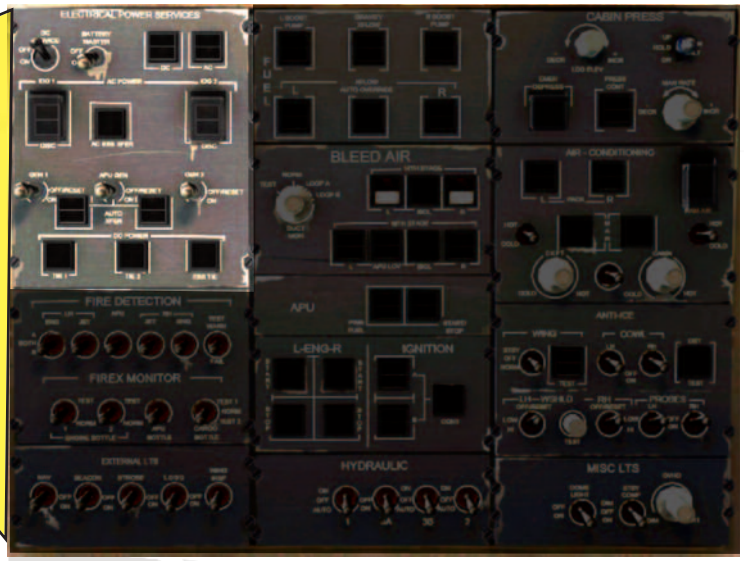
For the purpose of making the learning experience as clear and easy as possible, we will include a highlighted graphic of the instruments inside the cockpit.

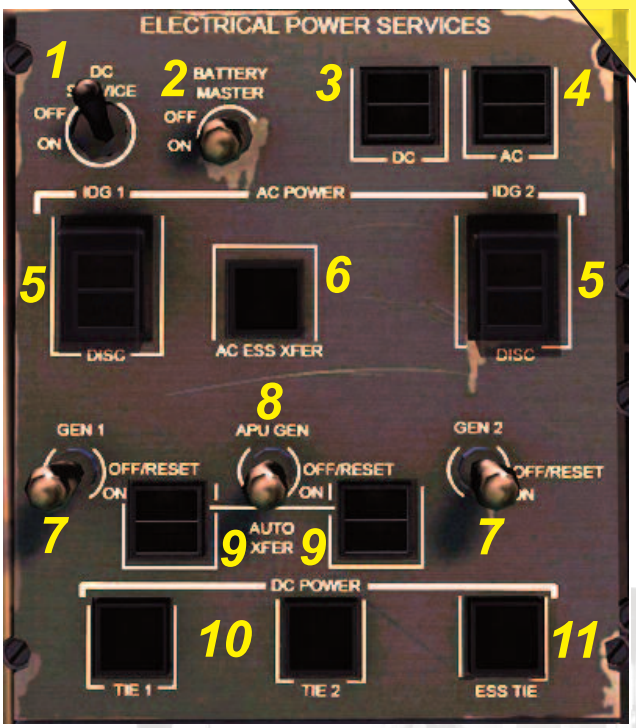
NOTE: Red color indicates Function still not Simulated

OVERHEAD PANEL

Electrical power services







1 DC SERVICE

Used to connect the DC service bus to the APU battery direct bus.

2 BATTERY MASTER

Used to connect the APU and main battery direct busses to the battery bus.

3 4 DC / AC

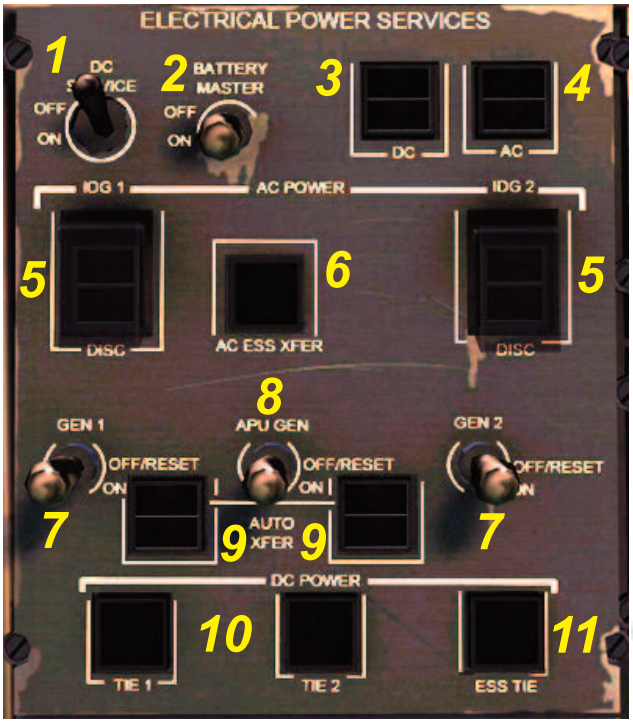
Used to select external DC / AC power.

- AVAIL (green) External power is connected and is ready to use.
- IN USE (white) The external DC / AC power unit is supplying the electrical system.

5 IDG1 and 2 DISC (Guarded)

Used to disconnect IDG from engine.

- DISC (white) selected disconnect is successful.
- FAULT (amber) There is a fault within IDG (low oil pressure or high oil temperature) IDG will automatically disconnect, when an overtemperature or over torque condition occurs Once disconnected, the IDG cannot be reset with the engine running.



6 AC ESS XFER

Used to switch essential bus feed from AC bus 1 to AC bus 2.

- ALTN (white) light indicates essential bus is fed from AC bus 2.

Transfer is automatic during an AC bus 1 failure.

7 8 GEN1, 2 and APU GEN

- ON - Connects generator to associated bus.
- OFF/RESET - Disconnects generator from associated bus and/or resets the generator control circuit

9 AUTO XFER

Used to disable automatic transfer of associated IDG.

- OFF (white) autotransfer is selected off.
- FAIL (amber) indicates a fault preventing autotransfer.

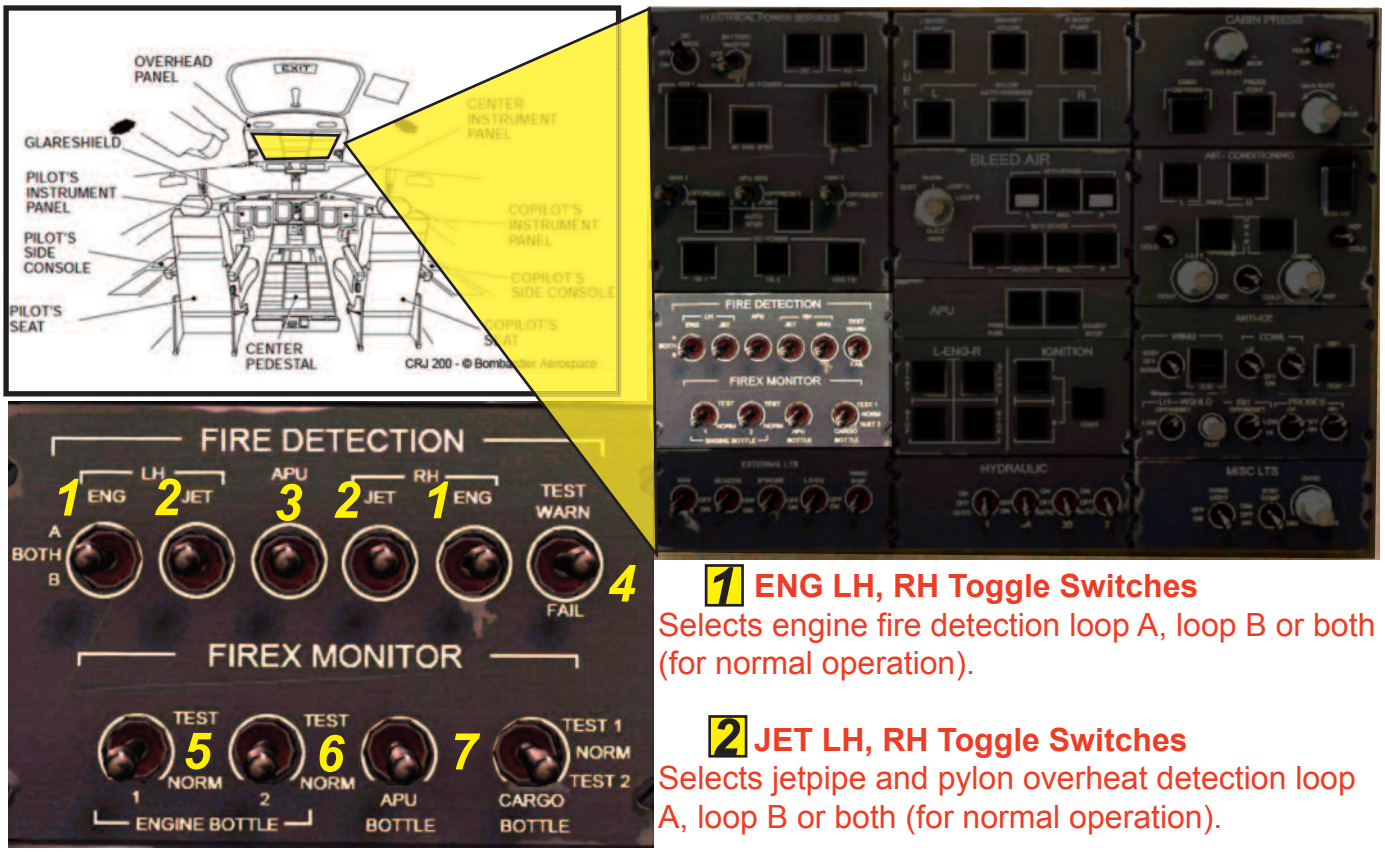
10 BUS TIE 1 or 2 Switch/lights

- CLOSED - Come on white to indicate that the corresponding DC bus has been automatic tide to the service TRU during an abnormal condition, or has been pressed in, to manually tie corresponding bus to the service TRU.
  CLOSED light (white) comes on.
  Corresponding utility bus is shed when switch/light indicates CLOSED.

11 ESSENTIAL BUS TIE Switch/Light

- CLOSED - When pressed in, comes in white to indicate that ESS Bus has been manually tied to the service TRU during a DC essential TRU failure.
  ESS TIE switch/light can only be selected manually.

FIRE PROTECTION
Fire Detection and Extinguishing (FIDEEX)



1 ENG LH, RH Toggle Switches
Selects engine fire detection loop A, loop B or both (for normal operation).

2 JET LH, RH Toggle Switches
Selects jetpipe and pylon overheat detection loop A, loop B or both (for normal operation).

3 APU Toggle Switch
Selects APU engine fire detection loop A, loop B or both (for normal operation).

4 TEST Toggle Switch

- WARN - Simulates a fire or overheat condition on the engines with the following indications:
  - Firebell rings
  - L/R ENG FIRE, and L/R JETPIPE OVHT warning messages come on.
  - "JETPIPE OVERHEAT" aural warning comes on.
  - HYD SOV 1/2 OPEN, L/R ENG SOV OPEN, caution messages come on.
  - LH/RH ENG FIRE PUSH, BOTTLE 1 AND 2 ARMED PUSH TO DISCH switch /light come on
  - FAIL - Simulates a short on the selected loops (A or B) with the following indications:
    L/R FIRE FAIL, APU FIRE FAIL, and L/R JET OVHT FAIL caution messages come on.

5

ENGINE BOTTLE 1, 2 Toggle switches

- TEST - Applicable Firex bottle squib circuit continuity are checked.
  L/R ENG SQUIB 1/2 advisory (green) message displayed if test successful
- NORM - Selects normal Operation.

6 APU BOTTLE

Test the Squibs on the Firex Bottles for the APU

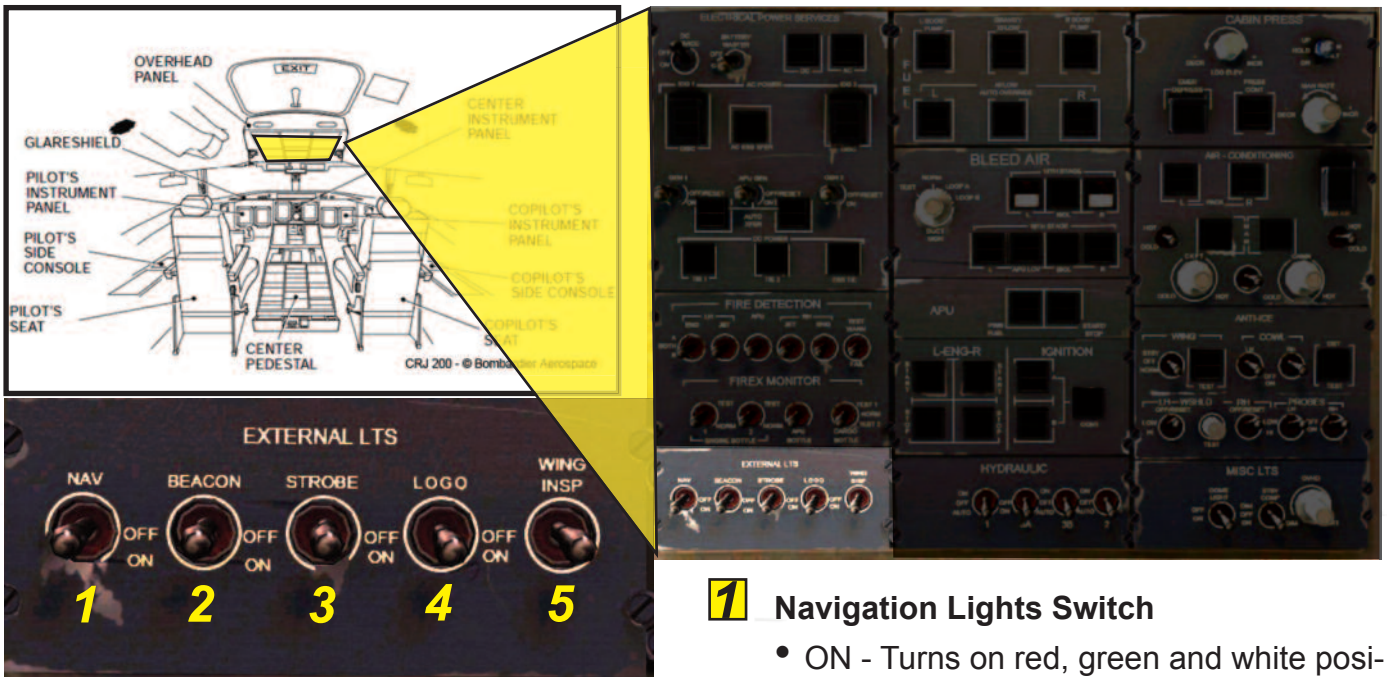
7 CARGO BOTTLE Toggle Switch

- **TEST1/2 -** Simulates a smoke condition on detector 1/ 2. The following come on:

  - "SMOKE" aural comes on.
  - SMOKE CARGO warning message comes on
  - CARGO SQUIB1/ 2 advisory message comes on (continuity check of squib 1/ 2)
  - CARGO FIREX panel: NORMAL CARGO SMOKE PUSH (red)
  - NORMAL BOTTLE ARMED PUSH TO DISCH (green)
  - STANDBY CARGO SMOKE PUSH (green) lights on.

  NORMAL - Selected for normal operation.

LIGHTING
External Lights



1 Navigation Lights Switch

- ON - Turns on red, green and white position lights.
- OFF - Turns off position lights.

2 BEACON Lights Switch

- ON - Turns on red beacon lights on upper and lower fuselage and starts flight data recorder
- OFF - Turns off beacon lights

3 Strobe Lights Switch

- ON - Turns on white anti-collision lights.
- OFF - Turns off anti-collision lights.

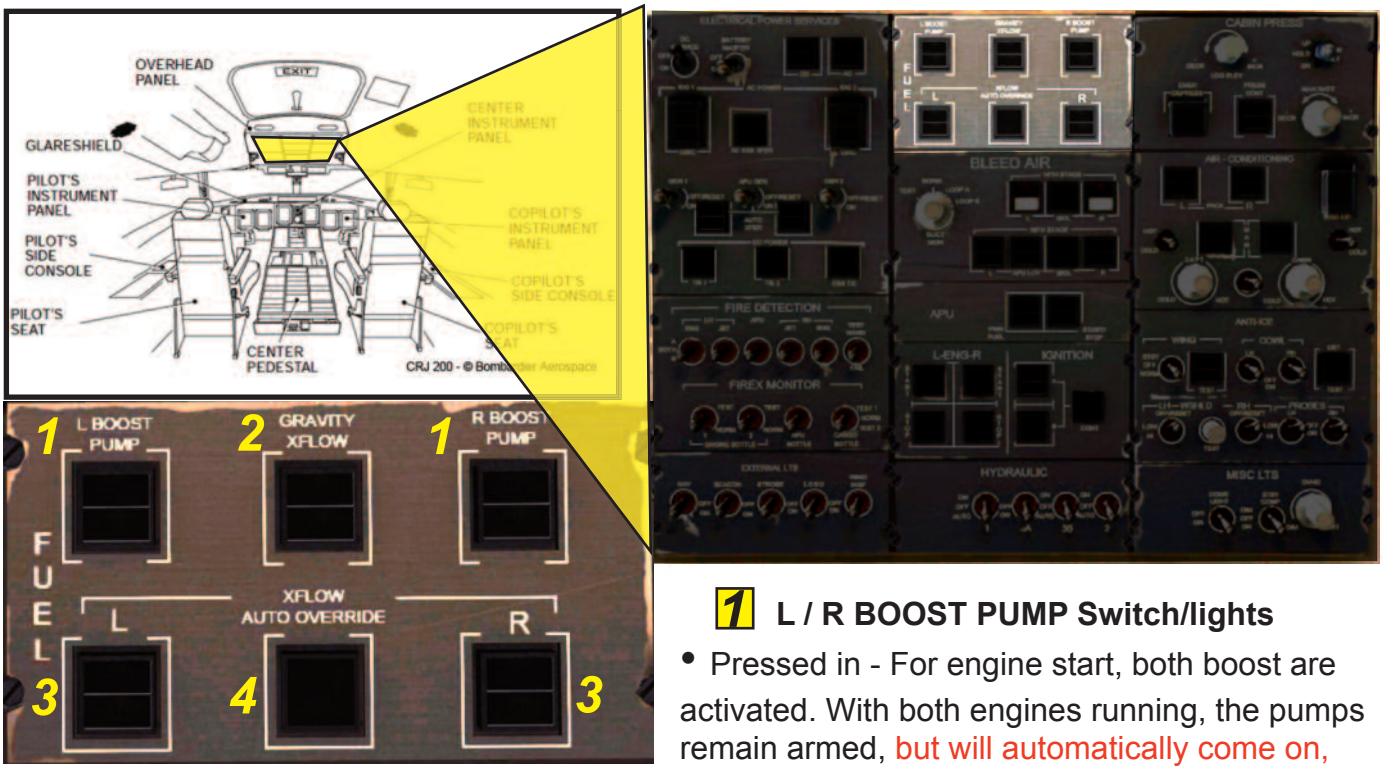
4 Vertical Stabilizer LOGO Light Switch

- ON - Turns on Airline logo light.
- OFF - Turns off logo light

5 Wing Inspection Switch

- ON - Turns on wing inspection lights
- OFF - Turns off wing inspection ligths

FUEL SYSTEM
Fuel Management



1 L / R BOOST PUMP Switch/lights

- Pressed in - For engine start, both boost are activated. With both engines running, the pumps remain armed, but will automatically come on, when low fuel pressure is detected in any engine feed line. The switch/lights show ON when the pumps are operating.
- Pressed out - The boost pump is disarmed on the respective side
- INOP light comes on to indicate that a low pump pressure has been detected, the respective boost pump has not been armed, or has failed.

2 GRAVITY/XFLOW X switch/light

- Pressed in - Opens the balance line SOV, OPEN light comes on.
- Pressed out - Closes the balance line SOV, OPEN light goes out.
- FAIL light comes on to indicate that the balance line SOV is not in the commanded posi tion.

3 L/R XFLOW switch/lights
(with AUTO OVERRIDE switch/light pressed in, manual mode)

- Pressed in - Respective crossflow SOV opens and crossflow/APU pump goes on, ON light goes on.
- Pressed out - Respective crossflow SOV closes and crossflow/APU pump goes off, ON light goes out.

(With AUTO OVERRIDE switch/light pressed out, automatic mode)

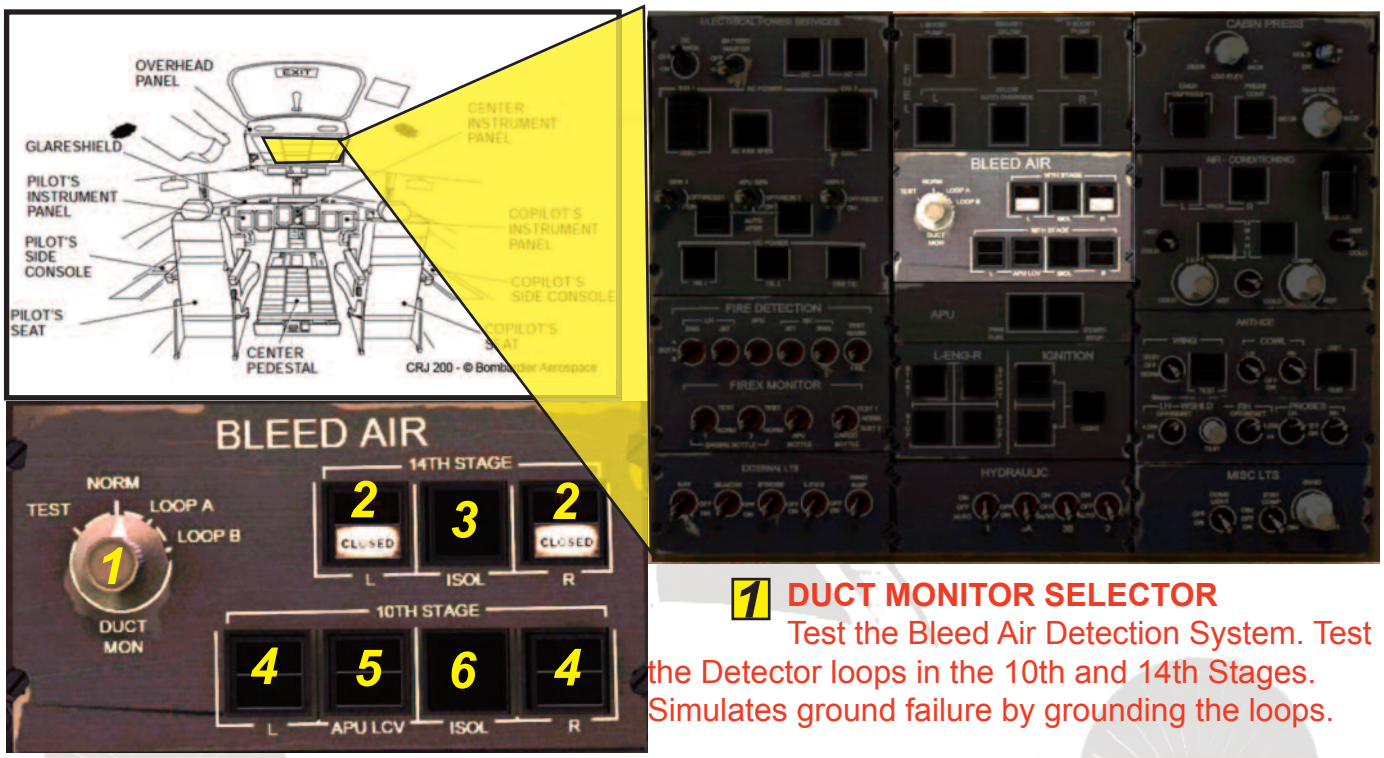
- ON light comes on to indicate that the respective SOV is open and the crossflow/APU pump is on.
- FAIL light comes on to indicate that the respective crossflow SOV is not in the

commanded position or the crossflow/APU pump fails to go on with the left or right cross-flow SOV selected open either manually or automatically.

4 AUTO OVERRIDE switch/light

- Pressed in - Crossflow/APU pump is armed for manual crossflow, automatic crossflow is disabled. MANUAL light goes on.
- Pressed out - Crossflow/APU pump is disarmed for manual crossflow automatic crossflow is enabled. MANUAL light goes out.

PNEUMATIC
Bleed Air System



1 DUCT MONITOR SELECTOR
Test the Bleed Air Detection System. Test the Detector loops in the 10th and 14th Stages. Simulates ground failure by grounding the loops.

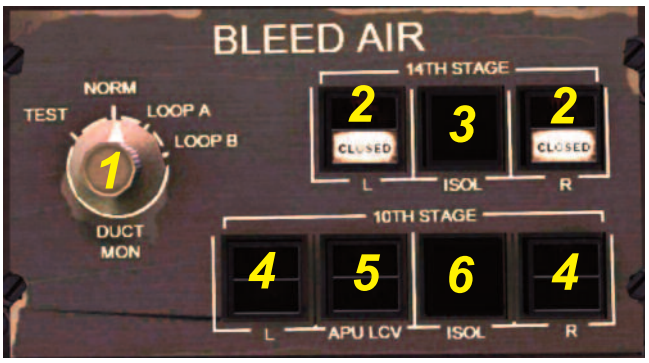
- TEST - Continuity of all Loops is checked. Grounds the Loop to simulate a Duct failure.

EICAS: a) L(R) 10th DUCT and aural “Bleed Air Duct”
b) L(R) 14th DUCT and aural “Bleed Air Duct”

- NORM - normal operation
- LOOP A(B) - Tests the respective 10th Stage Loop for shorts

2 L/R 14th Stage Bleed Air Switchlights
Controls the 14th - stage bleed air shutoff valves.

- DUCT FAIL - indicates bleed air leak in applicable duct. Illuminates during duct monitor test.
- CLOSED - Indicates shutoff valves fully closed



3 **14th Stage ISOL Switchlight**

- OPEN - Indicates isolation valve has been selected open.

4 **10th Stage Left/Right Bleed Air switch / Light.**

- When pressed in, associated bleed air shu toff valve opens and CLOSED (white) goes out.
- When pressed out, associated bleed air valve closes and CLOSED (white) comes on.
- DUCT FAIL (red) -- Comes on if bleed leak detector sensors detect a failure in associated duct section. DUCT FAIL goes out when the failed duct is isolated and temperature sensor cools.

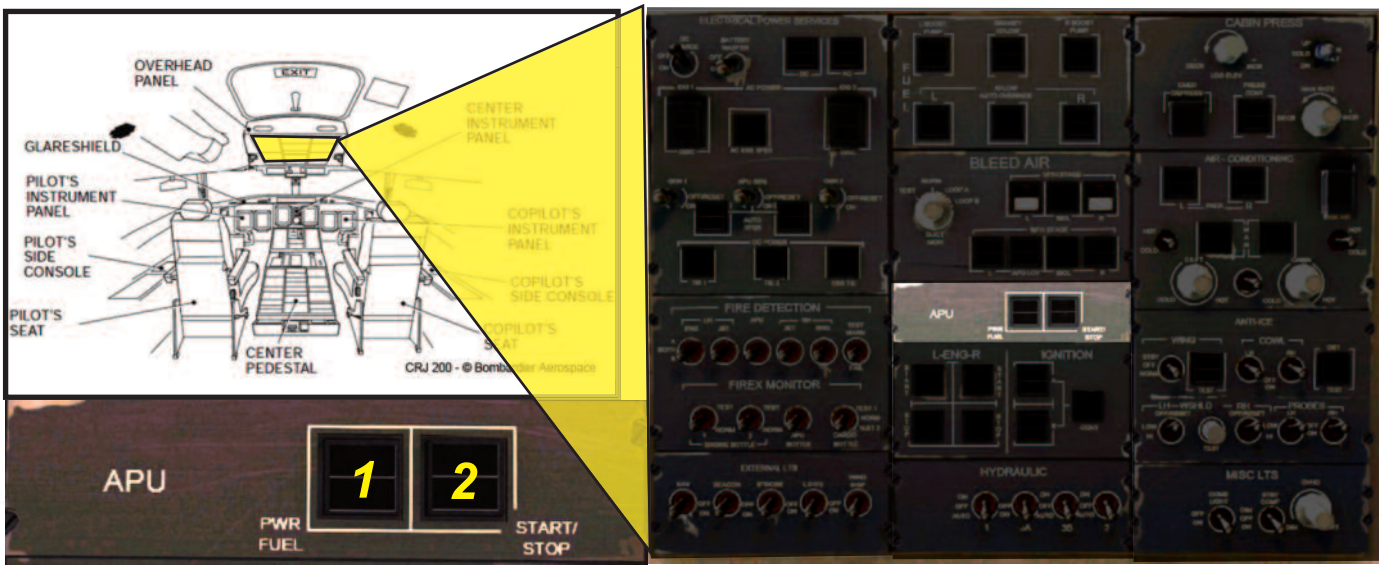
5 **APU LCV Switchlight**

- OPEN - APU LCV seleted open
- FAIL - APU LCV open when commanded by the interlock protection circuit.

6 **10th Stage Isolation Valve Switch/Light**

- When pressed in, bleed air isolation valve opens and OPEN (white) comes on.
- When pressed out, isolation valve closes and OPEN light goes out.

AUXILIARY POWER UNIT
Control



1 PWR FUEL Switch/Light

When pressed in, crossflow/APU pump is energized, APU IN BITE, APU gauges energized, door scheduled to open and APU fuel shut-off valve opens.

- PUMP FAIL light comes on to indicate that crossflow/APU pump has failed.
- SOV FAIL light comes on to indicate that the APU fuel feed SOV has failed.

2 APU START/STOP Switch/Light

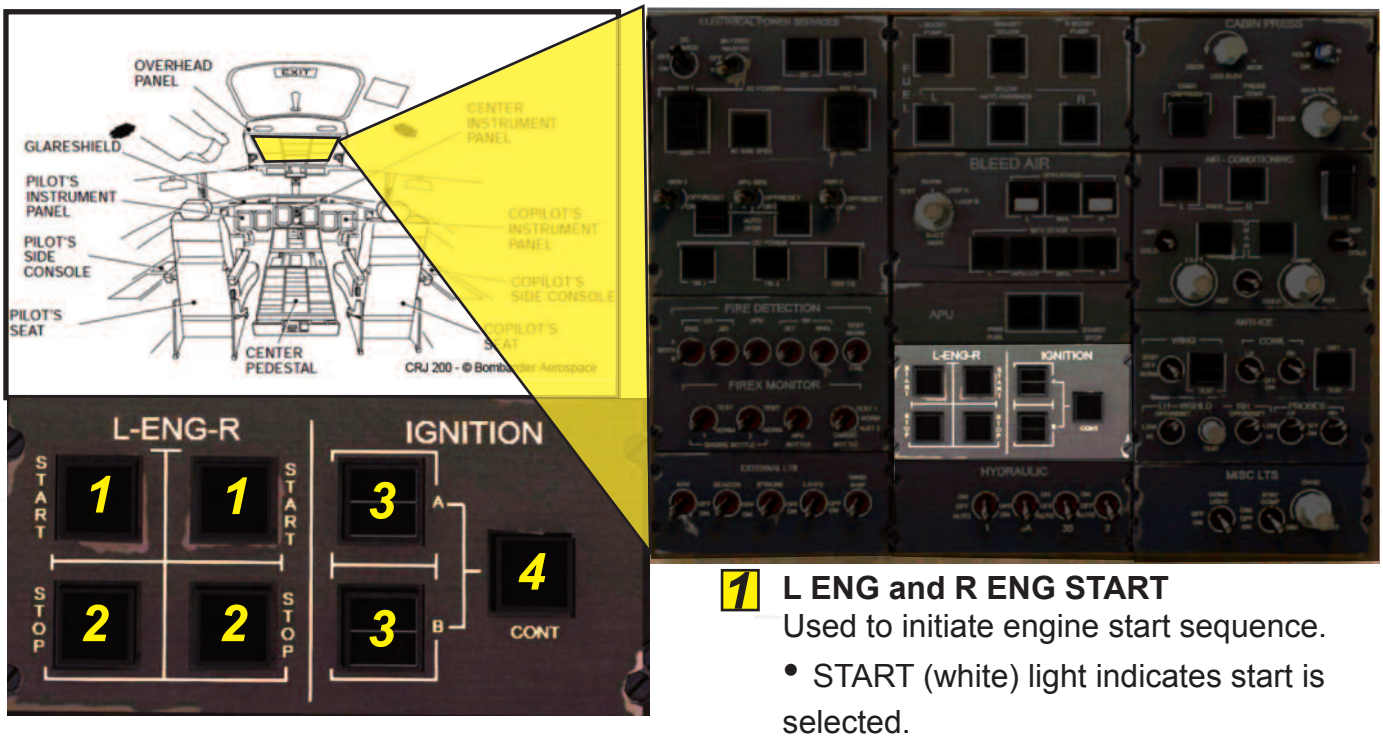
When pressed in, starter motor is energized and START light (amber) comes on.

- At 50% rpm, START light goes out.
- At 95% rpm, and 4 seconds later, AVAIL light (green) comes on.

When pressed out:

- FCU shut-off valve closes.
- APU shuts down
- AVAIL light goes out.

POWER PLANT
Starting and Ignition Systems



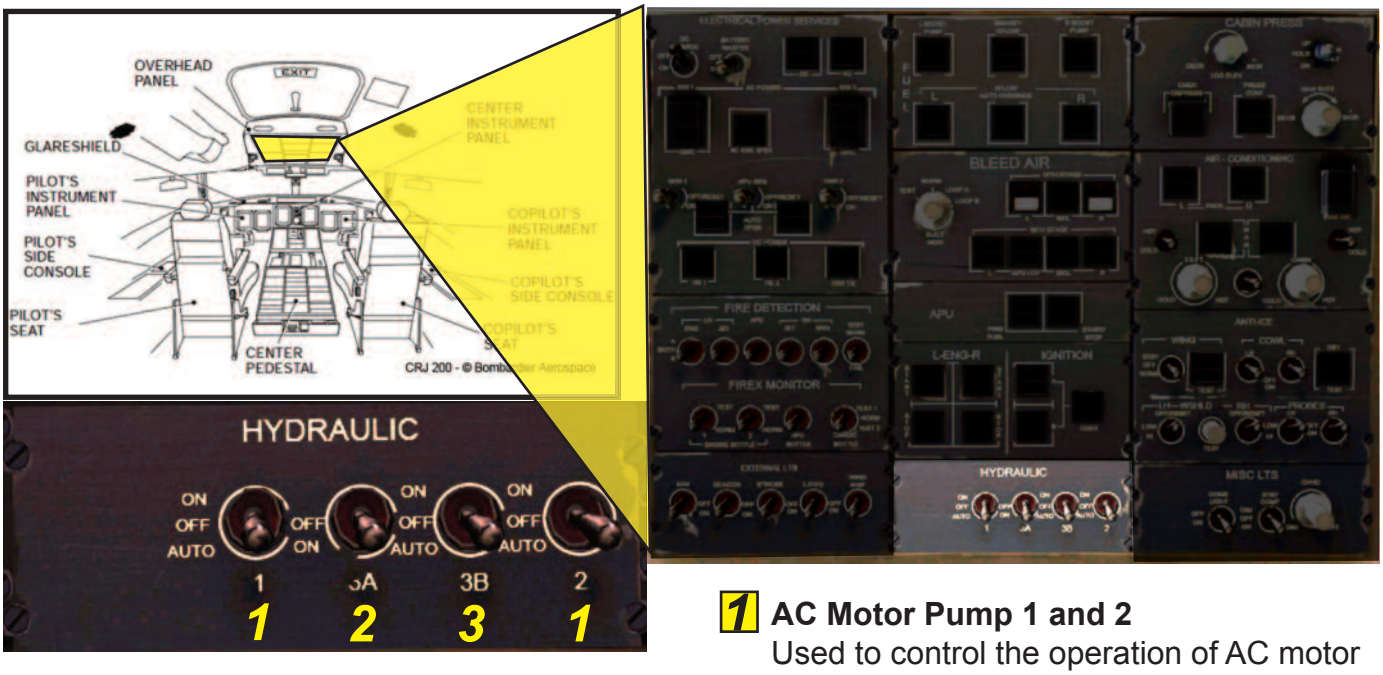
1 **L ENG and R ENG START**
Used to initiate engine start sequence.
- START (white) light indicates start is selected.

2 **L ENG and R ENG STOP**
Used to stop engine start sequence.
- STOP (white) light indicates stop is selected.

3 **IGNITION**
- ARM (green) - Arms respective ignition system on both engines.
- ON (white) - Indicates that the ignition system is activated.

4 **IGNITION CONT**
Used to select continuous ignition of both ignitors on both engines.
- ON (white) light indicates continuous ignition is selected on.

HYDRAULIC POWER
AC Motor Pumps



1 AC Motor Pump 1 and 2
Used to control the operation of AC motor pumps 1B and 2B.

- ON - Pump will operate at 3000 psi output.
- OFF - Pump inoperative
- AUTO - Pump will operate in AUTO position, when the flaps are greater than 0 - degrees and the respective generator is online
    - IDG2 for pump 1B
    - IDG1 for pump 2B

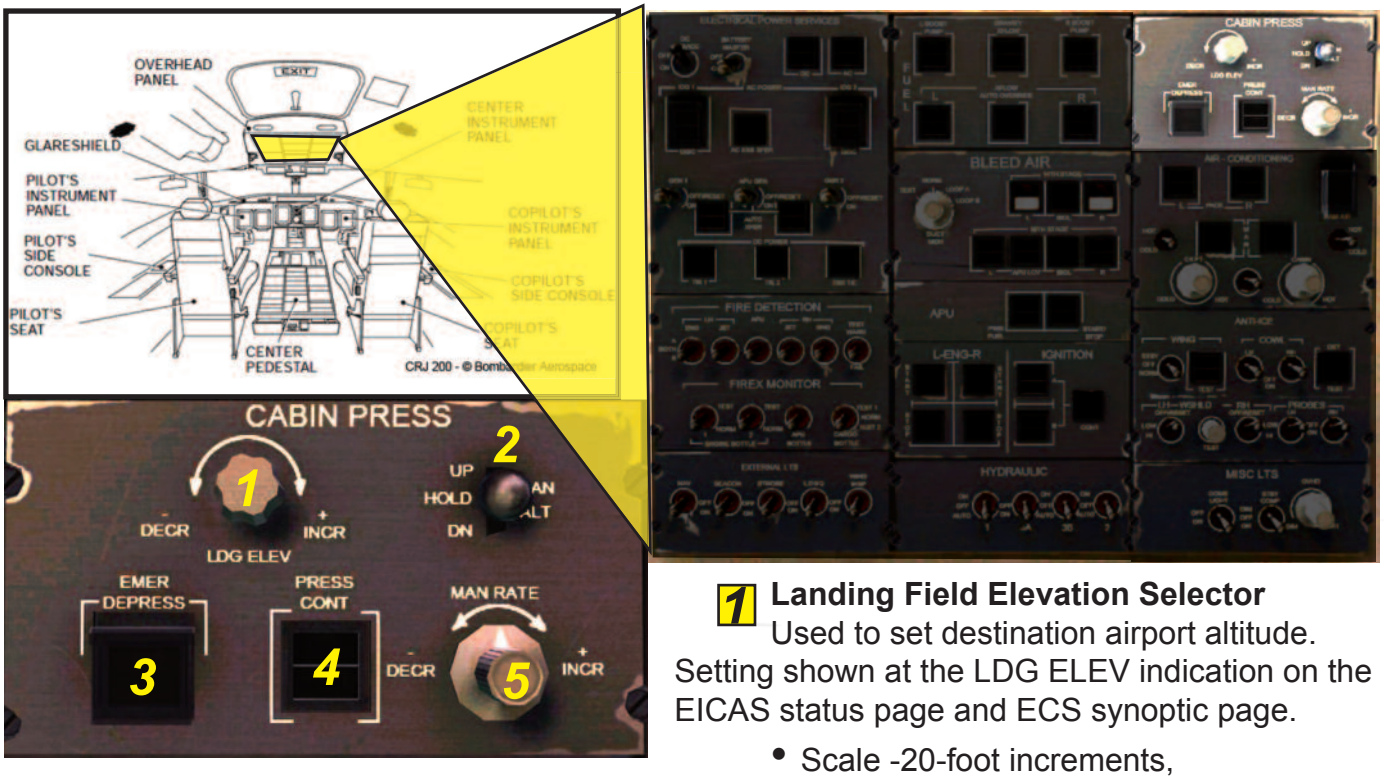
2 AC Motor Pump 3A
Used to control the operation of AC motor pump 3A.

- ON - Pump will operate at 3000 psi output.
- OFF - Pump Inoperative

3 AC Motor Pump 3B
Used to control the operation of AC motor pump 3B. Pump will operate irrespective of switch position when ADG is deployed.

- ON - Pump will operate at 3000 psi output.
- OFF - Pump inoperative.
- AUTO - Pump will operate in AUTO position, when flaps are greater than 0-degrees and either IDG1 or IDG2 is operating

ENVIRONMENTAL CONTROL SYSTEM
Pressurization System



1 Landing Field Elevation Selector
Used to set destination airport altitude. Setting shown at the LDG ELEV indication on the EICAS status page and ECS synoptic page.

- Scale -20-foot increments,
- Range -1,000 feet to +10,000 feet.

2 Manual Cabin Altitude Regulators
Used to control pressurization system in manual (pneumatic) mode.
MAN ALT selector is used to change cabin altitude manually:

- UP - causes outflow valves to open and increases cabin altitude. When selected cabin altitude is acquired, select middle/centre position.
- DOWN - causes outflow valves to close and decreases cabin altitude. When selected cabin altitude is acquired, select middle/centre position.
- Middle/Centre position - Disables all previous manual selections.

3 Emergency Depressurization Switch / Light
Used to depressurize airplane during and emergency.

- When pressed in, both outflow valves open fully to dump cabin pressure. At cruise, val ves dump to cabin pressure of 14250 ±750 feet. Amber ON light comes on when pressed in and EICAS displays.
- When pressed out, both outflow valves revert to automatic control and amber ON light goes out.

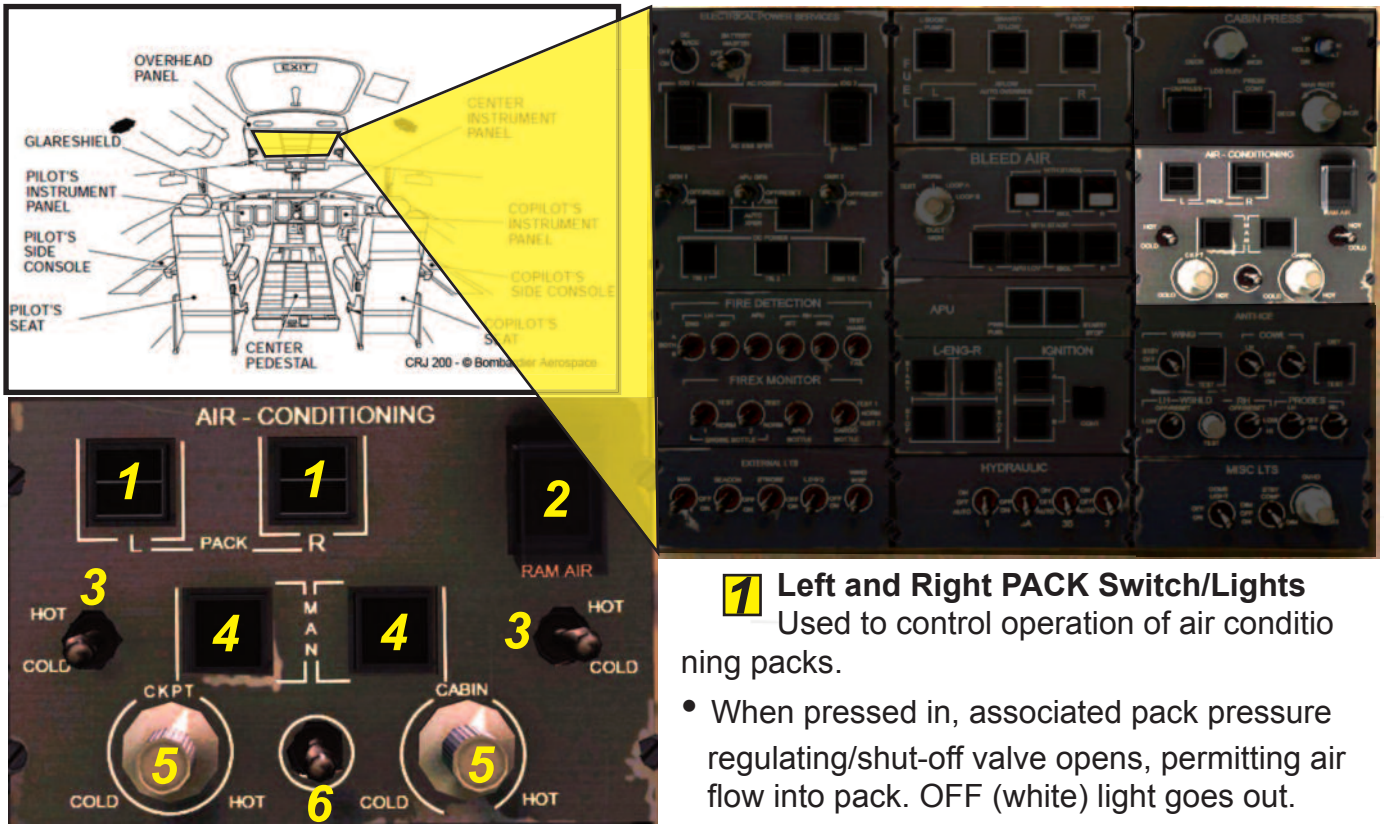
4 Pressurization Control Switch/Light
Selects either manual or automatic control of pressurization system.

- When pressed in, manual mode selected.
  Removes electrical supply from both outflow valves, locks them in their existing position and permits their manual (pneumatic) operation. MAN (white) light comes on and EICAS displays pressurization system data on EICAS primary display.
- When pressed out, automatic mode is selected and MAN light goes out. Automatic mode pressurization data is displayed on EICAS secondary display.
- When pressed twice, the redundant controller gains control.
- FAULT (amber) light comes on when system detects failure of both cabin pressure controllers. EICAS displays AUTO PRESS caution message.

5 RATE Control (Needle Valve) (Manual Mode)
Pneumatically adjusts outflow valve rate during manual mode.

- Ascent from 50 fpm to 3000 ± 1000 fpm
- Descent from 50 fpm to 3000 ± 1000 fpm
- Ascent and descent rates indicated on ECS page of EICAS.

ENVIRONMENTAL CONTROL SYSTEM
Air - Conditioning System



1 Left and Right PACK Switch/Lights
Used to control operation of air conditio ning packs.

- When pressed in, associated pack pressure regulating/shut-off valve opens, permitting air flow into pack. OFF (white) light goes out.
- When pressed out, associated pack pressure regulating/shut-off valve closes, shutting down airflow into pack. OFF (white) light comes on and EICAS displays L/R PACK OFF status message.
- Amber FAULT light comes on:
  When overpressure occurs between primary heat exchanger and compressor section of pack.

2 RAM AIR Ventilation Switch/Light (Guarded)
Used when both packs fail. Provides ambient air to left conditioned air (cockpit) supply duct.

- When pressed in, ram air vent valve opens and supplies air into cockpit supply duct. OPEN (white) light comes on. EICAS displays RAM AIR OPEN status message and ECS page indicates valve position.
- When pressed out, ram air valve closes and OPEN light goes out. EICAS ECS page indicates valve at closed position.

3 Manual Mode Temperature Control Switch/Light
Used to operate air conditioning temperature control valves in manual mode. Range is 1.7º C to 71º C (35º F to 160º F). Do not activate and hold switch for extended periods of time as excessive temperatures will occur.

4 Manual Mode - Temperature Control Switch/Light

Used to select manual mode temperature control.

- When pressed in, selects manual control and light comes on green and EICAS indicates CKPT/CABIN TEMP MAN.
- When pressed out, selects automatic control and light goes out.

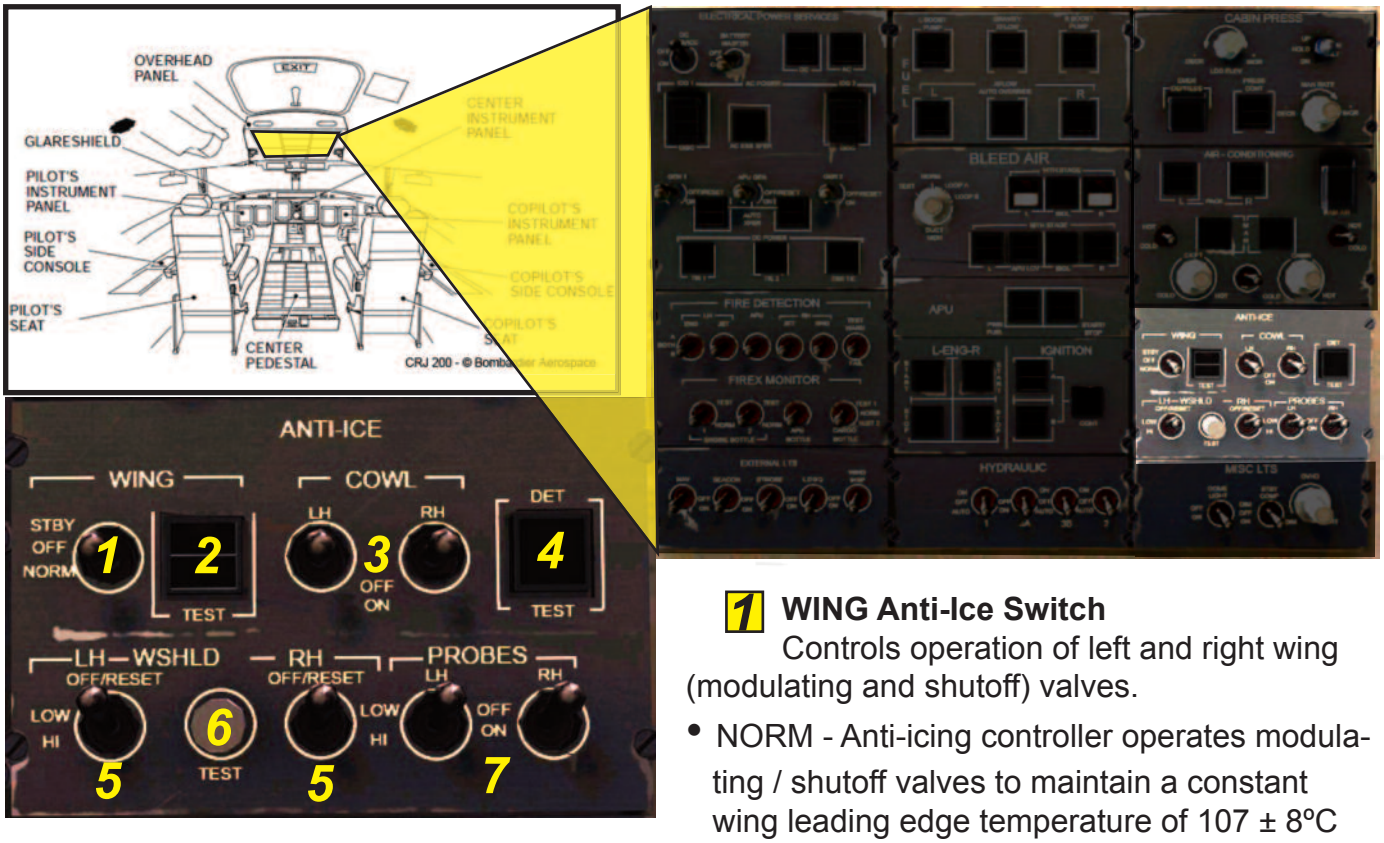
5 Automatic Mode - Temperature Controls

Used to provide automatic control of temperature in selected compartment. Total automatic range is approximately 14.5º C (58º F) to 28º C (82º F)

6 CARGO BAY AIR CONTROL switch

- OFF - Cargo Compartment Air Supply is shut of.
- FAN - This Fan draws air from the Aft Cabin Exhaust.
- COND Air - This selection permits conditioned air from the Air Distribution Manifold to be used

ICE AND RAIN PROTECTION SYSTEM
Anti-Ice Panel



1 WING Anti-Ice Switch
Controls operation of left and right wing (modulating and shutoff) valves.

- NORM - Anti-icing controller operates modulating / shutoff valves to maintain a constant wing leading edge temperature of 107 ± 8ºC (225 ± 15º F).
- OFF - Closes modulating / shutoff valves and shuts down air supply.
- STBY - Modulating / shutoff valves cycle open / closed to maintain wing leading edge temperature of 49 ± 4º C (120 ± 8º F).

2 Wing Overheat/Duct Failure Switch / Light
Used to test bleed air leak detection system and to indicate failures/ overtemperature conditions.

- OVHT (red) - OVHT light comes on when overheat condition exists in wing leading edge.
- DUCT FAIL (red) - Light comes on when bleed air leak is detected in wing left or right anti-ice ducts. Light goes out when the failed duct is isolated and temperature sensor cools.
- TEST - When switch is pressed, the normal mode of the overheat system is tested. WING OVHT warning message, "Wing overheat" aural, OVHT light and WING A/ICE OK status message will come on.The position of the wing switch (either STBY, OFF or NORM) does not alter the test.

3 COWL Anti-Ice LH/RH Switches
Controls operation of cowl anti-ice shut-off valves.

- ON - Opens applicable cowl anti-ice shut-off valve, to provide 14th stage bleed air to the cowl and T_2 probe at the engine inlet.
- OFF - Closes applicable cowl anti-ice shutoff valve.

4 ICE DET Switch / Light
Illuminated when icing conditions.

5 Windshield Anti-Ice / Anti-Fog LH/RH Switches
Used to heat windshields and windows

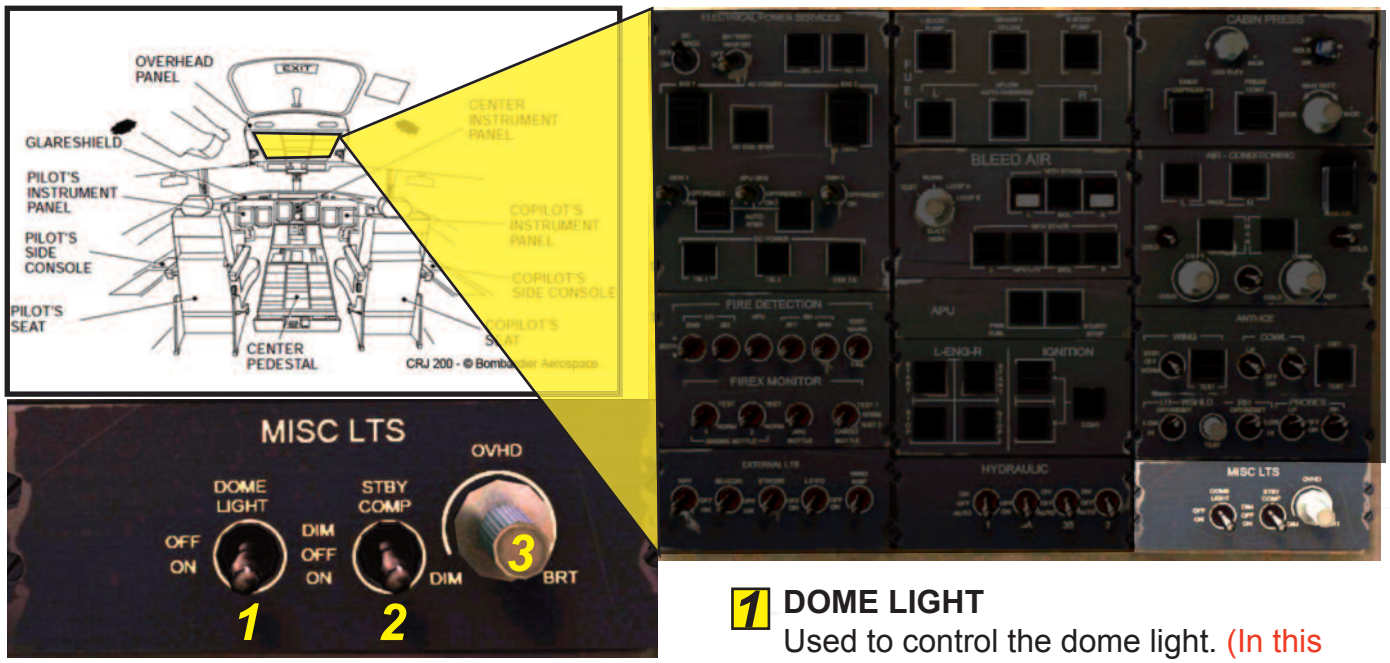
- HI - High temperature heat 41ºC (105ºF) to corresponding windshield (and low level 24ºC (75ºF) to side window.
- LOW - Low temperature heat 24ºC (75ºF) to corresponding windshield, and side window.
- RESET/OFF - Windshield and window heat not in use and resets corresponding overheat circuit.

6 Windshield Anti-Ice TEST Switch
Used to test windshield anti-ice system; simulates a no-heat condition.

7 PROBES, Anti-Ice LH/RH Switches Ground Operations:

- OFF - All probe heaters are off, when there is no AC power on-line or when the APU GEN is on.
- ON - With AC power on-line, probe heat is as follows:
  - TAT - OFF,
  - Static and AOA - ON
  - Pitot and Base - Half power heat.
- ON - With external power connected (no generators on-line), probe heat is as follows:
  - TAT - OFF,
  - Static and AOA - ON
  - Pitot and Base - Half power heat.

LIGHTING
Misc LTS



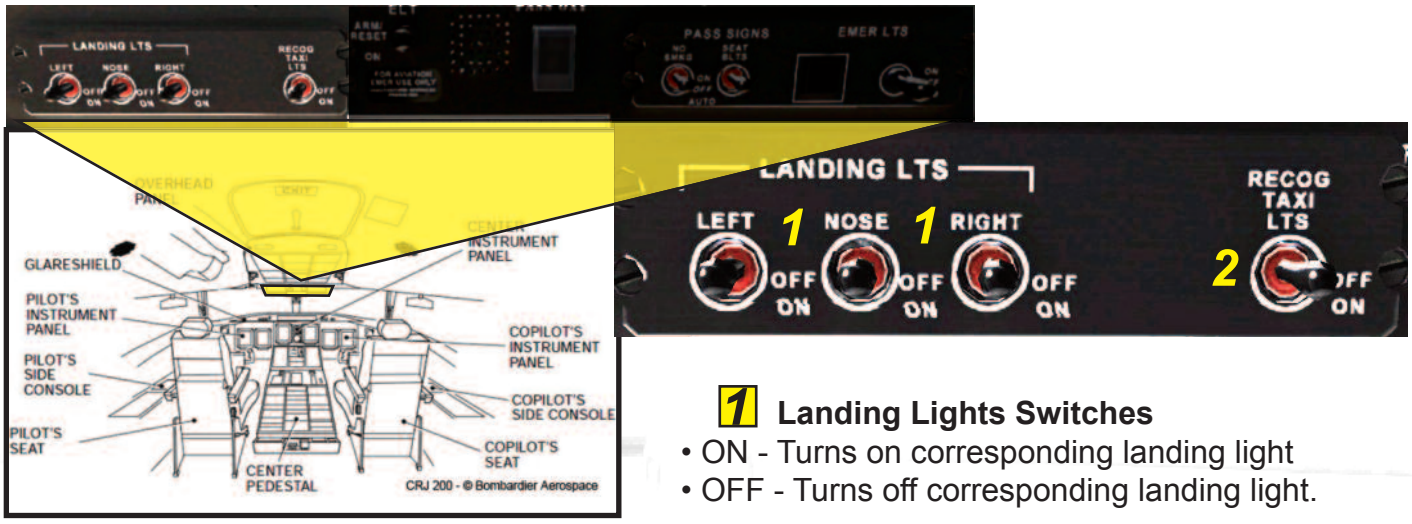
1 DOME LIGHT
Used to control the dome light. (In this case it controls the cabin lightning)

2 STBY COMP
Used to control operation of standby compass lighting.

3 OVHD
Used to control intensity of overhead panel integral lighting.

OVERHEAD FRONT PANEL

Landing and Taxi Lights



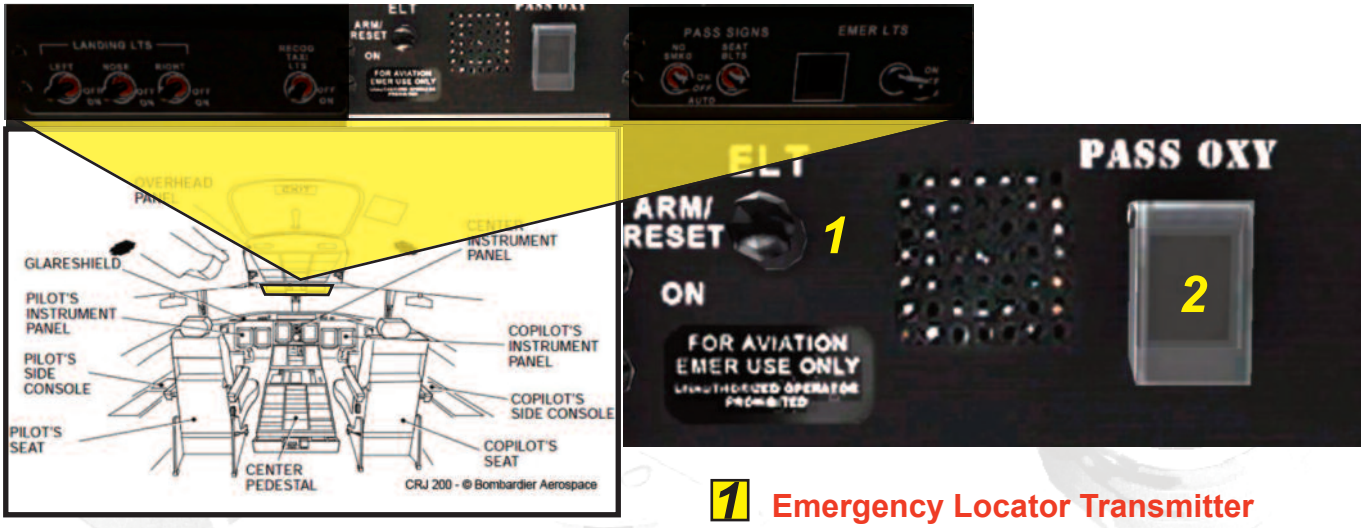
1 Landing Lights Switches

- ON - Turns on corresponding landing light
- OFF - Turns off corresponding landing light.

2 Recognition/Taxi Lights Switch

- On - turns on recognition/taxi lights.
- OFF - turns off recognition/taxi lights

EMERGENCY PANEL
ELT and Pass Oxy



1 Emergency Locator Transmitter

Used to test, arm and reset transmitter.

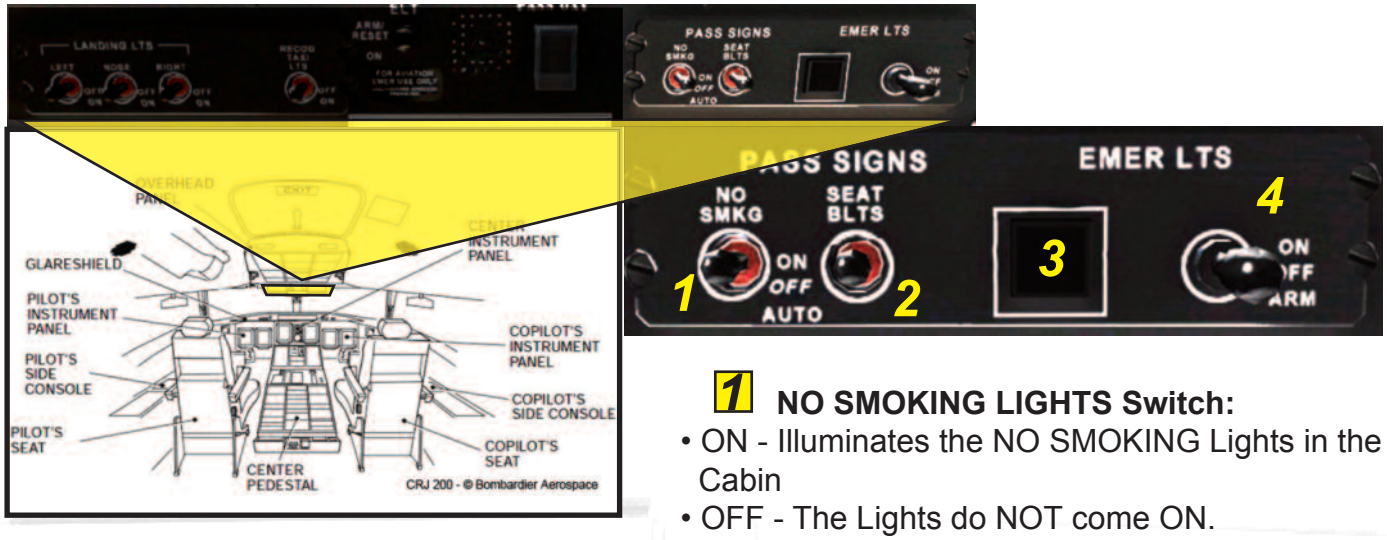
2 Passenger Oxygen Override Switch/Light (guarded)

Normally blank (not on).

Used when the passenger oxygen system auto-deploy has failed, or to override the auto deploy system.

- Comes on white to indicate that the oxygen system has deployed
- When pressed, electrically operates the latches on the oxygen compartment doors, which open to deploy the passenger O^2 masks.

EMERGENCY LIGHTING



1 NO SMOKING LIGHTS Switch:

- ON - Illuminates the NO SMOKING Lights in the Cabin
- OFF - The Lights do NOT come ON.
- AUTO - NO SMOKING Light Illuminate when any
  1. Oxigen Deployment
  2. Gear is Down
  3. Cabin altitude exceed 10.000' (This is driven by xplane so its not the same)

2 SEAT BELTS Switch

- ON - SEATS BELTS Lights illuminate in the Cabin.
- OFF - The Lighs do NOT come ON
- AUTO - SEAT BELTS Lights illuminate when any:
  1. Oxygen Deployment
  2. Gear is Down and Flaps NOT ZERO
  3. Cabin altitude exceed 10.000'(This is driven by xplane so its not the same)

3 EMERGENCY LIGHTS OFF

- OFF - Illuminates when the Emergency Lighting System has been selected to OFF
  1. Battery is OFF
  2. Lights are OFF

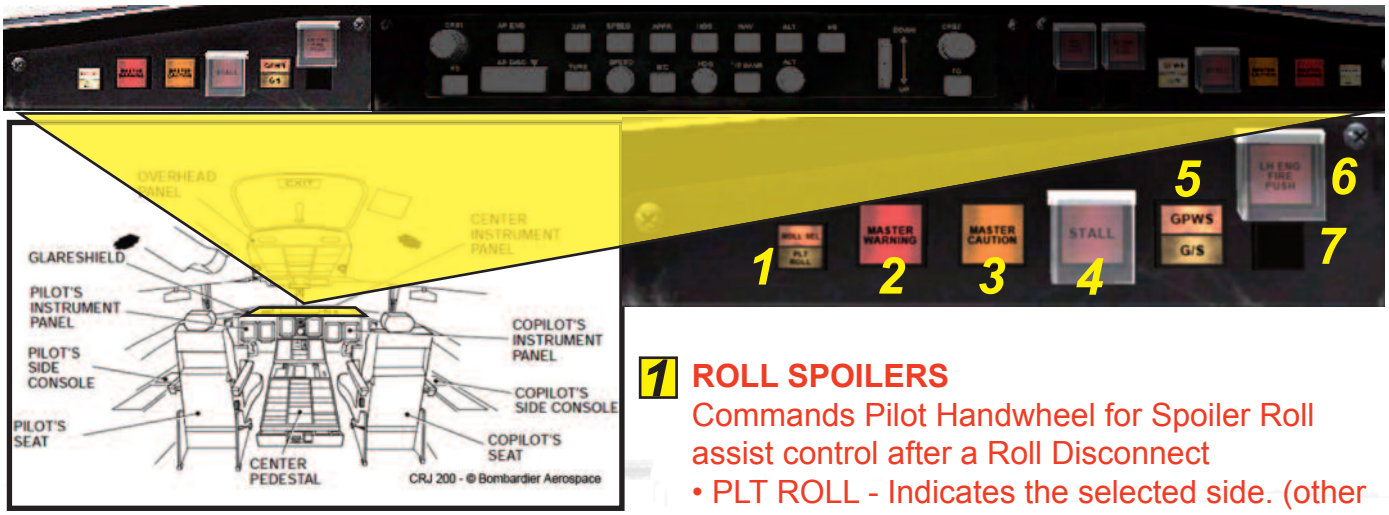
4 EMERGENCY LIGHTS Switch:

Commands the Emergency Lighting System. FA Switches have priority.

- ON - Emergency Lights illuminate
- OFF - Emergency Lights are selected OFF. OFF Light illuminates.
- ARM - Emergency Lights illuminate in case of loss of DC ESS BUS.

CENTRAL PANEL

Emergency Lights



1 ROLL SPOILERS

Commands Pilot Handwheel for Spoiler Roll assist control after a Roll Disconnect

- PLT ROLL - Indicates the selected side. (other switch says "CPLT")
- The ROLL DISC isolates the aircraft to one Aileron.
- The ROLL SEL Switch ensures the Spoileron are functioning on the operating circuit.

2 MASTER WARNING

Press to extinguish and stop alarms.
MASTER WARNING flashes with any new EICAS warning Message. Intensity cannot be dimmed.

3 MASTER CAUTION

PRESS to extinguish and stop alarms.
MASTER CAUTION flashes with any new EICAS Caution Message. Intensity cannot be dimmed.

4 STALL

PRESS to TEST the Stall System when on ground.
FLASHES - Indicates aircraft is approaching a Stall Situation according to AOA Sensing.

5 GPWS / GLIDESLOPE LIGHT

- Flashes (GPWS) - Indicates GPWS ALERT Stops when the aircraft recovers from the conflict.
- Illuminates - Indicates Aircraft is BELOW the Glideslope in Mode 5.
- PRESS - Stops Alert (aircraft between 30' - 1000' AGL)

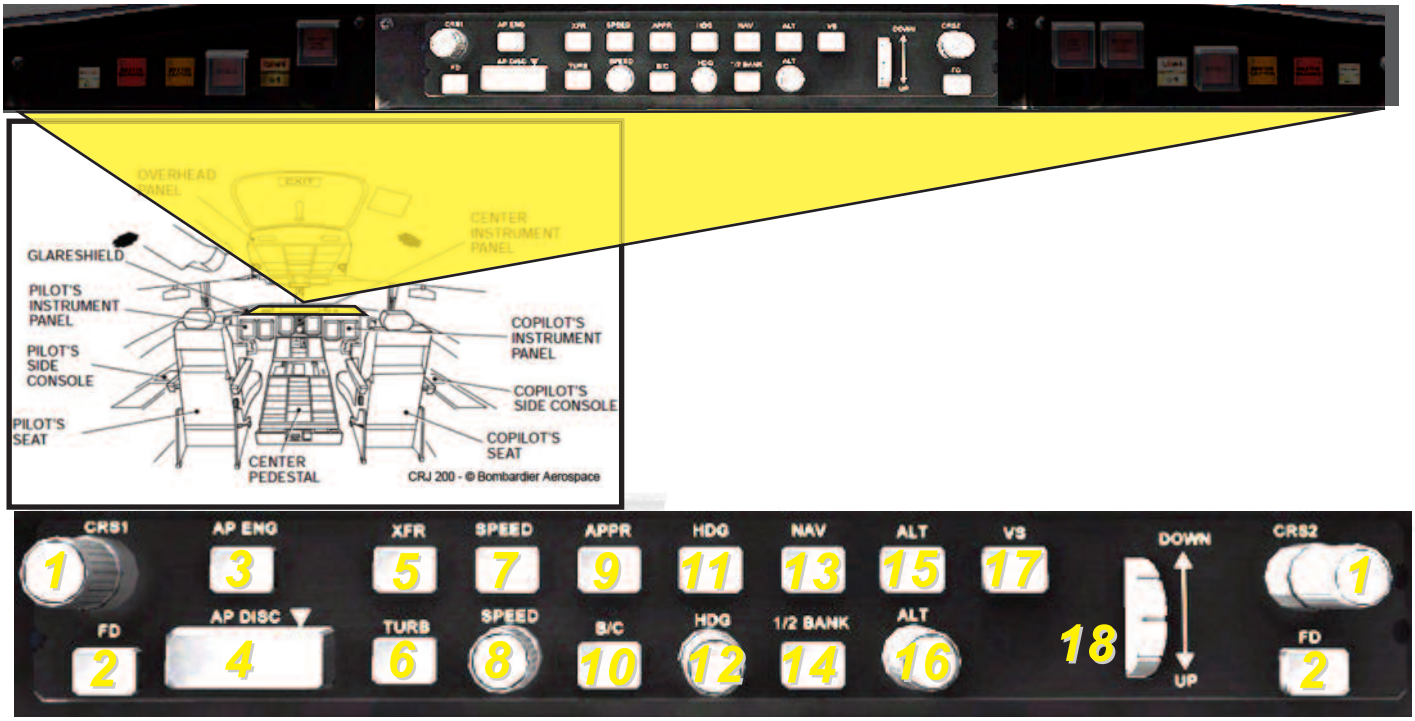
6 **LH/RH ENGINE PUSH (guarded)**
PRESS to:
1. Fuel Feed SOV - CLOSED
2. FIREX Bottle 1 Squib - ARMED
3. FIREX Bottle 2 Squib - ARMED
4. Bleed Air SOV - CLOSED
5. Hydraulic SOV - CLOSED
6. IDG - SHUTDOWN

PRESSED OUT: reverses the above
• LH/RH ENG FIRE PUSH Light - Illuminates, indicates FIRE condition in the LH/RH engine (pressing this button discharges the Firex Bottle into the Engine also)

7

BOTTLE 1 ARMED PUSH TO DISCH
PRESS to discharge the Firex Bottle 1 into the Engine
BOTTLE 1 AREMD TO DISCH Light - Illuminates when Squib is ARMED
a) LH ENG FIRE PUSH
b) RH ENG FIRE PUSH
and Bottle Pressure > 225 - 275 psi.

AUTOPILOT PANEL



1 CRS1/2
ROTATE - Sets the Course Pointer. Indication is on the PFD.
PUSH DIRECT - PRESS Points the Course Pointer directly at the Station.
(no winds or other factors considered)

2 FLIGHT DIRECTOR
PRESS - Removes the FD commands from the PFD on the uncoupled side.
- Selects the basic Pitch and Roll Modes
- Inoperative if the A/P is ON
Note: Use does NOT disengage the A/P

3 AP ENGINE
PRESS - Engages/Disengages the Autopilot.
Note: The aircraft must be within the Trim limits to be successfully engaged.

4 AP DISENGAGE
PRESS - Disengages the Autopilot
Couples, Uncouples, Transfers control, and reduces Gains. There is a “Cavalry charge” heard when the A/P is dissengaged.
Note: A pilot must hold the controls to disengage the A/P.

5 TRANSFER
PRESS - Changes the Flight Guidance Commands from the Pilot to the Copilot’s side.
Normally the A/P uses FCC1. Using the Switch will transfer the A/P to FCC 2 (or back)
The arrow on the PFD indicates which FCC is being used.

6 TURBULENCE

PRESS - Engages the Turbulence Mode. This reduces the Autopilot Gain.
TURB Requires the A/P to be engaged, is lost if A/P is lost.
The A/P Gains are reduced to provide a smoother flight. This mode is cleared if the LOC is captured.

7 SPEED

PRESS - Alternately selects the:
1. IAS Speed Mode
2. Mach Mode
3. Clears

IAS / Mach switch over occurs at 31,600'

8 SPEED KNOB

ROTATE - Sets the IAS or Mach Reference Value
This Speed reference indicates in MAGENTA on the PFD. This operates all the time and does not require the A/P or FDs.
When first selected the current conditions are synchronized

9 APPROACH

PRESS - Will ARM the Approach Mode for capture. Until capture, the aircraft will operate in the current Active Modes.
The type of Approach is determined by the NAVAID, NAV SOURCE Knob on the Display Control Panel and the Radio that tunes it.

- LOC Capture clears:
  1. previous lateral Mode
  2. Half Bank Mode
  3. TURB Mode
- it is cleared by:
  1. selection of NAV
  2. TOGA
  3. changing the NAVAID

The glideslope is ARMED after the LOC is captured. Glideslope only functions for Front Course approaches. At G/S capture command guidance is displayed on the PFD.

- It is cleared by:
  1. selection of another lateral Mode
  2. changing the NAVAID.

10 BACK COURSE

PRESS - alternately selects and deselects the B/C
This clears all lateral Modes upon capture. It indicates ARMED on the PFD as:

1. HDG
2. B/C 1

It indicates captured on the PFD as:

1. HDG
2. B/C 1

11 HEADING

PRESS - Alternately selects or deselects the Mode. HDG is display on the PFD.
Heading Readout and Bug is on the HSI.
It is cleared by selecting another lateral Mode.

12 HEADING KNOB

ROTATE - Sets the Heading Bug on the HSI.
PUSH SYNC - PRESS - Points the Heading Bug (both PFDs) directly to the present heading. The Present Heading is the Lubber Line on the PFD.

13 NAVIGATION

PRESS - NAV Mode is ARMED
FCC will try an all-angle capture.
FCC generates the lateral commands to follow
The NAVAID signal must be valid. NAVAID is selected by NAV SOURCE Knob.
This Knob is on the Display Control Panel and Radio Tuning Unit.
The NAV data is displayed on the PFD:

1. VOR 1(2)
2. LOC 1(2), etc.

Until capture the previous Mode remains active.

14 1/2 BANK

PRESS - During HDG Mode, alternately selects and deselects the Half bank mode.
This will automatically activate at 31,600'
Upon FCC initial power-up, the Max Bank Angle is set to 31.5º
and Half bank Angle will command 15º
It automatically clears descending through 31,600º
It is cleared by:

1. APPR Mode Capture
2. LOC Capture.

15 **ALTITUDE**

PRESS - Alternately selects or clears the ALT HOLD Mode.
When pressed ALT shows on the PFD.
Commands guide to maintain the current altitude.
- When FD Sync is pressed the current conditions are then synchronized.
- ALT HOLD is selected if the Altitude Preselector Knob setting is changed when the aircraft is in Altitude Tracking.

Cleared by selecting another Vertical Mode.

16 **ALTITUDE PRESELET KNOB**

ROTATE - Sets the Preselected Altitude for the AFCS.
Readout is on the PFD Barometric Tape and its Range is -1000 to 50,000.
PUSH CANCEL - PRESS - Cancels the Altitude ALERT
This will cancel the flashing display and Aural Warning.
If no warning exists it also TESTs the Altitude Alert System.

17 **VERTICAL SPEED**

PRESS - Alternately selects and deselects the V/S Mode.
The PFD display is synchronized to the current Vertical Speed.
The Vertical speed Whell is enabled to select the desired Vertical Speed when the on-side Air Data system is the selected Air Data Source.
When the FD SYNC is used the current Vertical Speed is re-synchronized.
It is cleared by:

1. selecting another Vertical Mode
2. Capture of another Vertical Mode.

18 **VERTICAL SPEED / PITCH WHEEL:**

ROTATE - Selects

1. Vertical Speed (with VS Switch pushed)
2. Pitch Attitude.

With VS Switch pushed, push the Wheel

1. Forward to decrease V/S
2. Backward to increase V/S

When VS Switch is not pushed this will act as the Pitch Mode Selector for the A/P and FD.
The Rate is Proportional, with current setting located at the Center Detent.
This Wheel is only operable when any:

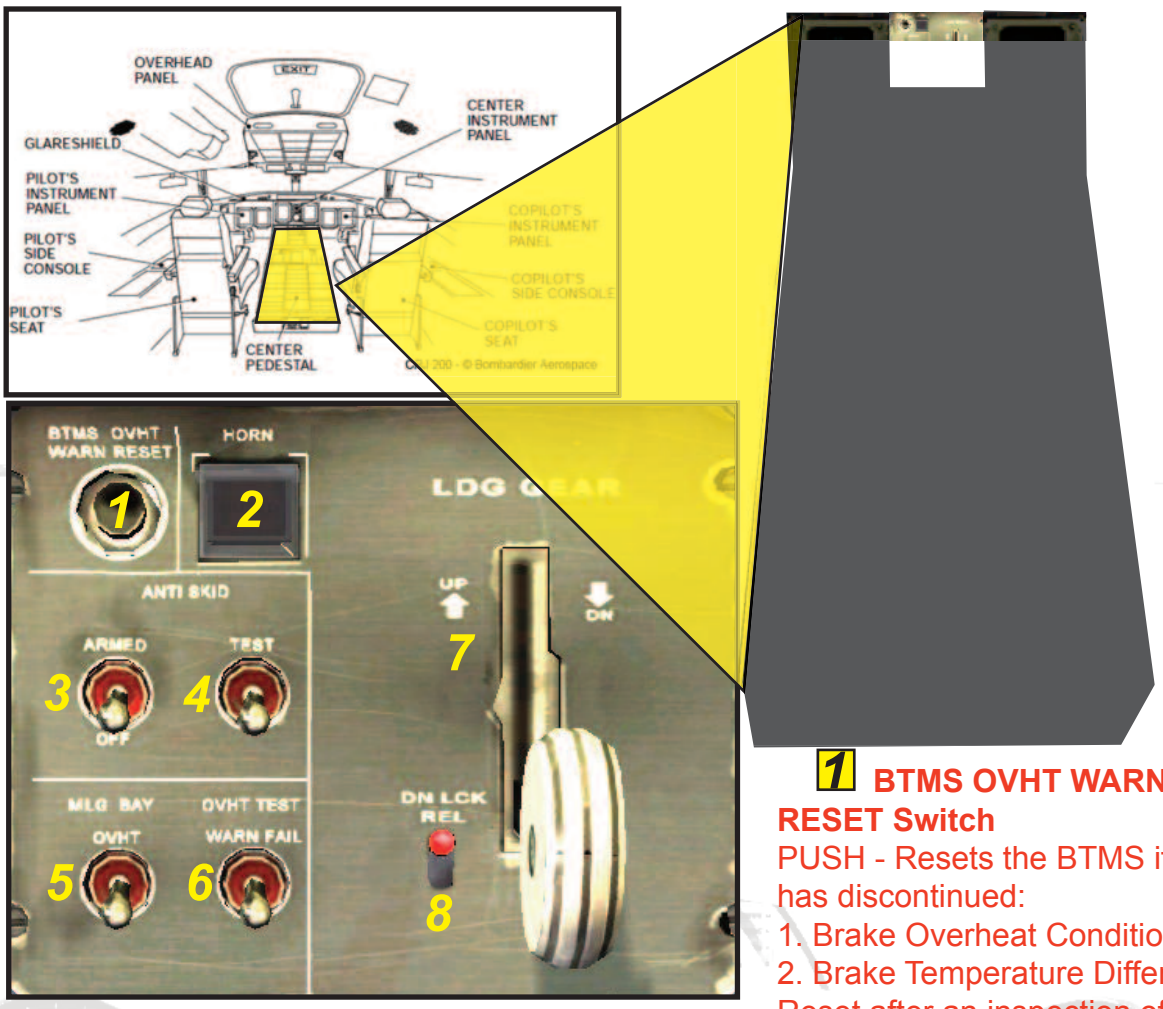
1. VS Switch pushed
2. A/P active
3. FD active.

When operable it will clear any Lateral Mode, except

1. Glideslope CAPTURE
2. Pitch Hold (indicated by PTCH)

PEDESTAL

Nose and Main Landing Gear



1 BTMS OVHT WARN RESET Switch

PUSH - Resets the BTMS if either has discontinued:

1. Brake Overheat Condition
2. Brake Temperature Difference

Reset after an inspection of the Brakes and they have cooled.

2 MUTE HORN

Commands the Landing Gear Horn

The Landing Gear Warning Horn will SOUND if 2 minutes after transition to in-flight status AND either:

1. IAS < 163 kts with one or both Thrust Levers at IDLE.
2. IAS < 185 kts with Flaps < 5 and one or both Thrust Lever is at IDLE

NOTE: The Warning Horn can be silenced when one Thrust Lever is at IDLE and the Landing Gear is NOT Down and Locked

PUSH - Warning Horn is silenced

NOTE: Landing Gear Warning Horn CANNOT be MUTED when either:

1. Flaps are selected to 30 or greater
2. Both Thrust Levers are set to IDLE and Gear is NOT Down and Locked.

MUTE LIGHT: Illuminated - The Landing Gear Warning Horn has been MUTED .

3 ANTI-SKID ARMED Switch

• ARMED - Anti-skid System will ACTIVATE with wheel spin up at 35 knots.
• OFF - Anti-skid System is non-operational.

4 ANTI-SKID TEST Switch

• TEST - Simulates a failure, alternating between:

a) Outboard Anti-Skid System,then
b) Inboard Anti-skid System.
Results are on EICAS

NOTE: The Anti-skid System Test presequisites:

1. Landing Gear DOWN & LOCKED
2. Anti-Skid System ARMED.

5 MLG BAY OVERHEAT TEST Switch

• OVHT - TESTS the MLG Bay Overheat Detection System
Message: MLG BAY OVHT, Aural: “GEAR BAY OVERHEAT”

6 MLG BAY OVERHEAT TEST WARNING FAILURE TEST Switch

• WARN FAIL - Tests the MLG Bay Overheat Detection System’s Failure Detection System.
Message: MLG OVHT FAIL

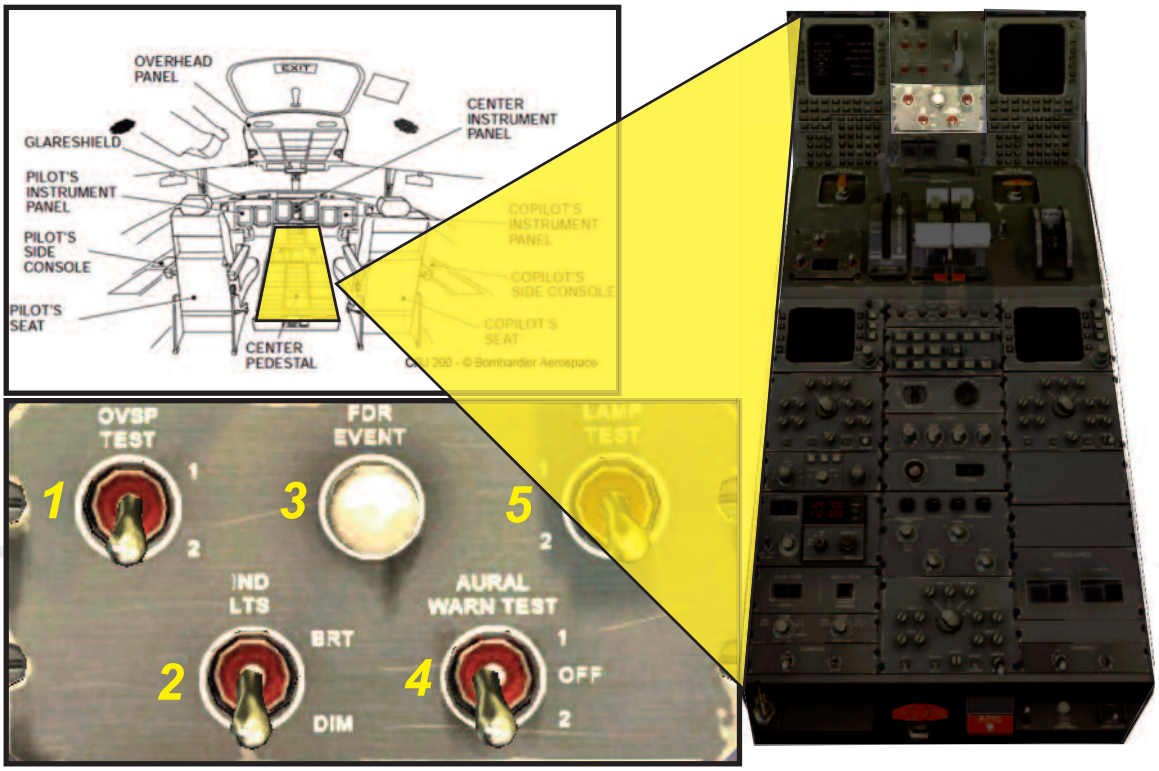
7 LANDING GEAR LEVER

PULL OUT and:
• RAISE - Commands the Landing Gear RETRACTION
• LOWER - Commands Landing Gear EXTENSION

8 DOWN LOCK RELEASE Switch

Used if there is a FAULT in the Solenoid Release circuit
MOVE DOWN and HOLD - Manually overrides the Landing Gear Control Lever Solenoid Lock.

EICAS TEST PANEL



1 OVERSPEED TEST 1, 2 Switch

- 1 - Tests the aircraft's Overspeed Warning System 1 Test ADC #1
- 2 - Tests the aircraft's Overspeed Warning System 2 Test ADC #2

2 BRIGHT / DIM Switch

- BRT - Almost all Cockpit indicator Lighting is at full Illumination
- DIM - Almost all Cockpit indicator Lighting is at night time operations levels

NOTE: No effect on EFIS and EICAS Displays.

3 FLIGHT DATA RECORDER (PDR) EVENT

Places a specific Time/Date on the FDR System

4 AURAL WARNING TEST 1, 2 Switch

- 1 - Test the Aural Warning Function of DCU 1.
- OFF - Function is OFF
- 2 - Test the Aural Warning Function of DCU2.

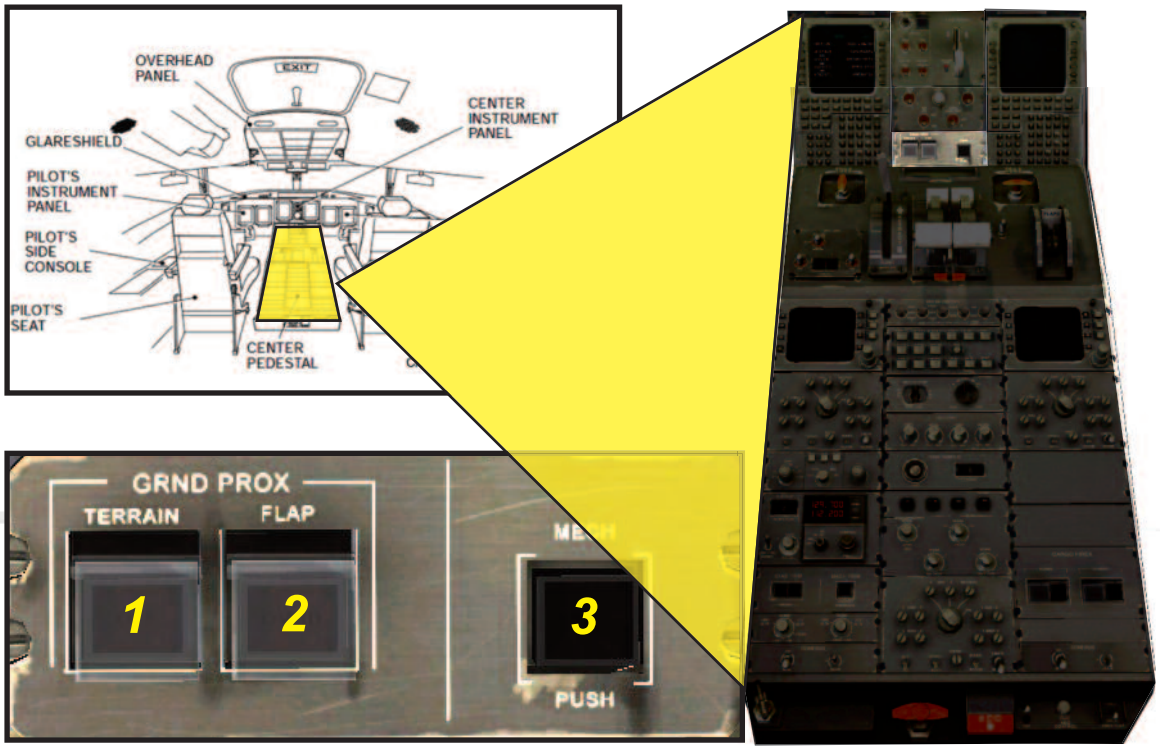
NOTE: To silence Aural Alerts during the TEST reselect the previous position

5 LAMP TEST Switch (this has only one channel. So on/off testing lights)

Lamp Driver Unit (LDU) has two Channels 1 (2)

- 1. Channel A, Tests the following: [BAT BUS]
  - a. Annunciator Lights
  - b. BRT /DIM Power Supplies
  - c. LDU Driver Unit Lamps
- 2. Tests Channel B for the same [DC BUS 1]

EGPWS/Mechanic call panel



1 GRND PROX TERRAIN (Guarded)

Used to inhibit the terrain map display (terrain clearance floor and terrain / obstacle awareness alerting and display functions). Basic GPWS mode and windshear mode remain active.

• OFF - Lights indicates inhibit is selected.

2 GRND PROX FLAP (Guarded)

Used to mute TOO LOW FLAPS or TERRAIN aurals.

• OVRD ligth indicates override is selected.

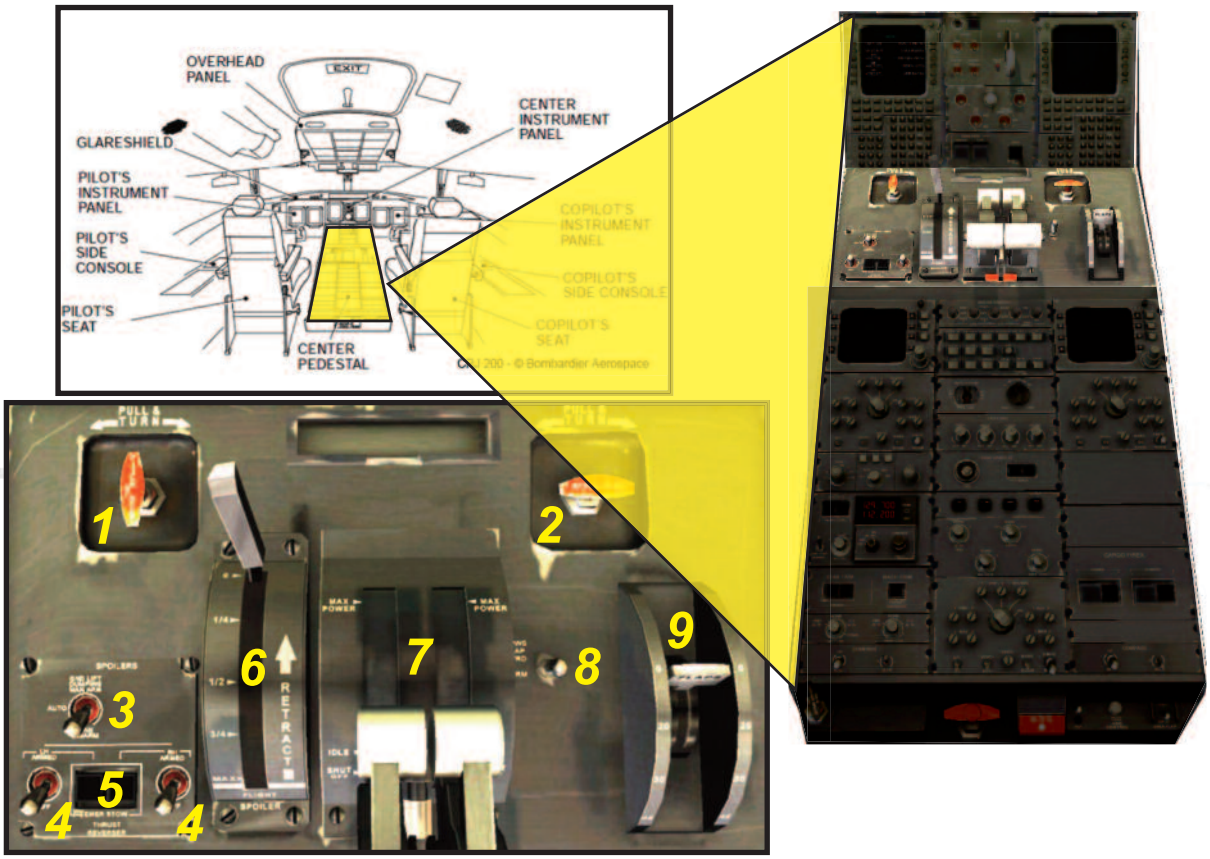
3 MECH / PUSH

CALL Ligth - The Mechanic is calling you

PUSH - You call the Mechanic.

A CALL Light on the External Service Panel illuminates.

Spoilers, Throttles and Flaps Panel



1 PITCH DISCONNECT HANDLE

This handle will disconnect the Control Columns in the event of a JAM on one of the Elevator Cables.

- PULL and ROTATE - Disconnects and Locks
- PULLED - The pilots individually control the Elevators:
  - CAPTAIN - control LEFT elevator
  - F.O. - Controls RIGTH elevator.

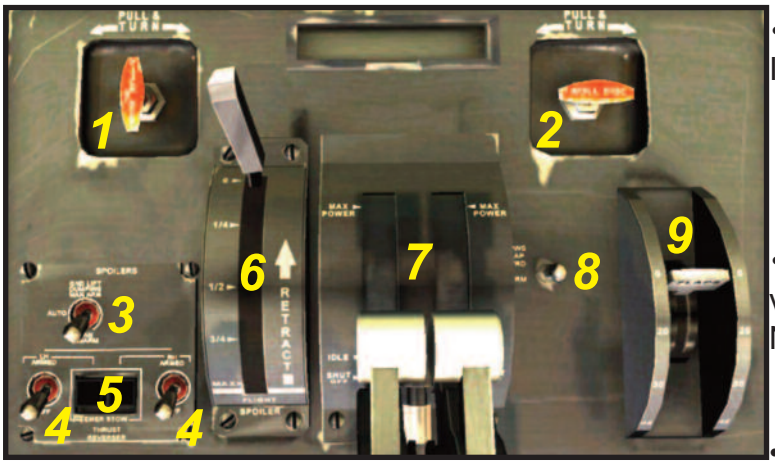
2 ROLL DISCONNECT HANDLE

This handle disconnect the Control Columns in the event of a JAM on one of the Aileron Cables.

- PULL and ROTATE - Disconnects and Locks
- PULLED - The pilots individually control the Ailerons
  - CAPTAIN - Control LEFT Aileron
  - F.O. - Controls RIGHT Aileron

3 GROUND LIFT DUMPING Switch (This only have 2 positions simulated)

- MAN ARM - ARMS the Ground Spoiler System for Ground Lift Dumping. Used if the automatic System has failed. (this is the auto deploy on touchdown position simulated on 1.0 version)
- AUTO - Enables the Auto Deployment function of the Spoilers on:
  1. Touchdown
  2. Rejected Takeoff



• MAN DISARM - Ground Lift Dumping is INHIBITED in case: (this is the off position)
1. inadvertent deployment
2. failure of the automatic System.

4 LH(RH) ARMED Switch

• ARMED - ARMS the respective Thrust Reverser System.
N1 Gauge ICON - REV - Thrust Reverser Deployed
REV - Thrust Reverser UNLOCKED
• OFF - respective Thrust Reverser System is DISARMED.

5 REVERSER THRUST LH / RH ARMED Switches

• ARMED - respective Reverser Deployment circuit is ARMED
• OFF - System is INHIBITED
• EMER STOW - used to STOW the Reverser during an Emergency
• UNLK Lights: Illuminated - respective either:
1. Thrust Reverser is UNLOCKED
2. Flex Shaft Lock is RELEASED
3. PDU Brake is RELEASED.

6 SPOILER CONTROL LEVER

This will MANUALLY deploy the Flight Spoilers. To Deploy the Fligth Spoilers, move the Lever AFT to any of the Detents. There are NINE Detents (in this plane is free motion) Deployment Position's Equivalence of Degrees:

• 0 - 0º Fully Retracted
• 1/4 - 8º
• 1/2 - 19º
• 3/4 - 33º
• MAX - 50º Fully Deployed

Note: there are FOUR additional Detents between the Positions Listed.

7 THROTTLE LEVER

Advance and Retard to adjust the Engine RPM and Thrust Setting.

SHUTTOFF RELEASE LATCH (red levers)

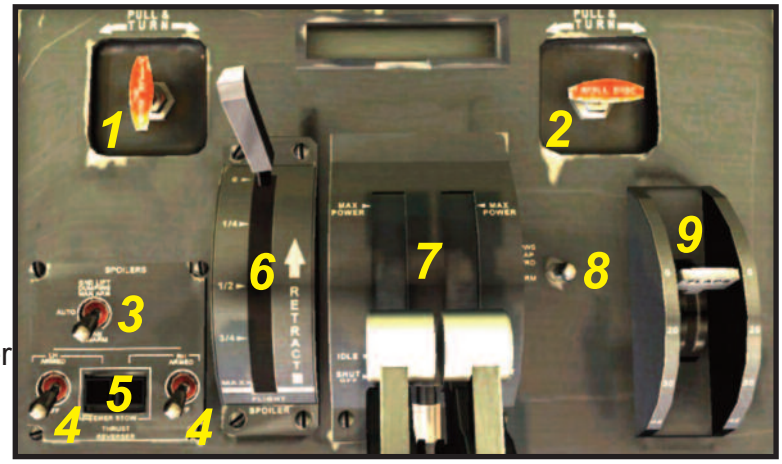
When Engine is in IDLE

• LIFT - Retruns the Throttle Lever from IDLE TO SHUTOFF and vice versa
NOTE: Thrust Reverser deployment does NOT prevent going to SHUT OFF.

THRUST REVERSER LEVER

With the Throttle at IDLE
PULL UP
1. deploys the Reverser
2. Increases Engine RPM

The Lever Lock RELEASES automatically when the Thrust Reverser is Fully Deployed
NOTE: You will be able to manipulate them only when the THROTTLE LEVERS are at IDLE Position)



8 GPWS / FLAP OVERRIDE Switch

NORM - Normal Operations.
GPWS FLAP OVRD - Silences the Flap Aural Warning when landing with the Flaps are not in the normal landing configuration. Inhibits “TOO LOW FLAPS” Aural warning

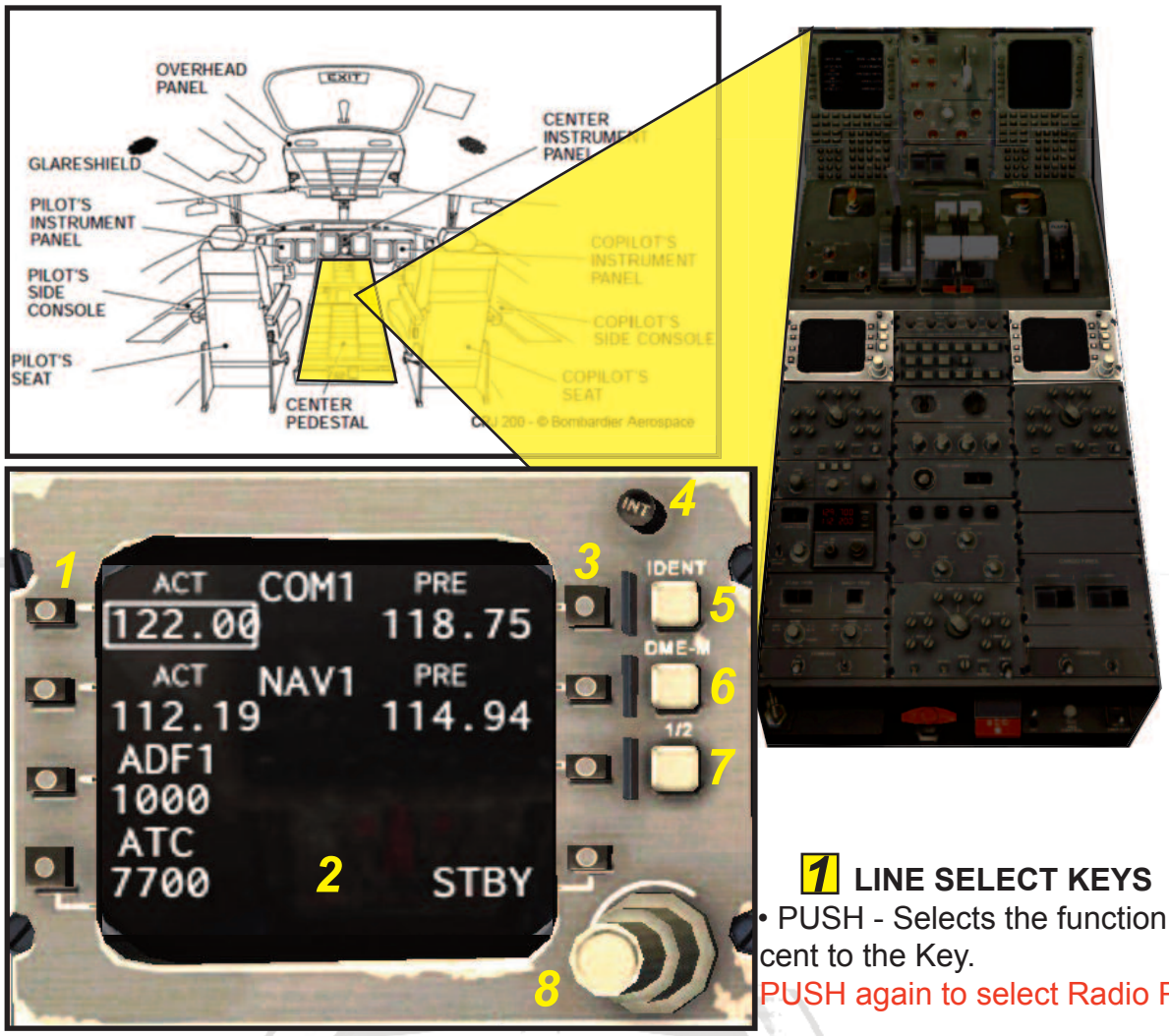
9 FLAPS CONTROL LEVER

This will MANUALLY deploy the Flaps. To Deploy the Flaps, move the Lever AFT to any of the Angles.
There are FIVE Detents.

- 0º Flaps UP
- 8º GATE (Push down to go through)
- 20º GATE (push down to go through)
- 30º
- 45º FULL Flaps

Aural warning: CLACKER - the aircraft speed is too fast for the selected Flaps.

RADIO TUNING UNIT



1 LINE SELECT KEYS

• PUSH - Selects the function adjacent to the Key.
PUSH again to select Radio Pages.

2 PRESET or RECALL FREQUENCY DATA

Screen where represented all info about the RADIO and TCAS system.

3 SELECTOR KEYS

These Keys are used for two functions:

1. Frequency Selector

TUNE - Use Tuning Knob to pre-tune next Frequency “PRE” then indicates. Press twice to SWAP the Freqs (make the standby freq. active.

2. Mode Selector

COM: TX - Radio is being usde to transmit
SQ OFF Squelch is OFF
NAV: H - DME - H pb is pushed in DME Hold Mode MRK-HI-Marker Sensivity is high
ADF: ANT / TONE - either has been selected on ADF Page
ATC: STBY - ATC is in Standby using the Remote TDR Switch
ALT OFF - Altitude reporting is OFF
R - Transponder is responing to ATC interrogation
ID - IDENT activated for 18 seconds
TCAS: AUTO / STBY / TA ONLY - That Mode is selected ABS /REL - Altitude is set to Absolute or Relative

4 BRIGHTNESS KNOB
Controls the Display brightness

5 ATC IDENTIFICATION
• PUSH - Inserts additional data on the ATC Ground Radar Display

6 DME - HOLD
• PUSH - Permits these capabilities:
1. Holds the Current DME Frequency
2. NAV Receiver can now be inde-pently tuned.

7 LEFT / RIGHT (1/2) RADIO
• PUSH - Alternatively selects the
a) Left Side Radios (1)
b) Right Side Radios (2)
Note: Arrows indicate the selected side.

8 TUNING FREQUENCY KNOBS
Controls the selection of Frequency

2 SCREEN INFO

PRE / RECALL
PRE - This is the Frequency set by the Tuning Frequency Knobs. Default position shown, it is moved by the Select Key.
RECALL - This is the Frequency transferred with the Active Frequency.
Left-Right ARROW - Indicates Frequency can be swapped.

• ACT - This is the Active Frequency

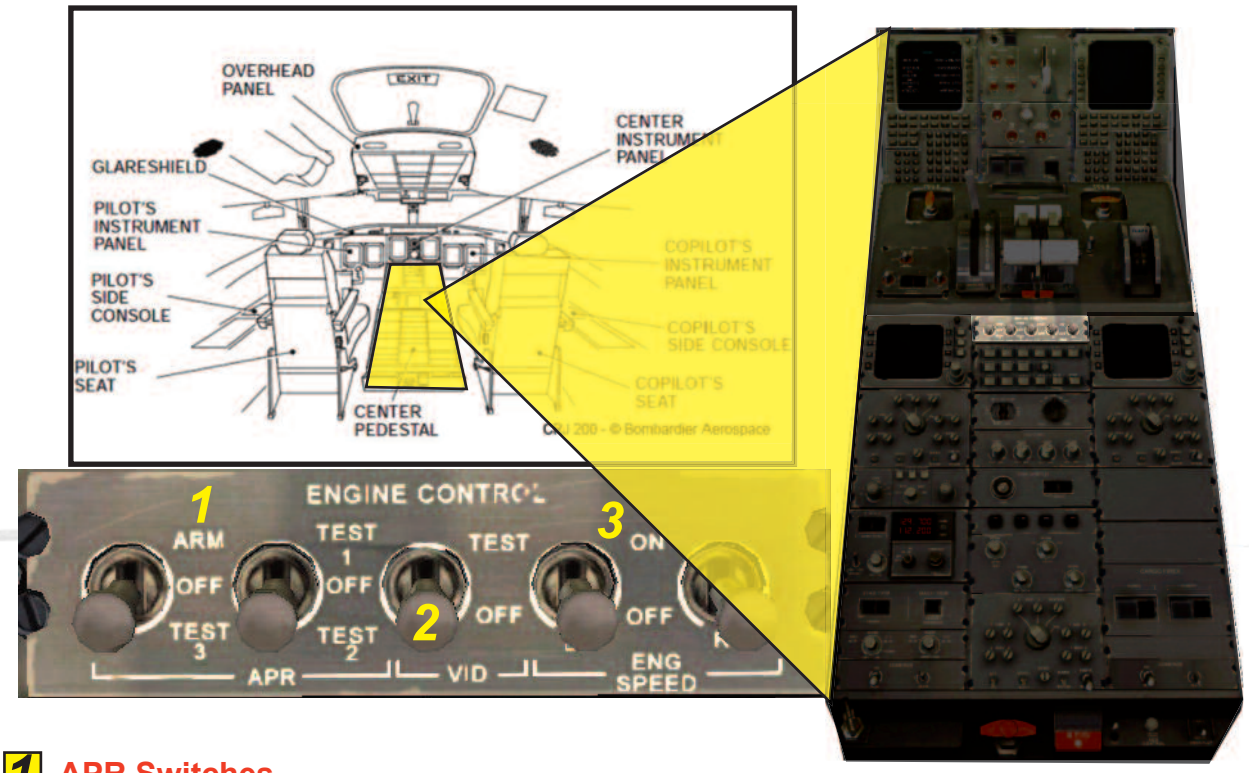
• ADF1 - This is the selected ADF and its selected Frequency

• ATC1 - This is teh selected Transponder and its Code.

• TCAS - This is the TCAS Mode.

• AUT - Automatic tuning is selected. Tuning is on the FMS. Select RADIO Function KEY to access the information. (The function is working but not appears the AUT label. Have to go to Radio page on FMS to select it to MAN or AUTO)

ENGINE CONTROL PANEL



1 APR Switches

- ARM - Automatic Reserve System is ARMED
  ARMS the System if both L and R ENG SPEED Switches are ON. (thus both Engines are in N1 Mode)
  ICON - APR on N1 Gauges
- OFF - ARP is INHIBITED
  The APR System will NOT activate is one Engine's Thrust is reduced.
- TEST - Static Test is initiated. Internal Fault latch in DCU 1, 2, 3 is RESET

2 ENGINE VIBRATION TEST Switch

- TEST - Initiates a Test of the Engine Vibration System this is a functional TEST of the Display and Control Circuit.
  EICAS will display FAN VIB 3.6 MILS and N2 VIB icon.
- OFF - normal operating position

3 ENGINE SPEED CONTROL Switches.

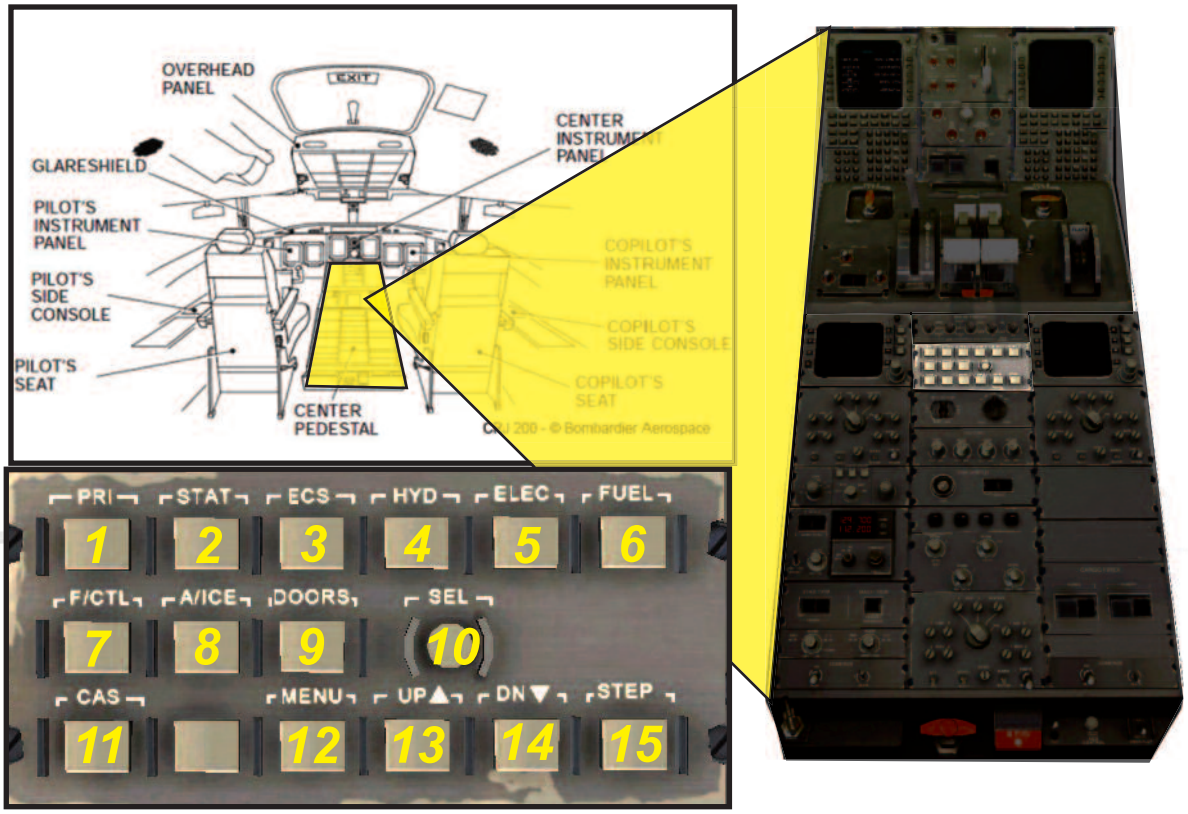
This Switch controls whether the Engine Speed Control is Electronic Mode (ECU) or Mechanical Mode (Thrust Levers directly)

- ON - Engine Speed Control is in N1 Mode when RPM exceeds 79.1%
- OFF - Engine Speed Control is in N2 Mode regardlees of N1 RPM.

NOTES: if N2 is used to set Take Off Thrust (ENG SPEED Switches - OFF) then:

1. APR Thrust will be INHIBITED
2. Take off Thrust will be obtained at a lower power lever angle than if N1 control was used.
3. Thrust Levers will NOT be aligned (it is mismatches) when the Fan Speeds are matched.

EICAS CONTROL PANEL



1 PRI
Displays the Primary Engine Page.

2 STAT
Displays the Status Page.
• PRESS - Display additional messages. Status Messages can be removed from view at any time.

3 ECS
Displays the Environment Control System Page.

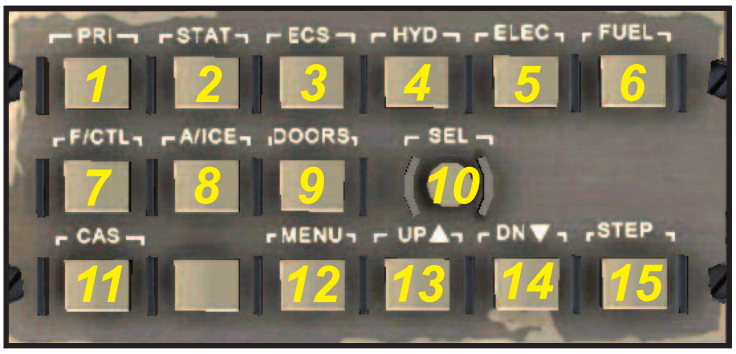
4 HYD
Displays the Hydraulics Page.

5 ELEC
Displays the AC Page on the first PRESS
Displays the DC Page on the second PRESS

6 FUEL
Displays the Fuel Page.

7 FLIGHT CONTROL
Displays the Flight Control Page

8 ANTI ICE
Displays the Anti Ice Page.



9 DOORS
Displays the Doors Page

10 SEL
Displays the Cursor Line on the Menu Page.
Enters a NUMBER when using UP or DN Key Cursor Symbol or alphanumeric will change from cyan to GREEN to indicate selection.

11 CREW ADVISORY SYSTEM
Displays the additional messages. Pages through the Caution Messages on the Primary Display. Caution Messages can be removed from view provide both Generators are powering on-line.
NOTE: Warning Messages are NOT paged.

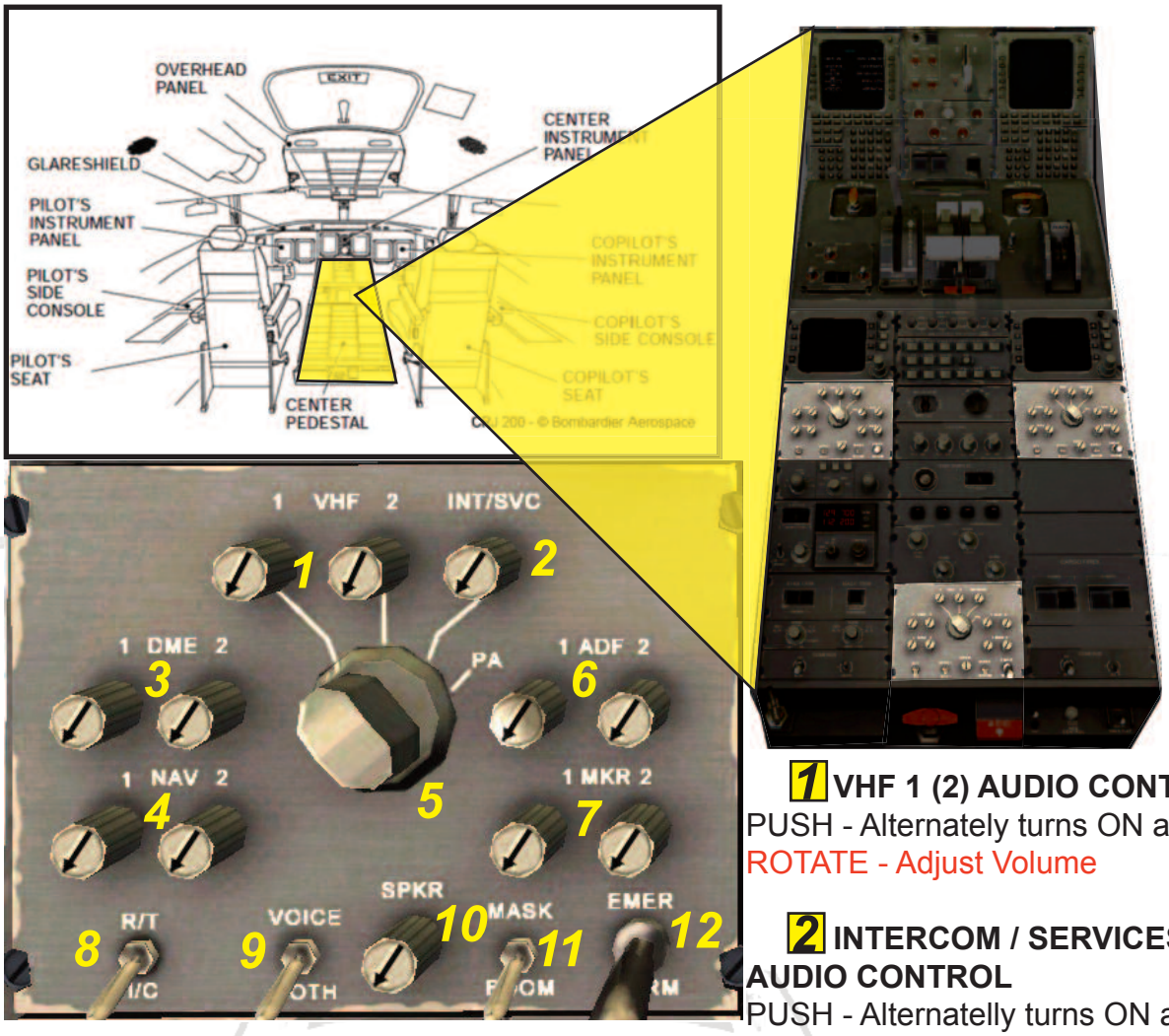
12 MENU
Displays the Menu Page. Used to enter data.

13 UP
Moves the Cursor UP one line on the Menu Page. SLEWS any displayed Underlined Alphanumerics. There are 36 Alphanumerics at Flight Number entry. There are 10 alphanumerics on the Take Off speed Bug page.

14 DOWN
Moves the Cursor DOWN one line on the Menu Page. SLEWS any displayed Underlined Alphanumerics.

15 STEP
Displays the next sequential EICAS Page.

AUDIO CONTROL PANEL



1 VHF 1 (2) AUDIO CONTROL
PUSH - Alternately turns ON and OFF
ROTATE - Adjust Volume

2 INTERCOM / SERVICES AUDIO CONTROL
PUSH - Alternatelly turns ON and OFF
ROTATE - Adjust Volume

3 DME 1 (2) AUDIO CONTROL
PUSH - Alternately turns ON and OFF
ROTATE - Adjust Volume

4 NAV 1 (2) AUDIO CONTROL
PUSH - Alternately turns ON and OFF
ROTATE - Adjust Volume

5 TRANSMITER SELECTOR SWITCH
ROTATE - Select th desired COM System and enables the Channels
MICROPHONE SELECTOR KNOB
PA - Passenger Address selected.

6 ADF1 (2) AUDIO CONTROL:
PUSH - Alternately turns ON and OFF
ROTATE - Adjust Volume

7 MARKER BEACON 1 (2) AUDIO CONTROL

PUSH - Alternately turns ON and OFF
ROTATE - Adjust Volume

8 RADIO TRANSMIT / INTERCOM Switch

- R / T - Boom or Mask Microphone is operational
- I / C - Hot Mic Function for Boom or Mask through the Intercom System

9 VOICE / BOTH Switch

- VOICE - only Voice information is provided NAVAID identifier data is filtered out.
- BOTH - Voice and Ident is provided

10 FLIGHT COMPARTMENT AUDIO CONTROL

PUSH - Alternately turns ON and OFF
ROTATE - Adjusts Volume

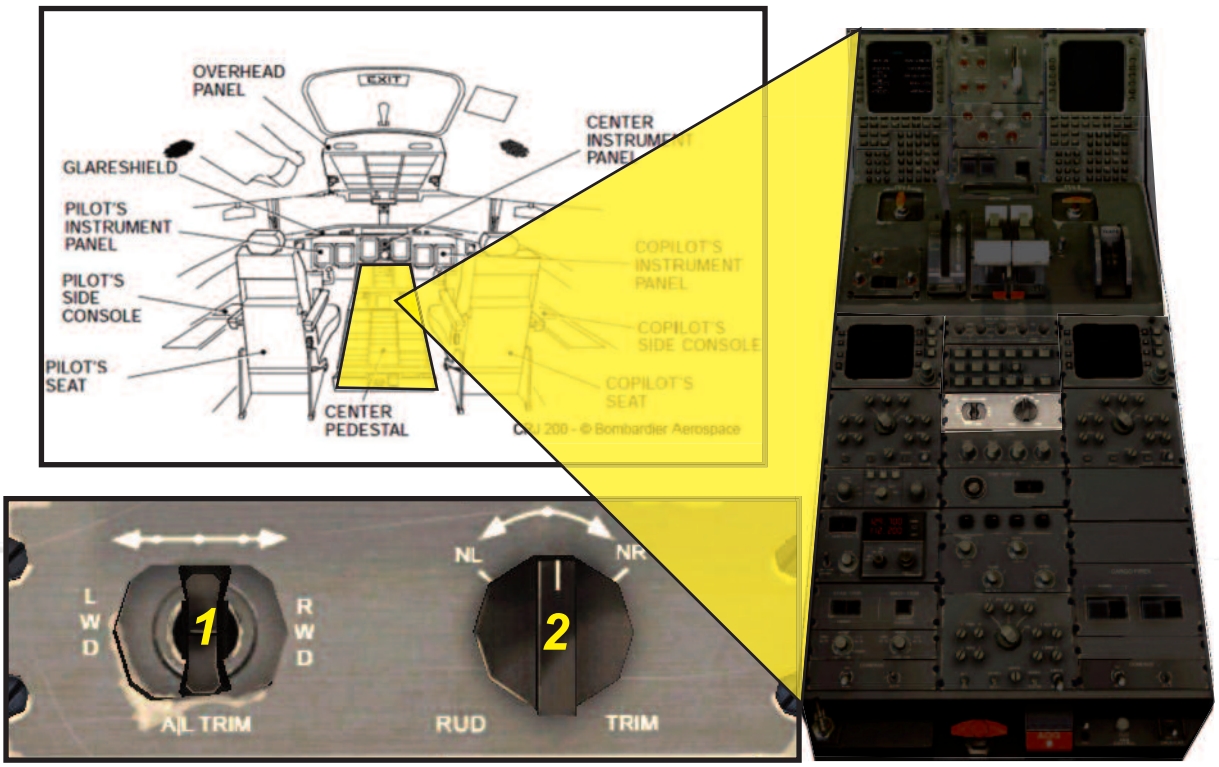
11 MASK / BOOM MIC Switch

MASK - Oxygen Mask is selected
BOOM - Boom Microphone is selected

12 EMERGENCY / NORMAL Switch (on normal)

NORMAL - as selected
EMER - These are the settings:
Captain - VHF 1NAV 1 Audio
F.O. - VHF 2 NAV Audio
Both receive Aural Warning. Observer position INHIBITED
NOTE: Audio Degradation will occur in EMER position.

AILERON / RUDDER TRIM PANEL



1 AILERON TRIM LEVER Switches

Commands the Aileron Trim System.

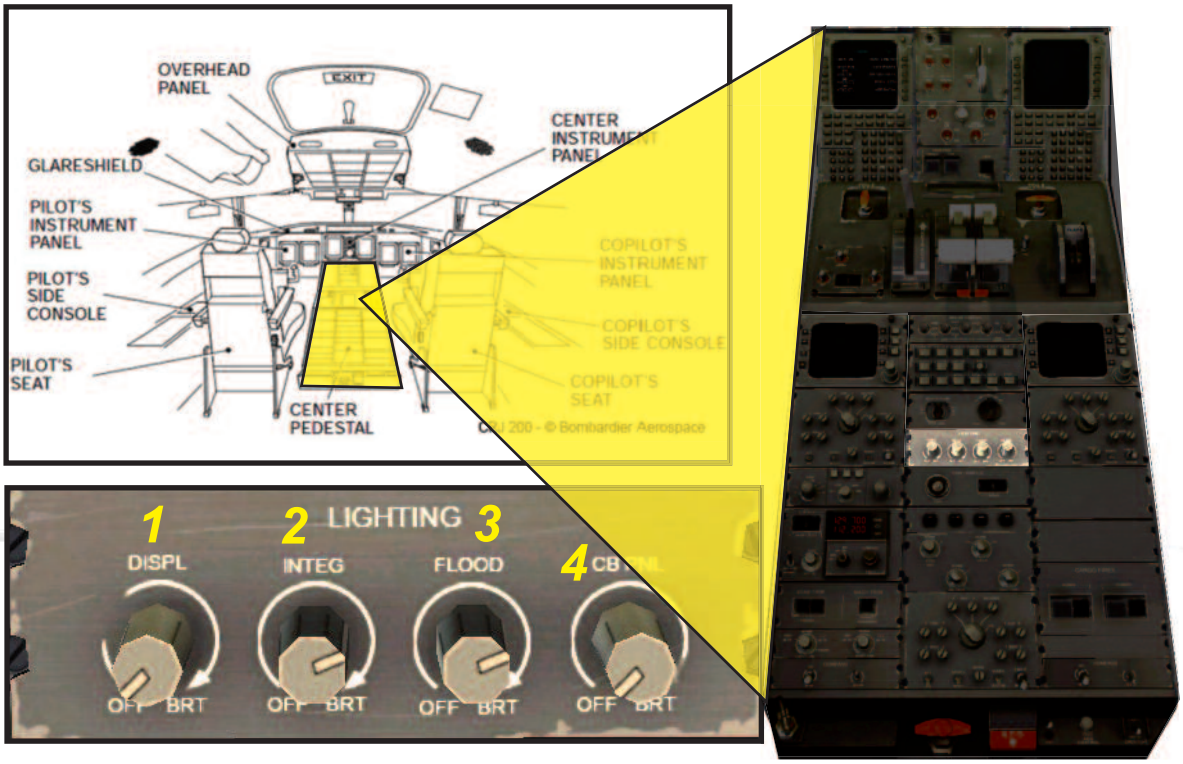
BOTH Levers stays on the position you leave them and have the same Trim Value.
LWD - Left Wing Down
RWD - Right Wing Down
Trim limit is ± 7.54º Wing UP/Down

2 RUDDER TRIM ROTARY Switch

Commands the Rudder Trim System.

BOTH Levers Stays on the rotation angle you leave them, and have the same Trim value.
NL - Nose Left
NR - Nose Right
Trim Limit is ± 8.56º Left - Right

LIGHTING CONTROL PANEL



1 DISPLAY LIGHTING CONTROL KNOB

ROTATE - Controls the Displays' Lightning illumination

Dimming power sources:

1. Captain EFIS CRT - DC ESS BUS
2. Center EFIS CRT - DC BAT BUS
3. F.O's EFIS CRT - DC ESS BUS

2 INTEGRAL LIGHTING CONTROL

Adjust the Panel and Instrument Integral Lighting. Between the panel and the instrument panel there are inverter Units converting DC to AC power. (Controls Light on pedestal and front panel)

3 FLOOD LIGHTING CONTROL (adjust flood light of the cockpit)

Adjusts the Center instrument Panel Lighting

Power sources:

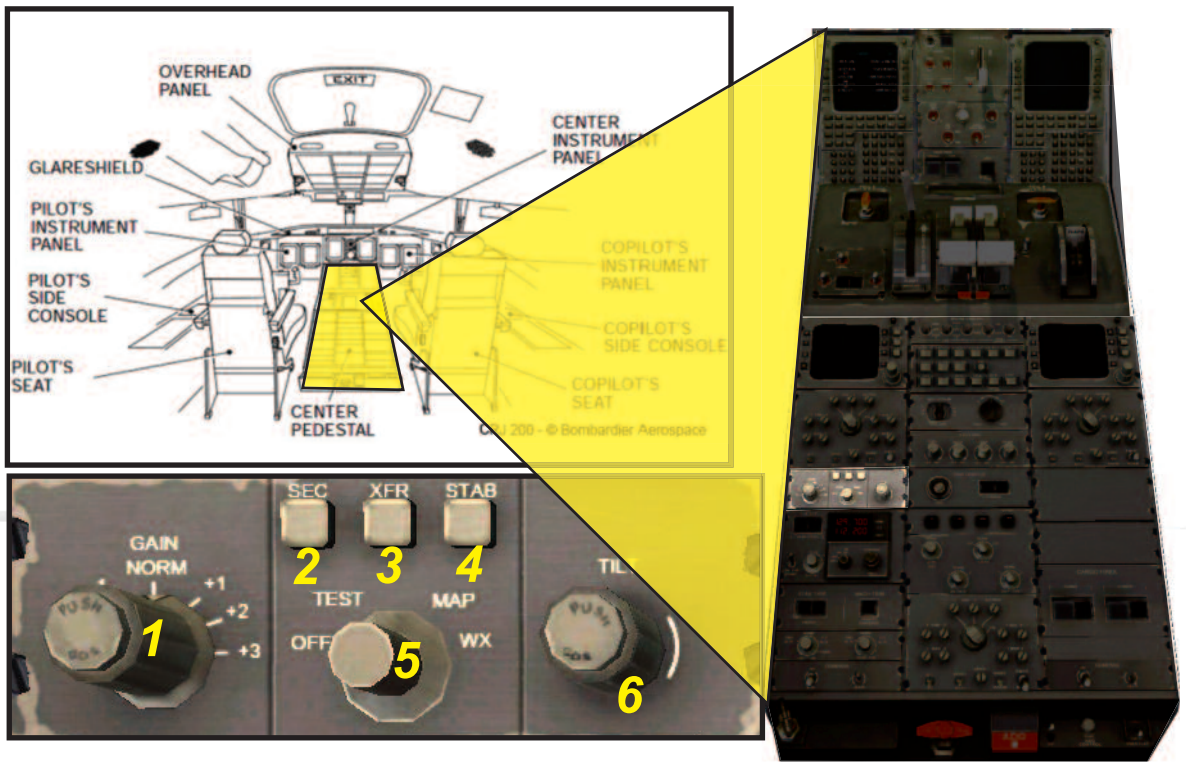
1. Captain Floodlights - DC ESS BUS
2. Center Floodlights - DC BAT BUS
3. F.O's Floodlights - DC BAT BUS

4 CIRCUIT BREAKER PANEL LIGHTING CONTROL

Adjust the Circuit Breaker Panel Integral Lighting

Power source for Dimming is from AC ESS BUS.

WEATHER RADAR CONTROL PANEL



1 RECEIVER GAIN KNOB (this is for controlling intensity of the Radar receiver)

ROTATE - Commands Increases or Decreases in Receiver Gain in 6 dB increments
- NORM - is a Calibrated Position

GROUND CLUTTER SUPPRESSION (GCS) Switch

PUSH - Reduces the intensity of the Ground Returns.

2 SECTOR SCAN Switch

PUSH ON / OFF - 60º or 120º

3 TRANSFER Switch

PUSH ON / OFF - Transfers Range Control between Captain and First Officer Controller

4 STABILIZATION Switch

PUSH ON / OFF - Controls Antenna Stabilization

5 MODE SELECTOR KNOB

Selects one of the following

- OFF - Radar is OFF
- TEST - Self Test
- MAP - Ground Mapping
- WX - Weather Radar

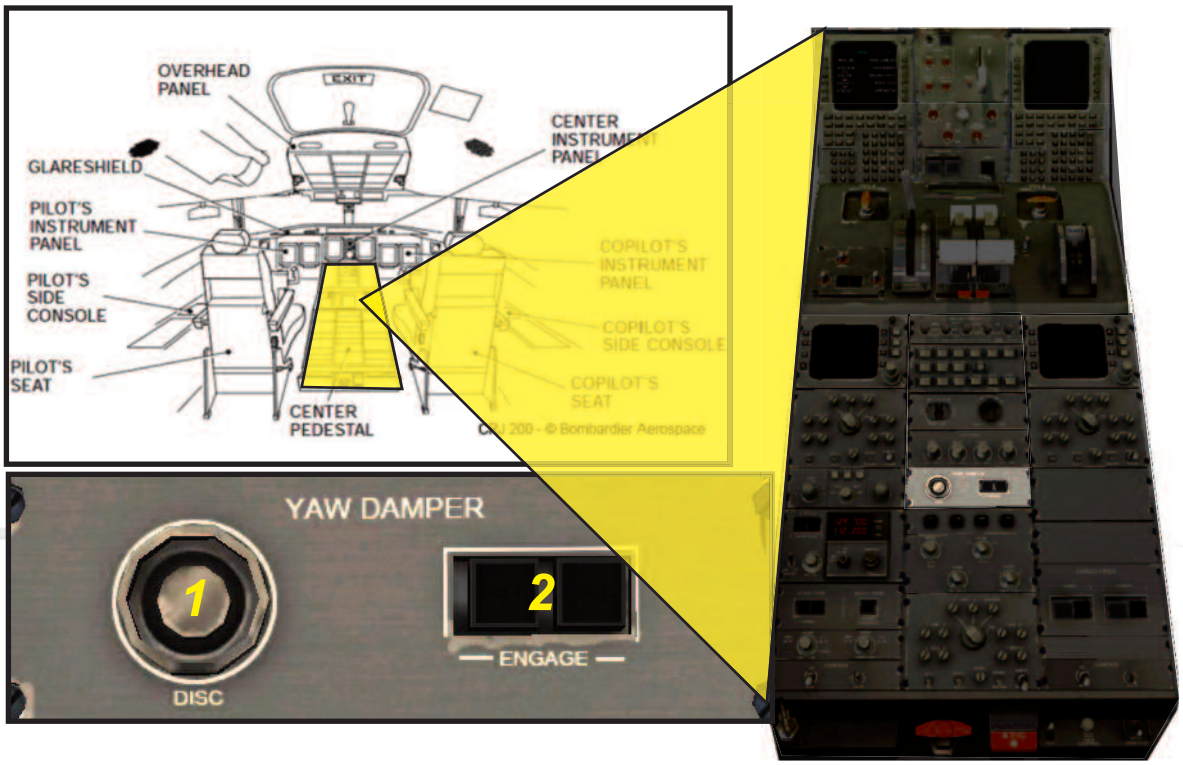
6 TILT CONTROL KNOB

ROTATE - Antenna Tilt is adjusted between +15º to -15º

AUTO TILT ON / OFF Switch

PUSH - Tilt changes as a funtion of Altitude and the Selected Range.

YAW DAMPER PANEL



1 DISCONECT PB

DIFFERENCES

Some sources say: Commands BOTH Yaw Damper Channels to DISENGAGE

Some sources say: Commands either/both Yaw Damper Channels to DISENGAGE

ILLUMINATES YD 1 & 2 Disengagement Lights (right)

NOTE: During ground operations, when switching electrical power between the APU and Generator 2, there will be a momentary power loss on DC BUS 2, which will DISENGAGE the Yaw Damper #2.

To Re-engage - wait 30 seconds with teh aircraft stopped, then select YD 2 Switch.

2 YAW DAMPER 1 (2)

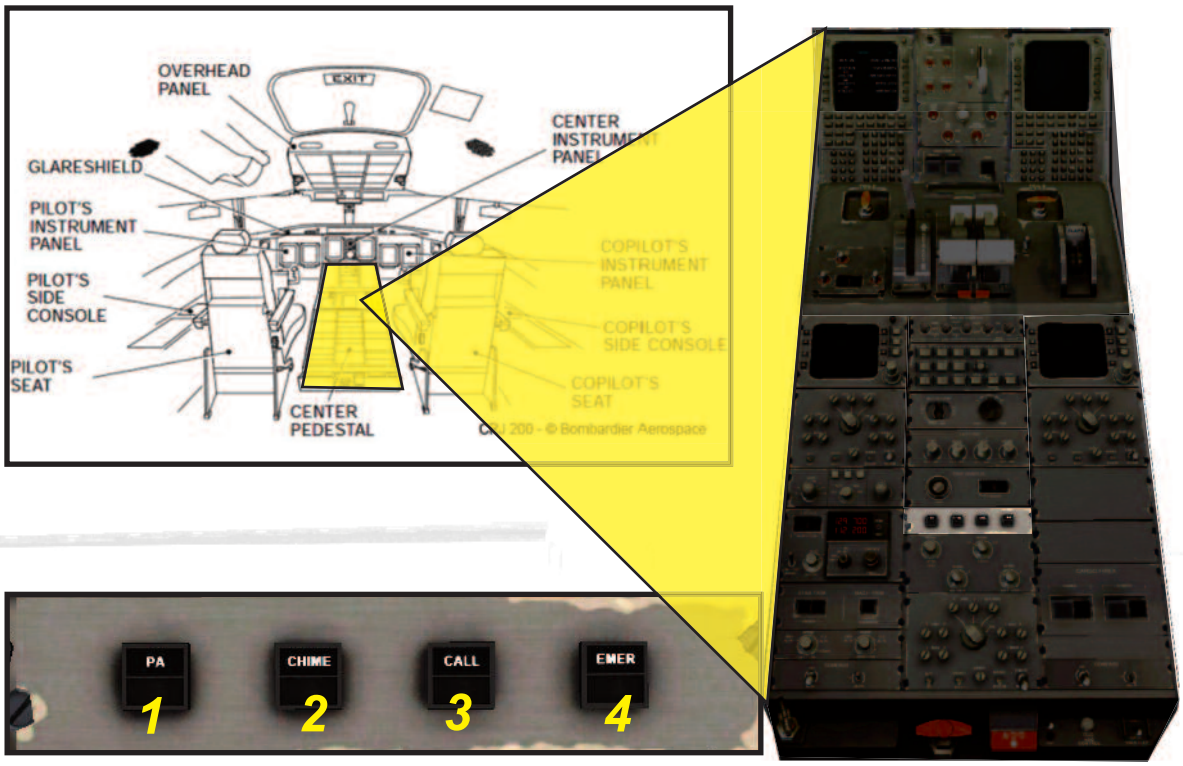
Commands respective Yaw Damper Channel 1 (2) to ENGAGE.

YD 1 (2) Lights - Illuminates when the respective Channel is NOT engaged. (when YES!!)

NOTE: During ground operations, when switching electrical power between the APU and Generator 2, there will be a momentary power loss on DC BUS 2, which will DISENGAGE the YAW Damper #2.

To re-engage - wait 30 seconds with the aircraft stopped, then select YD 2 Switch.

INTERPHONE CONTROL PANEL



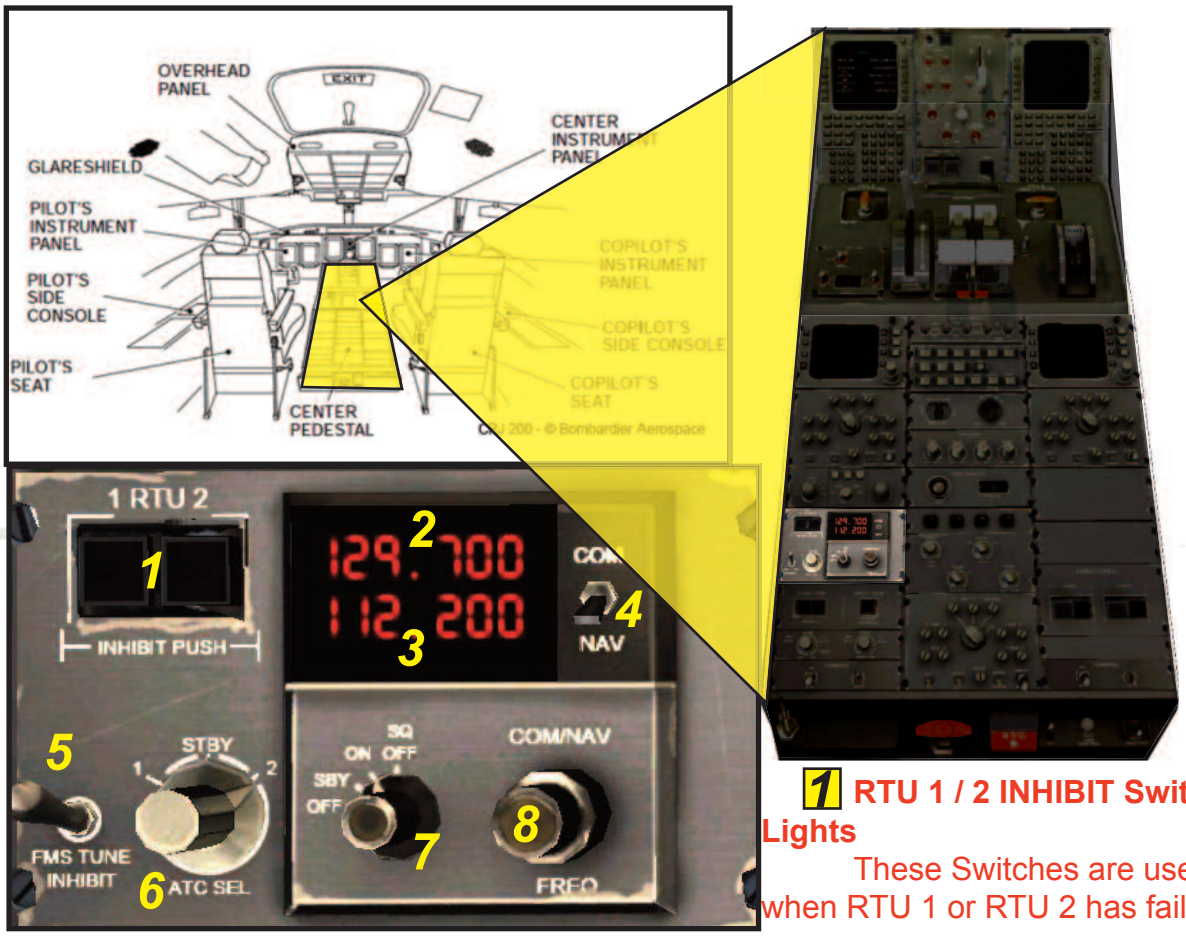
1 PA Switch (momentary contact)
Activates the Passenger Address System. This Switch has priority over the Cabin PA System.
RESULTS:
1. Chime in the Cabin
2. Green Light illuminate in the Cabin
3. Green Light illuminates in the Cockpit (on this Swtch)

2 CHIME Switch (momentary contact)
Activates the Chime in the Cabin. No visual indicators illuminate

3 CALL Switch (momentary contact)
Notifies the Flight Attendants, or they the Pilots.
RESULTS:
1. Single two-Tone Chime in the Cabin or Cockpit
2. Green Light illuminates at the FA Handset.
3. Green Light illuminates in the Cockpit (on this Switch)

4 EMER Switch (momentary contact)
Notifies the Flight attendats, or they the pilots
RESULTS:
1. Single two-tone chime in the Cabin or Cockpit
2. Flashing AMBER Light illuminates at the FA Handset.
3. AMBER Light illuminates in the Cockpit (on this Switch)

STANDBY TUNING CONTROL PANEL



1 RTU 1 / 2 INHIBIT Switch Lights

These Switches are used when RTU 1 or RTU 2 has failed

PUSH - Performs the following:

1. Inhibits the RTU from Tuning
2. Selected RTU turned OFF
3. Other RTU - TUNES (the cross side one)
4. RTU Blacks out.

2 VHF / COM #1 FREQUENCY

3 VHF / NAV #1 FREQUENCY

4 COM / NAV SELECTOR

Selects either for Turning

a. COM

b. NAV

5 FMS TUNE INHIBIT

SELECTED - Inhibits the FMS Remote Tuning through the RTU to the Radios

6 STANDBY ATC SELECTOR KNOB
Selects one of the following:

- 1. Transponder 1
- STBY - Standby setting, both Transponders
- 2. Transponder 2

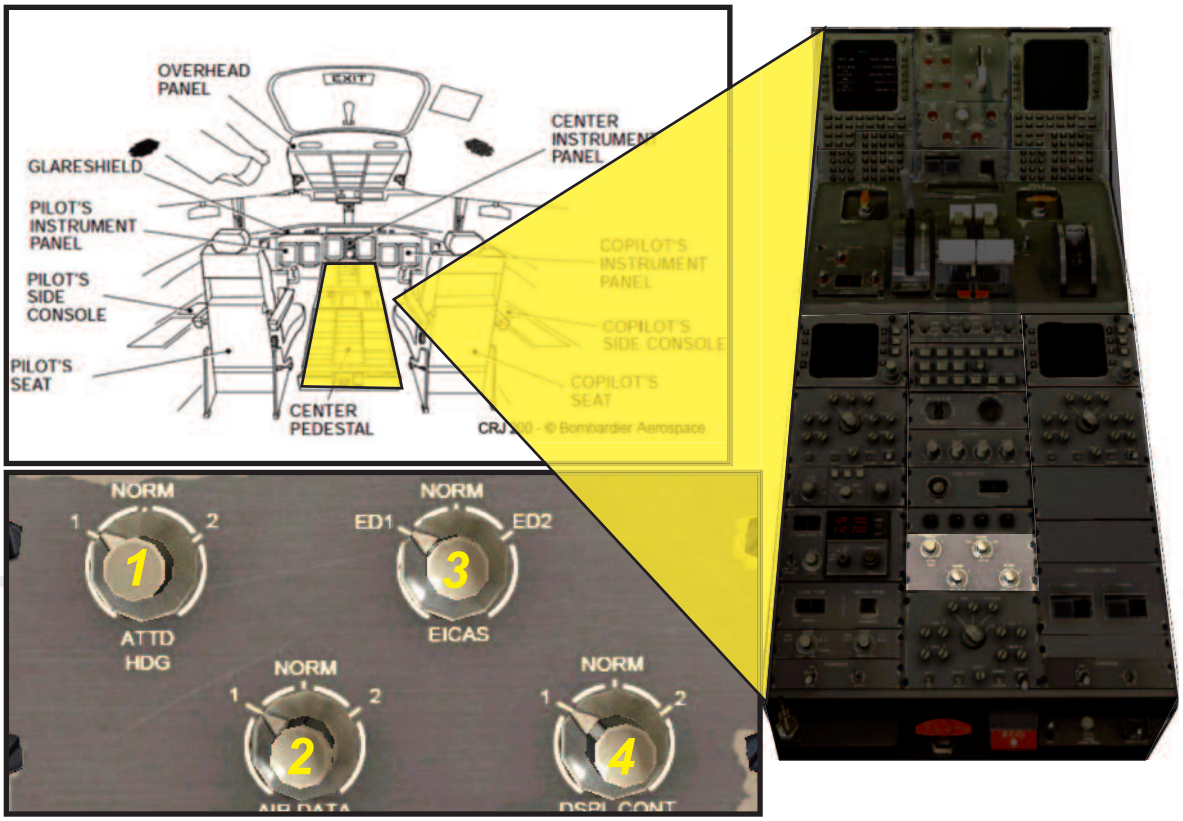
7 MODE SELECTOR
Selects the following:

- OFF - The Display is OFF
- STBY - RTU #1 Frequency is displayed
- ON - Frequency selected, by the Frequency selector, is displayed.
- SQ OFF - Squelch is OFF

8 FREQUENCY TUNING KNOBS

ROTATE - Sets the desired Frequency.
Outer Knob - Changes MHz
Inner Knob - Changes kHz:
a. NAV in 50 kHz steps
b. COM in 25 kHz steps.

SOURCE SELECTOR PANEL



1 ATTD HDG SELECTOR

- NORM - IRS/AHRS's are displayed
  1. on the LEFT
  2. on the RIGHT
- 1 - Both pilots using AHRS 1
  message : FD 2 FAIL
  WINDSHEAR (Inoperative on both sides)
- 2 - Both pilots using AHRS 2
  message : FD FAIL
  WINDSHEAR (Inoperative on Captain's side)

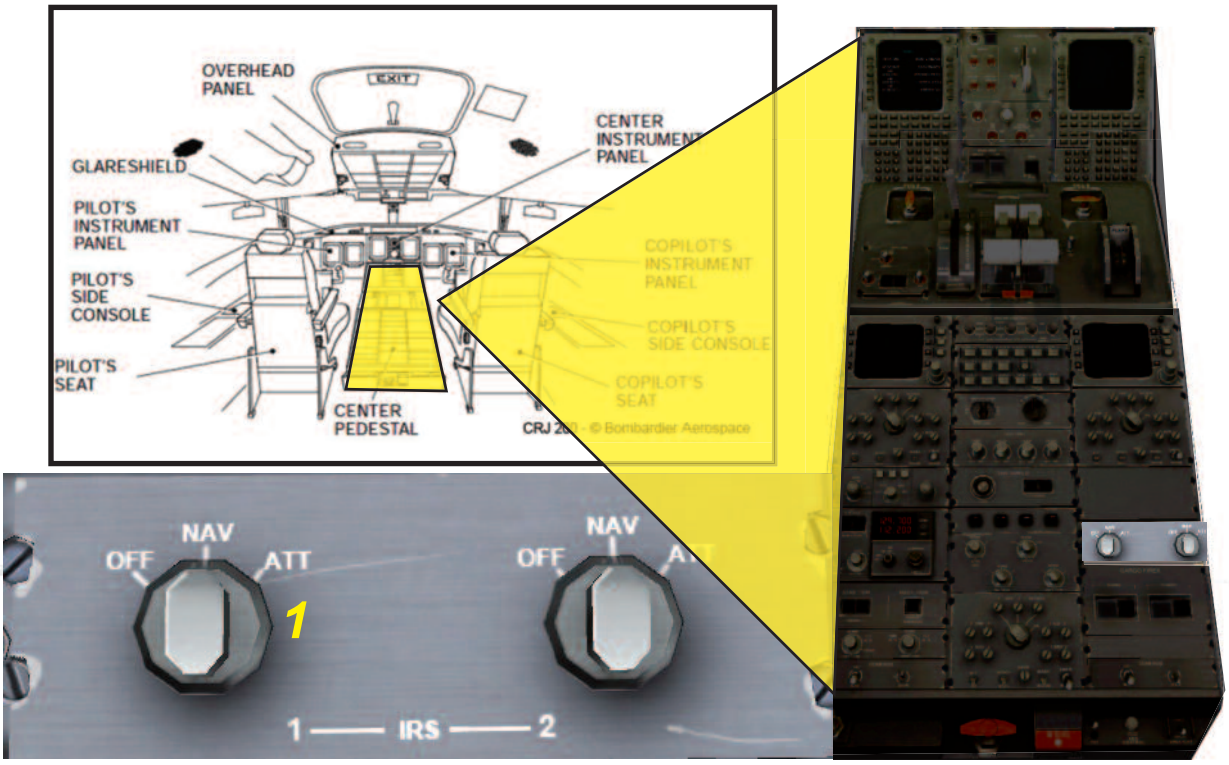
2 AIR DATA SELECTOR

- NORM - ADC'S are displayed:
  1. on the LEFT
  2. on the RIGHT
- 1 - on both LEFT and RIGHT
- 2 - on both LEFT and RIGHT

3 EICAS SELECTOR

NORM - normal operations
ED1 - LEFT EICAS displays Primary and Secondary data
RIGHT EICAS is blank
ED2 - RIGHT EICAS display Primary and Secondary data
LEFT EICAS is blank.

IRS MODE SELECT UNIT



To align the FMS, it is necesary to set the mode to NAV or ATT, to set power to both IRS. IRS initialization takes about 7 minutes at normal temperature. The IRS requires that the initial position be entered using the FMS.
The Primary flight display will not show information of the artificial horizon, speed or altitude until the IRS is initialized.

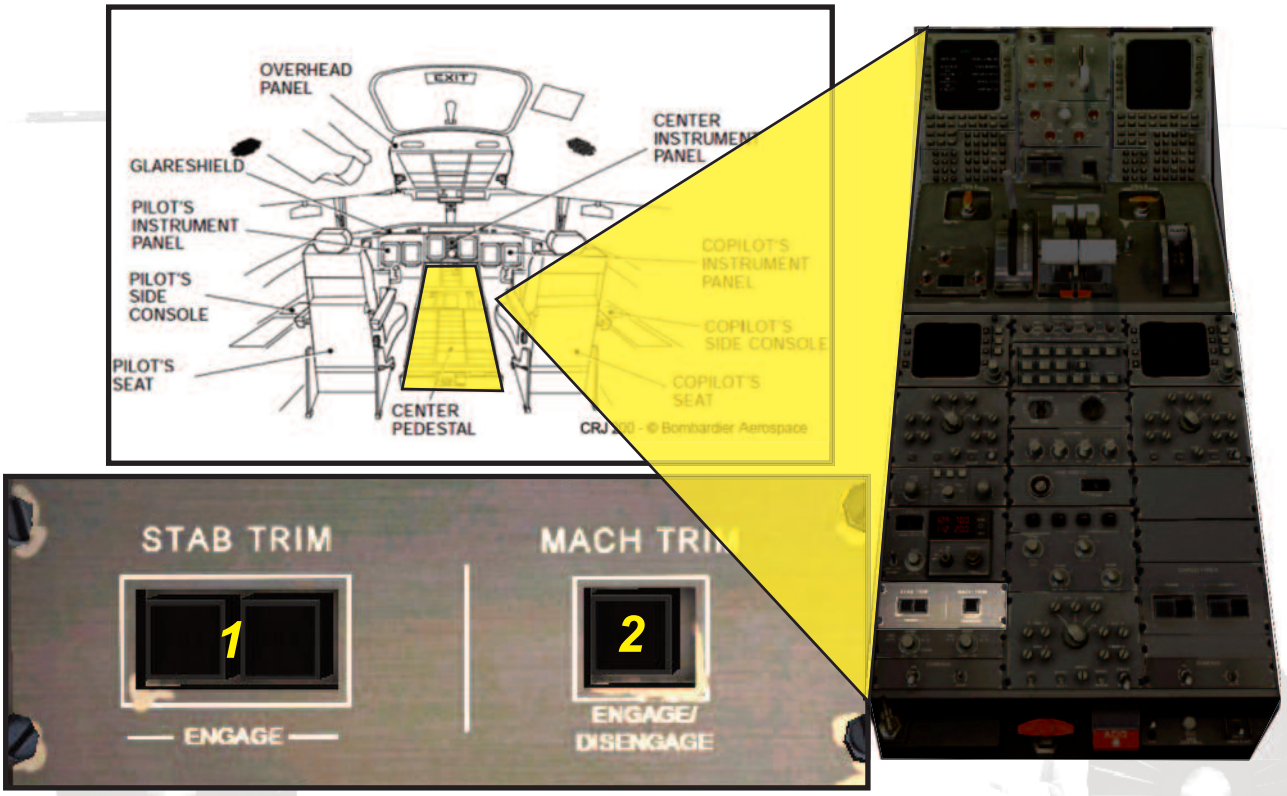
1 Used to select IRS mode.

- Off - Removes power from IRS.
- Nav - IRS operates in navigation mode.
- ATT - IRS operates in attitude mode.

4 DISPLAY CONTROL SELECTOR

- NORM - DCPs are controlling:
Left DCP controls the LEFT
Right DCP controls the RIGHT
- 1 - Left DCP controls both LEFT and RIGHT
- 2 - RIGHT DCP controls both LEFT and RIGHT

STABILIZER / MACH TRIM PANEL



1 HORIZONTAL STABILIZER TRIM / MACH TRIM STAB TRIM CH 1 (CH 2) Switches

PRESS

CH 1 - Engages the HSTCU Channel 1

CH 2 - Engages the HSTCU Channel 2

TO DISCONNECT : Press the Disconnect Switch on the Pilot's Control Wheel.

Messages: CONFIG STAB

Aural: "CONFIG TRIM"

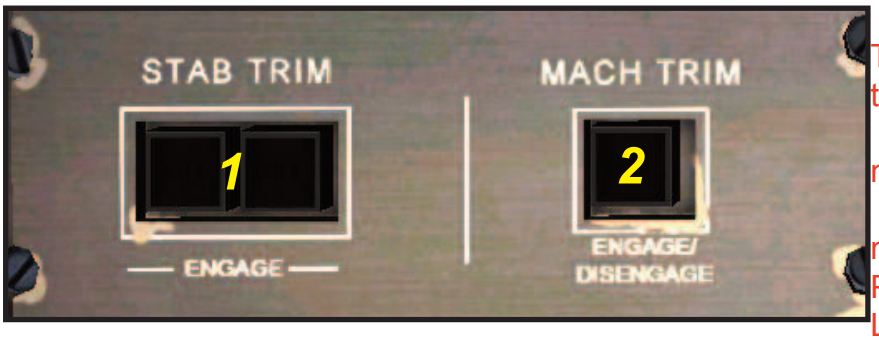
STAB TRIM

MACH TRIM

Aural: CLACKER - if Stab Trim motion exceed 0.3% sec for more than 3 seconds

NOTE: Mistrim indications appear on the PFD.

HTSCU: Horizontal Stabilizer Trim Contro Unit.



2 MACH TRIM Switch - Light

To ENGAGE the MACH TRIM function:

1. Both HTSCU Channels must be powered
2. At least one HTSCU Channel must be engaged.

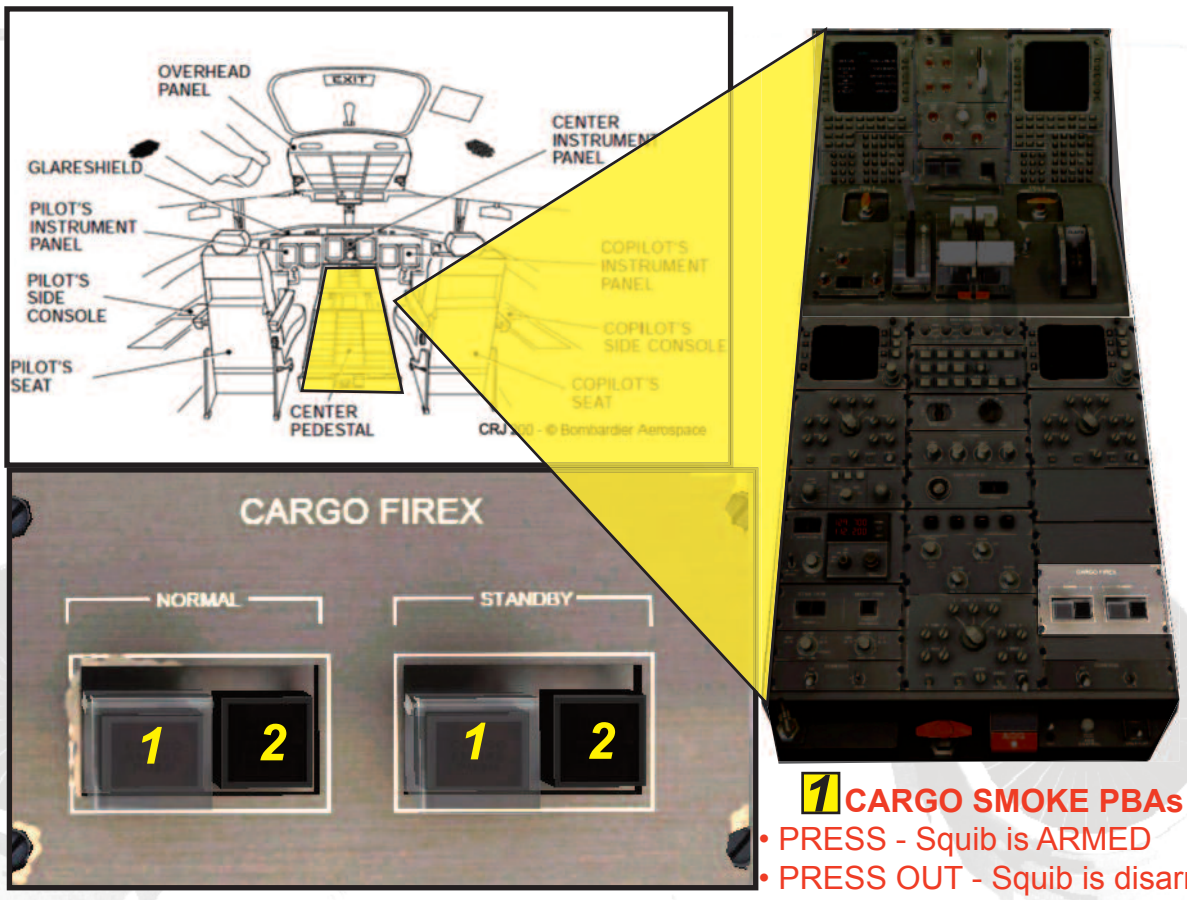
PRESS the MACH TRIM Switch - Light. The INOP will extinguish.

To DISENGAGE the MACH TRIM function: PRESS the MACH TRIM Switch-Light The INOP light will illuminate

INOP - System is disengaged.

HTSCU: Horizontal Stabilizer Trim Control Unit.

CARGO FIREX PANEL



1 CARGO SMOKE PBAs

- PRESS - Squib is ARMED
- PRESS OUT - Squib is disarmed
- FLASHES RED - Smoke is detected in the Cargo Compartment by either Cargo Smoke Detector

2 BOTTLE DISCHARGE PBAs

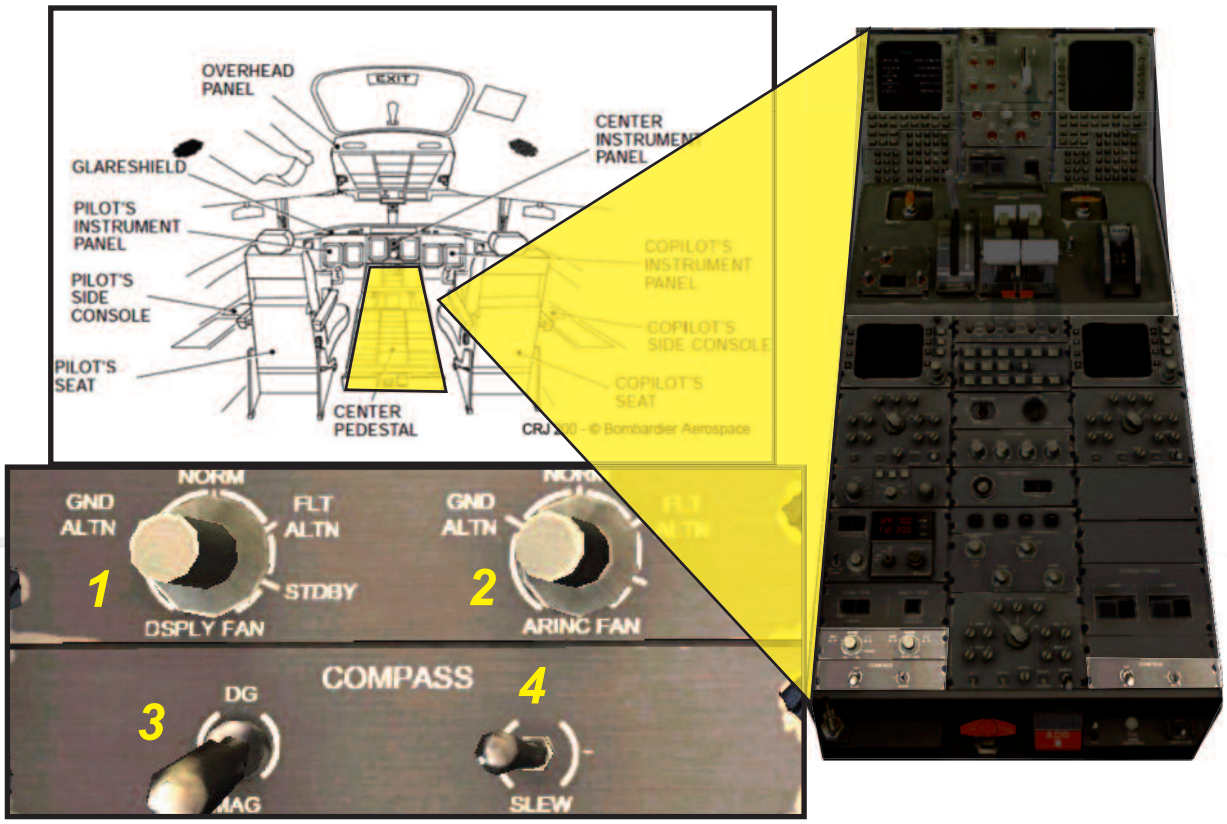
Commands the discharge of the Cargo Fire Extinguisher Bottles

- PRESS - Fires teh Squib
- Extinguished - Bottle is discharged.

This PBA is powered by the Battery (The other is off the DC BUS 1)

NOTE: it may take 20 minutes for the Bottle to discharge to the point where the CASM CARGO BTL LO message is received and the BOTTLE DISCHARGE Light to extinguish. At this point the Pressure Switch OPENS between 260 - 310 psi.

DISPLAY / ARINC CHASSIS FAN SELECTOR PANEL
COMPASS CONTROL PANEL



1 DISPLAY FAN SELECTOR KNOB

Select the following Avionics Cooling Display Fan(s) as the Alternate Fan (some airlines use the term REVERSIONARY).

- GND ALTN - FAN #1 AC ESS BUS
- NORM - FAN #1 when in flight
  FAN #2 when on ground
- FLT ALTN - Fan #2 AC BUS 1
- STBY - Standyb Fan AC ESS BUS

Message: DISPLAY COOL - When the ALTN Fan operates

2 ARINC FAN SELECTOR KNOB

Selects the following Avionics Cooling ARINC Display Fan(s) as the Alternate Fan. (Some airlines use the term REVERSIONARY)

- GND ALTN - Fan #1 AC ESS BUS
- NORM - Fan #1 when in flight
  Fan#2 when on the ground
- FLT ALTN - Fan #2 AC BUS 2

Message: ARINC COOL - When the ALTN Fan operates.

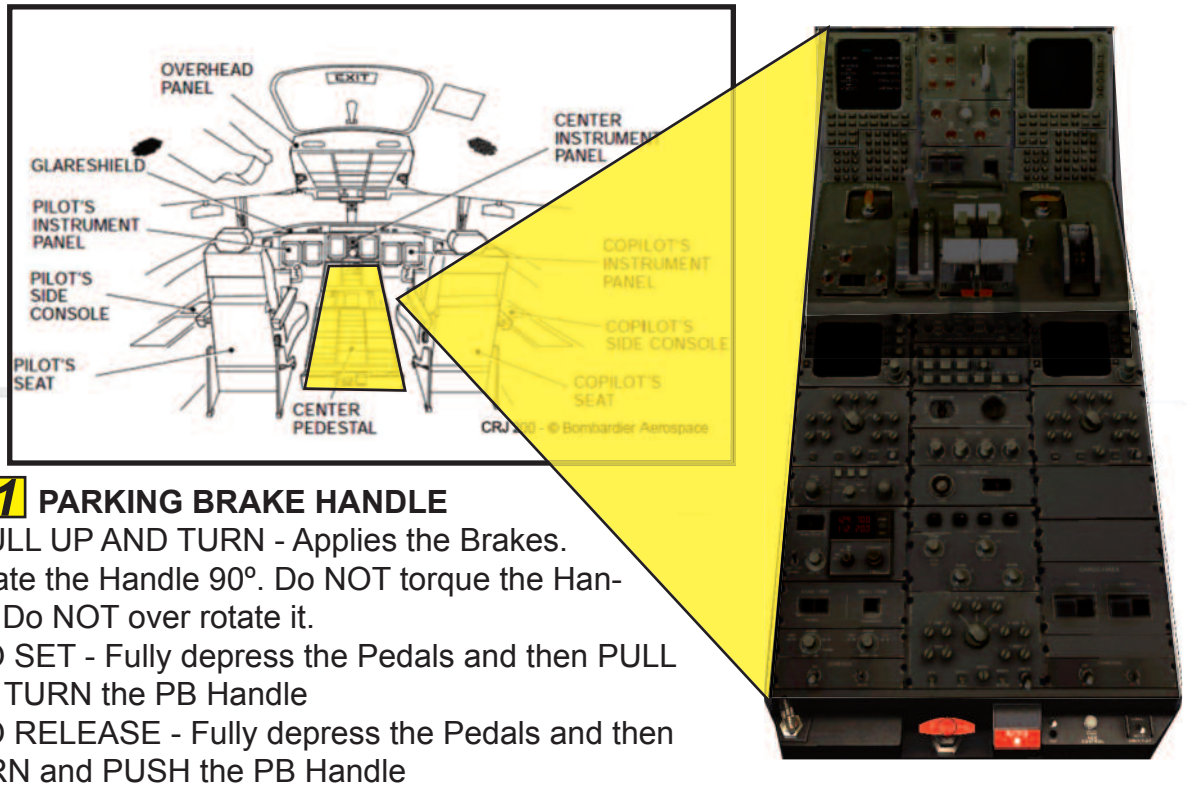
3 DG / MAG Switch

- DG - Directional Gyro Mode is selected. HSI is slaved to the DG
- MAG - Magnetic Compass Mode is selected. HSI is slaved to the Magnetic Flux Detectors.

4 SLEW Switch

Commands the Compass Card rotation when in Directional Gyro Mode (DG).

PARKING BRAKE / MANUAL LANDING GEAR RELEASE / AIR DRIVEN GENERATOR



1 PARKING BRAKE HANDLE

• PULL UP AND TURN - Applies the Brakes. Rotate the Handle 90º. Do NOT torque the Handle. Do NOT over rotate it.
• TO SET - Fully depress the Pedals and then PULL and TURN the PB Handle
• TO RELEASE - Fully depress the Pedals and then TURN and PUSH the PB Handle
(in both cases just is necesary to depress the pedals and grab and drag the parking brake handle in one direction or other to SET or RELEASE)

2 LANDING GEAR MANUAL RELEASE HANDLE

PULL - This commands the Landing Gear to extend
If Hydraulic System 3 FAILS, the Alternate Gear is actuated by the Manual Release Handle. Pulling the Handle through 4 Detents will

1. release Gear Uplocks (3 - one each Gear)
2. release Nose gear Doors forward camlocks
3. Dump Valves - OPEN
   (Hydraulic System pressure configuration is routed to return scheme)
4. Gear gravity drops to exteded position
   a) NLG is assisted to DOWN by two tension springs and airflow
   b) MLG is assisted to DOWN by Main Gear Assist Actuators powered by Hyd Sys2

3 AIR DRIVEN GENERATOR (ADG) MANUAL DEPLOY HANDLE

ACTUATE (one second) - Then STOW
This commands the Air Driven Generator to MANUALLY deploy. It also commands the Emergency Transfer Contactors to ENERGIZE.
NOTE: Restow the Handle to protect the GCU, which, through the Generator Ready Signal, prevents Overvoltage FAULT. This protection is bypassed when the Handle is not stowed. When the aircraft speed is slow and the ADG cannot power properly, the BATTERY BUS will power the DC ESS BUS

4 LAMP / UNIT

• LAMP - Checks the TEST Lamp (adjacent) for operation TESTs the Weight-on-Wheels (WOW) Circuit

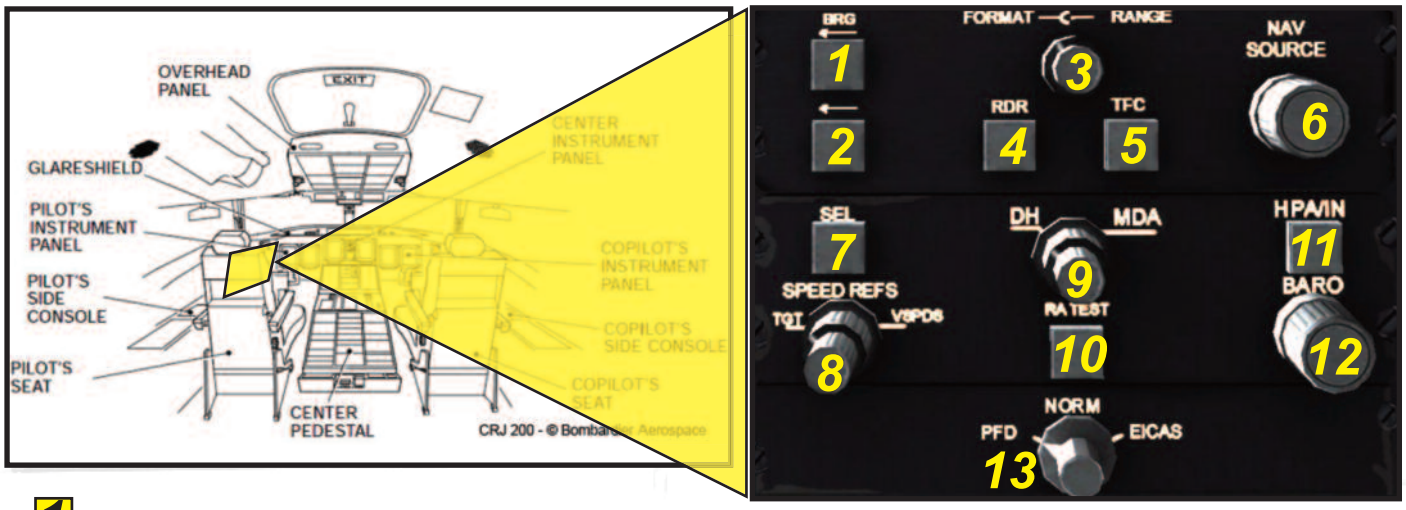
• UNIT - Checks the UNIT, including the:

1. GCU
2. Transfer Contactors (3)
3. Squib circuit
4. Uplock Squib circuit

DIFFERENCES: Some manuals do not include #1.

SIDE PANELS

DISPLAY / AIRDATA REFERENCE PANELS



1 BEARING POINTER SELECTOR: Single Pointer

PRESS - Selects Bearing Source from the NAV 1 Systems
SELECT:

1. OFF
2. VOR 1
3. ADF 1

2 BEARING POINTER SELECTOR: Double Pointer

PRESS - Selects Bearing Source from the NAV 2 Systems
SELECT:

1. OFF
2. VOR 2
3. ADF 2

3 MFD FORMAT SELECTOR: Outer Knob

ROTATE - Selects various Formats for the MFD

1. HSI
2. NAVAID SECTOR
3. FMS MAP
4. PLAN MAP
5. Weather (WX) Radar

MFD RANGE SELECTOR: Inner Knob

ROTATE - Selects Range when in MAP Mode SELECT:
PFD - 5, 10, 20, 40, 80, 160, 320 NM
MFD - 5, 10, 25, 50, 100, 200, 300, 600 NM
TCAS is limited to 40 NM

4 RADAR SELECTOR:

PRESS - Selects on the MFD:

a) Radar

b) Radar Overlay

5 TRAFFIC SELECTOR

DIFFERENCES: some aircraft label is TFC, some TCAS.

PRESS - Selects TCAS Format on the MFD

NOTE: Weather Radar can be displayed Ranges 5, 10, 20, 40 NM

6 NAV SOURCE KNOB: Outer Knob

ROTATE - Selects NAV Source for display

1. OFF
2. VOR / LOC 1 / 2
3. FMS 1

CROSS-SIDE COURSE

PUSH - selects Cross side Course and Data to be displayed on the On-side MFD, (HSI and NAV sector formats) with Course Deviation and Labels from the other side.

7 SEL

• PRESS - Selects either for display

a) Target Speed

b) Vspeed - alternately selects V1, VR, V2 for editing

8 SPEED REFERENCE MODE KNOB: Outer Knob - Two position

• ROTATE - selects the Reference Speed to be adjusted by the Set Knob.
• SET KNOB: Inner Knob
• ROTATE - Adjusts the Reference Speed as determined by

1. Speed Reference Mode Knob (outer) and
2. SEL push button (in VSPDS alternately edits V1, VR, V2)

• PUSH SET OFF: Center
• PUSH - Removes the Target or VSpeed from the Display.

9 DH / MDA KNOB - Two positions

ROTATE - Selects either:

1. Decision Height for Radio Altitude
2. MDA for barometric Minimum Descent Altitude in 10' increments

• SET KNOB: Inner Knob

ROTATE - Adjusts the Reference Altitude as determined by the DH / MDA Knob

1. Decision Height in 1' increments
2. MDA in 10' increments

PUSH SET OFF: Center

PUSH - Removes or displays on the EFIS the reference Altitude as selected by the DH / MDA Knob

10 RA TEST SELECTOR

PRESS - Initiates the RA Self Test. Appears on the PFD:

a) 50' RA
b) RA TEST
c) Rising Runnaway Symbol

Powered by DC BUS 1

11 HPA / INCHES

SELECTOR:

PRESS - Selects either

a) hecto Pascals
b) inches Mercury

12 BAROMETRIC KNOB. Outer Knob

ROTATE - Selects barometric correction for display. Range 745 - 1083 hPa (22 - 32 in Hg) correction Range of the Pressurization System.

Controller:

947 - 1051 hPa
27.969 - 31.030 inHg

PUSH STANDARD: Center

PUSH - Selects the Standard Reference Barometric Pressure of: 1013 hPa or 29.92 in/Hg

13 PFD 1 (2 for copilot side) SELECTION: use if left (right) side PFD fails

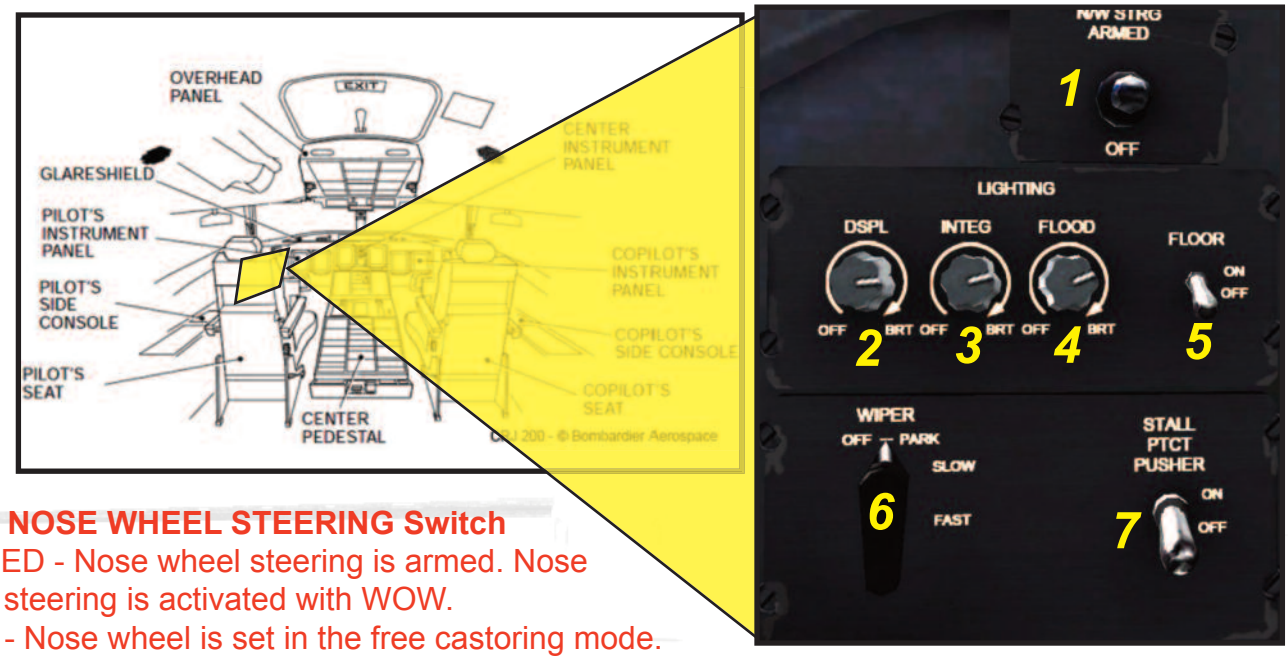
ROTATE

1) left side PFD goes BLANK (Right side for copilot)
2) PFD 1 displays MFD 1 data (PFD 2 displays on MFD 2)

NORM: ROTATE - normal operations

EICAS: ROTATE - use to view secondary pages on a MFD.

WIPER AND LIGHTING PANELS



1 NOSE WHEEL STEERING Switch

- ARMED - Nose wheel steering is armed. Nose wheel steering is activated with WOW.
- OFF - Nose wheel is set in the free castoring mode.

2 DISPLAY LIGHTING CONTROL KNOB

ROTATE - Controls the Displays' Lighting illumination
Dimming power sources:

1. Captain EFIS CRT - DC ESS BUS
2. Center EFIS CRT - DC BAT BUS
3. F.O's EFIS CRT - DC ESS BUS

3 INTEGRAL LIGHTING CONTROL KNOB

ROTATE - Controls Integral Lighting illumination for

1. Panels
2. Instruments

Between the Panel and the Instrument panels there are Inverter Units converting DC to AC power.

4 FLOOD LIGHTS CONTROL KNOB

ROTATE - Controls respective pilot's Flood Lighting Illumination

1. Captain Floodlights - DC ESS BUS
2. Center Floodlights - DC BAT BUS
3. FO's FloodLights - DC-BAT BUS

5 FLOOR LIGHTING Switch (this one is included on EMERGENCY LIGHTS Switch)

- ON - Floor Lights illuminate
- OFF - They are off.

6 WINDSHIELD WIPER SELECTOR Switch

Power Source for the Panel - DC BUS 1 and 2

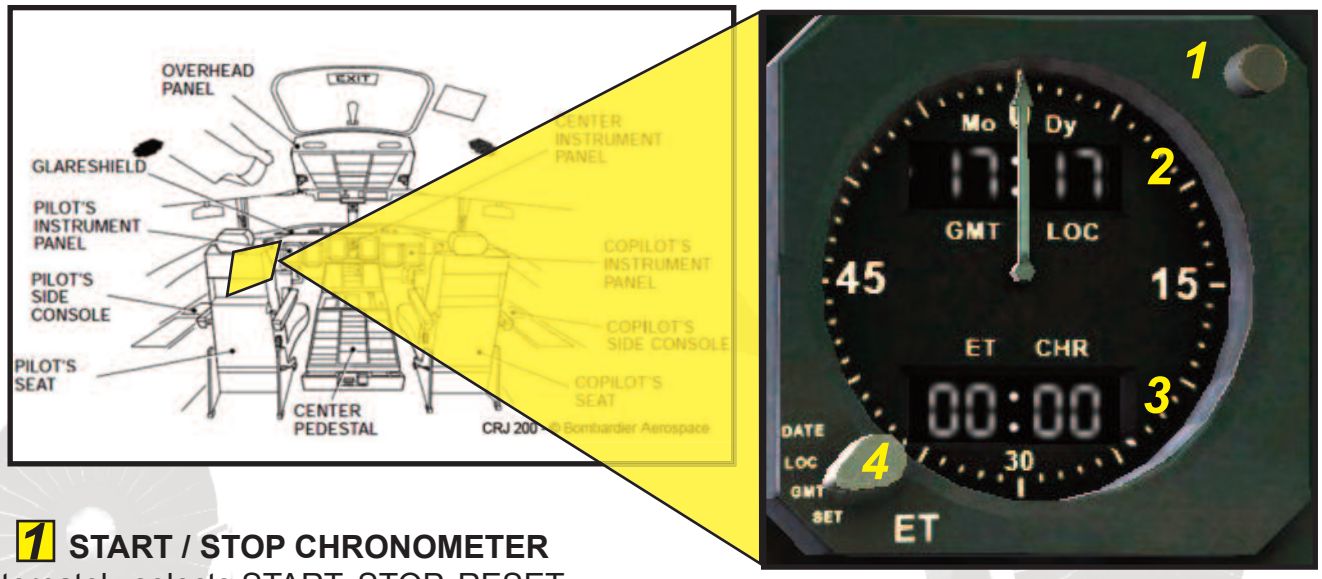
- OFF - PARK -
  1. Wiper is OFF
  2. Wiper is stowed
- SLOW - Wiper operates at LOW Speed
- FAST - Wiper operates at HIGH Speed

POWER SOURCES: for the Wiper Motors
LEFT Wiper - DC BUS 1
RIGHT Wiper - DC BUS 2

7 STALL PROTECTION PUSHER Lever Switch

ON - Stick Pusher is ARMED
NOTE: Both Pilot's Lever Switches must be ON
OFF - Stick Pusher is disabled

CHRONOMETER / DATE



1 START / STOP CHRONOMETER

Alternately selects START, STOP, RESET
Will override the ET display

- First Push - Starts
- Second Push - holds
- Third Push - resets to zero, ET will appear

When setting the time, CHR is used to incrementally set the desired values

2 DATE and TIME DISPLAY

Alternately:

- GMT - this is the source of EICAS (Captain's Clock)
- Local Time
- Date - Alternately (month/day) and (year) for 0.5 seconds

3 ELAPSED TIME DISPLAY

ET in hours & minutes

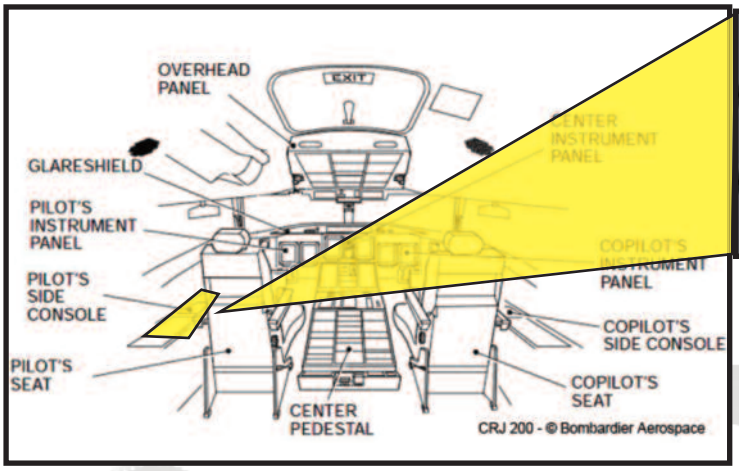
NOTE: Reset only on the ground, and begins at take off

CHR in minutes

4 FUNCTION SELECTOR

- DATE
- LOCAL TIME
- GMT TIME
- SET

ENGINE OIL LEVEL



1 LH / RH FAIL LIGHT

Illuminated - Associated Engine Oil Lever Sensor FAILED during a Self Test.

LH / RH REFILL LIGHT

Illuminated - Associated Engine Oil Level is LOW, either

4.8 Quarts or less, or

4543 cc or less

2 STOP / START

- PRESSED IN - Begins the self Test of Engine Oil Level Indication System
  START Light illuminates in a specific pattern.
- PRESSED OUT - Engine Oil Level Indication System is de-energized.
- START LIGHT: Illuminates
  1. START comes ON for 2 seconds
  2. All Light extinguish for 1 second
  3. All Light illuminate for 4 seconds
  4. START Light remains ON
- STOP LIGHT: Illuminated - Indicates the COMPLETION of the Engine Oil Level Indication system Self Test.

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JRollon Planes website:
http://www.jrollon.com

X-Aviation webpage:
http://www.x-aviation.com

The CRJ-200 plugin relies on the vascore plugin for simulating the FMS.

Vascore is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

Sourcecode is available from
https://github.com/PhilippMuenzel/vascore-embedded

Credits

Main Idea and Design
Javier Rollón Morán

Graphics and Animation
Javier Rollón Morán

PlaneMaker Flight Dynamics
Javier Rollón Morán

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Anton Volkov

FMS programming and connection with Vas-FMC (Vas-Core)
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Cameron Son

X-Aviation Support
Cameron Son

Extra Support
Austin Meyer
Ben Supnik
Ben Russell

I also want to give an special thank you with all my love to Inma Muñoz Moreno for supporting all the time, With her, lots of projects have come true. I have been very focused in everything I have done, thanks to her!.
And also thanks to Teo because soon you will be born into this world and if you want I will teach you how to make those things your “papá” does.

Javier Rollón Morán