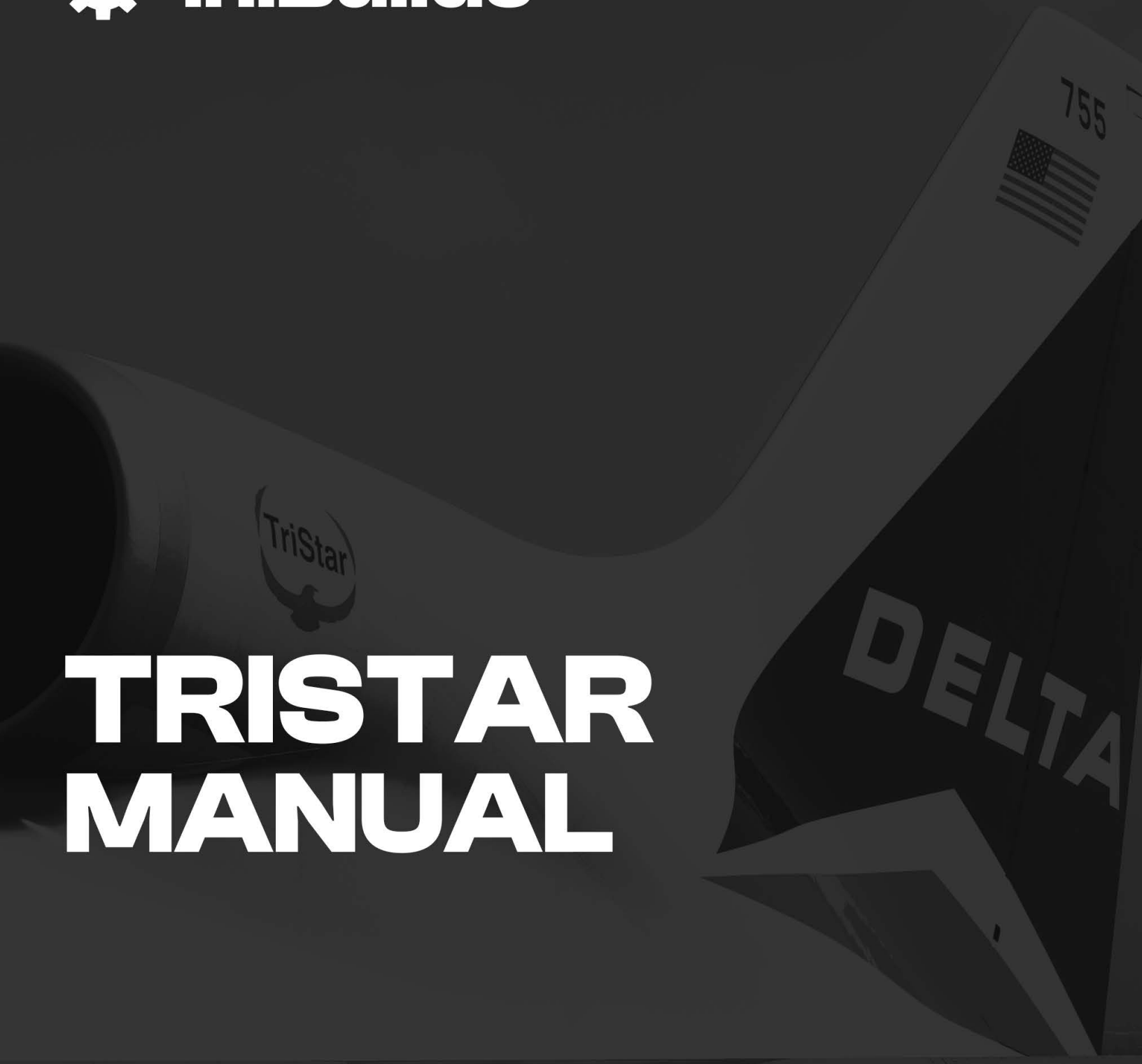
iniBuilds



TRISTAR MANUAL

Microsoft Flight Simulator 2024

PREFACE

FOR SIMULATION USE ONLY - DESIGNED FOR SINGLE-PILOT OPERATIONS

This guide is designed to help provide a straightforward set of instructions to aid in operating the iniBuilds TriStar Airliner. It has been produced using multiple real-world Tristar operator manuals from various dates and sources with modifications to various procedures to make them more manageable under single-pilot operations.

PHOTOSENSITIVE SEIZURE WARNING

A very small percentage of people may experience a seizure when exposed to certain visual images, including flashing lights or patterns that may appear in video games. Even people who have no history of seizures or epilepsy may have an undiagnosed condition that can cause these "photosensitive epileptic seizures" while playing video games.

Immediately stop playing and consult a doctor if you experience any symptoms.

These seizures may have a variety of symptoms, including light-headedness, altered vision, eye or face twitching, jerking, or shaking of arms or legs, disorientation, confusion, or momentary loss of awareness. Seizures may also cause loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.

Parents should watch for or ask their children about the above symptoms. Children and teenagers are more likely than adults to experience these seizures.

You may reduce risk of photosensitive epileptic seizures by taking the following precautions:

• Play in a well-lit room.
• Do not play if you are drowsy or fatigued.

If you or any of your relatives have a history of seizures or epilepsy, consult a doctor before playing video games.

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Version 1.0 – March 23rd, 2026

CONTENTS

CHANGE LOG

1.0

- Initial issue

ABOUT THE INIBUILDS TRISTAR AIRLINER

The L-1011-500 TriStar marked the final and most capable evolution of the iconic widebody trijet series. Engineered in response to growing demand for true intercontinental reach, the -500 variant introduced a suite of refinements that extended the aircraft's operational range while preserving the advanced systems and passenger comfort that had defined its predecessors.

Entering service in 1979, the -500 featured a fuselage shortened by approximately 14 feet compared to earlier models, which allowed for increased fuel capacity and improved weight distribution. With a maximum range of around 6,000 nautical miles, it was well-suited for nonstop flights across oceans and continents, connecting distant city pairs without refueling stops. The aircraft typically accommodated 246 passengers in a two-class layout, though configurations varied depending on operator preferences.

From a systems standpoint, the TriStar was head of its time. Its flight deck incorporated one of the most advanced autopilot systems of its era, capable of Category IIIB Autoland—enabling fully automated landings in extremely low visibility conditions. The aircraft's triple-engine layout, powered by high-bypass turbofans, delivered a balance of thrust, fuel efficiency, and quiet operation. The distinctive S-duct design feeding the tail-mounted engine was not only aerodynamically efficient but also contributed to the aircraft's sleek silhouette.
Cabin innovations included wide aisles, spacious seating arrangements, and a remarkably quiet interior thanks to advanced soundproofing and pressurization systems. Some configurations offered lower-deck lounges or crew rest areas, enhancing long-haul comfort for both passengers and flight crews.

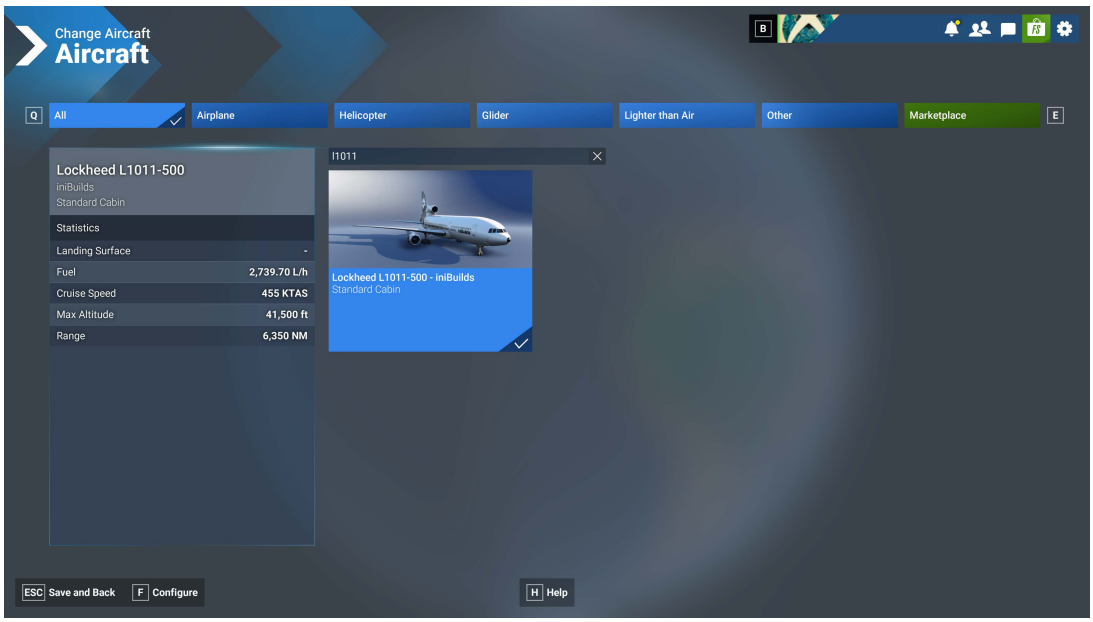
Though fewer units of the -500 were produced compared to earlier variants, its legacy endures among aviation enthusiasts and professionals alike. The aircraft's blend of range, reliability, and forward-thinking design cemented its place as a standout in the era of widebody trijets—a machine that pushed the boundaries of what long-haul air travel could be.

AIRCRAFT SELECTION AND LIVERIES

To fly the iniBuilds TriStar Airliner, you will need to select it from the Aircraft Selection menu. Click on FREE FLIGHT in the Main Menu and click the AIRCRAFT SELECTION icon on the top left.

You can either scroll through the list until you find the aircraft or type “1011” into the search bar for quick access.

After selecting the aircraft, press Configure to browse and choose from the different available models and liveries.



Checklists

Detailed checklists have been implemented using the default simulator EFB.

Two levels of detail are available: STANDARD and EXPERT.

Standard level filters the checklist items to only those that are essential to the operation and skips all system tests. Expert level includes all checklist items.

Clicking the blue eye icon to the right of the checklist item will switch your view to the required panel where the button/switch/dial/gauge is located.

LIMITATIONS

Weight Limits

Maximum Take Off Weight (MTOW)	231,332 kg	510,000 lbs
Maximum Landing Weight	166,922 kg	368,000 lbs
Maximum Zero Fuel Weight (MZFW)	147,418 kg	325,000 lbs

Operating Empty Weight (OEW / DOW)	111,312 kg	245,400 lbs

Fuel Capacity

Maximum Quantity	96,960 kg	213,758 lbs

Gear Operating Speeds

Maximum Gear Operation Speed extension & extended	250 kt	M 0.73
Maximum Gear Operation Speed retraction	230 kt	

Flight Manoeuvring g-Load Limits

Clean Configuration	+2.5 g	-1 g
Slats Extended Configuration	+2 g	0 g

Airport Operation Limitations

Mean Runway Slope	± 2 %

Maximum Slats/Flaps Speeds (VFE) & Maneuvering speeds

		Minimum maneuvering speed	
Flap Position	**Limiting Speed (V_{FE})**	**Take off**	**Approach**
0˚	-	V2+70	Vref+60
4˚	250 kt (M 0.60)	V2+60	Vref+40
10˚	230 kt (M 0.50)	V2+20	Vref+30
14˚	225 kt (M 0.50)	V2+10	Vref+20
18˚	220 kt (M 0.50)	V2+10	Vref+20
22˚	215 kt (M 0.50)	V2+10	Vref+20
33˚	200 kt (M 0.50)	-	Vref

Wind Speed Limitations

Maximum Tailwind Component for Take Off & Landing	10 kt
Maximum Certified Crosswind for Take Off & Landing	30 kt

Autoland Limitations

Maximum Headwind Component	25 kt
Maximum Crosswind Component	15 kt
Maximum Tailwind Component	10 kt

SPECIFICATIONS

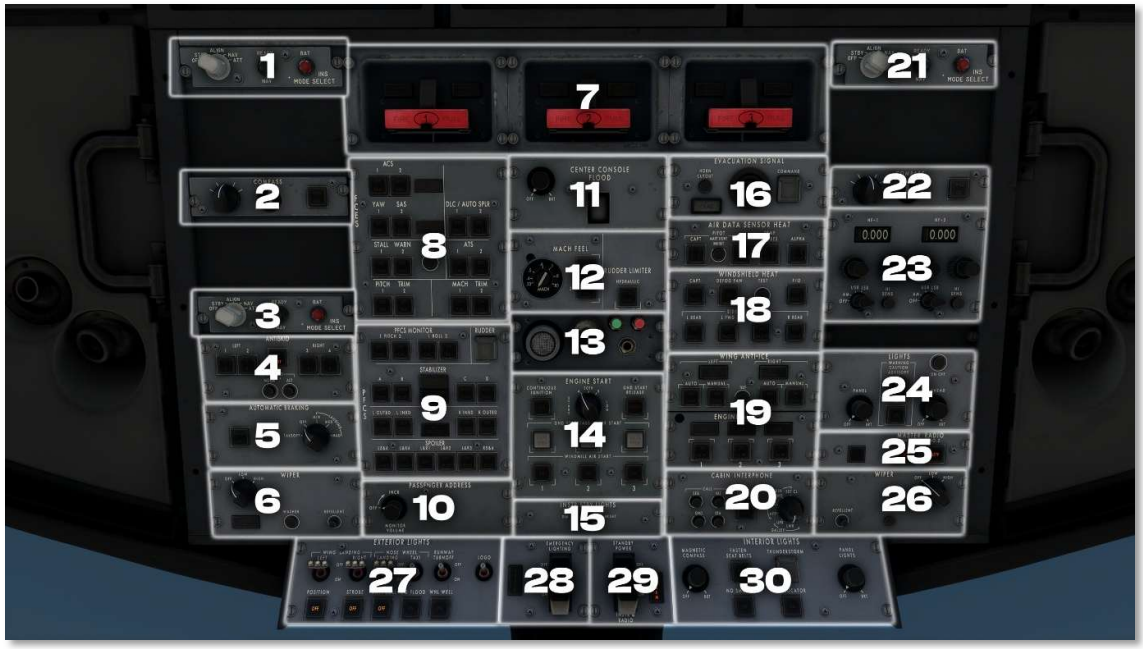
Cruise Speed	525 KTAS
Max Altitude	43,000 ft
Max Weight	231,332 kg (510,000 lbs)
Range	5,300 NM
Length	50.1 m (164 ft 2 in)
Wingspan	50.15 m (164 ft 4 in)

COCKPIT LAYOUT

MAIN PANEL

1. Glareshield and main panel lights
2. Weather radar
3. Clock
4. GPWS warning lights & PFB toggle
5. Instrument comparator
6. AFCS warnings & modes
7. Primary flight & navigation instruments
8. Instrument comparator
9. Surface Position Indicator
10. NAV 1 radio
11. Autopilot/Flight Director System (APFDS)
12. NAV 2 radio
13. Total Air Temperature (TAT)
14. Standby flight instruments
15. Pilots' annunciator panel
16. Engine instruments
17. Flap & slat indicator
18. Landing gear controls & indicators
19. Approach and performance data card
20. Magnetic compass

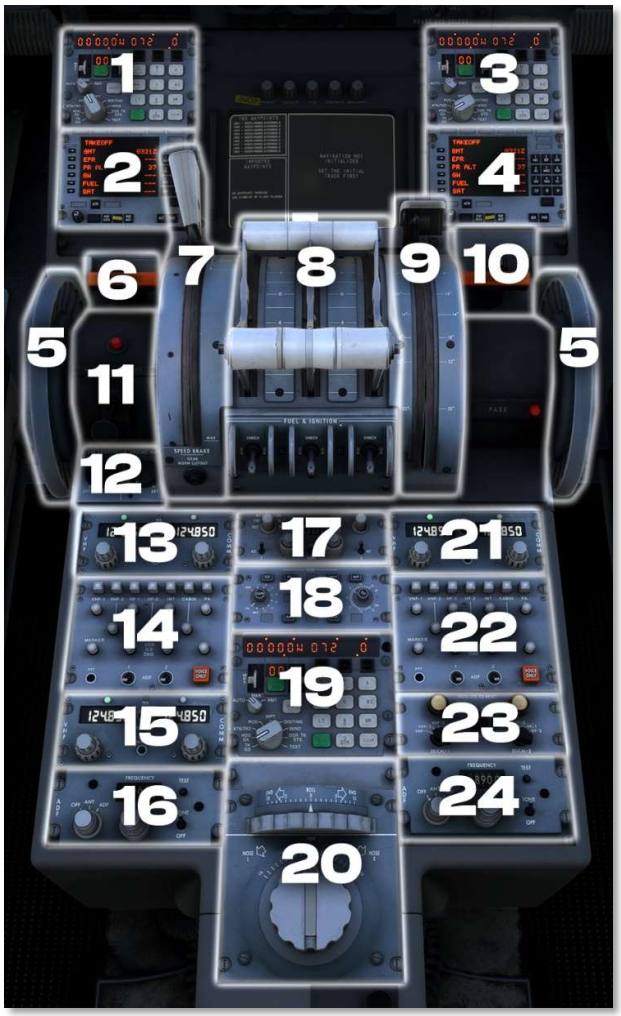
OVERHEAD PANEL



1. INS 1 Mode Selector Unit (MSU)
2. Captain's compass controller
3. INS 3 Mode Selector Unit (MSU)
4. Antiskid panel
5. Autobrake panel
6. Captain's wiper control
7. Engine fire pull handles
8. Flight Control Electronic System (FCES)
9. Primary Flight Control System (PFCS)
10. Passenger address monitor volume
11. Center console flood light
12. Mach feel & rudder limiter
13. Cockpit voice recorder
14. Engine start panel
15. Standby lights intensity selector
16. Evacuation panel
17. Air data sensor heat panel
18. Windshield heat panel
19. Wing and engine anti-ice panel
20. Cabin interphone panel
21. INS 2 Mode Selector Unit (MSU)
22. FO's compass controller
23. HF radio
24. Overhead panel lights, bright/dim selector & light test
25. Master radio power panel
26. FO's wiper control
27. Exterior lights panel
28. Emergency lights switch
29. Standby power switch
30. Interior lights panel & passenger signs

Note: the lower area of the overhead panel (containing items 27-30) is referred to as the **Eyebrow panel.**

CENTER CONSOLE



1. INS 1
2. Captain's PMS
3. INS 2
4. FO's PMS
5. Mechanical trim wheel
6. Pitch disconnect handle
7. Speed brake lever
8. Thrust levers and ignition switches
9. Flap lever
10. Roll disconnect handle
11. Parking brake knob & indicator
12. Center console & engine instrument lights
13. COMM 1
14. Captain's audio selector panel
15. COMM 3
16. ADF 1
17. Transponder
18. Weather radar
19. INS 3
20. Aileron & rudder trim
21. COMM 2
22. FO's audio selector panel
23. SELCAL panel
24. ADF 2

FLIGHT ENGINEER UPPER PANEL

1. APU fire pull handle
2. Fire extinguisher test panel
3. Fire detection loop test panel
4. Nacelle/pylon overheat detection test panel
5. Engine turbine cooling air panel
6. Wheel well fire test panel
7. Brake temperature panel
8. Hydraulic system panel
9. Engine bleed control panel
10. Cabin pressure control panel
11. Environmental control system panel
12. Slat monitor panel
13. Aural warning test panel
14. Flight engineer annunciator panel
15. Passenger oxygen control

FLIGHT ENGINEER LOWER PANEL

1. Electrical panel
2. Fuel system panel
3. Flight engineer audio selector panel
4. Flight engineer lights panel
5. Engine status panel
6. Engine oil panel
7. Fuel used & fuel control amplifier panel
8. Fuel jettison panel
9. Clock & movie cutoff control switch
10. APU control panel
11. Fault isolation data display
12. Humidity control switch
13. Smoke detection panel
14. Forward cargo compartment smoke panel
15. Waste water panel
16. Expandable Flight Data Acquisition & Recording System (EFDARS)

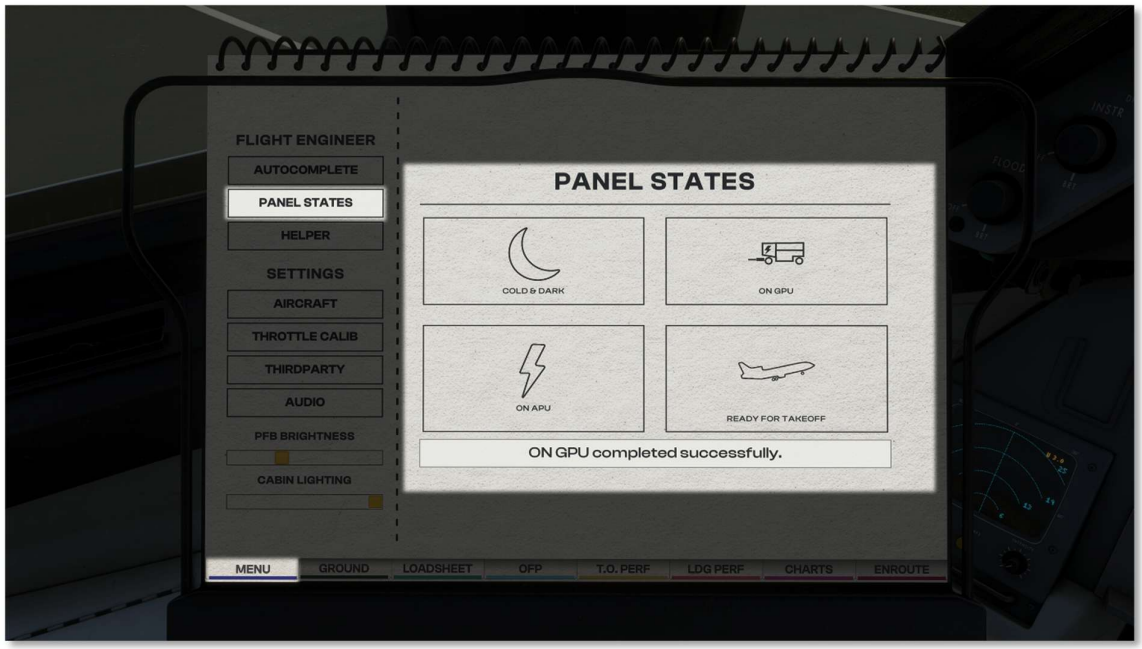
OTHER CONTROLS
PAPER FLIGHT BAG (PFB)

The aircraft is equipped with two Paper Flight Bags, one on the Captain side and another one on the First Officer side.

Various options are accessible by selecting the tabs located at the bottom of the PFB.

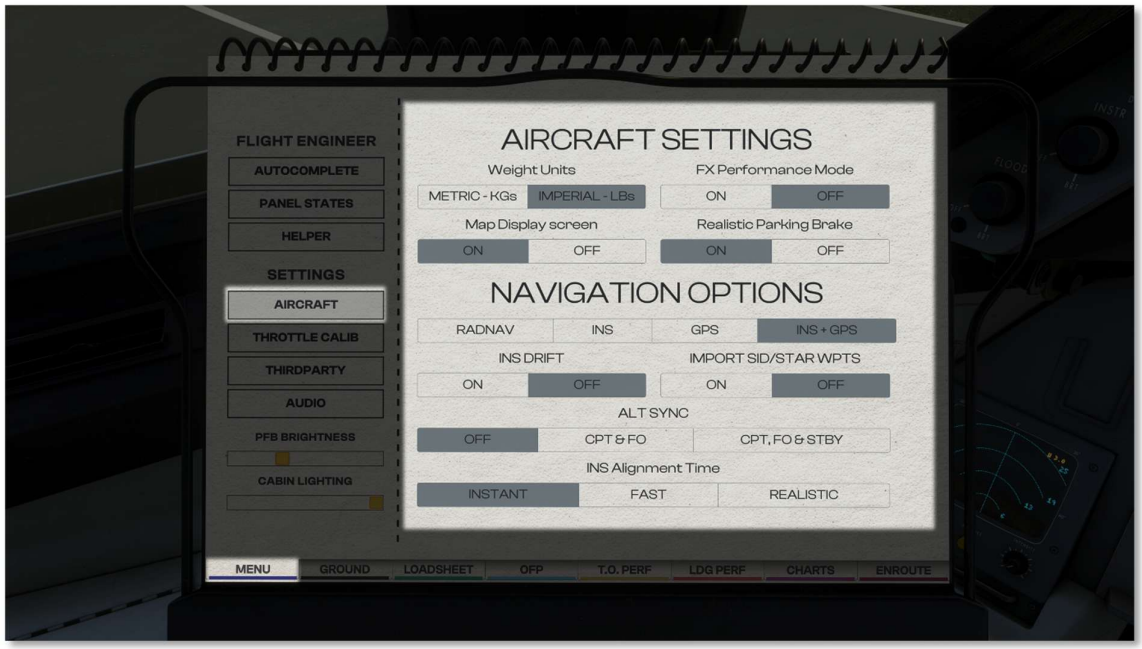
Menu, Flight Engineer: Autocomplete

- This page shows the different tasks the Flight Engineer can complete automatically
- Selecting the arrow adjacent to the item title will expand the list, displaying the various systems along with their current status:
    - Red: The system has not been set up correctly
    - Green: The system is set up correctly
- AUTOCOMPLETE finishes all steps
- COMPLETE sets up only the selected system



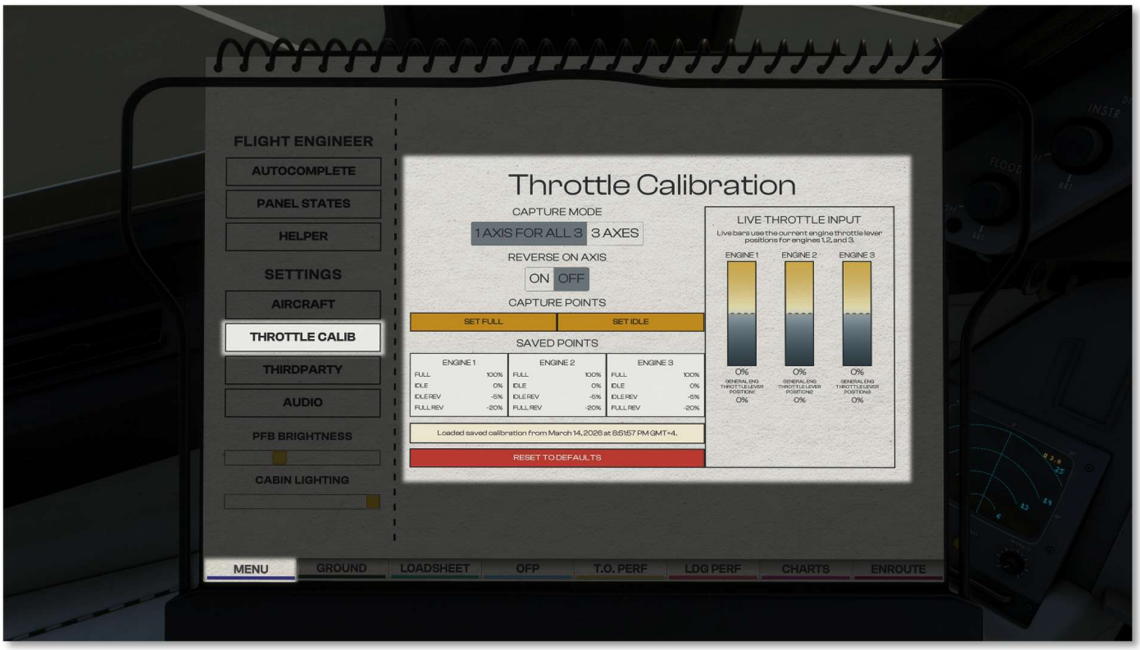
Menu, Flight Engineer: Panel States

- Set the desired panel state



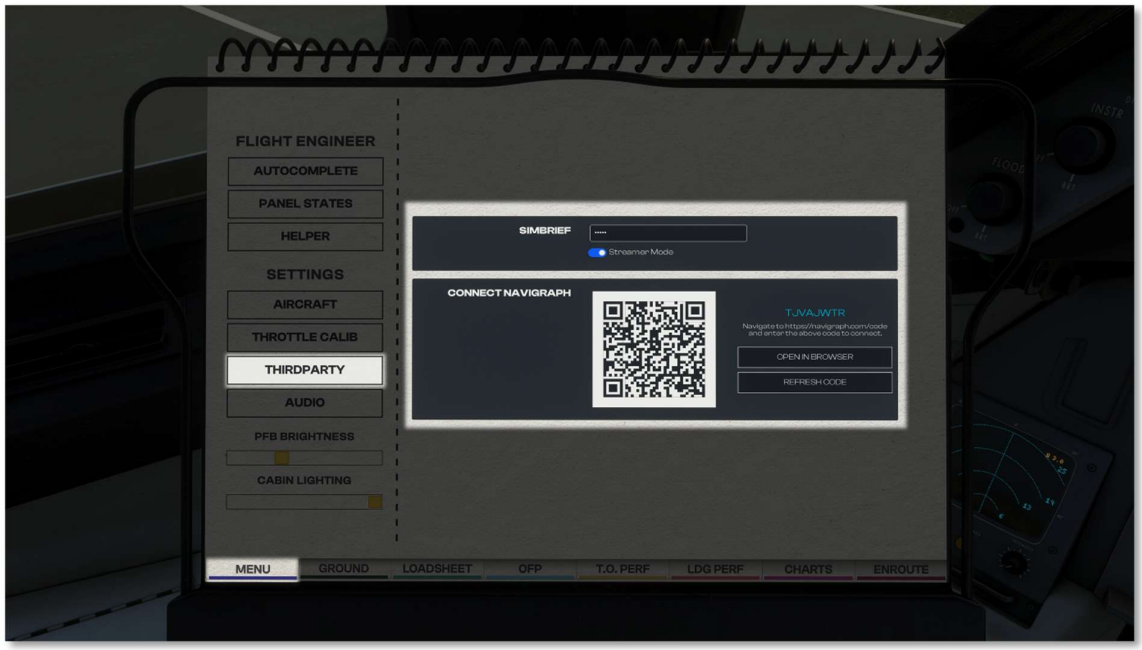
Menu, Settings: Aircraft

- FX Performance Mode: Certain graphical elements from the model will be omitted to improve performance
- Map display screen: toggle the moving map display, see Navigation section
- Realistic parking brake
    - On: depress the brakes fully, then pull the parking brake lever to engage the parking brake. To release, depress the brakes
    - Off: parking brake is applied and released by toggling the parking brake lever, there is no need to apply brake pressure
- Navigation options, INS drift, Import SID/STAR WPTS: see Navigation section
- ALT SYNC: select the desired barometric reference synchronization option
- INS Alignment Time
    - Instant: immediately aligns the units
    - Fast: alignment takes 5 minutes
    - Slow: alignment takes 17 minutes



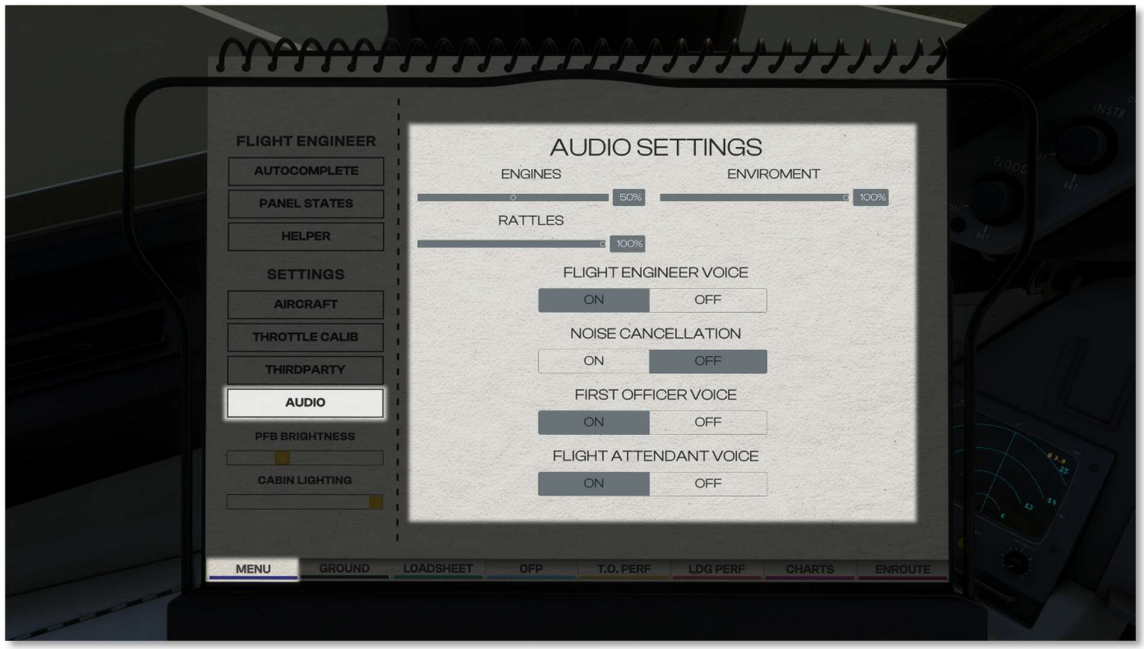
Menu, Settings: Throttle Calibration

- Choose the number of axes that matches your controller setup, then calibrate accordingly
- Please note: The throttle axis should not be configured using the option labeled "(0 to 100%)" in Settings > Controls



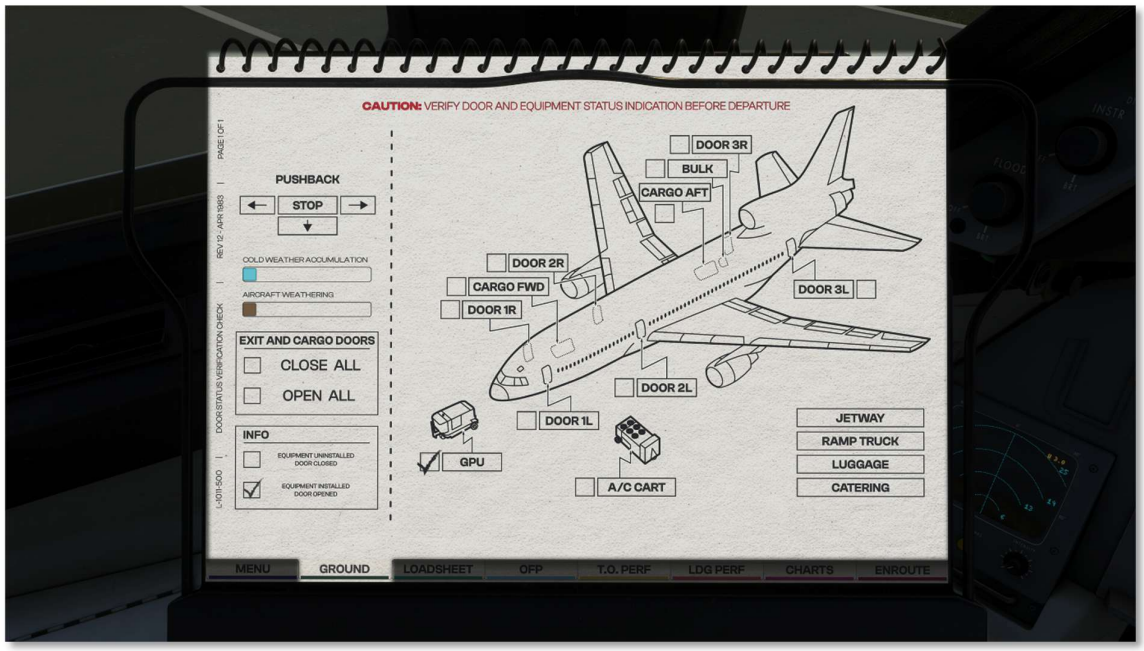
Menu, Settings: Thirdparty

- Simbrief: insert your Pilot ID, note this is not the same as your username
    - Streamer Mode: displays or hides your Simbrief ID present in this page
- Connect Navigraph:
    - Scan or click on Open Browser to approve Navigraph integration
    - Refresh code: Generates a new approval code



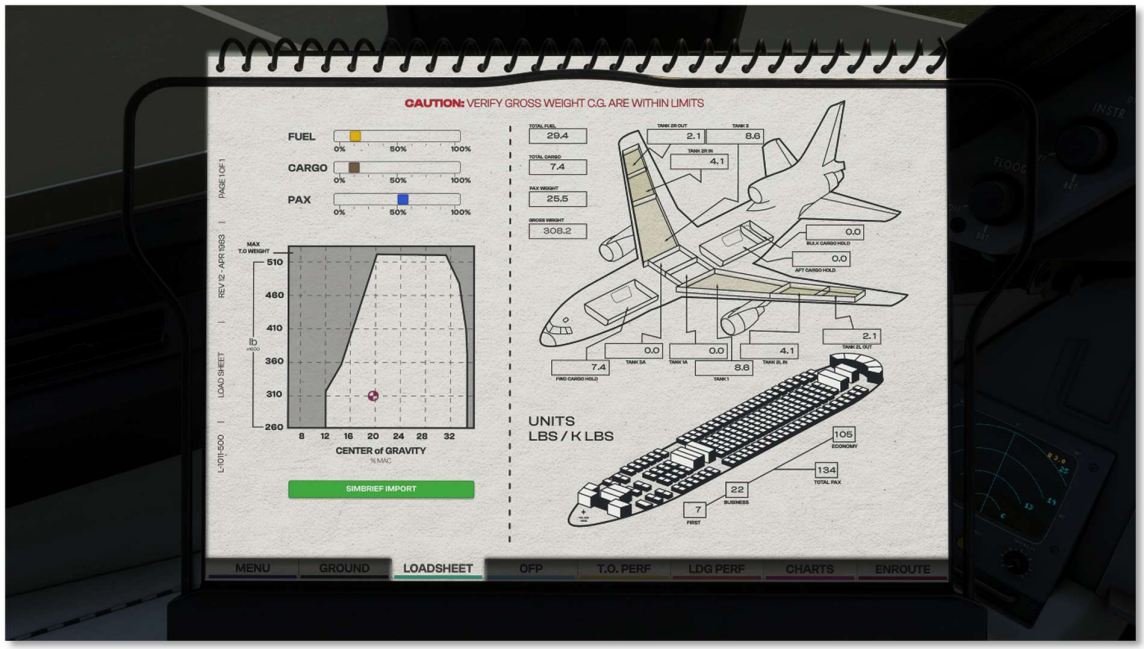
Menu, Audio Settings

- Adjust volume, toggle noise cancellation, and manage crew voices



Ground

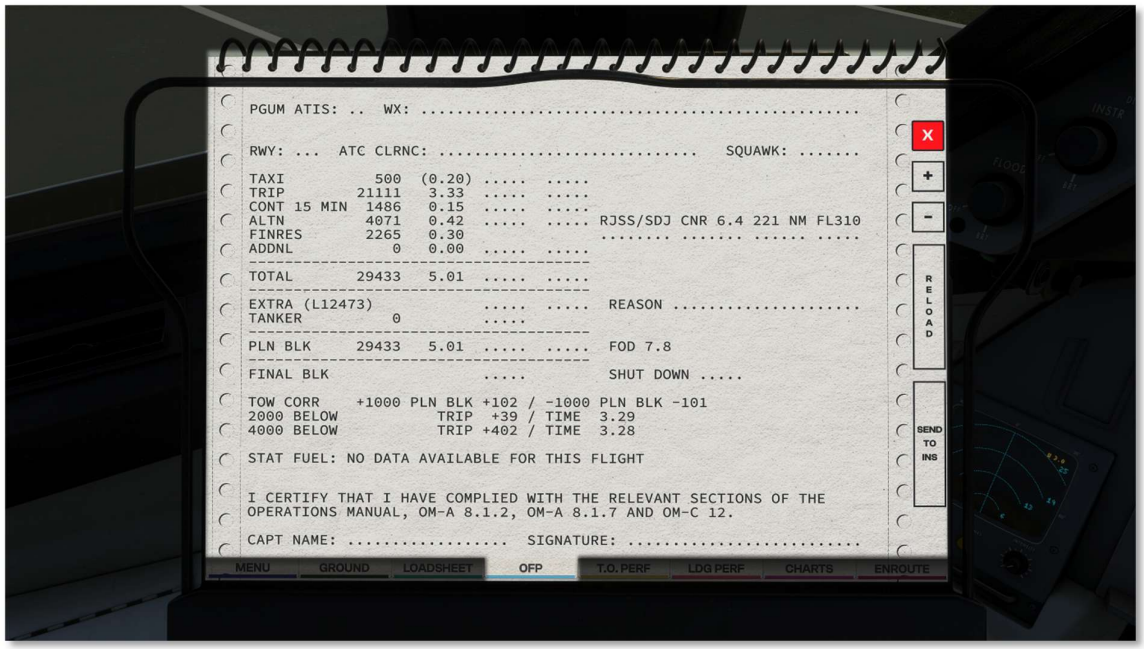
- This tab lets you toggle doors, ground services, pushback, and manage cold weather accumulation and aircraft weathering



Loadsheet

- Fuel, cargo and pax sliders: allows gross adjustment of these figures
- Simbrief import: fuel, cargo and passengers will be automatically imported and loaded from the Simbrief plan
- Total fuel, total cargo, pax weight: these values can be modified by clicking inside the box. An on-screen keyboard will appear allowing precise data entry
- Fuel tank & cargo holds: these values can be modified by clicking inside the box. An on-screen keyboard will appear allowing precise data entry
- Passenger cabin distribution: these values can be modified by clicking inside the box. An on-screen keyboard will appear allowing precise data entry

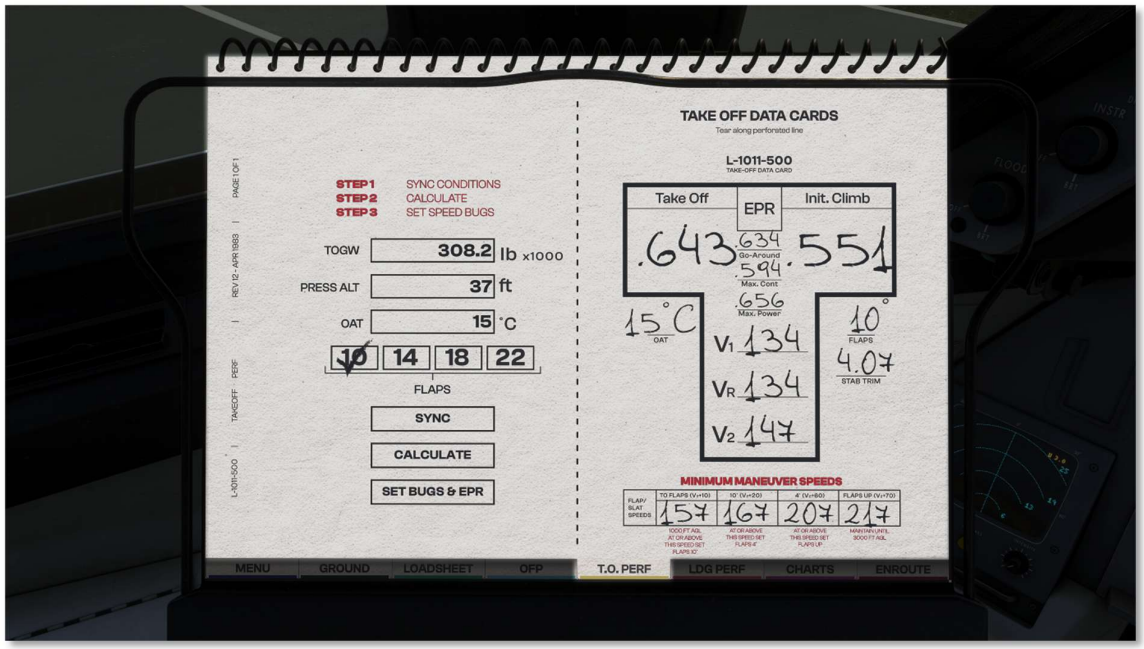
Always ensure that the load is distributed correctly, keeping the centre of gravity within the certified envelope displayed on the left-hand side of this page.



OFP

The imported Simbrief plan is displayed in this page. Scroll the plan by clicking and dragging the flight plan.

- Options on the right-hand side:
  - X: remove the flight plan
  - + / -: zoom in or out
  - RELOAD: reload the Simbrief plan
  - SEND TO INS: the waypoints from the flightplan will be inserted in the INS and will not require manual insertion



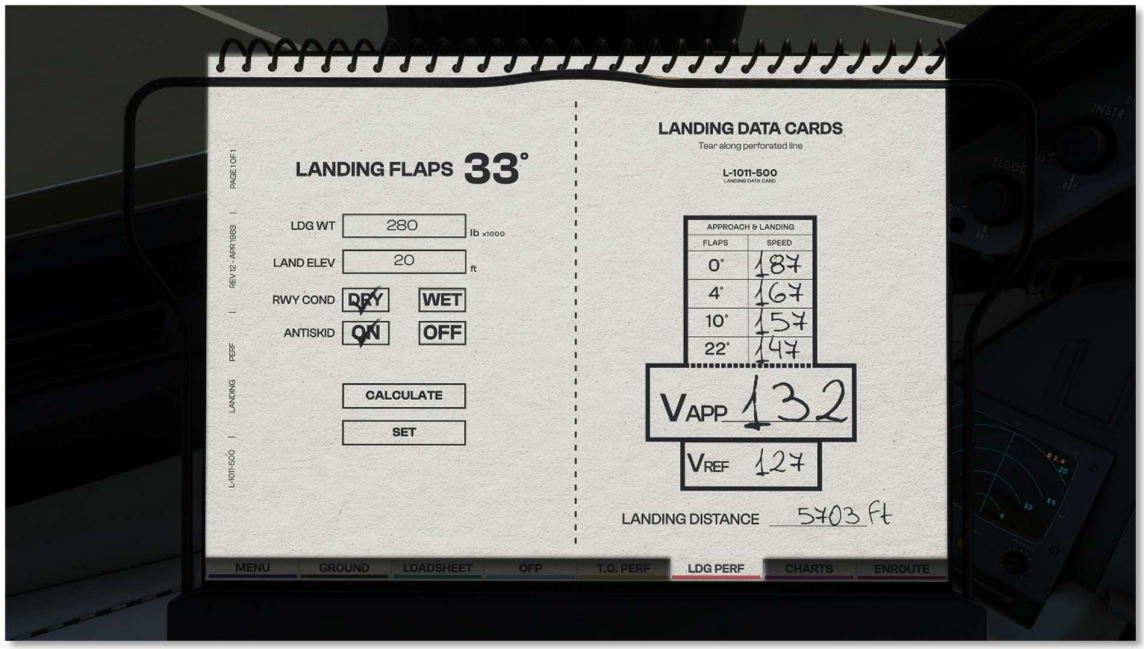
T.O. Performance

Input the relevant information on the left-hand side of the page to compute the takeoff speeds and thrust.

Speed and EPR bugs can be instantly set if desired.

Take off, climb and other thrust settings will be displayed on the right-hand side along with the V speeds and stabilizer trim setting.

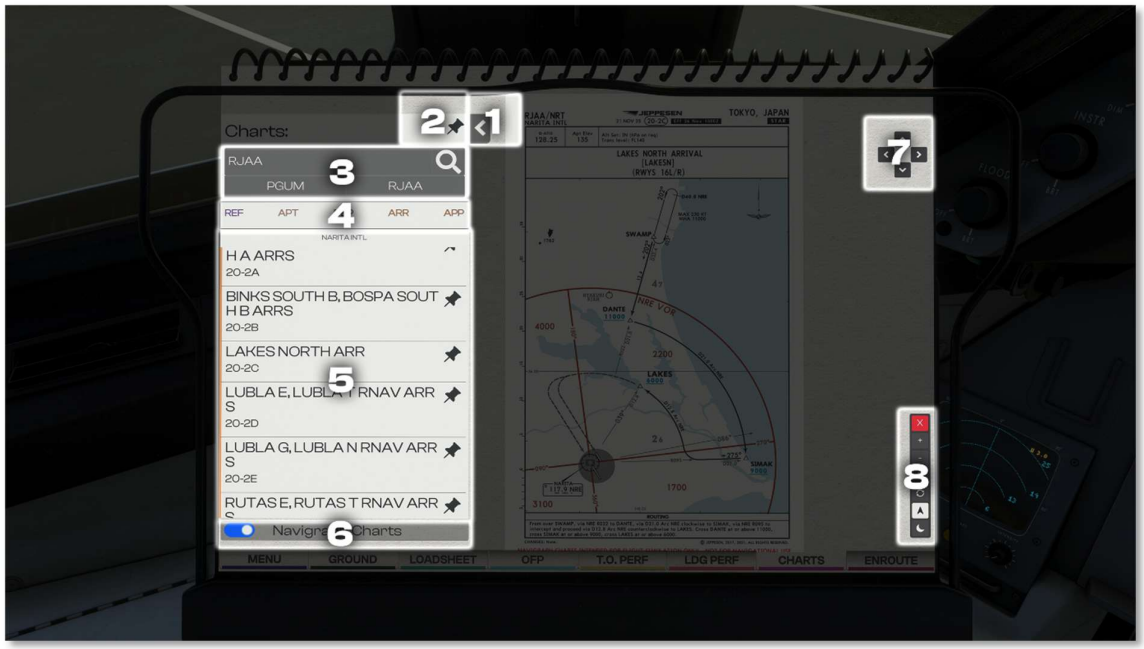
The minimum maneuver speeds and flap retraction schedule are displayed underneath the V speeds.



Landing Performance

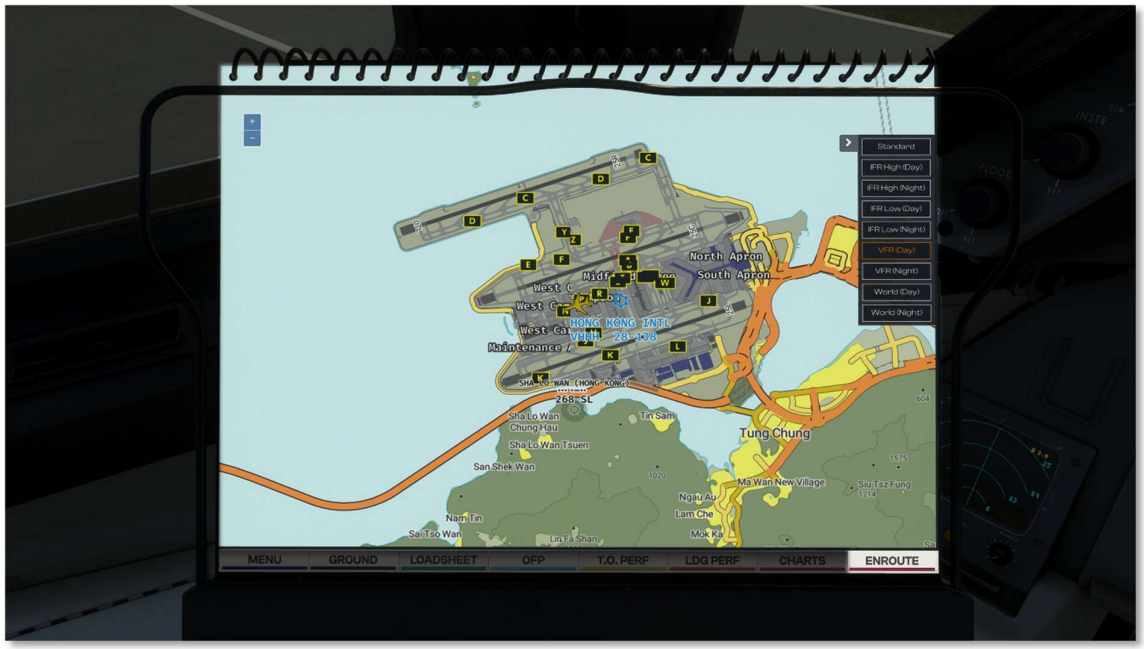
Input the relevant information on the left-hand side of the page to compute maneuvering and approach speed. The landing distance is also computed and displayed at the bottom of the right-hand side of the page.

Speed bugs can be instantly set if desired.



Charts

1. Display/hide menu bar
2. Pinned charts
3. Airport search box and departure/arrival imported airport quick access
4. Chart category selector
5. Chart list and pin chart (last symbol on the right)
6. Navigraph – default chart toggle
7. Scroll arrows (can also scroll the chart by clicking and dragging)
8. Other chart controls



Enroute

Different map options can be selected and displayed from this tab. Some map options are only available with a Navigraph subscription.

SYSTEMS

COCKPIT CONTROLS

Panels in the Tristar are composed of switches, selectors, indicators and lights to control, interact and indicate the status of various systems. It is important to understand some particularities of switches and lights.

Switches: buttons that are pressed to activate a function. Some of these switches act as on or off controls, whilst others engage a certain function if the logic is correct. As such instead of using an on/off terminology the **latched (LCH)** term is used to indicate a switch that has been **pushed in. Unlatched (UNL)** is used to indicate a switch that is in the **out position**. Some switches have **flowbars (FB)** to indicate flow of fluids or electricity. Other switches have text in them such as OFF, OVHT and some switches have both flowbars and text. The LCH, UNL, and FB abbreviations will be used throughout this manual.

Lights: Some lights look exactly like switches, they have the same shape and size, making them hard to differentiate. To avoid confusion, all lights have a black border painted in the panel around them. Switches do not have this black border.

AIR CONDITIONING

The air conditioning system provides complete control of the temperature in the cockpit, cabin, cargo holds and electronic centres.

Air is supplied by the pneumatic system via:

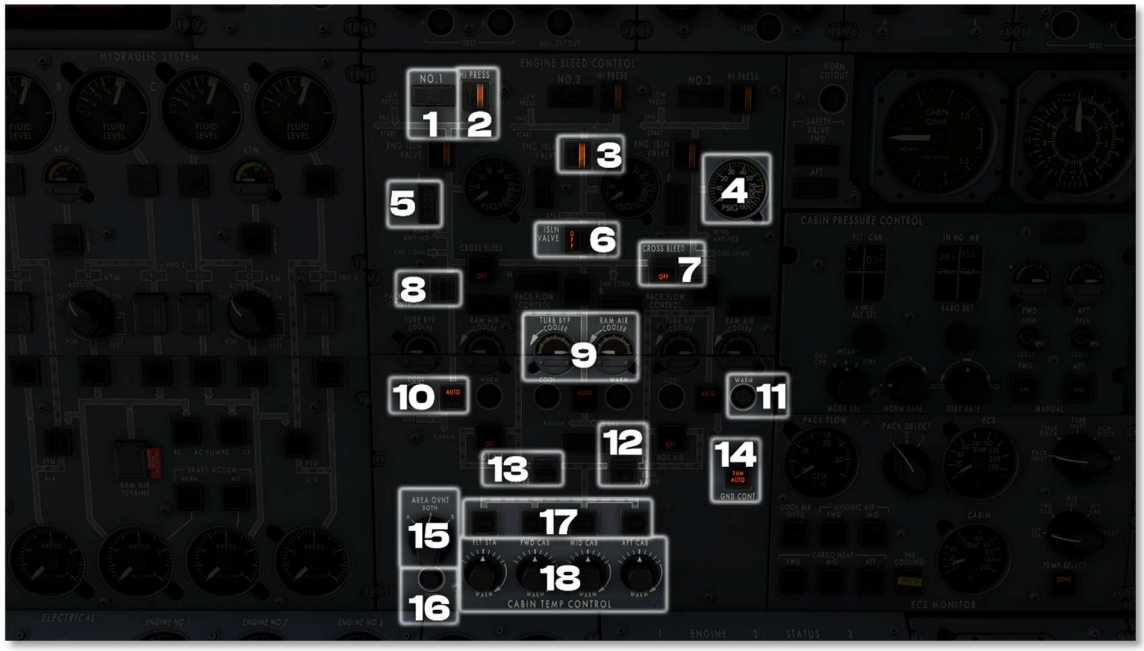
- Three packs.
- The temperature control system.
- The hot air distribution system.

The temperature control system modulates the pack ram air doors and turbine bypass valves to achieve the coldest required temperature for the aircraft. Hot air is then added to the cabin via the hot air distribution system.

The hot air distribution system receives hot air from pack 2 and 3 and is mixed with the primary cooled air before being delivered to the applicable zone at the selected temperature.

CONTROLS

Flight Engineer Upper Instrument Panel - Engine Bleed Control / Cabin Temp Control



1. **Duct overheat lights**
   - DUCT OVHT: illuminates to indicate an over temperature upstream of the engine isolation valve

2. **Engine high pressure valve switches: controls engine high pressure air bleed supply to the ejector. The ejector mixes high and low pressure air to achieve the required system demand.**
   - UNL: valve is closed and OFF illuminates
   - LCH: normal position, FB illuminates to indicate the valve is open

3. **Engine isolation valve switches: regulates bleed air from the engine into the pneumatic manifold**
    - UNL: valve is closed and OFF illuminates
    - LCH: normal position, FB illuminates to indicate the valve is open

4. **Duct pressure indicator**

5. **Area overheat lights**
    - AREA OVHT: illuminates to indicate an over temperature downstream of the engine isolation valves

6. **Fuselage isolation valve switch: connects or isolates engine 2, APU bleed & B2 ATM to the crossbleed manifold**
    - UNL: valve is closed, OFF illuminates
    - LCH: normal position, FB illuminates to indicate the valve is open

7. **Crossbleed valve switches: connects or isolates the pneumatic manifolds**
    - UNL: valve is closed, OFF illuminates
    - LCH: normal position, FB illuminates to indicate the valve is open

8. **Pack flow control switches**
    - LCH: FB indicates the flow control valve is open, pack operates
    - LCH: OVHT on and FB extinguished: The valve has closed automatically due to an overheat
    - UNL: The flow control valve is closed and the FB is extinguished

9. **Turbine bypass valve & ram air doors position indicator: indicates the position of the turbine bypass valve/ram air door position. Valve closes towards the cooler position**

10. **Pack auto/manual switches**
    - LCH: AUTO illuminates, turbine bypass valves and ram air doors modulate to achieve the required temperature
    - UNL: MNL illuminates, turbine bypass valves and ram air doors do not modulate automatically and have to be adjusted using the COOL and WARM switches

11. **Pack manual control cool and warm switches: switches used for manual temperature control when the pack auto/manual switch is in MNL. Cool and Warm switches must be pressed and held until the desired turbine bypass valve and ram air door positions are achieved**
    - COOL: Ram air pointer moves towards cooler position. When the full cool position is reached: Turbine bypass pointer starts moving towards cooler position
    - WARM: Turbine bypass pointer moves clockwise, when full clockwise position is reached: Ram air pointer starts moving clockwise

12. **Hot air switches: open or close the hot air valves**
    - LCH: arms the valve top open when there is sufficient pressure
        - *FB: illuminates when the valve is open*
    - UNL: valve is closed, FB extinguished and OFF illuminates

13. Hot air isolation valves: allows isolation of pack 2 or 3 from the hot air manifold

- LCH: arms the valve top open when there is sufficient pressure
    - FB: illuminates when the valve is open
- UNL: valve is closed, FB extinguished and OFF illuminates

14. Ground control switch: permits faster warmup of cold soaked aircraft

- LCH: normal position. Ram air doors are fully open when on the ground
- UNL: RAM/AUTO illuminates, doors are positioned automatically by the pack controller

15. Area overheat loop selector: selects the area overheat loop sensing circuit

- BOTH: Normal position, either loop A or B illuminates the AREA OVHT warning lights
- A: Only A loop illuminates the AREA OVHT warning lights
- B: Only B loop illuminates the AREA OVHT warning lights

16. Area overheat test button: test button to check the overheat loop sensing circuit

- When held all these warning lights illuminate:
    - *All seven AREA OVHT*
    - *Wing anti-ice DUCT FAIL*
    - *AREA/DUCT OVERHEAT*

17. Zone trim switches: controls the zone trim valve

- LCH: valve modulates to maintain the required temperature
- UNL: valve closes and CLOSE illuminates. No hot air is added to this zone

18. Zone temperature selectors: normal position is 12 o'clock, clockwise rotation increases temperature, anticlockwise rotation decreases temperature

Flight Engineer Upper Instrument Panel - ECS monitor panel

1. **Pack flow indicator: air output rate of selected pack**

2. **Pack selector: selects individual pack for temperature indication**

3. **ECS temperature indicator: indicates the temperature at the selected location using the ECS temperature selector**

4. **ECS temperature selector: normal position ACM DISCH. Select the location's temperature to be displayed**

5. **Overboard cooling selector**
   - IN: normal position, opens galley overboard valve. Arms both avionics compartment valves to open if there is a flow restriction and both valves automatically open when on the ground
   - OUT: closes all valves, CLOSE illuminates

6. **Avionics airflow indicator lights**
   - OVBD: illuminates when the cooling air valve is open
   - LO FLO: illuminates when the air flow is restricted in the ventilation duct

7. **Cargo heat switches**
   - IN: normal position, fan motor is automatically controlled to achieve the required temperature
   - OUT: fan is turned off
     - *COLD: illuminates when the temperature is below the minimum limit*
     - *HOT: illuminates when the temperature is above the maximum limit*

8. **Zone temperature indicator: displays either the duct or zone temperature of the selected zone**

9. **Zone temperature selector: select the cabin zone temperature to be displayed**

10. **Zone/Duct temperature selector switch**
    - IN: temperature of the selected zone duct is indicated. DUCT illuminates
    - OUT: temperature of the selected zone is indicated. ZONE illuminates

PRESSURIZATION

The pressurization system controls the cabin altitude by varying the exhaust of cabin air from the aircraft by modulating the position of the outflow valves.

Components:

- Control panel
- Cabin pressure controller
- Two outflow valves

CONTROLS

Flight Engineer Upper Instrument Panel - Cabin Pressure

1. **Cabin altitude horn cutout: an intermittent horn will sound when the cabin altitude exceeds 10,000ft. Pressing this button will silence the horn.**

2. **Safety relief valve open position lights: illuminates when the respective pressure safety valve opens.**

3. **Cabin rate of climb indicator: indicates the cabin vertical speed.**

4. **Cabin altitude and differential pressure indicator: outer scale indicates cabin altitude; inner scale indicates cabin pressure differential.**

5. **Cabin altitude selector & display: the ALT SEL knob is used to set the cruise altitude and corresponding cabin altitude.**
    - Displays the selected cruise altitude on the left half as set with the ALT SEL knob
    - The corresponding cabin altitude at maximum pressure differential is indicated on the right half

6. **Barometric pressure selector & display: knob used to set the barometric pressure.**

7. **Pressurization mode selector.**
    - GRD CHK: performs a normal system check when on the ground
    - NORM: fully automatic mode
    - STBY: selects cabin altitude rates using inputs from the STBY RATE knob

8. **Normal rate selector.**
    - ●: normal position, cabin climbs at +500 FPM and descends at -300 FPM
    - Out of ●: changes the cabin rate of climb
        - *Climb: minimum +200 FPM, maximum +1500 FPM*
        - *Descent: minimum -120 FPM, maximum -900 FPM*

9. **Standby cabin rate selector: manually set the cabin rate of change when the mode selector is in the STBY position. Note: the outflow valves will not open automatically on landing.**
    - HOLD: no cabin altitude rate of change. Note: this means there is no rate of change and should not be confused with 0 FPM cabin vertical speed
    - DSCD: reduces the cabin altitude with the rate progressively increasing with anticlockwise rotation. The rate of descent varies from 0 FPM to -1000 FPM
    - ASCD: increases the cabin altitude with the rate progressively increasing with clockwise rotation. The rate of climb varies from 0 FPM to +1000 FPM

10. **Outflow valve manual control: selects automatic or manual control of each valve.**
    - IN: MNL illuminates and the outflow valve is manually controlled by the outflow valve position switches
    - OUT: normal position, MNL extinguished and valves are automatically controlled

11. **Outflow valve position switches: switches to manually open or close the respective outflow valve. The valve must be in manual (MNL) mode to operate them with these switches.**

12. **Outflow valve position indicators: the green band is the normal operating range of both valves.**

13. **Cabin pressure system fault. This FAULT light can indicate two different types of failures and the outflow valve position indicator and cabin altitude indicator have to be referenced to determine the fault.**
    - Aircraft altitude FAULT: light illuminates when either outflow valve opens beyond the green band above 15,000 aircraft altitude
    - Cabin altitude FAULT: illuminates if the cabin altitude reaches 11,500ft. Both outflow valves automatically close in an attempt to maintain the cabin altitude below 11,500ft

Ice and Rain Protection

Anti-icing is provided for the following:

- Wing leading edge slats.
- Engine cowls.
- Cockpit windshields and side windows.
- Probes .

A defog system directs hot air onto the interior surface of the windshields to supplement the electrical heating.

Wing anti-ice (Pneumatic)

The wing anti-icing system prevents (and removes) icing on the four outboard slats of each wing. This is achieved by hot air bled from the engines.
Wing anti-ice will not work on the ground even if switched on. This is prevented by an air-ground sensor as the very hot skin temperature without airflow could damage the leading edge of the slats.

Engine anti-ice (Pneumatic)

Each engine cowl (and its associated pressure probe) uses bleed air from its respective engine to prevent (and remove) icing.

Probe heating (Electrical)

The pitot-static probes, Total Air Temperature probes and Angle of Attack probes are all electrically heated to prevent any malfunction caused by ice accumulation.

Windshield and side window heat (Electrical)

The two front windshields and two most forward side windows are electrically heated.

Windshield wipers

Each pilot has an independently controlled wiper with two speed settings.

CONTROLS

Overhead Panel

1. **Captain pitot heat: controls heating to the captain's left and right pitot tubes.**
    - IN: both heaters are electrically supplied.
    - OUT: pitot heat deactivated
        - *OFF: illuminates when the probes are unheated*

2. **First officer pitot heat: controls heating to the first officer's left and right pitot tubes.**
    - IN: both heaters are electrically supplied
    - OUT: pitot heat deactivated
        - *OFF: illuminates when the probes are unheated*

3. **Temperature probe heat: controls heating of the left and right temperature probes.**
    - IN: both probes are electrically supplied
    - OUT: probe heat deactivated
        - *OFF: illuminates when the probes are unheated*

4. **Angle of attack probe heat: controls heating of the left and right angle of attack probes.**
    - IN: both probes are electrically supplied
    - OUT: probe heat deactivated
        - *OFF: illuminates when the probes are unheated*

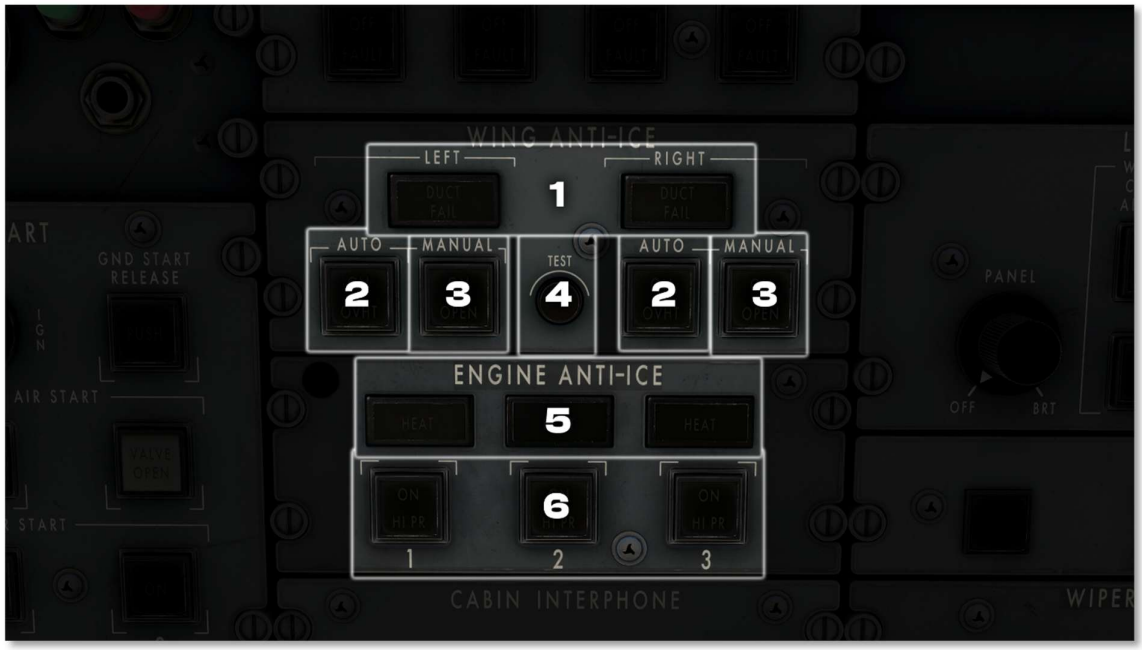
5. **Captain windshield heat.**
    - IN: normal windshield temperature
    - OUT: low temperature warmup cycle engaged
        - *IDLE: illuminates to indicate warmup cycle (switch in OUT position)*
    - FAULT: illuminates to indicate a fault in the heating system

6. **Defog fan control.**
    - IN: defog fan operates
        - *ON: illuminates to show switch position only*
    - OUT: defog fan does not operate and ON light extinguishes

7. **Windshield heat test: side window switches must be IN to carry out this test. Windshield heat switches can be IN or OUT.**
    - Normal result: all four FAULT lights cycle on and off rapidly

8. **FO windshield heat.**
    - IN: normal windshield temperature
    - OUT: low temperature warmup cycle engaged
        - *IDLE: illuminates to indicate warmup cycle (switch in OUT position)*
    - FAULT: illuminates to indicate a fault in the heating system

9. **L/R Side window heat.**
    - IN: normal side window temperatur
    - OUT: side window heat disengaged. OFF illuminates to indicate switch position
    - FAULT: illuminates to indicate a fault in the heating system



1. **DUCT FAIL: illuminates to indicate excessive air temperature around the duct.**

2. **Anti-ice automatic mode.**
    - IN: wing anti-ice valves operate automatically to maintain the correct anti-icing temperature
        - *ON: illuminates to indicate automatic mode engaged*
        - *OVHT: illuminates to indicate excessive slat temperature*
    - OUT: automatic mode is deactivated

3. **Anti-ice manually on.**
    - IN: engages the wing anti-ice
        - *ON: illuminates to indicate manual wing anti-ice mode engagement*
        - *OPEN: anti-ice valves are open (either in automatic or manual mode)*
    - OUT: disengages manual wing anti-ice

4. **Wing anti-ice test: OPEN lights illuminate to indicate normal anti-ice valve operation.**

5. **HEAT: illuminates to indicate normal anti-ice pressure in the engine cowl.**

6. **Engine anti-ice.**
    - IN: engages the engine anti-ice
        - *ON: illuminates to indicate switch position*
        - *HI PR: overpressure detected in the duct*
    - OUT: disengages the engine anti-ice

1. **Wiper control: select one of three speeds, OFF, LOW or HIGH.**

2. **Rain repellent switch.**

AUTO FLIGHT

The Avionic Flight Control System (AFCS) provides automatic control throughout the whole flight and consists of the following:

- Autopilot/Flight Director System (AFDS)
- Speed Command/Auto Throttle System (SCS)
- Stability Augmentation System (SAS)

The APFDS consists of two independent computers: computer A and B. Computer A is associated with the Captain's side and computer B is associated with the First Officer's side. Either computer can be engaged to provide flight director orders, autopilot function or both.

APFDS modes of operation

There are two separate modes of autopilot operation: Control Wheel Steering (CWS) and Command (CMD).

Control Wheel Steering (CWS)

In this mode the aircraft pitch and roll are kept constant by the APFDS, with the aircraft automatically trimming to maintain the set target. In order to change pitch or roll the pilot must apply the desired input in the control column (without having to apply any trim) and when the input is released the aircraft will hold the new attitude. This mode can be thought of as a set and release mode. Set the desired attitude and let go of the control, the CWS mode will then do what is required to keep this new attitude stable.
Turbulence mode is a CWS mode. Engaging this mode will result in the autopilot changing from CMD to CWS and the autothrottle disconnecting. This mode will result in a steady attitude and thrust, avoiding excessive oscillations.

Note: lateral and vertical deviations are likely in this mode as CWS will **not maintain APFDS targets** as this is **not** a CMD mode.

Command (CMD)

In this mode the autopilot will control the aircraft pitch and roll as required to track the desired modes as set in the autopilot panel in the glareshield.

Takeoff/Go-around mode

In this mode the flight director will provide wings level lateral guidance (unless HDG mode is engaged). Pitch guidance will target an angle of attack corresponding to an airspeed of 1.25 Vs for the current flap setting, limited to a pitch attitude of 17.5 degrees.
Spoilers will fully retract and DLC disabled if Go-around mode is engaged with flaps at 33 degrees.

Speed Command/Auto Throttle System (SCS)

The SCS systems is independent of the autopilot operation and can be used with or without the autopilot engaged. SCS will change the engine throttle setting in order to achieve and maintain the desired speed.
This system also monitors the angle of attack. As the angle of attack nears the stall angle, Alpha mode engages. The commanded speed is disregarded and thrust is increased to help recover from the high angle of attack scenario.

CONTROLS

Glareshield

1. **Autothrottle mode panel**
   - AT (Autothrottle): controls the autothrottle engagement
   - TM (Thrust Management): autothrottle commanded by the PMS

   - IAS numeric display:
     - *AT engaged/disengaged (TM disengaged): indicates selected IAS*
     - *TM engaged: indicates EPR (climb or descent) or IAS/Mach (cruise)*

   - Autothrottle mode display:
     - *AT engaged: indicates IAS*
     - *TM engaged: indicates EPR (climb or descent), M (Mach) or IAS in cruise*

   - IAS Selector knob

2. **Pitch mode panel**
   - VNAV: follows the vertical profile from the FMS in climb and descent

- VS: engages the vertical speed hold mode
- ALT: engages altitude hold mode and will capture the altitude at engagement
- IAS: holds indicated airspeed at the time of engagement. Disengages ATS if previously engaged. This is a speed on elevator mode, with the aircraft changing its pitch as required to maintain the IAS at time of engagement
- MACH: holds indicated Mach at the time of engagement. Disengages ATS if previously engaged. This is a speed on elevator mode, with the aircraft changing its pitch as required to maintain the Mach number at time of engagement

- Vertical speed selector

- Numeric display, indicates:
    - *Altitude.*
    - *Vertical speed.*
    - *Indicated airspeed*
    - *Mach number*

- Pitch mode display, indicates selected pitch mode:
    - *VS.*
    - *ALT.*
    - *CAP: altitude capture.*
    - *IAS: indicated airspeed mode.*
    - *M: Mach mode.*

3. **Heading mode panel.**
    - HDG: heading hold mode

    - Heading window
    - Heading selector knob

4. **APFDS engagement panel.**
    - Flight director switches
    - Turbulence switch
        - *Engages TURB mode whenever the autopilot is in command or CWS mode, unless approach/land or go around modes are engaged*
        - *Autopilot switch changes to CWS if in CMD mode, and disengages all other modes*
        - *Disengages autothrottles*
        - *Removes the flight director bars*
        - *Reduces pitch and roll gains by 50%*
        - *Note: once TURB mode is engaged no other mode can be engaged until the TURB mode is manually disengaged*

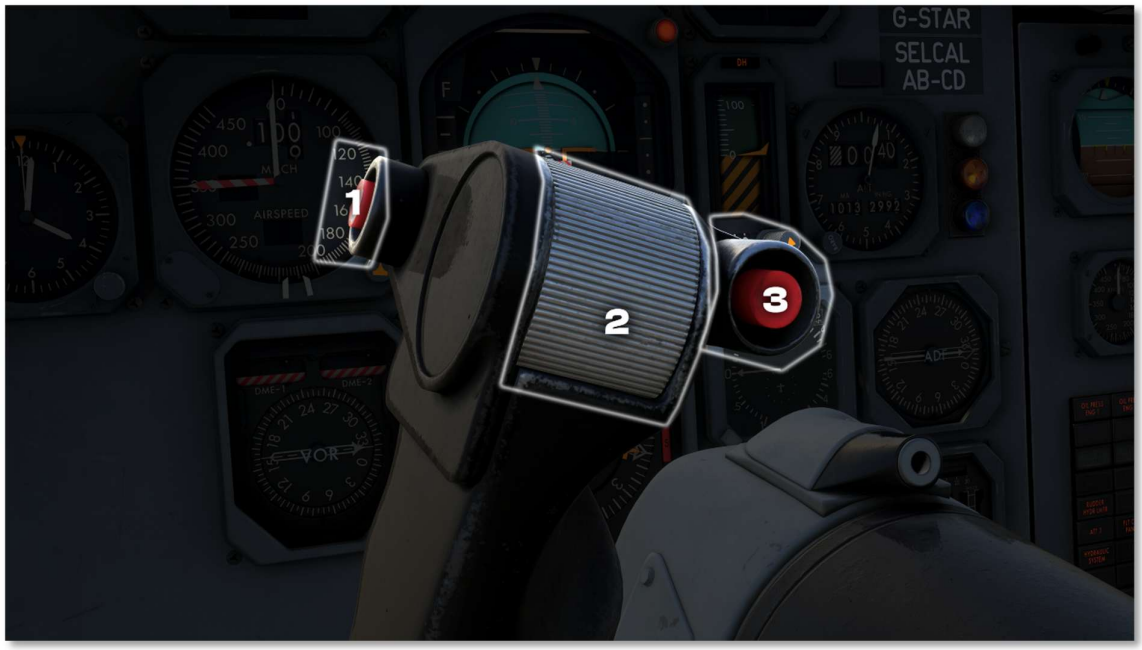
5. **Autopilot switches.**
    - CMD: autopilot engaged and mode guidance followed
    - CWS: engages Control Wheel Steering mode

6. **Navigation mode panel.**
    - ILS: localizer and glide slope capture, tracking and Autoland modes
    - LOC. localizer capture and tracking mode
    - VOR: VOR radial capture and tracking
    - INS (GPS): INS (or GPS) capture and tracking
        - *This switch will display either INS or GPS depending on the navigation instrument option selected in the PFB*

- HSI Course 1 and 2 selector knob and display
- BC: back course capture and tracking

7. **Altitude selector knob and display window.**
   - Inner knob: Select the altitude to be automatically captured by the autopilot
   - Outer knob, altitude source selector:
     - *NORM: the aural warning and altitude capture altitude reference is the number 1 ADC and Captain's altimeter setting*
     - *STBY: the aural warning and altitude capture altitude reference is the number 2 ADC and First Officer's altimeter setting*

Control Column



1. **Take off/Go-around switch.**
   - On ground: engages the Take off mode
   - Airborne: engages the Go-around mode

2. **Pitch trim switch**

3. **Autopilot disconnect switch**

Pilot instrument panel: AFCS mode annunciators.

The AFCS mode annunciators display the autopilot modes that are currently armed and or engaged.

- Armed modes: mode name in white text, followed by the word ARM on a black background.
- Engaged modes: mode name in black text on a white background.

Pilot instrument panel: AFCS warning indicator.

1. **Alert switch: flashes when an annunciator appears. Press the switch to reset the alert.**

2. **Test 1 switch: displays the following warnings:**
   - AP DISC, AP LIMIT, ATS DISC, NO FLAR, ALERT LIGHTS.

3. **Test 2 switch: displays the following warnings:**
   - NO DUAL, NO ALIGN, NO GA, CMD DISC, ALERT LIGHTS

APFDS warnings:
- *AP DISC (red): autopilot disconnection*
- *NO DUAL (orange): indicates single autopilot engagement after A/L annunciated*

SCS warnings:
- *ATS DISC (red): auto throttle system disengaged*
- *NO GA (orange): fault detected in the go around mode after glideslope capture*

CMD DISC warnings:
- *NO FLARE (orange): appears at 150ft RA if there is a fault affecting the A/L flare mode*
- *CMD DISC (orange): indicates autopilot mode change from CMD to CWS*

YAW SAS warnings:
- *AP LIMIT (red): the autopilot has reached the maximum deflection possible of the stabilizer*
- *NO ALIGN (orange): failure detected in the alignment/rollout mode*

Performance Management System (PMS)

The PMS is a system designed to optimise the flight and reduce fuel burn by:

- Computing and displaying various flight parameters that can be used for operating the aircraft as economically as possible
- Displaying performance data for various phases of flight
- Providing inputs for coupling the PMS with the autopilot and autothrottle systems

Modes of Operation

TAKEOFF

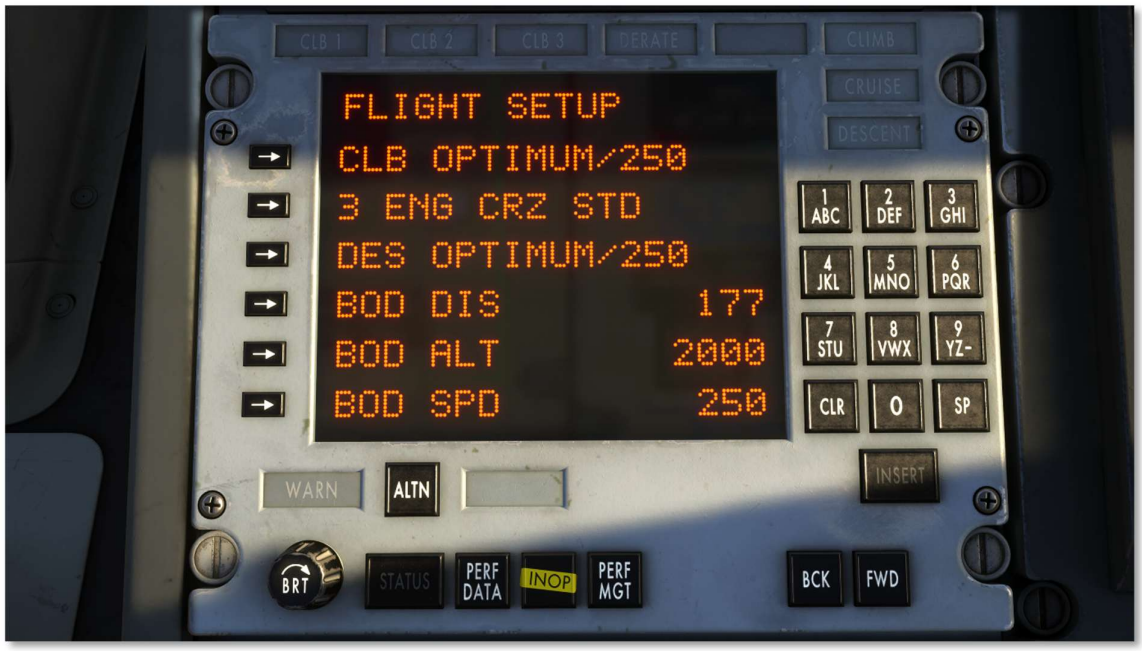
Display mode only, computes and displays takeoff EPR based on inserted temperature.

Page access: press PERF MGT on the ground.

GMT: actual GMT time as entered.
EPR: takeoff EPR displayed after all parameters in this page are entered.
PR ALT: automatically inserted from the air data computers.
GW: gross weight, requires manual entry, round this value to the nearest 1,000.
FUEL: total fuel weight, requires manual entry, round this value to the nearest 100.
SAT: static air temperature in degrees Celcius, requires manual entry.

FLIGHT SETUP

Bottom of descent (BOD) distance, altitude and speed entry page.



BOD DIS: Bottom of descent distance.
BOD ALT: Bottom of descent altitude.
BOD SPD: Bottom of descent speed.

CLIMB

The PMS uses pitch to control airspeed according to the IAS/Mach climb schedule. Engine thrust is controlled through the autothrottle system, following the climb EPR schedule.
The systems will automatically switch to Cruise mode when altitude hold is engaged and holds the selected cruise speed.

CLB 250/320/820: PMS climb schedule. 250 KIAS until 10,000 ft, then 320 KIAS until reaching Mach 0.82, then climb at M0.82 until reaching cruise level.
EPR .XXX/ .YYY: First value is the derated EPR, second value is the maximum climb EPR.
ALT XXX OPT YYY: The first value (ALT) is the entered cruise altitude, it will default to FL430 until manually changed by the pilot. Second value displays the current optimum cruise altitude.
TOC ---NM ----Z: Distance and time to reach the top of climb.
SAT XXX TAS YYY: Static Air Temperature and True Air Speed.

CRUISE
PMS controls the optimum cruise speed through the autothrottle system.

CRZ 0.830/285: Commanded cruise Mach and the corresponding indicated airspeed.
FUEL REM: Fuel remaining, fuel weight inserted in the takeoff page minus fuel used.
ALT XXX OPT YYY: The first value (ALT) is the entered cruise altitude, it will default to FL430 until manually changed by the pilot. Second value displays the current optimum cruise altitude.
TOD ---NM ----Z: Distance and time to reach the top of descent.
SAT XXX TAS YYY: Static Air Temperature and True Air Speed.

ENROUTE DESCENT
This mode applies to any descent that occurs more than 10 minutes prior to the top of descent (TOD).

DES 840/340: Descent speed schedule, in this case Mach 0.84 until the indicated airspeed is 340 KIAS, then descent at 340 KIAS.
ALT XXX OPT YYY: The first value (ALT) is the entered cruise altitude, it will default to FL430 until manually changed by the pilot. Second value displays the current optimum cruise altitude.
SAT XXX TAS YYY: Static Air Temperature and True Air Speed.

DESCENT

This mode applies to any descent that occurs less than 10 minutes prior to the top of descent (TOD).

The PMS descent mode computes backwards the top of descent (TOD) point required to reach a certain distance at a pilot defined altitude and speed. This is achieved by entering the distance, altitude and time to the bottom of descent (BOD).

Note: this is not a vertical navigation mode providing guidance to reach the required altitude and speed at the entered distance. Consider the descent progress and manually intervene if required to achieve the desired altitude and speed correctly by the BOD.

The entered BOD reduces based on the current ground speed as provided by the INS and not a distance to a certain waypoint. For example, an aircraft in a hold will see a constant decrease to the BOD even though the distance to the desired waypoint has not decreased. The pilot must update the BOD distance as required.

DES 800/300/250: Descent speed schedule, Mach 0.800 until the indicated airspeed is 300 KIAS, then descend at 300 KIAS until 10,000 ft. Descent below 10,000 at 250 KIAS.

BOD: Bottom of descent distance and time. The distance in this page will continuously countdown from the BOD DIS value entered in the FLIGHT SETUP page.

BOD ALT: Displays the BOD ALT value entered in the FLIGHT SETUP page.

BOD SPD: Displays the BOD SPD value entered in the FLIGHT SETUP page.

TOD ---NM ----Z: Distance and time to reach the top of descent.

SAT XXX TAS YYY: Static Air Temperature and True Air Speed.

LANDING
Display mode only, computes and displays the VTH and go-around EPR.

VTH: Indicated airspeed at the threshold.
GA EPR: The first value is the all-engine go-around EPR, second value is the two-engine go-around EPR.
PR ALT: Present pressure altitude.
GW XXX GS YYY: Current gross weight and ground speed.
FUEL: current fuel weight.
SAT XXX TAS YYY: Static Air Temperature and True Air Speed.

CONTROLS

1. **Line keys**
    - Clears the data from the line
    - Displays an arrow at right end of the line
    - Illuminates the INSERT key

2. **Keyboard**

3. **CLEAR key**

4. **INSERT key**

5. **Brightness knob**

6. **PERF MGT (Performance Management)**
    - Displays the currently engaged page

7. **BCK/FWD keys**
    - Pages back or forward to display different pages

PMS Preflight Procedures

Takeoff Page

GMT _____ **INSERT**

- Enter the current GMT time and INSERT

GW _____ **INSERT**

- Enter the aircraft gross weight as a rounded value to the nearest 1,000 with no decimals

FUEL _____ **INSERT**

- Enter the total fuel weight to the nearest 100, a decimal will automatically appear. For example, 190,300 lbs would be entered as 1903 and displayed as 190.3 after being inserted.

SAT _____ **INSERT**

- Enter the outside temperature in degrees Celsius

FLIGHT SETUP PAGE _____ **OPEN**

BOD DIS, BOD ALT, BOD SPD _____ **INSERT**

- Insert for preliminary calculations, update as required

CLIMB PAGE _____ **OPEN**

ALT _____ **INSERT**

- Insert the cruise altitude

APU (Auxiliary Power Unit)

The APU provides electrical and pneumatic power for:

- Ground operations conducted independently of ground-based services, including ground power units, air conditioning units, and air start units
- In flight backup

The APU generator can power the entire electrical network during normal loads.

CONTROLS

Flight Engineer Lower Panel – APU Control

1. **Ng tachometer: indicates gas turbine speed.**
2. **Ng Test button: when pressed and held drives the tachometer pointer to the 3 O'clock position.**
3. **TGT indicator: Turbine Gas Temperature.**
4. **TGT Test button: when pressed and held drives the TGT pointer to the 3 O'clock position.**
5. **Fault lights: indicate a fault and will automatically shut down the APU.**
6. **Fault reset button: press to reset the fault lights. Lights will remain in view if the fault condition is still present.**

7. **Fault lights.**
    - DON'T LOAD: the N2 turbine is outside the correct operating band
        - *APU generator field trips open*
        - *BLEED AIR S/O should be unlatched*
    - INLET FLOW: the compressor inlet is obstructed (ice or foreign object)
    - LOW OIL QUANTITY
        - *Light is inhibited in flight*
    - BATTERY CONDITION: the battery charger is deactivated
    - MAX MODE: load compressor inlet guide vanes are in the fully open position for maximum bleed air output
    - DOORS IN TRANSIT: the inlet and outlet doors are not in the required position

8. **Bleed air s/o: controls the bleed air supply from the APU to the pneumatic system.**
    - LCH: normal position, the valve is armed to open when there is sufficient APU bleed air pressure
        - *OPEN: illuminates when the valve is open*
    - UNL: normal position for APU shutdown or when another pneumatic source is supplying bleed air

9. **Start: switch initiates the APU start.**
    - To start the APU press and hold until DOORS IN TRANSIT illuminates, then release the switch

10. **Auto fire shutdown: controls the arming of the APU auto fire shutdown in flight.**
    - In flight:
        - *LCH: normal position, the system is armed provided the APU master power switch is on*
        - *UNL: system is disarmed*
    - On ground: the system is armed regardless of switch position provided the APU master power switch is on
    - ARMED: illuminates when the system is armed

11. **Compressor mode selector.**
    - MIN MODE: normal position for APU start, shutdown and small bleed air demands (i.e. only operating the packs)
    - NORM: normal position when there are high air demands (i.e. operating either ATM)
    - MAX MODE: only used for abnormal situations, selector is spring loaded out of this position. Commands maximum flow whilst held

12. **Stop button: press to shutdown the APU.**

13. **APU Master power switch.**

COMMUNICATIONS

CONTROLS

Communication radios & audio selector panel

1. **Frequency & frequency selector knobs.**

2. **Frequency light: illuminates to indicate the active frequency.**

3. **Transfer switch: activates the left (right) frequency.**

4. **Comm test: pressing this button disables the squelch circuit and background static is heard whilst the button is held.**

5. **Transmit switches.**
   - IN: light illuminates and microphone transmission selected
   - OUT: microphone transmission deselected

6. **Receive switches.**
   - IN: light illuminates and the receiver is audible. Rotate the switch clockwise to increase volume and anticlockwise to decrease volume
   - OUT: receiver deselected

Overhead panel - Master radio switches

1. **Essential master radio switch.**
    - LCH: powers VHF comm 1, PA, ADF 1, HF 1, voice recorder, instrument comparator, weather radar 1, radio altimeter 1, flight interphone
    - UNL: OFF illuminates and the above systems are deactivated

2. **Number 2 master radio switch.**
    - LCH: powers VHF comm 3, HF 2, ADF 2
    - UNL: OFF illuminates and the above systems are deactivated

Note: VHF 2 remains powered as long as the ground service bus is powered and is not controlled by either master radio switch.

Overhead panel - Cabin interphone

1. **Station call switches.**

2. **Call reset.**
    - CALL: illuminates when a call is initiated to any flight station in the cabin.
        - *Pressing the switch resets the system, permitting a new call to be initiated*

3. **Station selector: selects the cabin or galley station to be called when pressing the STA switch.**

Overhead panel – Evacuation signal panel

1. **Evacuation command switch: evacuation signal broadcasted in the cabin and an associated aural is audible in the cockpit. EVAC illuminates in the switch light.**

2. **Horn cutout & EVAC light.**
    - Horn cutout button: silences the evacuation aural in the cockpit
    - EVAC light: illuminates when the evacuation command switch is pressed

ELECTRICAL

AC power is generated by:

- Three engine driven generators
- One APU generator
- One standby inverter powered by the battery for critical scenarios
- One external power receptacle for ground power

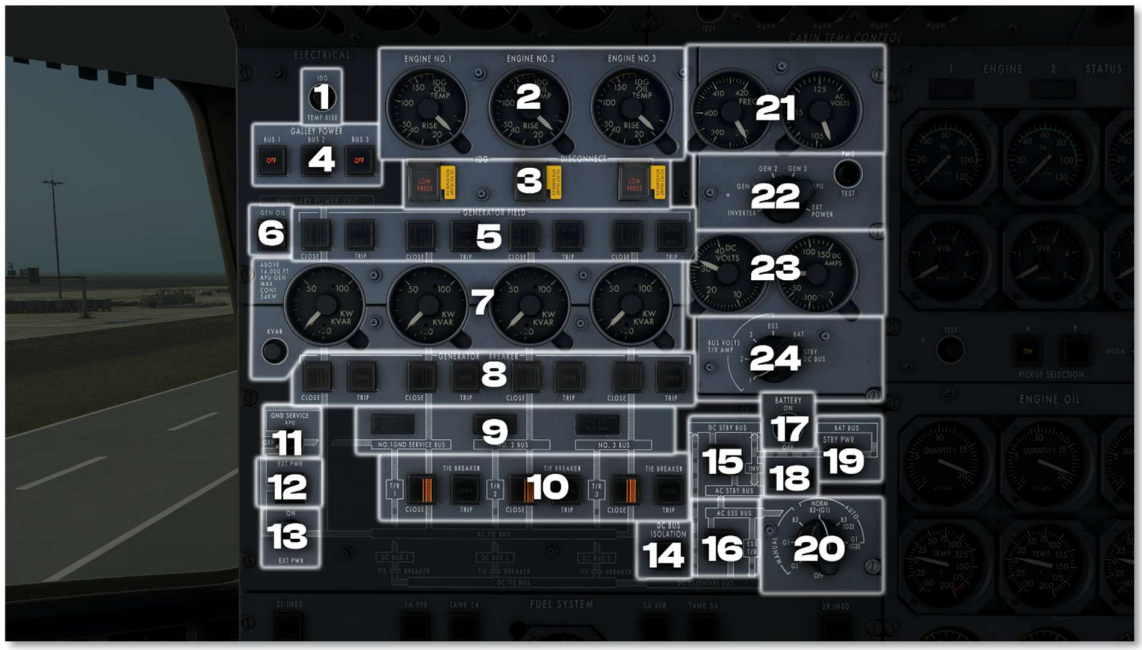
DC power is provided by:

- Four transformer/rectifier units (T/R
- One aircraft battery

The engine driven generators power their respective AC load buses. The buses normally operate in parallel through the AC tie bus to permit the generators to share the AC loads equally.
The AC load buses power the four T/R units which supply the respective DC buses.

CONTROLS

Flight Engineer Lower Panel – Electrical



1. **IDG TEMP RISE button.**
    - RELEASED: normal position, IDG oil outlet temperature indicated. The indicator should remain below the yellow band starting at 145C
    - PRESSED: indicates the temperature rise between the IDG oil inlet and outlet. This is an indication of how hard the IDG is working. The indicator should remain below the lower yellow band at 25C

2. **IDG oil temp/rise indicator: displays either the IDG oil outlet temperature or the temperature rise between the IDG oil inlet and outlet. The indication is determined by the position of the IDG TEMP RISE button**

3. **IDG disconnect switches.**
    - PRESSED: IDG disconnected, it can only be reset on the ground
        - *LOW PRESS: illuminates if the IDG is disconnected or if the IDG pressure is too low (engine shutdown)*

4. **Galley power switches.**
    - LCH: galley bus powered
    - UNL: galley bus unpowered
        - *OFF: illuminates when the bus in unpowered.*

5. **Generator field switches.**
    - CLOSE: arms the generator field to close automatically as required
        - *BRG: illuminates when the generator field is open*

    - TRIP: pressing this switch opens the generator field
        - *OPEN: illuminates when the generator field is open*
    - DIFF: illuminates when a fault is detected

6. **APU GEN OIL lights.**
    - OVHT: APU generator oil overheat
    - PRESS: APU oil pressure too low

7. **KW/KVAR meters: displays either the generator total load in KW or the reactive load in KVAR. The indication is determined by the position of the KVAR button.**
    - RELEASED: normal position, generator KW load indicated
    - PRESSED: indicates each generator's KVAR load. The load should be approximately equal between parallel generators

8. **Generator breaker switches.**
    - CLOSE: arms the generator breaker to close automatically.
        - *FB: illuminates when the generator breaker is closed*
    - TRIP: pressing this switch opens the generator breaker until CLOSE is pressed.
        - *OPEN: illuminates when the breaker is open*

9. **FLT STA BUS FAIL: illuminates when power is lost to the flight station bus.**

10. **AC tie breaker switches.**
    - CLOSE: arms the breaker to close automatically
        - *FB: illuminates when the breaker is closed*
    - TRIP: pressing this switch opens the breaker until CLOSE is pressed
        - *OPEN: illuminates when the breaker is open*

11. **Ground service switch.**
    - APU: APU generator supplies only the ground service bus
    - OFF: normal position. Ground service bus connected to the Number 1 load bus
    - EXT PWR: external power supplies only the ground service bus

12. **External power lights.**
    - AVAIL: external power is connected
    - ON: external power is powering the aircraft

13. **EXT power switch.**
    - ON: connects the external power to the aircraft electrical network
    - OFF: disconnects the external power from the aircraft electrical network

14. **DC bus isolation switch.**
    - UNL: normal position. DC bus 1, 2 and 3 are connected to the DC tie bus
    - LCH: isolates DC bus 1, 2 and 3 from the DC tie bus

15. **DC & AC STBY BUS FAIL light: illuminates when power is lost to the DC or AC STBY bus.**

16. **AC & DC ESS BUS FAIL light: illuminates when power is lost to the AC or DC essential bus.**

17. **Battery switch.**

18. **ESS AC ON ALT light: illuminates if the AC ESS BUS power selector is in the AUTO position and the AC essential bus power automatically switches to an alternate power source.**

19. **STBY PWR light.**
    - FB: illuminates when the standby power is on
    - ON: illuminates when:
        - *Battery switch on*
        - *Standby power switch armed*

20. **AC ESS bus power selector.**
    - AUTO: any of these positions provides automatic switching to the alternate power source if the primary power source fails
        - *NORM B3(G1): normal position, Number 3 AC load bus primary, generator 1 alternate*
        - *B3(G2): Number 3 AC load bus primary, generator 2 alternate*
        - *G1(G2): generator 1*
    - MANUAL: any of these positions provides a single power source with no automatic alternate power source switching
        - *B3: Number 3 AC load bus*
        - *G1: generator 1*
        - *G2: generator 2*
    - OFF: AC ESS bus unpowered

21. **AC frequency & AC voltage indicator.**
    - Normal frequency is 400 +/- 4 Hz
    - Normal voltage is 117 +/- 3 V

22. **AC selector & PMG test button.**

- AC Selector: used to display the frequency and voltage of the desired generator or inverter
- PMG test button: pressing this button will indicate permanent magnet generator voltage. This is an indication of generator rotation, and the normal indication is 125V. Disconnecting the IDG and pressing this button should display off to confirm successful IDG disconnection

23. DC voltage & DC ammeter indicator.

- DC voltage.
  - *BAT: normal battery voltage 23-34V. Minimum voltage 22V*
  - *Bus volts: buses should all have equal voltage as long as the DC tie breakers are closed*
  - *STBY DC bus*
- DC ammeter.
  - *STBY DC bus: indicates 0A as there is no ammeter connection to this position*
  - *BAT: positive indication for battery discharge, negative indication for battery charge*
  - *T/R amps: an indication of 0A indicates a failed T/R*

24. DC Selector: used to display the voltage and amps of the desired source.

Eyebrow panel (Overhead), Standby power

Standby power switch:

- OFF: normal position when securing the aircraft. Isolates the AC STBY BUS from the battery
- ARM: normal flight position, automatic transfer of the AC STBY BUS to the battery powered inverter if the AC ESS BUS fails
- ON: manual transfer of the AC STBY BUS and DC STBY BUS to battery power

UNARM light: illuminates if the standby power switch is OFF and the battery is ON.

FIRE PROTECTION

The engines, APU, nacelles, pylons, main wheel wells and galley exhaust duct are provided with either fire or overheat protections.

Fire extinguishing is achieved by freon type fire extinguishers. Each engine has 2 fire extinguisher bottles, the APU uses the same bottles for engine number 2.

Cargo smoke detection and fire suppression is available for all cargo holds. These extinguishers are of halon type and provide protection for up to four hours.

CONTROLS

Glareshield

Master FIRE warning lights.

- Illuminates when a fire is detected in any engine, APU or wheel well
- Pressing the button extinguishes the light and silences the warning
-

Flight engineer upper panel

1. **A and B loop lights: illuminate when:**
    - Test button is pressed
    - Overheat detected in the fire loop

2. **Loop selector**
    - BOTH: both A and B detection loops must detect a fire for the fire warning to activate
    - A: only detection of a fire by loop A will indicate a fire warning
    - B: only detection of a fire by loop B will indicate a fire warning

3. **Fire detection loop test buttons: provides a false fire warning to the detection loops.**

4. **BELL CUTOUT: silences the fire warning.**

1. **Nacelle/pylon loop lights: illuminate when:**
    - Test button is pressed
    - Overheat detected in the fire loop

2. **Nacelle/pylon loop selector.**
    - BOTH: both A and B detection loops must detect a fire for the fire warning to activate
    - A: only detection of a fire by loop A will indicate a fire warning
    - B: only detection of a fire by loop B will indicate a fire warning

3. **Nacelle/pylon detection loop test button: provides a false fire warning to the detection loops.**

4. **Wheel well A and B loop light: illuminates when:**
    - Test button is pressed
    - Overheat detected in the fire loop

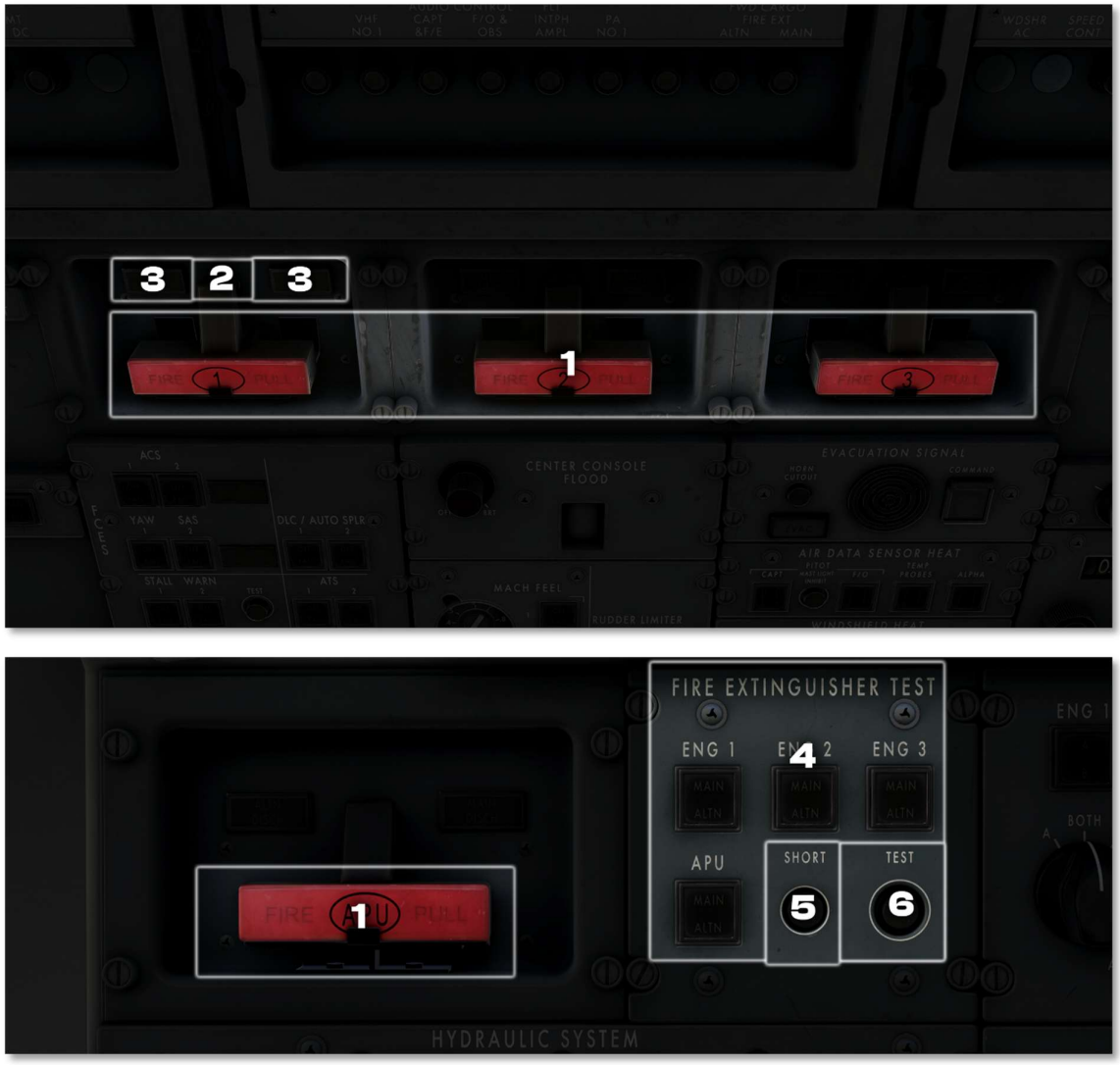
5. **Wheel well loop selector.**
    - BOTH: both A and B detection loops must detect a fire for the fire warning to activate
    - A: only detection of a fire by loop A will indicate a fire warning
    - B: only detection of a fire by loop B will indicate a fire warning

6. **Wheel well fire detection loop test buttons: provides a false fire warning to the detection loops.**

7. **Engine turbine overheat lights: illuminate when:**
    - Both test buttons are pressed
    - Both A and B thermal switches detect an overheat

8. **Engine turbine overheat test switches: provides a false overheat warning to the detection loops.**

Overhead & Flight engineer upper panel, Engine and APU fire handles



1. **Fire pull handles.**
    - IN: normal position
    - FIRE PULL: illuminates whaen a fire is detected
    - PULLED: emergency engine shutdown
        - *Silences the fire warning*
        - *Extinguishes master fire lights*
        - *Exposes the fire extinguisher discharge switch*
        - *Closes the engine isolation valve (bleed air shut off valve for the APU)*
        - *Opens the generator field*
        - *Closes the emergency shutoff valve*
        - *Engines 1 and 3: closes the engine tank valve*
        - *Closes the hydraulic shut off valves*

2. **Fire extinguisher discharge switch.**
    - Center: normal position
    - Right: discharges the main bottle
    - Left: discharges the alternate bottle

3. **MAIN DISCH and ALTN DISCH lights: illuminates to indicate which fire extinguisher has been discharged.**

4. **MAIN and ALTN lights.**
    - When test is pressed, they illuminate to indicate correct operation of the fire extinguisher circuits

5. **Short button: pressing short extinguishes all MAIN and ALTN lights that are illuminated while pressing the test button. If a light fails to extinguish this indicates a shorted circuit.**

6. **Test button: when pressed all the MAIN and ALTN lights illuminate unless there is a failure in one of the circuits.**

FLIGHT CONTROLS

The primary flight controls are:

- 2 Ailerons per wing.
- 6 Spoilers per wing.
- 1 Stabilizer.
- 1 Rudder.

The elevators are not directly positioned by the pilot but are linked by cables to the stabilizer and move as the stabilizer changes position. Pilot inputs are therefore directly controlling the stabilizer position, which in turn changes the elevator position.
All flight controls are hydraulically powered.

Secondary controls consist of 2 flaps and 7 slats per wing.

Spoilers

The spoilers serve different functions depending on flap configuration:

- Flaps up: spoilers 2-6 provide roll control.
- Flaps 4° or more: spoilers 2-6 provide roll augmentation.
- Flap lever more than 30°: spoilers 1-4 provide DLC in flight and AGS upon touchdown.
- Flaps in any position other than up: spoilers 1-4 extend for a rejected take-off or upon landing when any two throttles are positioned in reverse thrust.
    - Flaps up: rejected take-off system extends spoilers 1-6.

The position of the speed brake lever controls the extension of the spoilers. This lever has a power assisted servo that automatically moves the lever for DLC, AGS and RTO functions.
An automatic disable button and two amber lights are installed on top the speed brake lever. Pressing this button will disable the power assist and disable the DLC, AGS and RTO functions. Pressing the button again restores the power assist.
The lever is spring loaded to the stowed position when the power assist is disabled.

Note: manual speed brake extension in flight is prohibited unless the flaps are up.

Active Control System (ACS)

The ACS system provides additional control of the outboard ailerons by deflecting them symmetrically upwards to reduce wing tip loading depending on acceleration and airspeed.

Both ailerons are biased up approximately 8 degrees when the flaps are extended to further reduce wing loading during take off and landing.

Direct Lift Control (DLC)

The DLC system provides sink rate control with a minimum of pitch changes during approach. DLC operation automatically commences when the flap lever is positioned beyond 30˚.

When the flap lever is positioned beyond 30˚:

- The speed brake power assist moves the lever to extend spoiler panels 1-4 to the middle of the DLC range position.
- A pitch input to the stabilizer will cause a corresponding spoiler position change.
    - Nose down pitch input: spoiler extend
    - Nose up pitch input: spoilers retract

DLC spoilers automatically retract when:

- Flap lever positioned to less than 30˚
- Two throttles are advanced to maximum continuous thrust
- Stall warning
- Go around mode selected

Auto Ground Spoilers (AGS)

The AGS function will automatically deploy the spoilers upon landing.
It is armed whenever these two conditions are satisfied:

- DLC/AGS switch is latched
- Flap lever beyond 30˚

Similarly, during a rejected take off (RTO) the spoilers will automatically extend when any two throttles are positioned to reverse thrust.

Pitch and Roll disconnect handles

During normal operations both control columns are linked together and any input in pitch or roll is transferred to the relevant surfaces and displaces the opposite control column.
Disconnect handles are provided in case there is a cable jam or malfunction affecting one of the control columns. Pulling these handles separates the control columns in the selected axis.

Yaw Stability Augmentation System (SAS)

The yaw SAS system provides yaw damping and automatic turn coordination.

Flaps and Slats

Each wing contains seven slats and four flaps. The flaps are divided into pairs, two inboard and two outboard.

Both flaps and slats are hydraulically operated by systems A and C.

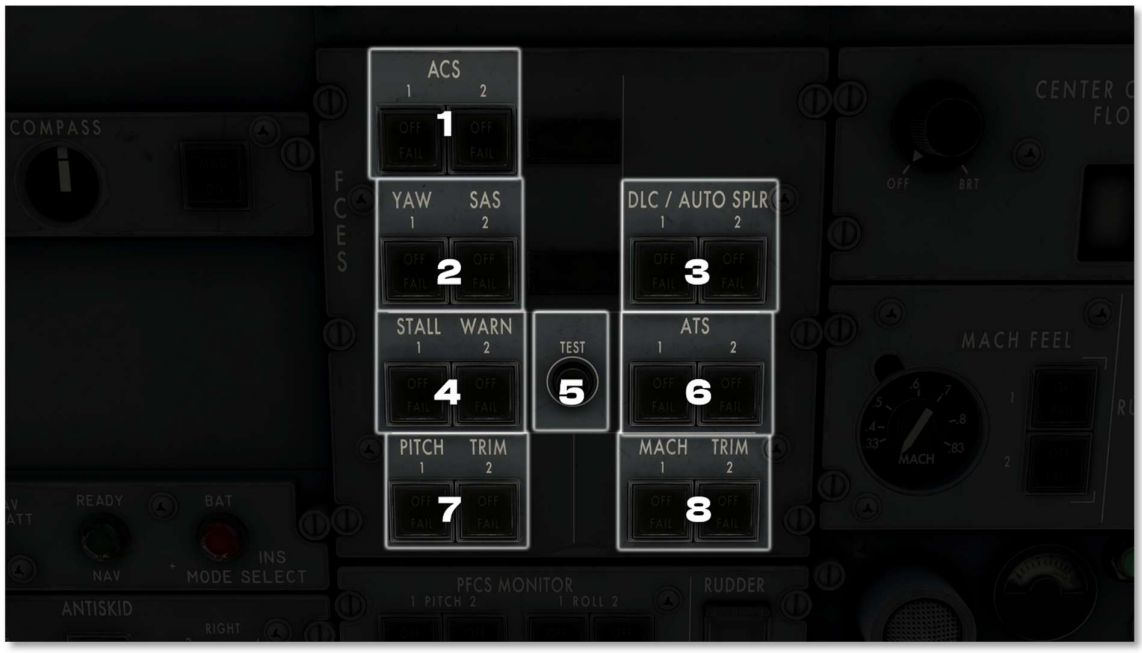
The slats have two positions: retracted or extended. They are extended when the flap lever is selected in any position except flaps up.
The flaps have six positions: 4˚, 10˚, 14˚, 18˚, 22˚, 33˚.

The flap lever commands the extension and retraction of the slats and flaps, and it also controls other functions:

- Flaps up: spoilers operate as manual speedbrakes
- Flaps extended on any position: spoilers operate for roll augmentation
- Flaps 33˚:
    - *warning sound unless the gear is down and locked*
    - *DLC operation is enabled*
    - *AGS armed for landing*

CONTROLS

Overhead Panel



1. **Active Control System (ACS)**
    - LCH: normal position
    - UNL: system is off and OFF light illuminates
    - FAIL: illuminates to indicate a system failure

2. **Yaw Stability Augmentation System (SAS).**
    - LCH: normal positio
    - UNL: system is off and OFF light illuminates
    - FAIL: illuminates to indicate a system failure

3. **Direct Lift Control/Auto Ground Spoilers (DLC/AGS) switches.**
    - LCH: normal position
    - UNL: channel is unpowered and OFF light illuminates (note one channel is required for DLC/AGS/RTO operation)
        - *FAIL: illuminates if both channels are OFF or if the speed brake lever automatic disable button has been pressed*

4. **Stall warning switches.**
    - LCH: normal position
    - UNL: stall warning channel and stick shaker shut off and OFF illuminates
    - FAIL: illuminates to indicate a stall warning channel failure

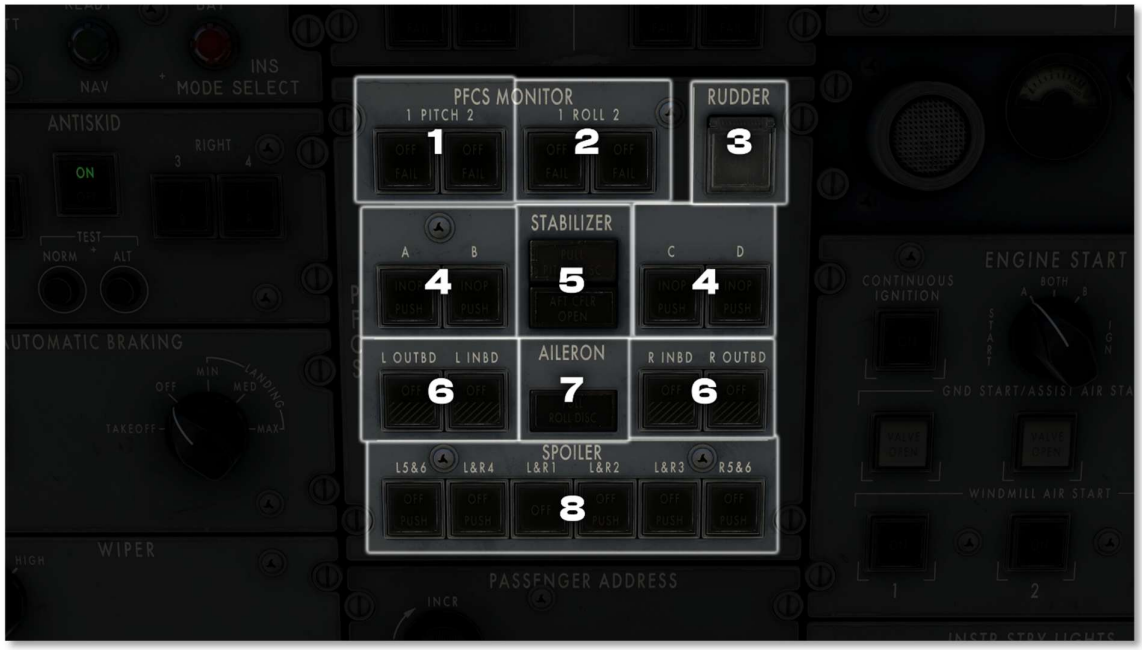
5. **Stall warning test button.**
    - Pressed: operates the First Officer stick shaker

6. **Auto Throttle System (ATS)**
    - LCH: normal position
    - UNL: system is off and OFF light illuminates
    - FAIL: illuminates to indicate a system failure

7. **Pitch trim switches.**
    - LCH: normal position
    - UNL: pitch trim channel shut off and OFF illuminates
    - FAIL: illuminates to indicate a pitch channel failure

8. **Mach trim switches.**
    - LCH: normal position
    - UNL: Mach trim channel shut off and OFF illuminates
    - FAIL: illuminates to indicate a Mach trim channel failure

Overhead Panel



1. **Pitch monitor switches.**
    - LCH: normal position
    - UNL: channel is unpowered and OFF illuminates
        - *FAIL: illuminates to indicate a pitch monitor channel failure*

2. **Roll monitor switches.**
    - LCH: normal position
    - UNL: channel is unpowered and OFF illuminates
        - *FAIL: illuminates to indicate a roll monitor channel failmure*

3. **Rudder switch.**
    - LCH: normal position
    - UNL: all rudder servos are shut off

4. **Stabilizer switches:**
    - LCH: normal position
    - INOP: illuminates to indicate hydraulic pressure lost to the servo
    - PUSH: illuminates to indicate a detected cable jam or break
    - UNL: stabilizer servo is shut off

5. **PULL PITCH DISC: illuminates when the pitch monitor detects a cable jam.**
   AFT COUPLER OPEN:
   - illuminates to indicate that the pitch system aft coupler is open, or
   - Illuminates whenever stabilizer switches A & B or C & D are unlatched at the same time

6. **Aileron switches:**
   - LCH: normal position
   - ////: illuminates if a cable jam is detected in the aileron cable path
   - UNL: aileron servo is shut off
     - *OFF: illuminates to indicate a shut off servo*

7. **PULL ROLL DISC: illuminates when the roll monitor detects a cable jam.**

8. **Spoiler switches:**

   Spoiler L&R1 switch
   - LCH: normal position
   - UNL: spoilers panel L1 and R1 are shut off and stowed, OFF illuminates

   Spoiler L5&6, L&R4, L&R2, L&R3, R5&6 switches
   - LCH: normal position
   - PUSH: illuminates if a jam is detected on the cable path
   - UNL: the selected spoiler panels are shut off and stowed

Overhead Panel

1. **Mach feel indicator: indicates current Mach number.**

2. **Mach feel switches: enables or disables the Mach feel system which provides artificial feel forces to the stabilizer control system.**

3. **Rudder limiter switch: hydraulic pressure delivered to the rudder varies depending on speed.**
    - LCH: normal position, rate of rudder travel is decreased as speed is increased.
    - UNL: rudder is powered at full hydraulic pressure regardless of speed.

Center Console

1. **Trim wheels**

2. **PITCH DISC handle**
    - DOWN: normal position
    - PULLED: control columns pitch axis not inter-linked
        - *Handle will illuminate and rotate 90˚ clockwise to the locked position*

3. **Speed brake lever**

Automatic disable button and lights

Pressed:
- Both amber lights illuminate
- DLC, AGS, RTO functions are inoperative

4. **Flap lever**

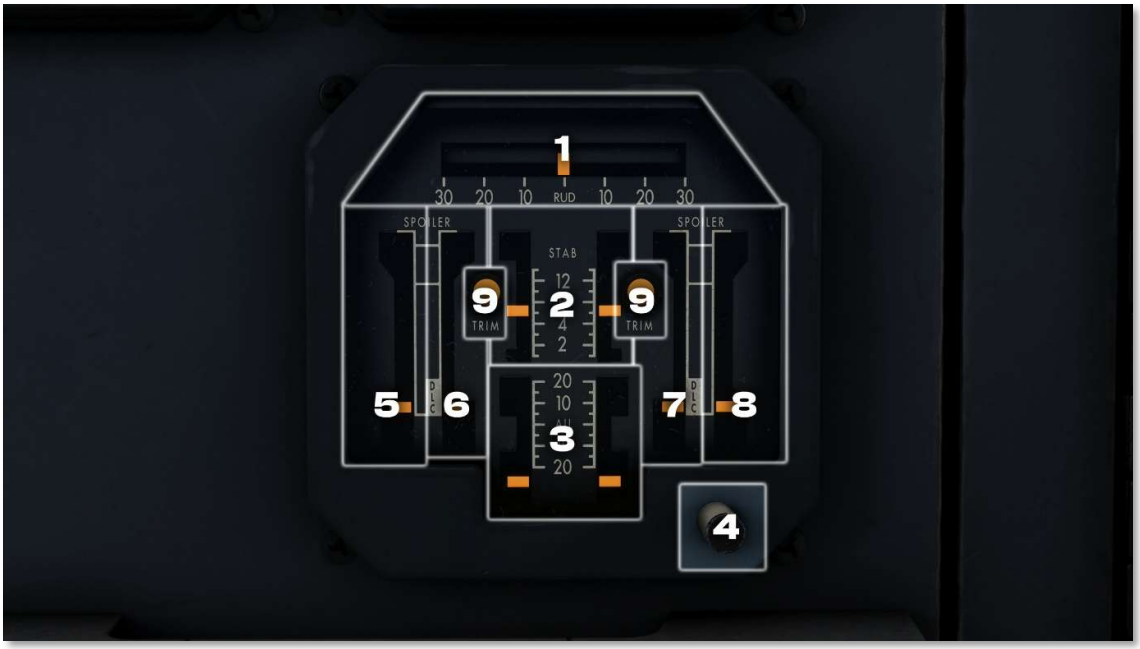
5. **ROLL DISC handle**
    - DOWN: normal position
    - PULLED: control columns roll axis not inter-linked
        - *Handle will illuminate and rotate 90° counterclockwise to the locked position*

Main panel, flap/slat position indicator

1. **Moving tape indication of the position of the left and right trailing edge flaps.**

2. **Slat position lights.**
   - SLAT: illuminates if not all leading-edge slats are in the commanded position. A 20 second delay prevent illumination of the light while the slats are transiting normally
   - LE EXT: illuminates when all leading-edge slats are in the extended position

Main panel, surface position indicator



1. Rudder position indicator.

2. Stabilizer position indicator.

3. Aileron position indicator: normally indicates inboard aileron position unless the outboard aileron switch is pressed.

4. Outboard aileron switch: displays the position of the outboard ailerons in the aileron position indicator.

5. Left outboard spoiler (number 5) position indicator.

6. Left inboard spoiler (number 4) position indicator.
   - DLC range: indicates range of spoiler travel during DLC operation.

7. Right inboard spoiler (number 2) position indicator.
   - DLC range: indicates range of spoiler travel during DLC operation.

8. Right outboard spoiler (number 6) position indicator.

9. TRIM: illuminates to indicate an out of trim situation with the autopilot engaged.

Flight Engineer Upper Panel

1. **Slat segment lights: illuminate when the associated leading edge slat panel is fully extended.**

2. **Slat segment light power switch:**
    - LCH: ON illuminates and the slat segment lights are powered
    - UNL: ON extinguished, slat segment lights not powered

3. **Slat degrees indicator: indicates the position of the slat torque shafts.**

4. **Slat lock switch.**
    - UNL: normal position
    - LCH: shut off hydraulic pressure to the slats and they are locked in the existing position. 1 LOCK and 2 LOCK illuminates

FUEL

There are six fuel tanks, two in each wing and two tanks located in the center section of the fuselage between the wings.
Tanks 1 and 3 are in the inboard section of each wing and they supply fuel to engines 1 and 3.
Tanks 2L and 2R are located in the outboard section of each wing. Tanks 2L and 2R together supply fuel to engine 2 and the APU. Tanks 2 are further subdivided into an inboard and outboard compartment.
Tanks 1A and 3A are located in the center section. They remain empty until the total fuel load exceeds 159,240 lb (72,230 kg). Fuel from these tanks must be transferred into tanks 1/3 to be used, there is no direct feed from tanks 1A/3A to the engines.

Fuel tank	Capacity (kg)	Capacity (lb)
1 / 3	24,480	53,969
1A / 3A	12,339	27,202
2L / 2R	11,661	25,708
Total	**96,960**	**213,758**

Two fuel pumps are installed in each tank to provide fuel under pressure.

Three cross feed valves are located in the fuel manifold. Latching any two cross feed valves allows any tank to supply any engine.

Fuel may be jettisoned from any tank if required. Jettison is automatically terminated when:

- Fuel in tanks 1 and 3 reaches 8,000 lb (3,629 kg) each, or
- Fuel in tanks 2L and 2R reaches 4,000 lb (1,814 kg) each.

This ensures a minimum amount of 24,000 lb (10,886 kg) of fuel available after jettison.

Fuel Management

Start, taxi and takeoff	– Tank-to-engine. – All crossfeed valves remain closed.
On climb, passing 5,000ft AGL, cruise and descent. **Fuel quantity is not equal between tanks 1, 2L+2R and 3**	– Latch in 1A and 3A XFR switches (see **note 1** below). – Open all crossfeed valves. – Turn off all the pumps in tanks 2L and 2R. – Feed all engines from tanks 1 and 3 until the fuel quantity is equal between tanks 1, 2L+2R and 3 (see **note 2** below). Then: – Turn on all the pumps in tanks 2L and 2R. – Close all crossfeed valves, continue Tank-to-engine.

On climb, passing 5,000ft AGL, cruise and descent. **Fuel quantity is equal between tanks 1, 2L+2R and 3**	– Latch in 1A and 3A XFR switches, (see **note 1** below). – The fuel load should be similar in tanks 1, 2L+2R and 3 (see **note 2** below). If not, balance fuel usage until the tank levels are equal. Then: – Tank-to-engine.
On approach	– Unlatch 1A and 3A XFR switches. – Tank-to-engine.

Note 1: Tank 1A and 3A XFR switches are latched even when these tanks are empty to prevent moisture accumulation.

Note 2: when considering equal tank quantities remember that tank 2 is composed of 2L plus 2R.

CONTROLS

Flight Engineer Lower Panel, Fuel System Panel

1. **2L & 2R inboard quantity switch/low light.**
    - UNL: normal position, indicator displays total (outboard & inboard) quantity
    - LCH: QTY illuminates, indicator only displays fuel contained in the inboard compartment
    - LOW: illuminates when fuel contained in the inboard compartment is less than 700 lbs

2. **Tank 1A / 3A transfer switches.**
    - LCH: fuel will transfer from tank 1A / 3A to tanks 1 / 3 using a jet pump. XFR illuminates.
    - UNL: normal position

3. **1A and 3A tank quantity switches.**
    - UNL: tank 1 and 3 indicate the total of tank 1 and tank 1A / tank 3 and tank 3A
    - LCH: tank 1 / 3 fuel quantity indicator indicates only the quantity in tank 1A / 3A.
        - *QTY illuminates*

4. **Gross weight / total fuel indicator & Gross weight set knob: select the aircraft gross weight to be displayed in the gross weight / total fuel indicator. The gross weight value will decrease as fuel is consumed.**

5. **Fuel quantity indicators.**
    - Tank 1 and 3 indicate the total of tank 1 and tank 1A / tank 3 and tank 3A unless the tank 1A / 3A tank quantity switch is latched

6. **Tank 1A / 3A gravity transfer switches.**
    - LCH: fuel will transfer from tank 1A / 3A to tanks 1 / 3 by gravity only. XFR illuminates
    - UNL: normal position

7. **Tank pump switches.**
    - LCH: normal position, pump is energized and flow bar illuminates.
    - UNL: pump is de energized, flow bar extinguished
    - LOW: illuminates when the pump output pressure is too low

8. **Cross feed valve switches.**
    - LCH: cross feed valve opens, flow bar illuminates
    - UNL: cross feed valve closes, flow bar extinguished
    - Blue disagreement light: illuminates when there is a disagreement between valve and switch position

9. **Eng tank valve switches.**
    - LCH: normal position, the engine tank valve is open. Flow bar illuminates
    - UNL: engine tank valve is closed, flow bar extinguished
    - Blue disagreement light: illuminates when there is a disagreement between valve and switch position

10. **Temperature indicator: indicates the fuel temperature in tank 2L or downstream of the fuel/oil heat exchanger at the inlet of the engine selected using the TEMP SELECTOR knob.**

11. **TEMP SELECTOR knob: determines the temperature selection to be displayed by the temperature indicator.**

12. **Quantity test button.**
    - When pressed and held all tank indications are driven to the full indication

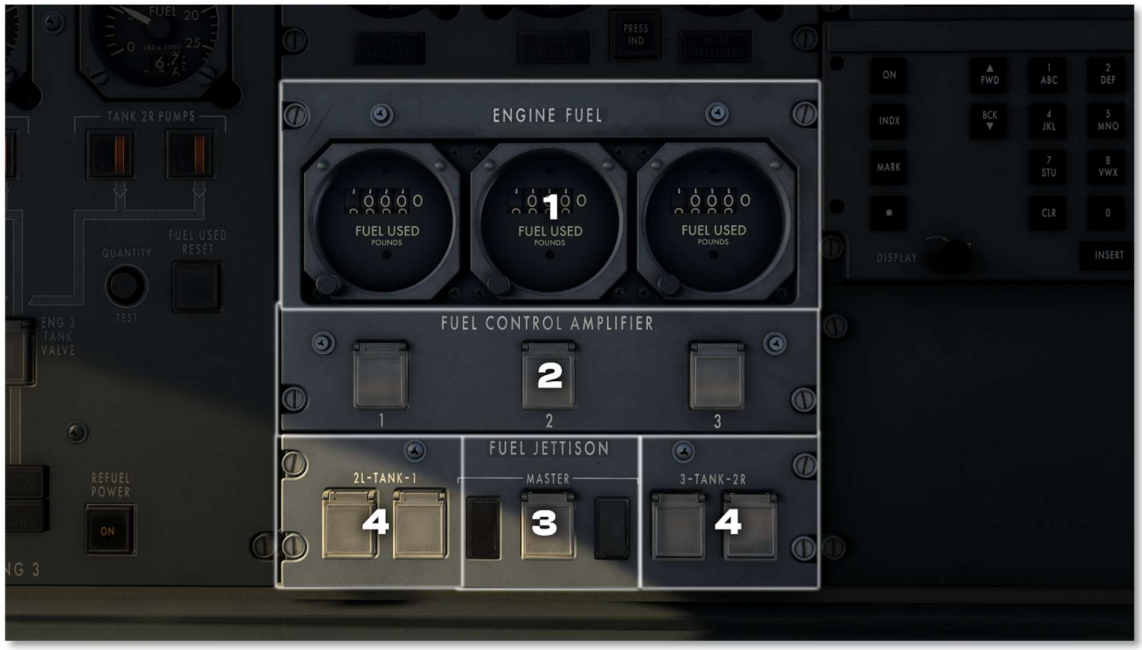
13. **Fuel used reset.**

14. **Emergency APU shutoff light: illuminates when valve position disagrees with the position selected by the fire pull handle.**

15. **Warning lights.**

16. **Refuel power switch: shuts down refueling operations.**

Flight Engineer Lower Panel, Engine Fuel / Fuel Control Amplifier / Fuel Jettison



1. **Fuel used indicator & test knobs.**
    - Turning knob clockwise: FF indicators show 10,000 lbs/hr & fuel used indicators start counting up

2. **Fuel control amplifier.**
    - UNL: normal position, the system automatically limits N2 if there is an over temperature or overspeed.
    - LCH: OVRD illuminates, system will not limit N2

3. **Fuel jettison master switch.**
    - UNL: normal position, tank dump switches are disarmed
    - LCH: wing jettison & isolation valves open and the tank dump switches are armed

4. **Tank dump switches.**
    - UNL: normal position, valves are closed
    - LCH: dump valves open provided the fuel jettison master switch is armed

Note: fuel jettison is <u>not supported</u> and will be implemented in a future update.

HYDRAULICS

The aircraft has four independent hydraulic systems: A, B, C and D. Normal operating pressure is 3,000 psi.

Hydraulic pressure is primarily generated by engine driven pumps. Engine 1 pressurizes system A, engine 2 pressurizes systems B and C, engine 3 pressurizes system D.

Systems A and D contain a Power Transfer Unit (PTU). The PTU is a hydraulic motor that uses hydraulic pressure from one system to drive a hydraulic pump in another system.
The B-A PTU uses hydraulic pressure from system B to drive a pump in system A.
The C-D PTU uses hydraulic pressure from system C to drive a pump in system D.

Systems B and C also contain an Air Turbine Motor (ATM) and electric pumps which function as backups to the engine driven pumps.

A Ram Air Turbine (RAT) is fitted to provide an emergency source of hydraulic pressure to system B in case of an emergency.

Two brake accumulators are installed. The normal braking accumulator is installed in system B, and the alternate braking accumulator is installed in system C.

CONTROLS

Flight Engineer Upper Panel, Hydraulic System

1. **Reservoir quantity indicator.**

2. **Reservoir fluid monitor lights.**
   - LO QTY: reservoir quantity low
   - HI TEM: hi reservoir fluid temperature

3. **ATM tachometer.**

4. **ATM lube monitor lights.**
   - HI TEM: hi oil temperature
   - LO PR: low oil pressure

5. **Engine pump shutoff switch.**
   - IN: valve opens and flowbar illuminates
   - OUT: pump is depressurized and OFF illuminates. Flowbar extinguishes

6. **ATM switch.**
   - OFF: ATM is shut down
   - AUTO: ATM automatically runs based on system pressure
   - ON: ATM runs continuously
   - OVSP TEST: ATM test mode

7. **Pump monitor lights.**
    - HI TEM: Hi case drain fluid temperature
    - LO PR: Lo pump output pressure

8. **PTU switches.**
    - IN: PTU pressurized, flowbar illuminates
    - OUT: PTU depressurized, flowbar extinguishes

9. **RAT switch/indicator.**
    - UNLKD: RAT released
    - PRESS: Illuminates to indicate pressure is being supplied by the RAT

10. **AC pump switches.**
    - OUT: Pump shutdown, ON extinguished
    - IN: Pump operates, ON illuminates

11. **Brake accumulator lights.**
    - LOW PRESS: Illuminates to indicate pressure is too low for braking

12. **Pressure indicators: indicates system hydraulic pressure.**

LANDING GEAR

The aircraft has one nose landing gear and two main landing gears. Nosewheel steering is provided by hydraulic system C.

Normal braking is provided by hydraulic system B and alternate braking by hydraulic system C. Both brake systems have separate anti-skid systems to prevent wheel lock-up during braking.

A retractable tailskid is installed on the bottom of the aft fuselage. The tailskid retracts and extends with the landing gear. Tailskid contact occurs at approximately 12.5° pitch attitude with the main landing gear on the ground in the fully compressed position.

Normal gear retraction and extension is provided by hydraulic system C. An alternate extension system allows the gear to free fall if the normal extension system fails.

A truck positioner maintains the main landing gears perpendicular to the strut while the aircraft is in flight. This positioning is required for gear retraction.

CONTROLS

Main Instrument Panel

1. **Landing gear lever.**
    - UP: Commands gear and tailskid retraction
    - NEUTRAL: Landing gear and tailskid are isolated from their hydraulic systems. Normal position after the gear is fully retracted
    - DOWN: Commands gear and tailskid extension

2. **Gear lights.**
    - LEFT GEAR/ NOSE GEAR/ RIGHT GEAR: Illuminates green to indicate gear down and locked
    - DOOR: Illuminates red when any gear door is open
    - IN TRANS: Illuminates red when any door is open or any gear position disagrees with the landing gear lever
    - TRUCK: Illuminates amber when either main gear truck is not level

3. **Brake pressure indicator.**
    - Left needle: Indicates the pressure in the normal system B accumulator
    - Right needle: Indicates the pressure in the alternate system C accumulator

4. **Brake system selector switch: Selects which hydraulic system will supply braking and antiskid.**

Center Console

1. **Park brake lights: Illuminates to indicate parking brake set.**

2. **Parking brake knob.**
    - The parking brake operation depends on the mode selected in the PFB Settings tab.
    - Realistic parking brake:
        - *On: depress the brakes fully, then pull the parking brake lever to engage the parking brake. To release depress the brakes.*
        - *Off: parking brake is applied and release by toggling the parking brake lever, there is no need to apply brake pressure.*

3. **Gear horn cutout button: press to cancel the gear warning horn.**
    - The horn will sound if any throttle is on idle with the gear up and speed below 180 KIAS. This warning can be silenced.
    - Flaps 33° or more with the gear up. This warning cannot be silenced.

Overhead Panel

1. **Anti-skid switch.**
    - LCH: Normal position from before takeoff until after landing, system is armed.
    - UNL: Normal position for ground operations, system is off.
    - ON: Illuminates green when the system is active.
    - OFF: Illuminates amber when the system is disarmed.

2. **Anti-skid lights.**
    - Individual lights illuminate in amber to indicate a released brake in the affected wheel or system failure.
    - F: front wheel, R: rear wheel.

3. **TEST NORM and ALT buttons.**
    - Test function for normal and alternate anti-skid system.
    - A successful test is indicated by illumination of all anti-skid lights and the anti-skid ON light.

1. **Automatic braking arming switch.**
    - ARMED: illuminates to indicate system operative and will provide automatic deceleration. **The switch has to be pressed to arm the system.**
    - ARMED: extinguishes in the following situations:
        - Pilot presses the switch after arming it.
        - In flight automatically with the selector in the TAKEOFF position.
        - Selector in the OFF position.
        - In flight with the gear handle UP or NEUTRAL.
            - *Note: this is the reason why automatic braking has to be ARMED after extending the landing gear.*
    - FAIL: illuminates to indicate a system failure.

2. **Automatic braking mode selector.**

Flight Engineer Upper Panel, Brake Temperature Panel

1. **Brake temperature indicator.**
    - Indicates temperature of pairs of brakes as selected by the brake selector switches.

2. **Brake temperature warning lights: the warning is related to the selected brakes.**
    - HIGH TEMP: illuminates when a brake temperature is in the amber band.
    - OVER HEAT: illuminates when a brake temperature is in the red band.

3. **Brake selector switches.**
    - All UNL: temperature indicators read zero.
    - One LCH: temperature indicator displays the temperature of the selected brakes.

4. **Test switch.**
    - Increases brake temperature indications by 100°C.

LIGHTS

CONTROLS

Overhead Panel

Flight Engineer Panel Lights

1. **BRT/DIM switch. Controls the intensity of flowbar lights and annunciator lights.**
   - UNL: BRT illuminates and lights are set at full intensity
   - LCH: DIM illuminates and lights are set at a reduced intensity

2. **TEST switch.**
   - UNL: normal position, lights are individually controlled
   - LCH: ON illuminates, all switches, indicator and annunciator lights illuminate

3. **Overhead panel lights: rotate to control the intensity of the overhead panel background lights.**

4. **Overhead lights control: rotate to control the intensity of the cockpit ceiling lights. The button above must be selected ON to activate the ceiling lights.**

5. **Flight engineer instrument lights.**

6. **Flight engineer panel background lights.**

7. **Circuit breaker lights.**

8. **Flight engineer area flood light.**

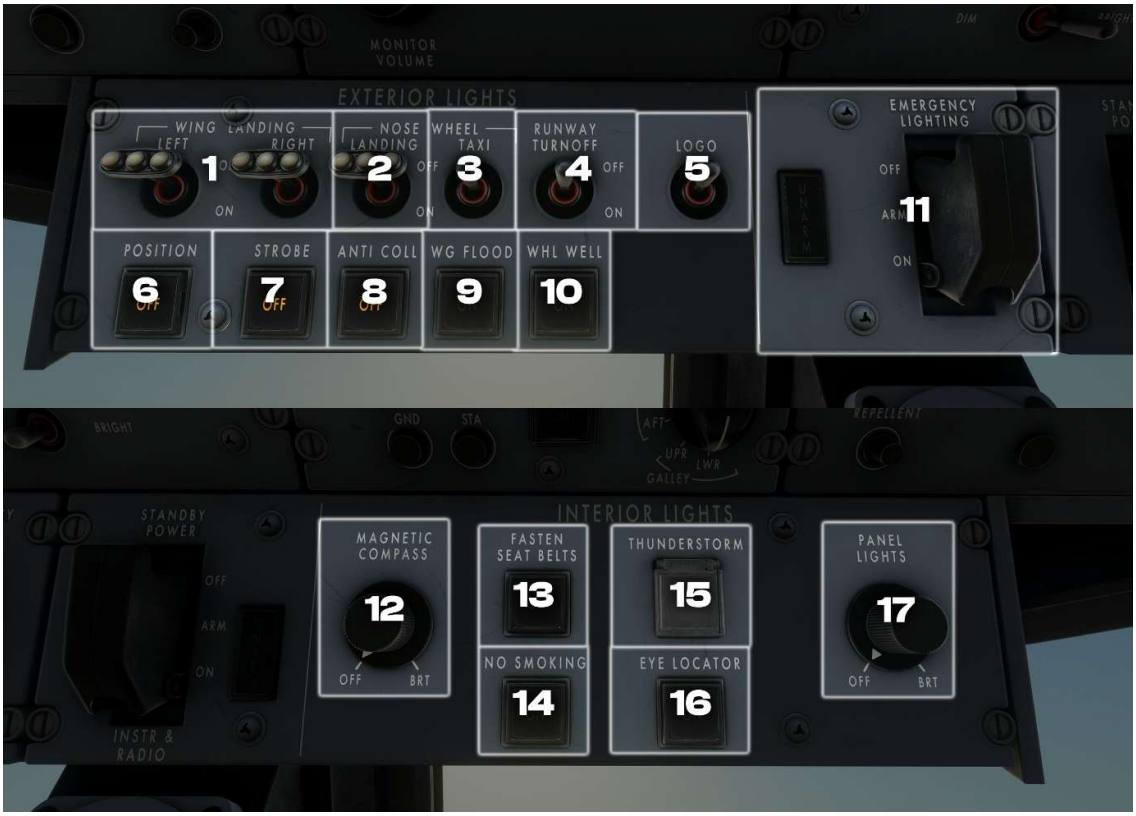
9. **Flight engineer desk light.**

Overhead Panel

1. **Center console flood light control.**

2. **Instrument standby lights dim/bright switch: controls the intensity of the standby lights.**
    - These lights are normally extinguished and only illuminate if the DC essential bus fails.

Overhead Panel, Eyebrow Panel



1. **Wing landing lights.**

2. **Nose wheel landing lights.**

3. **Nose wheel taxi lights.**

4. **Runway turnoff lights.**

5. **Logo lights.**

6. **Position lights.**
   - LCH: normal position, OFF is extinguished. Position lights on
   - UNL: OFF illuminates and the position lights off

7. **Strobe lights.**
   - LCH: OFF is extinguished, strobe lights are on
   - UNL: OFF illuminates, strobe lights off

8. **Anti-collision lights.**
   - LCH: OFF is extinguished, anti-collision lights on
   - UNL: OFF illuminates, anti-collision lights off

9. **Wing flood lights.**
   - LCH: ON illuminates, lights are on
   - UNL: ON extinguishes, lights are off

10. **Wheel well lights.**
    - LCH: ON illuminates, lights are o
    - UNL: ON extinguishes, lights are off

11. **Emergency light switch and UNARM indicator**
    - UNARM: illuminates when the switch is in the off position

12. **Magnetic compass light.**

13. **Fasten seat belts sign.**

14. **No smoking sign.**

15. **Thunderstorm light switch.**
    - LCH: ON illuminates and all cockpit lights illuminate at full intensity
    - UNL: ON extinguishes, normal cockpit light control

16. **Eye locator light switch.**

17. **Eyebrow panel light control: rotate to control the intensity of the eyebrow panel background lights.**

Center Console

1. Center console: controls the intensity of the center console background lights.

2. Engine instrument: controls the intensity of the center panel engine instruments.

Glareshield (Captain side depicted, First Officer has the same controls except the Glareshield knob)

1. **Glareshield panel light control: controls the intensity of the glareshield background lights.**

2. **Utility light control: controls the illumination of the pilot seat area.**
    - Inside button: toggles the light on or off
    - Outside knob: controls the intensity of the light

3. **Instrument panel lights control: controls the intensity of the corresponding instrument panel background lights.**

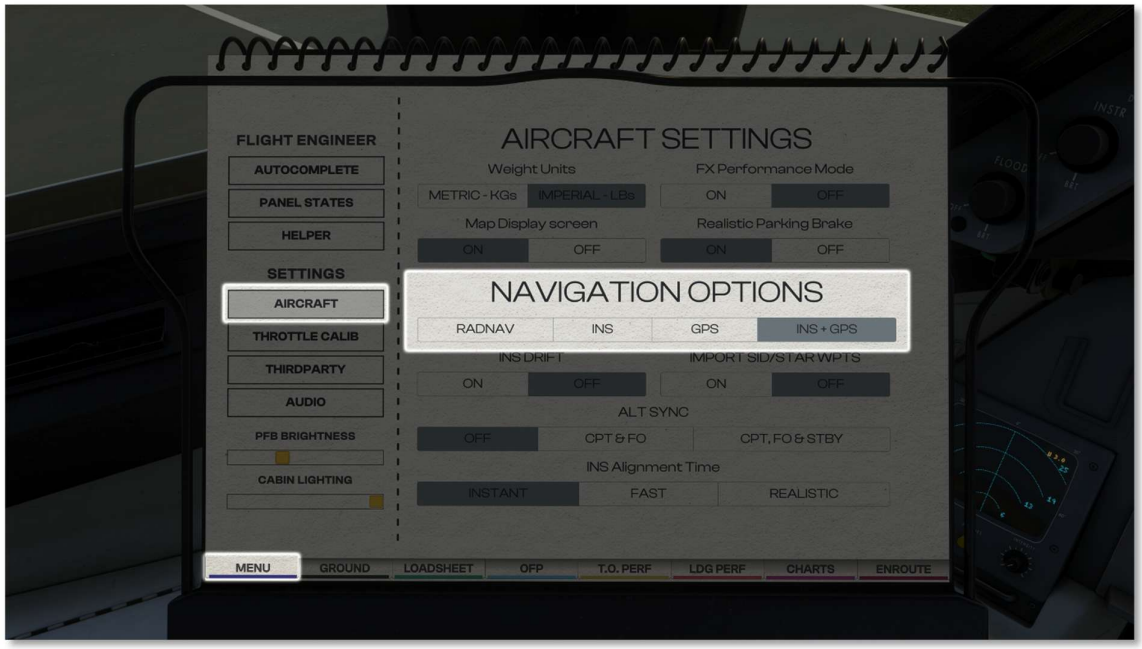
4. **Flood light control: controls the intensity of the corresponding instrument panel floodlights.**

NAVIGATION

The aircraft is equipped with the following navigation instruments:

- Horizontal situation indicator (HSI)
- Radio digital distance magnetic indicator (RDDMI)
- Automatic Direction Finder (ADF)
- Three Litton LTN-72 INS
- GNSS 530

There are four navigation instrument combinations that can be selected (and changed in flight if desired) from the PFB:




GPS
GPS + INS
RAD NAV
INS

Map Display Screen

z

Selecting this option displays a moving map in the upper center console. Imported waypoints from the Simbrief plan will be displayed here as well as a moving map when the INS navigation is initialised.

Inertial Navigation System (INS)

The Litton LTN-72 INS is a self-contained, worldwide navigation system which is independent of any ground or satellite-based system. Due to its independence from outside inputs, the INS position will drift over time and will require the pilot to periodically update its position to increase its accuracy. Drift is simulated and can be deactivated from the PFB if desired.

Due to drift and no automatic position updates, the INS supports only RNAV-5/10 navigation, making it unsuitable for routes needing higher accuracy.

To achieve RNAV-1/2 capability, disable drift from the PFB or use the GPS for navigation.

The INS consists of the Mode Selector Unit (MSU – Overhead panel) and the Control Display Unit (CDU – Center console).

Mode Selector Unit (MSU)

1. **Mode selector switch:**
    - OFF: INS unit off
    - STBY: INS is powered on; aircraft position can be entered in preparation for alignment
    - ALIGN: the unit commences alignment based on the entered position. The aircraft must remain stationary during alignment. The READY NAV light will illuminate when the alignment is complete.
    - NAV: navigation mode, normal flight position. This position must be selected when the alignment is complete before the aircraft moves.

- ATT: attitude reference mode, IsNS only provides pitch, roll and platform heading outputs only. The CDU does not display this information and navigation capabilities are disabled for the remainder of the flight.
    - *This position can be used when INS navigation is not required for the route*

2. **READY NAV light: illuminates on ALIGN mode when the alignment sequence is complete and the NAV mode can be selected.**

3. **BATT light: illuminates when the back up DC voltage is being used and is less than the minimum required to operate the INS. Continuous operation with this warning will cause the INS to shut down.**

Control Display Unit (CDU)

1. Numerical display
2. Waypoint (WPT) selector switch
3. From/to waypoint display
4. Track change pushbutton
5. Dim control
6. Warning lights

- ALERT: illuminates when approaching a waypoint and extinguishes when the track change takes place
- BATT: illuminates when the INS is operating on battery power
- WARN: illuminates to indicate a system issue

7. **AUTO/MAN/RMT switch**
   - AUTO: system makes automatic sequential track changes and permits manual track changes
   - MAN: manually initiated track changes only
   - RMT: enables entering waypoint information on multiple INS units simultaneously, remote ranging and display of inserted cross- track offset

8. **Insert push button: inserts displayed data in the numerical display into the INS**

9. **Display selector switch: see section Data display selection**

10. **Keyboard**
    - Numeric pushbuttons: permits data entry in the numerical display. Some pushbuttons serve dual functions such as 2 (North), 6 (East).
    - HOLD pushbutton permits position check and update
    - CLEAR pushbutton: removes displayed data if pressed before it is inserted

Map Display Screen

1. **List of current active INS imported waypoints that are already inserted in the INS. The list shows the INS waypoint number and its corresponding waypoint name from the Simbrief plan.**

2. **Imported waypoint list. All the Simbrief plan waypoints will be shown in this area. This list is scrollable by clicking and dragging the scroll bar.**

3. Map display. Zoom controls are located on the top left, map can be panned by clicking and dragging. The map displays the currently inserted waypoints (see point 1) and the current aircraft location as a magenta diamond.

4. Current track leg: in this example the aircraft is flying between WPT7-WPT8. Looking at the INS WAYPOINTS list it is possible to confirm the name and coordinates of these waypoints. WPT7 (ITBEB), WPT8 (TIMVI)

INS PREFLIGHT PROCEDURES

STARTUP

Mode selector switch_____ STBY

Display selector switch_____ POS

Numerical display indications _____ CHECK
- Left numerical display 00° 00.0'N
- Right numerical display 72 – 0

Display Test
- Display selector switch _____ TEST
  - Numerical display _____ ALL CHARACTERS 8
  - From/to waypoint display_____BOTH 8
  - TK CHG, INSERT, HOLD pushbuttons _____ ILLUMINATED

Present Position Entry and Alignment

Alignment must be performed on the ground and without any movement.

Note: alignment time can be changed in the PFB Menu tab, settings.

Display selector switch_____ POS

Latitude_____ ENTER

- Press N or S, the left numerical display blanks and displays either N or S.
- Enter latitude including any leading zeros. **Inputs containing less than 5 characters will not be accepted.**
    - Example: latitude N05° 23.5' must be entered as 05235.
- If the latitude is correct _____ INSERT
- If the latitude is incorrect _____ CLEAR

Longitude_____ ENTER

- Press E or W, the left numerical display blanks and displays either E or W.
- Enter longitude including any leading zeros**. Inputs containing less than 6 characters will not be accepted.**
    - Example: longitude W006° 32.7' must be entered as 006327.
- If the longitude is correct _____ INSERT
- If the longitude is incorrect _____ CLEAR

Waypoints Coordinates Entry

Up to 9 waypoints can be stored in the INS memory. Coordinates can be entered on the ground or in the air by using the waypoint selector switch using WPT 1 to WPT 9. Note that WPT 0 is reserved for the INS to establish a track from the aircraft's present position and coordinates can not be entered for WPT 0.

Waypoints can be entered manually by the user or imported from the Simbrief plan.

The normal procedure to follow for routes containing more than 9 waypoints is to re-enter waypoint coordinates as they are sequenced.

For example, consider a route containing 12 waypoints. During the preflight setup, 9 waypoints will be entered in the INS (waypoint 1 to waypoint 9). When airborne, after waypoint 1 is sequenced, enter waypoint 10 as WPT1. As waypoint 2 and 3 are sequenced enter waypoint 11 and 12 as WPT 2 and WPT 3.

When the INS reaches the last waypoint (WPT 9), the unit will track to waypoint 1 (WPT 9 -> WPT 1). This waypoint coordinate re-entry procedure can be repeated as many times as required.

Manual Waypoint Entry

Note: remote loading of waypoints on other INS units is <u>not supported</u> and will be implemented in a future update.

AUTO/MAN/RMT switch in all units_____ AUTO OR MAN

Display selector switch_____ **WPT**

WPT selector switch _____**1**

Waypoint 1 coordinates _____ **ENTER**

- Enter coordinates in the same manner as the present position entry during alignment.

WPT selector switch _____ **2**

- Continue entering waypoint coordinates.

Simbrief Waypoint Import – Batch Loading Feature

To preserve the authenticity and realism of the original INS system on the L-1011, **the core waypoint logic of the INS has not been modified.** The system continues to support a maximum of 9 waypoints at any given time, as in the real aircraft.

An **auxiliary feature** has been added to simplify the workflow for pilots who prefer a faster and more convenient way to handle long flight plans. This allows seamless management of large route files without requiring constant manual entry into the INS, providing an accessible, smooth experience while maintaining full fidelity to the original INS behaviour.

PFB_____ **LOADSHEET TAB**

- Select Simbrief import, this will import the cargo, passenger and fuel weights as well as the flight plan.

PFB_____ **OFP**

- Select SEND TO INS on the right-hand side of the OFP page.

When the user presses **SEND TO INS** the system performs the following steps:

1. All incoming waypoints are collected and stored in a local variable (the complete imported route list).

2. The **first 9 waypoints** are automatically loaded into the INS (positions INS 1 through INS 9).

3. During flight, the system continuously monitors aircraft progress:
    - When the aircraft sequences waypoint 9 (or the next waypoint is manually selected),
    - The INS **automatically cycles** back from waypoint 9 to waypoint 1.

- At that exact moment, the **next batch of 9 waypoints** (10–18, then 19–27, etc.) is loaded into the INS.

4. This process repeats continuously until all imported waypoints have been used.

Note: the last imported waypoint might not be the destination airport but a waypoint or fix. This can lead to erroneous navigation.

Always ensure that the INS waypoints match your flightplan.

Alignment status check

Display selector switch_____DSR TK/STS

Right numerical display_____CHECK NUMBER

- The number will commence at 90 and reduce towards 01

Alignment Monitoring & Status Codes

Status number	Status
90	Alignment commencing value
50, 10	Major checkpoints, if there is an issue with the alignment the status code will not decrease below 50 or 10
0.2 and below	Alignment complete

READY NAV light illuminated_____ MODE SELECTOR SWITCH TO NAV

- The light illuminates when the status reaches 02

Note: the mode selector switch can be set directly to the NAV position from STBY after the present position coordinates have been entered. The INS will automatically enter NAV mode when the status number reaches 01. The READY NAV light will not illuminate.

The aircraft can move after all INS units are in NAV mode.

Initial Track Selection

The initial track is the direct route between the aircraft's present position and the selected initial waypoint. **The pilot must select and initiate the initial track.**

Mode selector switch_____MUST BE IN NAV

AUTO/MAN/RMT switch in all units_____ AUTO

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate

Press 0, followed by the desired initial waypoint number. For example, 0 1.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT
- For example, 01

INSERT pushbutton _____ PRESS
- TK CHG and INSERT buttons extinguish

The INS is now initialised and ready for movement and navigation.

Display selector switch_____ TK/GS
- Track angle is displayed on the left numerical display
- Ground speed is displayed on the right numerical display

INS Usage in Attitude Reference Mode

The INS can be used in attitude reference mode (ATT) if the navigation capability is not required or desired. This could be the case for radio or GPS only navigation not requiring the use of the INS.

Mode selector switch_____ ATT
- ATT can be selected at any time from any other position, including OFF. There is no need to perform an alignment to use the attitude reference mode.

INS IN-FLIGHT PROCEDURES

Waypoint and Track Sequencing

In automatic operation, the change to the next sequential track occurs automatically as each waypoint is reached.

AUTO/MAN/RMT switch in all units_____ AUTO

2 Minutes before each waypoint_____ALERT ILLUMINATES
- If ground speed is below 250 KT the ALERT light will not illuminate, but sequencing will still take place.

30 Seconds before each waypoint _____ ALERT EXTINGUISHES

From/to display _____ SEQUENCES TO THE NEXT LEG
In manual operation, the change to the next sequential track occurs when the user inserts it.

Executing a Direct-To

A track change from present position to any stored waypoint can be initiated at any time by inserting a track change from position 0 (present position) to the desired waypoint number.

AUTO/MAN/RMT switch in all units_____ AUTO

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate

Press 0, followed by the desired initial waypoint number. For example, 0 3.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT

- For example, 03

INSERT pushbutton _____ PRESS

- TK CHG and INSERT buttons extinguish and the from/to display shows 03.

Bypassing a Waypoint

A track leg change can be inserted in advance if it is desired to bypass one or more waypoints. For example, the aircraft is on leg 5-6, 6 being the next waypoint. The objective is to bypass WPT 7 and WPT 8, routing directly between WPT 6 to WPT 9. The procedure is identical to Executing a direct-to but instead of selecting 0 as the starting waypoint insert 6 followed by 9.

AUTO/MAN/RMT switch in all units_____ AUTO

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate.

Press 0, followed by the desired initial waypoint number. For example, 6 9.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT

- For example, 69.

INSERT pushbutton _____ PRESS

- TK CHG and INSERT buttons extinguish and the from/to display shows the current track leg 56. When WPT 6 is reached, the from/to display shows 69 instead of 67.

Position Update

The INS position will drift over time based on the amount of time elapsed since initial alignment or last position update.

Note: INS drift can be disabled from the PFB Settings option in the Menu tab.

Position updating consists of freezing the INS position display and inserting the correct coordinates for that location, this will update the INS position to the user entered coordinates.

Caution: always check the coordinates and position carefully before updating as this action cannot be undone to restore the INS to the previous position.

Re-apply the position update procedure if the inserted position is found to be erroneous.

There are various methods to obtain the current location of an aircraft, all varying in accuracy.

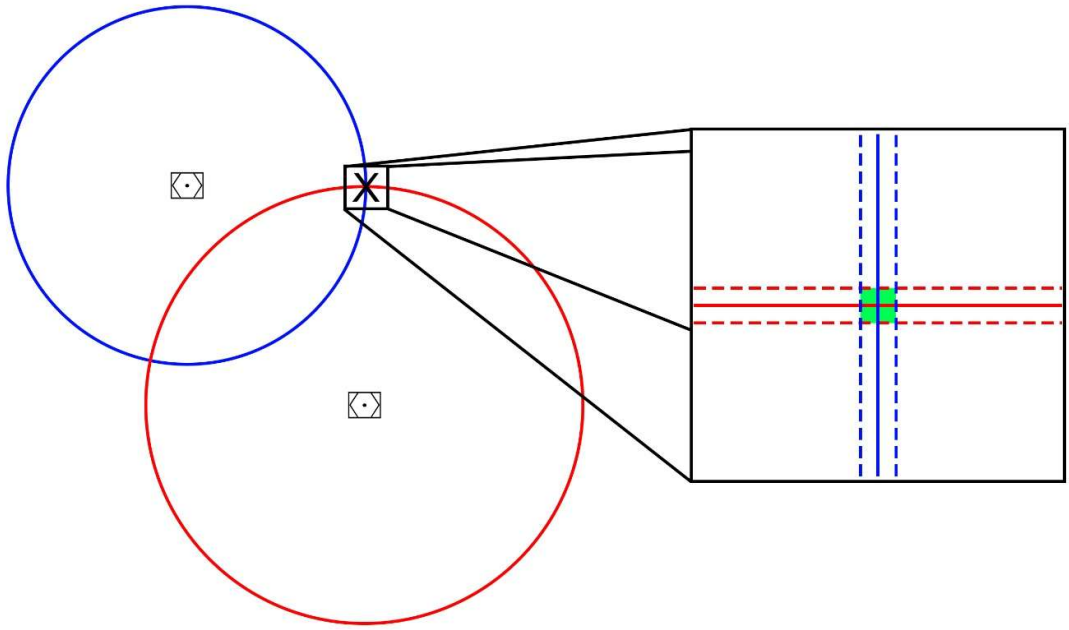
- Radio navigation fixes
- ATC radar position fix
- Visual fix
- GPS coordinate fix

The most accurate, self-contained legacy (non-GPS) method is the radio navigation fix method. The aircraft position is determined using radio aid bearings, distances or a combination of bearing and distances. In the examples below all radio aid systems are considered accurate, having no system error.

The user will have to plot the fix in a map to extract the coordinates.

DME – DME

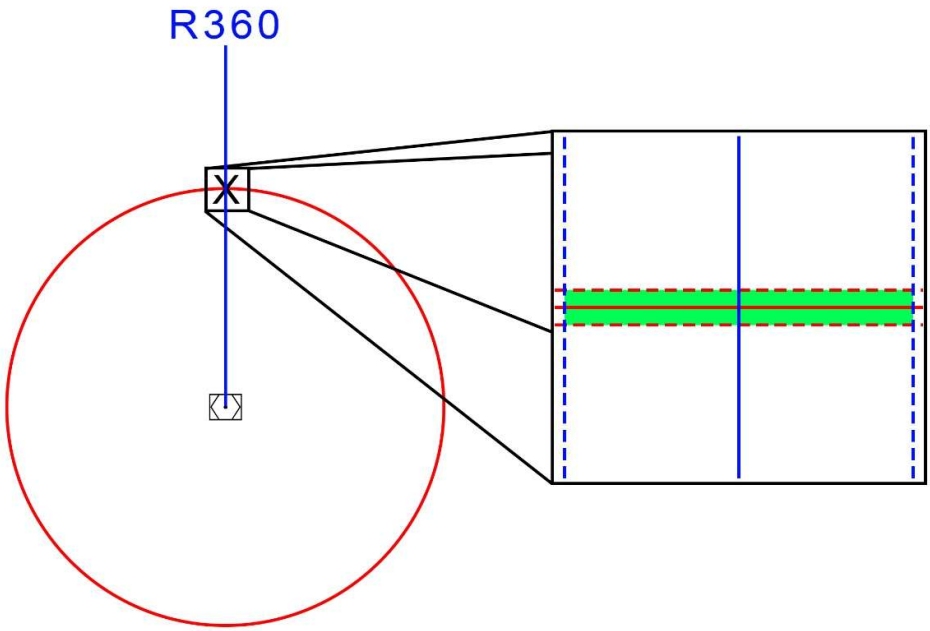
When two DME arcs cross, they form the most accurate fix. This happens because the aircraft's RDDMI shows distance measurements with a precision of 0.1 nautical miles.



In this example, an aircraft at location X uses two DME stations to fix its position. The magnified view on the right shows dashed lines representing a ±0.1 NM error, resulting in a 0.2 NM by 0.2 NM ambiguity zone for the actual fix.

VOR – DME

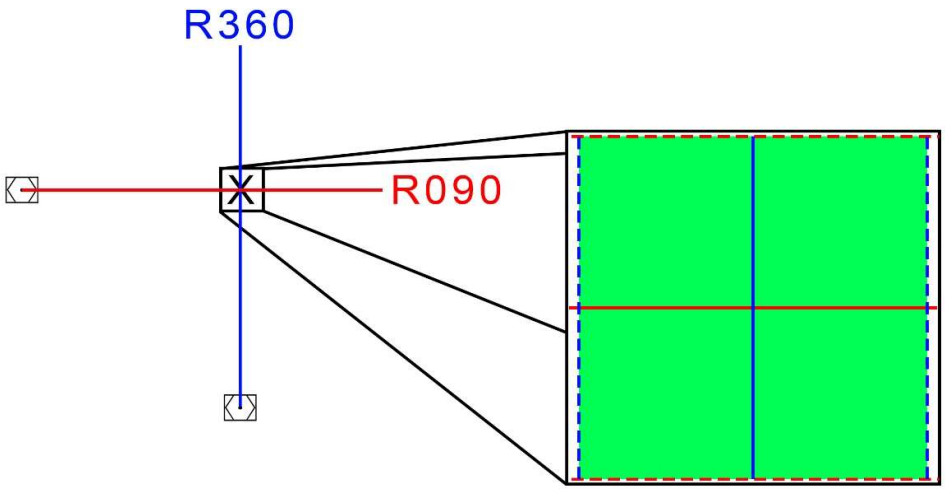
Next in terms of accuracy is the technique involving the intersection of a VOR radial with a DME range. This approach is considered less precise due to the increase in VOR radial cross-track error as distance from the beacon increases. The display resolution for a VOR bearing on the DDRMI typically measures approximately one degree, which results in increased lateral error with distance: for instance, a one-degree error at 60 NM from a VOR corresponds to a lateral displacement of 1 NM, whereas the same one-degree error at 120 NM corresponds to a displacement of 2 NM.



In this example, the intersection of radial 360 at 60 NM from the VOR/DME has a larger zone of ambiguity (compared to DME – DME) due to VOR radial accuracy of +/- 1 degree, which equals 1 NM at that distance. The green area becomes a 2 NM by 0.2 NM rectangle.

VOR – VOR

Among bearing and range fixes, those created by intercepting two distinct VOR radials tend to be the least precise.



The above example shows that intersecting two radials from separate VORs at 60 NM creates a large ambiguity area of 2 by 2 NM. Doubling the range to 120 NM increases this area to 4 by 4 NM.

Procedure

When at a known position _____ PRESS HOLD

- The current position of the aircraft is frozen for comparison.

Mode selector switch_____ POS

- Compare the displayed position with the known/plotted fix position.

If the position update is not required _____ PRESS HOLD

- This resumes normal navigation.

If the position requires updating _____ ENTER POSITION

- The INS position will be updated after INSERT is pressed for the second time following the longitude entry.

Offset Hold Mode

The INS can intercept and maintain a route offset to the left or right of track.

Mode selector switch_____ XTK/TKE

Press 1 (activates offset entry), followed by 7 (L/left) or 9 (R/right) and the number of miles including tenth of a mile.

- For example, a right 5NM offset should be entered as follows: 1 9 50.

INSERT pusbhbutton_____ PRESS

- The left numerical display will show the current amount of miles L or R of track.
- The right numerical display will show the track angle error; this value will increase as the aircraft turns to intercept the new offset track.

Data Display Selection

TK/GS (Track angle and ground speed)

Left numeric display: shows the aircraft heading (ground speed below 10KT) or aircraft true track (ground speed above 10KT).

Right numeric display: shows the groundspeed of the aircraft.

HDG/DA (Heading and drift angle)

Left numeric display: shows the aircraft's true heading.

Right numeric display: shows the aircraft's drift angle, preceded by L or R.

XTK/TKE (Cross-track offset)

Left numeric display: shows the current offset being flown, preceded by L or R.

Right numeric display: shows the aircraft's track angle error.

POS (Present position)

Left numeric display: shows the current latitude, followed by N or S.

Right numeric display: shows the current longitude, followed by E or W.

Pressing the HOLD pushbutton freezes the display to assist in assessing the current position. Pressing HOLD a second time resumes the normal position display.

WPT (Waypoint positions)

Waypoint selector switch: selects the desired waypoint for coordinate display or entry.

Left numeric display: shows the waypoint latitude, followed by N or S.

Right numeric display: shows the waypoint longitude, followed by E or W.

DIS/TIME (Distance and time to waypoint)

This mode can either display the distance and time to the current next waypoint, direct distance and time between any two stored waypoints, the along-flight plan cumulative distance and time between present position and any waypoint or the direct distance between present position and any waypoint.

1) Distance and time to the current next waypoint.

From/to waypoint display: by default this will indicate the active leg being flown. For example, 05 (present position to waypoint 5) or 78 (leg between WPT 7 and WPT 8 being flown).

Left numeric display: shows the distance.

Right numeric display: shows the time in minutes with an accuracy of a tenth of a minute.

2) Direct distance and time between any two stored waypoints.

AUTO/MAN/RMT switch in the desired unit _____RMT

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate.

Insert the desired waypoint numbers, for example 7 8.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT

- For example, 78.

INSERT pushbutton _____ PRESS

- TK CHG and INSERT buttons extinguish and the from/to display shows the desired leg 78.

Left numeric display: shows the distance between WPT 7 and WPT 8.

Right numeric display: shows the time in minutes between WPT 7 and WPT 8 with an accuracy of a tenth of a minute. This time computation is based on a speed of 512 KT (ground speed less than 100 KT) or actual current ground speed (ground speed mode than 100 KT).

3) Along-flight plan cumulative distance and time between present position and any waypoint.

AUTO/MAN/RMT switch in the desired unit _____RMT

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate.

Insert the desired waypoint numbers, for example 0 4.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT

- For example, 04.

INSERT pushbutton _____ PRESS

- TK CHG and INSERT buttons extinguish.

Left numeric display: shows the along-flight plan distance between present position and WPT 4.

Right numeric display: shows the time in minutes between present position and WPT 4 with an accuracy of a tenth of a minute following the along-flight plan distance. This time computation is based on a speed of 512 KT (ground speed less than 100 KT) or actual current ground speed (ground speed mode than 100 KT).

4) Direct distance between present position and any waypoint.

AUTO/MAN/RMT switch in the desired unit _____RMT

TK CHG pushbutton_____ PRESS

- TK CHG and INSERT buttons illuminate.

Insert the desired waypoint number, followed by 0. For example, 5 0.

From/to display _____VERIFY CORRECT NUMBERS, IF NOT CLEAR AND RE-INSERT

- For example, 50.

INSERT pushbutton _____ PRESS

- TK CHG and INSERT buttons extinguish.

Left numeric display: shows the direct distance between present position and WPT 5.

Right numeric display: shows the time in minutes between present position and WPT 5 with an accuracy of a tenth of a minute. This time computation is based on a speed of 512 KT (ground speed less than 100 KT) or actual current ground speed (ground speed mode than 100 KT).

WIND (Wind direction and speed)

Left numeric display: shows the true wind direction.

Right numeric display: shows the wind speed.

Note: wind display is operational when the true airspeed exceeds 170 KT.

DSR TK/STS (Desired track angle and status)

Left numeric display: shows the desired track angle, based on the mode selection.

Right numeric display: shows the action codes and alignment status during the ALIGN mode.

TEST (Test mode)

Left numeric display: shows all characters as 8.

Right numeric display: shows all characters as 8.

From/to waypoint display: 88.

TK CHG, INSERT, HOLD pushbuttons: illuminate.

INS POST-FLIGHT PROCEDURE

INS navigation accuracy check

Parking spot coordinates _____ ENTER AS A WAYPOINT

AUTO/MAN/RMT switch in the desired unit_____ AUTO OR MAN

TK CHG pushbutton _____ PRESS

- Enter a TK CHG from 0 to the WPT number containing the parking spot coordinates.

Display selector switch _____ DIS/TIME

Divide the distance readout by the time spent by the INS unit in NAV mode. This will give the drift average per hour. The block time is a close estimation of the time spent in NAV mode.

- 1-2 NM per hour is an average amount of drift

- 2-3 NM per hour is within limits but not ideal.
- >3 NM per hour requires maintenance action.

Shutdown

Mode selector switch _____OFF

Controls

Main panel & glareshield

1. GPS
2. NAV 1
3. NAV 2
4. HSI NAV<>INS/GPS reference
5. Captain/FO HSI course
6. Marker beacon lights
7. RDDMI (VOR 1 & VOR 2 indications only)
8. HSI
9. ADF 1 & ADF 2

HSI

The HSI displays either RADIO or INS/GPS guidance depending on the position of the HSI NAV<>INS/GPS reference switch.

Top left indication: Distance to the active waypoint.

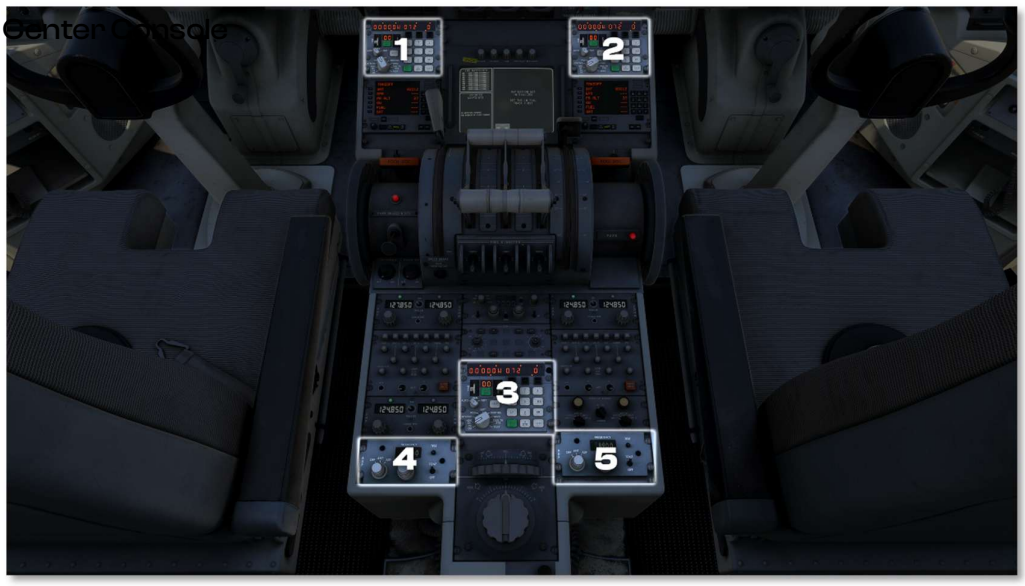
Top right indication: Time to the active waypoint.

Note: INS reference will automatically change the HSI reference to TRUE.

Overhead Panel

1. INS 1 MSU
2. INS 2 MSU
3. INS 3 MSU

Center Console



1. INS 1 CDU
2. INS 2 CDU
3. INS 3 CDU
4. ADF 1
5. ADF 2

OXYGEN

Two separate Oxygen systems are fitted, one for the cockpit and a separate one for the cabin.

Cockpit Oxygen system: a single oxygen cylinder provides oxygen directly to the pilot and flight engineers masks located in the cockpit.

Cabin Oxygen system: chemical oxygen generator provides continuous oxygen for all passengers when activated, for approximately 15 minutes.

CONTROLS

Flight engineer panel

1. **Oxygen flow light: passenger oxygen masks deployed and chemical generators active.**

2. **Manual switch.**
    - UNL: normal position, masks deploy automatically if the cabin altitude exceeds 13,000 ft
    - LCH: manually deploy the masks and activates the chemical generators, MASKS DPLYD illuminates

ENGINES

The aircraft is powered by three Rolls Royce RB-211-524 engines rated at 50,000 pounds of thrust. The RB211 was the first three-spool engine to be produced.

All engines are fitted with pneumatically actuated reverse systems to assist in decelerating the aircraft on the ground.

CONTROLS

Center Console

1. **Throttle levers**
2. **Auto throttle disconnect switches**
3. **Thrust reverser levers**
4. **Fuel and ignition switches**
    - ON: activates ignition & opens the high-pressure shutoff valves
    - OFF: deactivates ignition & closes the high-pressure fuel shutoff valves

Center Panel

1. **Engine 2 fail lights: indicates failure of engine 2 during the takeoff roll**
    - Inoperative when the aircraft is airborne or if the flaps are not in the takeoff range

2. **EPR indications**

3. **N1 tachometers**

4. **TGT indicators**

5. **N3 tachometers**

6. **Fuel flow indicators**

7. **UNLOCK & REVERSE lights**
    - UNLOCK: illuminates when the reverser is not stowed & locked
    - REVERSE: reverser fully deployed

8. **MAX IND RESET switch: resets N1, TGT & N3 maximum position pointers**

Flight engineer lower panel, engine status & engine oil panels

1. REVERSER PRESSURE light: indicates HP bleed air is available to operate the reverser

2. N2 tachometer

3. Engine vibration indicator: displays vibration as selected by the pickup selector and filter selector

4. Test button: engine vibration indicators move to the 4 unit position

5. Vibration pickup selector switches: selects pickup signal A or B for vibration display
   - A LCH: ON illuminates, normal position: pickup signal A selected
   - B UNL: ON extinguished, normal position: pickup signal B deselected

6. Vibration filter selector
   - NORM: average vibration of N1, N2 & N3
   - LOW: N1 vibration
   - MED: N2 vibration
   - HIGH: N3 vibration

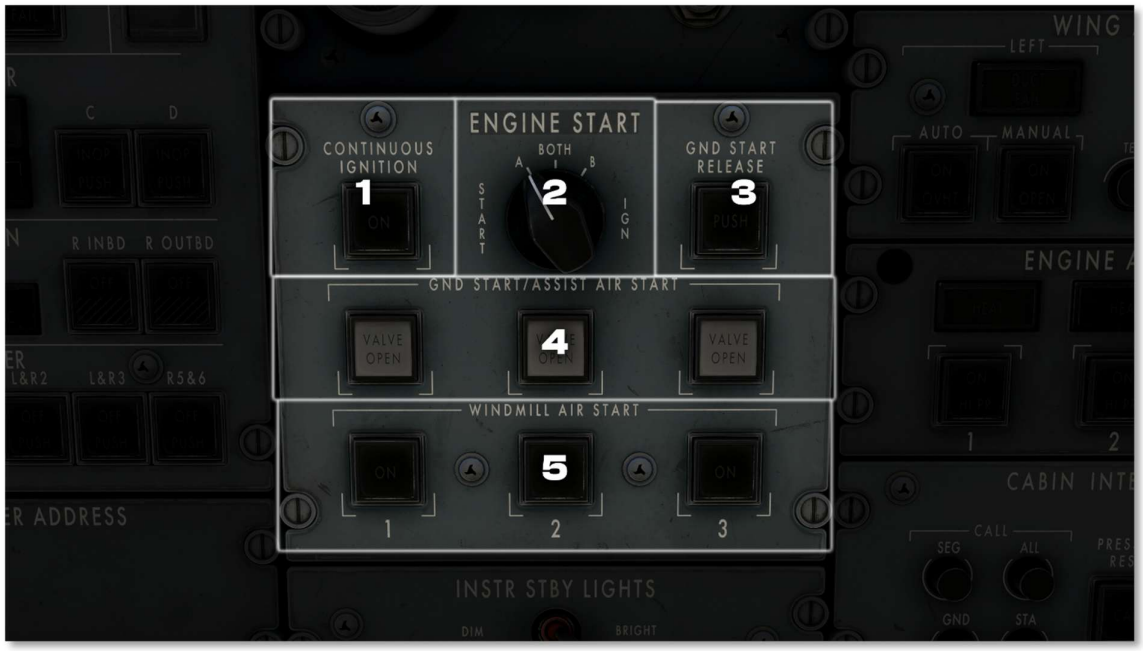
7. Oil quantity indicators

8. Oil temperature indicators

9. Indicator test button: oil pressure indicators move to the 9 o'clock position

10. Oil pressure indicators & filter pressure lights

Overhead Panel



1. **Continuous ignition**
    - IN: both low energy ignition systems are energized when the fuel and ignition switches are turned on. ON illuminates
    - OUT: deenergizes both low energy ignition systems. ON extinguishes

2. **Ignition system selector: selects either ignition system A, B or both**

3. **Ground start release switch: pressing this switch deenergizes the start system. PUSH illuminates while the ground start switch is in**

4. **Ground start switches: commences the engine start sequence and arms the high energy ignition systems**
    - VALVE OPEN illuminates when the switch is pressed. At approximately 46% N3 the VALVE OPEN light extinguishes

5. **Windmill air start switches**
    - IN: both high energy ignition systems are energized when the fuel and ignition switches are turned on. ON illuminates
    - OUT: deenergizes both high energy ignition systems and ON is extinguished.

Normal Procedures

Preflight Preparation

Flight engineer cockpit safety inspection

Circuit breakers _____ **CHECKED**
- Check all in

Engine and APU fire pull handles _____ **IN**

Continuous ignition _____ **UNLATCHED**

Essential and number 2 master radio switches _____ **LATCH**

Gear lever _____ **DOWN**

Speed brake handle _____ **FWD**

Flaps and flap handle _____ **AGREE**
- Check flap position and handle agrees

Stab trim _____ **FULL NOSE DOWN**
- Minimizes mismatch between control column position and stabilizer before hydraulics are powered up

Throttles _____ **CLOSED**

Fuel and ignition switches _____ **OFF**

Transponder _____ **STBY**

Radar _____ **OFF**

ATM switches _____ **OFF**

AC Hydraulic pump switches _____ **UNLATCHED**

Galley power switches _____ **UNLATCHED**

Fuel tank pump switches _____ **UNLATCHED**

Master jettison switch and dump switches _____ **UNLATCHED**

Passenger oxygen manual switch _____ **GUARDED AND UNLATCHED**

Standby power _____ **CHECK**

- Battery switch _____ OFF
- Standby power switch _____ ON
- UNARM light _____ ON
- STBY PWR flowbar _____ ON
- DC and AC ESS BUS FAIL lights _____ OUT
- DC and AC STBY BUS FAIL lights _____ ON
    - *DC meter selector* _____ *STBY DC BUS*
- Check 26V to 28V, 0A.
    - *AC meter selector* _____ *INVERTER*
- Check 400 HZ & 115V.
    - Battery switch _____ ON
- Unarm light _____ OUT
    - *Standby power switch* _____ *ARM*
- STBY PWR flowbar _____ OUT
- DC and AC STBY BUS FAIL lights _____ OUT
    - *AC ESS power selector* _____ *NORM B3(G1)*

Flight engineer panel lights _____ **SET**

Overhead panel lights _____ **SET**

Main panel lights _____ **SET**

Center console flood lights _____ **SET**

Center console lights _____ **SET**

Engine and APU fire test _____ **CHECK**

- Detection loop selectors (4) _____ BOTH
- Loop A & B test _____ PRESS
- Fire bell _____ ON
- Loop A & B lights _____ ON
- Master fire warning lights _____ ON
    - *Located in the main panel*
- FIRE DET LOOP light _____ ON
    - *Located in the main panel*
- Fire pull handle lights _____ ON
- Loop A & B test _____ PRESS TO RELEASE
- Detection loop selectors (4) _____ ALL ON A
- Loop A test _____ PRESS
- Fire bell _____ ON
- Loop A lights _____ ON
- Master fire warning lights _____ ON

    - *Located in the main panel.*
- FIRE DET LOOP light_____ON
    - *Located in the main panel.*
- Fire pull handle lights_____ON
- Loop A test _____PRESS TO RELEASE
- Detection loop selectors (4) _____ALL ON B
- Loop B test _____ PRESS
- Fire bell _____ON
- Loop B lights_____ON
- Master fire warning lights _____ON
    - *Located in the main panel.*
- FIRE DET LOOP light_____ON
    - *Located in the main panel.*
- Fire pull handle lights_____ON
- Loop B test _____PRESS TO RELEASE

External electrical power _____ AS REQUIRED

- GPU_____CONNECT
    - *Select GPU in the ground tab of the EFB if required.*
- External power light _____ AVAIL
- AC meter selector _____EXT POWER
- Check voltage _____ 114V +/- 7V
- Check frequency_____ 400HZ +/- 4HZ
- External power switch_____ON
- Bus tie breakers _____ CLOSE

APU _____ AS REQUIRED

- If starting the APU:
    - *APU master power switch_____ON*
    - *Bleed air S/O switch_____ UNLATCHED*
    - *Compressor mode selector _____MIN*
    - *One tank boost pump _____ON*
- Any pump can be used, open crossfeed as required to pressurize the engine 2 feed line
    - *Engine 2 tank valve switch _____ON*
    - *Start switch_____PRESS AND RELEASE*
- When APU start is complete:
    - *APU generator field & breaker close switches _____ LATCHED*
    - *Bus tie breakers_____ CLOSE*

Air conditioning _____ START

- Fuselage isolation valve switch _____ LATCH
- Crossbleed valve switches _____ LATCH
- Pack flow control valve switches_____ UNLATCHED
- Pack auto/manual control switches _____ AUTO
- Ground control ram auto switch _____AS REQUIRED
    - *Turn on (out position) to speed up warming of the cabin*
- Hot air isolation valve switches _____ UNLATCHED
- Hot air valve switches_____ UNLATCHED

- Zone trim switches _____ LATCHED
- Zone temperature selectors _____ 12 O'CLOCK
- Area overheat selector_____ A
- Area overheat test switch_____ PRESS & HOLD
- AREA OVHT lights (7) _____ON
- Wing anti-ice DUCT FAIL lights (2)_____ON
    - *Located in the overhead panel*
- AREA/DUCT OVERHEAT light _____ON
    - *Located in the main panel*
- Area overheat selector_____B
- Area overheat test switch_____ PRESS & HOLD
- AREA OVHT lights (7) _____ON
- Wing anti-ice DUCT FAIL lights (2)_____ON
    - *Located in the overhead panel*
- AREA/DUCT OVERHEAT light _____ON
    - *Located in the main panel*
- Area overheat selector_____BOTH
- If ground air conditioning will be used:
    - *Ground air conditioning _____ON*
        - *Select A/C CART in the ground tab of the PFB*
- If APU bleed air will be used:
    - Ground air conditioning _____OFF
        - *Deselect A/C CART in the ground tab of the PFB*
    - APU bleed air shut off switch _____ LATCH IN
        - *Check OPEN light on*
- Pack flow control valve switches _____ LATCH IN
- Monitor each pack before opening the next pack valve
- APU mode selector _____NORM
    - *Use MIN for single pack operation*
- Hot air valve switches_____ LATCH IN
- Hot air isolation valve switches _____ LATCH IN
- Humidity control switch _____AS REQUIRED
    - *Turn on if OAT is above 21C and humidity above 50%*

All INS _____ ALIGN

Flight engineer station preparation

Brake temperature panel _____ CHECK

- Left gear 1F & 2F switch _____ LATCH IN
    - *Brake temperature displayed*
- Test button_____ PRESS & HOLD
    - *Both temperature indicators should read 100C above existing brake temperature*
- Test button_____RELEASE
- Left gear 1F & 2F switch _____UNLATCH
- Left gear 1R & 2R switch _____ LATCH IN

    - *Brake temperature displayed*
- Test button _____ PRESS & HOLD
    - *Both temperature indicators should read 100C above existing brake temperature*
- Test button _____ RELEASE
- Left gear 1R & 2R switch _____ UNLATCH
- Right gear 3F & 4F switch _____ LATCH IN
    - *Brake temperature displayed*
- Test button _____ PRESS & HOLD
    - *Both temperature indicators should read 100C above existing brake temperature*
- Test button _____ RELEASE
- Right gear 3F & 4F switch _____ UNLATCH
- Right gear 3R & 4R switch _____ LATCH IN
    - *Brake temperature displayed*
- Test button _____ PRESS & HOLD
    - *Both temperature indicators should read 100C above existing brake temperature*
- Test button _____ RELEASE
- Right gear 3R & 4R switch _____ UNLATCH

Wheel well fire panel _____ CHECK

- Detection loop selector _____ BOTH
- A test button _____ PRESS & HOLD
- Fire bell _____ ON
- A loop lights _____ ON
- Master fire warning lights _____ ON
    - *Located in the main panel*
- WHEEL WELL FIRE light _____ ON
    - Located in the main panel
- A test button _____ RELEASE
- B test button _____ PRESS & HOLD
- Fire bell _____ ON
- B loop lights _____ ON
- Master fire warning lights _____ ON
    - *Located in the main panel*
- WHEEL WELL FIRE light _____ ON
    - *Located in the main panel*
- B test button _____ RELEASE

Engine turbine cooling air panel _____ CHECK

- A test button _____ PRESS & HOLD
- ENG 1, 2, 3 OVHT lights _____ ON
- TURB AIR OVHT ENG 1, 2, 3 lights _____ ON
    - *Located in the main panel*
- A test button _____ RELEASE
- B test button _____ PRESS & HOLD
- ENG 1, 2, 3 OVHT lights _____ ON

- TURB AIR OVHT ENG 1, 2, 3 lights _____ ON
    - *Located in the main panel*
- B test button _____ RELEASE

Nacelle/pylon overheat detector panel _____ CHECK

- Detection loop selector _____ BOTH
- Test button _____ PRESS & HOLD
- A and B loop lights _____ ON
- NACELLE NO. 1, 2, 3 OVHT lights _____ ON
    - *Located in the main panel*
- Test button _____ RELEASE

Fire extinguisher test panel _____ CHECK

- Test button _____ PRESS & HOLD
- MAIN and ALTN lights _____ ON
- Test button _____ RELEASE

Hydraulic panel _____ CHECK

- Hydraulic fluid levels _____ IN GREEN BAND
- Reservoir LO QTY and HI TEM lights _____ OUT
- Engine pump S/O switches _____ LATCHED
    - *Check OFF lights out and flowbars on*
- EDP case drain HI TEM lights _____ OUT
- EDP output LO PR lights _____ ON
- ATM switches _____ OFF
- ATM tachometers _____ ZERO
- ATM lube HI TEM and LO PR lights _____ OUT
- ATM pump case drain HI TEM lights _____ OUT
- ATM pump output LO PR lights _____ OUT
- PTU switches _____ UNLATCHED
    - *Check flowbar lights out*
- RAT unlocked light _____ OUT
- B AC pump switch _____ LATCH
- System B pressure _____ NORMAL
- NORM Brake accumulator LOW PRESS light _____ OUT
- C AC pump switch _____ LATCH
- System C pressure _____ NORMAL
- ALT brake accumulator LOW PRESS light _____ OUT
- PTU switches _____ LATCH
    - *Check flowbar lights on*
- Minimum system A hydraulic pressure _____ 900 PSI
- Minimum system D hydraulic pressure _____ 1400 PSI
- AC pump and PTU switches _____ UNLATCH
- Hydraulic pressure gauges _____ ZERO

Electrical panel _____ CHECK

- IDG oil temperatures _____ NORMAL
    - *Check normal and temp rise*

- Galley power bus switches _____AS REQUIRED
    - *Turn on minimum power required for cabin crew duties*
- IDG LOW PRESS lights _____ON
- AC meter selector _____ APU/EXT PWR
- APU gen oil OVHT & PRESS lights _____ OUT
- Engine generator field trip switches _____ PRESS
- OPEN lights _____ON
- BRG, DIFF and flowbar lights _____ OUT
- Engine generator breaker close switches _____ PRESS
- APU KW/KVAR meter _____ LESS THAN 81KW
- Engines KW/KVAR meters _____ZERO
- DC meter _____ CHECK
    - *Check all buses for normal indications*
- DC meter _____ BAT
- AC ESS power selector_____ NORM B3(G1)
- FLT STA bus fail lights_____ OUT
- Bus tie breakers _____CLOSED
    - *Check flowbars on*

Fuel system panel _____CHECK

- Refuel power light_____ OUT
- Fuel quantity test switch_____ PRESS & HOLD
    - *Check all indications move to the full position*
- Fuel quantity test switch_____RELEASE
- 2L & 2R tank quantities _____ CHECK
- 1 & 3 tank quantities _____ CHECK
    - *Values indicate total tank amounts for 1 & 1A and 3 & 3A*
- 1A & 3A tank quantities _____ CHECK
    - *Latch tank 1A & tank 3A switches to display only the tank 1A & 3A amounts*
- 1A/3A transfer switches_____ UNLATCHED
- Tank pump switches_____ ON, THEN OFF
    - *Check flowbar on, LOW light out when ON*
    - *If the APU is running leave one pump ON in tank 1 or 3*
- Crossfeed switches _____ OPEN, THEN CLOSE
    - *Check flowbar ON when OPEN.*
- All engine tank valve switches _____ LATCHED

Fuel jettison panel _____CHECK

- Master & tank jettison switches_____ UNLATCHED

Engine fuel panel _____CHECK

- Fuel control amplifier switches_____ UNLATCHED
- Fuel used/fuel flow indicators _____ PRESS & HOLD
    - *Check fuel flow 10,000 lbs/hr and fuel used counting up.*
- Fuel used/fuel flow indicators _____RELEASE
- Fuel used reset switch_____ PRESS
    - *Hold in until all fuel used indicators read zero*

Engine oil panel_____**CHECK**

- Filter pressure lights_____ OUT
- Oil PRESS IND test switch_____ PRESS & HOLD
  - *Indicator moves to 9 o'clock position*
- Oil PRESS IND test switch_____RELEASE
- Oil temperature test switch _____ PRESS & HOLD
  - *Indicators move to 12 o'clock position*
- Oil temperature test switch _____RELEASE
- Oil quantity _____ CHECK
- Minimum _____ 8QT + 2QT PER HOUR
- Oil quantity test switch_____ PRESS & HOLD
  - *Indicators move to 12 o'clock position*
- Oil quantity test switch_____RELEASE

Engine status Panel_____**CHECK**

- A (FAN) switch _____ LATCH
- Filter selector _____NORM
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____ LOW
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____MED
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____ HIGH
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- A (FAN) switch _____UNLATCH
- B (TURB) switch_____ LATCH
- Filter selector _____NORM
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____ LOW
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____MED
- Test button_____ PRESS & HOLD
  - *Vibration indicators _____ 4 UNITS*
- Test button_____RELEASE
- Filter selector _____ HIGH
- Test button_____ PRESS & HOLD

    - *Vibration indicators* _____ *4 UNITS*
- Test button _____ RELEASE
- B (TURB) switch _____ UNLATCH
- N2 test buttons _____ PRESS & HOLD
    - *N2 pointer moves to 91%.*
- N2 test buttons _____ RELEASE
- REVERSER PRESSURE lights _____ OUT

Reverser pressure lights _____ OUT

Clock _____ CHECK CORRECT TIME

Movie interrupt switch _____ UNLATCHED

Waste water panel _____ CHECK
- Pump FWD light _____ OUT
- Drainmast heater switches _____ LATCHED IN

Forward cargo compartment smoke panel _____ CHECK
- Smoke detector channel selector _____ BOTH
- Test switch _____ PRESS & HOLD
- A1, A2, B1, B2, MAIN, ALTN, SMOKE lights _____ ON
- Test switch _____ RELEASE

Smoke detection panel _____ CHECK
- Smoke detection circuit selector _____ BOTH
- Test switch _____ PRESS & HOLD
- FWD, MID, AFT lights _____ ON
- Test switch _____ RELEASE

Flight engineer annunciator panel lights _____ CHECKED

Aural warning test panel _____ CHECK
- All modes _____ SET INDIVIDUALLY
- Test switch _____ PRESS & HOLD
    - *Check each aural*
- Test switch _____ RELEASE

Slat monitor panel _____ CHECKED
- Monitor switch _____ LATCH
    - *ON light on.*
- Segment lights _____ OFF OR ON
    - *Retracted OFF, extended ON*
- Position indicator _____ CHECK
    - *Agrees with slat position*
- Monitor switch _____ UNLATCH
- Lock switch _____ CHECK
    - *Unlatched & guarded*

Engine bleed control panel_____**CHECK**

- Hi pressure bleed switches_____LATCHED
- Engine isolation valve switches_____LATCHED
- Fuselage isolation valve switch_____LATCHED
- Crossbleed valve switches _____LATCHED
- Pack flow control switches _____LATCHED
- AUTO/MNL switches _____ AUTO
- Hot air switches_____LATCHED
- Hot air isolation switches _____LATCHED
- Ground control ram auto switch_____AS REQUIRED
- Zone trim switches _____LATCHED
- Zone temp selectors_____SET

ECS monitor panel_____**CHECK**

- COOL AIR OVBD switch_____LATCHED
- CARGO HEAT switches_____LATCHED
- INS COOLING switch _____AS REQUIRED
- Latch when CDU on & OAT above 35C.
- TEMP SELECT switch_____ZONE
- Zone temperatures_____CHECK
  - *Check each zone & adjust.*
- Cabin temperature selector_____ MID CAB
- ECS temperature selector _____ACM DISCH
- Pack selector _____PACK 2

Cabin pressure control panel_____**CHECK**

- MODE SEL_____ GND CHK
- ALT SEL control panel _____BELOW AIRPORT ELEVATION
  - *Outflow valves start to close and FWD valve stops at white dot until AFT valve reaches the same position, then AFT valve closes before the FWD valve*
- MODE SEL_____ STBY
  - *FWD valve starts to open and stops at the white dot until the AFT valve reaches the same position, then both valves open together*
- STBY RATE_____ DSCD
  - *Check valves start closing*
- STBY RATE_____HOLD
  - *Check valves stop*
- MODE SEL_____NORM
  - *Check valves open fully*
- ALT SEL control_____ SET AIRPORT ELEVATION
- FWD & AFT manual switches _____ LATCH IN
  - *MNL lights on*
- FWD manual switch _____CHECK
- AFT manual switch _____CHECK
- FWD & AFT manual switches _____UNLATCH
  - *MNL lights off*
  - *Both outflow valves open fully*

- NORM RATE selector _____ SET TO INDEX
- BARO SET control _____ SET QNH
- ALT SEL control _____ SET CRUISE ALT

Overhead Preparation

INS 1 _____ CHECK ALIGNMENT
- If alignment complete _____ NAV

Fire pull handles _____ IN

INS 2 _____ CHECK ALIGNMENT
- If alignment complete _____ NAV

Compass 2 _____ MAG & SYNC
- Sync index needles _____ CENTERED

Light test switch _____ LATCH
- Check all lights on in both DIM & BRT

Light test switch _____ UNLATCH

Master radio switches _____ ON
- Both latched.

F/O wiper _____ OFF

Engine anti-ice switches _____ UNLATCHED

Wing anti-ice switches _____ UNLATCHED

Windshield heat panel _____ SET
- CAPT & F/O switches _____ LATCHED
  - *IDLE lights on*
- Side window switches _____ LATCH IN
  - *OFF lights out*
- Test button _____ PRESS & HOLD
  - *FAULT lights flash*
- Test button _____ RELEASE
- Defog fan switch _____ AS REQUIRED

Air data sensor heat switches _____ ALL OFF
- OFF lights on

Mach feel switches 1 & 2 _____ LATCHED

Hydraulic rudder limiter switch _____ LATCHED

Cockpit voice recorder test button _____ **PRESS & HOLD**
- Meter in GOOD range

Cockpit voice recorder test button _____ **RELEASE**

Engine start lights _____ **ALL OUT**

Ignition _____ **A OR B**
- Select A for first start and alternate

Instrument standby lights _____**BRT**

All PFCS switches_____**LATCHED**

PFCS stabilizer switches lights _____**INOP**
- INOP lights on

All FCES switches_____**LATCHED**
- Yaw SAS & ACS FAIL lights _____ON

Compass 1_____**MAG & SYNC**
- Sync index needles _____CENTERED

INS 3 _____ **CHECK ALIGNMENT**
- If alignment complete _____ NAV

Anti-skid _____ **TEST**
- Brake selector switch _____NORM SYS B
  - *In pilot's center panel*
- Parking brake _____RELEASE
  - *Confirm chocks in place*
- Anti-skid switch _____ LATCH
  - *ON light on*
- NORM test button_____ PRESS & HOLD
  - *All lights* _____ *ON*
- NORM test button_____RELEASE
- ALT test button _____ PRESS & HOLD
  - *All lights* _____ *ON*
- ALT test button _____RELEASE
- Anti-skid switch _____UNLATCH
  - *OFF light on*
- Parking brake _____SET

Auto brake _____**OFF**

CAPT wiper _____**OFF**

Exterior lights _____ **SET**

- WING LANDING _____ OFF
- NOSE WHEEL _____ OFF
- RWY TURNOFF _____ OFF
- LOGO _____ ON
- POSITION _____ ON
- STROBE _____ OFF
- ANTI-COLL _____ OFF
- WG FLOOD _____ OFF
- WHL WELL _____ OFF

Emergency lights _____ **TEST**

- Emergency lighting switch _____ ON
  - *UNARM light on*
- Emergency lighting switch _____ OFF
  - *UNARM light off*
- Emergency lighting switch _____ ARM

Standby power _____ **ARMED**

Seat belts _____ **ON**

- When refuel complete.

No smoking _____ **ON**

Main panel preparation

Radio/INS selector _____ **AS REQUIRED**

NAV1 _____ **SET**

NAV1 DME _____ **NORM**

Autopilot _____ **SET**

- IAS _____ V2 + 70
- Heading _____ SET RUNWAY HEADING & ENGAGE
- Flight directors _____ ON
- Autopilot masters _____ OFF
- Course 1 & 2 _____ SET
- Altitude _____ SET AND ARMED
- TO/GA _____ ENGAGED

NAV2 _____ **SET**

NAV2 DME _____ **NORM**

Instrument comparator _____ **TEST**

- Test 1 switch _____ PRESS & HOLD
  - *Annunciators on both panels* _____ *ON*
  - *ATT flag in CAPT ADI* _____ *VISIBLE*
- Test 1 switch _____ RELEASE
- Test 2 switch _____ PRESS & HOLD
  - *Annunciators on both panels* _____ *ON*
- Test 2 switch _____ RELEASE

AFCS warning & mode annunciators _____ **TEST**

- Test 1 switch _____ PRESS & HOLD
  - *Check all annunciators*
- Test 1 switch _____ RELEASE
- Test 2 switch _____ PRESS & HOLD
  - *Check all annunciators*
- Test 2 switch _____ RELEASE

Instrument panel _____ **SET**

- ASI _____ NO FLAGS, 60KT
- ADI _____ ERECT, NO FLAGS
- Radio altimeter _____ 5 FEET, NO FLAGS
- Altimeter _____ SET QNH, NO FLAGS
- Standby horizon _____ ERECT, NO FLAGS
- Standby ASI _____ NO FLAGS, 60KT
- Standby altimeter _____ SET QNH, NO FLAGS
- RDDMI _____ CHECK HEADING, NO FLAGS
- HSI _____ SET COURSE, NO FLAGS
- VSI _____ NO FLAGS
- Instrument source selector _____ NORMAL
  - *All unlatched, lights out*
- Annunciators _____ CHECKED
- Engine instruments _____ CHECKED
- Landing gear _____ DOWN, 3 GREEN
- Brake system pressure _____ NORMAL
- Brake system _____ NORM SYS B

Center Console Preparation

INS 1 & 2 _____ **SET**

PMS _____ **SET**

Pitch & roll disconnect handles _____ **NORMAL**

Parking brake _____ **SET**

Speed brake lever _____ **FORWARD**

Throttles _____ **CLOSED**

Flaps lever _____ **CHECK**
- Agrees with indication

Fuel & ignition switches _____ **OFF**

Communication radios _____ **SET**

Audio selector panel _____ **SET**

ADF _____ **SET**
- Set ADF mode

Transponder _____ **SET & STBY**

Radar _____ **STBY**

INS3 _____ **SET**

Rudder & aileron trim _____ **ZERO**

ENGINE START

The normal engine start sequence is 2 – 1 – 3.

Pneumatic pressure for engine start can be supplied from three sources:
- APU bleed.
- Ground air.
- Crossbleed from another engine.

Typically, engine 2 is started with APU bleed, then engines 1 and 3 are started using crossbleed air from engine 2 instead of the APU.
To achieve proper duct pressure for crossbleed starting, engine 2 thrust may need to be increased up to a maximum of 72% N3.

Do not use more than one air source when starting engines.

From this moment onwards actions are sometimes carried out by the pilot and flight engineer in quick succession. Colour coding will be used to identify the crew member (and station) responsible for the action.

Pilot items will be in black; flight engineer items will be in blue.

All INS _____ **NAV**

- Confirm in NAV before any movement

Transponder _____ **TA/RA**

Seatbelt sign _____ **ON**

ANTI COLL light _____ **ON**

Start ignition _____ **A OR B**

- Select A for the first flight of the day

Door lights _____ **OUT**

Galley power _____ **OFF**

Fuel pump _____ **MINIMUM ONE ON**

- Tank 2L or 2R pump on

If APU air will be used for start

- APU _____ MIN MODE
- Packs _____ PACK 2 ON
  - *Pack 1 & 3* _____ *OFF*
- All engine isolation valves _____ LATCHED
- Pneumatic pressure _____ 24 PSI MINIMUM

If external air will be used for start

- EFB AIR START UNIT _____ CONNECT
- Packs _____ ALL OFF
- All engine isolation valves _____ LATCHED
- Pneumatic pressure _____ 24 PSI MINIMUM

Engine 2 GND START switch _____ **PUSH**

- GND START RELEASE PUSH light _____ ON
- GND START VALVE OPEN light _____ ON
- If no N3 rotation within 30 seconds _____ PUSH GND START RELEASE

At 20% N3 _____ **FUEL & IGNITION ON**

At 55% N3 _____ **GND START SWITCH RELEASED**

- PUSH light out.

Engine parameters _____ **CHECK**

- N1 _____ 23%
- TGT _____ 350C
- N3 _____ 60%
- Fuel Flow _____ 1500 PPH

If APU air is used for the next start

- Engine 2 ISLN VALVE _____ UNLATCH
- Crossbleed valves _____ LATCHED

If external air is used for the next start

- Engine 2 ISLN VALVE _____ UNLATCH
- Crossbleed valves _____ LATCHED

If crossbleed air is used for the next start

- APU bleed air shutoff switch _____ UNLATCH
- EFB AIR START UNIT _____ DISCONNECT
- Start duct pressure _____ 25-30 PSI
- Engine 2 throttle up maximum 70% N3

Fuel pump _____ MINIMUM ONE ON

- One tank 1 pump on

Engine 1 GND START switch _____ PUSH

- GND START RELEASE PUSH light _____ ON
- GND START VALVE OPEN light _____ ON
- If no N3 rotation within 30 seconds _____ PUSH GND START RELEASE

At 20% N3 _____ FUEL & IGNITION SWITCH ON

At 55% N3 _____ GND START SWITCH RELEASED

- PUSH light out

Engine parameters _____ CHECK

- N1 _____ 23%
- TGT _____ 350C
- N3 _____ 60%
- Fuel Flow _____ 1500 PPH

If APU air is used for the next start

- Engine 1 ISLN VALVE _____ UNLATCH
- Crossbleed valves _____ LATCHED

If external air is used for the next start

- Engine 1 ISLN VALVE _____ UNLATCH
- Crossbleed valves _____ LATCHED

If crossbleed air is used for the next start

- APU bleed air shutoff switch _____ UNLATCH
- EFB AIR START UNIT _____ DISCONNECT
- Start duct pressure _____ 25-30 PSI
    - Engine 2 throttle up maximum 70% N3

Fuel pump _____ MINIMUM ONE ON

- One tank 3 pump on

Engine 3 GND START switch _____ **PUSH**
- GND START RELEASE PUSH light _____ ON
- GND START VALVE OPEN light _____ ON
- If no N3 rotation within 30 seconds _____ PUSH GND START RELEASE

At 20% N3 _____ **FUEL & IGNITION SWITCH ON**

At 55% N3 _____ **GND START SWITCH RELEASED**
- PUSH light out

Engine parameters _____ **CHECK**
- N1 _____ 23%
- TGT _____ 350C
- N3 _____ 60%
- Fuel Flow _____ 1500 PPH

If the APU was used for start
- APU generator breaker _____ TRIP
- OPEN light _____ ON
- Flowbar light _____ OFF
- APU bleed air shutoff valve _____ UNLATCH
- APU stop button _____ PRESS
- APU MASTER POWER _____ OFF
    - *2 minutes after pressing STOP*

If external air was used for start
- External power switch _____ OFF
- EFB AIR START UNIT _____ DISCONNECT
- GPU _____ DISCONNECT

AFTER START

Engine bleed control panel _____ **SET**
- All engines HI PRESS switches _____ LATCHED
- All ENG ISLN VALVE _____ LATCH
- Fuselage isolation valve switch _____ LATCHED
- All CROSS BLEED switches _____ LATCHED
- PACK FLOW CONTROL switches _____ LATCHED

Hydraulic panel _____ **SET**
- ATMs _____ ON
    - *Observe RPM rise*
- ATMs _____ AUTO
- Warning lights _____ OUT

- Hydraulic pressures _____ NORMAL

Electrical panel _____ **SET**
- GALLEY POWER _____ ON
- Engine generator field _____ CLOSE
- Engine generator breaker _____ CLOSE
- Generator loads _____ APPROXIMATELY EQUAL
- IDG temperatures _____ NORMAL
- IDG low pressure lights _____ OUT
- All bus fail lights _____ OUT
- ESS AC ON ALT light _____ OUT
- AC meter selector _____ GEN 3
- DC meter selector _____ BAT
- Essential power selector _____ NORMAL B3 (G1)

Fuel panel _____ **SET**
- Fuel tank pumps _____ ALL ON
- Crossfeed valves _____ CLOSED
- If there is fuel in tanks 1A/3A _____ LATCH XFER

CAPT & F/O pitot heat _____ **ON**

ALPHA probe heat _____ **ON**

CAPT & F/O windshield heat _____ **LATCH**

Side window heat switches _____ **LATCH**

Engine anti-ice _____ **AS REQUIRED**

Engine ignition _____ **BOTH**

Stabilizer trim _____ **SET FOR TAKE OFF**

Speed brakes _____ **CHECK**
- Cycle full aft and full forward, checking indications

Flaps _____ **SET FOR TAKE OFF**
- Standard takeoff flap setting is 14
- Flap position indication _____ CHECK
- LE EXT lights _____ ON

Flight controls _____ **CHECK**

TAXI

NOSE WHEEL TAXI light _____ **ON**

RWY TURNOFF lights _____ **AS REQUIRED**

Parking brake _____ **RELEASE**

Brakes _____ **CHECK**

- Check response

Speed _____ **MAXIMUM 25 KT**

- Reduce speed to 10 kt during sharp turns

LINE UP

Packs

- Normal: pack 2 only _____ PACK 1 & 3 OFF
- All off _____ ALL PACKS OFF

Antiskid _____ **ON**

Autobrake _____ **AS REQUIRED**

Strobe lights _____ **ON**

Landing lights _____ **ON**

Continuous ignition _____ **ON**

Temp probe heat _____ **ON**

Transponder _____ **TA/RA**

Radar _____ **ON**

TAKEOFF

Autopilot modes _____ **CHECK**

- Confirmed desired modes set

Thrust levers _____ **VERTICAL**

- Set & allow engines to stabilize

When engines stabilized _____ **SET THRUST**

Engine 2 fail light _____ **MONITOR**

At Vr _____**ROTATE**

- Rate of 3˚ per second, target 18˚ pitch

Initial speed target_____ **V2+10**

- Maximum 18 ˚ pitch

Positive rate of climb _____ **LANDING GEAR UP**

At acceleration altitude

- Pitch _____ SET 10˚
- At V2+10_____ SET FLAPS 10˚
- At V2+20 _____SET FLAPS 4˚
- When flaps are at 4˚_____SET CLIMB THRUST
- At V2+60 _____SET FLAPS UP
- Minimum clean speed _____V2+70

CLIMB

Autobrake_____**OFF**

NOSE WHEEL LANDING & TAXI lights_____**OFF**

RWY TURNOFF lights_____**OFF**

Continuous ignition _____**OFF**

Packs _____**ON**

- Turn all on

Passing 5,000 FT

- **1A & 3A XFR switches**_____ **LATCH**

Fuel quantity is not equal between tanks 1, 2L+2R and 3

- All crossfeed valves_____OPEN
- Tank 2L & 2R pumps_____OFF
- Tank 1 & 3 pumps _____ON

When fuel quantity is equal between tanks 1, 2L+2R and 3

- All tank pumps _____ON
- All crossfeed valves_____ CLOSE

At 10,000 ft

- Seatbelt signs _____OFF
- Landing lights_____OFF

At transition altitude

- Altimeters _____SET 1013/29.92

DESCENT

Landing data _____ PREPARED

- Set speed bugs

30 minutes before landing

- Seatbelt signs _____ON

At transition level

- Altimeters _____ SET QNH
- FLT CAB ALT SEL _____SET DESTINATION ELEVATION
- BARO SET _____ SET QNH

At 10,000 ft

- Landing lights_____ON

APPROACH

Fuel panel

- 1A & 3A XFR switches _____ CLOSE
- All tank pumps _____ON
- All crossfeed valves_____CLOSED

Configuration

- Minimum clean speed _____Vref+60
- At minimum Vref+60 _____FLAPS 4˚
  - *Vfe 250 KT*
- At minimum Vref+40 _____ FLAPS 10˚
  - *Vfe 230 KT*
- At minimum Vref+30 _____ FLAPS 22˚
  - *Vfe 215 KT*
- Landing gear _____ DOWN
- At minimum Vref+20 _____FLAPS 33 ˚
  - *Vfe 200 KT*

Autobrake_____SET

NOSE WHEEL LANDING & TAXI lights_____ON

RWY TURNOFF lights _____ **ON**

Continuous ignition _____ **ON**

GO-AROUND

Go-around thrust _____ **APPLY**
- Press TO/GA button

Pitch target _____ **18˚**

After descent stopped _____ **FLAPS 22˚**

Positive rate of climb _____ **LANDING GEAR UP**

At acceleration altitude
- Pitch _____ SET 10˚
- At Vref+10 _____ SET FLAPS 10˚
- At Vref+20 _____ SET FLAPS 4˚
- When flaps are at 4˚ _____ SET CLIMB THRUST
- At Vref+60 _____ SET FLAPS UP
- Minimum clean speed _____ Vref+70

Autobrake _____ **OFF**

NOSE WHEEL LANDING & TAXI lights _____ **OFF**

RWY TURNOFF lights _____ **OFF**

Continuous ignition _____ **OFF**

AFTER LANDING

Antiskid _____ **OFF**

Autobrake _____ **OFF**

Landing lights _____ **OFF**

Strobe lights _____ **OFF**

Continuous ignition _____ **OFF**

Air data sensor heaters _____ **ALL OFF**

Windshield heat panel
- CAPT & F/O _____ IDLE
- SIDE WINDOWS _____ OFF

Stabilizer trim _____ **ZERO**
- Full nose down

Speedbrake lever _____ **FORWARD**

Flaps _____ **UP**

Radar _____ **OFF**

APU MASTER POWER _____ **ON**

APU _____ **START**

Fuel panel
- All crossfeed valves _____ OPEN
- Tank pumps _____ ONE ON
- 1A & 3A XFR switches _____ UNLATCH

PARKING

NOSE WHEEL LANDING & TAXI lights _____ **OFF**

RWY TURNOFF lights _____ **OFF**

Parking brake _____ **SET**

If APU power will be used
- APU generator field _____ CLOSE
- APU generator breaker _____ CLOSE

If external electrical power will be used
- GPU _____ CONNECT
- External power switch _____ ON

Fuel & ignition switches _____ **OFF**

ANTI COLL light _____ **OFF**

Seatbelt signs _____ **OFF**

INS _____ ALL OFF

Transponder _____ STBY

ATMs & AC HYD PUMPS _____ OFF

Fuel tank pumps _____ LEAVE ONE ON
- One pump on for APU operation

APU bleed air shut off valve _____ ON

SECURING

Emergency exit lights _____ OFF

Standby power _____ OFF

Master radio switches _____ OFF

Galley power _____ OFF

If APU power was used
- APU generator breaker _____ TRIP
- APU bleed air shutoff valve _____ UNLATCH
- APU stop button _____ PRESS
- APU MASTER POWER _____ OFF
  - *2 minutes after pressing STOP*

If external electrical power was used
- External power switch _____ OFF
- GPU _____ DISCONNECT

Fuel tank pumps _____ OFF

Battery switch _____ OFF