X-Plane
Boeing 747-400

Author: Julian Lockwood (julian@x-plane.com)

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Contents

Background: The Boeing 747

The Boeing corporation developed the 747 in the late-1960s with the original objective of increasing the seating capacity of the 707 model by an additional 50%. The aircraft went into service in 1970, with Pan American as the first carrier. Boeing expected the aircraft to have a short production run due to the advent of supersonic airliners which were just around the corner at the time. However, this prediction turned out to be false, and to date over 1,500 aircraft have been manufactured. Production continues into 2019 but is expected to be terminated.

Production of the original variant (designated 100) began in 1970, with capacity for 480 passengers, and an upper deck comprising just six windows (later expanded to ten). These models were equipped with four Pratt & Whitney JT9D-3A engines.

A short-range version designated SR followed for the Japanese market. This aircraft had a smaller fuel capacity but greater payload capability. It was designed for short-haul flights with greater cycle numbers, featuring stronger landing gear and fuselage to facilitate this.

Following the SR model was a 100B variant. This utilized the stronger airframe and landing-gear from the SR, but with an increased fuel capacity that allowed for a range of 5,000 nautical miles, and a passenger payload of 452. This model first flew in 1979.

Following a joint request from Pan Am and Iran Air, Boeing developed the SP model. This was 48 feet shorter than the original 100, which enabled operations to major airports with short runways.

The 747-200 satisfied the desire for increased payload and range. This aircraft entered service in 1971 and utilized four Pratt & Whitney JT9D-7 engines. Also produced was a freighter version (200F), and convertible version (200C), and combined version (200M).

The 300-model debuted in 1982 with an upper deck stretched by an additional 23 feet. Powerplant options from Pratt & Whitney, Rolls-Royce and General Electric were available. A cargo model designated 300M, and short-range model designated 300SR also followed.

In 1989 the 747-400 model entered service with Northwest Airlines. This variant featured winglets for increased fuel efficiency, and a glass-cockpit that allowed for a flight-crew of two to operate the aircraft. Tail fuel tanks, and a revised interior were also featured. Powerplant options comprised Pratt & Whitney PW4062, General Electric CF6-80C2, or Rolls-Royce RB211-524 engines.

In 2005 Boeing announced the 747-8 model, which incorporated the engine and flight deck technology from the 787. This model is quieter, and more economical to operate, and first went into service with Lufthansa in 2012.

Government and Military variants

VC-25: In service with the US Air Force for VIP operations, including Air Force One.

E-4B: In service with the US Air Force as the National Airborne Operations Center (NAOC).

YAL-1: Equipped with an airborne laser for missile defense testing.

SCA: Shuttle Carrier Aircraft, operated by NASA.

B747-400 Series Specifications

Engines:

Model	----------	4 x Pratt & Whitney PW4062 turbofans
Power	----------	4 x 44,700 lb. thrust

Fuel:

Capacity	----------	57,000 Gallons / 215,700 liters / 382,000 lbs.
Fuel	----------	Jet A-1
Fuel Burn (average)	----------	3,600 Gallons / 24,000 lbs. per hour

Weights and Capacities:

Max. Takeoff Weight	----------	910,000 lbs. / 412,770 kg.
Max. Landing Weight	----------	652,000 lbs. / 295,743 kg.
Empty Operating Weight	----------	404,600 lbs. / 183,900 kg.
Maximum Payload	----------	248,600 lbs. / 113,000 kg.
Maximum Passengers	----------	524

Performance:

Max. Level Speed	----------	585 KTAS
Long Range Cruise Speed	----------	530 KTAS
Final Approach Speed	----------	130 - 140 KTAS (full flap/gear down)
Minimum Takeoff Distance*	----------	8,700 ft. / 2,650 m
Minimum Landing Distance*	----------	6,900 ft. / 2,103 m
Range	----------	8,300 nm
Service Ceiling	----------	45,000 ft. / 13,700 m

- *Representative value depending on conditions*

The X-Plane B747-400

Unlike other flight simulators, X-Plane employs a technique called “blade element theory”. This utilizes the actual shape of the aircraft (as modeled in the simulator) and breaks down the forces on each part separately. The force of the “air” acting on each component of the model is individually calculated, and combined, to produce extremely realistic flight.

When you “fly” an airplane in X-Plane, there are no artificial rules in place to govern how the aircraft behaves. Your control inputs move the control surfaces of the aircraft, and these interact with the virtual flow of air around it. As such, you may consider that you are really flying the aircraft.

Due to the use of “Blade Element Theory” in X-Plane, an aircraft must be modeled with great accuracy, in order that it behaves like its real-life counterpart. This means the fuselage, wings and tail surfaces must be the right size and shape, the center of lift and center of gravity must be in the right places, and the engine(s) must develop the right amount of power. In fact, there are a great many properties that must be modeled correctly to achieve a high-fidelity flight model.

The 747-400 featured in X-Plane has been modeled by our design team with a degree of accuracy that ensures its flight characteristics are like the real aircraft. However, despite this, some differences will be apparent, because even the smallest factor plays into the ultimate behavior of the aircraft in reality, and in X-Plane. The systems modeling of this aircraft involves some compromise too, because of the degree of complexity present in the real aircraft. However, in many cases, the actual 747-400 procedures could be followed when operating the X-Plane version. Checklists are presented later in this document (with modifications to suit this specific simulation platform and model). It is recommended that X-Plane pilots follow those procedures to extract the maximum capability and enjoyment from this aircraft.

Views and Controls

The X-Plane B747-400 features a detailed 3-D cockpit with a great many of the primary controls and systems modeled, including: Flight controls (yoke, rudder pedals, thrust levers, prop levers, condition levers), electrical systems, pneumatic systems, navigation aids, radios, autopilot, interior and exterior lighting, and fuel systems.

Hint:

To best view some of the switches featured in this aircraft, it is helpful to hide the pilot and co-pilot yokes. This can be accomplished selecting “Joystick and Equipment” from the “Settings” menu, and assigning a button, or key, to the following:

Operation | Toggle Yoke Visibility

(The default keyboard assignment is ‘y’).

Use the assigned button/key to toggle the yoke view as required. This will have no effect on the yoke operation.

Creating “Quick Look” views

Before discussing the controls, we suggest that the pilot establish a series of “Quick Look” views that will be helpful later when interacting with this particular aircraft. If you are not familiar with this technique, more information is available in the X-Plane Desktop Manual.

The following “Quick Look” views are recommended for the B747-400, in a situation where the pilot is not using a Virtual Reality (VR) headset, or a head tracking device. To some degree, these correspond (on the keyboard Number Pad) with their physical locations in the cockpit, and are therefore logical and easy to recall later.

Control Display Unit (CDU)

Pilot’s Primary Instrument Panel

Thrust Lever Quadrant and Center Console

Co-Pilot's Primary Instrument Panel

Pilot's EFIS (Electronic Flight Instrument System) Control Panel

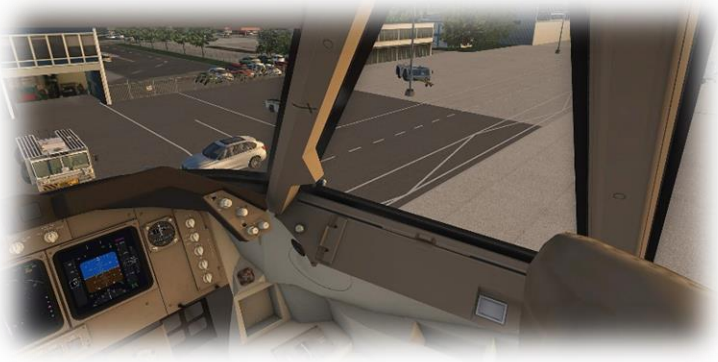
Engine-indicating and crew-alerting system (EICAS)

Co-Pilot's EFIS (Electronic Flight Instrument System) Control Panel

Pilot's Left Glance View

Overhead Panel

Co-Pilot's Right Glance View



Operating the controls

This section covers the basic techniques for the operation of the controls that you will encounter in the cockpit of an X-Plane aircraft. Control manipulators are consistent across all X-Plane aircraft. However, the specific illustrations in THIS chapter may differ from YOUR aircraft.

Toggle and Rocker switches are operated with a single click of the mouse. Place the mouse pointer slightly above, or below, the center point of the switch, depending on the direction you intend to move it. A small white arrow is displayed to confirm the intended direction. Click the mouse button to complete the operation.

Levers are operated by assigning a peripheral device to the necessary axes in X-Plane (throttle, prop, mixture etc.). More information is available in the X-Plane Desktop Manual.

Levers may also be operated by clicking and dragging the mouse pointer.

Some rotary dials are operated by positioning the mouse pointer on top of the control, and then a click and drag to the right, or to the left. The same can be accomplished using the mouse wheel - if one is present on your device.

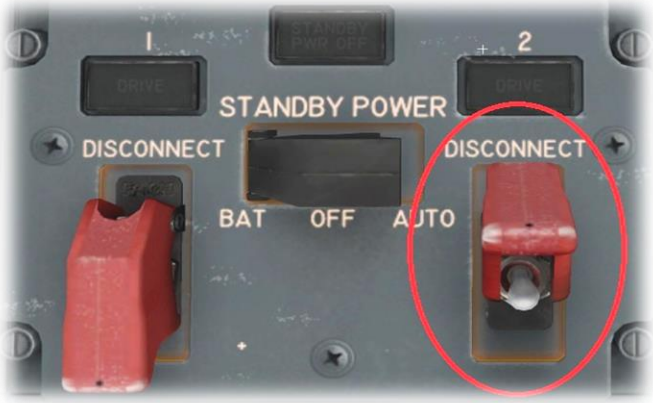
Other rotary controls require finer precision. When the mouse pointer is positioned slightly to the left of such a control, a counter-clockwise arrow appears. This indicates that you are ready to rotate the control counter-clockwise. Correspondingly, a clockwise arrow indicates that you are ready to rotate the control clockwise. After positioning the mouse pointer, changing the frequency in the desired direction is accomplished in two ways:

i) By rolling the mouse wheel forwards, or backwards

ii) By clicking (dragging is not supported here)

Radio and Navigation frequency rotary dials are grouped together as “twin concentric knobs”. Here, the larger rotary is used to tune the integer portion of the frequency, and the smaller rotary is used to tune the decimal portion. Each works independently, using the same technique, as described above.

Push buttons are operated by pointing and clicking with the mouse.



Guarded switches are used in situations where accidental activation of the switch must be prevented. To operate a guarded switch, the guard must first be opened. Do this by positioning the mouse pointer over the switch until the two vertical white arrows are displayed. Click once. If the switch is currently closed, it will open, and vice-versa. After the guard has been opened, the switch may be operated like a toggle and rocker switch (see earlier in this section).

The Yoke / Stick / Joystick is operated by assigning a peripheral device to the “roll” and “pitch” axes in X-Plane. This is discussed in greater detail later in the guide.

The Rudder Pedals are operated by assigning a peripheral device to the “yaw” axis in X-Plane. If your rudders also support toe braking, create additional assignments to the “left toe brake” and “right toe brake” axes in X-Plane. This is discussed in greater detail later in the guide.

Note that you may also assign keys on your keyboard, or buttons on your external peripheral to move the rudder to the left or right, or to center the rudder.

Assigning peripheral devices

This section of the manual deals with an “ideal” scenario, in terms of the assignment of external computer peripherals to operate the X-Plane B747-400 with the highest degree of realism. If you are missing some of these external peripherals, you may elect to choose a different configuration that better suits your hardware.

More information is available in the X-Plane Desktop Manual.

The B747-400 is equipped with Yokes, for roll and pitch control.

To simulate this, assign the lateral axis of your yoke (or joystick) to the “Roll” command in X-Plane, and the vertical axis to the “Pitch” command.

The B747-400 is equipped with four thrust levers – which control the thrust generated by engines 1 through 4 respectively.

To simulate the thrust levers for a B747-400, assign four levers on your quadrant to the “Throttle 1”, “Throttle 2”, “Throttle 3” and “Throttle 4” properties in X-Plane.

The B747-400 is equipped with a “Fuel Control toggle” for each engine. These are manually actuated by the flight crew to turn the fuel flow on, or off for each engine individually.

To simulate this, assign four toggle-switches to the “Fuel Control Switch 1”, “Fuel Control Switch 2”, “Fuel Control Switch3” and “Fuel Control Switch 4” properties in X-Plane.

The B747-400 is equipped with a Flap lever, which controls the deployment of the flaps for takeoff and landing.

To simulate this, assign a peripheral lever to the “Flaps” property in X-Plane.
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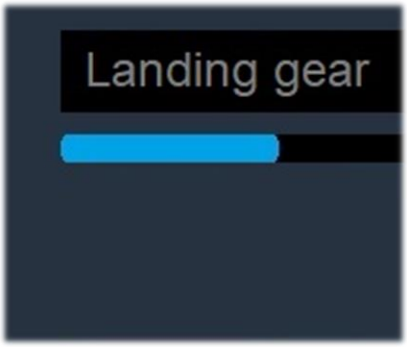

The B747-400 is equipped with a Landing Gear lever.

To simulate this, assign a peripheral lever to the “Landing gear” property in X-Plane.
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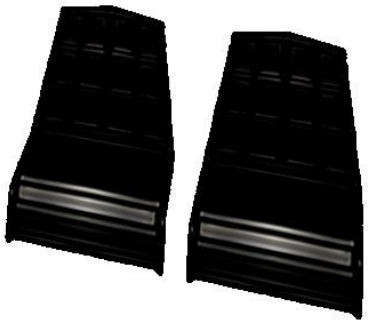
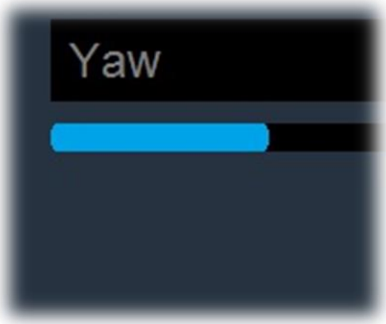
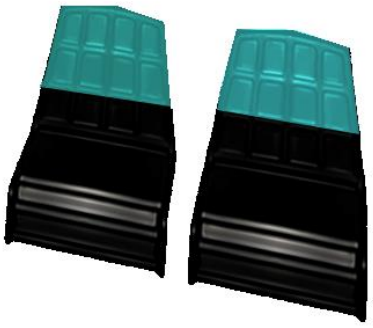




The B747-400 has conventional rudder controls, actuated by the rudder pedals.

The pedals activate the rudder, which is part of the tail assembly, and this “yaws” the aircraft to the left or right. The rudders keep the aircraft straight during takeoff and landing and help make coordinated turns.

To simulate this, assign the yaw axis of your pedals peripheral device (or a joystick axis) to the “yaw” property in X-Plane.



The B747-400 has rudder toe-braking, actuated by the tip of the rudder pedals.

To simulate this, assign the brake “toe-tipping” motion of each individual pedal (or a joystick axis) to the “left toe brake” and “right toe brake” property in X-Plane.

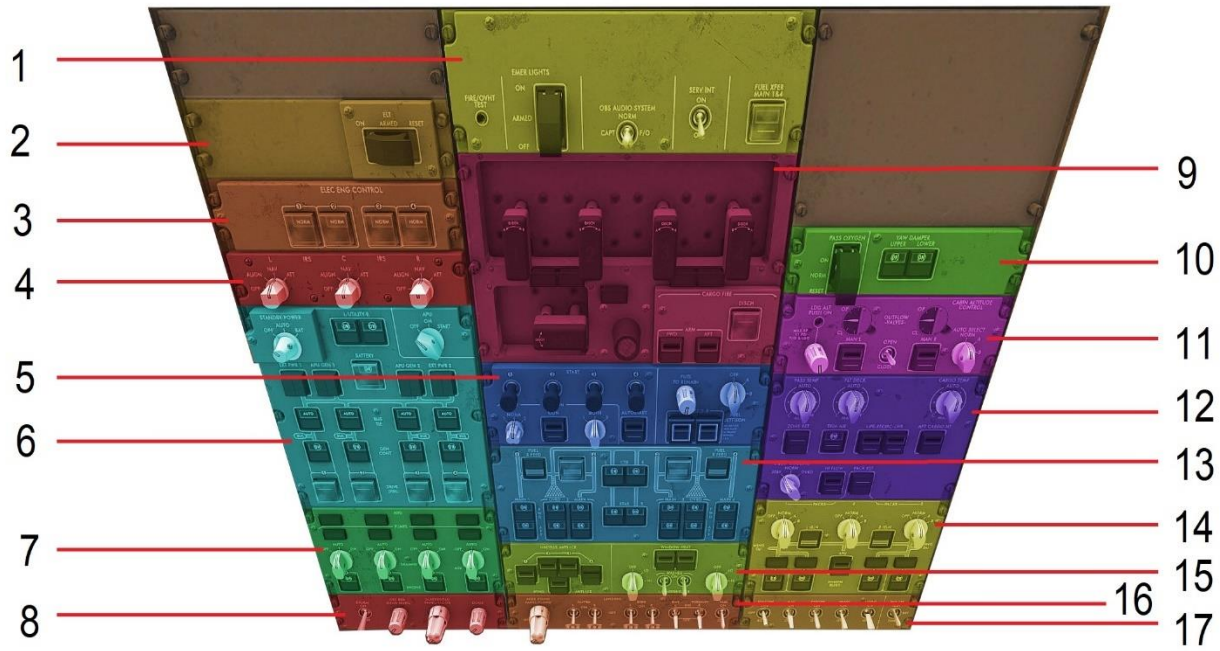
A Tour of the Cockpit

In this section of the manual, the cockpit will be broken down into distinct functional areas, and the controls that are featured in those areas will be identified and described. This will assist in locating the necessary instruments and controls later, when working through the aircraft check lists, and flying the aircraft.

Overhead Panel

The overhead panel comprises a collection of smaller panels that manage the aircraft's electrical, pneumatic, lighting, pressurization, engine start, and other systems. Many of these were previously the domain of a flight engineer in the era of three-person flight crews.

Note: Not all of the functions contained within these panels are fully simulated in the X-Plane 747-400 model.



1	**FIRE/OVHT TEST** Pushing the FIRE/OVHT TEST ENG switch creates an artificial engine fire signal (Rolls Royce RB211 engines). **OBS AUDIO SYSTEM** When CAPT is selected, the captain's audio control panel is disabled. When F/O is selected, the first officer's audio control panel is disabled. **SERV INT** The service intercom switch enables the flight crew to communicate with ground support staff.
2	**ELT** When ON is selected, the ELT (emergency locator transmitter) will begin operating immediately. When ARMED is selected, the ELT will begin operating in the event an impact is detected. When RESET is selected, this cancels an inadvertent activation of the ELT.
3	**ELECTRONIC ENGINE CONTROL** When NORMAL is selected, engine thrust is governed by EPR (Engine Pressure Ratio). When ALTERNATE is selected, engine thrust is manually set using N1 and the controlling parameter.
4	**INERTIAL REFERENCE SYSTEM** An inertial reference system (IRS) is a navigation device that accelerometers and gyroscopes to continuously calculate the orientation, direction and speed of the airfract. Select ALIGN to initialize the IRS at the start of the flight (not supported by the X-Plane FMS). Select NAV mode for normal operation, after the alignment has occurred. Select ATT mode in the event of failure or power loss. Only attitude and heading data is maintained.

5	**ENGINE IGNITERS/STANDBY** Select NORM to supply power to the engine igniters from the main AC bus. Select 1 or 2 to supply power to the engine igniters from standby buses 1 or 2 respectively. **ENGINE IGNITERS/IGNITION** Set CON to ON to enable continuous operation of the engine igniters. **ENGINE IGNITERS/AUTO** Select BOTH for the engine igniters to operate automatically on engine startup, and when trailing edge flaps are deployed, or the engine anit-ice system is on. Select 1 or 2 for the engine igniters to be powered from standby buses 1 or 2 respectively (otherwise operating as described for AUTO/BOTH). **FUEL TO REMAIN** This rotary selects the fuel to remain at the conclusion of a jettizon cycle. The value is displayed by the EICAS system. **FUEL JETTIZON SYSTEM** Select A or B for the desired fuel jettizon pumping system. Both operate in the same way, and provide redundency. **L – NOZZLE - R** Use these guarded buttons to jettizon fuel from the left or right nozzles.
6	**STANDBY POWER** Select AUTO for the normal operations. This will engage the battery standby electrical buses (via a relay), automatically when needed. Select BAT -for a manual transfer to the standby electrical buses. Select OFF to cut power entirely from the standby electrical buses. **L – UTILITY – R** Each of these two switches powers two utility and two galley electrical buses. **APU** Select (and hold briefly) START to start the APU (Auxiliary Power Generator). Select ON once APU has started. Select OFF to stop the APU. **EXT PWR** EXT PWR 1 and EXT PWR 2 are two-mode buttons that indicate the availability of external power, and connect this to buses 1 and 2 respectively. **APU GEN** APU GEN 1 and APU GEN 2 are two-mode buttons that indicate the availability of power from the APU, and connect this to buses 1 and 2 respectively.

7	**HYDRAULIC PUMPS/OFF** Turns off the hydraulic pump driven by its respective engine (1,2,3 or 4). **HYDRAULIC PUMPS/AUTO** The hydraulic pump driven by its respective engine (1,2,3 or 4) will activate automatically when pressure is low. **HYDRAULIC PUMPS/ON** Turns on the hydraulic pump driven by its respective engine (1,2,3 or 4). **ENGINE PUMPS/ON** Pressurizes the hydralic system from the respective engine pump. **ENGINE PUMPS/OFF** Cuts pressure to the hydraulic system from the respective engine pump.
8	**STORM** Globally sets the cockpit lighting to maximum intensity. Helps prevent temporary blindness due to lightening flashes in a dark cockpit. **CKT BKR OVHD PANEL** Controls the brightness of the overhead panel back-lighting. **GLARESHIELD PANEL/FLOOD** Controls the brightness of the lighting underneath the glareshield. **DOME** Controls the brightness of the cockpit dome lighting.
9	**ENGINE DISCH** In the event of an engine overheat or fire, pull (click) the associated DISCH handle to cut off hydraulics/fuel/electrical power to that engine. If the warning continues, rotating the handle clockwise or counter-clockwise will discharge fire extinguisher bottles A or B respectively. **APU DISCH** In the event of an APU overheat or fire, pull (click) the associated DISCH handle to cut off hydraulics/fuel/electrical power to the APU. If the warning continues, rotating the handle clockwise or counter-clockwise will discharge fire extinguisher bottles A or B respectively. **CARGO FIRE ARM** These switches arm the forward and aft cargo fire extinguisher system. **CARGO FIRE DISCH** Discharges the fire extingisher system for the forward or aft cargo area.

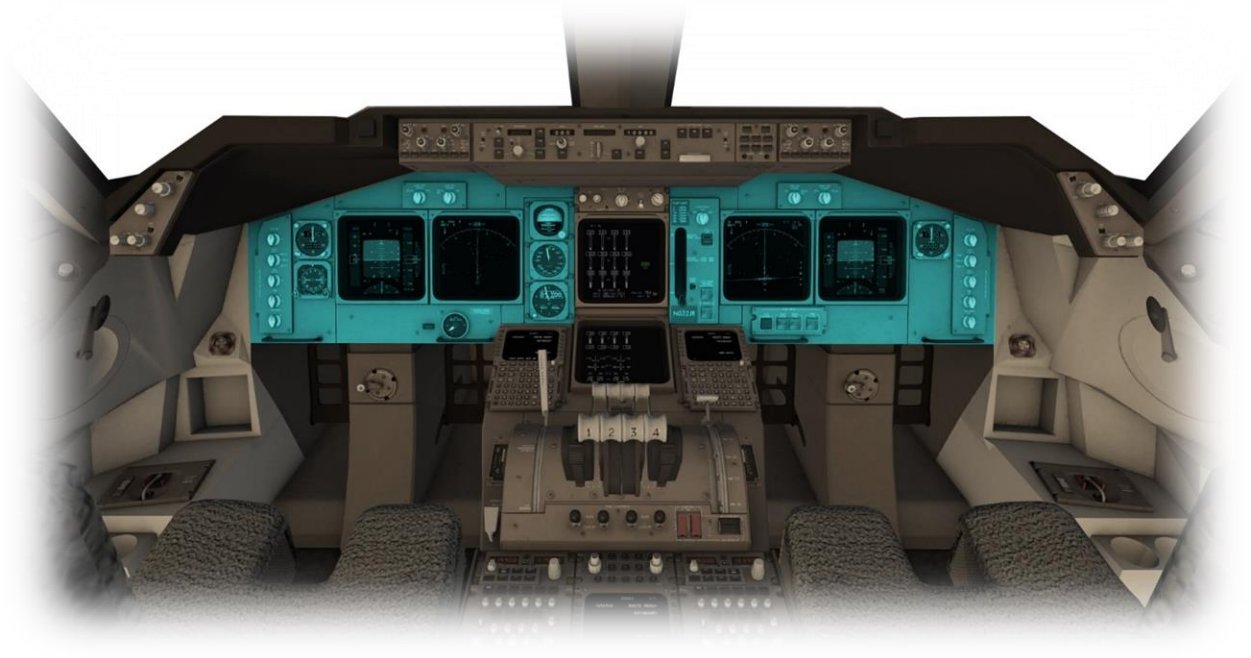
10	**PASSENGER OXYGEN (SUPPLIMENTAL)** NORM System automatically activates if cabin altitude exceeds 14,000 feet. ON Manually activates system. RESET Manually deactivates system if cabin altitude is below 12,000 feet. **YAW DAMPER** UPPER Activates upper rudder for automated yaw dempening. LOWER Activates lower rudder for automated yaw dampening.
11	**LDG ALT Button and Rotary** Set to ON in conjunction with the rotary control to manually set cabin landing pressurization altitude. **OUTFLOW VALVES** Indicators display the position of the pressurization system outflow valves (OPEN through CLOSED). **MANUAL OVERRIDES** These switches may be used to set the outflow valves to either manual (ON) or automatic (OFF) modes. **OPEN/CLOSE** Open or close the outflow valves (when in manual mode). **CABIN ALTITUDE CONTROL** NORM Automatically sets cabin altitude controller to A or B on alternating flights. A / B Selects cabin altitude controller A or B as the primary controller.

12	**PASS TEMP** Provides automatic temperature control for the passenger cabin. **FLT DECK (TEMP)** Provides automatic temperature control for the flight deck. **CARGO TEMP** Provides automatic temperature control for the cargo holds. **ZONE RST** Resets zone temperature controller in the event a fault occurred and no longer exists **TRIM AIR** The trim air system adds warm air to zones in the event they exceed the desired air-conditioning threshold. Set to ON for automated operation. **UPR-RECIRC-LWR** Arms the recirculating fans for automated operation. **AFT CARGO HT** When ON, bleed air from the engines is used to heat the aft cargo compartment. **EQUIP COOLING** NORM Cooling air is automatically directed into the forward cargo compartment, or exausted overboard, depending on the outside air temperature. STBY Always directs outside air to the forward cargo compartment. OVRD Never directs outside air to the forward cargo compartment. **HIGH FLOW** When ON, all climate control packs provide a high flow of air. **PACK RST** Resets climate control packs in the event a fault occurred and no longer exists.
13	**FUEL X FEED** Set to ON to enable cross-feed of fuel between the tanks illustrated by the schematic. **PUMP SWITCHES** Set to ON to activate the fuel pump for the tank illustrated by the schematic.

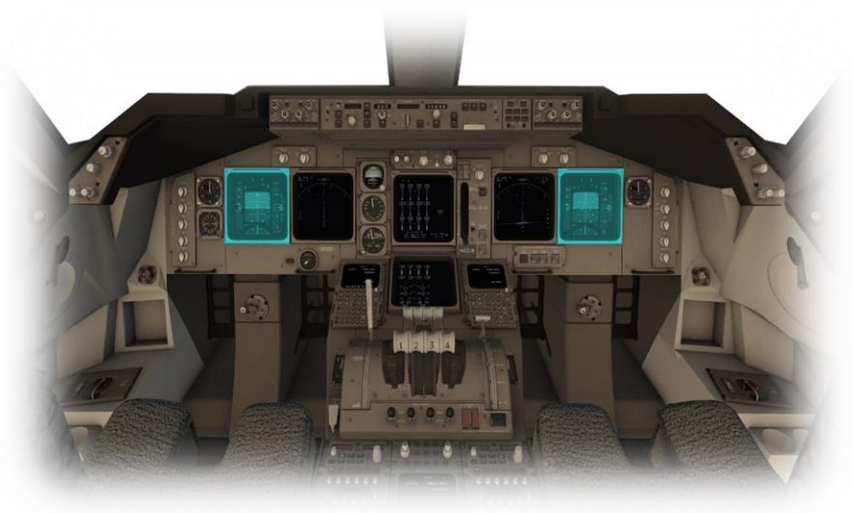
14	**PACKS** Set to OFF to disable the associaed air-conditioning pack. Set to NORM for automated selection of the operational air-conditioning pack (A or B on alternating flights). Set to A or B to manually activate the desired air-conditioning pack. **ENGINE BLEED** Set to ON to open the bleed air valve for the associated engine. This connects the engine to the bleed air system. **APU (BLEED)** Set to ON to pressurize the bleed air system from the APU. **L ISLN / R ISLN** Set to ON to isolate the air-conditioning packs from bleed air pressure provided by the APU.
15	**NACELLE ANTI-ICE** Set to ON to open the bleed-air anti-icing valve for the associated engine. Used when icing is possible. **WING ANTI-ICE** Set to ON to open the bleed-air anti-icing valve for the left and right wings. Used when icing is possible. **WINDOW HEAT** Set to ON to enable anti-ice and de-fogging measures to the associated cockpit window. **WIPER (LEFT and RIGHT)** These rotaries control the left and right windshield wiper speeds. **WASHER** Set to ON to apply washer fluid to the associated cockpit window.
16	**AISLE STAND PANEL/FLOOD** Use the inner rotary to set the brightness of the pedestal flood lighting. **OUTBOARD LANDING LIGHTS** Set to ON to activate the left and right outboard landing lights respectively. **INBOARD LANDING LIGHTS** Set to ON to activate the left and right inboard landing lights respectively. **RUNWAY TURNOFF** Set to ON to enable the left and right (nose-gear mounted) runway turn-off lights respectively. **TAXI LIGHT** Set to ON to enable the (nose gear mounted) taxi lights.

17	**BEACON** Set to LWR to activate the underside beacon. Set to BOTH to activate both beacons. **NAV** Set to ON to activate the (green, red and white) navigation lights. **STROBE** Set to ON to activate the wing and tail-mounted strobe lights. **WING** Set to ON to activate the wing leading edge lights (for ice or damage inspection). **LOGO** Set to ON to enable the tail logo lights. **INDICATOR LIGHTS/TEST** Set to TEST to illuminate all indicator lights in the cockpit. Set to BRT for bright indicator lights throughout the cockpit. Set to DIM for dim indicator lights throughout the cockpit.

Primary Instrument Panels



Electronic Attitude Director Indicator (EADI)



This is the outboard CRT panel in the avionics cluster. The EADI displays the attitude of the aircraft relative to the horizon, and the altitude (above sea level) - via the scale on the right.

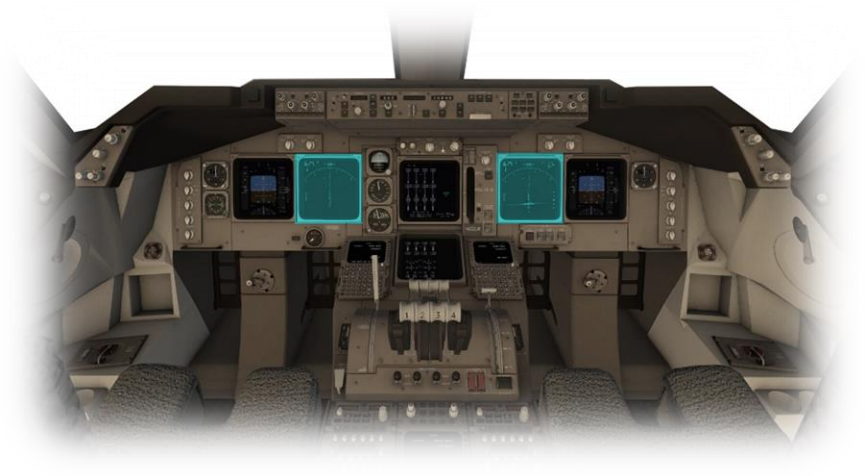
The attitude display informs the pilot whether the aircraft is flying straight, or turning, and whether the aircraft is climbing, or descending. This information is crucial in “instrument conditions” - when the outside horizon is not visible.

The EADI also displays localizer and glideslope deviation, when coupled to an ILS approach.

The EADI is covered in detail in a separate chapter:

Electronic Attitude Director Indicator (EADI) Components

Electronic Horizontal Situation Indicator (EHSI)



This is the inboard CRT panel in the avionics cluster. The EHSI displays the aircraft's position & (magnetic) heading.

The display is presented in a plan view, as if looking down at the aircraft from directly above.

If a flight plan has been input (using the FMS), this panel also displays the aircraft's position relative to the desired track.

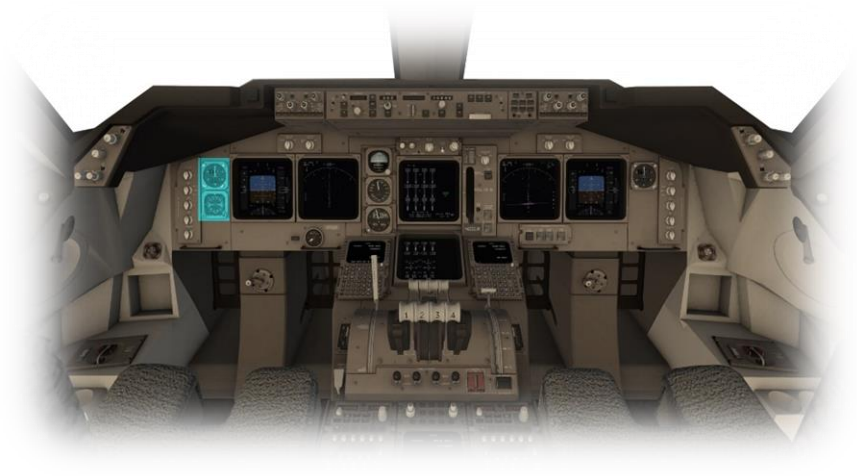
The EHSI is covered in detail in a separate chapter:

Electronic Horizontal Situation Indicator (EHSI) Components

Standby Attitude/Airspeed/Altitude Indicators

These instruments use an alternate static system and provide redundancy in case of failure of the EADI/EHSI systems.

Chronometer and ADF



Chronometer

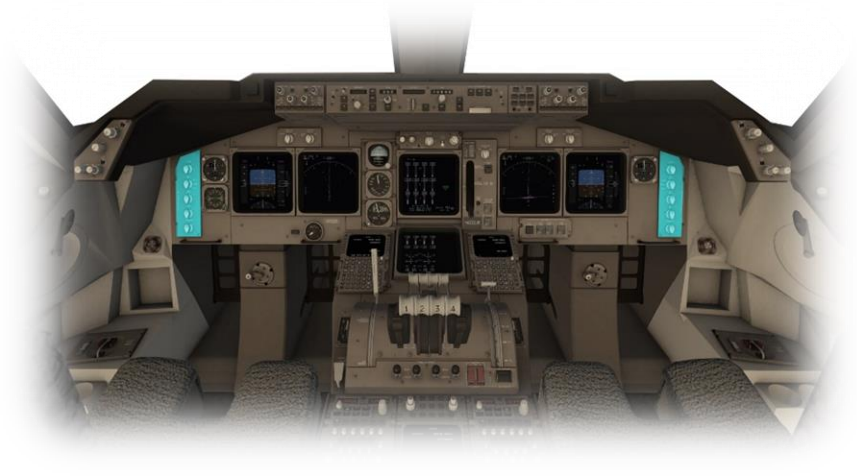
Displays the current time, and (flight) elapsed time. Current time is displayed in UTC, or local (controlled by the button at the upper-right). Start, Hold and Reset the chronometer timer using the CHR button at the upper left.

ADF

This instrument displays a direct course to the chosen navigation aid (VOR or NDB).

The chosen navigation aid is that tuned by the active 'Nav' radio.

Source Selector Panels



AIR DATA

Selects the active Air Data Computer (ADC) providing airspeed data to the associated EADI/EHSI.

FLT DIR

Selects the active Flight Control Computer for the associated EADI/EHSI.

NAV

Selects the active Flight Management Computer (FMC) and Control Display Unit (CDU) for the associated EADI/EHSI.

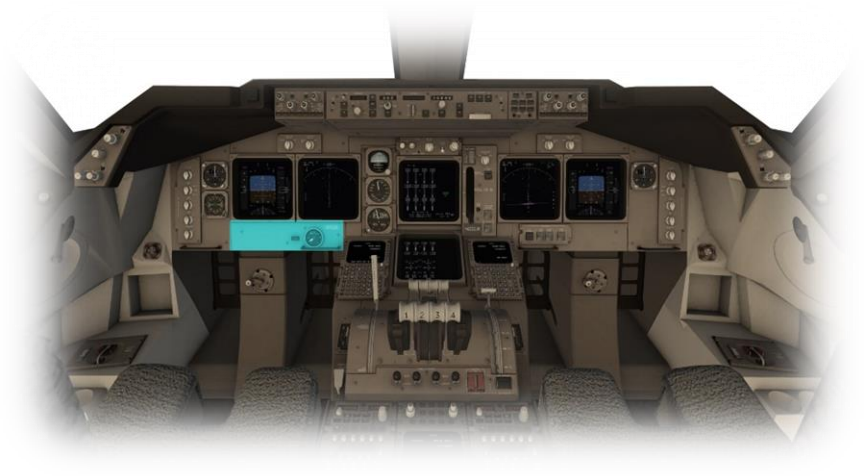
EIU

Selects the Engine Information Unit (EIU) for the associated EADI/EHSI.

IRS

Selects the active Inertial Reference System (IRS) for the associated EADI/EHSI.

Brake/Accumulator Pressure Indicator



Indicates hydraulic pressure available to the normal braking system.

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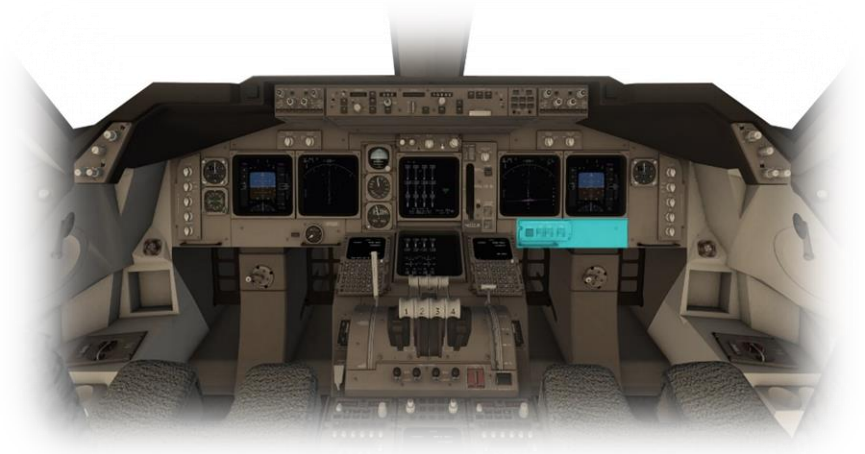
Ground Proximity Warning System



G/S INHIBIT

Inhibits or cancels the 'Below Glideslope' aural warning.

FLAP OVRD

Inhibits or cancels aural warnings related to flap position.

GEAR OVRD

Inhibits or cancels aural warnings related to gear position.

TERR OVRD

Inhibits or cancels aural warnings related to terrain.

CRT Selector Panels

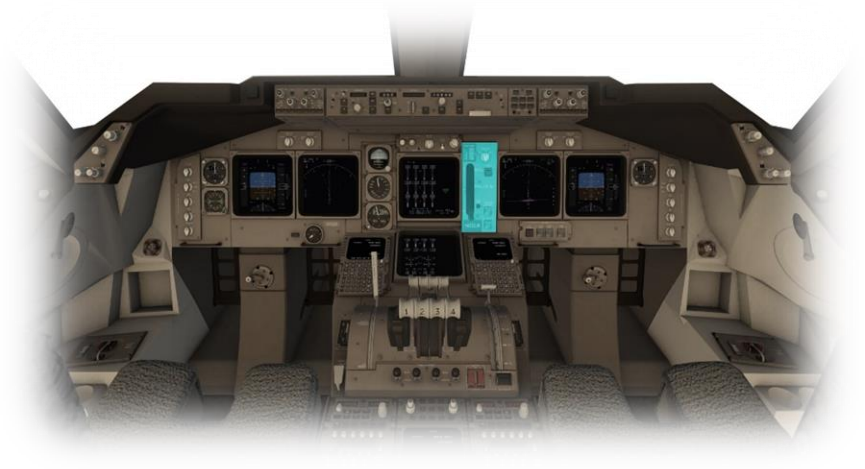
LWR CRT

Selects the presentation to be displayed on the lower (central) CRT display.

INBD CRT

Selects the presentation to be displayed on the inboard CRT panel.

Landing Gear and ALTN Flaps



UP

Landing gear retracted

DOWN

Landing gear down

OFF

Landing gear stowed

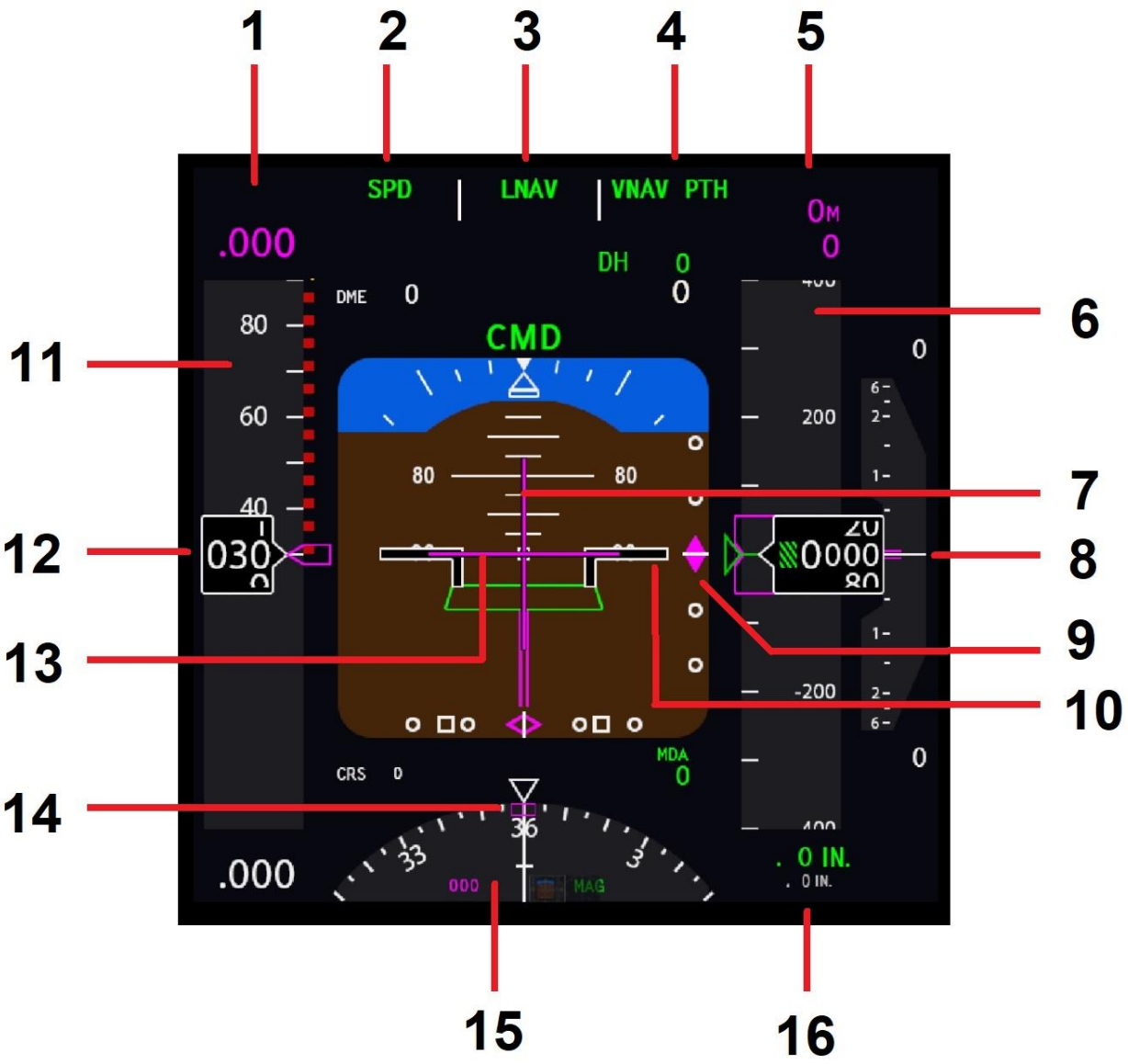
ALTN Flaps

This rotary extends or retracts the flaps using an (alternate) electrically powered system. This is used in the event the hydraulics are not operating normally.

ARM

Arms the alternate flap system.

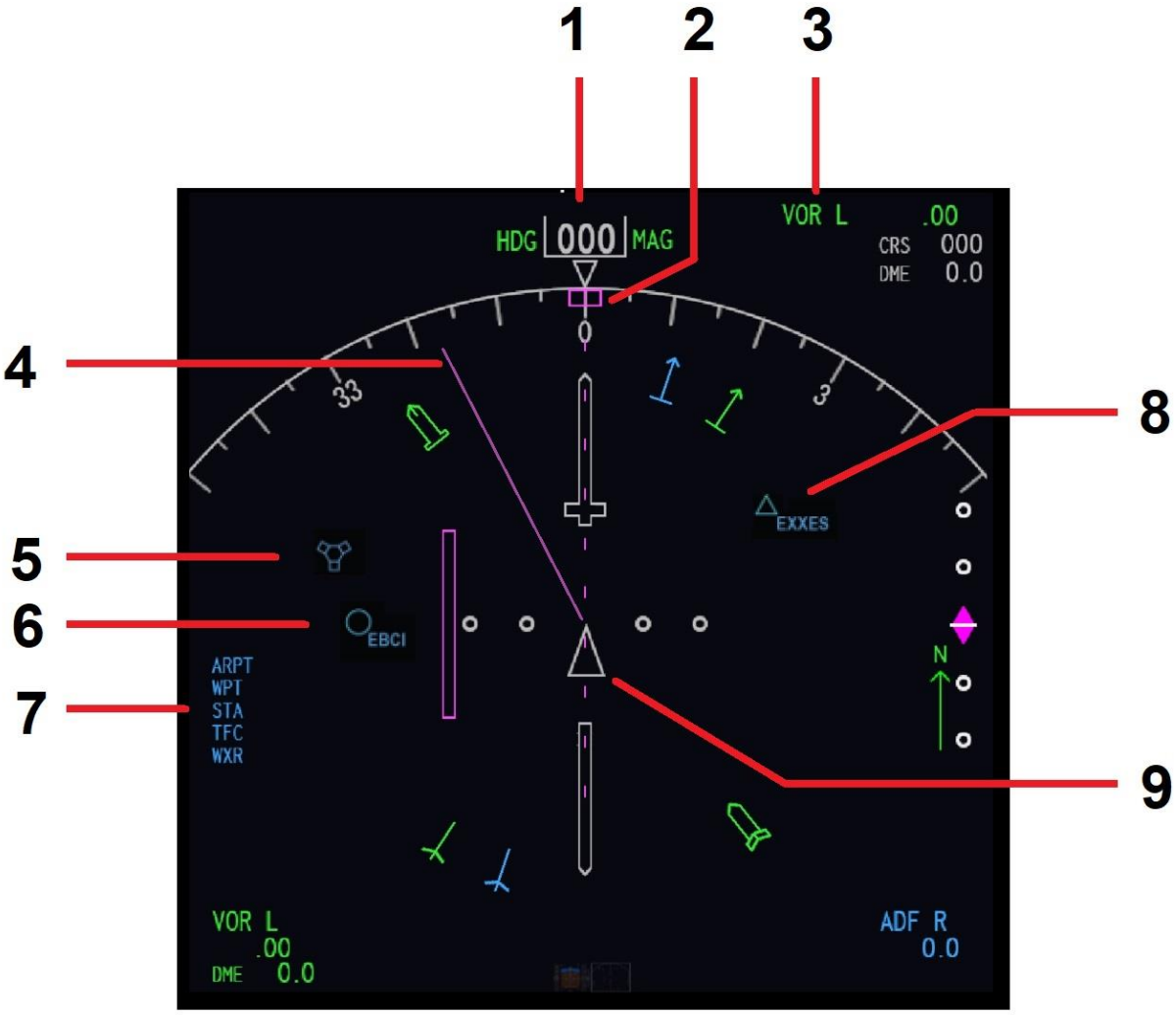
Electronic Attitude Director Indicator (EADI) Components



1	Mach Number	Airspeed expressed as a percentage of the speed of sound (Mach-1).
2	FMC SPD	Aircraft speed is controlled by the FMC (Flight Management Computer)
3	LNAV	LNAV (Lateral Navigation Mode) engaged. The autopilot will steer the aircraft laterally according to the programmed flight plan.
4	VNAV	VNAV (Vertical Navigation Mode) engaged. The autopilot will manage altitude according to the programmed flight plan.

5	**Altitude Pre-Set**	Pre-set altitude at which the autopilot will level off.
6	**Altitude Scale**	
7	**Flight Director Horizontal Deviation Bar**	When the aircraft is following a flight-plan, or according to a navigation aid, this bar informs the pilot to climb, or descend, to intercept the desired altitude.
8	**Current Altitude**	
9	**ILS Vertical Deviation Scale**	Displays the extent of any vertical deviation above, or below the desired ILS glide slope.
10	**Static Reference Lines**	A static reference showing the position of the aircraft with respect to the artificial horizon – in terms of ascent, descent, a left turn, or a right turn.
11	**Airspeed Scale**	
12	**Current Airspeed**	
13	**Flight Director Vertical Deviation Bar**	When the aircraft is following a flight-plan, or according to a navigation aid, this bar informs the pilot to steer left, or right, to intercept the desired track.
14	**Heading Bug**	Sets the desired heading for the autopilot (when in the appropriate mode).
15	**Magnetic Heading**	The aircraft's current magnetic heading.
16	**Altimeter Setting**	STD (29.92 inches of mercury) or manual setting.

Electronic Horizontal Situation Indicator (EHSI) Components



	GS / TAS / Wind	GS: Ground Speed TAS: True Air Speed Wind speed and direction. The graphic indicates wind direction relative to the aircraft's current heading.
1	**Current Magnetic Heading**	
2	**Heading Bug**	Sets the desired heading for the autopilot (when in the appropriate mode).
3	**VOR Information**	Frequency and distance of VOR tuned by NAV radio
4	**Flight Plan Course**	

5	**VOR**	The location of a VOR relative to the current position of the aircraft
6	**Airport**	The location of an airport relative to the current position of the aircraft
7	**Active Features**	The features currently displayed by the EHSI ARPT: Airports are displayed WPT: Waypoints are displayed STA: Radio navigation aid STATIONS TFC: Traffic WXR: Weather radar
8	**Waypoint**	
9	**Current Location**	

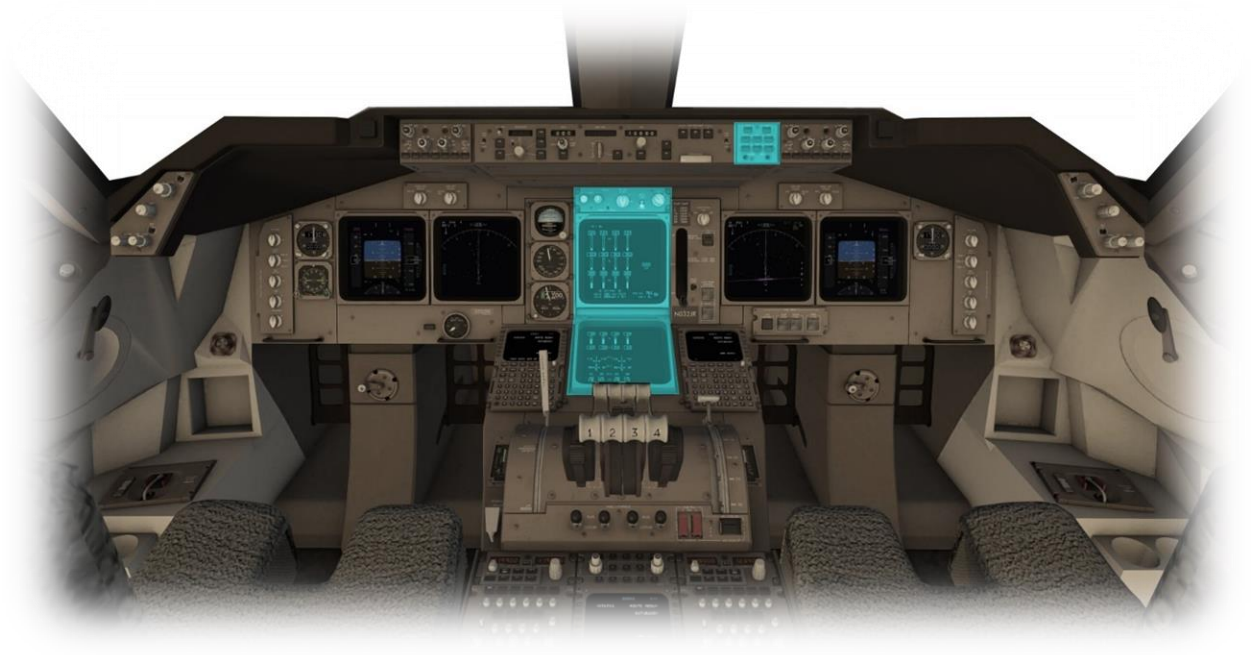
EADI / EHSI Control Panel

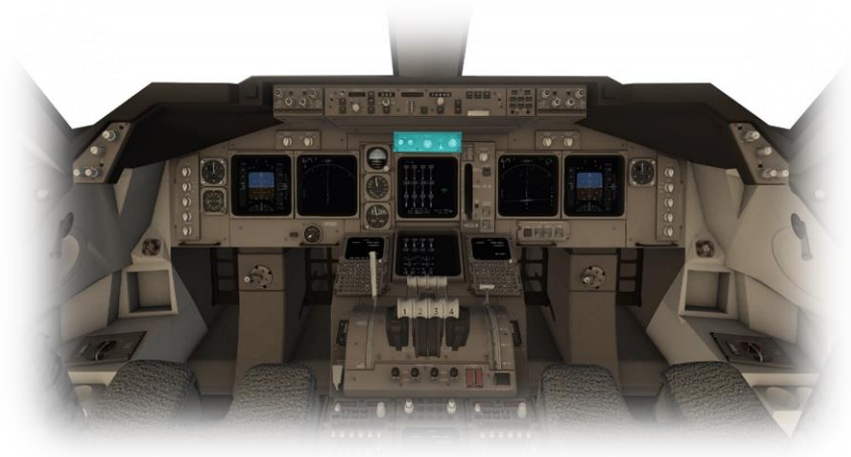
A separate EADI / EHSI Control Panel is provided for the pilot and first-officer. These work independently, and are used to control and customize the settings and information presented on the pilot and first-officer displays respectively:

DH/MINS/MDA	Selects the display of Decision Height, Minimums, or Minimum Decision Altitude. This is dependent on the approach type currently in effect.
MTRS	The EADI altitude scale will also display altitude data in meters.
Baro Rotary	Used to set the altimeter barometric pressure and units.
VOR L / ADF L	Enables navigation using the VOR L / ADF L NAV radios.
VOR R / ADF R	Enables navigation using the VOR R / ADF R NAV radios.

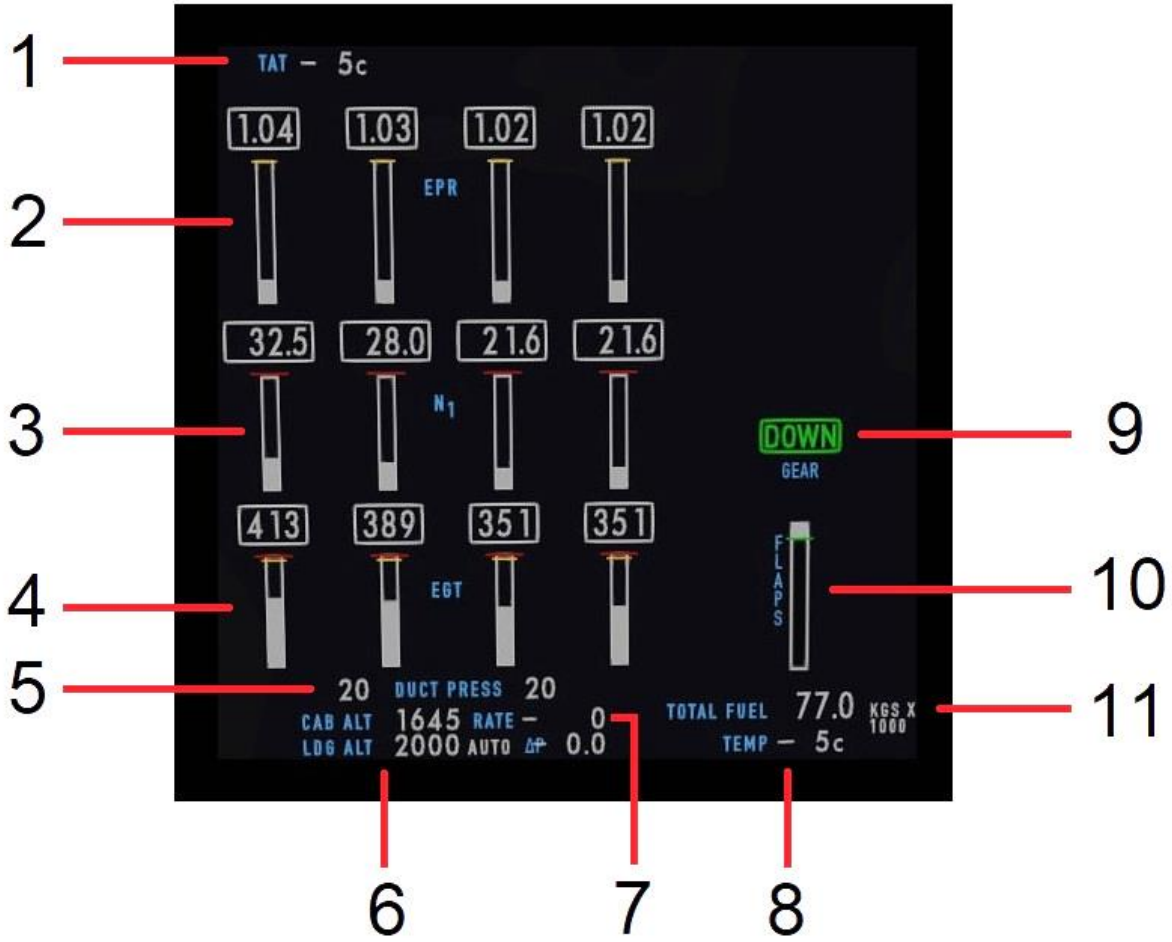
EHSI Mode	APP: Places the EHSI display in 'Approach' mode. Lateral deviation from the desired course is included. VOR: Places the EHSI display in 'VOR' mode. Lateral deviation from the desired radial is included. MAP: Places the EHSI display in 'MAP' mode. The location of the aircraft is presented at the bottom of the screen, and the map incorporates airports, navigation aids and waypoints (within the selected range) that are ahead of, and 45 degrees either side of, this position. PLAN: Places the EHSI display in 'PLAN' mode. The location of the aircraft is presented at the center of the screen, and the map incorporates airports, navigation aids and waypoints (within the selected range) in all directions.
TFC	The rotary control sets the maximum distance displayed by the EHSI map
Push Buttons	Used to select the features displayed by the EHSI WXR: Weather radar STA: Radio navigation aid STATIONS WPT: Waypoints are displayed ARPT: Airports are displayed DATA: Not supported POS: Not supported TERR: Not supported

EICAS System



EICAS Master Controls	
	BRT The left outer rotary controls the brightness of the Upper EICAS (Engine Indications and Crew Alerting System) Display. The right outer rotary controls the brightness of the Lower EICAS (Engine Indications and Crew Alerting System) Display EIU SEL Selects the engine interface unit providing data to the EICAS system HDG Sets true north or magnetic north at the top of the EHSI display. FMC Selects the FMC (CDU) that will interface with the engine electronic controller, flight control computer, and navigation radio tuning.

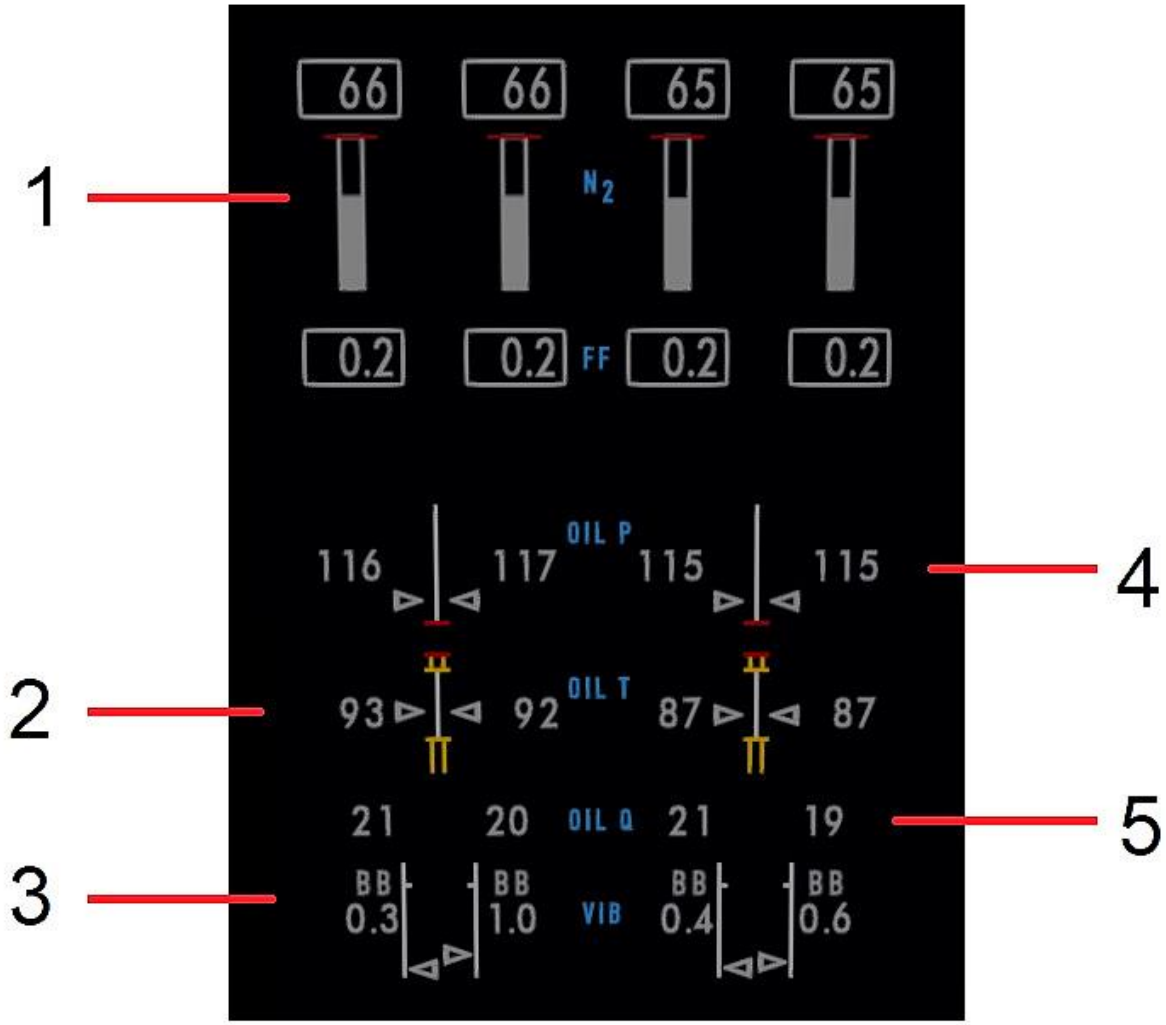
Upper EICAS (Engine Indications and Crew Alerting System) Display



1	TAT	Total Air Temperature: Measured by an external probe. This an essential data item for the calculation of true airspeed.
2	EPR	Engine Pressure Ratio (EPR) for engines 1 through 4 respectively. EPR is a measure of actual thrust.
3	N1	N1 for engines 1 through 4 respectively. Expressed as a percentage, this is a measure of the rotational speed of the low-pressure compressor at the front of the engine.
4	EGT	Exhaust Gas Temperature for engines 1 through 4 respectively.
5	Duct Pressure	Hydraulic pressure at the left and right APU bleed air ducts.
6	Pressurization Altitudes	Displays current cabin altitude and (auto-selected) cabin landing altitude (used by the pressurization system).

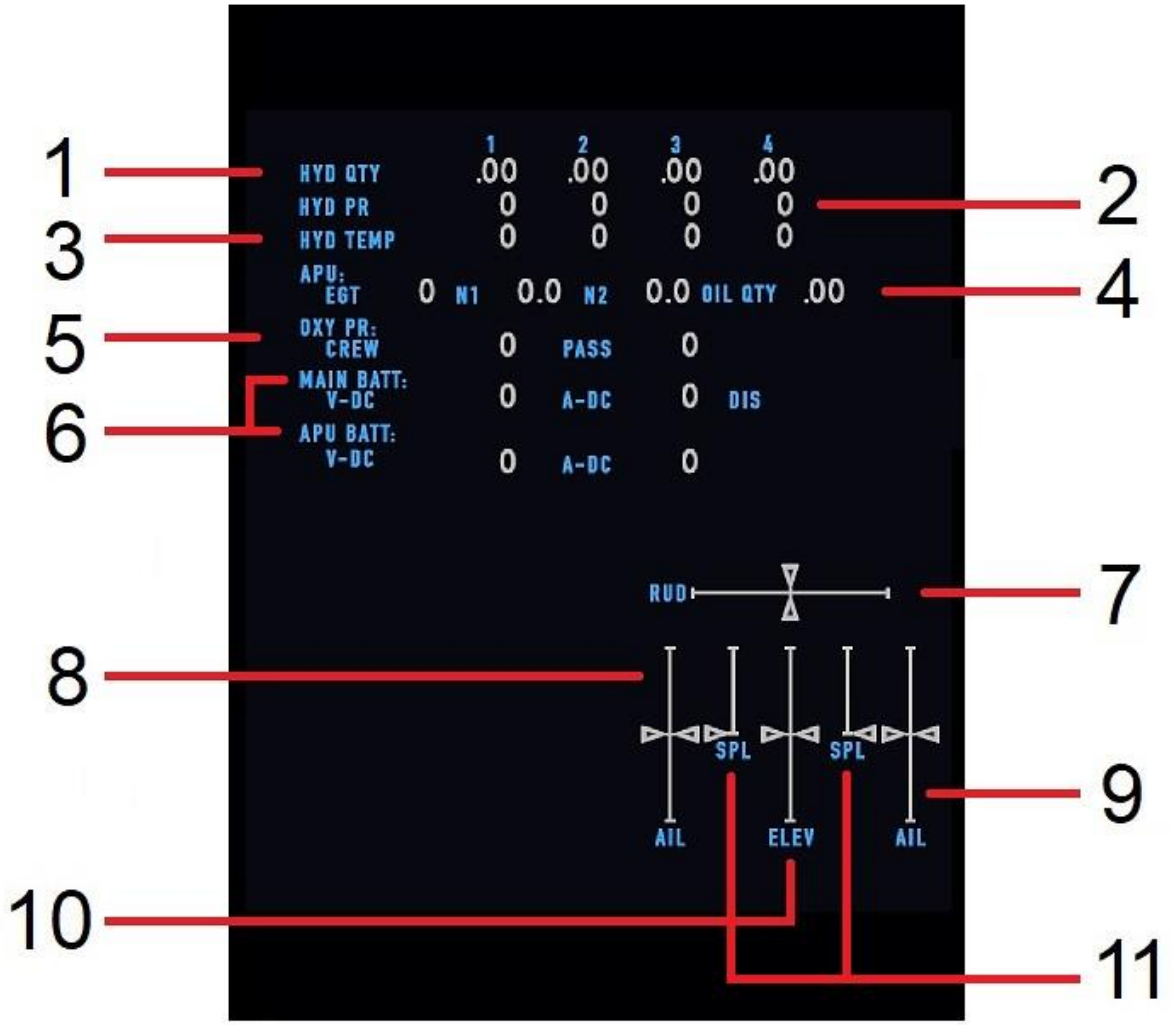
7	Rate	The rate of pressure-change in the cabin.
8	Fuel Temperature	
9	Landing Gear Status	
10	Flap Status	
11	Fuel Quantity	

Lower EICAS (Engine Indications and Crew Alerting System) ENG Display



1	N2	N2 for engines 1 through 4 respectively. Expressed as a percentage, this is a measure of the rotational speed of the high-pressure compressor at the rear of the engine.
2	OIL TEMP	Engine and gearbox oil temperature (in degrees Celsius)
3	VIB	N1 and N2 rotor vibration expressed on a scale of 1.0 (good) to 4.0 (bad).
4	OIL P	Engine and gearbox oil pressure (in psi)
5	OIL QTY	Engine and gearbox oil quantity remaining (in quarts)

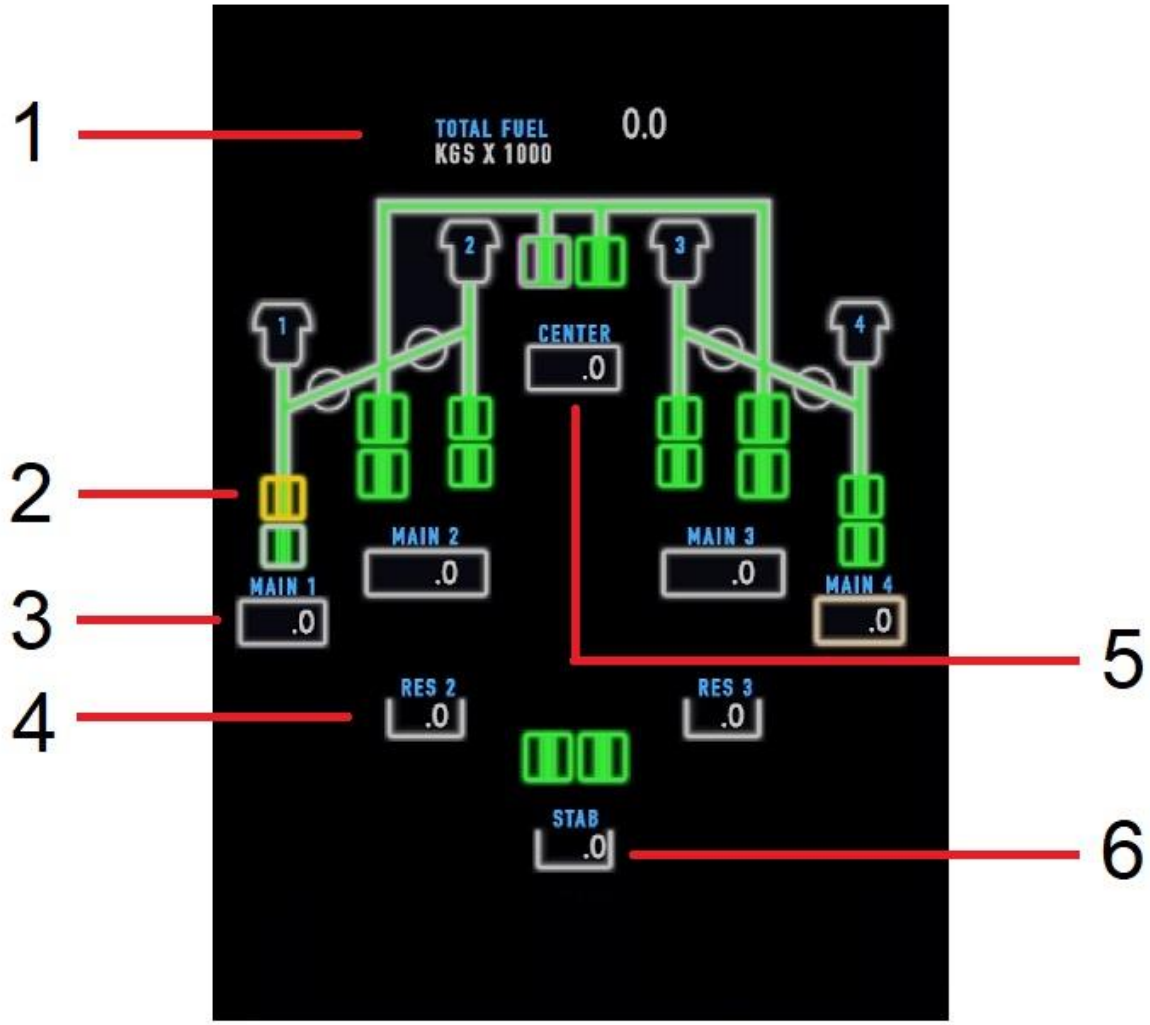
Lower EICAS (Engine Indications and Crew Alerting System) STAT Display



1	HYD QTY	Hydraulic fluid quantity (%) for engines 1 through 4 respectively.
2	HYD PR	Hydraulic pressure (PSI) for engines 1 through 4 respectively.
3	HYD TEMP	Hydraulic fluid temperature for engines 1 through 4 respectively.
4	APU EGT / N1 / N2 / OIL QTY	Auxiliary Power Unit (APU) Exhaust Gas Temperature / N1 rotation speed % / N2 rotation speed % / Oil Quantity.
5	OXY PR	Cabin Supplementary oxygen pressure for crew and passengers.
6	Main and APU Battery Voltage	The main and APU batteries provide backup power to select DC powered components in the aircraft.

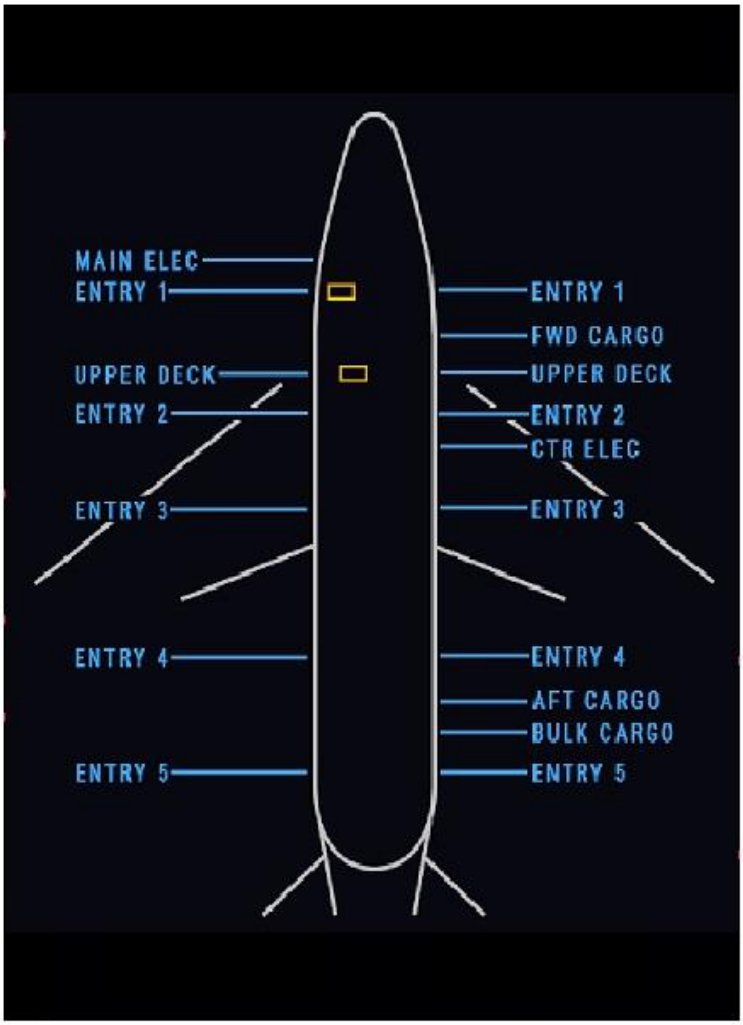
7	Rudder Position	Rudder position relative to neutral.
8	Left Aileron Position	Left Aileron position relative to neutral.
9	Right Aileron Position	Right Aileron position relative to neutral.
10	Elevator Position	Elevator position relative to neutral.
11	Left and Right Speed Brake Positions	Left and right speed brake deployment relative to zero.

Lower EICAS (Engine Indications and Crew Alerting System) FUEL Display



1	TOTAL FUEL	Total fuel remaining across all tanks.
2	Fuel Pump Status	The status of the fuel pump indicated in the schematic. White = Pump Off, Green = Pump On, Amber = Low Pressure.
3	Main Tank Fuel	Fuel remaining in the MAIN tank indicated in the schematic.
4	Reserve Tank Fuel	Fuel remaining in the RESERVE tank indicated in the schematic.
5	Center Tank Fuel	Fuel remaining in the CENTER tank.
6	Stabilizer Tank Fuel	Fuel remaining in the STABILIZER tank. Fuel in this tank is transferred automatically to manage the aircraft's Center of Gravity (CG).

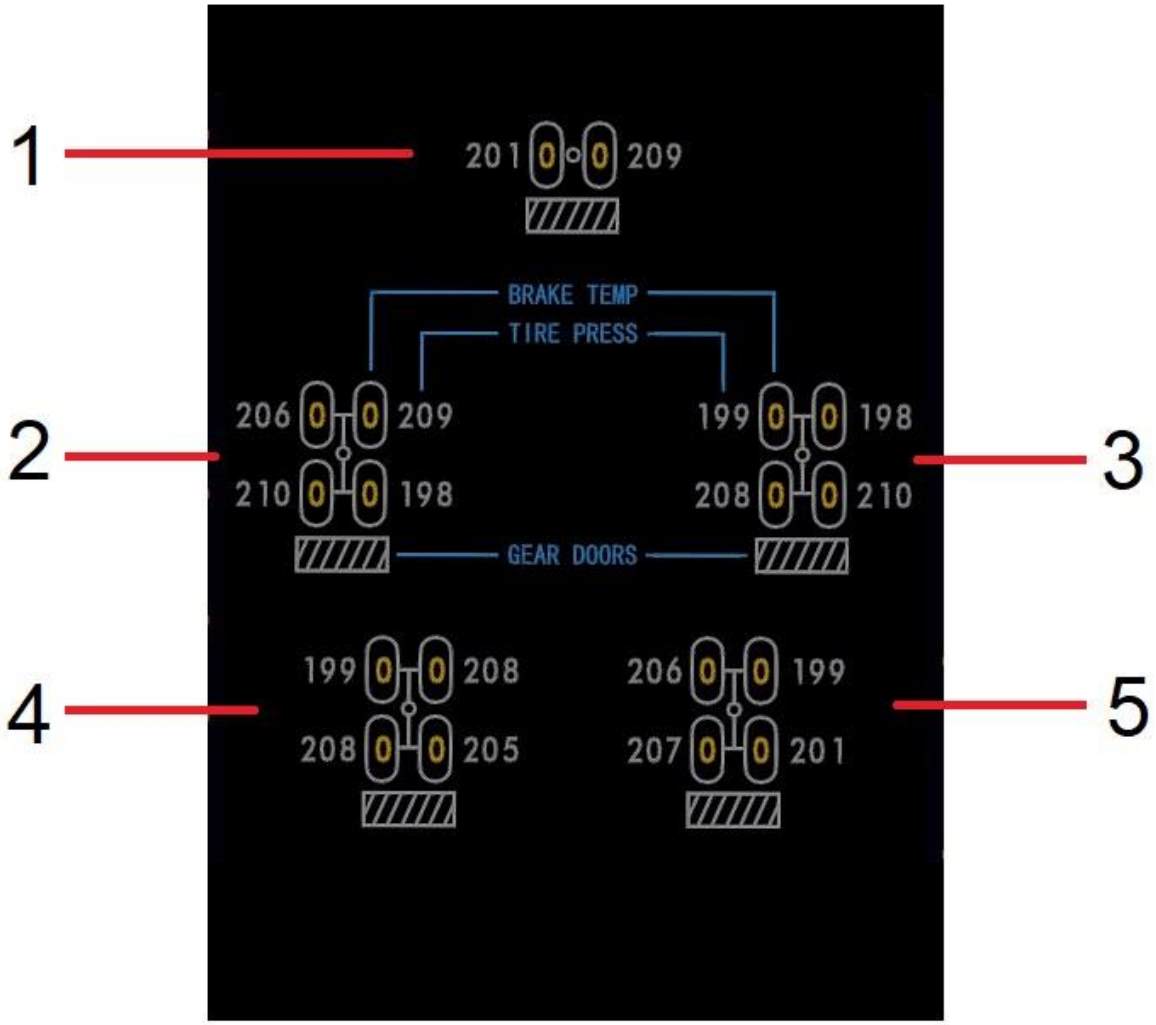
Lower EICAS (Engine Indications and Crew Alerting System) DRS Display



MAIN ELEC	External Electrical Connectivity Door	Yellow indicator = Open. Blank = Closed.
ENTRY 1	Lower Deck #1 Door Pair	Yellow indicator = Open. Blank = Closed.
FWD CARGO	Forward Cargo Door	Yellow indicator = Open. Blank = Closed.
UPPER DECK	Upper Deck Doors	Yellow indicator = Open. Blank = Closed.
ENTRY 2	Lower Deck #2 Door Pair	Yellow indicator = Open. Blank = Closed.
ENTRY 3	Lower Deck #3 Door Pair	Yellow indicator = Open. Blank = Closed.

ENTRY 4	Lower Deck #4 Door Pair	Yellow indicator = Open. Blank = Closed.
AFT CARGO	Aft Cargo Door	Yellow indicator = Open. Blank = Closed.
BULK CARGO	Large Cargo Door	Yellow indicator = Open. Blank = Closed.
ENTRY 5	Lower Deck #5 Door Pair	Yellow indicator = Open. Blank = Closed.

Lower EICAS (Engine Indications and Crew Alerting System) GEAR Display



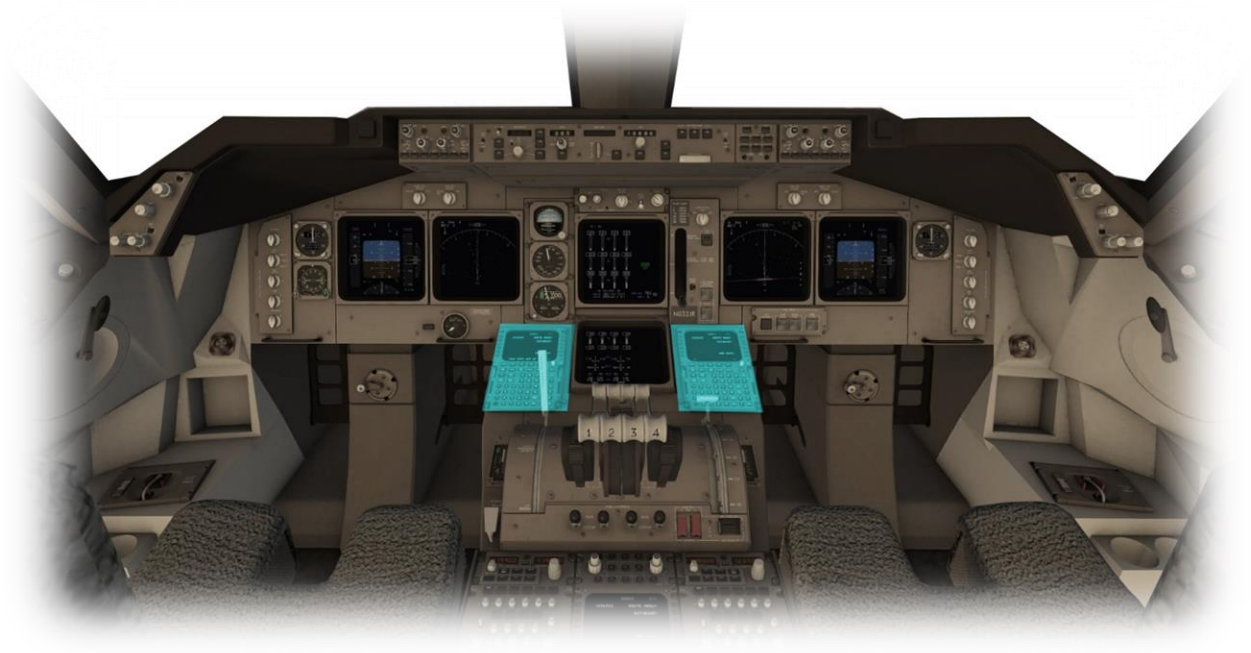
1	Nose Landing Gear	Tire Pressure and Brake Temperature indicators
2	Left Center (Forward) Landing Gear	Tire Pressure and Brake Temperature indicators
3	Right Center (Forward) Landing Gear	Tire Pressure and Brake Temperature indicators
4	Left Center (Aft) Landing Gear	Tire Pressure and Brake Temperature indicators
5	Right Center (Aft) Landing Gear	Tire Pressure and Brake Temperature indicators

EICAS Control Panel

The EICAS Control Panel is used to select the information presented by the lower EICAS display:

ENG	Places the lower EICAS display in ENG mode
STAT	Places the lower EICAS display in STAT mode
FUEL	Places the lower EICAS display in FUEL mode
DRS	Places the lower EICAS display in DRS mode
GEAR	Places the lower EICAS display in GEAR mode

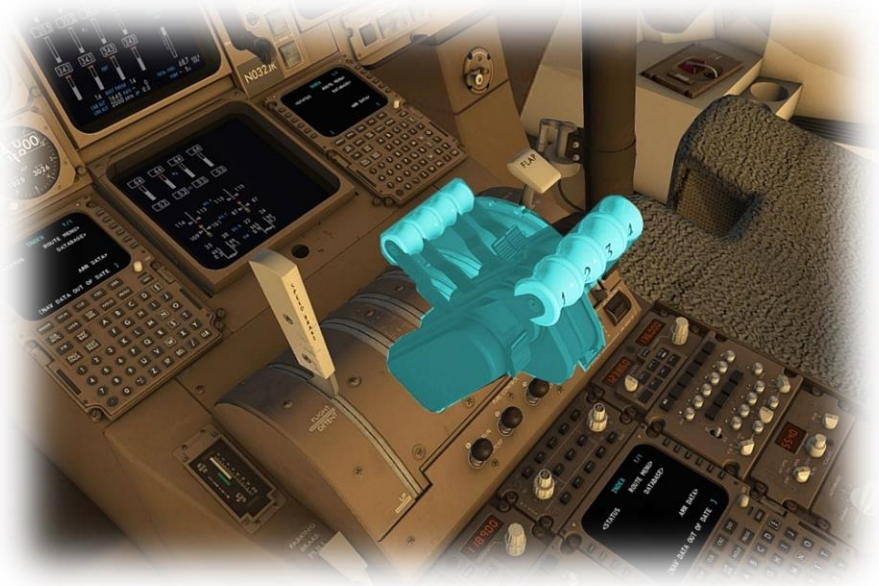
FMS Control Display Units (CDUs)



See the (separate) **X-Plane Flight Management System (FMS) Manual** for comprehensive instructions in relation to the function and operation of the Flight Management System installed in this aircraft.

Center Pedestal

Thrust Levers



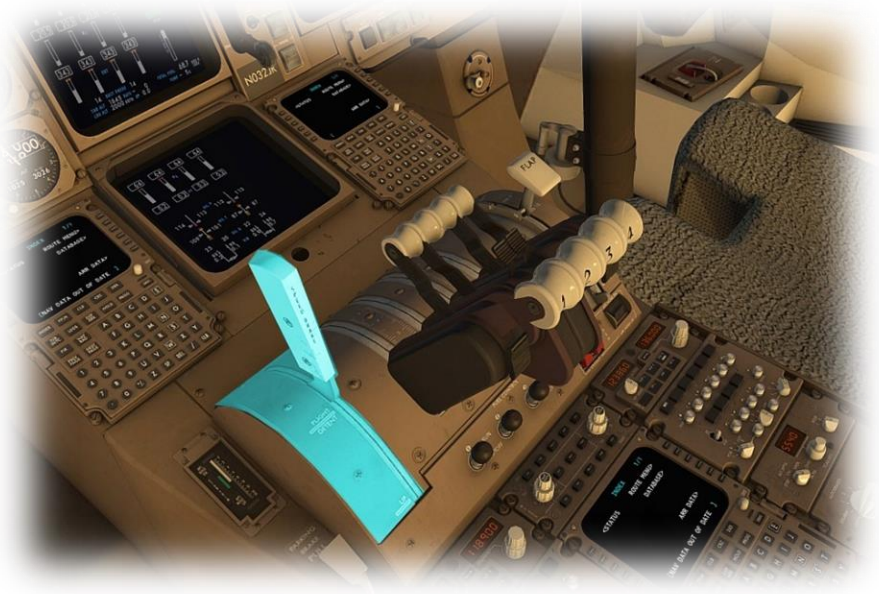
The B747-400 is equipped with four thrust levers – which control the thrust generated by engines 1 through 4 respectively.

Also included in this unit are (smaller) reverse-thrust levers, located behind the (larger) thrust levers.

Advance the thrust levers to increase thrust and retard them to reduce thrust.

Pull the reverse thrust levers towards you to engage reverse thrust, and back to their resting position to disengage.

Speed Brake Lever



The B747-400 is equipped with a speed brake lever, which deploys the speed brakes located on top of the wings.

Speed brakes are very effective at reducing lift generated by the wings and adding drag, and are usually deployed partially during descent, or fully at touchdown.

There are four speed brake settings…

Down: Not deployed.

Armed: For automatic deployment on touchdown.

Flight Detent: Deployed to the maximum position for in-flight use.

Up: Deployed to the maximum position for ground use.

Flap Lever

The Flap Lever operates the wing flaps. Wing flaps change the contour of the wing. When extended, the flaps generate more lift, and more drag, which is beneficial during the takeoff and the landing phases of the flight.

This lever provides for a fixed position of the flaps, at 0, 1, 2, 5, 10, 15, 25, 30 and 40 degrees.

Fuel Control Switches

The Fuel Control Switches are manually actuated by the pilot to introduce fuel into the engines, or cut-off fuel from the engines.

During startup, the pilot moves the switch to the up position to introduce fuel when the jet turbine has achieved the desired rotation speed.

During shutdown, the pilot moves the switch to the down position to close the supply of fuel to the engine.

VHF (Comm) Radios

This aircraft is equipped with three communications radios - VHF L, VHF C and VHF R.

Control panels are located for each on the center pedestal.

Use the buttons marked VHF L / VHF R to connect the panel to the associated VHF radio.

Use the button located between the frequency displays to toggle the active and standby frequency.

Use the rotary controls below each of the standby frequency displays to change the frequency. The outer-rotary changes the numeric value, and the inner-rotary changes the decimal value.

See: Audio Control

NAV Radios

This aircraft is equipped with the following nav radios:

VOR L
VOR R
ADF L
ADF R
ILS L

Nav radios are tuned via the center pedestal-mounted CDU (Control Display Unit).

Hover the mouse pointer over the desired frequency, or VOR course radial, and either click or use the mouse-roller to set this.

See: Audio Control and EADI / EHSI Control Panel

Positional information from Nav radios designated ‘L’ is displayed on the pilot’s EADI.

Positional information from Nav radios designated ‘R’ is displayed on the first officer’s EADI.

Transponder

The transponder works in conjunction with ATC radar, to identify the aircraft to controllers. When operating in controlled airspace, each aircraft is provided with a unique transponder code to accomplish this.

Use the outer rotary control to adjust the left-most digits of the transponder code.

Use the inner rotary control to adjust the right-most digits of the transponder code.

Use STBY when operating on the ground, and XPDR when in flight.

Audio Control

This panels controls the active mic, and active audio source.

The buttons along the top of the panel toggle the mic for the associated radio. For example, clicking the VHF L button to ON will activate the mic connected to the VHF L (pilot-side) radio.

The ‘rotaries’ control the volume of their respective source. Clicking the rotary controls to toggle audio on or off for the selected source.

The VOR/ADF rotary selects the audio source for Morse identification of the desired VOR or ADF navaid.

The L-C-R-MKR rotary selects the audio source for Morse identification of the desired ILS localizer or marker beacon.

Auto Brakes

This rotary controls the auto-braking system.

RTO: Maximum auto brakes will be applied in the event of a rejected take-off.

OFF: Disarms and resets the system

1,2,3,4, MAX, AUTO: Sets the level of auto-braking that will be applied on touch-down.

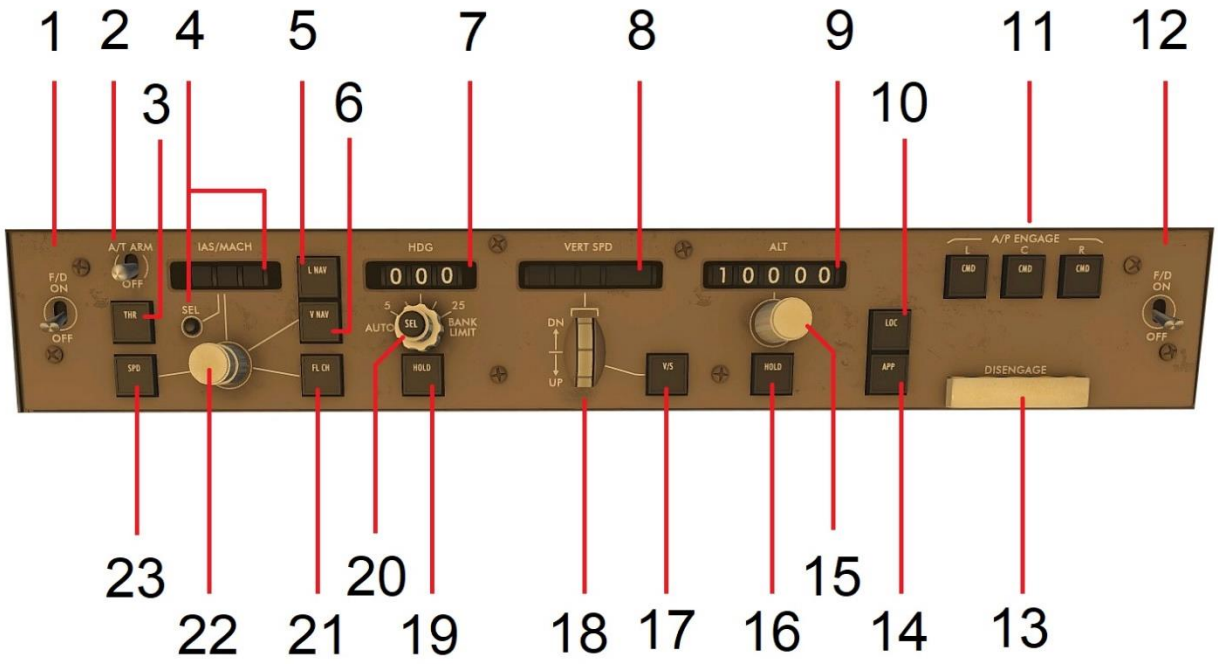
Trim

This panel features trim adjustments for roll and yaw.

Use the Left / Right wing down switch for aileron trim. (You may choose to map a joystick control to this function).

Use the Rudder rotary control for yaw trim – in accordance with the rudder trim indicator. (You may choose to map a joystick control to this function).

Autopilot Operation



1	**Pilot's Flight Director Switch**	Use this switch to toggle the 'Flight Director' display on, or off for the captain's EADI. The flight director computes and displays the proper pitch and bank angles required for the aircraft to follow the desired flight plan. The flight-crew can manually fly the aircraft according to the flight plan - by aligning the attitude indicator with the Flight Director pitch and bank command bars.
2	**Auto-Throttle Arm/Disarm**	This switch is used in conjunction with the SPD button, the IAS / MACH Rotary and Display. When Auto-Throttle is armed and engaged, the autopilot has command of the throttles, and will govern the airspeed according to the value indicated by the IAS / MACH Display.
3	**THR**	Not modeled.
4	**IAS / MACH Display and SEL Button**	Used in conjunction with the SPD Button and IAS / MACH Rotary. When the Auto-Throttle is armed, and Speed Mode is engaged, the autopilot will maintain the speed displayed here. The SEL button Toggles the IAS / MACH display units between Knots and Mach-number.

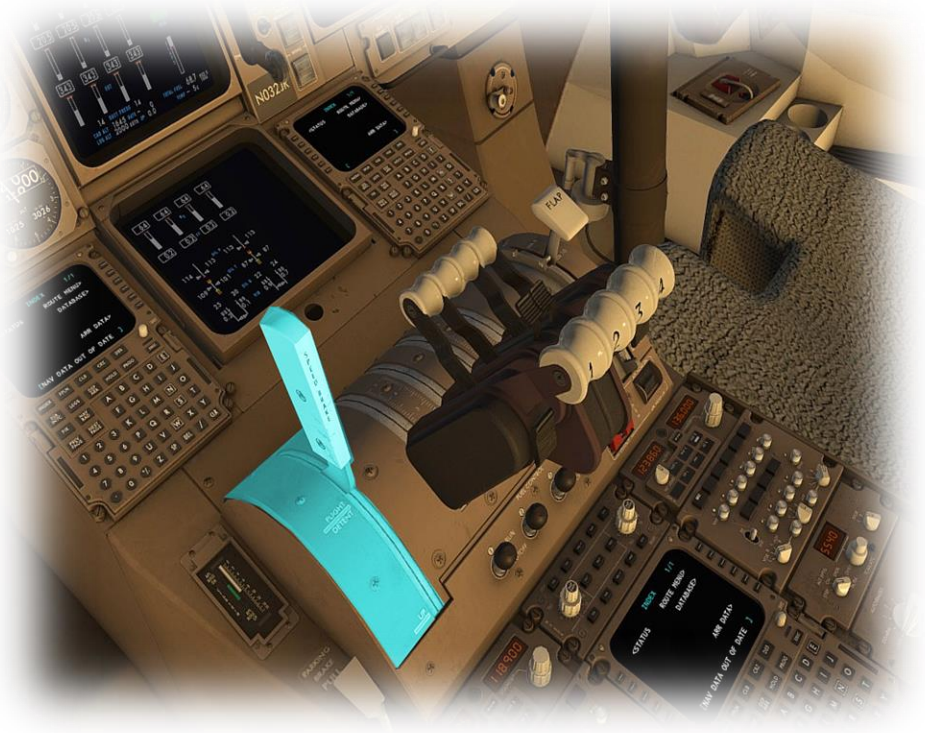
5	**LNAV Button**	**LNAV (Lateral Navigation).** The autopilot will follow the lateral components of your flight plan.
6	**VNAV Button**	**VNAV (Vertical Navigation).** The autopilot / Auto-Throttle will follow the vertical components of your flight plan.
7	**Heading Display**	Used in conjunction with the (Heading) Hold Button and Heading Rotary. When Heading-Select mode is engaged, the autopilot will steer the aircraft to the heading displayed here.
8	**Vertical Speed Display**	This display is used in conjunction with the VS Button and Vertical Speed Rotary. When VS (Vertical Speed) Mode is engaged, the autopilot will govern the rate of ascent, or descent, according to this value.
9	**Altitude Display**	Used in conjunction with the (Altitude) Hold Button, Altitude Rotary, and Vertical Speed Button. When Altitude Hold is engaged, the autopilot will immediately level-off, and the level-off altitude will be displayed here. When Vertical Speed mode is engaged, the autopilot will ascend, or descend at the desired rate, until reaching the altitude displayed here, at which point it will level-off.
10	**LOC Button**	Click this button to engage **Localizer Mode**. The autopilot will steer the aircraft laterally to intercept and track the ILS localizer that is selected via the active Nav radio.
11	**A/P ENGAGE**	The CMD buttons are used to engage the selected autopilot system - noting there are three separate and identical systems – L (Left), C (Center) and R (Right). After engaging the autopilot, the desired mode must still be selected subsequently. Systems L, C and R may be engaged exclusively, or together for redundancy in case of failure.
12	**First-officer's Flight Director Switch**	Use this switch to toggle the 'Flight Director' display on, or off for the first officer's EADI. The flight director computes and displays the proper pitch and bank angles required for the aircraft to follow the desired flight plan. The flight-crew can manually fly the aircraft according to the flight plan - by aligning the attitude indicator with the Flight Director pitch and bank command bars.
13	**Autopilot Disengage**	Click this button to disengage the autopilot and return full manual control to the flight crew.
14	**APP Button**	User in conjunction with the Auto-Throttle and NAV-1 radio to activate a localizer or ILS approach.

15	**Altitude Rotary**	Used in conjunction with the Altitude Display, (Altitude) Hold Button, Altitude Rotary, and Vertical Speed Button. When Altitude Hold is engaged, the autopilot will immediately level-off, and the level-off altitude will be displayed here. When Vertical Speed mode is engaged, the autopilot will ascend, or descend at the desired rate, until reaching the altitude displayed here, at which point it will level-off.
16	**ALT Hold Button**	Click this button to engage **Altitude Hold Mode**. The autopilot will level-off and hold the current altitude.
17	**VS Button**	Click this button to engage **Vertical Speed Mode**. Used in conjunction with the Auto-Throttle, the autopilot will govern the rate of ascent, or descent, according to the value indicated by the Vertical Speed Display.
18	**Vertical Speed Rotary**	When VS (Vertical Speed) Mode is engaged, the autopilot will govern the rate of ascent, or descent, according to this value.
19	**HDG Hold Button**	Click this button to engage **Heading Hold Mode.** The autopilot will maintain the current heading.
20	**Heading Rotary**	Used in conjunction with the Heading Rotary and Heading Display. Click the center to engage Heading-Select mode. The autopilot will steer the aircraft to the heading displayed above. Use the Rotary Control outer ring to adjust the bank angle / rate of turn. Use the Rotary Control inner ring to adjust the Heading Display.
21	**FL CH Button**	Click this button to engage **Vertical Speed Mode**. Used in conjunction with the Auto-Throttle, the autopilot will maintain the current airspeed while ascending, or descending to the selected altitude.
22	**IAS / MACH Rotary**	When used in conjunction with the SPD Button, and Auto-Throttle, the autopilot will govern the speed according to this value.
23	**SPD Button**	Click this button to engage Speed Mode. Used in conjunction with the Auto-Throttle and IAS / MACH Display, the autopilot will maintain the selected airspeed.

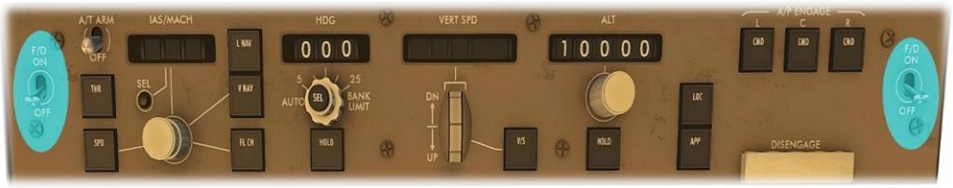
Auto-Land

This aircraft is capable of auto-land, provided the ILS in use is CAT-3 approved (check this using the X-Plane map). Establish the aircraft first on a sensible intercept for both the localizer and glideslope, and then follow this procedure:

ARM the Speed Brakes



Tune the ILS frequency
(see: NAV Radios)

Check both Flight Director switches are ON	
Select desired approach speed. Engage auto-throttle and select SPD (speed) mode.	
Engage autopilot A, B and C (for maximum redundancy)	
Arm APP mode	

Deploy flaps and gear manually during descent phase.

Adjust auto-throttle speed as required for safe flap and gear deployment

On (or prior to) touchdown:

Disarm auto-throttle and autopilot.

Assume full manual control of aircraft.

Flight Planning

Flight planning is the process of determining a route from origin to destination that considers fuel requirements, terrain avoidance, Air Traffic Control, aircraft performance, airspace restrictions and notices to airmen (NOTAMS).

General information about flight plans is available on Wikipedia at http://en.wikipedia.org/wiki/Flight_planning

Flight plans can be generated by onboard computers if the aircraft is suitably equipped. If not, simulation pilots may elect to use an online flight planner. A web search for the phrase “Flight Planner” will yield a great many options, many of which are free services.

A good online flight planner will utilize the origin and destination airports, together with the aircraft type and equipment, the weather conditions, the chosen cruise altitude, known restrictions along the route, current NOTAMS, and other factors to generate a suitable flight plan. The waypoints incorporated into the flight plan can be subsequently input into the aircraft’s Flight Management Computer (FMS), or Global Positioning System (GPS). Some online flight planners provide the option to save the plan as an X-Plane compatible file, with an ‘fms’ extension. A saved flight plan can be loaded into the GPS or Flight Management Computer unit featured in the B747-400.

It is recommended the pilot generate a flight plan for the chosen route before using the FMS or GPS units.

Instructions for operating the Laminar Research FMS and GPS units can be found in separate (dedicated) manuals.

Fuel Calculation

Note: All calculations here are based on the X-Plane B747-400, and NOT the real B747-400. Differences may exist.

Load Sheet Tables

The tables in the next pages illustrate a series of hypothetical load-sheet scenarios. For these purposes, passengers are deemed to have an average weight of 165 lbs. and cruise will be Mach .85 @ 35.000 feet.

If you wish to allow additional fuel for ground operations, pick the next row in the table after the one that satisfies your specific flight.

PAYLOAD: EMPTY

Cruise Time (Minutes)	T/O and Climb Fuel (lbs.)	Cruise Fuel (lbs.)	Total Fuel Weight (lbs.)	PAX Upper Deck	PAX First Cabin	PAX Business Cabin	PAX Main Cabin	Cargo Forward (lbs.)	Cargo Aft (lbs.)	Payload Weight	CG
30	12,500	10,800	23,300	0	0	0	0	0	0	**0**	**DEFAULT**
60	12,500	21,600	34,100	0	0	0	0	0	0	**0**	**DEFAULT**
90	12,500	32,400	44,900	0	0	0	0	0	0	**0**	**DEFAULT**
120	12,500	43,200	55,700	0	0	0	0	0	0	**0**	**DEFAULT**
150	12,500	54,000	66,500	0	0	0	0	0	0	**0**	**DEFAULT**
180	12,500	64,800	77,300	0	0	0	0	0	0	**0**	**DEFAULT**
210	12,500	75,600	88,100	0	0	0	0	0	0	**0**	**DEFAULT**
240	12,500	86,400	98,900	0	0	0	0	0	0	**0**	**DEFAULT**
270	12,500	97,200	109,700	0	0	0	0	0	0	**0**	**DEFAULT**
300	12,500	108,000	120,500	0	0	0	0	0	0	**0**	**DEFAULT**
330	12,500	118,800	131,300	0	0	0	0	0	0	**0**	**DEFAULT**
360	12,500	129,600	142,100	0	0	0	0	0	0	**0**	**DEFAULT**
390	12,500	140,400	152,900	0	0	0	0	0	0	**0**	**DEFAULT**
420	12,500	151,200	163,700	0	0	0	0	0	0	**0**	**DEFAULT**
450	12,500	162,000	174,500	0	0	0	0	0	0	**0**	**DEFAULT**
480	12,500	172,800	185,300	0	0	0	0	0	0	**0**	**DEFAULT**
510	12,500	183,600	196,100	0	0	0	0	0	0	**0**	**DEFAULT**
540	12,500	194,400	206,900	0	0	0	0	0	0	**0**	**DEFAULT**
570	12,500	205,200	217,700	0	0	0	0	0	0	**0**	**DEFAULT**
600	12,500	216,000	228,500	0	0	0	0	0	0	**0**	**DEFAULT**
630	12,500	226,800	239,300	0	0	0	0	0	0	**0**	**DEFAULT**
660	12,500	237,600	250,100	0	0	0	0	0	0	**0**	**DEFAULT**
690	12,500	248,400	260,900	0	0	0	0	0	0	**0**	**DEFAULT**
720	12,500	259,200	271,700	0	0	0	0	0	0	**0**	**DEFAULT**
750	12,500	270,000	282,500	0	0	0	0	0	0	**0**	**DEFAULT**
780	12,500	280,800	293,300	0	0	0	0	0	0	**0**	**DEFAULT**
810	12,500	291,600	304,100	0	0	0	0	0	0	**0**	**DEFAULT**
840	12,500	302,400	314,900	0	0	0	0	0	0	**0**	**DEFAULT**
870	12,500	313,200	325,700	0	0	0	0	0	0	**0**	**DEFAULT**
900	12,500	324,000	336,500	0	0	0	0	0	0	**0**	**DEFAULT**
930	12,500	334,800	347,300	0	0	0	0	0	0	**0**	**DEFAULT**
960	12,500	345,600	358,100	0	0	0	0	0	0	**0**	**DEFAULT**
990	12,500	356,400	368,900	0	0	0	0	0	0	**0**	**DEFAULT**

PAYLOAD: MEDIUM

Cruise Time (Minutes)	T/O and Climb Fuel (lbs.)	Cruise Fuel (lbs.)	Total Fuel Weight (lbs.)	PAX Upper Deck	PAX First Cabin	PAX Business Cabin	PAX Main Cabin	Cargo Forward (lbs.)	Cargo Aft (lbs.)	Payload Weight	CG
30	12,500	10,800	23,300	5	4	14	81	1750	1750	20660	**DEFAULT**
60	12,500	21,600	34,100	5	4	14	81	1750	1750	20660	**DEFAULT**
90	12,500	32,400	44,900	5	4	14	81	1750	1750	20660	**DEFAULT**
120	12,500	43,200	55,700	5	4	14	81	1750	1750	20660	**DEFAULT**
150	12,500	54,000	66,500	5	4	14	81	1750	1750	20660	**DEFAULT**
180	12,500	64,800	77,300	5	4	14	81	1750	1750	20660	**DEFAULT**
210	12,500	75,600	88,100	5	4	14	81	1750	1750	20660	**DEFAULT**
240	12,500	86,400	98,900	5	4	14	81	1750	1750	20660	**DEFAULT**
270	12,500	97,200	109,700	5	4	14	81	1750	1750	20660	**DEFAULT**
300	12,500	108,000	120,500	5	4	14	81	1750	1750	20660	**DEFAULT**
330	12,500	118,800	131,300	5	4	14	81	1750	1750	20660	**DEFAULT**
360	12,500	129,600	142,100	5	4	14	81	1750	1750	20660	**DEFAULT**
390	12,500	140,400	152,900	5	4	14	81	1750	1750	20660	**DEFAULT**
420	12,500	151,200	163,700	5	4	14	81	1750	1750	20660	**DEFAULT**
450	12,500	162,000	174,500	5	4	14	81	1750	1750	20660	**DEFAULT**
480	12,500	172,800	185,300	5	4	14	81	1750	1750	20660	**DEFAULT**
510	12,500	183,600	196,100	5	4	14	81	1750	1750	20660	**DEFAULT**
540	12,500	194,400	206,900	5	4	14	81	1750	1750	20660	**DEFAULT**
570	12,500	205,200	217,700	5	4	14	81	1750	1750	20660	**DEFAULT**
600	12,500	216,000	228,500	5	4	14	81	1750	1750	20660	**DEFAULT**
630	12,500	226,800	239,300	5	4	14	81	1750	1750	20660	**DEFAULT**
660	12,500	237,600	250,100	5	4	14	81	1750	1750	20660	**DEFAULT**
690	12,500	248,400	260,900	5	4	14	81	1750	1750	20660	**DEFAULT**
720	12,500	259,200	271,700	5	4	14	81	1750	1750	20660	**DEFAULT**
750	12,500	270,000	282,500	5	4	14	81	1750	1750	20660	**DEFAULT**
780	12,500	280,800	293,300	5	4	14	81	1750	1750	20660	**DEFAULT**
810	12,500	291,600	304,100	5	4	14	81	1750	1750	20660	**DEFAULT**
840	12,500	302,400	314,900	5	4	14	81	1750	1750	20660	**DEFAULT**
870	12,500	313,200	325,700	5	4	14	81	1750	1750	20660	**DEFAULT**
900	12,500	324,000	336,500	5	4	14	81	1750	1750	20660	**DEFAULT**
930	12,500	334,800	347,300	5	4	14	81	1750	1750	20660	**DEFAULT**
960	12,500	345,600	358,100	5	4	14	81	1750	1750	20660	**DEFAULT**
990	12,500	356,400	368,900	5	4	14	81	1750	1750	20660	**DEFAULT**

PAYLOAD: FULL

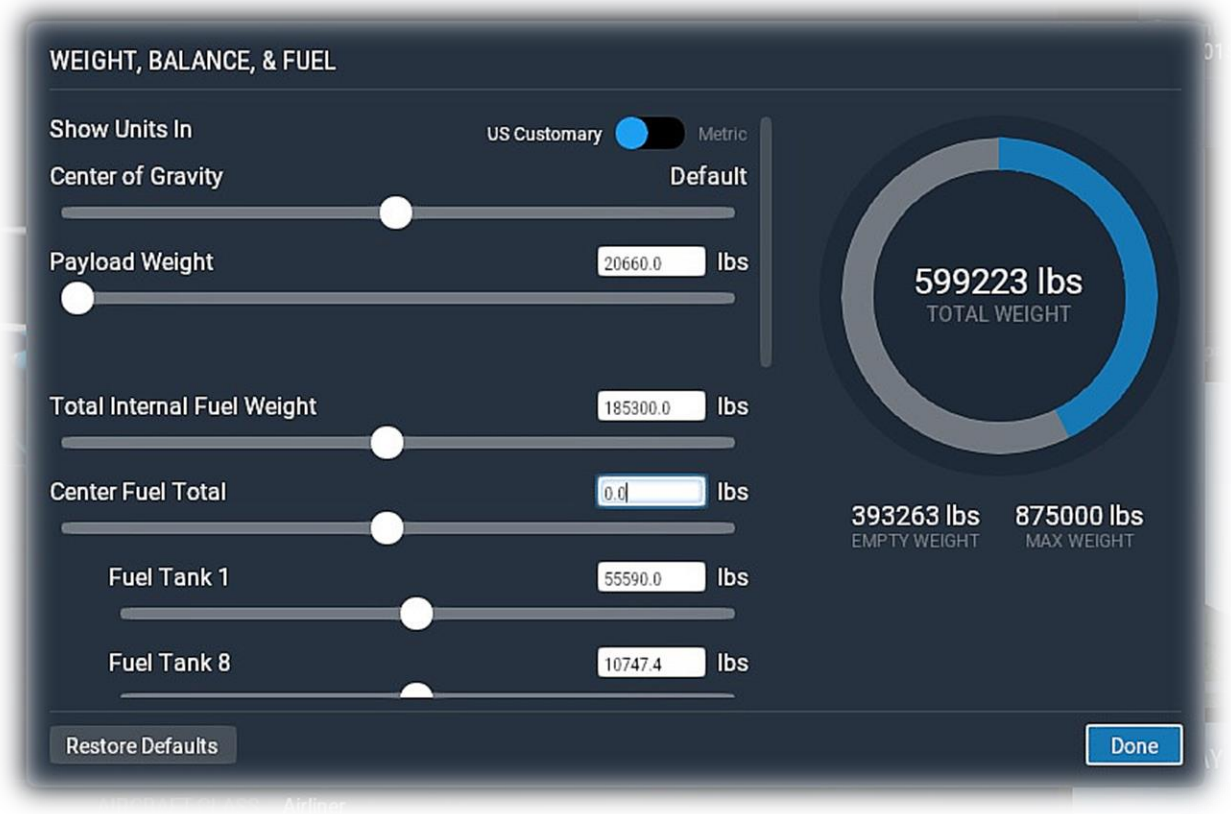
Cruise Time (Minutes)	T/O and Climb Fuel (lbs.)	Cruise Fuel (lbs.)	Total Fuel Weight (lbs.)	PAX Upper Deck	PAX First Cabin	PAX Business Cabin	PAX Main Cabin	Cargo Forward (lbs.)	Cargo Aft (lbs.)	Payload Weight	CG
30	12,500	10,800	23.300	11	8	28	162	3500	3500	41485	**DEFAULT**
60	12,500	21,600	34,100	11	8	28	162	3500	3500	41485	**DEFAULT**
90	12,500	32,400	44,900	11	8	28	162	3500	3500	41485	**DEFAULT**
120	12,500	43,200	55,700	11	8	28	162	3500	3500	41485	**DEFAULT**
150	12,500	54,000	66,500	11	8	28	162	3500	3500	41485	**DEFAULT**
180	12,500	64,800	77,300	11	8	28	162	3500	3500	41485	**DEFAULT**
210	12,500	75,600	88,100	11	8	28	162	3500	3500	41485	**DEFAULT**
240	12,500	86,400	98,900	11	8	28	162	3500	3500	41485	**DEFAULT**
270	12,500	97,200	109,700	11	8	28	162	3500	3500	41485	**DEFAULT**
300	12,500	108,000	120,500	11	8	28	162	3500	3500	41485	**DEFAULT**
330	12,500	118,800	131,300	11	8	28	162	3500	3500	41485	**DEFAULT**
360	12,500	129,600	142,100	11	8	28	162	3500	3500	41485	**DEFAULT**
390	12,500	140,400	152,900	11	8	28	162	3500	3500	41485	**DEFAULT**
420	12,500	151,200	163,700	11	8	28	162	3500	3500	41485	**DEFAULT**
450	12,500	162,000	174,500	11	8	28	162	3500	3500	41485	**DEFAULT**
480	12,500	172,800	185,300	11	8	28	162	3500	3500	41485	**DEFAULT**
510	12,500	183,600	196,100	11	8	28	162	3500	3500	41485	**DEFAULT**
540	12,500	194,400	206,900	11	8	28	162	3500	3500	41485	**DEFAULT**
570	12,500	205,200	217,700	11	8	28	162	3500	3500	41485	**DEFAULT**
600	12,500	216,000	228,500	11	8	28	162	3500	3500	41485	**DEFAULT**
630	12,500	226,800	239,300	11	8	28	162	3500	3500	41485	**DEFAULT**
660	12,500	237,600	250,100	11	8	28	162	3500	3500	41485	**DEFAULT**
690	12,500	248,400	260,900	11	8	28	162	3500	3500	41485	**DEFAULT**
720	12,500	259,200	271,700	11	8	28	162	3500	3500	41485	**DEFAULT**
750	12,500	270,000	282,500	11	8	28	162	3500	3500	41485	**DEFAULT**
780	12,500	280,800	293,300	11	8	28	162	3500	3500	41485	**DEFAULT**
810	12,500	291,600	304,100	11	8	28	162	3500	3500	41485	**DEFAULT**
840	12,500	302,400	314,900	11	8	28	162	3500	3500	41485	**DEFAULT**
870	12,500	313,200	325,700	11	8	28	162	3500	3500	41485	**DEFAULT**
900	12,500	324,000	336,500	11	8	28	162	3500	3500	41485	**DEFAULT**
930	12,500	334,800	347,300	11	8	28	162	3500	3500	41485	**DEFAULT**
960	12,500	345,600	358,100	11	8	28	162	3500	3500	41485	**DEFAULT**
990	12,500	356,400	368,900	11	8	28	162	3500	3500	41485	**DEFAULT**

Setting the Weight, Balance and Fuel in X-Plane

After referencing the Load Sheet Tables, you are ready to configure the weight, balance and fuel for your upcoming flight. Select the B747-400 from the flight menu, and click on the 'Customize' button, followed by the 'Weight, Balance & Fuel' button.

Use the 'Total Fuel Weight' slider to set the fuel according to the load sheet tables in the previous chapter. This will distribute the fuel in the manner required to maintain the default center of gravity (CG).

The example below is for the scenario highlighted in blue in the Load Sheet Tables.



Checklists

The following check lists are designed with the convenience of the simulation pilot in mind and customized to the X-Plane B747-400 aircraft. These differ from those of the real aircraft.

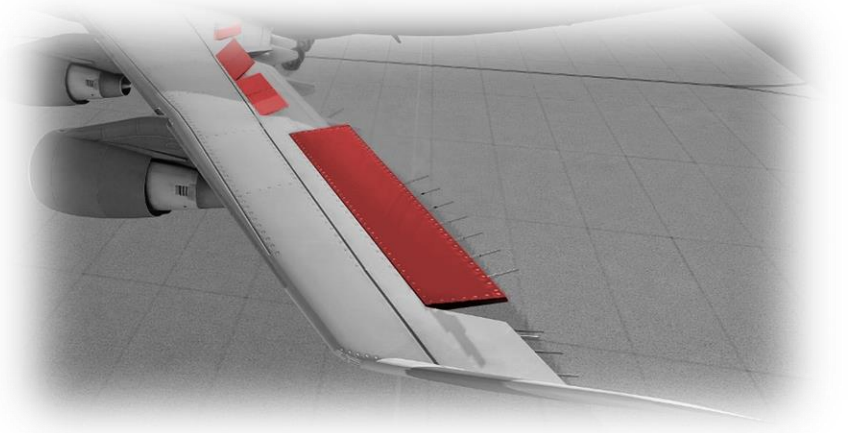
Pre-Flight Exterior Inspection

A Pre-Flight Inspection should always precede flight in any aircraft. The purpose of this inspection is to ensure the aircraft is in a state of readiness for the upcoming flight.

In X-Plane, a pre-flight inspection is not merely undertaken to simulate reality, but does in fact have real purpose, because the control surfaces of the aircraft interact directly with the airflow over and around them, just as in real life. As such, correct movement of all control surfaces is necessary for normal flight.

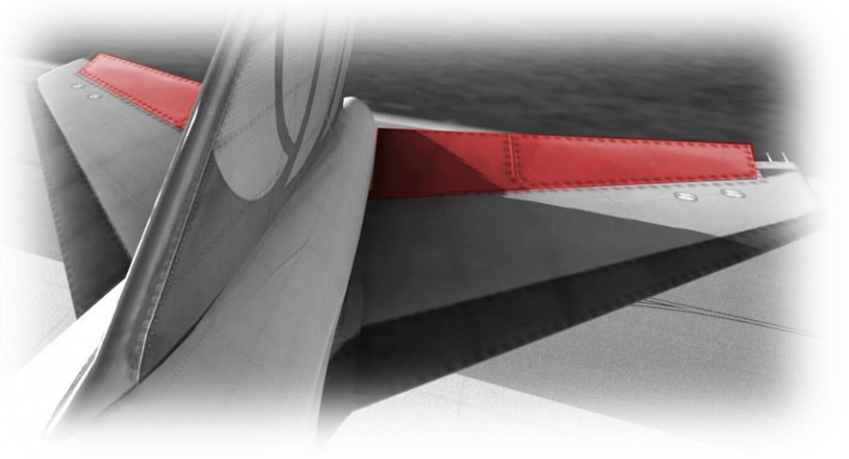
Hold roll axis at full deflection.

Visually check corresponding movement of ailerons and speed-brakes.



Hold pitch axis at full deflection.

Visually check corresponding movement of elevators.

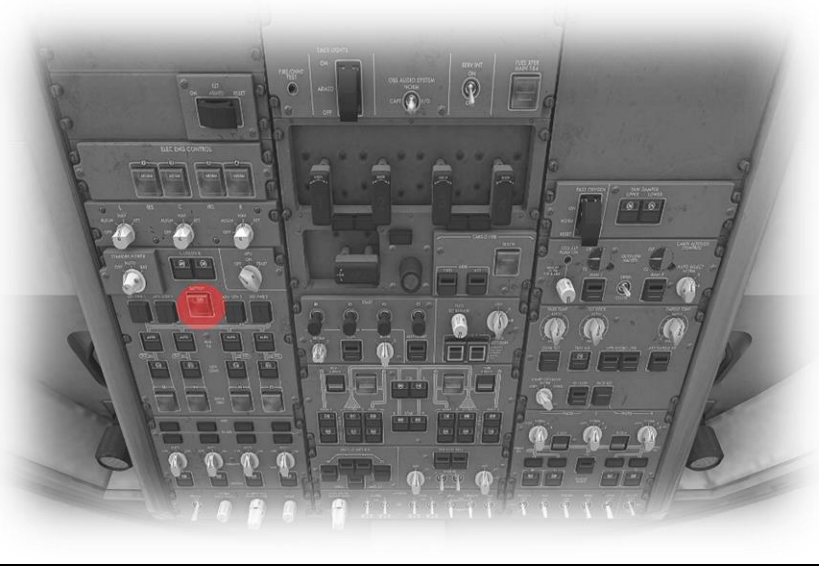


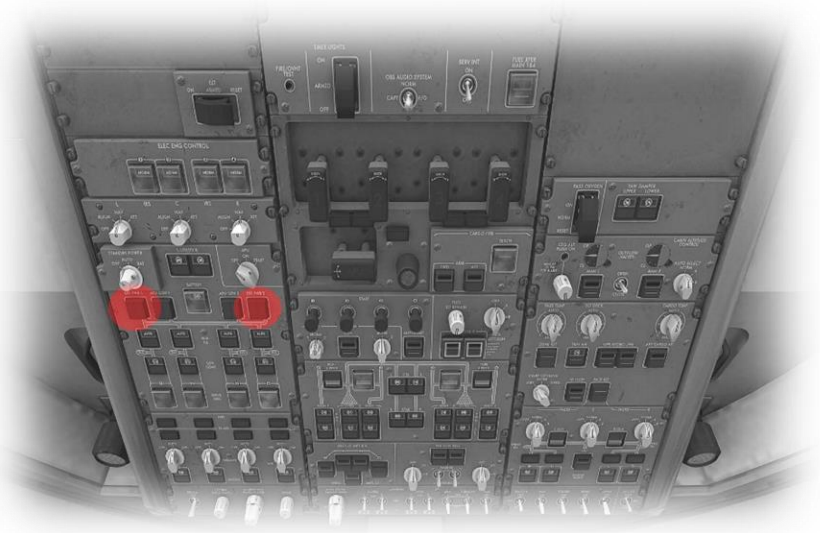
Hold yaw axis at full deflection.

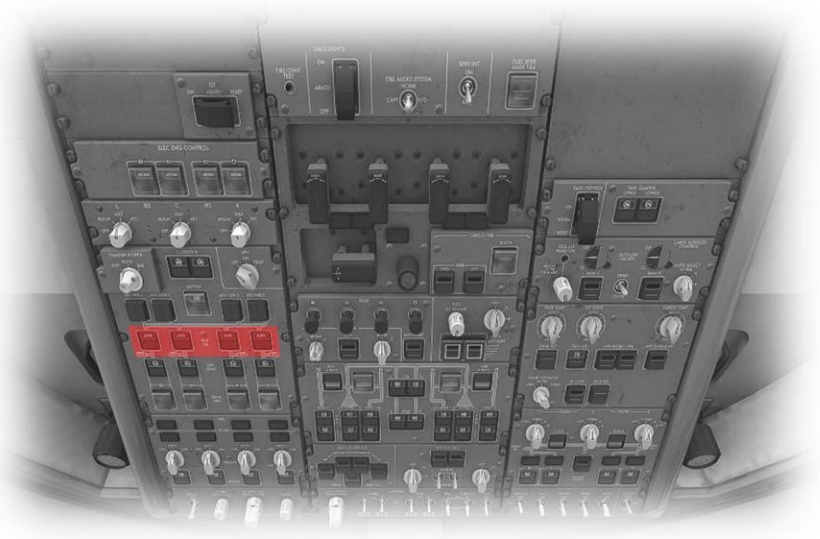
Visually check corresponding movement of rudder.

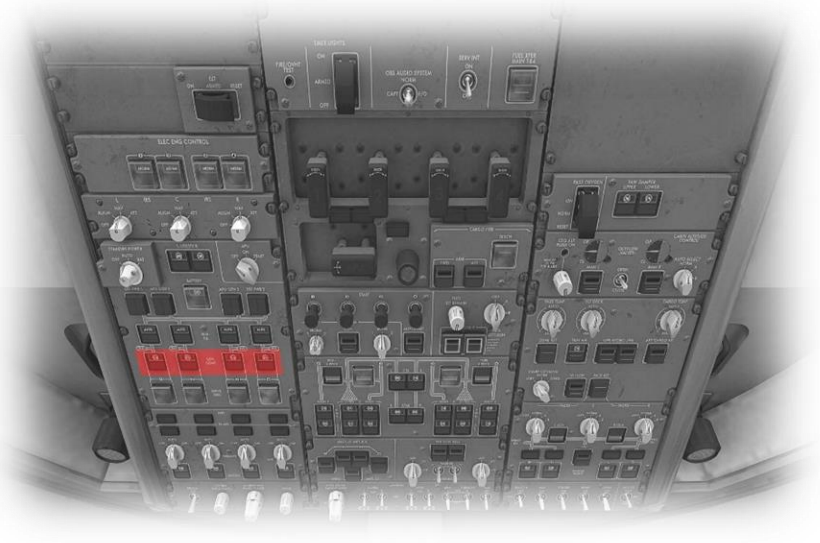
Cold and Dark to Engine Start

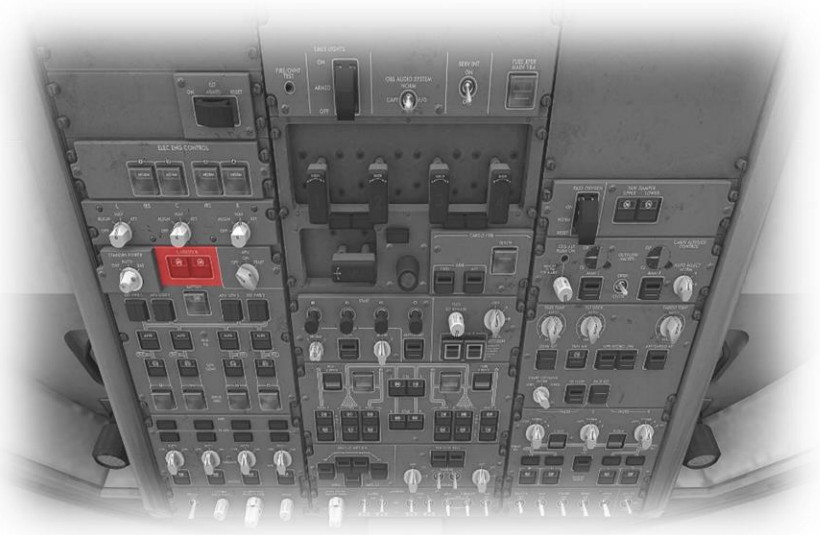
The following check list applies to the X-Plane 747 only and assumes the aircraft state will not be carried over to a future flight. This checklist may not be accurate for the real aircraft:

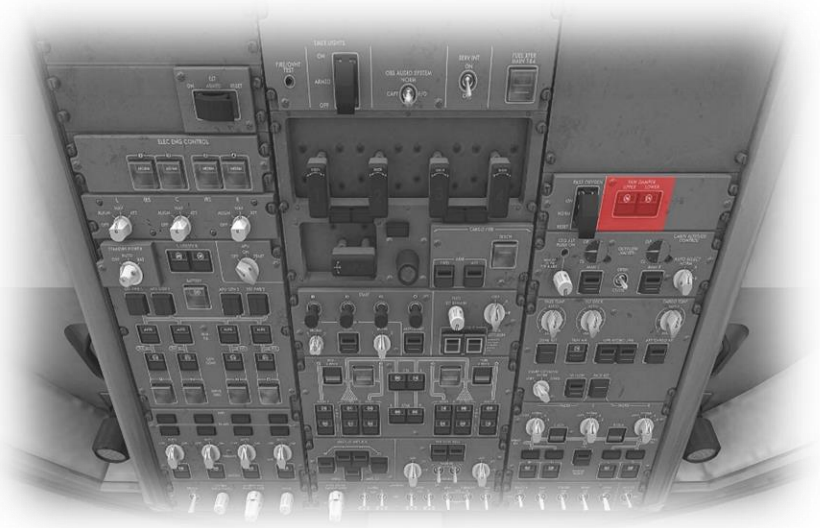
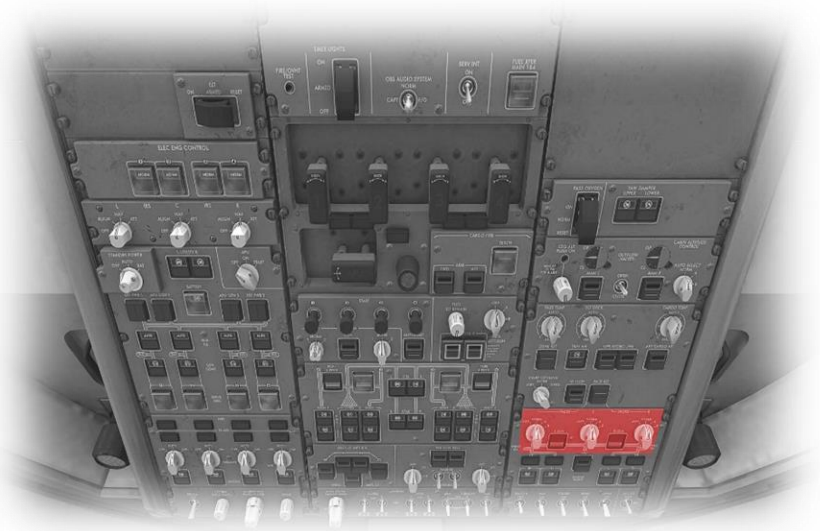
PARKING BRAKE – ON	
BATTERY MASTER – ON	

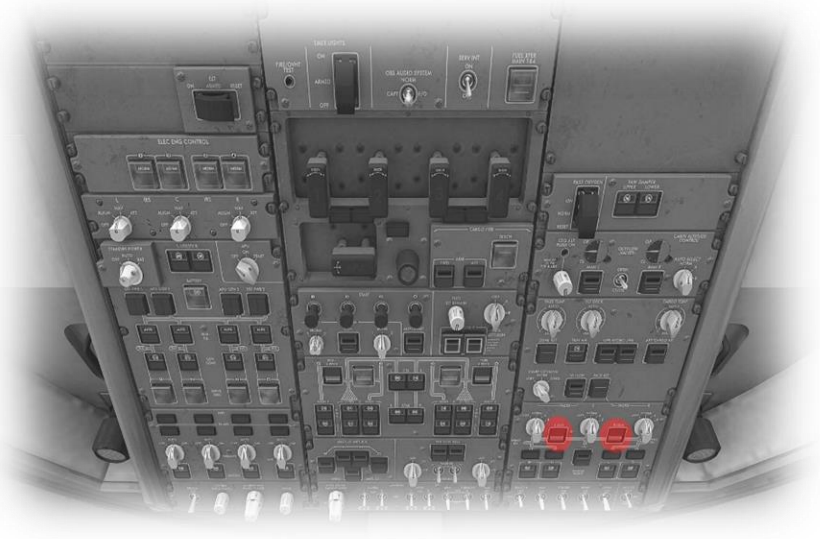
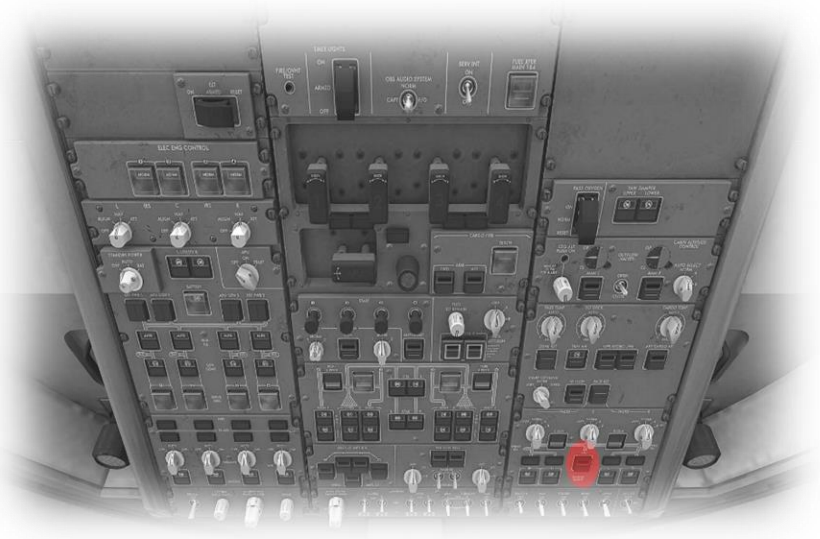
STANDBY POWER – AUTO	
EXTERNAL POWER – ON	

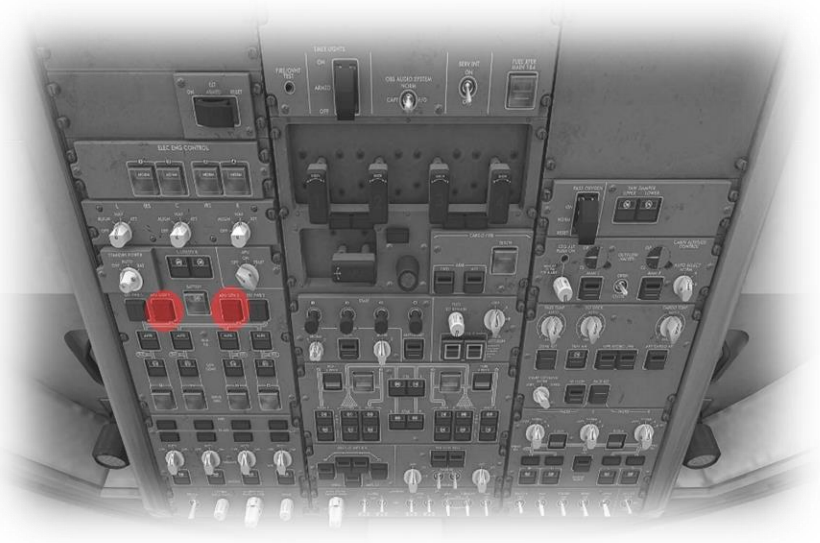
APU – START *Move switch to START, then release to ON.* *Wait for APU Gen illumination.*	
BUS TIES – AUTO	

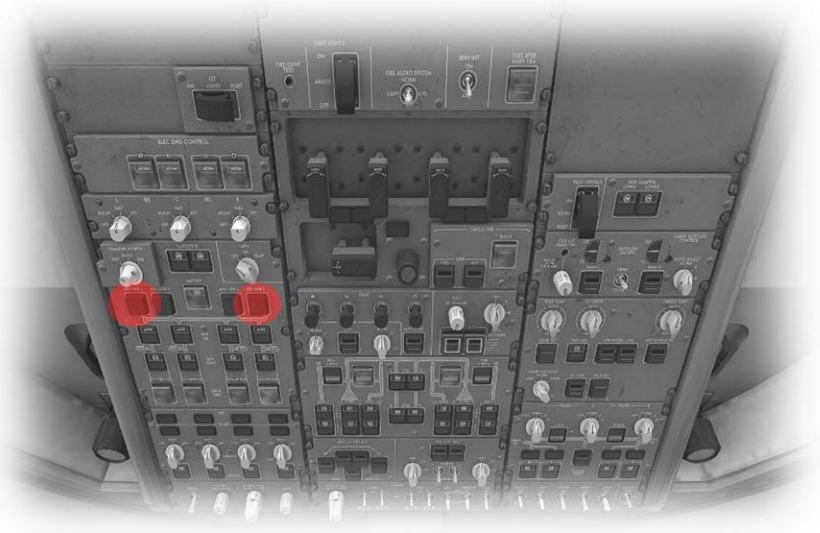
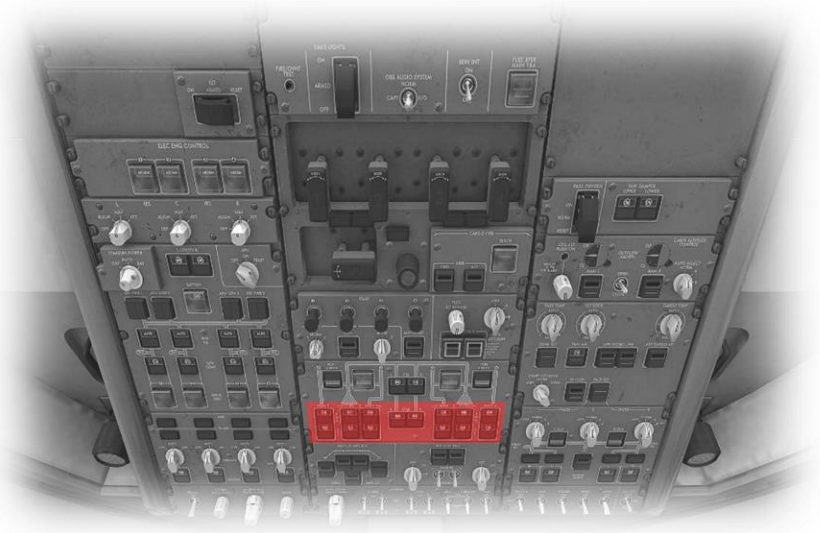
GENERATOR CONTROLS - ON	
HYDRAULIC PUMP DEMANDS OFF	

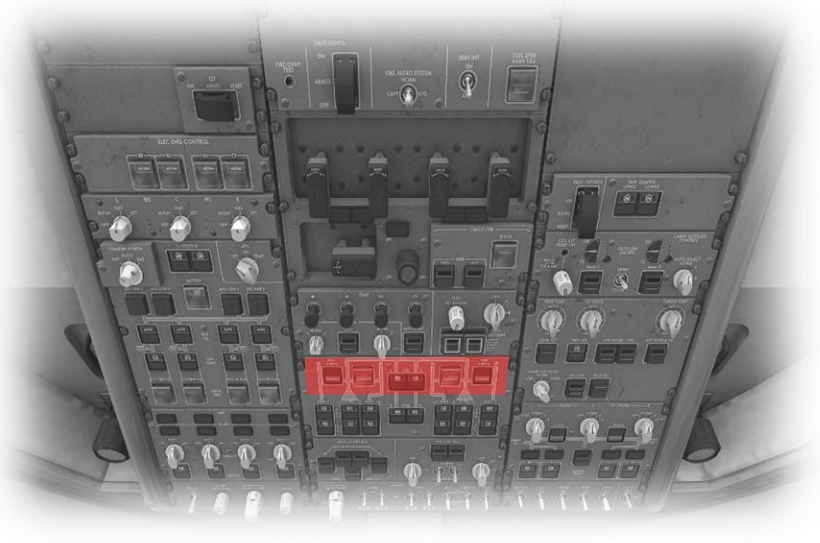
HYDRAULIC PUMPS ENGINE ON	
L – UTILITY – R ON	

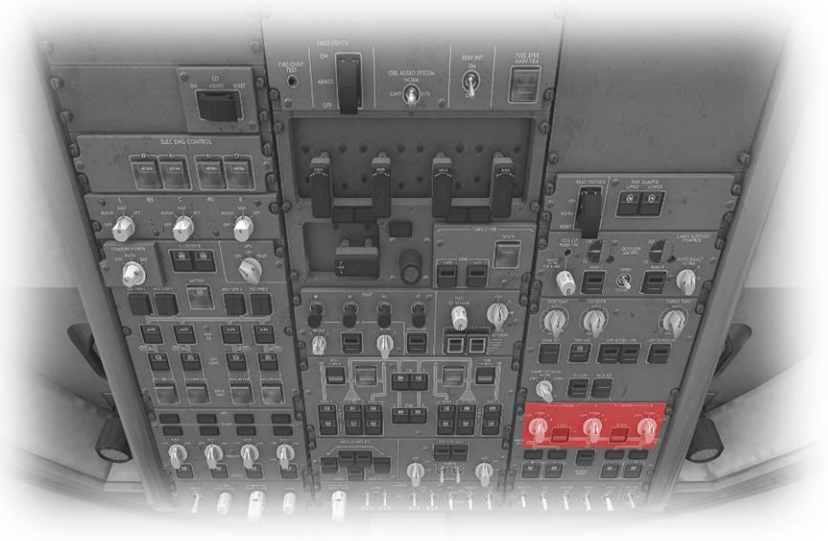
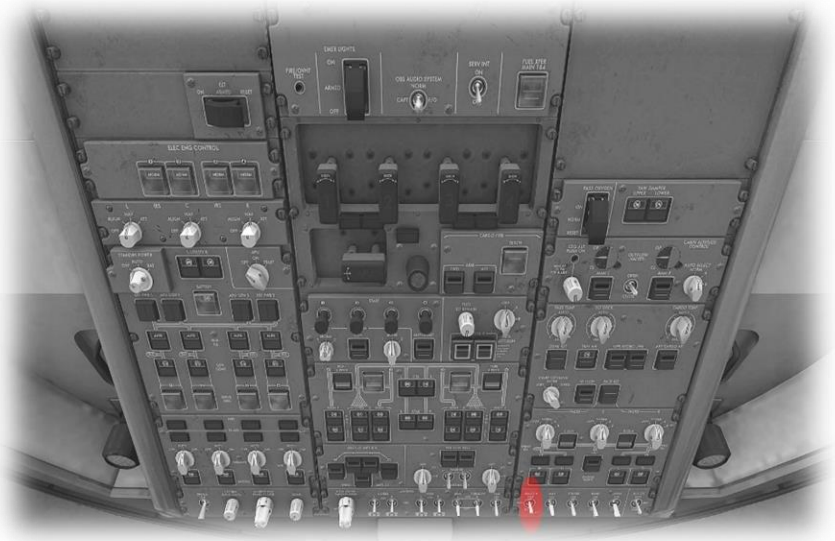
YAW DAMPERS – ON	
PACK SELECTORS – NORM	

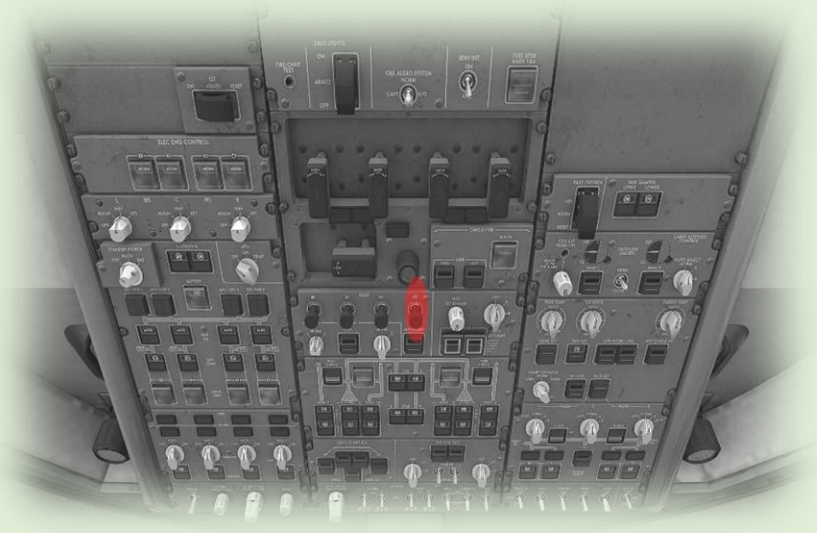
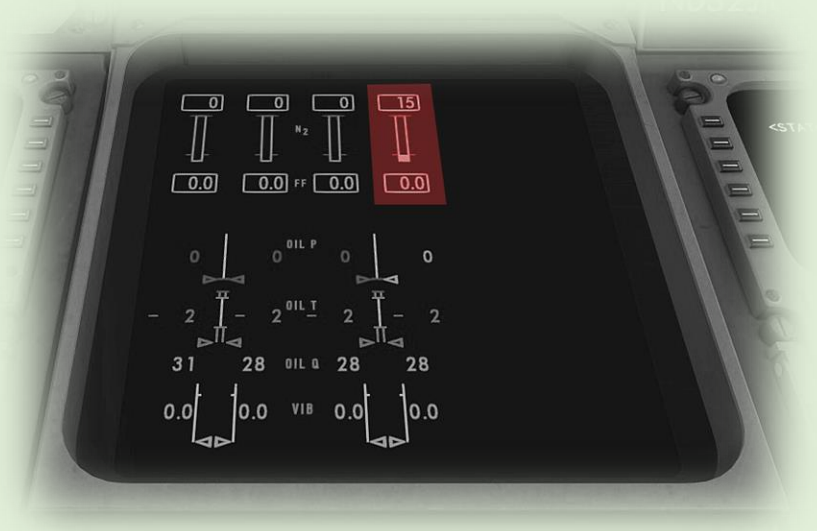
PACK ISOLATION VALVES OPEN	
APU BLEED – ON	

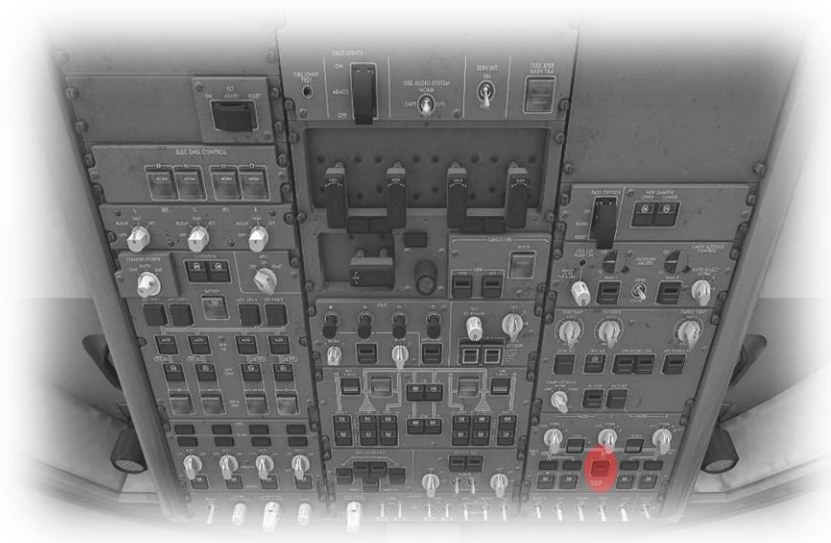
ENGINE BLEEDS – ON	
APU GENERATORS – ON	

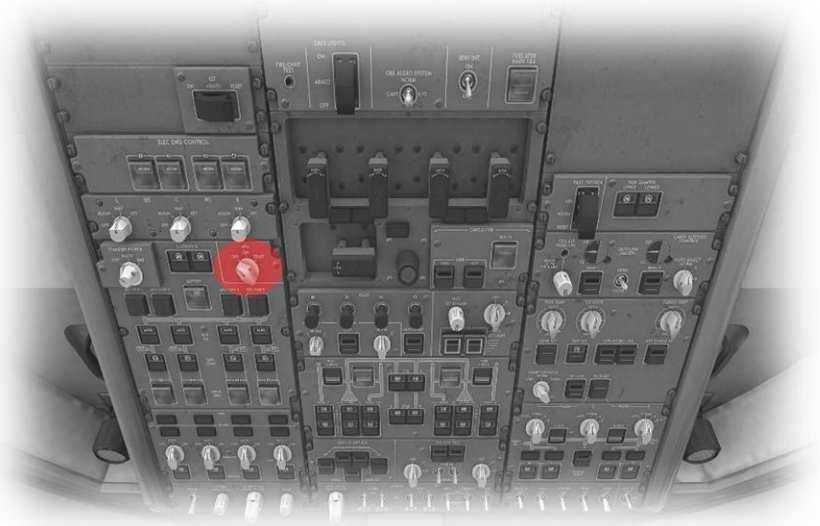
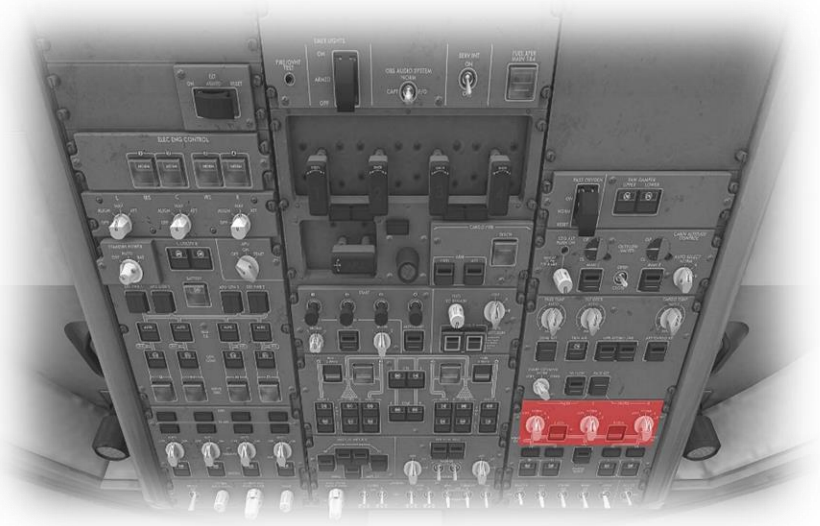
EXTERNAL POWER – OFF	
FUEL PUMPS – ON	

FUEL X-FEEDS – ON	
HYDRAULIC PUMP DEMANDS AUTO | AUTO | AUTO | AUX	

PACK SELECTORS – OFF	
BEACON – BOTH	

ENGINE 4 – START	
Wait until N2 = 15%	

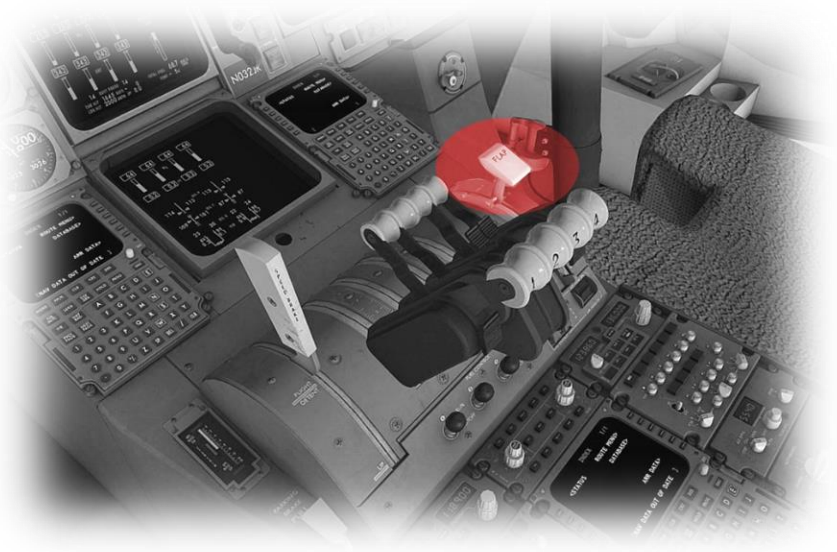
ENGINE 4 FUEL CONTROL ON	
REPEAT HIGHLIGHTED STEPS **(ENGINES 1 THRU 3)**	
APU BLEED – OFF	

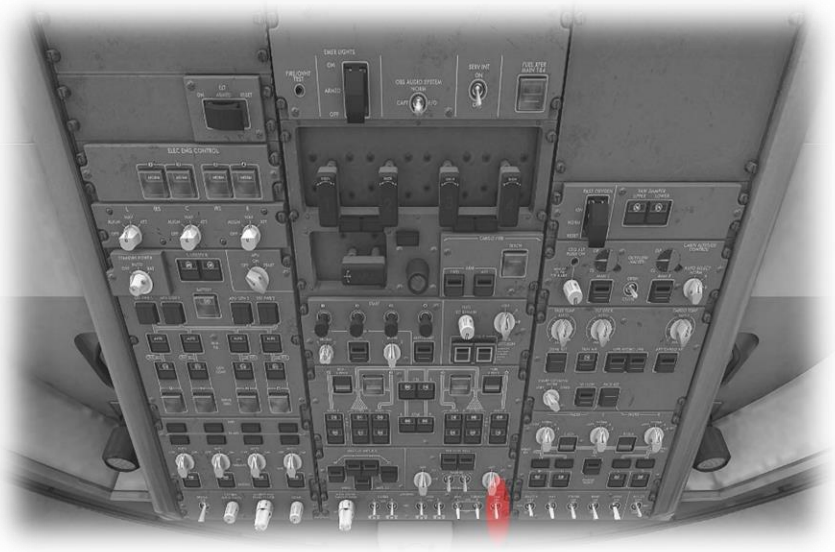
APU – OFF	
PACK SELECTORS – NORM	

HYDRAULIC PUMP DEMANDS AUTO | AUTO | AUTO | AUTO	

Before Taxi

SEATBELT SIGN - ON	
ELEVATOR TRIM – TAKEOFF 	

FLAPS – SET (5 Degrees)	
FLIGHT CONTROLS – CHECKED (Pitch / Roll / Yaw) See: Assigning peripheral devices	

TAXI LIGHTS - ON	
TRANSPONDER – ON	

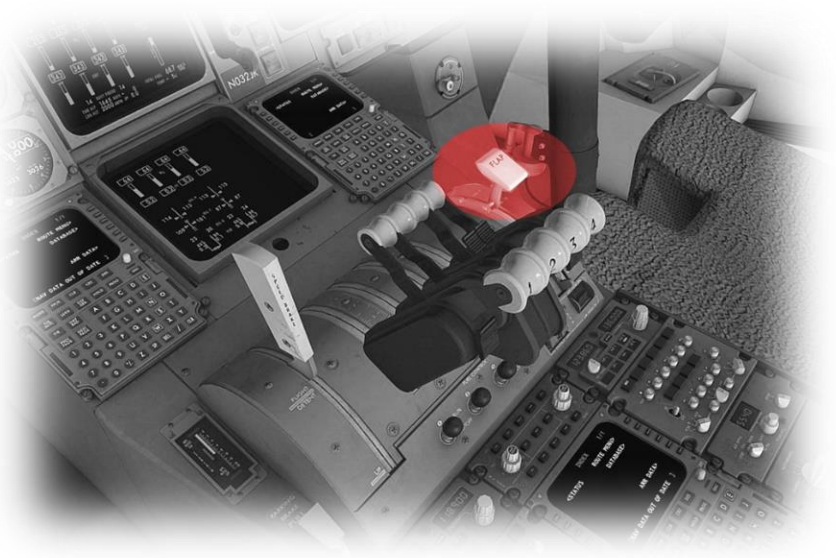
PARKING BRAKE – OFF	

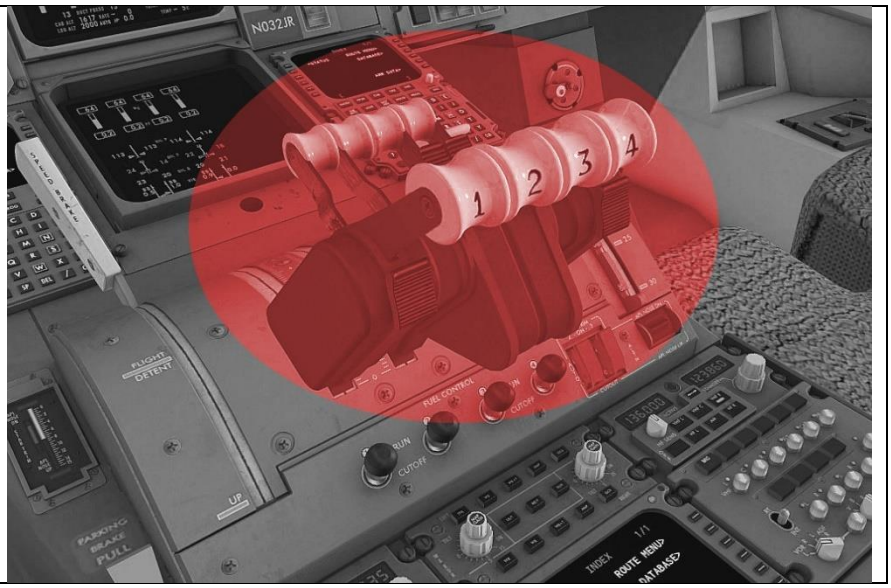
Before Takeoff

ALTIMETER - SET	
TRANSPONDER – XPDR	

LANDING LIGHTS – ON (TAXI LIGHTS – OFF)	

After Takeoff

LANDING GEAR – UP	
FLAPS – RETRACTED	

THRUST – SET AS REQUIRED	

Cruise

SEATBELT SIGN - OFF	
LANDING LIGHTS - OFF	

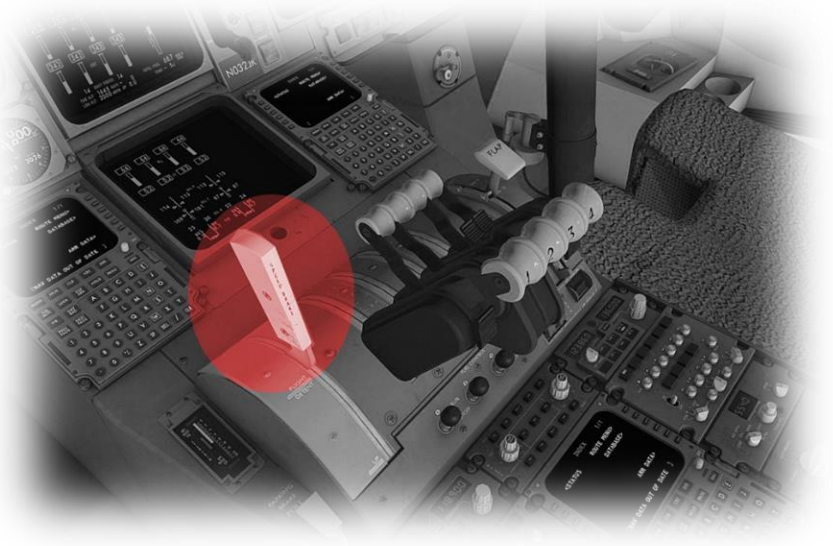
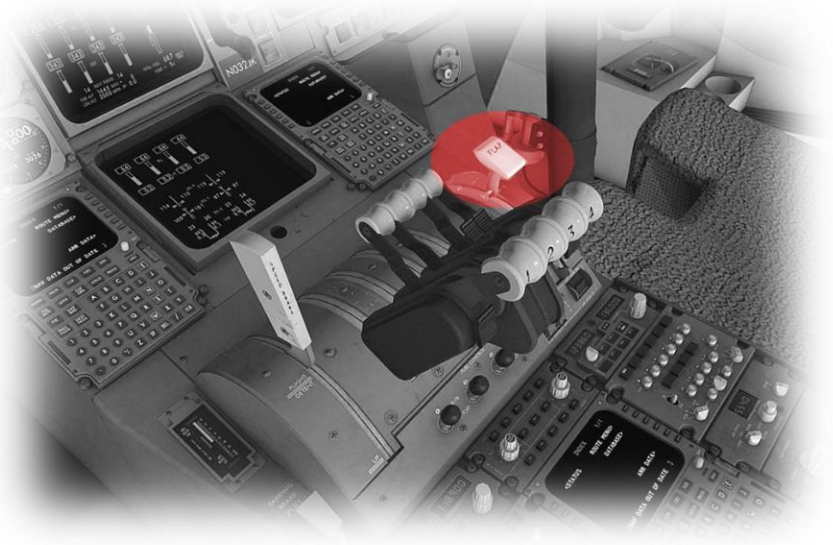
ALTIMETER - SET	

Before Landing

SEATBELT SIGN - ON	
ALTIMETER - SET	

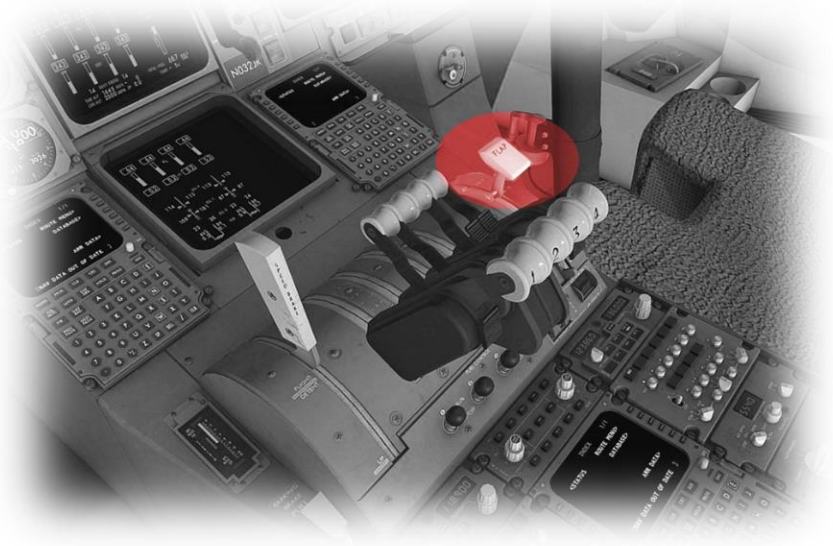
LANDING LIGHTS - ON	

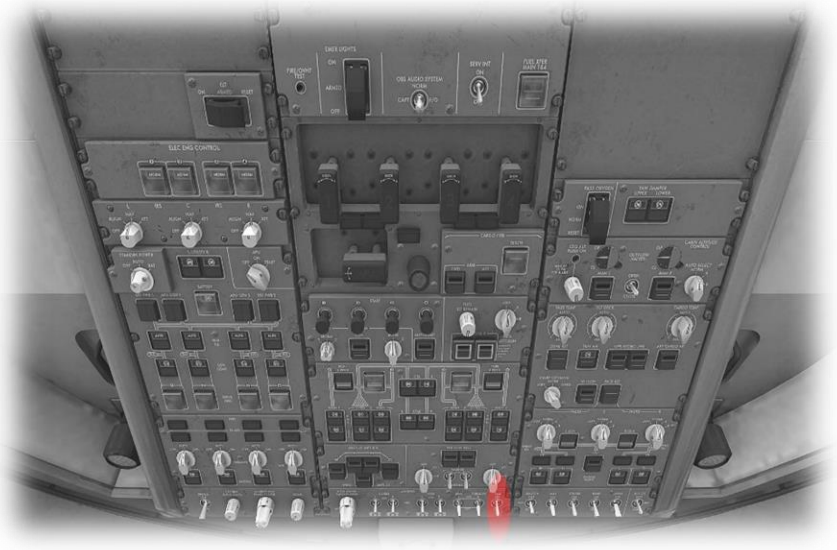
Landing

SPEED BRAKES SET AS REQUIRED	
FLAPS SET AS REQUIRED	

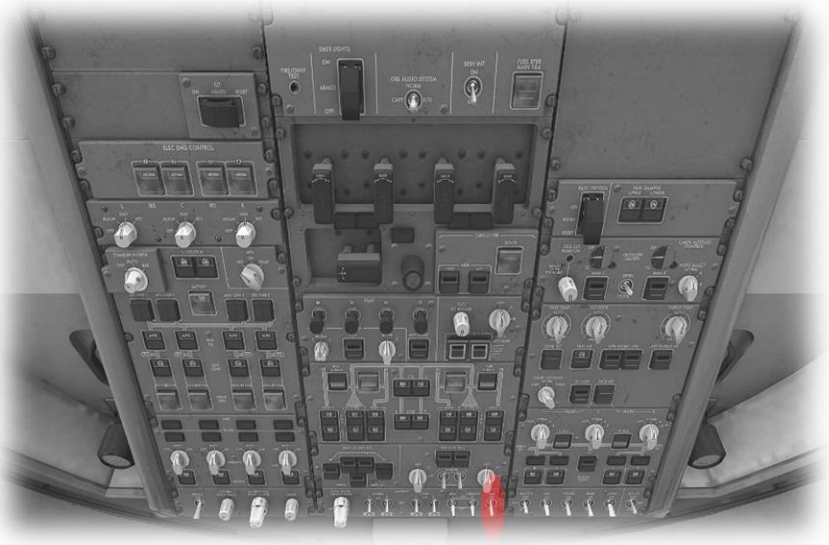
LANDING GEAR – DOWN	

After Landing

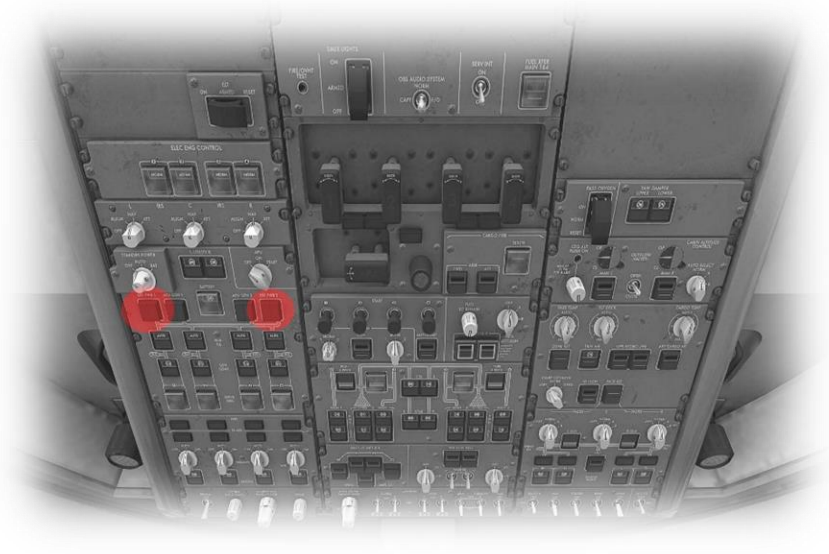
FLAPS – RETRACTED	
SPEED BRAKES RETRACTED	

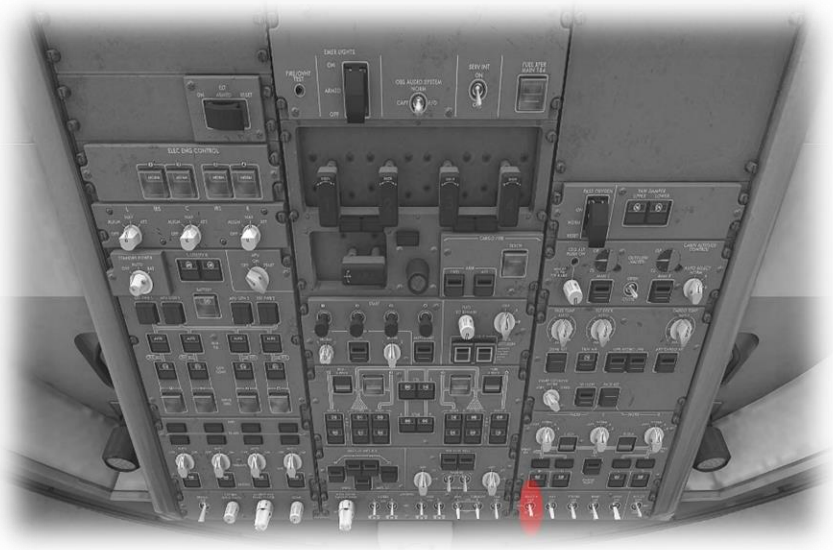
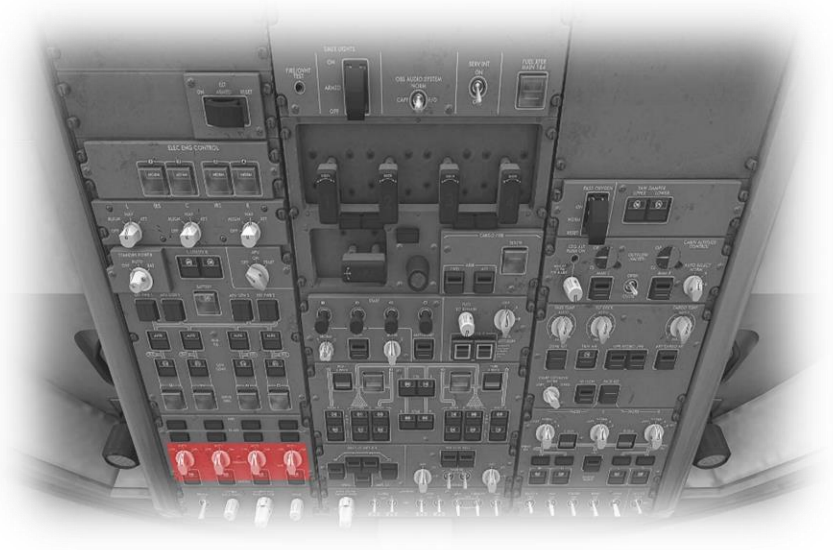
LANDING LIGHTS - OFF	
TAXI LIGHTS - ON	
TRANSPONDER – ON	

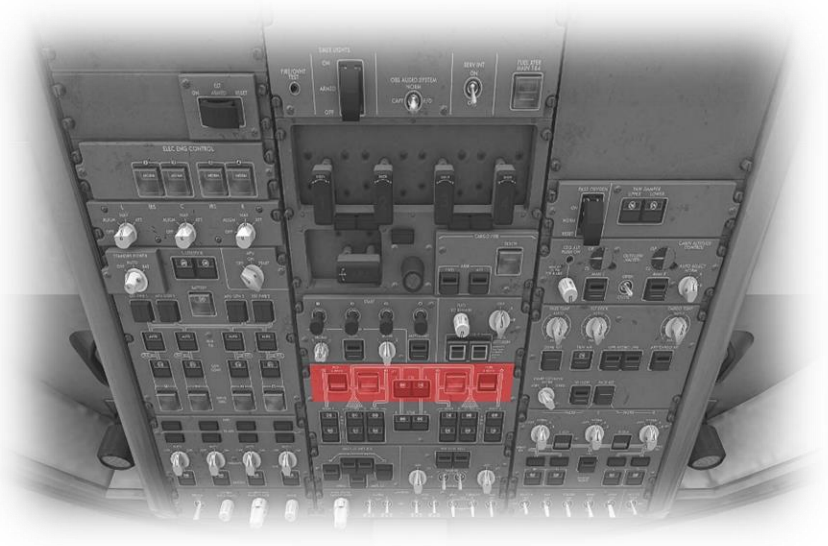
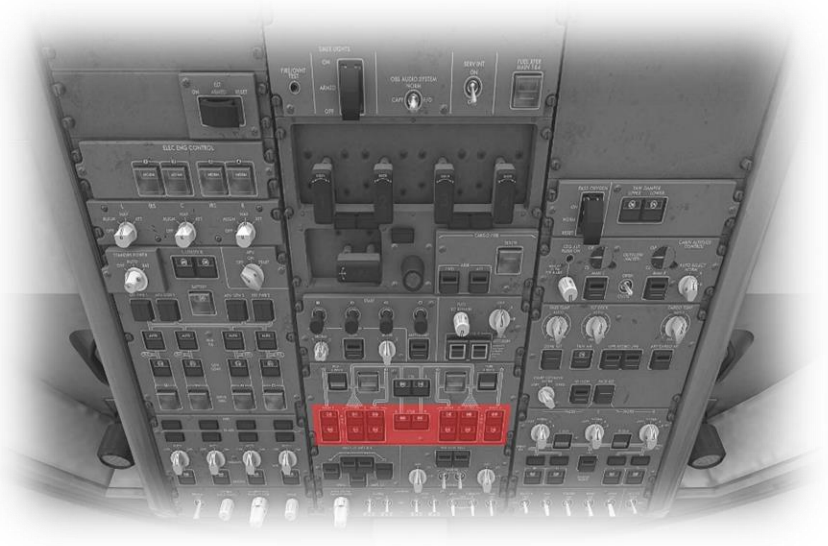
Parking

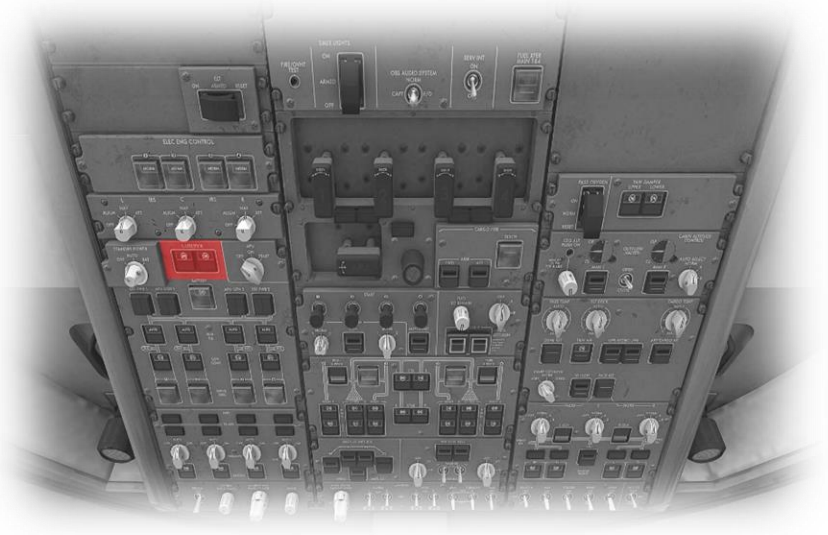
PARKING BRAKE – ON	
TAXI LIGHTS - OFF	

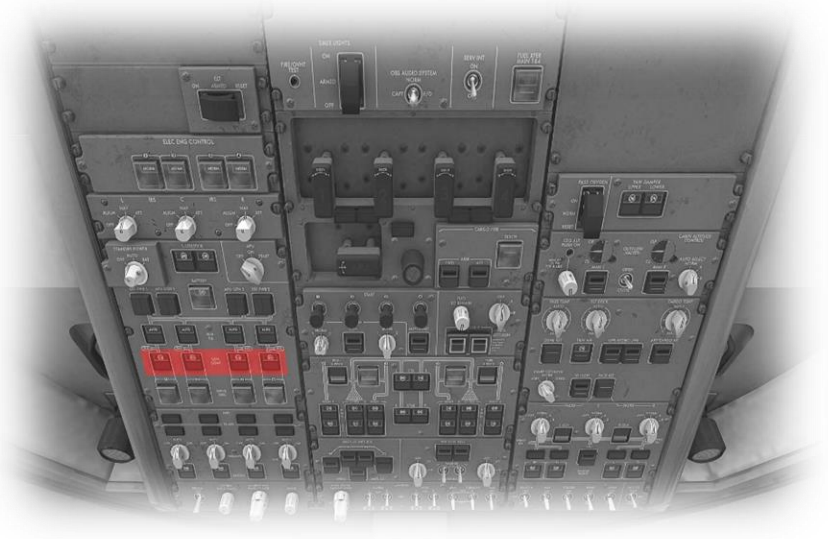
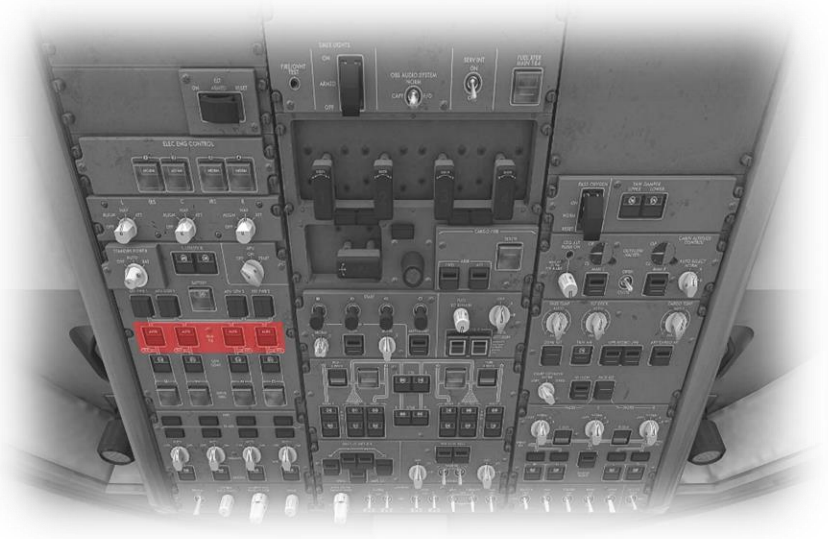
SEATBELT SIGN - OFF	
TRANSPONDER – STBY (Standby)	

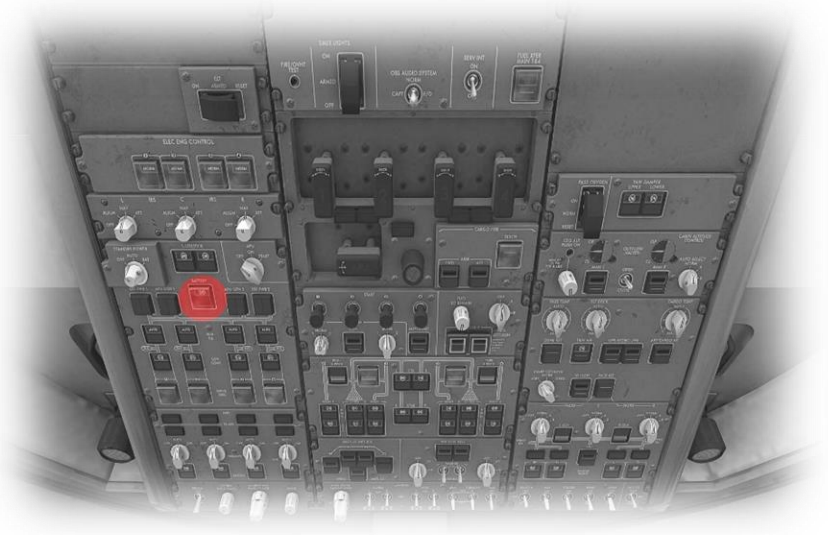
FUEL CONTROL LEVERS DOWN (OFF)	
EXTERNAL POWER – ON	

BEACON – OFF	
HYDRAULIC PUMP DEMANDS OFF | OFF | OFF | OFF	

FUEL X-FEEDS – OFF	
FUEL PUMPS – OFF	

L – UTILITY – R OFF	
HYDRAULIC PUMPS ENGINE OFF	

GENERATOR CONTROLS OFF	
BUS TIES – OFF	

BATTERY MASTER – OFF	
EXTERNAL POWER – OFF