Concorde

Systems Manual

Contents

Introduction

Overview

The PSS Concorde simulation attempts to realistically model the real aircraft systems, controls and indications using some of the latest technology available.

Some of the panel features include:

- Realistically modelled cockpit instruments.
- True 3D-effect ADI ball.
- Zoomed panel mode for precise instrument flying.
- Accurate functional Virtual Cockpit.
- Authentic autopilot and flight director system models all the modes found on the real aircraft.
- Realistic Inertial Navigation System (INS) Control Display Unit (CDU).
- The Autopilot can be driven by the INS, by Flight Simulator built-in GPS, or by external programs and modules.
- Electronic TCAS display.
- Functional ADF2 receiver.
- Complex Flight Engineer panel; each subpanel of it can be zoomed into for easier operation.
- Realistically modelled aircraft systems include Electrics, Hydraulics, Fuel, Air conditioning, Pressurization and Ventilation, complex Power plant controls and instruments.
- Complex Fuel and Center of Gravity (CG%) management.
- Virtual Flight Engineer can automatically control aircraft systems, making flying and learning the aircraft easier.
- Panel Configuration Utility allows to assign custom key combinations or joystick buttons to numerous panel functions.
- Complete panel state is saved when a Flight Simulator flight is saved, and is automatically restored when this flight is loaded later.

Panel view system

The PSS Concorde includes several panel views and windows. You can navigate the panel system using the view select icons below the glareshield, the mouse hot spots, or using the keyboard short-cuts.

The view select icons are normally dimmed and blended into the panel so as not to stand out. The icons are highlighted and their description is displayed when you move the mouse over one of them.

● View select icons

Full panel view

The main view includes the Pilots panel, Center panel and the Glareshield. It is the default view loaded at startup.

Zoom panel view

The zoomed view expands the Pilot's flight instruments for a better view and precise hand flying.

The zoomed view is toggled by clicking the corresponding icon or by clicking in the center of the ADI or the HSI.

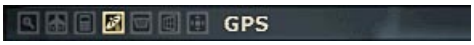
Centre console window

The centre console includes throttle levers, INS CDUs, autopilot datum adjust panel, trim controls and radio and audio equipment.

The centre console is toggled by clicking the corresponding icon or by clicking in the dark area in the lower right corner of the main view.
It can also be toggled by pressing Shift-4.

INS CDU window

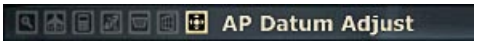
The INS CDU can be opened in a separate window. This is done by clicking the corresponding icon or pressing Shift-5.



GPS window

This window is the Flight Simulator built-in GPS.

The window is toggled by clicking the corresponding icon.
It can also be toggled by pressing Shift-7.



Datum adjust panel window

The autopilot datum adjust panel, normally located on the center console, can be opened in a separate window.
This is done by right-clicking on the autopilot panel or pressing Shift-6.

Overhead Panel

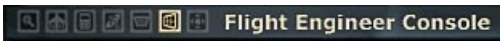
Overhead panel view

This overhead panel is split into two full screen views.

The overhead view is opened by clicking the corresponding icon. It can also be opened by clicking near the compass on the top of the center post in the main view.

Another way of opening the overhead is to push and hold the Numpad 5 key. This allows to glance at the overhead, it will be closed when you release the 5 key. To keep the overhead open, hold down CTRL key before releasing the Numpad 5.

The view is switched between upper and lower overhead by clicking on the arrows in the top or bottom right corners of the screens. The overhead view is closed by clicking the X icon in the bottom corner of the lower overhead view.



Flight Engineer console view

This view shows the Flight Engineer console.

This view is opened by clicking the corresponding icon.
It can also be opened by clicking near the right edge of the main view, or pressing Shift-8.

The view is closed by clicking the X icon in the top left corner.

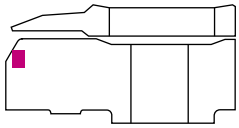
Each of the individual sub-panels on the Flight Engineer console can be enlarged in a pop-up window. This is done by right-clicking inside the needed panel. To close a pop-up window, right-click inside the window.

Please note that some controls on the Flight Engineer console use right mouse button to operate (all guarded or capped switches require a right-click to open the guard), and so right-clicking near such an element will operate it instead of zooming/restoring an individual panel.

Right-clicking near any edge of a pop-up window will display Flight Simulator context menu allowing you to undock the window.

Virtual Flight Engineer

The PSS Concorde features a Virtual Flight Engineer function which automatically performs the duties of the real Flight Engineer. This function can be used to reduce your workload and lets you concentrate on the actual flying.



● **Virtual Flight Engineer (VFE) switch**

When activated, this function:
- monitors and controls the center of gravity and fuel system
- controls the pressurization system
- selects appropriate engine ratings
- performs checklist actions corresponding to the current stage of flight.

Panel state saving and loading

When you save a flight in Flight Simulator, only the basic aircraft state and basic panel properties are saved. If a 3rd party addon has any extra functionality beyond the default, its state is not normally saved. If such flight is loaded at a later time, the custom panel may not be fully restored to a state it was at the time the flight was saved.

The PSS Concorde has a feature which tracks the flight saving and loading, and saves and restores its own state correspondingly. When a flight is saved under a certain file name, the panel saves its state into a file with the same name and an extension of `.pss`, which is placed in the same folder as the saved flight, i.e. "My Documents\Flight Simulator Files". When this flight is later loaded, the panel will restore its state from its saved file.

Please note that, if you delete a saved flight, the matching panel `.sav` file will not be automatically deleted. Also, the Flight Simulator flight save/load is not always reliable. Sometimes the flight can be loaded with different fuel contents which will lead to an erroneous panel behavior such as M/CG warnings and autopilot disconnects. The workaround is, if incorrect restore is evident, to load the same flight again right away.

Several abbreviations are used throughout this manual to describe controls and indications. They include these uncommon ones:

MI Magnetic Indicator, a magnetically controlled mechanical indicator which can have two or three states.
MWS Master Warning System, or a certain light on the Master Warning System panel.

Air Conditioning & Pressurization

Overview

The air conditioning system consists of four independent groups. The groups take high pressure air form the engines and condition it by cooling, heating and dehumidification. The air is then used to pressurize the pressurized areas and for cooling and ventilation of the equipment racks.

Air Bleed

Each air conditioning group is supplied from an engine high pressure compressor through a bleed valve which comprises a shut-off valve and a pressure reducing valve. The shut-off valve allows air direct from the source to the pressure reducing valve which limits the supply pressure to 65 psi.

Four cross-bleed valves, downstream of the bleed valves, allow cross feeding between two adjacent supplies on each side of the aircraft. Each cross-bleed valve also permits the ground supply of air from a high pressure ground start truck for air conditioning purposes.

Air Conditioning

An air conditioning valve downstream of the cross-bleed valve controls the entry of bleed air into the air conditioning system.

The bleed air is cooled in a primary heat exchanger then, after passing through the cold air unit compressor, by a secondary heat exchanger and a fuel/air heat exchanger.

The primary and secondary heat exchanger cooling air is taken from an air intake, located on the engine nacelle, at low speeds and, from a bleed inside the air intake, at high speeds. Two jet pumps supplement the ram air flow through the primary and secondary heat exchangers when the landing gear is down.

Upstream from each primary heat exchanger a ram air valve regulates the ram air inlet flow to maintain the air temperature, upstream of the cold air unit, greater than 100°C when the ram air inlet is below 25°C. The fuel/air heat exchangers provide additional air cooling in supersonic flight.

An overheat conditioning in the primary heat exchanger, in the secondary heat exchanger, in the duct downstream of the cold air unit, will close and latch the conditioning valve.

An overpressure condition downstream of the bleed valve will close and latch the bleed valve.

A high differential pressure between the cold air unit and the pressurized cabin will close and latch the bleed valve.

Pre-conditioned air can be supplied through an external ground air supply connection located at the rear of the fuselage. The air is supplied directly to the distribution manifold.

Temperature control

The four air conditioning groups supply air to a manifold which distributes the air to the flight deck and the cabin. The manifold shape is such that with all four groups operating normally:

- group 1 supplies the flight deck
- group 2 supplies the forward cabin
- groups 3 and 4 supply the rear cabin

Temperature control is normally automatic through group temperature selectors. Normally:

- group 1 selector controls the flight deck
- group 2 selector controls the forward cabin
- group 4 selector controls the rear cabin

Pressure Control

Cabin pressure is controlled and maintained by using discharge valves and a ground pressure relief valve to control the outflow of conditioned air from the pressurized zones. Cabin pressure control includes two identical systems SYS 1 and SYS 2. There are two discharge valves, one forward and one aft for each system. Both systems are automatic and operate to the requirements selected on the cabin altitude selector, throttle settings and weight switches. Limited manual control of the pressurization is provided on each system. This permits the direct selection of either of the discharge valves to shut.

The cabin differential pressure is limited to 10.7 psi by the amplifier of the selected system and to 11.2 psi by the cabin pressure limiter of each discharge valve.

The cabin altitude is limited to 11,000 ft by a cabin altitude limiter on each discharge valve and to 15,000 ft by the discharge valve geometry when all four air conditioning groups are operating.

Provision is made for rapid dumping of cabin pressure within the range of the cabin altitude limiters.

A thrust recuperator is fitted to SYS 1 forward discharge valve; it is controlled by differential pressure.

Equipment Bay Cooling

Two fans extract air from the cabin and exhaust into the forward racks.

Three fans extract air from the forward electronic racks, instrument panels, consoles, weather radar, TRU and INS crates and exhaust the air through the operating forward discharge valve.

Two main fans and a standby fan is case of failure, extract air from the rear racks and exhaust the air underfloor to the aft discharge valve region.

A non-returning valve allows extraction of air from the underfloor region into the extract ducting, then to the forward discharge valves.

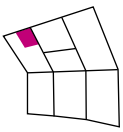
Ventilation

The main landing gear bay and flying control chassis bay are ventilated, using conditioned air from the cabin.

The main landing gear bay is cooled by air bled from the cabin underfloor area. The hydraulic ventilation valve is controlled by a barometric pressure switch.

The hydraulic bay at the rear of the aircraft is normally ventilated, using air bled from the cabin. The ventilation is assisted by a fan, drawing air from outside the aircraft when the cabin differential pressure is low.

Controls and Indications



② **System select switches (2)**

① **Discharge valves selectors (2)**

③ **Ground pressure relief valve MI**

④ **Ground pressure relief valve selector**

⑤ **Ditching valves switches (2)**

⑥ **Emergency depressuri-zation selector**

⑦ **Air vents hydraulic MI**

⑧ **Thrust recuperator MI**

① **Discharge valves selectors**

FWD SHUT - energizes a solenoid on the forward discharge valve of the corresponding system causing it to shut.

NORM - allows normal control of the discharge valves.

AFT SHUT - energizes a solenoid on the aft discharge valve of the corresponding system causing it to shut.

② **System select switches**

SYS 1 - the system 1 discharge valves are controlled by the system 1 cabin altitude selectors. The system 2 discharge valves ate closed.

SYS 2 - the system 2 discharge valves are controlled by the system 2 cabin altitude selectors. The system 2 discharge valves ate closed.

NOTE: both switches should always be in the same position.

④ **Ground pressure relief valve selector**

SHUT 1 - the No.1 motor is energized and shuts the ground relief valve.

AUTO - the ground pressure relief valve opens or shuts according to the position of the throttle levers and the aircraft weight switches.

SHUT 2 - the No.2 motor is energized and shuts the ground relief valve.

⑤ **Ditching valves switches**

NORM - allows normal control of the discharge valves.

SHUT - overrides normal control and ensures that the discharge valves will be shut when the aircraft is ditched thus preventing ingress of water through the discharge valves.

⑥ **Emergency depressurization selector**

EMERG DEPRESS - Allows the cabin differential pressure to reduce to zero if flight altitude is less than 11,000 ft or to the differential pressure corresponding to a cabin altitude of 11,000 ft if the flight altitude is more than 11,000 ft.

NORM - allows normal control of the discharge valves.

TEST - cancel the normal function and is only used for maintenance purposes.

⑦ **Air vents hydraulic MI**

OPEN - air vents are open.

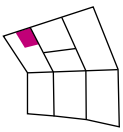
SHUT - air vents are closed when cabin altitude exceeds 11,000 ft.

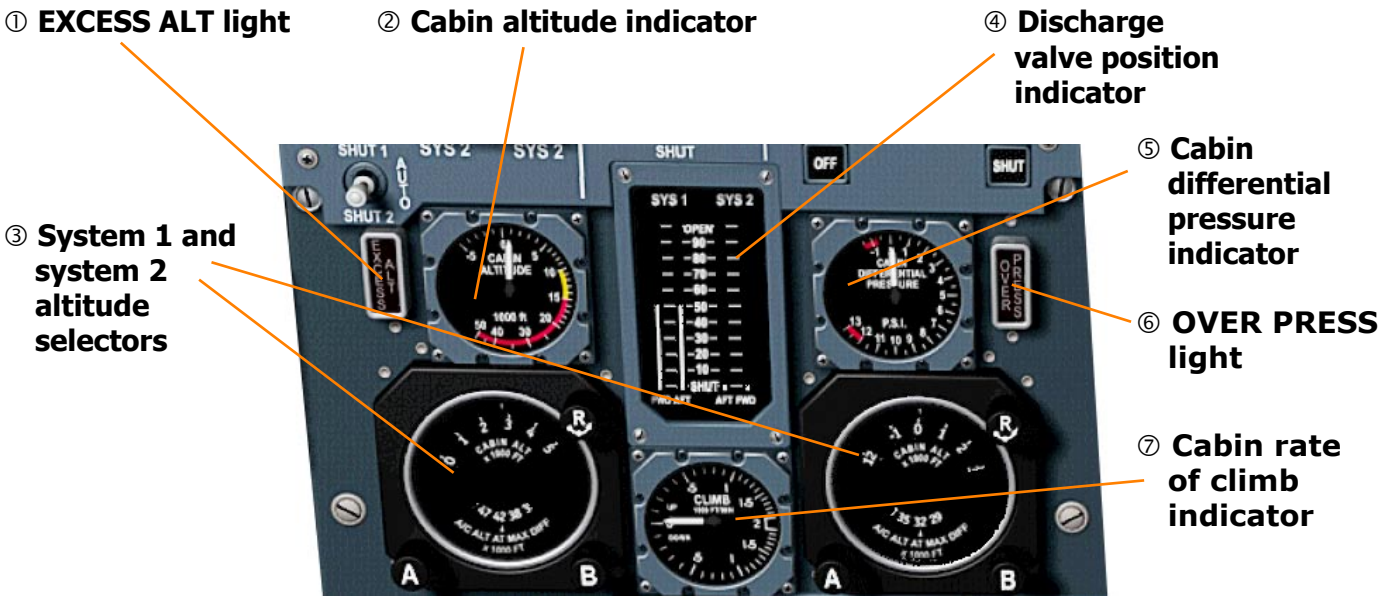
⑧ **Thrust recuperator MI**

OFF - Thrust recuperator is off when differential pressure is less than 3 psi.

ON - Thrust recuperator is on.

Controls and Indications





① **EXCESS ALT light (Red)**
Indicates - cabin altitude is above 10,000 feet. Accompanied by a master warning PRESS light (red) and audio (gong).

② **Cabin altitude indicator**
Reads the cabin altitude in 1000 ft's.

③ **System 1 and system 2 altitude selectors**
Turning the A knob sets the required cabin altitude.

At the same time the bottom window shows the altitude at which maximum differential pressure will be reached with the required cabin altitude.

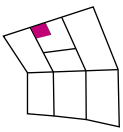
④ **Discharge valve position indicator**
In flight the forward indicator of the operating system normally indicates a greater opening than the aft indicator. A red and black striped flag appearing at the top of a discharge valve position scale indicates loss of electrical power to that indication.

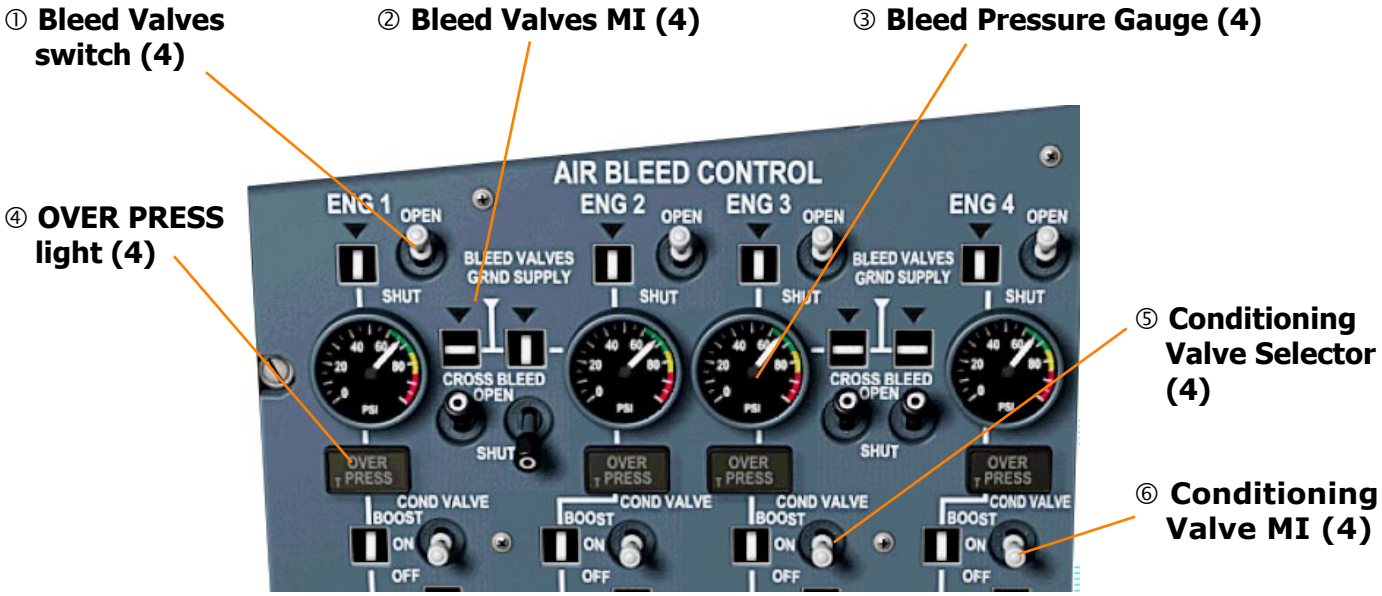
⑤ **Cabin differential pressure indicator**
Displays cabin differential pressure in psi.

⑥ **OVER PRESS light (Red)**
Indicates - cabin differential pressure exceeds 11 psi. Accompanied by a master warning PRESS light (red) and audio (gong).

⑦ **Cabin rate of climb indicator**
Shows cabin rate of climb in ft/min.

Controls and Indications





① Bleed Valves switch

OPEN - signals the bleed valve to open except when the engine shut down handle is pulled or when the cabin inlet safety valve is closed.

② Bleed Valves MI

INLINE: valves are open.

CROSSLINE: only when both the shut off and pressure reducing valves are shut regardless of the bleed valve switch position.

③ Bleed Pressure Gauge

Displays air pressure at the inlet of corresponding air conditioning group.

④ OVER PRESS light (Amber)

ON - indicates that the air pressure downstream of the corresponding bleed valve exceeds 85 psi. Accompanied by master warning AIR light (amber).

⑤ Conditioning Valve Selector

BOOST - increases the regulation value of the mass flow valve located downstream of the conditioning valve.

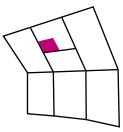
ON - allows the supply air to flow into its air conditioning groups.

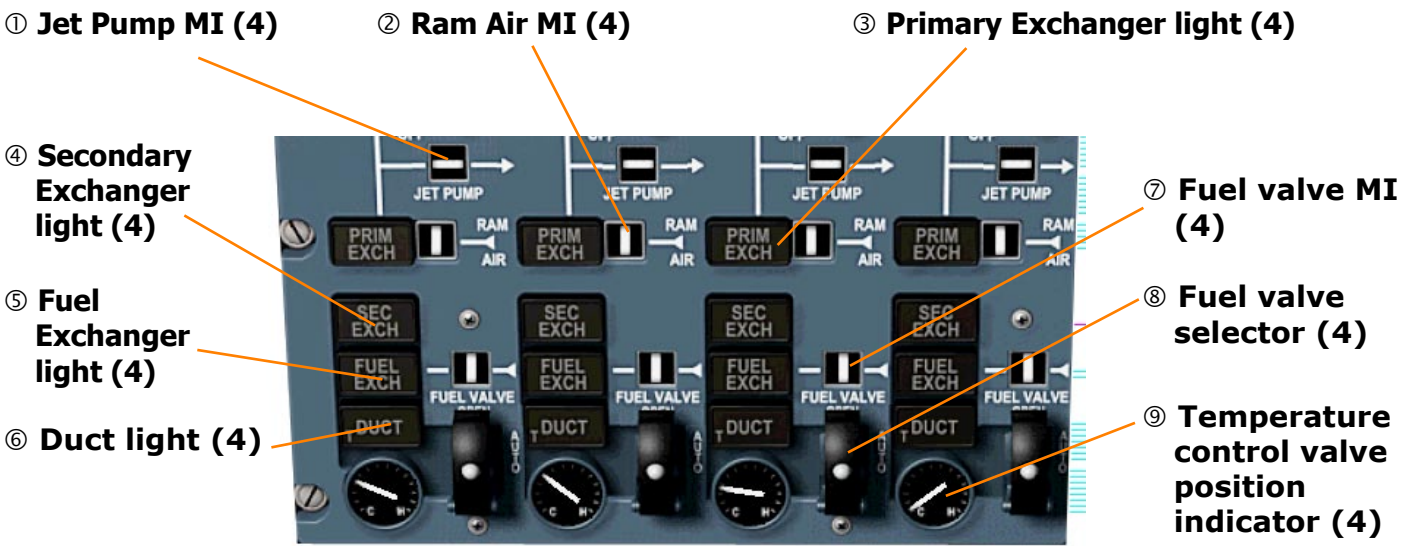
OFF - the conditioning valve is shut thus isolating the air conditioning group from the air supply.

⑥ Conditioning Valve MI

Shows the position of the conditioning valve.

Controls and Indications





① Jet Pump MI
Indicates position of a jet pump.

② Ram Air MI
INLINE: valve is fully open.
CROSSLINE: valve is not fully open.

③ Primary Exchanger light (Amber)
ON - indicates that a high temperature exists downstream of the primary exchanger. Accompanied by master warning AIR light (amber) and audio (gong).

④ Secondary Exchanger light (Amber)
ON - indicates that a high temperature exists downstream of the secondary exchanger. Accompanied by master warning AIR light (amber) and audio (gong).

⑤ Fuel Exchanger light (Yellow)
ON - indicates that a high temperature exists downstream of the fuel/air heat exchanger.

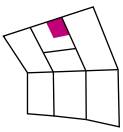
⑥ Duct light (Amber)
ON - indicates that a high temperature exists downstream of the fuel/air heat exchanger, or that the temperature downstream of the cold air unit exceeds 120°C, or a high differential pressure exists between the cold air unit outlet and the pressurized fuselage. Accompanied by master warning AIR light (amber) and audio (gong).

⑦ Fuel valve MI
INLINE: valve is fully open.
CROSSLINE: valve is shut.

⑧ Fuel valve selector
OPEN - fuel valve open
SHUT - fuel valve shut
AUTO - the fuel flow through the heat exchanger is controlled by a controller using the temperature of the fuel and the conditioning air temperature upstream and downstream of the fuel/air heat exchanger.

⑨ Temperature control valve position indicator
Shows the position of the temperature control valve which regulates the amount of air bypassing the cold air unit. When the indicator reads C the valve is shut.

Controls and Indications



① **LEAK light (4)**

② **CAU inlet temperature gauge (4)**

③ **Duct temperature gauge (4)**

④ **Mass flow gauge (4)**

⑤ **Area temperature indicators (3)**

⑥ **Comparator light**

① **LEAK light (Yellow)**
Indicates a leak in the double wall of the cold air unit.

② **CAU inlet temperature gauge**
Shows the cold air unit inlet temperature.

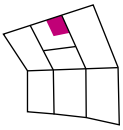
③ **Duct temperature gauge**
Shows the air temperature at the mixing point downstream of the cold air unit.

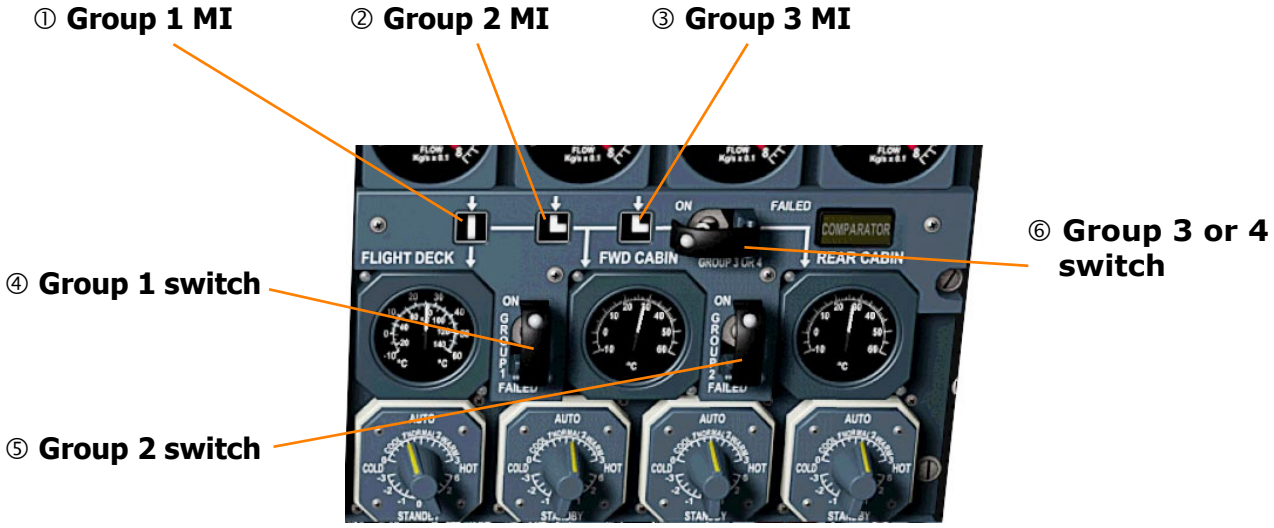
④ **Mass flow gauge**
Shows the air mass flow for each air conditioning group upstream of the distribution manifold.

⑤ **Area temperature indicators**
Show the flight deck, forward, and rear cabin temperatures.

⑥ **Comparator light (Yellow)**
ON - indicates a discrepancy exists between temperatures at the mixing point of group 3 and group 4 or the comparator has failed.

Controls and Indications





① **Group 1 MI**
Shows group 1 control selection.

② **Group 2 MI**
Shows group 2 control selection.

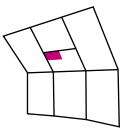
③ **Group 3 MI**
Shows group 1 control selection.

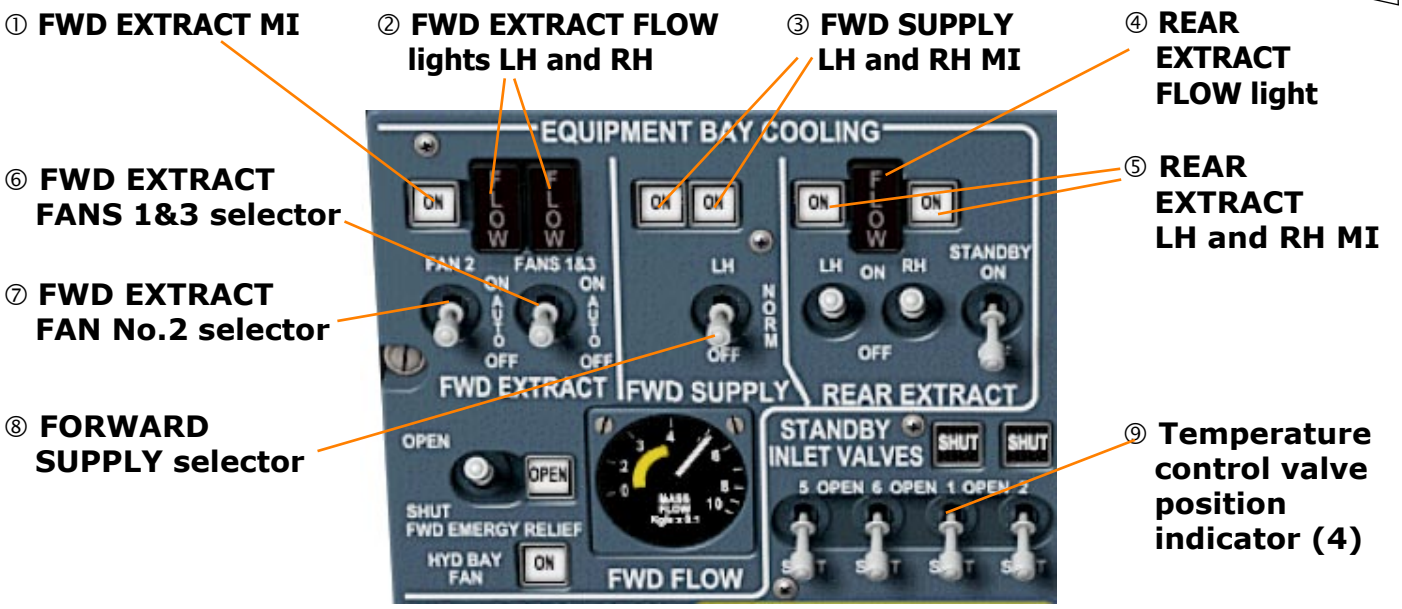
④ **Group 1 switch**
ON - selects the control of the flight deck temperature to group 1.
FAILED - selects the control of the flight deck temperature to group 2, the control of the forward cabin temperature to group 3 and unslaves group 3 and 4.

⑤ **Group 2 switch**
ON - selects the control of the forward cabin temperature to group 2.
FAILED - selects the control of the forward cabin temperature to group 3 and unslaves group 3 and 4.

⑥ **Group 3 or 4 switch**
ON - selects the control of the rear cabin temperature to group 4 and slaves the control of group 3 to group 4.
FAILED - unslaves group 3 from group 4.

Controls and Indications





① FWD EXTRACT MI

OFF - when less than three fans are electrically supplied.

ON - when all 3 forward extract fans are electrically supplied.

② FWD EXTRACT FLOW lights LH and RH (Amber)

ON - indicates that the mass flow from the affected side is below approx 50% normal. Accompanied by a master warning AIR light (amber) and audio (gong).

③ FWD SUPPLY LH and RH MI

Indicate the state of forward supply fans.

④ REAR EXTRACT FLOW light (Amber)

ON - indicates that the mass flow upstream of the three rear extract fans is low. Accompanied by a master warning AIR light (amber) and audio (gong).

⑤ REAR EXTRACT LH and RH MI

Each main rear extract fan is monitored by a MI.

⑥ FWD EXTRACT FANS 1&3 selector

ON - No. 1 & 3 forward extract fans run regardless of the differential pressure. Overrides its AUTO position.

AUTO - No. 1 & 3 forward extract fans run so long as the cabin differential pressure is lower than 2 psi.

⑦ FWD EXTRACT FAN No.2 selector

ON - No. 2 forward extract fan runs regardless of the differential pressure. Overrides its AUTO position.

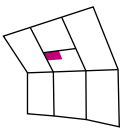
AUTO - No. 2 forward extract fan runs so long as the cabin differential pressure is lower than 2 psi.

⑧ FORWARD SUPPLY selector

LH - the right hand fan is switched off.

NORM - two fans extract air from the cabin and exhaust it into the forward racks, the weather radar crate and inertial navigation crate.

Controls and Indications



① **FWD EMERGENCY RELIEF MI**

② **FWD EMERGENCY RELIEF switch**

③ **HYDRAULIC BAY FAN MI**

④ **REAR EXTRACT LH and RH switches**

⑤ **REAR EXTRACT STANDBY switch**

⑥ **FORWARD FLOW indicator**

① **FWD EMERGENCY RELIEF MI**
Indicates the position of the forward emergency relief valve.

② **FWD EMERGENCY RELIEF switch**
OPEN - the forward emergency relief valve permits flow of rack exhausts air to the underfloor area and then to the rear discharge valves.

③ **HYDRAULIC BAY FAN MI**
ON - when the cabin differential pressure is lass than 5 psi.

④ **REAR EXTRACT LH and RH switches**
LH ON - left hand fan runs.
RH ON - right hand fan runs.

⑤ **REAR EXTRACT LH and RH MI**
Each main rear extract fan is monitored by a MI.

⑥ **FORWARD FLOW indicator**
Shows the mass flow downstream of the forward extract fans.

Automatic Flight

Overview

The Automatic Flight Control System (AFCS) is designed to provide the capability for 'hands off' flight during climb, cruise and descent to a Cat III landing and, if required, a go-around. The AFCS comprises the autothrottle, auto-pilot, warning and landing display and an interlock failure monitor and test system.

Autothrottle

The autothrottle system provides thrust control of speed for approach and cruise flying. The system includes airspeed and Mach hold modes (with datum adjust provision) and an airspeed acquire mode which captures a selected speed in the range 130-400 kts. Throttle reduction is initiated by the autopilot during an automatic landing.

The autothrottle system comprises two separate channels each engaged by a separate switch. Both channels are normally engaged, channel 1 having control authority and channel 2 being in a synchronised standby condition. Each channel is self monitored and disengages automatically in the case of a self detected failure or a failure of the air data system or inertial system supplying it with manometric and attitude data.

Instinctive disconnect switches on outboard throttle levers disengage the autothrottle. *These switches are not modelled on PSS Concorde panel but their function can be assigned a key combination or a joystick button using the Concorde Panel Config Utility.*

Please note that, if the autothrottle is disconnected either manually or automatically, the aircraft throttles may not match your actual joystick throttle positions. The Flight Simulator will only refresh the aircraft throttles after the physical throttle is moved i.e. you move the joystick throttle.

Autopilot and Flight Director

The aircraft installation comprises two separate channels each providing integrated autopilot and flight director systems. The input signals and computing are common to the autopilot and flight director. The autopilot signals operate the pitch, roll and yaw relay jacks in their autopilot mode and via the mechanical control linkages displace the pilots controls.

Normally both flight director channels are engaged but both autopilots may only be engaged after LAND mode is selected.

Selection of modes for both autopilot and flight director is common. If an autopilot is engaged with flight director already engaged the mode reverts to PITCH HOLD and HDG HOLD except if the flight director is in the LAND mode then the autopilot will also engage in LAND mode unless a GO-AROUND has been initiated, in which case engaging an autopilot will cause reversion to basic modes. If the flight director is engaged after autopilot the flight director engages in the modes already held by the autopilot. Modes which may be selected prior to automatic capture are provided with 'prime' lights to indicate successful arming. Subsequent selection of PITCH HOLD will de-select the 'primed' mode and extinguish the 'prime' light.

An autopilot instinctive disconnect button is placed on each handwheel. *These buttons are not modelled on PSS Concorde panel but their function can be assigned a key combination or a joystick button using the Concorde Panel Config Utility.*

Datum Adjust

A datum adjust unit allows small adjustments to the speed hold modes of the autothrottle and the pitch modes of the autopilot. The pitch datum adjust is zeroed and inhibited in MAX CRUISE mode. In heading hold mode an autopilot turn knob allows adjustment of heading at a fixed roll rate.

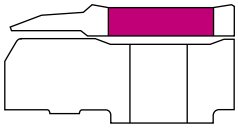
Warning and Landing Display

The system provides information on the operational status and functional capability of the automatic flight control system in its automatic approach and landing role and displays autopilot and auto throttle warnings during cruise flying.

Certain malfunctions in the latter stages of an automatic landing cause illumination of the AUTOLAND light which indicates that either a manual take over or an Automatic Go Around must be initiated.

Controls and Indications

AFCS panel



Controls and Indications

Autothrottle

① **IAS HOLD push button light**
PRESSED - holds the existing airspeed.
ON - indicates engagement of the mode.

IAS HOLD is the basic autothrottle mode and is engaged when autothrottle is selected.

② **MACH HOLD push button light**
PRESSED - holds the existing Mach No.
ON - indicates engagement of the mode.

③ **IAS ACQ push button light**
PRESSED - initiates the acquisition and subsequent hold of speed set on the SPEED SELECT.
ON - indicates engagement of the mode.

④ **AUTOTHROTTLE switches**
The engage switch for each AT channel is solenoid held in the engage position only when the associated channel has been satisfactorily engaged, or when satisfactorily primed when the autopilot is in the ALT ACQ mode. Thus the position of the switch always indicates the engagement state of the channel.

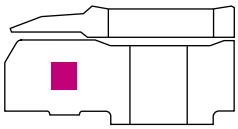
Normally both autothrottle switches are engaged. The disengagement of both autothrottle systems is accompanied by the AT light (red) flashing on landing display and, if the aircraft is below 600 ft in LAND or GLIDE mode, AUTOLAND lights (red) flashing on the dash panel.

⑤ **Speed setting indicator**
Shows selected speed datum for IAS ACQ mode. The window is covered by a white bar unless IAS ACQ mode is active.

⑥ **SPEED SELECT control**
Adjusts speed datum for IAS ACQ mode. Available range is 130-400 kts.

Left-click on the left or right side of the knob to decrement or increment datum by 1 kt. Right-click to adjust datum by 10 kt. Mouse wheel can also be used to adjust the datum.

Controls and Indications **Attitude Director Indicator**



① **Pitch index**

② **Roll Command bar**

③ **Rising Runway**

④ **DH light**

⑤ **Fixed aircraft symbol**

⑥ **Glide slope pointer**

⑦ **Pitch Command bar**

⑧ **TEST push button**

⑨ **Slip indicator**

⑩ **Localizer index**

① **Pitch index**
Preset to mark specific pitch.

On real aircraft, the index is adjusted by rotary selector on control column. In PSS Concorde, click to the left or to the right of the TEST push button to move the index.

② **Roll Command bar**
Provides roll guidance commands from the selected Flight Director.

③ **Rising Runway**
Shows the radio altimeter height. It appears as soon as the radio altimeter reads 200 ft.

④ **DH light**
ON - indicates that the aircraft is at or below the decision height set into the radio altimeter.

⑤ **Fixed aircraft symbol**
Shows the position of the aircraft in relation to the horizon index.

⑥ **Glide slope pointer**
Shows vertical position relative to glide slope - 2 dots represent half a degree.
The pointer is out of view when ILS frequency is not selected.

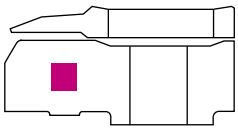
⑦ **Pitch Command bar**
Provides pitch guidance commands from the selected Flight Director.

⑧ **TEST push button**
PRESSED - tests the ADI functioning, the operation of the failure flag G and the CHECK ATT lights.

⑨ **Slip indicator**
Indicates aircraft side slip.

⑩ **Localizer index**
Shows lateral position relative to the localizer.

Controls and Indications — Attitude Director Indicator



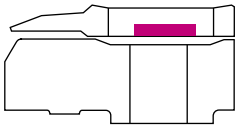
① **CHECK ATT light**
Indicates loss of valid INS attitude data.

② **Platform flag**
Black G on a red background.
G - indicates either an ADI internal failure or selected INS attitude failure.

③ **Glide slope flag**
Black G/S on a red background.
G/S - indicates the glide slope is not valid. Accompanied by disappearance of the glide slope pointer.

④ **Localiser flag**
Black LOC on a red background.
LOC - indicates the localiser data is not valid. Accompanied by disappearance of the localiser pointer.

Controls and Indications **Flight Director switches**



Flight Director switches

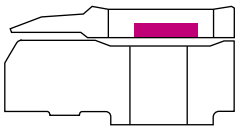
Flight Director switches
The engage switch for each Flight Director is solenoid held in the engage position only when the associated channel has been satisfactorily engaged, or when satisfactorily engaged. Thus the position of the switch always indicates the engagement state of the channel.

The basic Flight Director engagement mode is PITCH HOLD and will be engaged on selection of a Flight Director if no autopilot is engaged.

If a Flight Director is engaged when an autopilot is already engaged the Flight Director will assume the established mode.

If PITCH HOLD is engaged on the autopilot the Pitch Command bar will be biased out of view.

Controls and Indications **Autopilot switches**



① **Autopilot switches** ② **AP1 and AP2 lights**

① **Autopilot switches**
The engage switch for each autopilot channel is solenoid held in the engage position only when the associated channel has been satisfactorily engaged, or when satisfactorily engaged. Thus the position of the switch always indicates the engagement state of the channel.

At engagement the autopilot maintains the pitch attitude and engaged heading. Should the aircraft not be in a wings level condition upon engagement, automatic wings levelling and attainment of the engaged heading will be initiated.

Only one autopilot may be engaged except with LAND mode selected, when engagement of both autopilot channels is possible.

The loss of autopilot control is accompanied by the AP light (red) on landing display, accompanied by an audio (cavalry charge).

The instinctive autopilot disconnect buttons are located on control columns.
These buttons are not modelled, but their function can be assigned to a custom key combination or a joystick button using the supplied Concorde Panel Config Utility.

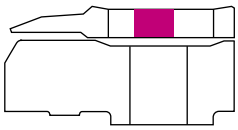
NOTES:

If engagement of an autopilot channel is attempted when a Flight Director is already engaged the system will return to the basic autopilot modes irrespective of the previously established mode associated with the Flight Director, except after LAND mode is selected when the autopilot will also engage in LAND mode. If the Flight Director is engaged in GO-AROUND mode autopilot engagement causes reversion to the basic mode.
If an autopilot is engaged when the autothrottle is already engaged and a non-compatible mode is selected on the autopilot, both channels of the autothrottle will disengage. If an autothrottle is engaged when the autopilot is engaged in a non-compatible mode the autopilot reverts to basic modes.

② **AP1 and AP2 lights (Green)**
ON - indicates engagement of the associated autopilot channel.

Controls and Indications

Autoflight modes



① **INS**
push button light

② **HDG TRK**
push button light

③ **HDG HOLD**
push button light

④ **PITCH HOLD**
push button light

① **INS push button light**
PRESSED - initiates the acquisition and subsequent hold of the track between two any points set in the INS.
ON - indicates engagement of the mode.

This mode also allows to follow Flight Simulator built-in GPS flight plan or external program commands. These features are controlled by the INS-FS and GPS-EXT switches.

② **HDG TRK push button light**
PRESSED - initiates the acquisition and subsequent hold of the track or heading preselected using the HDG-TRK selector.
ON - indicates engagement of the mode.

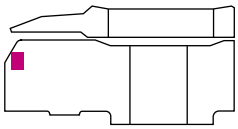
③ **HDG HOLD push button light**
PRESSED - holds the existing magnetic heading.
ON - indicates engagement of the mode.

HDG HOLD is a basic autopilot mode and is engaged when autopilot is selected.

④ **PITCH HOLD push button light**
PRESSED - holds the existing pitch attitude.
ON - indicates engagement of the mode.

PITCH HOLD is a basic autopilot mode and is engaged when autopilot is selected.

If an incompatible autothrottle mode is selected the autopilot will revert to this basic mode.

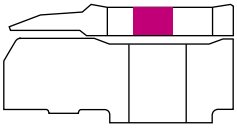


① **INS - FS switch**
INS - autopilot INS mode works normally.
FS - autopilot INS mode is controlled by the GPS - EXT switch.

② **GPS - EXT switch**
GPS - autopilot INS mode follows the flight plan created and loaded using Flight Simulator Flight Planner and visible on the built-in Flight Simulator GPS.
EXT - autopilot INS mode will follow the commands of any third party flight planning or autopilot software which controls aircraft using Flight Simulator standard autopilot heading selector.

Controls and Indications

Autoflight modes



① **TURB push button light**

② **BACK BEAM push button light**

③ **VOR LOC push button light**

④ **LAND push button light**

⑤ **GO-AROUND light**

① **TURB push button light**
PRESSED - holds the existing pitch attitude and heading and reduces the trim rate of the electric trim system.
TURB mode is specific to the autopilot.
ON - indicates engagement of the mode.

② **BACK BEAM push button light**
This mode is specific to the Flight Director and can only be used with the autopilot disengaged.
PRESSED - permits capture and tracking of a BACK BEAM LOC.
ON - indicates engagement of the mode.

③ **VOR LOC push button light**
PRESSED - initiates the acquisition and subsequent hold of the selected VOR radial (or LOC).
ON - indicates successful capture of the radial.

During the acquisition the prime light is on (white triangle below the button).

④ **LAND push button light**
PRESSED - primes both the VOR LOC and GLIDE modes.
ON - indicates successful capture of the LOC beam and GLIDE beam in LAND mode.

Before acquisition the prime light (white triangle) is on accompanied by VOR LOC prime (white triangle) and GLIDE prime light (white triangle).

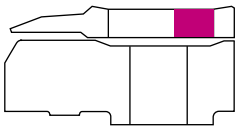
After LAND mode is selected the second autopilot can be engaged.

⑤ **GO-AROUND light**
ON - indicates that automatic go-around has been initiated.

Automatic go-around is initiated if at least two throttle levers are pushed fully forward with the autopilot engaged in LAND or GLIDE mode and autothrottles disengaged. If an autopilot and flight director are engaged the autopilot will pitch the aircraft 15° up and hold wings level and the ADI will show the appropriate command signals.

This mode is disengaged by disengagement of the autopilot or selection of HDG HOLD.

Controls and Indications **Autoflight modes**



① **IAS HOLD push button light**

② **VERT SPEED push button light**

③ **ALT HOLD push button light**

⑥ **ALT ACQ push button light**

④ **HDG PULL / TRK PUSH selectors (2)**

⑤ **VOR LOC selectors (2)**

① **IAS HOLD push button light**
PRESSED - holds the existing airspeed by adjusting aircraft pitch attitude.
ON - indicates engagement of the mode.

② **VERT SPEED push button light**
PRESSED - holds the existing vertical speed.
ON - indicates engagement of the mode.

③ **ALT HOLD push button light**
PRESSED - holds the existing altitude.
ON - indicates engagement of the mode.

④ **HDG PULL / TRK PUSH selectors**
Selects heading or track on the corresponding HSI. If the autopilot AP1 is active, heading or track selected in the left window is used. If AP2 is active, right window is used.

Left-click to the left or to the right of selector to adjust the window by 1.
Right-click to the left or to the right of selector to adjust the window by 10.
Click on the selector to toggle between TRK (pushed) and HDG (pulled).

⑤ **VOR LOC selectors**
Selects VOR course on the corresponding HSI.
In PSS Concorde, only the course selected in the left window is used by both the AP1 and AP2.

Left-click to the left or to the right of selector to adjust the window by 1.
Right-click to the left or to the right of selector to adjust the window by 10.

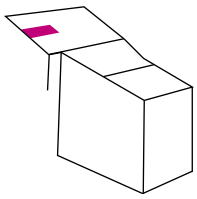
⑥ **ALT ACQ push button light**
PRESSED - initiates the acquisition of the altitude set on the ALTITUDE SELECT.

Upon selection of ALT ACQ the prime light will come on and the aircraft will remain under the control of the previous mode except in the case of ALT HOLD when VERT SPEED is automatically engaged at 800 fpm to intercept the selected altitude.
At the capture point, capture will be automatically initiated, this being indicated by the previous mode and the prime light going off and the ALT ACQ light coming on.
At the selected altitude the ALT ACQ light will go off and the ALT HOLD light will come on.

NOTE: if at the capture point an autothrottle is not engaged the AT light (red) will flash continuously on landing situation displays.

NOTE: if, during capture, altitude is reselected, pitch hold is engaged until the new capture point is reached.
If selected altitude passes through the present altitude, ALT HOLD is engaged at that level.

Controls and Indications **Datum adjust and turn control**



NOTE: The datum adjust and turn control panel is located on the centre console. For easier use, it can be opened in a separate pop-up window by right-clicking on the autopilot panel.

① **Autothrottle datum adjust**

② **Autopilot turn knob**

① **Autothrottle datum adjust**
The autothrottle datum adjust is a spring return to centre selector. The function of the selector is dependent on the speed mode in control:

MODE	Parameter / Range	Adjustment
IAS HOLD	Airspeed ±22 kt.	2 kt/sec.
MACH HOLD	Mach No. ±0.06 M.	0.006 M/sec

Click and hold on the upper or the lower part of the selector to shift the selector. Release mouse button to release the selector to centre position.

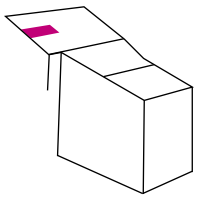
② **Autopilot turn knob**
In HDG HOLD the TURN knob will demand a bank angle proportional to the amount of movement of the knob but not exceeding 35 degrees.

Use of the TURN knob will cause reversion to the autopilot basic heading mode. The TURN knob must be returned to the centre detent position before any further heading mode selection is done.

The TURN knob is inoperative with LAND selected.

Click on the left or right part of the knob to turn. Right-click the knob to quickly return it to center detent.

Controls and Indications **Datum adjust and turn control**



NOTE: The datum adjust and turn control panel is located on the centre console. For easier use, it can be opened in a separate pop-up window by right-clicking on the autopilot panel.

Autopilot pitch datum adjust
The autopilot pitch datum adjust is a spring return to centre selector with two pressures in each direction. The function of the selector is dependent on the pitch mode in control:

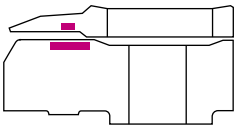
MODE	Parameter / Range	Slow adjustment	Fast adjustment
PITCH HOLD	Pitch	0.3 deg/sec.	2 deg/sec.
ALT HOLD	Altitude ±600 ft.	20 ft/sec.	60 ft/sec.
IAS HOLD	Airspeed ±20 kt.	0.7 kt/sec.	2.0 kt/sec.
MACH HOLD	Mach No. ±0.06 M.	0.002 M/sec.	0.007 M/sec.
MAX CLIMB	Airspeed ±13.7 kt.	0.7 kt/sec.	2.0 kt/sec.
VERT SPEED	Vert. speed ±6000 fpm.	80 fpm/sec.	800 fpm/sec.

To use the slow adjustment, left-click and hold on the upper or the lower part of the selector to shift it.

To use the fast adjustment, right-click and hold on the upper or the lower part of the selector to shift it.

Release mouse button to release the selector to centre position.

Controls and Indications **Warning and Landing Display**



① **AUTOLAND light (Red)**
ON flashing - indicates:
In LAND or GLIDE mode an ADC airspeed comparator warning or loss of both autothrottles below 600 ft
or
in LAND or GLIDE mode an ILS transmitter or double receiver failure below 200 ft for LOC or between 200 and 75 ft for GLIDE
or
in LAND mode and excessive ILS deviation below 200 ft for LOC or between 200 and 100 ft for GLIDE

② **AP light (Red)**
ON - indicates total loss of autopilot control. Accompanied by an audio (cavalry charge).

The AP light may be cancelled by operation of the AP instinctive disconnect push button (*This button is not modelled but its function can be assigned to a key combination or joystick button using Concorde Panel Config Utility*). It can also be cancelled by pressing the light.

③ **AT light (Red)**
Flashing - indicates total loss of autothrottle control.
or
if, in autopilot/flight director ALT ACQ mode the autothrottle is not engaged at capture initiation.
or
If, in autopilot/flight director LAND or GLIDE mode the autothrottle is not engaged at glide capture initiation.

The AT light may be cancelled by operation of the AT instinctive disconnect push button (*This button is not modelled but its function can be assigned to a key combination or joystick button using Concorde Panel Config Utility*). It can also be cancelled by pressing the light.

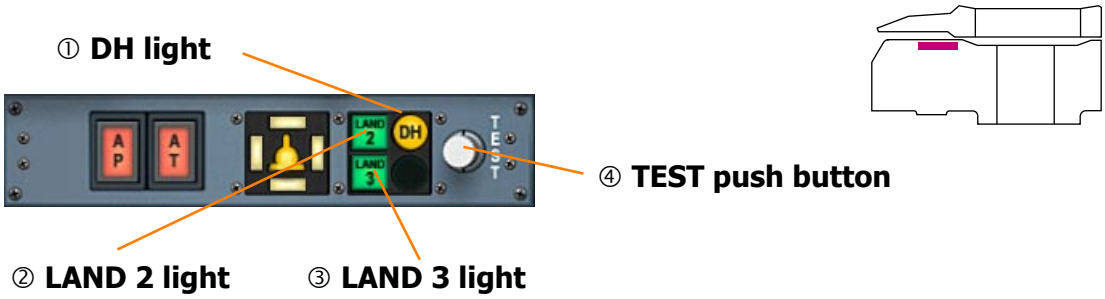
④ **Aircraft deviation lights**
Associated with the autopilot and/or flight director in the approach modes.

Aircraft symbol light (Amber):
ON - accompanied by left vertical light - indicates that the aircraft has deviated 1/4 dot to the right of the LOC centre line.
or
ON - accompanied by right vertical light - indicates that the aircraft has deviated 1/4 dot to the left of the LOC centre line.
or
ON - accompanied by upper horizontal light - indicates that the aircraft has deviated one dot below the glide slope.
or
ON - accompanied by lower horizontal light - indicates that the aircraft has deviated one dot above the glide slope.

NOTE: Below 100 ft the glide slope deviation warning is inhibited.

NOTE: Below 200 ft in the LAND mode a localizer or glide deviation warning will be accompanied by the AUTOLAND lights (red) flashing.

Controls and Indications **Warning and Landing Display**



① **DH light (Amber)**
ON - indicates that the aircraft is at or below the decision height set into the associated radio altimeter.

NOTE: the DH light is independent of autopilot / flight director engagement.

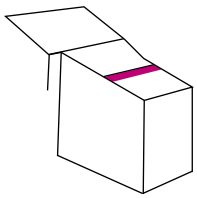
② **LAND 2 light (Green)**
Associated with the autopilot in LAND mode.
ON - indicates that the capability of the system is that of automatic landing in category 2 conditions.
Land 2 capability requires:
- Flight controls in an electrical mode.
- One autopilot engaged in LAND mode.
- The flare light test successful.
- At least one landing display serviceable.
- At least one autothrottle engaged in IAS ACQ mode.

③ **LAND 3 light (Green)**
Associated with the autopilot in LAND mode.
ON - indicates that the capability of the system is that of automatic landing in category 3 conditions.
Land 3 capability requires:
- Flight controls in an electrical mode.
- Two autopilot engaged in LAND mode.
- The flare law tests successful.
- At least one landing display serviceable.
- At least one autothrottle engaged in IAS ACQ mode.
- At least one flight director engaged.
- Green/yellow hydraulic system pressure correct.
- Both AFCS VOR LOC selectors at the same course.
- Electrical generation split.

④ **TEST push button**
PRESSED - tests all the filaments of the Warning and Landing Display and most of the associated logic and excessive deviation thresholds inside the associated computer.

Communications

Controls and Indications



VHF Radio

① **Active frequency indication**

② **Standby frequency indication**

③ **Transfer button**

④ **Frequency selector knob**

① **Active frequency indication**
The active operating radio frequency.

② **Standby frequency indication**
The standby frequency is selected using the selector knob and can be swapped into the active window using the Transfer button.

③ **Transfer button**
PUSHED - The selected standby frequency becomes the new active frequency. The previous active frequency is swapped into the standby window.

④ **Frequency selector knob**
Adjusts the standby frequency.
Clicking to the left of the knob adjusts the whole part of the frequency. Clicking to the right of the knob adjusts the fractional part. You can also use mouse wheel to quickly dial the frequency.

Controls and Indications

ATC Transponder

① **ATC mode selector**
Selects the standby or normal mode of transponder operation.

② **ATC switch**
Selects the first or the second of the two transponders for operation.

③ **ATC digital code display**
Shows the selected ATC digital code.

④ **Code selector knobs**
Used to select the digital ATC code. The left knob changes the first two digits, the right knob changes the second two digits.
Clicking to the left of a knob adjusts the left digit in a pair, clicking to the right adjusts the right digit. You can also use mouse wheel to quickly change digits.

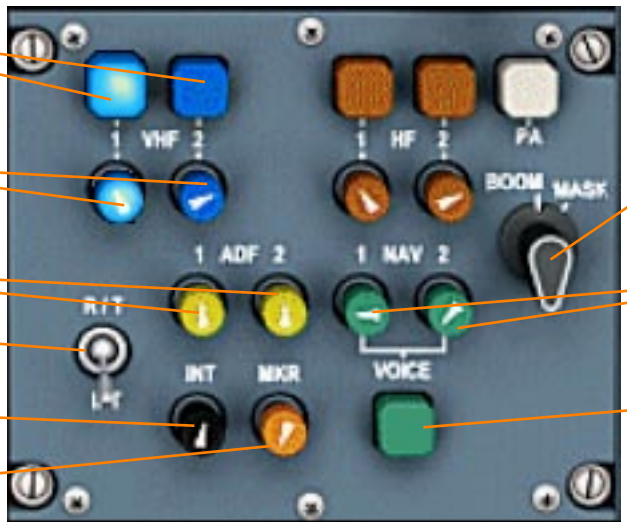
⑤ **ALT RPTG switch**
1 - the altitude reporting function that transmits altitude information to the ground radar uses the altitude from ADC1.
2 - the altitude reporting function uses the altitude from ADC2.

⑥ **IDENT button**
PRESSED - gives additional pulse reply for positive identification.

⑦ **REPLY light (Green)**
ON - indicates that the selected transponder is being interrogated.

Controls and Indications

Audio Panel



① **VHF 1&2 Tx select push buttons**
Chooses the COM1 or COM2 communications radio to transmit. *Only one radio can be selected*.

② **VHF 1&2 Rx select push buttons**
Selects the COM1 and COM2 radio reception. *In Flight Simulator, you can only select reception of either both radios or reception of the same radio as selected for transmitting.*

③ **ADF 1&2 Rx buttons**
Select reception of NDB station morse idents.

④ **R/T - INT selector**
Selects the radio/telephone or interphone for transmission*. Has no effect in Flight Simulator.*

⑤ **INT button**
Selects the interphone reception. *Has no effect in Flight Simulator.*

⑥ **MKR button**
Selects the reception of marker beacon audio.

⑦ **BOOM/MASK selector**
BOOM - selects the boomset microphone.
MASK - selects the oxygen mask microphone.
Has no effect in Flight Simulator.

⑧ **VHF NAV 1&2 Rx buttons**
Selects the NAV1 and NAV2 morse ident reception.

⑨ **VOICE button**
Toggles voice/range filter for NAV 1&2 audio.
Has no effect in Flight Simulator.

Doors

Overview

The aircraft has two passenger and four cabin service exterior doors, upper and a lower baggage compartment doors and several miscellaneous ground servicing doors. The interior doors consist of four lavatory doors and a flight deck door. All the doors are operated manually.

Passenger and Service Doors

Two outward opening doors in the left-hand side of the fuselage, one forward and the other midway along the passenger compartment, provide normal entry and exit for passengers and crew, and may be opened from inside or outside of the aircraft.

Four outward opening doors, two in the right-hand side of the fuselage opposite the passenger doors, and two, one each side of the fuselage, at the rear end of the passenger compartment, provide access to crew and passenger compartment for servicing between flights, and may be opened from either inside or outside the aircraft.

All the doors may be used for emergency evacuation of the aircraft and are provided with escape equipment.

The two passenger doors and the intermediate cabin service door are fitted with slide/raft escape facilities, while the forward and two rear cabin service doors are fitted with escape slide only. Each forward passenger and forward cabin service door is fitted with an observation window.

Baggage Compartment and Miscellaneous Doors

The upper baggage compartment door is normally opened from outside but a means of opening the door from inside by an emergency handle is provided. When not in use the handle is clipped to the door surround structure. To retain the door in its fully open position it is necessary to utilize a separately stowed retention pin.

The lower baggage compartment and miscellaneous doors can only be opened from outside.

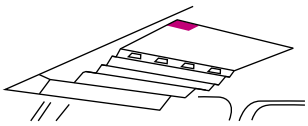
Flight Deck Door

An electrically operated lock striking plate controlled by a switch on the flight compartment roof panel, provides the crew with an independent means of unlocking the door. The door can be opened from the inside the flight compartment at any time by turning the door knob, and from the cabin side only by a key. The door is fitted with a manually operated latch bolt, a mirror, and a cabin observerscope on the forward face.

Door Warning

The door warning system is an automatically controlled electrical system which, when a door in the pressure hull is not properly locked in position, activates the master warning system.

Controls and Indications



① **Flight deck door switch**

① **Flight deck door switch**

OPEN - the door lock electric strike is de-energized. In this condition the door can be opened from either side without turning the knob or using the key.

NORMAL - the door lock electric strike is energized. In this condition the door can be opened from flight deck side by turning the knob and from the cabin side, only by using a key.

Electrical

Overview

Electrical power for the aircraft is generated by integrated drive generators (IDG) mounted in each engine. Hydraulically powered emergency generator can provide power for essential supplies in case of failure or emergency. The generators provide A.C. power.

On the ground, the system can be powered using external ground power.
In Flight Simulator, the ground power is always available when the parking brake is set.

D.C. power is provided by Transformer Rectifier Units (TRU) and batteries.

The Concorde does not have an Auxiliary Power Unit (APU).

AC Generating System

During ground operations power is supplied from an external source. When the ground power unit is connected to the aircraft its output is automatically checked for voltage, frequency and direction of rotation.

A ground power breaker controls the connection of ground power to the split system breakers, the bus tie breakers and hence the a.c. main busbars.

Normal power is supplied by four engine-driven IDGs. At engine start the output from each generator is automatically connected to its a.c. main busbar when minimum control conditions of voltage and frequency are reached and the frequency synchronism is acceptable to the busbar.

Frequency control of each generator is provided by its constant speed drive (CSD). CSD can be disconnected at any time but it can only be reconnected on the ground with the engine stopped.

AC Distribution System

Each generator is connected to its a.c. main busbar (AC MAIN 1, 2, 3 and 4) by a generator circuit breaker (GCB). The generators outputs may be used in parallel combination up to all four in parallel, the busbars being by means of bus tie breakers (BTB) and split system breakers (SSB). The SSB connect the left hand main a.c. system to the right hand main a.c. system. Each BTB connects an a.c. main busbar in parallel with the other a.c. main busbars.

Normally the a.c. essential busbars (AC ESS 1, 2, 3 and 4) are powered each from its associated a.c. main busbar, but if any a.c. main busbar fails the emergency generator automatically starts and connects to the dead a.c. essential busbar.

Emergency Generation

An emergency generator powered by a hydraulic motor supplied from the green hydraulic system is capable of supplying sufficient power for all essential electrical systems in flight. The emergency generator automatically starts if any a.c. main busbar fails or if No. 1 and No. 2 engines fail while airborne.

Emergency Distribution

Under failure conditions the emergency generator is directly connected to emergency busbar A and through the auto shed breaker (ASB) to emergency busbar B. Emergency busbar A powers the a.c. essential busbars AC ESS 1 and AC ESS 2. Emergency busbar B powers the essential busbars AC ESS 3 and AC ESS 4.

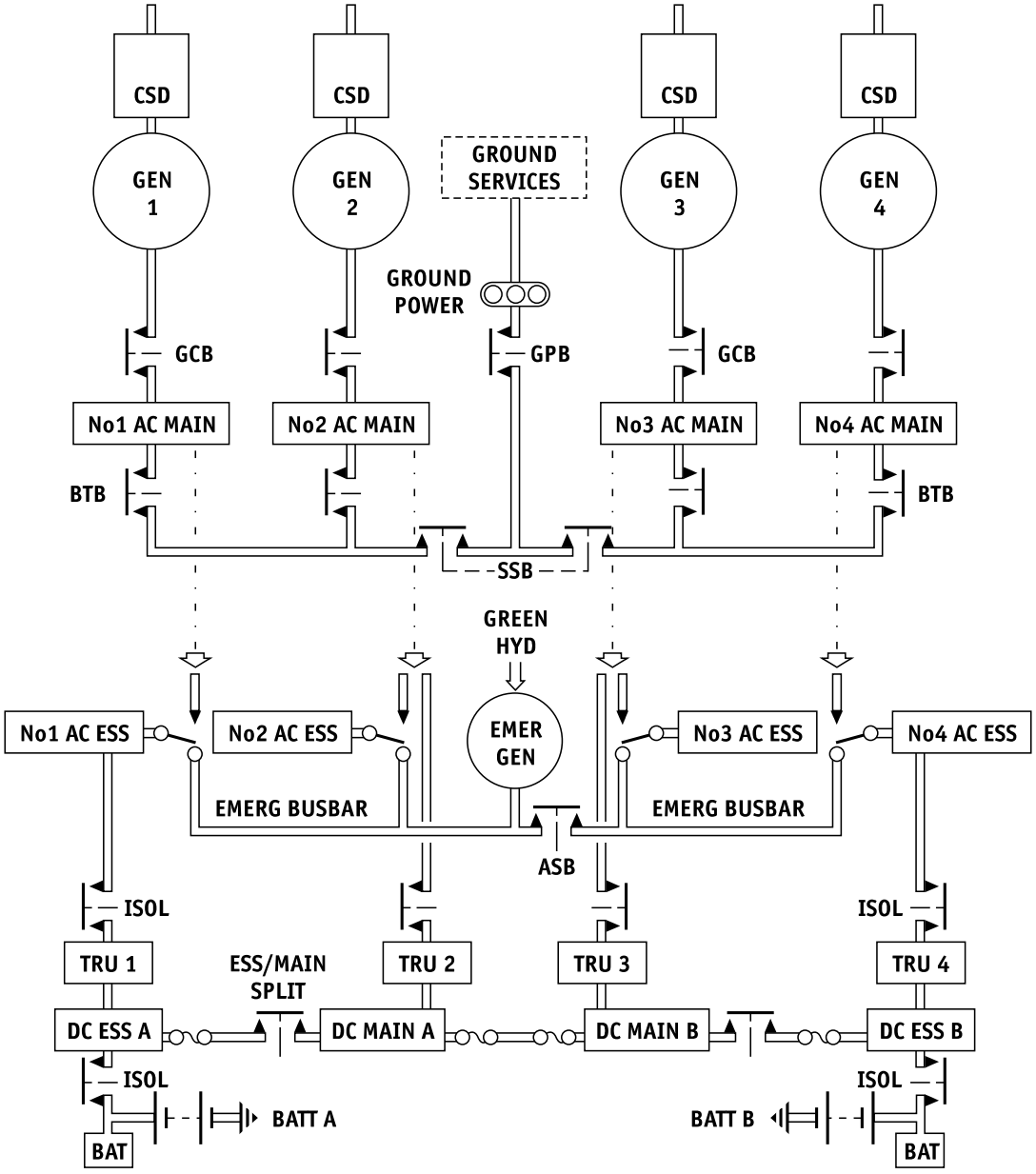
D.C. Generating System

Four transformer rectifier units (TRU) are the primary source of d.c. power. TRU No. 1 and No. 4 are powered from the a.c. essential busbars AC ESS 1 and AC ESS 4. TRU No. 2 and No. 3 are powered from the a.c. main busbars AC MAIN 2 and AC MAIN 3.

D.C. Distribution System

The TRU No. 2 and No. 3 power the d.c. main busbars DC MAIN A and B. The TRU No. 1 and No. 4 power the d.c. essential busbars DC ESS A and B.

Electrical System Schematic



Controls and Indications

① **CSD Oil Temperature indicator**
Left hand indicator shows the INLET temperature, the right hand indicator shows DIFF (differential) between the inlet and outlet temperatures.

② **CSD Oil Overtemperature light (Yellow)**
ON - indicates a high oil temperature at the inlet to the CSD.

③ **CSD Disconnect switch**
DISC - disconnects the CSD from the engine. The CSD speed drops and automatically disconnects the generator from its associated a.c. main busbar.

④ **CSD light (Amber)**
ON - indicates low oil pressure within the CSD. Accompanied by MWS ELEC light (amber) and audio (gong).

⑤ **kW / kVAR meter**
Normally indicates generator load in kilowatts

⑥ **kVAR push button**
PRESS - to obtain generator load indication in kilovolt-amps (reactive)

⑦ **Generator selector**
ON - the output from the generator will be connected to the a.c. main busbar as soon as datum conditions are reached
OFF - disconnects the generator from its associated a.c. main busbar.

⑧ **Generator light (Amber)**
ON - when the GCB is not connecting the generator to the associated a.c. main busbar. Accompanied by MWS ELEC light (amber) and audio (gong).

⑨ **GCB MI**
INLINE - generator is connected to the main a.c. busbar. This is a backup to the GEN light.
CROSSLINE - generator is disconnected from the busbar.

Controls and Indications

① **AC MAIN BUS light (4)**

② **BTB Selector (4)**

③ **BTB MI (4)**

④ **SSB MI (4)**

⑤ **SSB switch**

⑥ **GRND POWER AVAILABLE light**

⑦ **Ground power switch**

① AC MAIN BUS light (Red)
ON - indicates a failure of supply at the a.c. essential busbar. Accompanied by MWS ELEC light (red) and audio (gong).
OFF - when the busbar is powered by either its attendant a.c. main busbar or the emergency generator.

② BTB Selector
RESET - closes the BTB.
NORM - automatically controls the connection of its a.c. main busbar to the other a.c. main busbars.
TRIP - opens the BTB and disconnects the associated a.c. main busbar from the others.

③ BTB MI
INLINE - BTB closed.
CROSSLINE - BTB open.

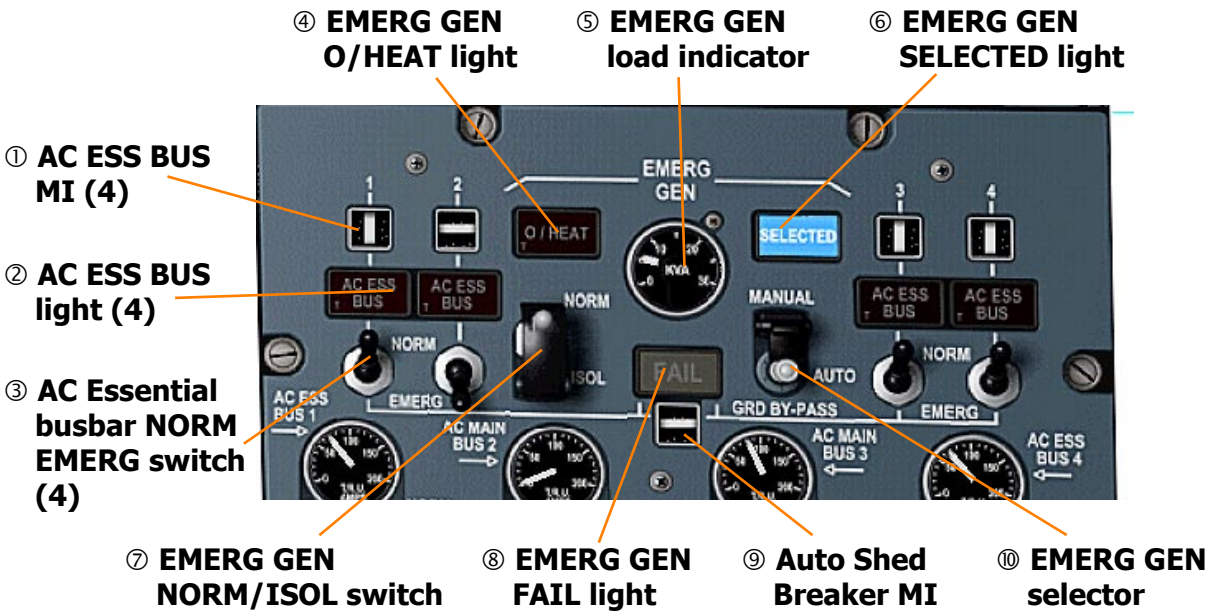
④ SSB MI
INLINE - SSB closed.
CROSSLINE - SSB open.

⑤ SSB switch
CLOSE - automatically parallels No. 1 and No. 2 generators with No. 3 and No. 4 generators when voltage and frequency are compatible.
OPEN - Isolates No. 1 and No. 2 a.c. main busbars from No. 3 and No. 4 a.c. main busbars.

⑥ GRND POWER AVAILABLE light (white)
ON - indicates that the ground supply is of the required voltage, frequency and direction of rotation and is available for connection to the busbars.

⑦ Ground power switch
CLOSE - closes the ground power breaker and directs ground supply to SSBs, BTBs and hence the main a.c. busbars. On engine shutdown, arms the ground power breaker circuit. The ground supply will be connected automatically to the busbars as the last generator is disconnected.
TRIP - disconnects the ground supply from the aircraft busbars.

Controls and Indications



① AC ESS BUS MI

INLINE - Indicates that the a.c. essential busbar is connected to its associated a.c. main busbar.

② AC ESS BUS light (Red)

ON - indicates a failure of supply at the a.c. essential busbar. Accompanied by MWS ELEC light (red) and audio (gong).

OFF - when the busbar is powered by either its attendant a.c. main busbar or the emergency generator.

③ AC Essential busbar NORM EMERG switch

NORM - connects the a.c. essential busbar to its associated a.c. main busbar.

EMERG - selects the emergency generator on and disconnects the a.c. essential busbar from its associated a.c. main busbar and connects it to the emergency generator busbars.

④ EMERG GEN O/HEAT light (Red)

ON - indicates an emergency generator high temperature. Accompanied by MWS ELEC light (red) and audio (gong).

⑤ EMERG GEN load indicator

Reads output of the emergency generator.

⑥ EMERG GEN SELECTED light (Blue)

ON - indicates that hydraulic power has been selected to drive the generator.

⑦ EMERG GEN NORM/ISOL switch

NORM - arms the emergency generator for subsequent operation.

ISOL - switches off the emergency generator hydraulic supply and the O/HEAT light supply.

⑧ EMERG GEN FAIL light (Yellow)

ON - Indicates that the emergency generator has been selected to run but is outside its operating limits.

⑨ Auto Shed Breaker MI

INLINE - indicates that the AC ESS 3 and 4 busbars can be connected to the AC ESS 1 and 2 busbars.

CROSSLINE - indicates that there is no connection between AC ESS 3 and 4 busbars and the AC ESS 1 and 2 busbars.

⑩ EMERG GEN selector

MANUAL - providing the EMERG GEN NORM/ISOL switch is at NORM, causes the emergency generator to run bypassing the automatic switching system and regardless of weight switch position.

AUTO - providing the EMERG GEN NORM/ISOL switch is at NORM, the emergency generator is armed to operate when any a.c. main busbar loses its supply or when No.1 and No.2 engines fail while airborne.

GRD BY-PASS: by-passes the weight switch inhibit circuit of the emergency generator.

Controls and Indications

① **TRU load indicator (4)**

② **TRU O/HEAT light (4)**

③ **TRU switch (4)**

④ **D.C. ESS BUS light (2)**

⑤ **ESS/MAIN SPLIT MI (2)**

⑥ **D.C. MAIN BUS light**

⑦ **Battery selector (2)**

⑧ **BATT ISOLATE light (2)**

⑨ **Battery MI**

① **TRU load indicator**
Reads TRU load in amps.

② **TRU O/HEAT light (Yellow)**
ON - indicates a TRU excess temperature.

③ **TRU switch**
NORM - connects TRU to its a.c. supply.
ISOL - breaks a.c. supply to the TRU.

④ **D.C. ESS BUS light (Red)**
ON - indicates that the d.c. essential busbar is not supplied. Accompanied by MWS ELEC light (red) and audio (gong).
OFF - when the busbar is powered by the TRUs or the batteries.

⑤ **ESS/MAIN SPLIT MI**
INLINE - indicates that the attendant d.c. main and essential busbars are connected.
CROSSLINE - d.c. main and essential busbars are disconnected.

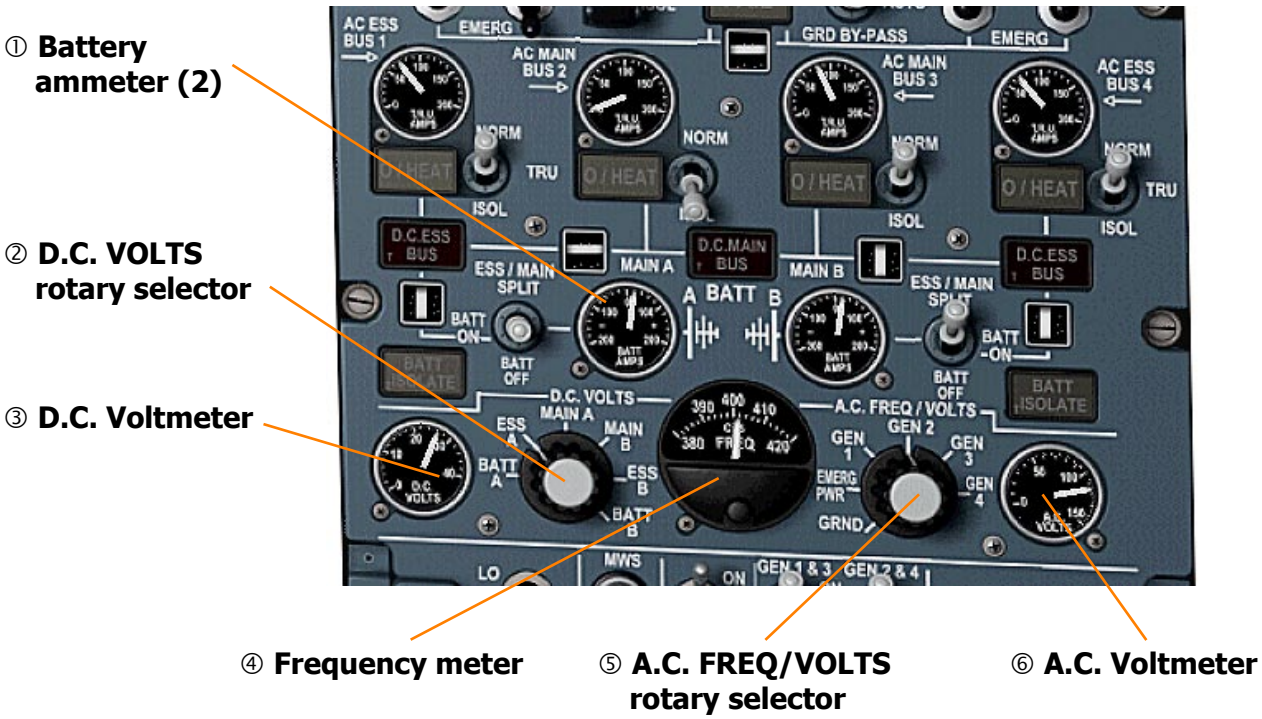
⑥ **D.C. MAIN BUS light (Amber)**
ON - indicates that one or both parts of the busbar are at less than 25 volts and are automatically disconnected from the associated d.c. essential busbar. Accompanied by MWS ELEC light (amber) and audio (gong).
OFF - when the busbar is powered by the TRUs.

⑦ **Battery selector**
ESS/MAIN SPLIT: connects the battery to its associated d.c. essential busbar and opens the associated d.c. ess/main isolate breaker, thus disconnecting the d.c. main and d.c. essential busbars from each other.
BATT ON: connects the battery to its associated d.c. essential busbar and arms the associated d.c. ess/main isolate breaker, thus connecting the d.c. main and d.c. essential busbars together.
BATT OFF: disconnects the battery from its associated d.c. essential busbar and arms the associated d.c. ess/main isolate breaker, thus connecting the d.c. main and d.c. essential busbars together.

⑧ **BATT ISOLATE light (Amber)**
ON - Indicates that the battery is disconnected from the associated d.c. essential busbar. Accompanied by MWS ELEC light (amber) and audio (gong).

⑨ **Battery MI**
This is a back up to the BATT ISOLATE light.
INLINE: Battery is connected to the d.c. essential busbar.
CROSSLINE: Battery is disconnected from the d.c. essential busbar.

Controls and Indications



① **Battery ammeter**
Reads battery current in amps.

② **D.C. VOLTS rotary selector**
Selects the input system for the D.C. voltmeter.

③ **D.C. Voltmeter**
Displays voltage in the system selected by D.C. VOLTS selector.

④ **Frequency meter**
Shows the frequency in cycles per second in the system selected by A.C. FREQ/VOLTS selector.

⑤ **A.C. FREQ/VOLTS rotary selector**
Selects the input system for the A.C. voltmeter and frequency meter.

⑥ **A.C. Voltmeter**
Displays voltage in the system selected by A.C. FREQ/VOLTS selector.

Flight Controls

Overview

The aircraft is controlled in pitch and roll by elevons and in yaw by rudders. Each control surface is independently operated by a Power Flying Control Unit (PFCU).

The three elevons, on each side of the aircraft, are in two groups: the outer and middle elevons because their deflection angles are always synchronised, and the inner elevons because their deflection angles in the roll axis are less than that of the outer and middle elevons.

Flight Control Channels

Conventional flight deck controls actuate three signal channels; two electrical (one called Blue and the other Green) and one Mechanical.

Each electrical flying control channel is supplied from its own inverter which has the same colour code as the channel it supplies. The electrical signalling operates at a different frequency from the main aircraft system.

On both blue and green electrical channels pilot control movements generate, by means of synchro transmitters called resolvers, electrical signals that directly control the PFC servos. Each flight control group, middle and outer elevons, inner elevons and rudders, operates independently through its own resolvers that also ensure the pitch and roll mixing for the elevons.

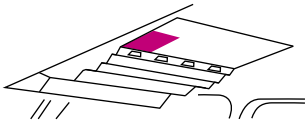
The mechanical channel also transmits pilot control movements to the PFC servos but is unclutched at the servos when either electrical channel is operating.

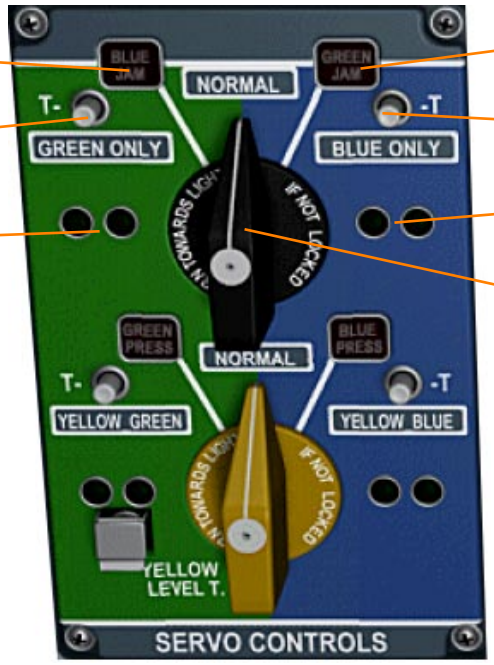
Three signals, blue, green and mechanical are therefore available at the PFC servos but only one is activated by the monitoring system that monitors the operation of the control surfaces by groups.

On the mechanical channel of each flight control axis pilot control movements are transmitted to the PFC servos by linkages and cables through a relay jack that compensates for linkage inertia.

The PFCUs, relay jacks and artificial feel units are normally supplied with pressure from blue and green hydraulic systems. In the case of the PFCUs and relay jacks only, the yellow standby system may be selected to replace either a failed blue or green main system. Control of these supplies is through selection on the SERVO CONTROLS panel.

Controls and Indications





① **BLUE JAM light**

② **BLUE JAM Test button**

③ **GREEN ONLY PEA lights**

④ **GREEN JAM light**

⑤ **GREEN JAM Test button**

⑥ **BLUE ONLY PEA lights**

⑦ **Servo controls BLACK rotary selector**

① **BLUE JAM light (Red)**
ON - indicates jamming of a spool valve on the blue system side of a PFC servo. Accompanied by MWS PFC light (red) and audio (gong).

② **BLUE JAM Test button**
PRESSED - tests the warning light and its connection to the master warning system.

③ **GREEN ONLY PEA lights (Green)**
ON - to show that both electrical controls of the blue system PFC selectors are signalled to close.

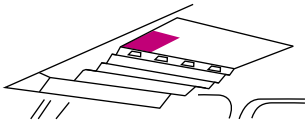
④ **GREEN JAM light**
ON - indicates jamming of a spool valve on the green system side of a PFC servo. Accompanied by MWS PFC light (red) and audio (gong).

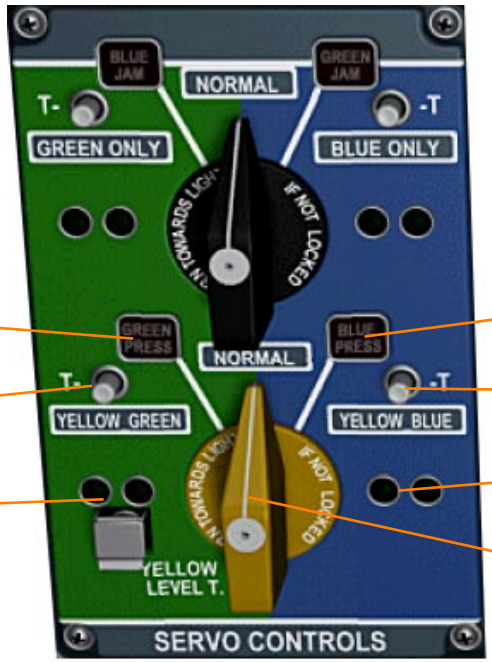
⑤ **GREEN JAM Test button**
PRESSED - tests the warning light and its connection to the master warning system.

⑥ **BLUE ONLY PEA lights (Green)**
ON - to show that both electrical controls of the green system PFC selectors are signalled to close.

⑦ **Servo controls BLACK rotary selector**
NORMAL - provided the yellow rotary selector is at NORMAL, blue hydraulic pressure is selected to supply the blue side of all PFC servos and green hydraulic pressure to supply the green side.
BLUE JAM GREEN ONLY - signals both controls of the blue system PFC selectors to close, inhibits the BLUE JAM light, and arms the auto change system that selects yellow/green in the event of green low pressure.
GREEN JAM BLUE ONLY - signals both controls of the green system PFC selectors to close, inhibits the GREEN JAM light, and arms the auto change system that selects yellow/blue in the event of blue low pressure.

Controls and Indications





① **GREEN L. PRESS light**

② **GREEN L. PRESS Test button**

③ **YELLOW GREEN PEA lights**

④ **BLUE L. PRESS light**

⑤ **BLUE L. PRESS Test button**

⑥ **YELLOW BLUE PEA lights**

⑦ **YELLOW (PFC) rotary selector**

① **GREEN L. PRESS light (Red)**
ON - indicates low pressure downstream of the green system PFC servos selector, or if YELLOW_GREEN is selected, low pressure downstream of the yellow/green PFC servos selector. Accompanied by MWS PFC light (red) and audio (gong).

② **GREEN L. PRESS Test button**
PRESSED - tests the warning light and its connection to the master warning system.

③ **YELLOW GREEN PEA lights (Green)**
ON - to show that both electrical controls of the YELLOW GREEN system PFC selector are signalled to OPEN.

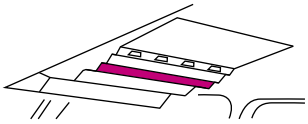
④ **BLUE L. PRESS light (Red)**
ON - indicates low pressure downstream of the blue system PFC servos selector, or if YELLOW_BLUE is selected, low pressure downstream of the yellow/blue PFC servos selector. Accompanied by MWS PFC light (red) and audio (gong).

⑤ **BLUE L. PRESS Test button**
PRESSED - tests the warning light and its connection to the master warning system.

⑥ **YELLOW BLUE PEA lights (Green)**
ON - to show that both electrical controls of the YELLOW BLUE system PFC selector are signalled to OPEN.

⑦ **YELLOW (PFC) rotary selector**
NORMAL - The yellow hydraulic system is isolated from the flight control system.
YELLOW GREEN - the green hydraulic system selectors to the green side of the PFC servos and relay jacks are signalled to close and the yellow hydraulic system selectors to the green side of the PFC servos and relay jacks are signalled to open thus the yellow system powers the green ram of each PFC servo and relay jacks.
YELLOW BLUE - the blue hydraulic system selectors to the blue side of the PFC servos and relay jacks are signalled to close and the yellow hydraulic system selectors to the blue side of the PFC servos and relay jacks are signalled to open thus the yellow system powers the blue ram of each PFC servo and relay jacks.

Controls and Indications



① BLUE INVERTER selector

ON - provides a.c. power to the corresponding blue flight control electrical channel.

OFF INV - cuts the a.c. power to the corresponding blue flight control electrical channel. Inhibits the associated FAIL light.

PWR OFF - cuts both the a.c. and d.c. power to the corresponding flight control electrical channel and the flight control monitoring system.

② BLUE and GREEN INVERTER FAIL light (Red)

ON - indicates that the output from the inverter is outside limits and the d.c. supply has been cut. Accompanied by the MWS PFC light (red) and audio (gong).

③ GREEN INVERTER selector

ON - connects the a.c. power to the corresponding green flight control electrical channel.

OFF INV - cuts the a.c. power to the corresponding green flight control electrical channel. Inhibits the associated FAIL light.

PWR OFF - cuts both the a.c. and d.c. power to the corresponding flight control electrical channel and the flight control monitoring system.

④ O&M ELEVONS, IN ELEVONS and RUDDER selectors

BLUE - selects the blue electrical signalling channel as the primary operating channel for the flight controls.

GREEN - selects the green electrical signalling channel as the primary operating channel for the flight controls.

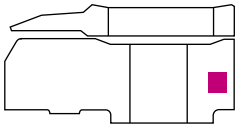
MECH - selects the mechanical channel as the primary operating channel for the flight controls.

⑤ ANTI STALL SYSTEM switches

ON - Engage the anti high incidence system (not modelled).

OFF - Disengage the anti high incidence system.

Controls and Indications



① **Elevon positions**

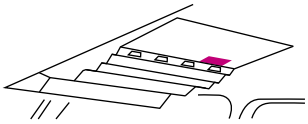
② **Rudder position**

③ **Flight control channel MIs (8)**

① **Elevon positions**
Indicate the position of outer, middle and inner elevons

② **Rudder position**
Indicates the position of rudder.

③ **Flight control channel MIs**
M - the mechanical channel is in use for the control surface.
B - the blue electrical channel is in use for the control surface.
G - the green electrical channel is in use for the control surface.



① **Relay Jacks selector**

② **BLUE JAM and GREEN JAM lights**

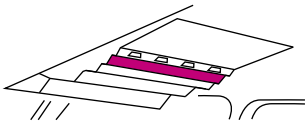
③ **BLUE and GREEN TEST button**

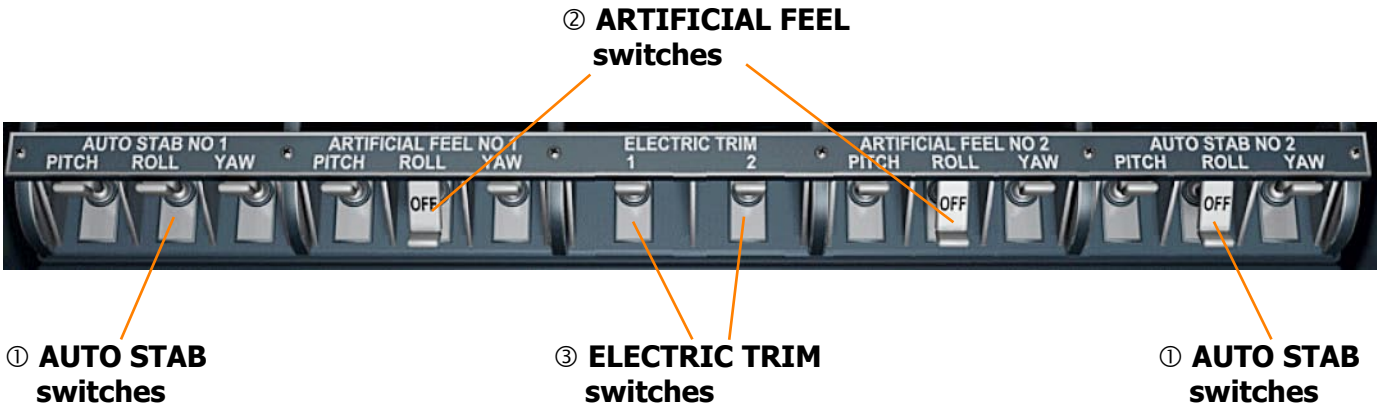
① **Relay Jacks selector**
GREEN ONLY - signals the relevant hydraulic selector for the blue side of the relay jack to close and inhibits the BLUE JAM light.
NORM - blue system hydraulic pressure is selected to supply the blue side of the pitch, roll and yaw relay jacks and green system hydraulic pressure is selected to supply the green system.
BLUE ONLY - signals the relevant hydraulic selector for the green side of the relay jack to close and inhibits the GREEN JAM light.

② **BLUE JAM and GREEN JAM lights (Red)**
ON - indicates that the spool valve on the blue or green side of the relay jack has jammed. Accompanied by MWS PFC (Red).

③ **BLUE and GREEN TEST button**
Pressed - tests the BLUE JAM or GREEN JAM warning light and its connection to the master warning system.

Controls and Indications





① AUTO STAB PITCH-ROLL-YAW switches
The engage switch for each autostabilisation channel is solenoid held in the engage position only when the associated channel has been satisfactory engaged. Thus the position of the switch always indicates the engagement state of the channel.

OFF - the axis is disengaged. Failure of both autostabilisation channels is accompanied by a MWS STAB light (Red) and audio (gong).

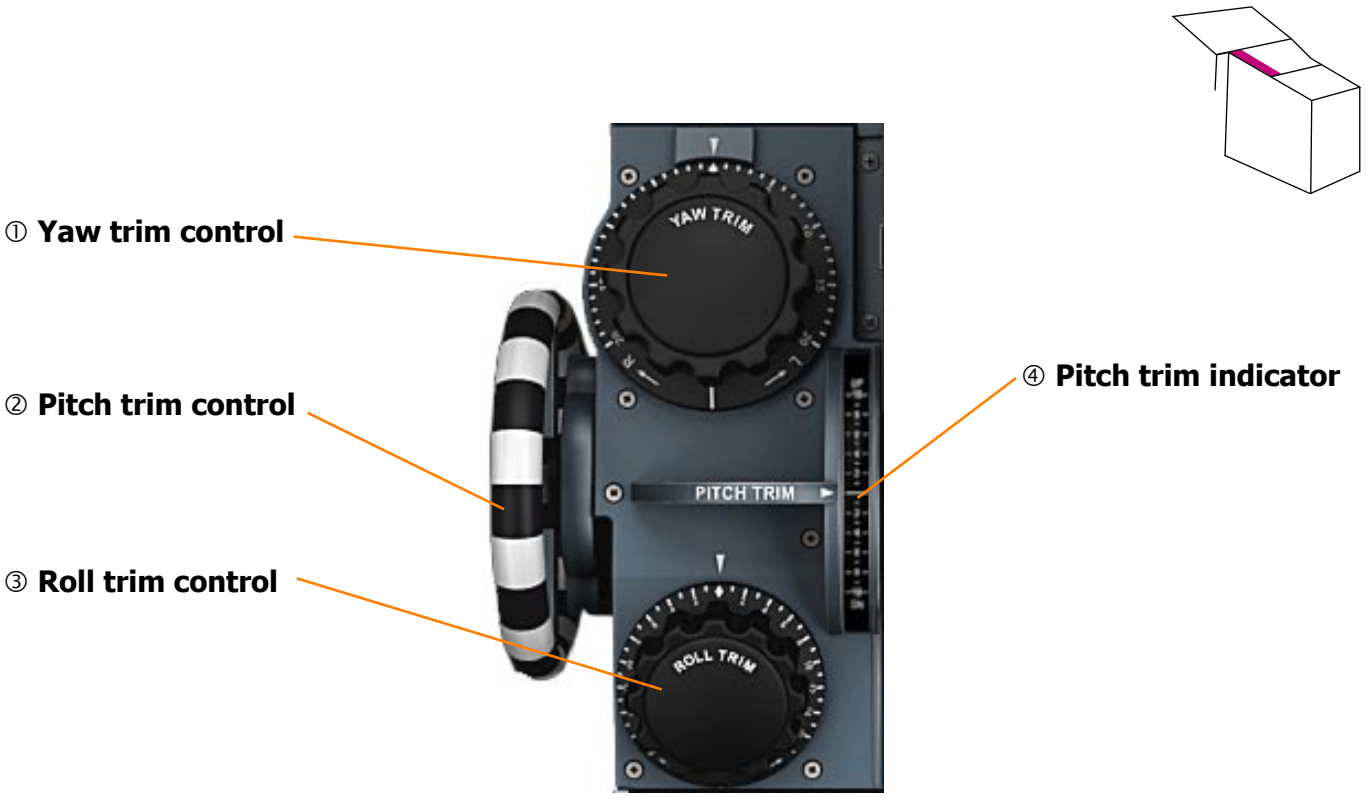
② ARTIFICIAL FEEL switches
The engage switch for each artificial feel channel is solenoid held in the engage position only when the associated channel has been satisfactory engaged. Thus the position of the switch always indicates the engagement state of the channel.

OFF - the axis is disengaged. A switch dropping to OFF indicates a loss of the associated jack, while three switches dropping to OFF indicate a loss of hydraulic pressure, or an artificial feel computer malfunction or an ADC malfunction. The second switch of an axis dropping to OFF is accompanied by a MWS FEEL light (Red) and audio (gong).

③ ELECTRIC TRIM switches
The engage switch for each electric trim channel is solenoid held in the engage position only when the associated channel has been satisfactory engaged. Thus the position of the switch always indicates the engagement state of the channel.

OFF - the channel is disengaged. Failure of both electrical trim channels is accompanied by a MWS TRIM light (Red) and audio (gong).

Controls and Indications



① **Yaw trim control**
Provides manual control of rudder trim.

② **Pitch trim control**
Provides manual control of elevon trim in pitch.

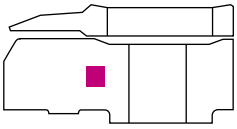
③ **Roll trim control**
Provides manual control of elevon trim in roll.

④ **Pitch trim indicator**
Indicates the existing trim position.

Flight Instruments

Controls and Indications

Altimeter



① **Altitude alert light (Amber)**
ON - steady indicates approach to the altitude selected on the autopilot ALTITUDE SELECT.
ON - flashing indicates deviation from the altitude selected on the autopilot ALTITUDE SELECT.

② **Window**
The altitude information appears in digital form, in a window in the centre of the instrument. The left part of the window displaying flight levels is outlined with a white line.
A red and black striped flag across the digits indicates loss of power supply or valid signal.

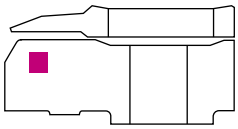
③ **Datum pressure setting knob**
Used to set the datum pressure displayed in two windows marked inHg and mbar. Rotate static pressure knob to set the required setting in corresponding windows.

④ **Reminder bugs**
White, yellow, red and green bugs used to mark specific altitudes.
To move a bug, simply drag it with the mouse. Please note that the mouse cursor doesn't change from pointer to hand when placed over a bug.

⑤ **Altitude pointer**
Indicates altitude in hundreds of feet.

Controls and Indications

Airspeed Indicator



① **Window**
Displays calibrated airspeed (CAS) in digital form. An OFF flag indicates loss of electrical supply or valid signal.

② **Orange Bug**
Orange T-shaped reminder bug used to mark specific reference speed.

③ **Bug Knob**
Used to set the orange T-shaped reminder bug.

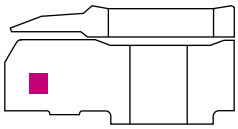
④ **Reminder bugs**
White bugs used to mark specific speeds. *To move a bug, simply drag it with the mouse. Please note that the mouse cursor doesn't change from pointer to hand when placed over a bug*.

⑤ **CAS pointer**
A white pointer indicates calibrated airspeed.

⑥ **Max speed pointer**
An orange and black pointer indicates the limiting value of M_{MO}, V_{MO} or T_{MO}.

Controls and Indications

Machmeter



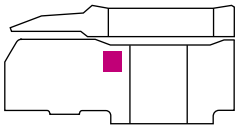
① **Window**
Displays Mach number in digital form. Digital readout is covered with a black bar when below M=0.45.

② **Mach number pointer**
A white pointer indicates the Mach number.

③ **Indices**
Two orange indices labelled AFT and FWD indicate the maximum and minimum allowed Mach number according to the aircraft center of gravity.

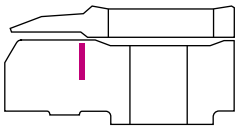
④ **Max Mach pointer**
An orange and black pointer indicates the limiting value of M_{MO}, V_{MO} or T_{MO}.

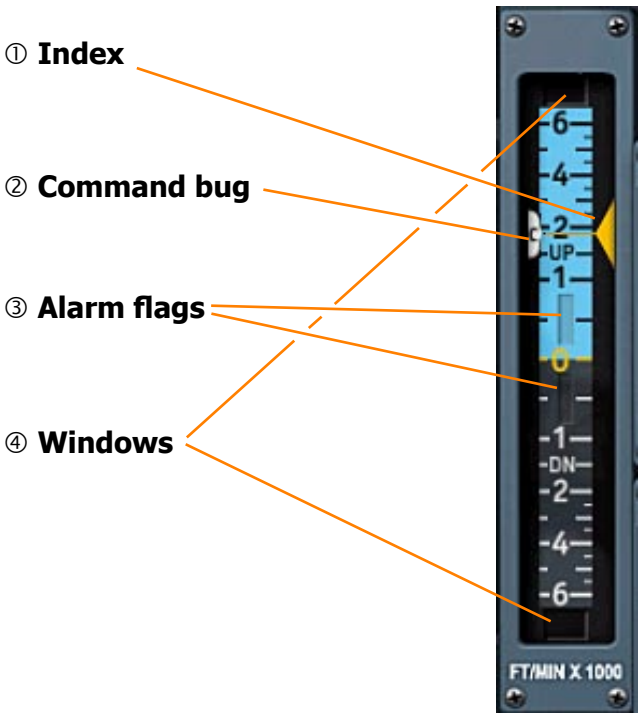
Standby Horizon



Controls and Indications

Vertical Speed Indicator





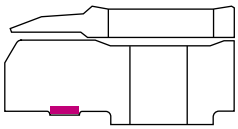
① **Index**
The vertical speed is indicated by a yellow index running in front of a scale graduated from 0 to ±6000 ft/min.

② **Command bug**
A bug marked C shows, with the AFCS in VERT SPEED mode, the commanded vertical speed. The command bug is moved using the autopilot datum adjust.

③ **Alarm flags**
Two red and black striped flags indicate loss of power supply or valid signal.

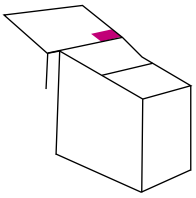
④ **Windows**
If vertical speed exceeds plus or minus 6000 ft/min, the vertical speed is indicated in thousands of ft/min by digits 8, 9 or 10 appearing in windows above or below the scale.

Sideslip Indicator



Sideslip indicator
A white index indicates aircraft side slip angle in degrees directly from a sideslip vane.

Controls and Indications



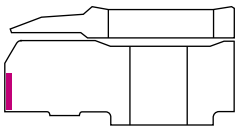
Temperature Indicator

① **Total temperature**
Displays Total air temperature (TAT). A red flag with TOTAL printed in black indicates loss of power supply.

② **Static temperature**
Displays Static air temperature (SAT). A red flag with STATIC printed in black indicates loss of power supply.

③ **Temperature in relation to ISA**
Indicates the difference between the Static air temperature (SAT) and International Standard Atmosphere (ISA) temperature.
A red flag with ISA printed in black indicates loss of power supply.

Accelerometer / Angle of Attack Indicator

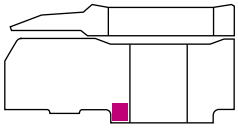


① **Accelerometer moving index**
The g values are shown by a white index running in front of a scale.
There is no failure indicator for the accelerometer.

② **Angle of Attack moving tape**
The angle of attack value is indicated by a white bar running alongside a scale.
Two red and black striped flags covering the scale indicate loss of power supply or valid signal.

Controls and Indications

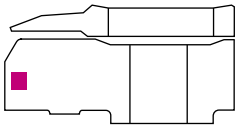
Standby Altimeter



① **Altitude**
The barometric altitude is indicated by a white pointer showing hundreds of feet, and a digital readout showing thousands of feet.

② **Pressure datum**
The pressure datum repeats the in.Hg. setting of the main altimeter.

Standby Airspeed / Machmeter



① **Max speed pointer**

② **Airspeed / Mach No. pointer**

③ **Reminder bugs (4)**

④ **Orange V reference bug**

⑤ **V reference setting knob**

① **Max speed pointer**
Orange and black pointer indicates the limiting value of Vmo.

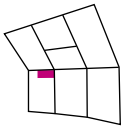
② **Airspeed / Mach No. pointer**
The pointer indicates airspeed on airspeed scale, and Mach number on Mach scale moving behind the IAS scale.

③ **Reminder bugs**
White bugs used to mark specific speeds. *To move a bug, simply drag it with the mouse. Please note that the mouse cursor doesn't change from pointer to hand when placed over a bug*.

④ **Orange V reference bug**
Marks specific reference speed.

⑤ **V reference setting knob**
Turn to adjust the orange V reference bug.

Controls and Indications



Flight Engineers Flight Instruments

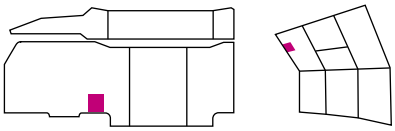
① **Mach number**
Red and black striped flag indicates loss of power supply.

② **Total temperature indicator**
The instrument range is -50°C to +220°C.
Red and black striped flag indicates loss of power supply.

③ **Altimeter**
Shows pressure altitude.
Red and black striped flag indicates loss of power supply.

Controls and Indications

Clock



Captain's Clock as illustrated has three displays, GMT, ELAPS and CHRONO. The CHRONO display can be switched to Timer function to give a noise abatement count down facility.
Flight Engineer's Clock is the same as Captain's clock except that there is no ELAPS time facility.

① TIMER - CHRONO switch
CHRO: with switch in this position, the CHRONO indicator operates as a normal stopwatch and is controlled by three-state CHRONO button:
PUSH - to start,
PUSH - to stop,
PUSH - to reset.
TIMER: with switch in this position, the CHRONO display operates as a countdown timer. Use GMT selector at SLOW or FAST to preset the countdown value. To start the countdown, press the CHRONO button. Stop and Reset functions are inhibited in this mode.

② TIMER ALERT lights
In the TIMER mode only, the lights begin to flash 5 seconds before the display achieves zero. At zero seconds the lights become steady. The lights are inhibited in CHRONO mode.

③ GMT selector
These positions work only in TIMER mode:
RUN - the timer is counting, if started.
HOLD - the timer is frozen.
SLOW - the timer is increased at slow rate.
FAST - the timer is increased at fast rate.

The TEST position illuminates all segments on all displays regardless of operation mode.

④ Tendency indicator
Represents GMT seconds:
NO BARS LIT: 0 to 14 seconds.
BOTTOM BAR: 15 to 29 seconds.
TWO BARS: 30 to 44 seconds.
THREE BARS: 45 to 59 seconds.

⑤ ELAPSED TIME selector
The switch controls Elapsed Time display.
STOP - counter stopped
RUN - counter operating
RESET (springloaded) - counter reset to zero and indicators out

⑥ CHRONO button
Controls CHRONO display.

With TIMER/CHRONO switch set to CHRONO:
Three-state pushbutton:
PUSH - starts counter increasing.
PUSH - stops counter.
PUSH - resets counter to zero.

With TIMER/CHRONO switch set to TIMER:
Single state pushbutton:
PUSH - starts counter decreasing.

Fuel System

Overview

Fuel is stored in thirteen sealed tanks which are integral with the wing and fuselage structures. The tanks are arranged in three principal groups:

- Engine Feed
- Main Transfer
- Trim Transfer

This arrangement ensures that fuel is delivered to the engines at suitable flow rates, temperatures and pressures to satisfy all engine operating conditions. It provides a means of controlling and adjusting the aircraft's centre of gravity both prior to take-off and during flight to match the differing aerodynamic centre of pressure positions which occur during transonic acceleration and deceleration. The system also provides a heat sink for the dissipation of heat rejected by the air-conditioning and hydraulic systems and ensures that the temperature increase arising from kinetic heating is kept to a minimum. The use of a number of separate tanks, together with their internal bracing, reduces the amount of surging of the stored fuel. Because of the high climb rate of the aircraft, the tanks that store fuel during the climb require to be de-aerated, to ensure that air in solution in the fuel does not become a hazard.

Engine Feed

Each engine has its own feed system from a collector tank, however, a crossfeed system allows any engine or group of engines to be supplied from any collector tank.

An accumulator is used to provide a limited amount of fuel when a low pressure is sensed in the engine feed.

Between the LP valve and engine driven pump each feed system contains air conditioning and hydraulic heat exchangers. A fuel LP protection system, when armed, causes the fuel to the engine to bypass the air conditioning and hydraulic heat exchangers in the event of a low fuel pressure. Disarming the bypass valve circuit ensures a constant fuel flow through the heat exchanger.

Main Transfer

The collector tanks are replenished from the main transfer tanks 5, 6, 7, & 8 in a sequence that minimizes the movement of the aircraft centre of gravity.
The main transfer sequence is manually initiated using the pumps in tanks 5 and 7, and is:

- Tank 5 replenishing tank 1 via the left hand pump, and tank 2 via the right hand pump.
- Tank 7 replenishing tank 3 via the left hand pump, and tank 4 via the right hand pump.

When tanks 5 and 7 are empty, the pumps in tanks 6 and 8 continue the transfer by:

- Tank 6 replenishing tank 1 via the left hand pump, and tank 2 via the right hand pump.
- Tank 8 replenishing tank 3 via the left hand pump, and tank 4 via the right hand pump.

Transfer of fuel from the auxiliary tanks 5A and 7A is into their respective main tanks 5 and 7.

Trim Transfer

The trim transfer system is used to redistribute the fuel in the trim tanks and main transfer tanks so that the aircraft centre of gravity can be moved to optimum positions for take off, subsonic and supersonic flight.

The trim transfer is normally automatically sequenced and controlled from the Flight Engineer's Panel, however there is a forward transfer override control available to the Pilots for use in abnormal circumstances requiring a rapid forward transfer of fuel.

The aft trim tank (11) has four pumps two of which, PUMP GREEN and PUMP BLUE, are powered by their respective hydraulic system. Thus forward transfer capability is available using electric or hydraulic power.

The trim transfer system is augmented in the aft trim condition by a reduced level operation in collector tanks 1 and 4, As tanks 1 and 4 are located well forward this moves the aircraft centre of gravity further rearward. The resultant rearward centre of gravity is the optimum for minimum trim drag in supersonic cruise.

Venting and Pressurization

The tanks vent into a ring main gallery and thence into a scavenge tank which connects to atmosphere through vents in the rear fuselage. A scavenge pump automatically removes any fuel that has entered the scavenge tank and returns it to tank 3.

At high altitudes the fuel tanks are pressurised, thus facilitating fuel pumping and preventing fuel boiling, to a maximum of between 1.2 and 1.5 psi. This increasing differential pressure is necessary to maintain a minimum absolute tank pressure with increasing altitude.

De-aeration

De-aeration is provided in tank 10 by a special pump, and in tanks 11, 6, 8, 5A and 7A by the normal pumps.

De-aeration is required in fuel tanks where the fuel remains static for relatively long periods during the climb. Under these conditions it is possible that as the fuel tank air pressure decreases, air in solution will expand causing fuel pump cavitation or transient increases in tank pressure and subsequent fuel transfer via the vent gallery.

Fuel Quantity Indication

The fuel quantity indication (FQI) system measures the fuel contents of the tanks by means of capacitance type gauging channels, and provides individual indication of each tank content at the Flight Engineers fuel management panel or alternatively, at the refuel control panel for refuelling.

The fuel gauging information is also used to provide:
(a) Total fuel indication at the centre dash panel, the fuel management panel and at the refuel control panel.
(b) Tank load limit control during trim transfer and refuelling operations.
(c) CG position indication at the pilots dash panels and the fuel management panel.
(d) CG and mach limits indication at the pilots dash panels and fuel management panel.
(e) CG and mach limit warnings at two levels within the defined flight envelope.

Load Limit Control

During the normal mode of trim transfer, fuel is pumped either from tanks 9 and 10 into tanks 11, 5 and 7 to obtain a rearward CG shift, or from tank 11 into tanks 9, 5 and 7 to obtain a forward CG shift. The trim tank contents are preselected on two load limit selectors, one for tanks 9 and 10 and the other for tank 11. Any fuel in excess of the trim tank requirements is transferred into tanks 5 and 7. The load limit control channels are duplicated and each one automatically continues controlling should the other channel fail.

CG and Mach Limits Indication

Bugs on the CG Indicators show the forward (FWD) and rear (AFT) boundaries of the CG corridor relative to mach number. Bugs on the Machmeters show the maximum and minimum mach limits relative to the aircraft CG position. Both the CG and mach number band widths move relative to mach number and CG respectively.

CG and Mach Limit warnings are provided at two levels of CG/Mach number values. The first warning activates at a normal boundary level and the second warning activates when the normal boundary limits have been exceeded by a further margin.

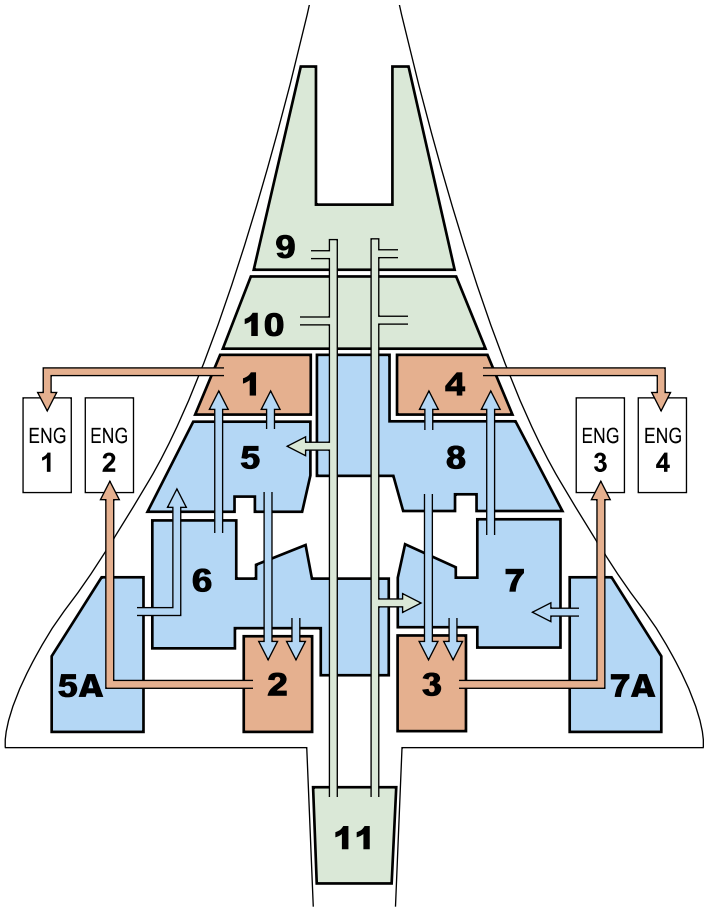
The second warning level is defined as an extreme boundary. Its purpose is to indicate when corrective actions, taken at the normal boundary warning, are not producing a rapid enough correction of CG/Mach values.

Flight Simulator Implementation

PSS Concorde simulates all 13 fuel tanks, although the aircraft flight model has only 7 tanks, as can be seen in Flight Simulator Fuel Settings dialog. This is a limitation of Flight Simulator aircraft. In Fuel Settings, some PSS Concorde tanks combine several tanks of the real aircraft. When a new fuel quantity is entered in such tank, it is distributed between the simulated tanks this tank represents. The tank arrangement is shown on the next page.

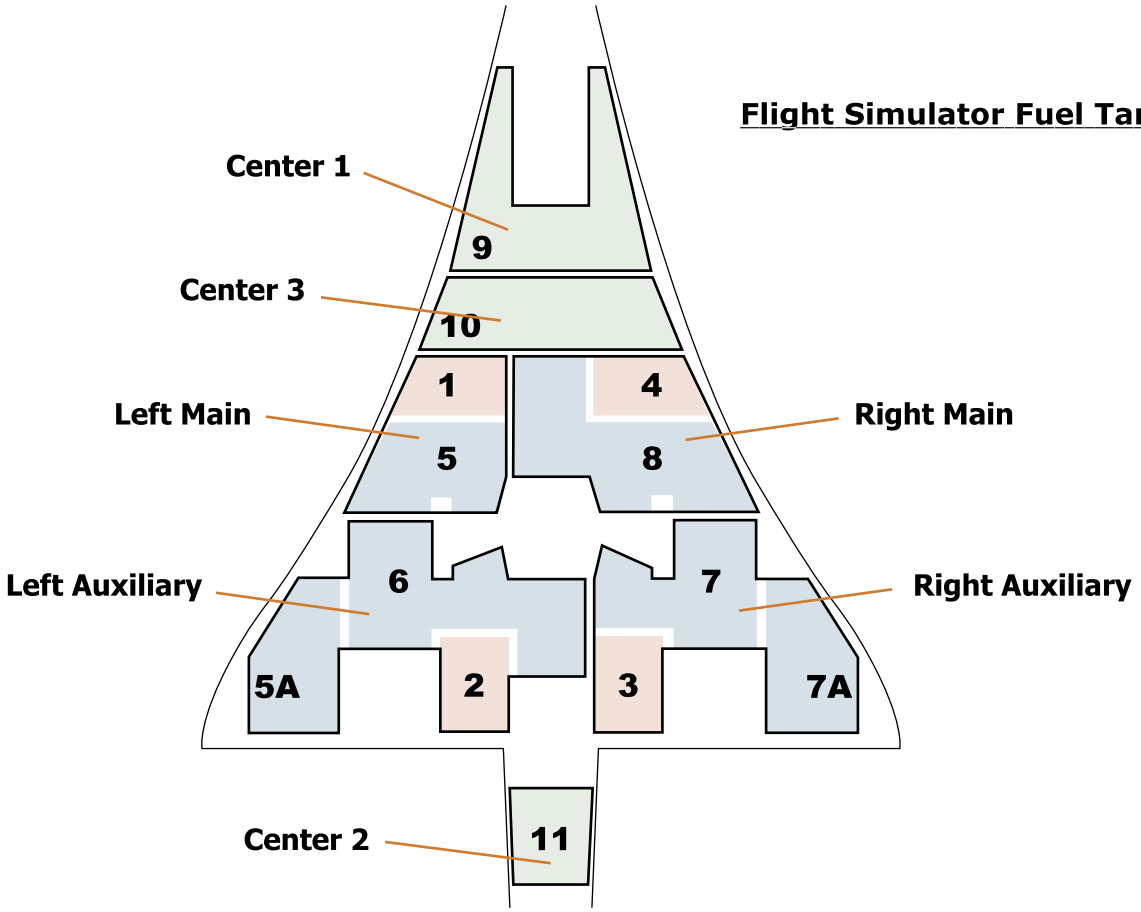
The Virtual Flight Engineer (VFE) feature can be used to automatically manage fuel transfer and CG control.

Concorde Fuel Tanks

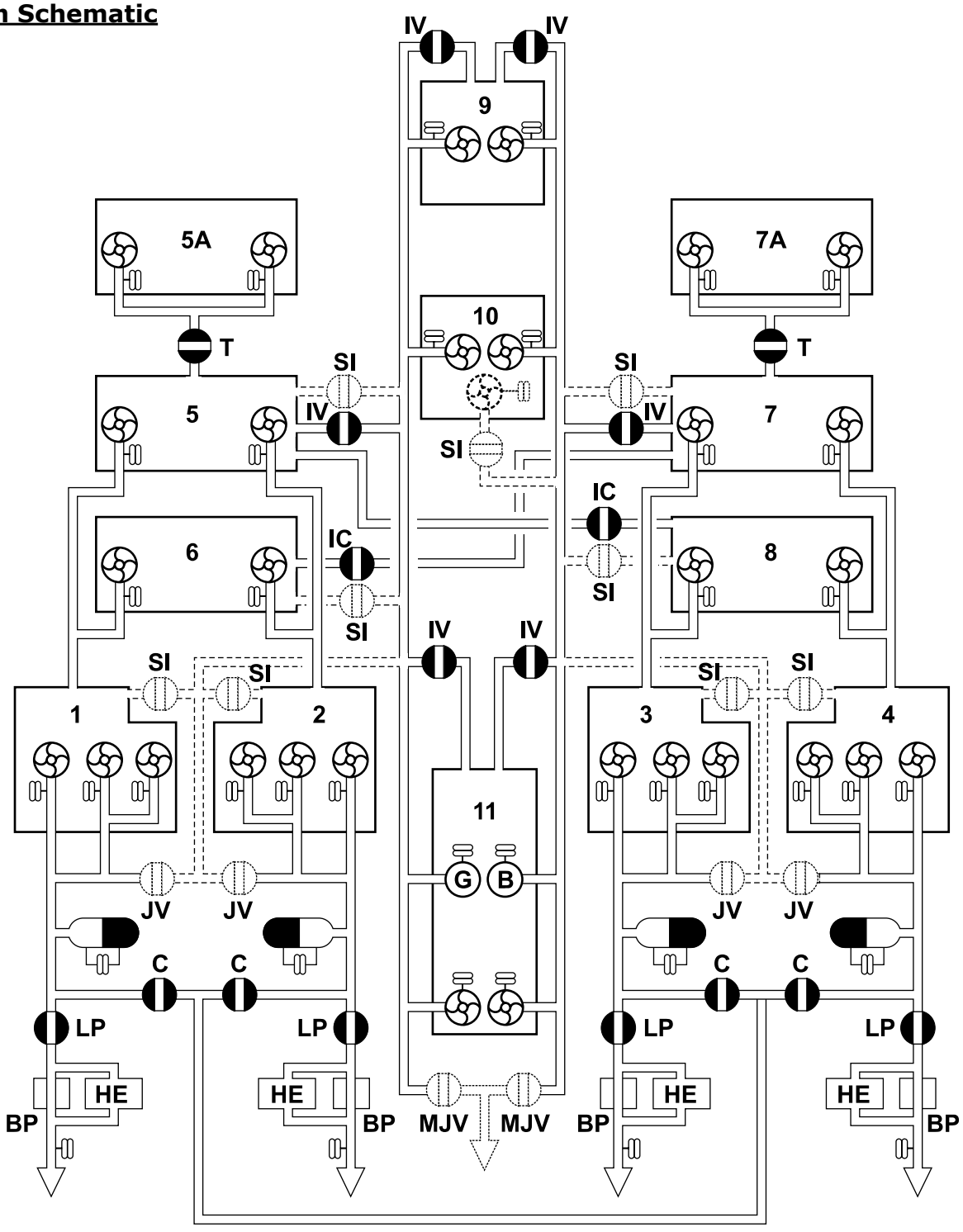


ENGINE FEED TANKS
MAIN TRANSFER TANKS
TRIM TRANSFER TANKS

Flight Simulator Fuel Tanks

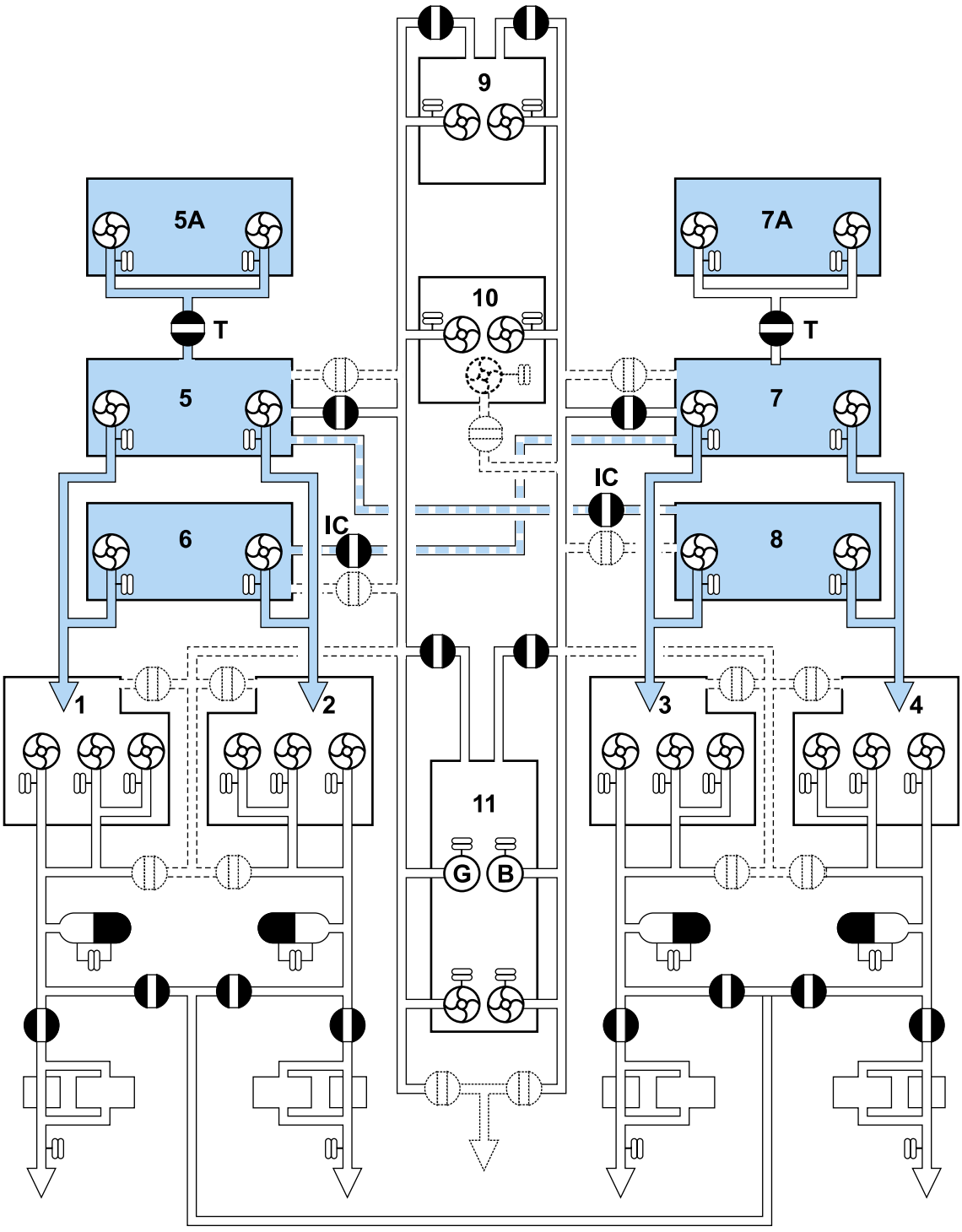


System Schematic

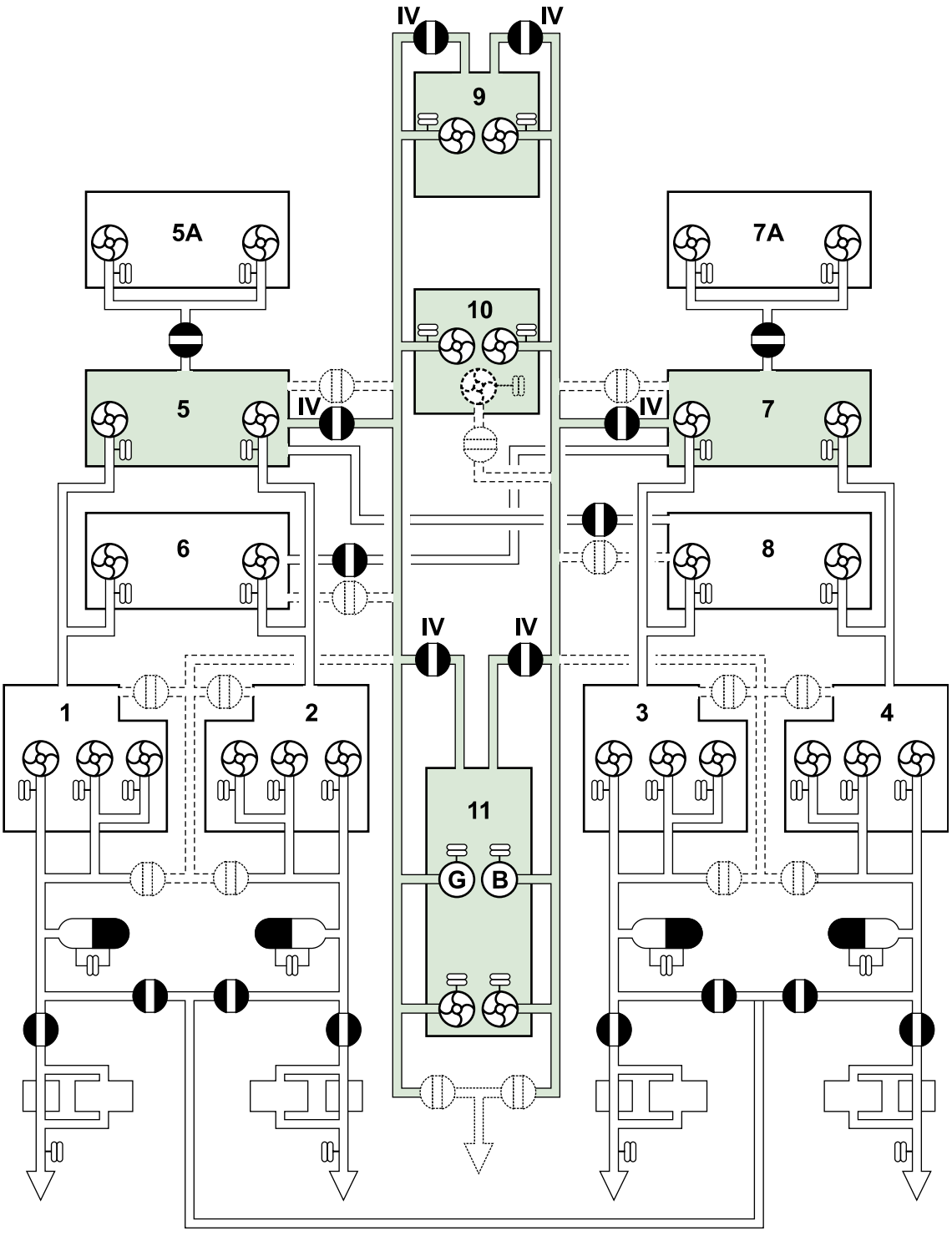


IV	Inlet Valve (Trim Transfer)	IC	Inter Connect Valve
LP	L.P. Fuel Valve		L.P. Fuel Valve
C	Crossfeed Valve	G B	Crossfeed Valve
SI	Standby Inlet	BP	Standby Inlet
JV	Tank Jettison Valve	HE	Tank Jettison Valve
MJV	Master Jettison Valve		Master Jettison Valve
T	Trans Valve		

Main Transfer

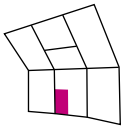


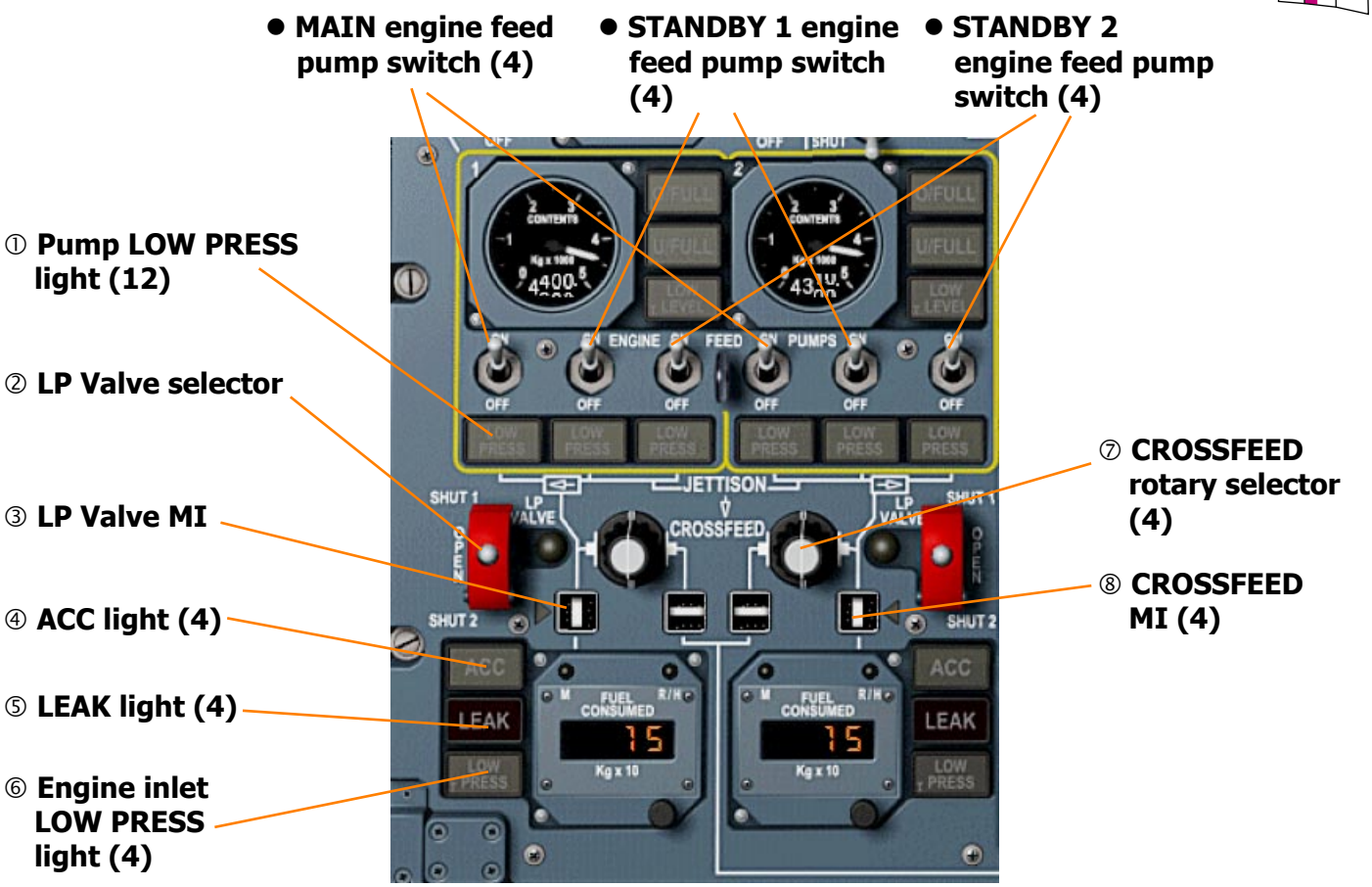
Trim Transfer



Controls and Indications

Engine Feed





① **Pump LOW PRESS light (Yellow)**
ON - indicates a low pressure condition exists at the pump outlet.

② **LP Valve selector**
OPEN - the LP valve is open except when the engine shut down handle is pulled in which case it is shut.
Alternative SHUT positions enable selection of either motor.
SHUT 1 and SHUT 2 - select the LP valve to shut using the associated motor.

③ **LP Valve MI**
Indicates the position of LP valve.

④ **ACC light (Yellow)**
ON - indicates either a low level fuel pressure downstream of the collector tank pumps or a low air pressure in the accumulator.

⑤ **LEAK light (Red)**
ON - indicates that a leakage of fluid into the bay above the engine has been detected. Accompanied by MWS ENG (Red).

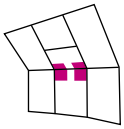
⑥ **Engine inlet LOW PRESS light (Amber)**
ON - indicates that a low pressure condition exists upstream of the engine pump. Accompanied by MWS FUEL (Amber) and audio (gong).

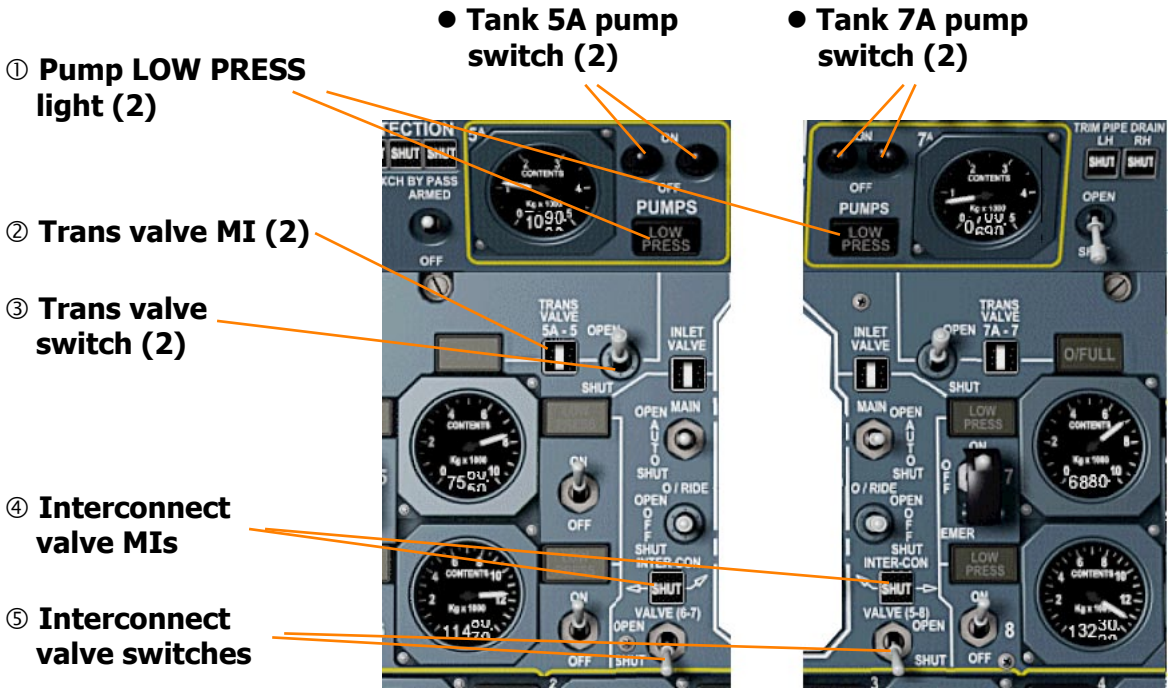
⑦ **CROSSFEED rotary selector**
INLINE - opens crossfeed.
CROSSLINE - crossfeed closed.

⑧ **CROSSFEED MI**
Indicates the position of a crossfeed valve.

Controls and Indications

Main Transfer





① Pump LOW PRESS light (Yellow)
ON - indicates a low pressure condition exists at either pump outlet. Is armed for each pump outlet only when the associated PUMPS switch is at ON.

② Trans valve MI
Indicates the position of tanks 5A-5 or 7A-7 transfer valve.

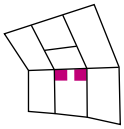
③ Trans valve switch
OPEN - allows the tank (5A or 7A) pumps to transfer fuel from the associated auxiliary tank into its associated main transfer tank. NOTE: In the event of tanks 5 and/or 7 reaching high level the respective TRANS valve(s) will close until the level falls.
SHUT - the tank (5A or 7A) is isolated from its respective main tank thus allowing the tank (5A or 7A) pumps to de-aerate the fuel without transfer.

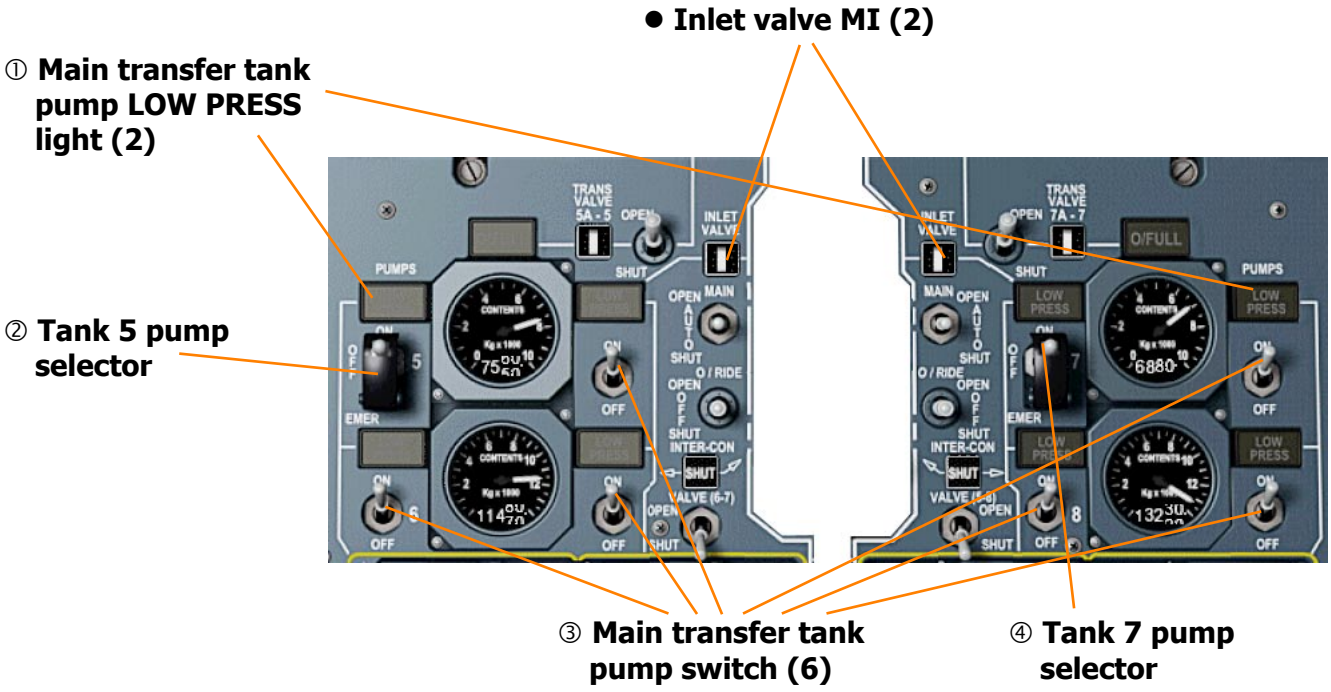
④ Interconnect valve 6-7 and 5-8 MIs
Show the positions of tanks 6-7 and 5-8 interconnection valves - OPEN or SHUT.

⑤ Interconnect valve 6-7 and 5-8 switches
OPEN - allows fuel to flow between tanks 6 and 7 or 5 and 8. The direction of flow depends only on the relative fuel levels.

Controls and Indications

Main Transfer





① Main transfer tank pump LOW PRESS light (Yellow)

ON - indicates a low pressure condition at the pump outlet. Is armed only when the pump switch/selector is at ON or EMER.

② Tank 5 pump selector

Guarded to prevent inadvertent selection of EMER. *Right-click to open or close the guard*.

ON - transfers fuel from tank 5 to tank 1

EMER - the pump is powered from the essential busbar and the standby 1 engine feed pump of tank 2 is inhibited.

③ Main transfer tank pump switch

ON - transfers fuel:
- from tank 5 to tank 2
- from tank 7 to tank 4
- from tank 6 to tank 1 via the LH pump
- from tank 6 to tank 2 via the RH pump
- from tank 8 to tank 3 via the LH pump
- from tank 8 to tank 4 via the RH pump

④ Tank 7 pump selector

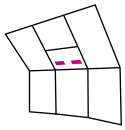
Guarded to prevent inadvertent selection of EMER. *Right-click to open or close the guard*.

ON - transfers fuel from tank 7 to tank 3

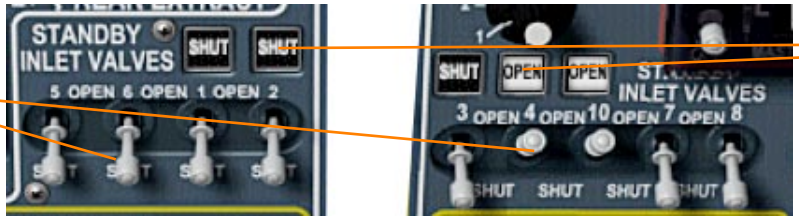
EMER - the pump is powered from the essential busbar and the standby 1 engine feed pump of tank 4 is inhibited.

Controls and Indications

Trim Transfer



① **STANDBY INLET VALVES switch (9)**



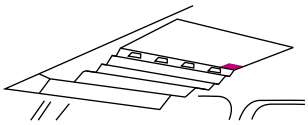
② **Standby inlet valve MIs**

① STANDBY INLET VALVES switch

OPEN - allows fuel from the main trim transfer pipe to enter directly into the appropriate tank.

② Standby inlet valve MIs

These MIs are provided only for those standby inlet valves 1, 2, 3, 4 and 10, that may be used in procedures that require monitoring of the valves.



FUEL FORWARD TRANSFER switch

This switch is only removed from its guarded position in an abnormal situation requiring an override of the automatic trim transfer system.

O/RIDE - initiates an automatic forward transfer sequence provided tank 11 pump selectors and tank 9, 5 and 7 inlet valve selectors are at AUTO, whatever the position of the TRIM TRANS AUTO MASTER selector.
The sequence is:
Tank 11 pumps on.
Tank 9 inlet valves open.
Then when tank 9 reaches high level,
Tank 9 inlet valves close and tanks 5 and 7 inlet valves open.

Controls and Indications — Trim Transfer

① **TRIM TRANSFER AUTO MASTER selector**

② **TANKS 1 & 4 MI**

③ **TANKS 1 & 4 switch**

① **TRIM TRANSFER AUTO MASTER selector**

FORWARD - provided the associated inlet valve and pump selector are at AUTO, initiates an automatic forward transfer sequence.
The sequence is:
Tank 11 pumps on and tank 9 inlet valves open then when tank 9 reaches the preset load limit or high level, tank 9 inlet valves close and tanks 5 and 7 inlet valves open.
Then when tank 11 preset load limit is reached, tank 11 pumps off and tanks 5 and 7 inlet valves close.

REARWARD - switches and latches off the de-aeration mode of tank 11 left-hand pump and provided the associated inlet valve and pump selector are at AUTO, initiates the automatic rearward transfer of fuel.
The sequence is:
Tank 9 pumps on to pump fuel into the trim transfer pipes and tank 11 inlet valves open to allow the fuel into tank 11.
Then when tank 11 reaches the preset load limit or high level, tank 11 inlet valves close and tank 5 and 7 inlet valves open to allow fuel into tanks 5 and 7 provided their contents are below high level.
Then when tank 9 is empty and its LOW PRESS lights (yellow) come on, tank 10 pumps on.
Then when tanks 9 and 10 preset load limit is reached, tanks 9 and 10 pumps off and tanks 5 and 7 inlet valves close.

② **TANKS 1 & 4 MI**

Indicates NORM or AFT corresponding to the mode of operation set by TANKS 1 & 4 switch.

③ **TANKS 1 & 4 switch**

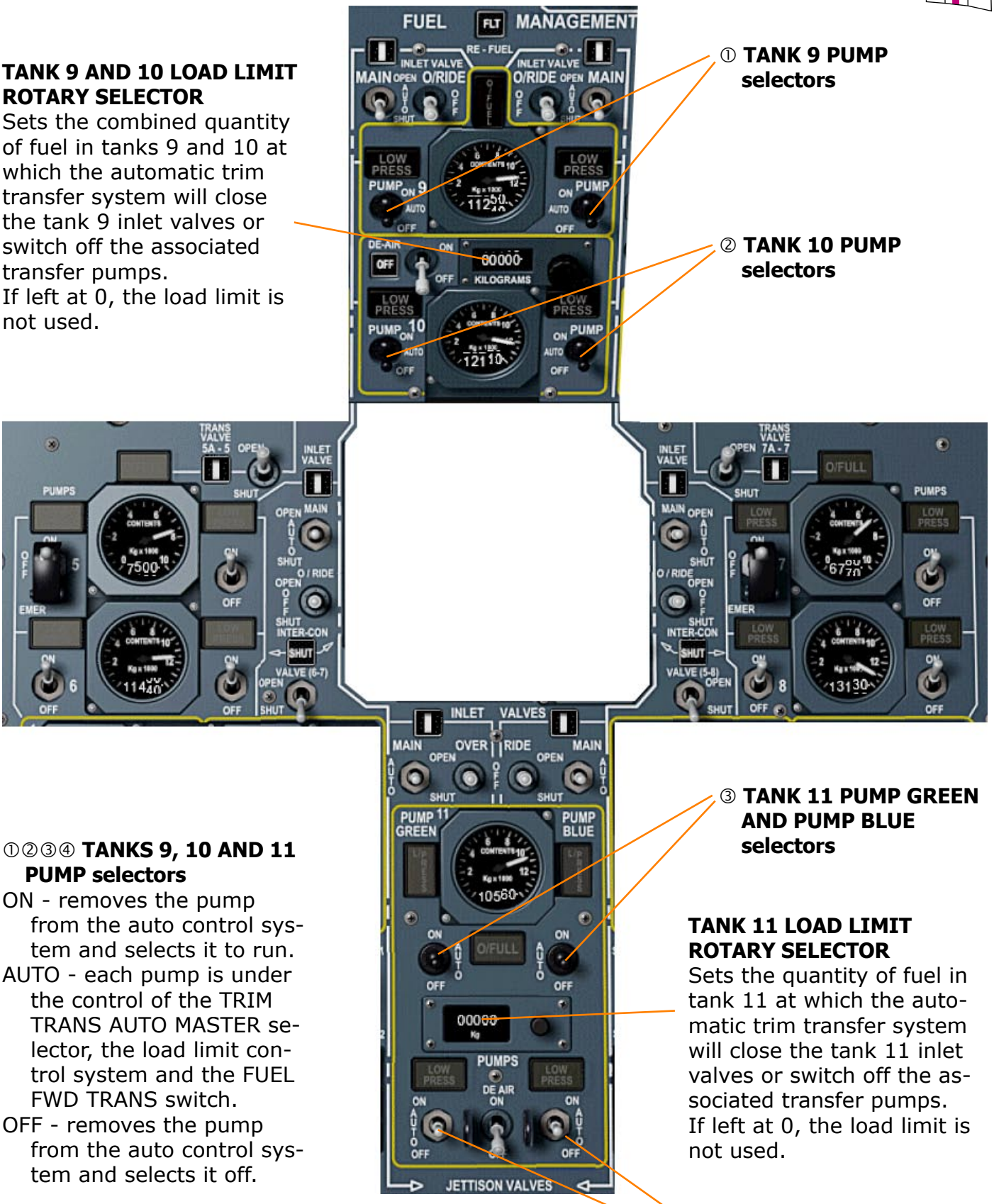
NORM - allows the main transfer control valves to maintain tanks 1 and 4 at nearly full level.

AFT TRIM - selects a reduced fuel level operation in tanks 1 and 4 and inhibits the underfull warning. The reduced operating level is 40% of the nominal volume.

Controls and Indications

Trim Transfer

TANK 9 AND 10 LOAD LIMIT ROTARY SELECTOR
Sets the combined quantity of fuel in tanks 9 and 10 at which the automatic trim transfer system will close the tank 9 inlet valves or switch off the associated transfer pumps.
If left at 0, the load limit is not used.



① **TANK 9 PUMP selectors**

② **TANK 10 PUMP selectors**

③ **TANK 11 PUMP GREEN AND PUMP BLUE selectors**

①②③④ **TANKS 9, 10 AND 11 PUMP selectors**
ON - removes the pump from the auto control system and selects it to run.
AUTO - each pump is under the control of the TRIM TRANS AUTO MASTER selector, the load limit control system and the FUEL FWD TRANS switch.
OFF - removes the pump from the auto control system and selects it off.

TANK 11 LOAD LIMIT ROTARY SELECTOR
Sets the quantity of fuel in tank 11 at which the automatic trim transfer system will close the tank 11 inlet valves or switch off the associated transfer pumps.
If left at 0, the load limit is not used.

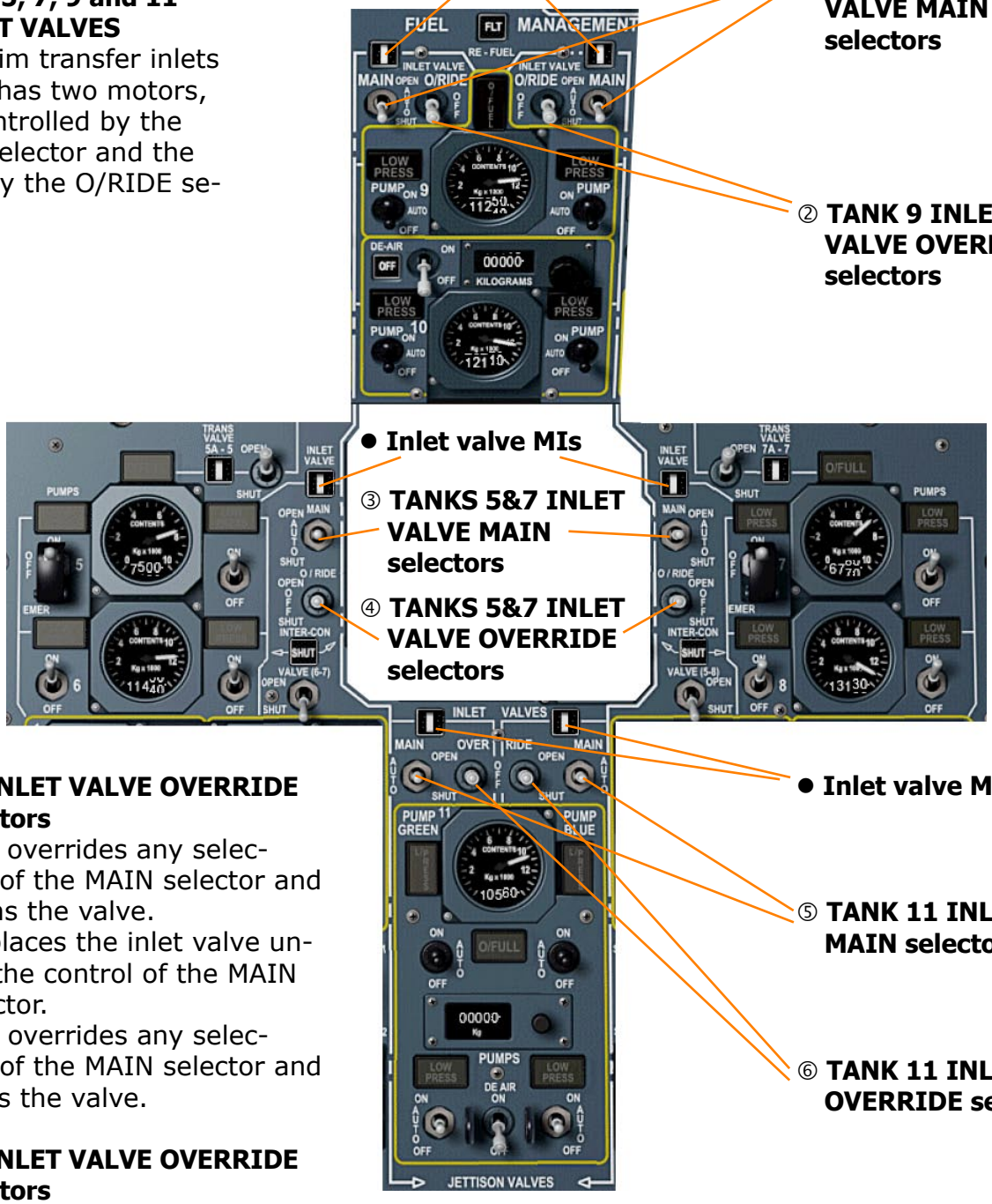
④ **TANK 11 LH & RH PUMP selectors**

Controls and Indications

Trim Transfer

TANKS 5, 7, 9 and 11 INLET VALVES

Each trim transfer inlets valves has two motors, one controlled by the MAIN selector and the other by the O/RIDE selector.



②④⑥ INLET VALVE OVERRIDE selectors

OPEN - overrides any selection of the MAIN selector and opens the valve.

OFF - places the inlet valve under the control of the MAIN selector.

SHUT - overrides any selection of the MAIN selector and shuts the valve.

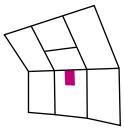
①③⑤ INLET VALVE OVERRIDE selectors

OPEN - removes the valve from the automatic control system and opens it.

AUTO - places the inlet valve under the control of the TRIM TRANS AUTO MASTER selector, the load limit control and the FUEL FWD TRANS switch.

SHUT - removes the valve from the automatic control system and shuts it.

Controls and Indications — Trim Transfer



① **CG% Co indicator light**

② **CG% Co indicator**
Repeated on Captain's instrument panel

③ **CG% Co readout**

④ **CG% computer and FQI test panel**

⑤ **TOTAL FUEL REM indicator**

⑥ **A/C WEIGHT indicator**

⑦ **TOTAL CONTENTS indicator**
Repeated on Pilot's centre instrument panel

① CG% Co indicator light (Red)
ON STEADY - indicates infringement of either the forward or aft boundary of the defined flight envelope.
ON FLASHING - indicates infringement of the forward or aft extreme boundary of the defined flight envelope.
Accompanied by MWS M/CG light (red), pilot's M/CG lights (red) and audio (gong).

② CG% Co indicator
The white pointer indicates the present Center of Gravity CG%. The CG limit bugs are orange pointers labelled FWD and AFT on the right-hand side of the instrument.
The red and black diagonal striped flag appears across the middle of the scale to indicate a servo imbalance, bugs jammed, loss of power supply or loss of validity signal to the CG pointer.

③ CG% Co readout
Displays present CG% in digital form.

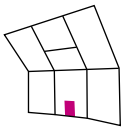
④ CG% computer and FQI test panel
Controls and functions are not modelled.

⑤ TOTAL FUEL REM indicator
Shows the total fuel in Kg x10 by subtracting the fuel consumed from the datum settings.

⑥ A/C WEIGHT indicator
Shows the preset aircraft weight in Kg x10.
This value is automatically read from Flight Simulator data.

⑦ TOTAL CONTENTS indicator
Shows the total fuel on board in Kg by summing the individual FQI readings.
A flag across the digital readout indicates a loss of electrical power to the instrument.

Controls and Indications **Trim Transfer**



① **Fuel quantity indicator (FQI)**

② **O/FULL light**

③ **U/FULL light**

④ **LOW LEVEL light**

⑤ **FUEL CONSUMED indicator**

① **Fuel quantity indicator (FQI)**
Shows the contents of the associated fuel tank in Kg.

② **O/FULL light (Yellow)**
ON - indicates that the fuel tank is more than 97% full.

③ **U/FULL light (Yellow)**
ON - if its collector tank is below approximately 80% full.
NOTE: with TANKS 1 & 4 switch at AFT TRIM the underfull warnings of tanks 1 and 4 are inhibited.

④ **U/FULL light (Yellow)**
ON - indicates that the fuel tank is below approximately 20% full.
Accompanied by the MWS FUEL light (amber) and audio (gong).

⑤ **FUEL CONSUMED indicator**
Shows the fuel consumed by the engine integrated from its flow meter.

Hydraulics

Overview

Hydraulic power is provided by three independent systems. Each of these systems is powered by two engine-driven pumps. There are two main systems called Green and Blue and a stand-by system called Yellow.

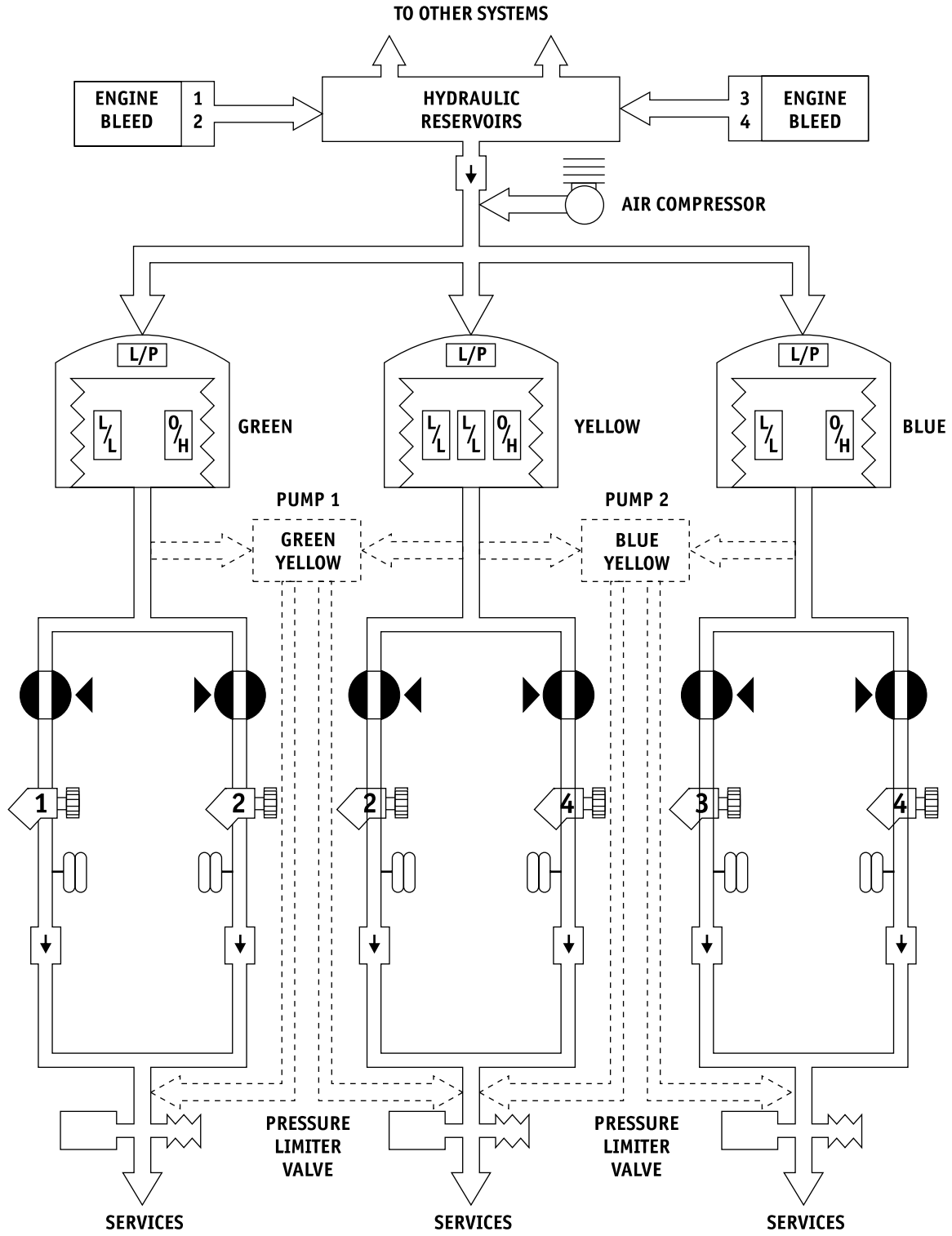
Normal and standby generation

Normal and standby generation is provided by six engine-driven pumps. The two Green system pumps are driven by engines 1 and 2, the two Blue system pumps by engines 3 and 4 and the two Yellow system pumps by engines 2 and 4.
Normal pressure of the three hydraulic systems is 4000 psi and in case of overpressure a pressure limiter allows a maximum pressure of 4500 psi.
To prevent cavitation of the engine-driven hydraulic pumps the three reservoirs must be pressurized.
An auxiliary air compressor is provided to ensure that the three reservoirs are pressurized before engine start.

Ground

Ground generation is provided by two electric pumps that can be selected to pressurize the main and standby systems while the aircraft is on the ground and is connected to ground power supply unit. The maximum delivery pressure and flow of the electric pumps is less than that of the engine-driven pumps. The pumps can supply both main systems, standby system and one of the main systems, or both pumps can be selected to power the standby system.

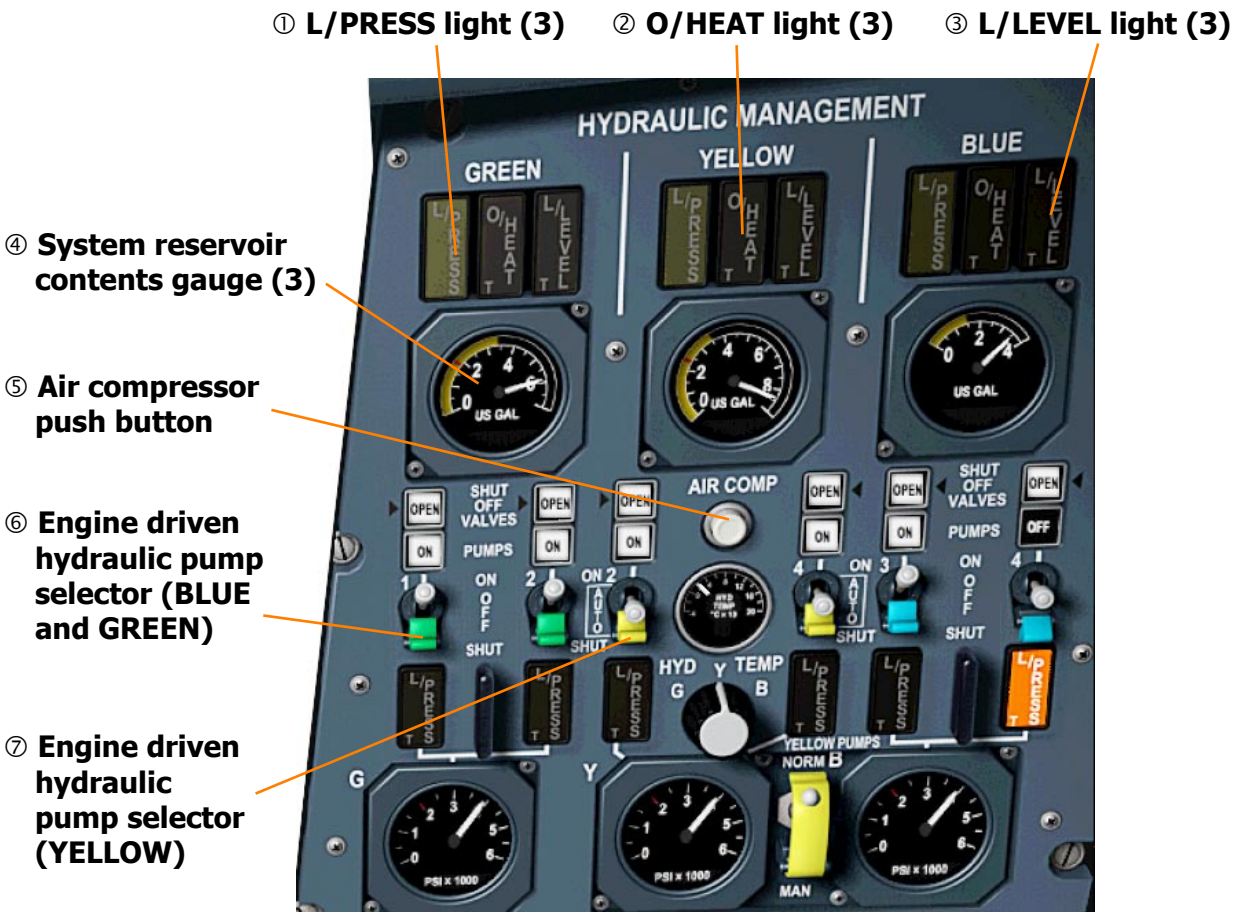
Hydraulic System Schematic



↓	NON RETURN VALVE		VALVE
	PRESSURE SWITCH		ENGINE DRIVEN PUMP
	PRESS TRANS		

NOTE:
VALVES INDICATED THUS ▶ AUTO CLOSE WHEN APPROPRIATE ENGINE SHUT-DOWN HANDLE PULLED.

Controls and Indications



① L/PRESS light (Yellow)
ON - indicates a low air pressure in the hydraulic reservoir.

② O/HEAT light (Amber)
ON - indicates that the fluid temperature exceeds 140 °C. Accompanied by MWS HYD light (amber) and audio (gong).

③ L/LEVEL light (Amber)
ON - indicates that the hydraulic quantity has fallen below the minimum level. Accompanied by MWS HYD light (amber) and audio (gong).

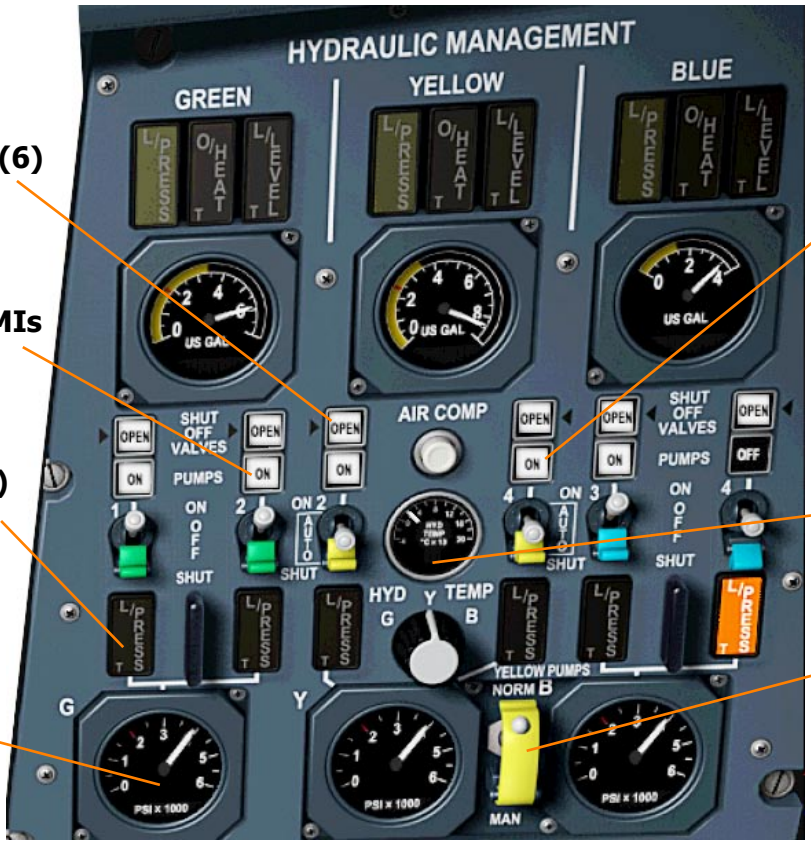
④ System reservoir contents gauge
Indicates the hydraulic fluid level in corresponding system reservoir.

⑤ Air compressor push button
PRESSED - starts the auxiliary air compressor. It will operate until either the reservoir pressure is sufficient or approximately 3 minutes have elapsed.
NOTE: Only used on ground.

⑥ Engine driven hydraulic pump selector (BLUE and GREEN)
ON - onloads the engine driven pumps.
OFF - offloads the engine driven pumps allowing only a small internal cooling/ lubrication flow.
SHUT - the engine driven pumps shut-off valve is driven to SHUT and the pumps are offloaded. This position is guarded to prevent inadvertent operation. *(click RIGHT mouse button to open the guard)*

⑦ Engine driven hydraulic pump selector (YELLOW)
ON - onloads the engine driven pumps.
AUTO - offloads the engine driven pumps except when the landing gear lever is DOWN or when the yellow system is selected or required by other system failures.
SHUT - the engine driven pumps shut-off valve is driven to SHUT and the pumps are offloaded. This position is guarded to prevent inadvertent operation. *(click RIGHT mouse button to open the guard)*

Controls and Indications



① **Shut off valve MI (6)**

② **GREEN and BLUE hydraulic pumps MIs**

④ **Hydraulic pumps L/PRESS lights (6)**

⑤ **Hydraulic pressure gauge (6)**

③ **YELLOW hydraulic pumps MIs**

⑥ **HYD TEMP gauge and selector**

⑦ **YELLOW PUMPS switch**

① **Shut off valve MIs**
Indicate the position of shut off valves. The valves are controlled by the engine driven pumps selectors or by the engine shut down handle.

② **GREEN and BLUE hydraulic pumps MIs**
ON - Pump selector at ON. Onloaded.
OFF - Pump selector at OFF or SHUT. Offloaded.

③ **YELLOW hydraulic pumps MIs**
ON - Pump selector at ON
or
Pump selector at AUTO when
- Main system at low level or low pressure.
- Any engine air intake selector at YELLOW.
- Any engine shut down handle pulled.
- Flight controls servo selector at YELLOW/BLUE or YELLOW/GREEN.
- Nose/visor standby control in use.
- Landing gear selected DOWN.

OFF - Pump selector at SHUT or pump selector at AUTO when landing gear selected UP.

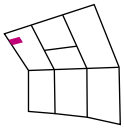
④ **Hydraulic pumps L/PRESS lights**
ON - indicates a low pressure condition exists downstream of the engine driven pump. Accompanied by MWS HYD light (amber) and audio (gong).

⑤ **Hydraulic pressure gauge**
Reads the pressure in corresponding hydraulic system.

⑥ **HYD TEMP gauge and selector**
The gauge reads the hydraulic fluid temperature in reservoir selected by the HYD TEMP selector:
G - Green system reservoir.
Y - Yellow system reservoir.
B - Blue system reservoir.

⑦ **YELLOW PUMPS switch**
NORM - the yellow system engine driven pump AUTO function is armed.
MAN - the AUTO function of the yellow system engine driven pumps is inhibited and the AUTO position of the EDP selectors offloads the engine driven pumps.

Controls and Indications



① **Pump switches (2)**

② **Ground hydraulics check out selector**

① **Pump switches**
Are of the magnetic hold type and go to the OFF position when ground power is disconnected.

ON - Operates the electric pumps.

② **Ground hydraulics check out selector**
YELLOW YELLOW - both electric pumps are supplying the yellow system.
GREEN BLUE - the green system is pressurized by PUMP 1 G-Y and the blue system by PUMP 2 B-Y.
BLUE YELLOW - the blue system is pressurized by PUMP 2 B-Y and the yellow system by PUMP 1 G-Y.
GREEN YELLOW - the green system is pressurized by PUMP 1 G-Y and the yellow system by PUMP 1 G-Y.

Ice and Rain protection

Overview

The ice and rain protection system includes:

- wing leading edge anti-icing
- intakes anti-icing
- engines anti-icing
- ADS and engine probe heaters
- flight compartment transparency anti-icing and demisting
- windshield rain dispersal
- ice detection system
- pressurisation / static heaters
- drain mast heaters

Ice detection

Two independent and identical ice detection systems each provide a blue ICE warning light when icing conditions are detected. Either blue ICE light arms a red ICE light and the MWS red ICE light which are inhibited when the anti-icing is selected on.

Please note that the ice detection is not functional in Flight Simulator.

Wing and intake anti-icing

The intake leading edges, rear ramp leading edges, spill doors, high speed air conditioning intakes, and the wing leading edges in front of the intakes and inboard to the fuselage, are de-iced by a combination of continuous and cyclic heating which prevents uncontrolled shedding of ice into the intakes.

The wing and intake anti-icing system is inhibited by weight switches while the aircraft is on the ground and by an ADC signal when the total air temperature is above +15 °C. The warning lights however are not inhibited.

Two independent control systems are provided, namely, main and alternate. A push button on the alternate system can be used to by-pass the above "+15 °C" inhibition.

Engine anti-icing

The engine inlet guide vanes are protected by hot air tapped from the engine. The system can be operated either on the ground or in flight.

ADS and engine probe heating

The ADS and engine probe heating consists of the total air temperature heaters 'Tt', static sensor heaters 'S', sideslip sensor heaters 'β', angle of attack sensor heaters 'α' which are inhibited when the total air temperature is above +15 °C, the pitot probe heater 'P', standby pitot probe heater 'STBY', and the engine intake temperature probe heaters T_1.

Windshield and visor de-icing, sliding side window (DV) demisting

The transparency de-icing and demisting systems are automatically regulated by a normal control channel. If this channel fails, the temperature will be automatically regulated by a second channel operating at a higher temperature.

The windshield heaters have two heating levels, high and low. When high is selected the system will automatically change to the low condition if the visor is raised or if the aircraft is on the ground.

The visor heater operates only when the visor is locked up.

Rain dispersal

The windshield wipers and deflectors and the rain repellent system are used in combination to ensure adequate visibility in all rain conditions.

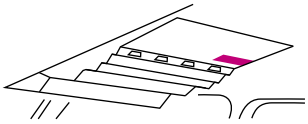
Pressurisation static heating

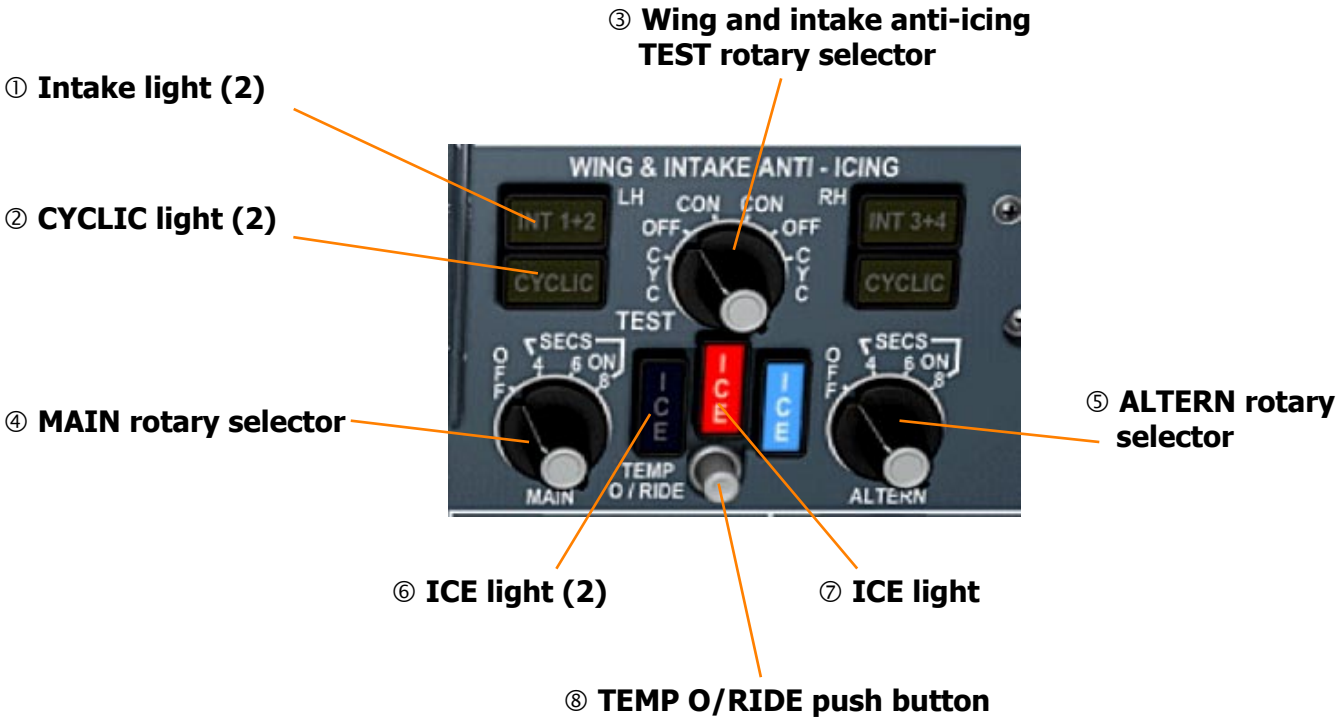
The pressurisation static vents are electrically heated.

Drain mast heating

The drain masts are electrically heated.

Controls and Indications





① Intake light (Yellow)
ON - indicates a fault in a continuously heated anti-icing area which may allow uncontrolled ice shedding into the indicated intakes.

② CYCLIC light (Yellow)
ON - indicates a fault in some of cyclically heated areas.

③ Wing and intake anti-icing TEST rotary selector
Used to test the operation of the anti-icing system. *Not modelled.*

④ MAIN rotary selector
OFF - The left and right wing and intake anti-icing systems are not powered.
4, 6, 8 SECS ON - The systems are powered. The cyclic areas are powered with pulses of selected duration.

⑤ ALTERN rotary selector
Selects the alternative control of the wing and intake anti-icing system.

⑥ ICE light (Blue)
ON - Indicates that icing conditions have been detected. The ICE lights (blue) will go off 3 mins after leaving icing conditions.
PRESS - tests the electrical part of the ice detector warning.

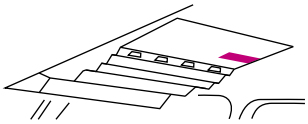
⑦ ICE light (Red)
ON - Indicates that icing conditions have been detected and one or more ENGINE ANTI-ICING switches are at OFF or both the MAIN and ALTERN WING & INTAKE ANTI-ICING rotary selectors are at OFF. Accompanied by the MWS ICE light (RED) and audio (gong).

⑧ TEMP O/RIDE push button
PRESS - with ALTERN selected ON will override the ADC temperature signal that normally inhibits the wing and intake anti-icing at temperatures greater than 15 °C. *Not modelled.*

Controls and Indications

① **Inlet guide vane pressure light (4)**

② **Engine anti-icing switch (4)**



① **Inlet guide vane pressure light (Green)**

ON - to indicate that adequate hot air pressure is available for the engine anti-icing system.

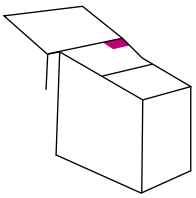
OFF - when the ENGINE ANTI-ICING switch is at ON indicates that hot air pressure is inadequate.

② **Engine anti-icing switch**

ON - hot air is allowed to flow through the nose cone and the engine inlet guide vanes.

① **Windshield wipers rotary selector (2)**

② **RAIN REPEL push button**



① **Windshield wipers rotary selector**

OFF - selects the park position. With a wiper not fully parked, the normal operation of the visor raise sequence is inhibited.

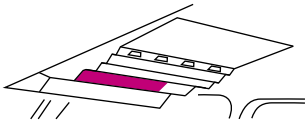
EMERG PARK - provides a second system to park the wiper.

SLOW, FAST - selects wiper on.

② **RAIN REPEL push button**

Pressing the RAIN REPEL push button applies a predetermined quantity of rain repellent liquid to the windshield.

Controls and Indications



① **Windshield de-ice MI (2)**

② **De-ice or demist O/HEAT light (6)**

③ **Windshield de-ice selector (2)**

④ **Visor de-ice switch (2)**

⑤ **Sliding side window demist switch (2)**

① **Windshield de-ice MI (2)**

INLINE - indicates power is supplied to windshield.

CROSSLINE - indicates panel heating has reached control temperature and power is OFF.

STRIPS - de-energised.

② **De-ice or demist O/HEAT light (Yellow)**

ON - indicates that panel heating has reached overheat control temperature and power is off.
Regulation in the overheat control temperature range is indicated by the O/HEAT light going on and off.

③ **Windshield de-ice selector**

HIGH - windshield panels are heated by high voltage and automatically maintained at working temperature.
With a W/SHIELD DE-ICE selector at HIGH the associated windshield de-ice system will automatically change to LOW condition if the visor is raised or the aircraft is on the ground.

LOW - windshield panels are heated by low voltage and automatically maintained at working temperature.

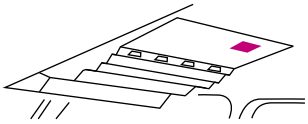
④ **Visor de-ice switch**

ON - with the visor locked UP the visor panels are heated and automatically maintained at working temperature. The visor heater operates only when the visor is locked up.

⑤ **Sliding side window demist switch**

ON - sliding side panels are heated and automatically maintained at working temperature.

Controls and Indications



① **Drain mast heaters selector (3)**

② **MAST light (3)**

① **Drain mast heaters selector**

ON - powers a drain mast heater provided that the ADC switches are at ON and that the total temperature is below +15 °C. There are two ON positions for each selector; each position supplies a separate but similar heater. Either ON position may be selected as the normal selection.

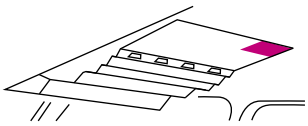
② **De-ice or demist O/HEAT light (Yellow)**

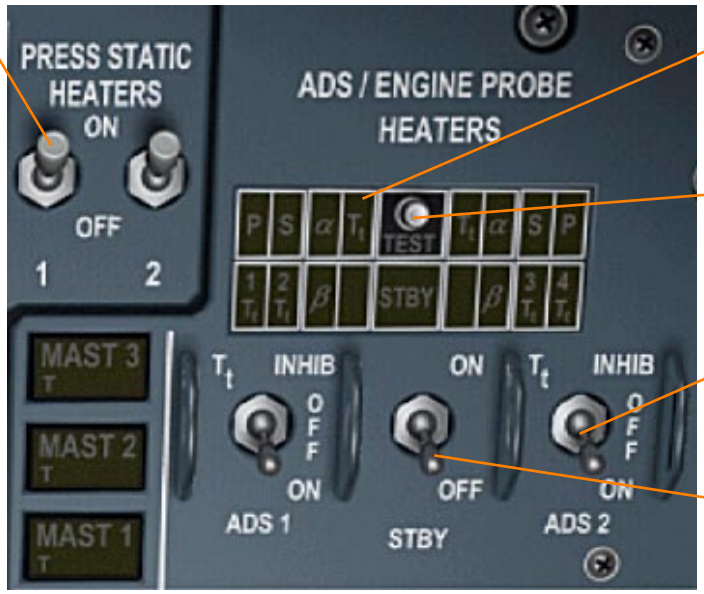
Pressing a MAST light while the selector is at OFF tests the failure warning system. The light on indicates correct operation.

Pressing a MAST light while the selector is at ON tests the failure warning system. The light on (yellow) indicates an inoperative heater.

A MAST light (yellow) on with the DRAIN MAST HTRS selector at ON indicates incorrect mast heater operation.

Controls and Indications





① **PRESS STATIC HEATERS switch (2)**

② **ADS/ENGINE PROBE HEATERS light (15)**

③ **TEST push button**

④ **ADS probe heaters selector (2)**

⑤ **STANDBY switch**

① **PRESS STATIC HEATERS switch**

ON - powers corresponding pressurisation static port heaters.

② **AIR DATA SYSTEM / ENGINE PROBE HEATERS light (Yellow)**

ON - with selectors at ON, indicates that the associated heater is powered but inoperative.
NOTE - if the ADS/probe heater selector is at T_t INHIB and the temperature is below +15 °C the associated T_t light (yellow) will be on.

③ **TEST push button**

Pressed - tests the heater operation.

④ **Air Data System probe heaters selector**

T_t INHIB - the pitot probe heaters P are powered. The static sensor heaters S, angle of attack sensor heaters α and sideslip sensor heaters β are powered when the total air temperature is below +15 °C. The total air temperature sensor heaters T_t are inhibited.

ON - the pitot probe heaters P are powered. The total air temperature sensor heaters T_t, the static sensor heaters S, angle of attack sensor heaters α and sideslip sensor heaters β are powered when the total air temperature is below +15 °C.

⑤ **STANDBY switch**

ON - powers the heater in the standby pitot static probe.

Landing Gear

General

The aircraft has a tricycle landing gear plus a tail gear; it comprises four wheel bogies on each main gear, twin wheels on the nose gear and a twin wheel tail gear. The landing gears and doors are hydraulically powered.

Operation

Normal operation of the landing gear is achieved through electrical control by the landing gear lever and hydraulic power supplied by the green system. Once retracted, in addition to mechanical locks, hydraulic pressure holds the gear and doors. However, when the L/GEAR lever is at NEUTRAL, both electrical control and hydraulic supply are shut off leaving the doors held by the mechanical locks, thus preventing inadvertent landing gear extension through control or actuator failure. During the landing gear retraction the main and nose wheels are automatically braked and released.

Brakes and Anti-skid

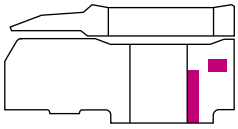
Normal brakes and anti-skid systems are supplied by the green hydraulic system. In the event of a green system pressure loss there is an automatic changeover to the yellow hydraulic system provided YELLOW-GREEN has been selected on the SERVO CONTROLS yellow rotary selector.

A brakes accumulator charged by the yellow hydraulic system supplies the emergency and parking brakes system only.

Nosewheel Steering

The nosewheel steering is electrically controlled, through the rudder pedals and hand wheels, and hydraulically operated. The normal operation uses the green hydraulic system with stand-by power from the yellow hydraulic system.

Controls and Indications



LANDING GEAR UPPER LOCKS LIGHT (Amber)

ON - with the L/GEAR lever at DOWN indicates that a gear uplock is in an engaged condition.

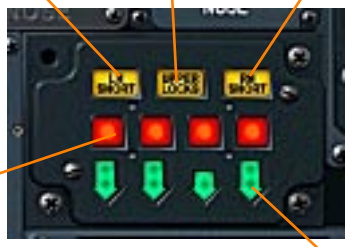
ON - with the L/GEAR lever at NEUTRAL or UP indicates that a gear uplock is not engaged.

LEFT GEAR SHORT light (Amber)

Armed only when the L/GEAR lever at down.
ON - indicates that the shortening lock is not engaged.

RIGHT GEAR SHORT light (Amber)

Armed only when the L/GEAR lever at down.
ON - indicates that the shortening lock is not engaged.



GEAR TRANSIT light (Red) (4)

ON - indicates that the corresponding main or nose landing gear doors are not closed or in the case of the tail gear it is in transit.

GEAR LEG arrow light (Green) (4)

ON - indicates that the corresponding leg of the gear is down and locked.

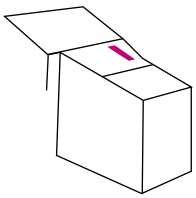
Gear lever

UP - commands the landing gear to retract.

N - Neutral position. The landing gear electrical control is de-activated, the gear and door selector valves go to their neutral position and the landing gears and doors are held by mechanical locks. In addition, provided the visor is locked in the UP position the green hydraulic supply to the landing gear and door selectors is shut off thus preventing any inadvertent landing gear extension in supersonic flight.

DOWN - Commands the landing gear to extend. This position is protected by a spring loaded guard which secures the L/GEAR lever in the N position to prevent inadvertent landing gear DOWN selection.
The gear down position can be directly selected in Flight Simulator and the guard will be removed without any separate action.

Controls and Indications

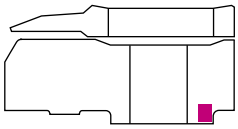


Brakes lever

NORM - full anti-skid braking is selected powered by the green hydraulic system or by the yellow hydraulic system if the yellow rotary selector on the servo control panel is set to YELLOW/GREEN and green pressure is low.

EMERG - braking is powered by the yellow hydraulic system but no anti-skid is available.

PARK - the brakes are applied with pressure from the brakes accumulator.



R light (White) (8)

Armed when the landing gear is down and locked.
ON - indicates that the corresponding brake anti-skid is released.
OFF - indicates that the corresponding brake anti-skid is not released.

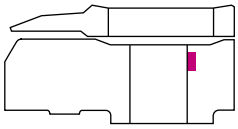
Anti-skid system test selector

TEST 1 and TEST 2 are continuity checks of the two channels for aircraft speed detection and the anti-skid units.

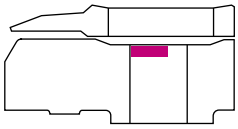
WHEELS O/HEAT light (Red)

ON - indicates a brake temperature exceeding 220°C.

Controls and Indications



WHEELS O/HEAT light (Red)
ON - indicates a brake temperature exceeding 220°C.



① **Dual brakes pressure gauge**

② **BRAKES FAIL light**

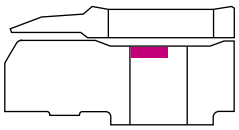
③ **BRAKES EMERGENCY light**

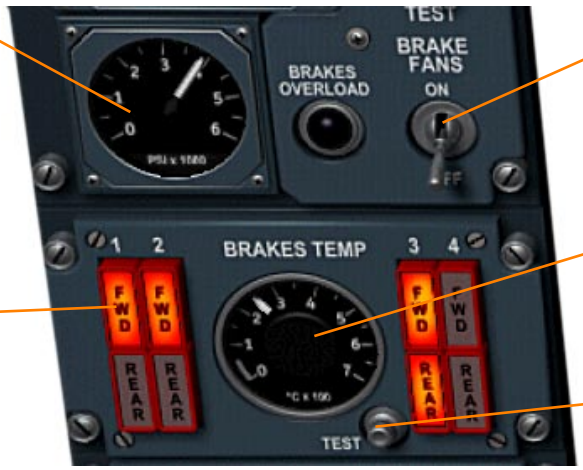
① **Dual brakes pressure gauge**
Displays only the emergency and parking brakes pressure. The left- and right-hand gauges refer to left and right hand gear wheel brakes.

② **BRAKES FAIL light (Red)**
ON - indicates a low hydraulic pressure condition in the normal brakes system.

③ **BRAKES EMERGENCY light (Amber)**
ON - indicates the brakes lever is not at the NORM position.

Controls and Indications





① Brakes accumulator pressure gauge
Displays the brakes accumulator pressure.

② BRAKES FAN switch
ON - the eight brake fans operate providing that the landing gear is down.

③ BRAKES TEMP FWD AND REAR light (8)
ON - indicates that the corresponding brake temperature exceeds 220°C.
Accompanied by the WHEELS O/HEAT light.
PRESSED - causes the BRAKES TEMP gauge to indicate the temperature of the associated brake.

④ BRAKES TEMP gauge
Displays the highest brake temperature or if a BRAKES TEMP light is pressed, the temperature of the associated brake.

⑤ BRAKES TEMP TEST push button
PRESSED - tests the wheel overheat warning system by adding 270°C to the gauge reading.

Lights

Description

The modelled cockpit lighting include instrument lights and panel flood lighting, controlled separately.

One anti-collision light is situated in each wing root leading edge and one is situated at the end of the tailcone. The three lights flash simultaneously.

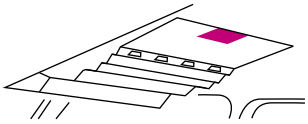
The taxi-turn lights are situated on the left and right side of the front fuselage. *The taxi-turn lights are not modelled.*

The landing taxi lights are situated on the right hand and left hand nose gear doors. A landing taxi light will not illuminate until it has left the retracted position even if the lamp is switched on. On the ground, a nose gear switch circuit ensures that a 400 W filament is operated. When airborne, a 600 W filament is operated and the lamp angle is depressed to compensate for the approach attitude.

The main landing lights are situated in the right and left wing leading edge roots. A main landing light will not illuminate until it has left its retracted position even if the lamp is switched on. Automatic blowback occurs at 365 knots.

The navigation lights are situated one in the outer leading edge of each wing and one in the tailcone.

Controls and Indications



① **Emergency lights selector**

② **Anti collision lights switch**

③ **Navigation lights switch**

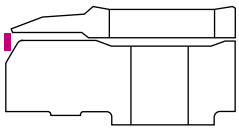
① **Emergency lights selector**
ON - test facility.
ARM - all aircraft emergency lights will come on in the event of a failure of the d.c. essential A busbar.
OFF - isolates the battery supplies in the lighting units.

② **Anti collision lights switch**
Controls the anti collision lights.

③ **Navigation lights switch**
Controls the navigation lights.

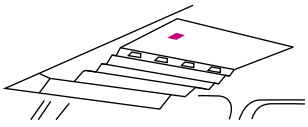
① **Instrument lights selector**
Controls the instruments back lighting.

② **Flood lights switch**
Controls the panel flood lighting.

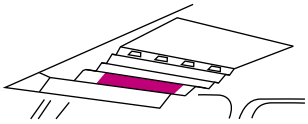


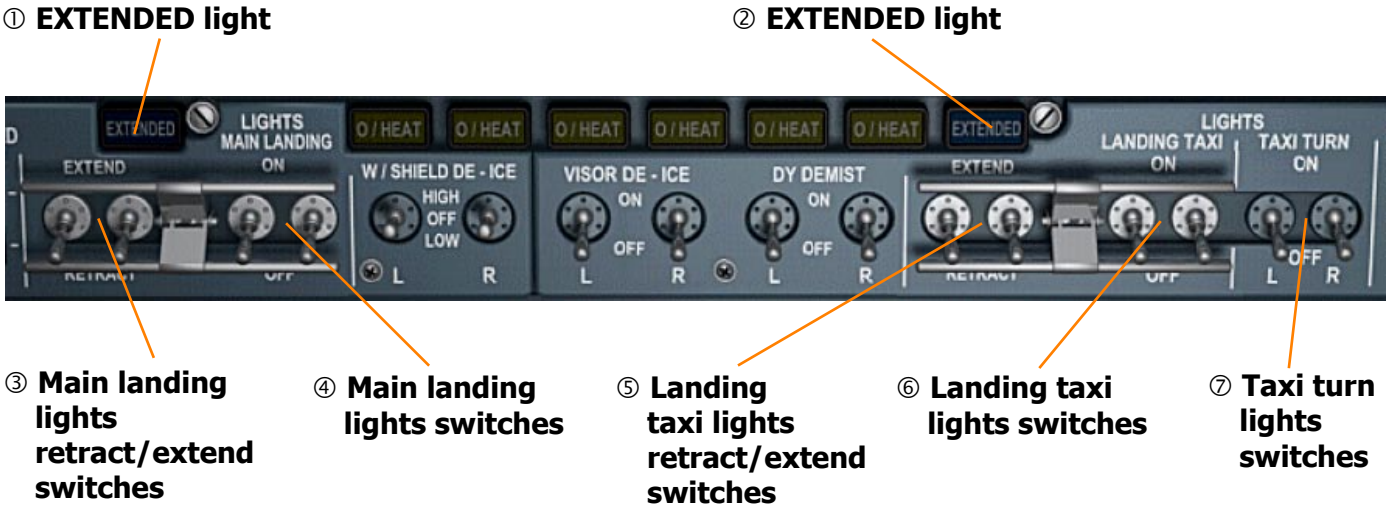
① **FASTEN SEAT BELTS switch**
ON - lights the FASTEN SEAT BELTS signs in the passenger cabin, the FASTEN SEAT BELTS lights (amber) on each stewards panel and RETURN TO SEATS lights in the toilets. Accompanied by an audio tone on the public address.

② **NO SMKG switch**
ON - lights the NO SMOKING signs in the passenger cabin, the NO SMOKING lights (amber) on each stewards panel, the cabin EXIT signs and switches on the standby lighting in the passenger cabin, vestibule, galley and toilets. Accompanied by an audio tone on the public address.



Controls and Indications





① EXTENDED light
ON - at least one light is not fully retracted.

② EXTENDED light
ON - at least one light is not fully retracted.

③ Main landing lights retract/extend switches
EXTEND - a motor drives each landing light to the extended position.

④ Main landing lights switches
ON - main landing lights are illuminated.

⑤ Landing taxi lights retract/extend switches
EXTEND - a motor drives each landing light to the extended position.

⑥ Landing taxi lights switches
ON - landing taxi lights are illuminated.

⑦ Taxi turn lights switches
ON - taxi turn lights are illuminated.
The taxi turn lights are not modelled.

Navigation Systems

General

The navigation system includes those items that provide position and direction data to the flight crew. The system includes both ground equipment and independent position locating systems.

Two separate and independent air data systems are supplied by two air data computers, ADC 1 and ADC 2.

Three separate and independent inertial navigation systems INS 1, INS 2 and INS 3 provide navigation, heading and attitude information.

Duplicated radio navigation systems provide bearings of a VOR or ADF beacon, distance to a DME beacon and localiser and glide slope indications.

The Horizontal Situation Indicator displays commands from three sources, VOR, ILS and INS. Input source to each HSI is controlled by a RAD/INS switch.

Two independent radio altimeters provide low altitude information in the height range from 0 to 2500 feet.

The decision height is adjustable and visual and aural warnings are given at the selected height.

Inertial Navigation System

The INS has a facility to store coordinates of up to 10 waypoints. It can provide navigation information to guide the aircraft on the route between these waypoints in sequence, between any two waypoints, or direct to any waypoint. The navigation information is sent to the HSI and the AFDS. The AFDS can automatically fly the aircraft on the pre-programmed route.

The INS guidance is programmed and interacted with via the Control Display Units (CDUs). There is one CDU for the Pilot, First Officer and Flight Engineer. *Flight Engineer CDU is not modelled.*

Ground Proximity Warning System

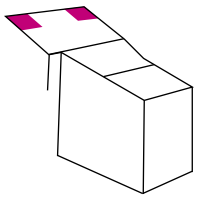
A single Ground Proximity Warning System provides warning of impending collision with terrain. The system uses inputs of radio altitude and vertical speed, plus glideslope deviation during approach, to provide five different modes of protection.

1. Excessive rate of descent with respect to terrain.
2. Excessive closure rate with terrain.
3. Loss of altitude below 700 feet after take off.
4. Proximity to ground with aircraft not in landing configuration.
5. ‘Duck under’ the glideslope.

Form modes 1, 2, 3 and 4 the warning takes the form of a flashing red TERRAIN light on the captain’s and first officer’s panels plus an aural warning - “Whoop Whoop Pull-Up” from the audio warning system.

For mode 5 the warning is aural only; this is independent of other aural warning and says “Glide-Slope”.

Controls and Indications **INS Control Display Unit**



The INS Control Display Units are located on the center pedestal. For ease of use, a CDU can be opened in a separate pop-up window. This is done by pressing corresponding icon below the glareshield, or by pressing Shift-5. The pop-up window is closed the same way.

The controls on the CDU are operated using the mouse. You can use mouse wheel you rotate the Data selector, AUTO-MAN switch and Waypoint selector.

Your PC keyboard can also be used to operate the INS CDU. To enable keyboard entry, click on either of the CDU displays. A blue blinking "K" symbol appears to indicate that the key-board input is trapped and sent to the CDU. To resume normal operation, click on the CDU display or on the blinking "K" again. The keyboard input is also cancelled if the CDU window is closed.

The keys used by the CDU are the following:
- Numpad digits: CDU digits
- Numpad ENTER: INSERT
- Numpad '.' (Del): CLEAR
- Numpad PLUS/MINUS: rotate the Waypoint selector wheel
- Numpad '/' and '*': rotate the Data selector

Please note that the INS CDU has numeric keys starting from the top, while the PC keyboard has them starting from the bottom. When waypoint latitude is entered, the entry starts with specifying either north or south hemisphere. On the onscreen CDU keyboard, this is done by pressing '2' for N and '8' for S. When using PC keyboard for entry, you should still press the Upper key for north and the Lower key for south. This means that the 'N' is indicated by pressing the '8' key and the 'S' is indicated by pressing the '2' key.

CDU in keyboard entry mode

Controls and Indications — INS Control Display Unit

① Left data indicator
Displays latitude, track, heading, cross track distance, wind direction or desired track as selected by the Data selector.

② HOLD switch light
Pressing HOLD switch with the Data selector at POS freezes the displayed present position. Switch light stays illuminated until pressed again, this resumes position update.

③ INSERT switch light
ON: whenever the keyboard is armed.
PRESSED: Inserts entry into the computer.

④ Right data indicator
Displays longitude, ground speed, drift angle, track angle error, time, wind speed, or system status, as selected by the Data selector.

⑤ ALERT light
ON - one minute before waypoint change is due.
FLASHING - when past waypoint in MAN mode when ground speed is in excess of 250 knots.
OFF - when INS automatically switches to next navigation leg in AUTO mode.

This light is repeated on main panel above the clock, replacing the INS failure lights found on the real aircraft.

INS alert lights on the main panel

Controls and Indications — INS Control Display Unit

① Waypoint selector
Used in conjunction with WAY PT on the data selector. Selecting 1 through 9 determines the waypoints for which data is to be inserted or displayed. Selecting 0 displays the present position which is always kept at waypoint 0.

② Data selector
Used to select data to be displayed in the data indicators.

③ TEST push button / AUTO - MAN switch
TEST: lights all filaments of the indicators and all button lights.
AUTO: the waypoint numbers in the FROM-TO indicator automatically sequence to the next flight leg when waypoint is reached.
MAN: the next flight leg number must be set manually through the keyboard.

④ FROM-TO indicator
Indicates the flight leg for which navigation data is being computed. Automatically goes to 12 when system is turned on.
In WAY PT mode, the indicator shows the selected waypoint number. This number blinks if the selected waypoint is part of the leg currently being flown.

⑤ WY PT CHG switch light
Allows different waypoints to be loaded into the FROM-TO indicator through the keyboard.

⑥ Keyboard
Used to enter data into data indicators and to change numbers in the FROM-TO indicator.

⑦ CLEAR button
Used to clear data indicators when erroneous data has been loaded.

Controls and Indications — INS Control Display Unit

Data selector modes

TK/GS
Present track is displayed in left data indicator; ground speed in right data indicator.
If ground speed is below 75 kt, true heading is displayed instead of present track.

HDG DA
True heading is displayed in the left data indicator; drift angle in right data indicator.

XTK TKE
Cross track distance (L or R) is displayed in the left data indicator; track error in right data indicator.

POS
Position latitude is displayed in the left data indicator; longitude in right data indicator.

WAY PT
Used with Waypoint selector and keyboard to insert and display waypoint data. Latitude is inserted and displayed in the left data indicator; longitude in right data indicator.

DIS/TIME
Distance to waypoint in TO indicator is displayed in the left data indicator; time to waypoint in TO indicator is displayed in right data indicator.

WIND
Wind direction is displayed in the left data indicator; wind velocity in right data indicator.

DSR TK/STS
Desired track is displayed in the left data indicator; system status in right data indicator.

Controls and Indications **INS CDU Basic Operation**

The INS has storage for 10 waypoints labelled 0..9. The waypoints 1..9 are entered by the pilot. The waypoint 0 is constantly updated and contains the present aircraft position.

The waypoints are entered in the following manner:
- Move the Data selector to WAY PT position.
- Select the waypoint to be entered using the Waypoint selector.
- Start entry by pressing '2' key for northern latitude or 8 for southern latitude. This illuminates the 'INSERT' switch, clears the indicator to zeroes and shows N for northern or S for southern latitude.
- Type waypoint latitude. No degrees or decimal points are required. For example, type '3' '5' '5' '1' '4' to enter 35°51.4. The digits are inserted at the far right shifting the indicator contents to the left as you type.
- If a mistake is made, press the CLEAR switch to cancel entry, or simply start typing the latitude from the beginning which will shift the previously entered digits out of the indicator.
- Complete the latitude entry by pressing the INSERT switch.
- Insert the waypoint longitude in the same manner, starting the entry by pressing 4 for western or 6 for eastern longitude.
- Complete the longitude entry by pressing the INSERT switch.
- Continue entering subsequent waypoints by selecting appropriate waypoint using the Waypoint selector and repeating the procedure.

Up to 9 waypoints can be entered in this manner. If the flight plan contains more than 9 waypoints, the consequent waypoints should be entered in the place of already flown waypoints. For example, while enroute from waypoint 8 to waypoint 9, the pilot can enter the next 7 waypoints into slots 1 to 7. You should make notes of what was the last entered waypoint and which slot it was inserted into.

The INS generates navigation data and commands for the leg defined by a pair of waypoints entered into the FROM-TO window. With AUTO-MAN switch at AUTO, this window automatically advances to the next leg when reaching TO waypoint: TO waypoint becomes FROM, and the next waypoint becomes the new TO. If TO was 9, the display will change to 9-1. In MAN mode, you must manually enter new waypoint pair to change the active leg. You can change the FROM-TO waypoints in AUTO mode as well.

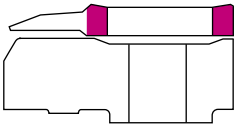
To change FROM-TO waypoints, press the WY PT CHG selector, illuminating it. Type the new pair of waypoints, and press the INSERT switch to confirm change. CLEAR can be pressed to cancel the change.

The FROM and TO waypoints need not be in sequence; you can enter '3' '5' and the INS will navigate on the great circle route from waypoint 3 to waypoint 5. If 0 is entered as FROM, the INS will navigate direct from present position (waypoint 0) to the TO waypoint.

WY PT CHG can be used to quickly check if the route is entered correctly. Move Data selector to DIST/TIME, press WY PT CHG and type '1' '2', and check that the displayed leg distance matches flight plan distance. Type '3' - the display changes to 2-3 - and check the next leg, type '4' to check leg 3-4 distance and so on. After checking all leg distances, press CLEAR and FROM-TO display will return to 1-2.

Controls and Indications

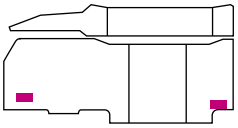
Radio Navigation Frequency Selectors



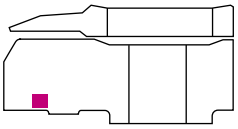
① **Selected frequency window**
Selected NAV1 or NAV2 VOR or ILS frequency.

② **Frequency rotary selectors**
Adjust the radio frequency.
Clicking to the left of the knob adjusts the whole part of the frequency. Clicking to the right of the knob adjusts the fractional part. You can also use mouse wheel to quickly dial the frequency.

DME Indicators

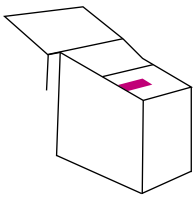


VOR Radio Magnetic Indicator



- **VOR1 pointer**
- **Compass card**
- **VOR2 pointer**

Controls and Indications

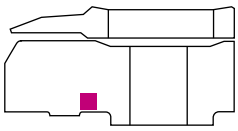


Automatic Direction Finder Frequency Selectors

① **Selected frequency windows**
Selected ADF1 and ADF2 frequencies.

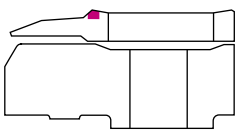
② **Frequency rotary selectors**
Adjust the radio frequency.
Click or scroll to the left of a knob to tune 100s, click on the knob to tune 10s, and click to the right of the knob to change fractional part and 1s. Mouse wheel can also be used.

Automatic Direction Finder



- **Compass card**
- **ADF1 pointer**
- **ADF2 pointer**

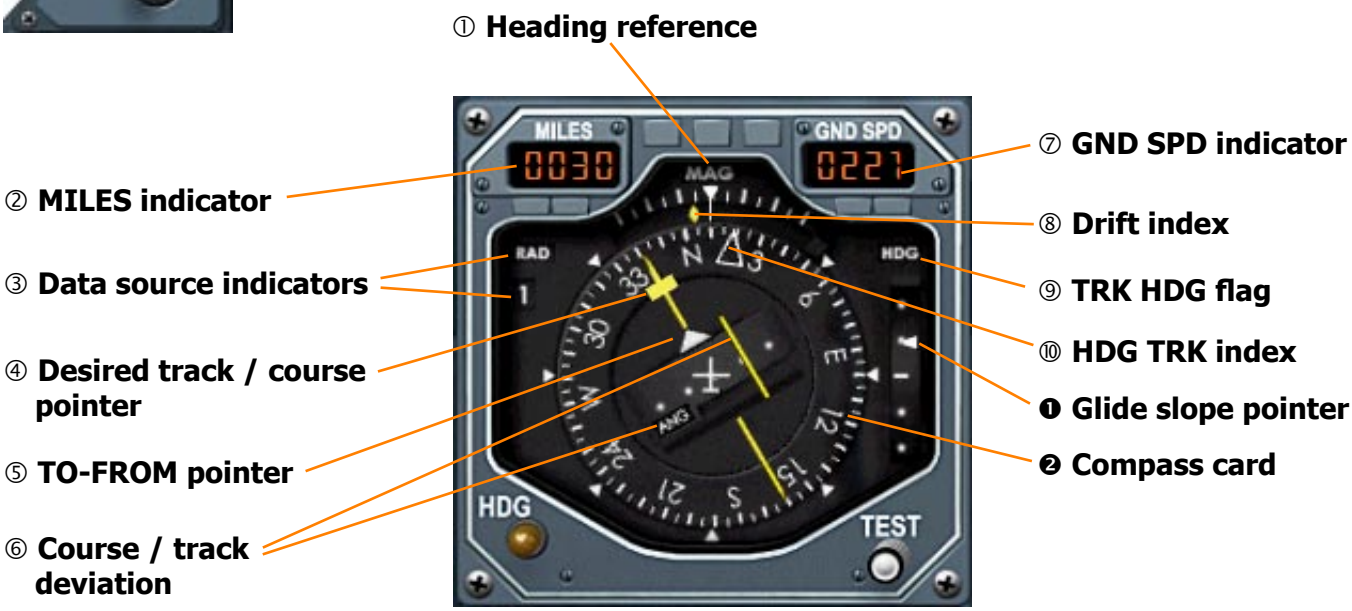
RAD-INS switch



RAD-INS switch
RAD: Horizontal Situation Indicator (HSI) displays navigation data from NAV1 radio.
INS: Horizontal Situation Indicator (HSI) displays navigation data from INS computer.

Controls and Indications

Horizontal Situation Indicator (HSI) RAD mode



① **Heading reference**
Shows MAG when RAD/INS switch at RAD.

② **MILES indicator**
Shows mileage to go to next waypoint whatever the position of the RAD/INS switch.

③ **Data source indicators**
Shows which radio navigation system (RAD) is providing navigational data to HSI.

④ **Desired track / course pointer**
Shows the course selected on the AFCS VOR LOC selector.

⑤ **TO-FROM pointer**
Indicates whether aircraft is going to or from selected radio beacon.

⑥ **Course / track deviation**
With ANG flag showing, the bar shows angular displacement from VOR or ILS over the deviation scale.
2 dots represent 10 degrees on VOR or 2.5 degrees on ILS.

⑦ **GND SPD indicator**
Shows ground speed in knots as computed in the INS.

⑧ **Drift index**
Shows drift angle as computed in the INS.

⑧ **TRK HDG flag**
Shows TRK or HDG depending on selection at the AFCS HDG/TRK selector.

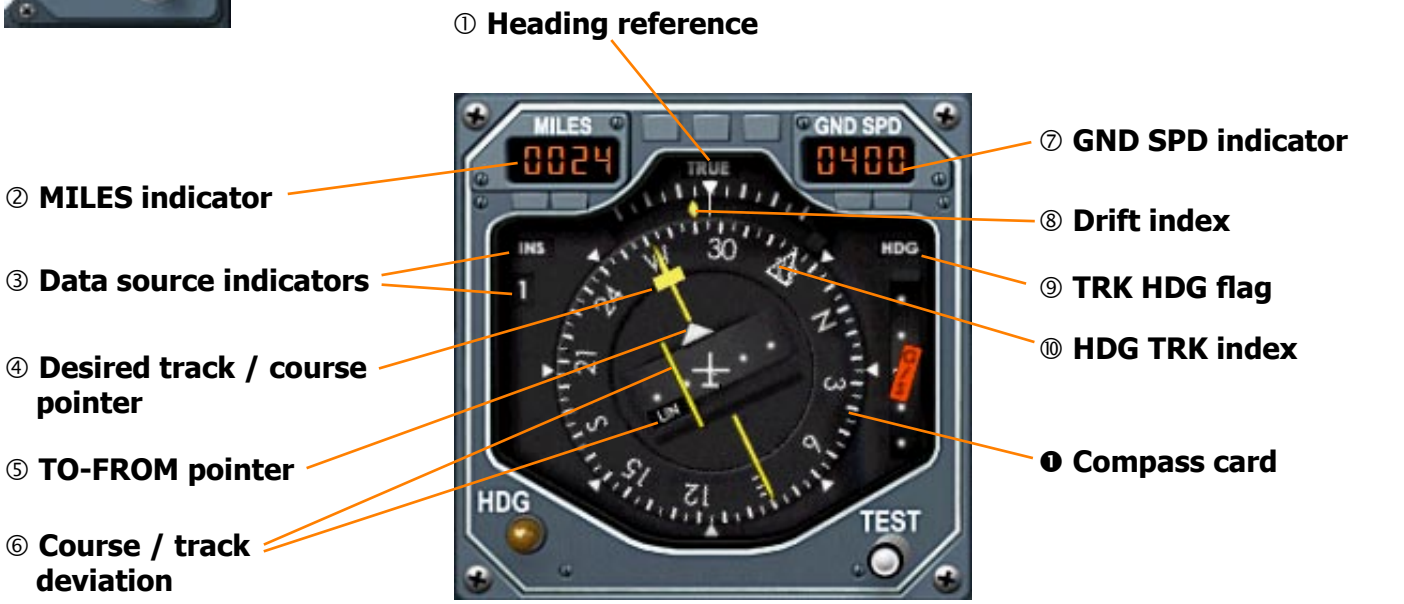
⑨ **HDG TRK index**
Shows the heading or track set in the AFCS HDG/TRK selector.

❶ **Glide slope pointer**
Shows vertical position relative to glide slope.
2 dots represent half degree.
The pointer is out of view when ILS frequency is not selected.

❷ **Compass card**
Shows magnetic heading.

Controls and Indications

Horizontal Situation Indicator (HSI) INS mode



① **Heading reference**
Shows TRUE when RAD/INS switch at INS.

② **MILES indicator**
Shows mileage to go to next waypoint whatever the position of the RAD/INS switch.

③ **Data source indicators**
Shows which INS is providing navigational data to HSI.

④ **Desired track / course pointer**
Shows the desired INS track.

⑤ **TO-FROM pointer**
Indicates whether aircraft is going to or from waypoint in TO side of INS FROM-TO indicator.

⑥ **Course / track deviation**
With LIN flag showing, the bar shows linear displacement from INS track over the deviation scale.
2 dots represent 7.5 nautical miles.

⑦ **GND SPD indicator**
Shows ground speed in knots as computed in the INS.

⑧ **Drift index**
Shows drift angle as computed in the INS.

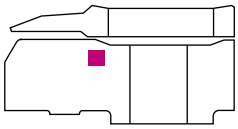
⑧ **TRK HDG flag**
Shows TRK or HDG depending on selection at the AFCS HDG/TRK selector.

⑨ **HDG TRK index**
Shows the heading or track set in the AFCS HDG/TRK selector.

❶ **Compass card**
Shows true heading.

Controls and Indications

Radio Altimeter



① **TEST push button**

② **Index**

③ **Pointer**

④ **DH setting knob**

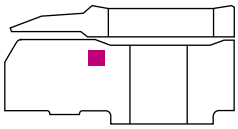
① **TEST push button**
Pressed - tests the radio altimeter and its connection to the ADIs.

② **Index (Amber)**
Shows the selected decision height (DH).

③ **Pointer**
Shows aircraft radio altitude when below 2500 ft.

④ **DH setting knob**
The DH setting knob sets the index to the decision height.

Marker Beacon System



① **AIRWAYS light (White)**
ON - indicates aircraft is positioned over an airway marker beacon. Accompanied by audio warning (3000 Hz).

② **MIDDLE light (Amber)**
ON - indicates aircraft is positioned over a terminal middle marker beacon. Accompanied by audio warning (1300 Hz).

③ **OUTER light (Blue)**
ON - indicates aircraft is positioned over an terminal outer marker beacon. Accompanied by audio warning (400 Hz).

④ **TEST push button**
PRESSED - lights each lamp in turn.

Nose and Visor

General

On take-off and landing the entire nose fairing forward of the windshield, including the visor, is drooped to improve visibility. When raised the nose and visor give the aircraft a clean aerodynamic shape. The visor, which also protects the windshield from the effects of kinetic heating, has large transparent panels which provide a good field of vision around the flight path.

Description

The visor has two positions: Up and down
- Up position is maintained by a mechanical uplock
- Down position is maintained by hydraulic pressure and mechanical springs.

The nose has three positions: Up, 5°, down (12½°)
- Up position is maintained by two mechanical uplocks
- 5° down position is maintained by 2 jacks internal locks
- Down position is maintained by hydraulic pressure, aerodynamic loads and nose weight.

This gives 4 normal configurations:
1. Visor up, nose up
2. Visor down, nose up
3. Visor down, nose 5°
4. Visor down, nose down

The visor/nose configuration is easily recognizable from the flight deck.

Operation

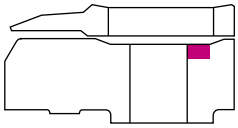
There are three different operational modes:

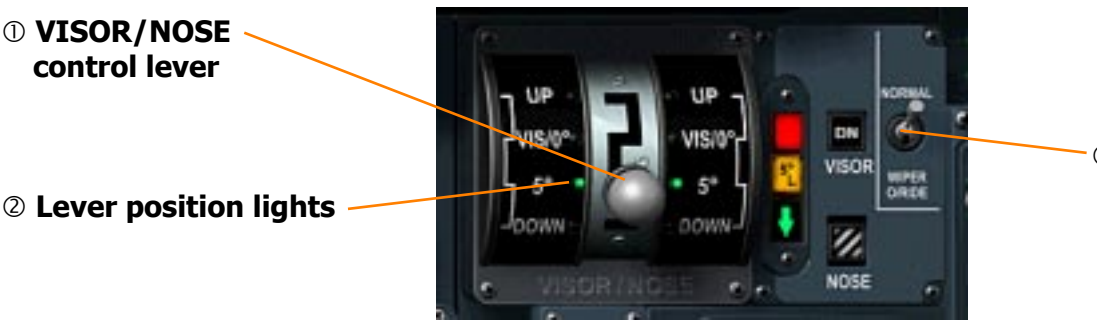
Normal:
Green hydraulic power supplies
- a single jack which operates the visor
- a pair of jacks working in parallel to operate the nose.

It also supplies power to release visor and nose uplocks.

Standby:
The yellow system is available only for lowering the visor and nose. This standby system unlocks and lowers the visor through the normal jack but only releases the locks of the nose thus allowing its own weight and aerodynamic loads to lower it to the 5° or down (12½°) positions.

Controls and Indications





① VISOR/NOSE control lever
Selects the desired visor / nose positions.

② Lever position lights
There are two lights at each lever position for each visor/nose selection. They are on to indicate only the position of the lever.

③ WIPER O/RIDE switch
NORMAL - inhibits the visor raise operation if one of the windscreen wipers is not correctly parked.
O/RIDE - if the visor raise sequence remains inhibited, with the windscreen wipers correctly parked, O/RIDE is used to bypass the inhibition.

① UNLOCK light (Red)
ON - indicates that either the visor or nose is not at a specified position or is not positively locked.

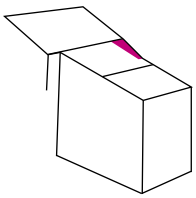
② 5° L light (Amber)
ON - indicates that one or both of the nose 5° locks is or are released.
NOTE: The light goes off, though the 5° locks remain released, when the nose down position is reached.

③ DOWN light (Green)
ON - indicates that the nose and visor are both fully down.

④ VISOR magnetic indicator
UP - Visor fully raised.
DOWN - Visor fully lowered.
STRIPES - Visor in transit.

⑤ NOSE magnetic indicator
UP - Nose fully raised.
5° - Nose 5° down.
DOWN - Nose fully lowered.
STRIPES - Nose in transit.

Controls and Indications



NOSE/VISOR STBY control
The nose/visor STBY control comprises 3 switches guarded by a lock and slotted plate that ensures correct sequencing of the system.

① **STBY control switch to VISOR DOWN**
Setting the STBY control switch to VISOR DOWN on-loads the yellow hydraulic system and selects it to release the visor uplock and drive the visor down.

To release the switch lock, click it with the right mouse button.

② **STBY control switch to NOSE 5°**
Setting the STBY control switch to NOSE 5°, selects the yellow hydraulic system to release the nose uplocks, thus allowing the nose to fall to the 5° position under its own weight and aerodynamic loads.
If the visor is up as the nose falls the visor uplock is released by a mechanical linkage and the visor is then lowered by yellow hydraulic pressure.

③ **STBY control switch to NOSE DOWN**
Setting the STBY control switch to NOSE DOWN, selects the yellow hydraulic system to release the 5° locks (2) allowing the nose to fall to the down position.

Power Plant

Overview

The power plant comprises four identical propulsion units mounted in nacelles beneath the wings. Each nacelle contains two propulsion units separated by a centre wall forming a fire-wall, each propulsion unit comprising:

- A variable-geometry engine air intake.

- A Rolls-Royce OLYMPUS 593 Mark 610 engine with reheat, aligned with the air intake. The engine is contained within an engine bay formed by the centre wall, access doors and, for-ward, a firewall separating the engine bay from the intake structure.

- A secondary nozzle structure which provides a mounting for the thrust reverser buckets forming the variable area secondary nozzle.

Engine air intakes

Each engine air intake is basically rectangular in cross section with a moveable ramp in the roof and spill door in the floor. Hydraulic actuators position the ramp to vary the intake cap-ture area and will open the spill door to augment the spill of unwanted air.

At take off and low speeds an auxiliary inlet vane, integral with the spill door, provides extra air to the engine. This vane is operated by differential pressure only. During operation of the spill door the vane is locked in the closed position.

A perforated bleed through the lower surface of the intake aids inlet performance at high Mach numbers. The flow through this bleed is limited by the exit cross section only and is not mechanically controlled.

Intake Operation

At speeds below M=1.3 the ramps remain fully up and the spill doors closed. At speeds above M=1.3 the ramps and spill doors are positioned between scheduled maximum and minimum angular positions determined by the prevailing control parameters, namely intake pressure area, Mach number, engine speed N_1, angle of attack and actual ramp and spill door positions. The change in ramp angle varies the intake capture area, controls the fore spillage of air and creates a shockwave system originating at the ramp angle. This shockwave system slows the air entering the intake to approximately M=0.5. In the optimal configuration at any Mach number the ramp is positioned to cause the shockwaves to converge on the lower lip of the floor. When the predetermined scheduled ramp angle is reached any excess air entering the intakes (e.g. during very high ambient temperatures or during throttling) is dumped through the spill door. In addition, as the angle of the spill door increases the scheduled maximum ramp angle is increased by an incremental function of the spill door angle.

The hydraulic actuators of the ramps and spill doors are supplied by the two main hydraulic systems. Intakes 1 and 2 are supplied by the green system and the intakes 3 and 4 by the blue system. The standby supply for all intakes is the yellow system.

There are two identical control lanes per intake. A failure of the lane in control will cause an automatic changeover to the other lane. A method of manual control of the ramps and spill doors is provided.

Engine bay ventilation

Engine bay ventilation is provided by air from the engine air intakes passed to the engine bay by way of secondary air doors in the firewall between the intake structure and the engine bay.

The secondary air doors are opened to provide a cooling ventilating flow of air around the engine, and are automatically controlled to open when the aircraft speed exceeds M=0.26 for engine 1, 2 and 3 and 220 kt for engine No.4

Engine fuel feed

Fuel under aircraft collector tank pump pressure is delivered to the engine first stage pump and on through a fuel filter and oil cooler to the second stage pump in the fuel control unit. The fuel then passes through the throttle valve, the HP shut-off valve, a flow meter and a dump valve to the burners. Reheat fuel is taken from the first stage pump outlet and delivered via a flow meter to the reheat spray ring.

Engine oil system

The engine lubrication system lubricates the five main bearings of the engine, accessory drives and gears. Scavenge pumps return the oil from the five main bearings and gearbox through a fuel-cooled oil cooler to the tank.

Reheat system

The reheat system operates by burning fuel within the jet pipe to increase the temperature of the turbine exhaust gases. This increases the velocity of the exhaust gases thereby producing additional thrust.

The reheat is normally used at take off and during the transonic acceleration.

Engine control

Two identical, electrical throttle control systems control each engine; a failure of the system in control will cause an automatic changeover to the other system.

The throttle control units control the engine, using the position of the throttle levers, the engine control schedulers and the engine limiters.

The engine control schedule is the schedule of the relationship between the low pressure spool (N_1) and high pressure spool (N_2) speeds. The twin-spool engine is fitted with a variable primary nozzle that enables the jet pipe pressure to be varied. The jet pipe pressure acts upon the low pressure spool thus allowing controlled variation of N_1 without affecting the N_2 speeds. This facility allows matching of the N_1 an N_2 speeds in a series of engine control schedules that allow optimal operation of the engine while ensuring adequate compressor surge margins throughout the operating range of the engine.

The four schedules are, **flyover**, **high**, **mid** and **low**.

Flyover (F/O) is required during flyover noise abatement at speeds greater than 220 knots and for prolonged flying within range M=0.80 to M=1.00 provided that the throttle levers are not advanced more than 95% of travel.

High (HI) is required during dry engine operation at speeds greater than 220 knots. It provides maximum fuel economy.

Mid is required during reheated engine operation in CLIMB rating at speeds greater than 220 knots. Mid also protects against excessive N_1 overspeed when reheat is cancelled and during the approach for noise abatement to touch down.

Low (LO) is required during dry engine operation at speeds less than 220 knots and during reheated engine operation in T/OFF rating at any speed; it also protects against excessive N_1 overspeed when reheat is cancelled.

The engine limiters automatically control the engines to the limitations appropriate to the prevailing phase of flight. Thus the need for fine tuning of the throttle levers to remain within limitations is avoided and the throttle levers are only used when thrust below the appropriate limitation is required.

Please note that the separate control of actual N_1 and N_2 speeds is not available in this simulation.

Engine ignition

There are two igniters per engine, identified as left hand and right hand. They may be used together or individually.

An auto-ignition system provides a rapid automatic relight facility. The N_2 rpm is monitored and should a rapid decay of N_2 occur, or N_2 fall below 58%, the auto ignition system signals the engine fuel throttle valves to close, the start pump to run and the ignitors to spark. When light-up of the engine is detected the fuel throttle valve is opened to correspond to the throttle lever position and the start pump, together with the ignitors, is switched off.

Engine starting

The engines are started by low pressure air acting on air starter to crank the engine. The air may be supplied independently to each wing from a ground supply or cross bled from the adjacent engine if it is already running.

Secondary nozzle

The variable area secondary nozzle is formed by the thrust reverser buckets. The secondary nozzle is positioned fully open at speeds greater than M=1.1. At lower speed a nozzle angle scheduling unit (NASU) positions the secondary nozzle as a function of Mach number and also provides the appropriate signals for the automatic selection of the engine control schedules. There are two NASU systems; No.1 system signals engines 1 and 4 and No.2 system signals engines 2 and 3.

Protection against inadvertent bucket movement toward the reverse thrust position is afforded in the following manner. Should the buckets move beyond the 27 degree position an air shut off valve cuts the air supply to the bucket drive motor. This should prevent bucket movement beyond 35 degrees, if however the buckets move beyond 42 degrees a "wind down" system operates and signals via the selected throttle control system a reduction of N_2 to idle.

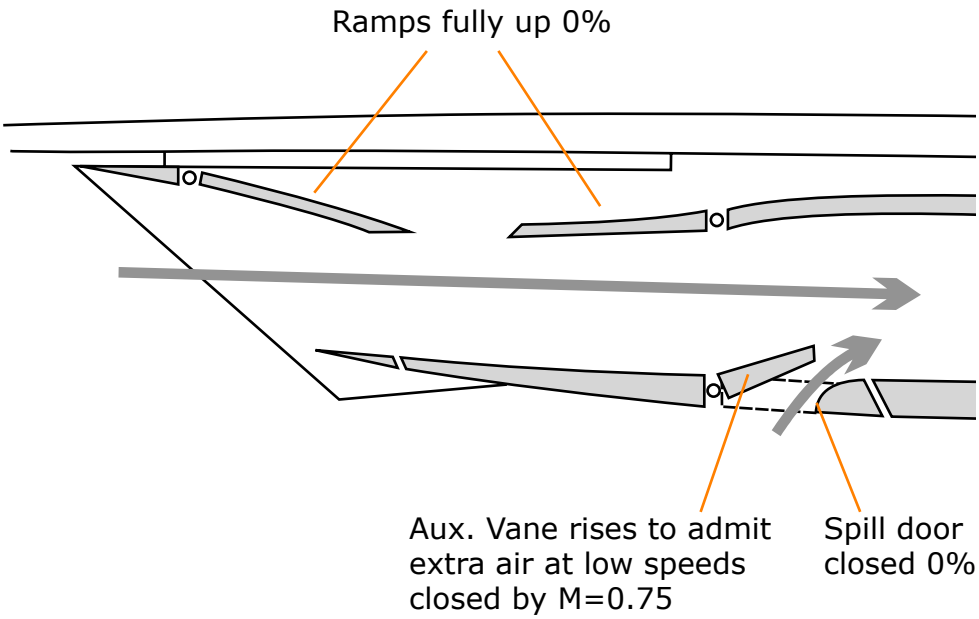
Reverse thrust

Reverse thrust is provided on all four engines for use on the ground.

The Concorde also provides facility to use limited two-engine in-flight reverse thrust. It is implemented by partial deployment of engine 2 and 3 reverser buckets at idle thrust.

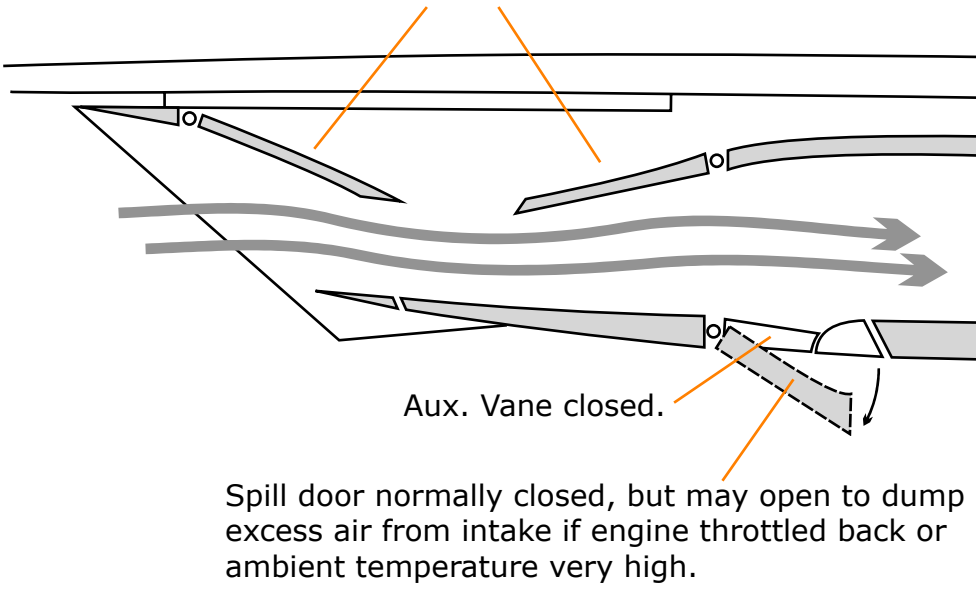
The in-flight reverse is activated using the Flight Simulator Spoiler key (Slash '/'). Before using the in-flight reverse, move thrust levers to idle and arm the in-flight reverse using the FLIGHT REV ARM button on the Flight Engineer console. If Virtual Flight Engineer is used, the in-flight reverse will be automatically armed when you press the Spoiler key to activate the reverse.

Intake configuration below M=1.3

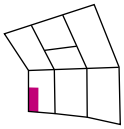


Intake configuration above M=1.3

Ramps lowering with increasing Mach; approx. 50% by M=2.02. Ramps will move as intake compensates for ambient temperature changes or engine throttling.



Controls and Indications



① **RAMP/SPILL MASTER switch (4)**

② **Ramp indicator (4)**

③ **Ramp inching switch (4)**

④ **Spill indicator (4)**

⑤ **Spill inching switch (4)**

⑥ **HYD light (4)**

⑦ **Hydraulic selector (4)**

⑧ **Aux inlet MI (4)**

① **RAMP/SPILL MASTER switch**

MAN - the RAMP and SPILL inching switches are armed. The auto control of the air intake, the auto change facility of lane and hydraulics are inhibited.

AUTO - the intake control system controls the intake ramp and spill doors. Below M=0.7 the ramp remains fully up and the spill door is closed.

② **Ramp indicator**

Shows ramp position as a percentage of its movement from fully up.

③ **Ramp inching switch**

Enables the ramp to be raised and lowered providing the RAMP/SPILL MASTER switch is at MAN and hydraulic pressure is available. It is spring returned to the centre position.

④ **Spill indicator**

Shows spill door position as a percentage of its movement from fully closed.

⑤ **Spill inching switch**

Enables the spill door to be opened and shut providing the RAMP/SPILL MASTER switch is at MAN and hydraulic pressure is available. It is spring returned to the centre position.

⑥ **HYD light (Amber)**

ON - indicates a failure of the hydraulic actuation of the intake.
Accompanied by MWS INT light (AMBER).

⑦ **Hydraulic selector**

YELLOW - the yellow hydraulic system is selected to sully the intake and the yellow hydraulic pumps are onloaded.

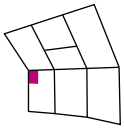
AUTO - the main hydraulic operating system for each intake is selected and the automatic changeover facilities are armed. The automatic changeover will occur when a failure of the main hydraulic operation or a low level in main hydraulic reservoir is sensed.

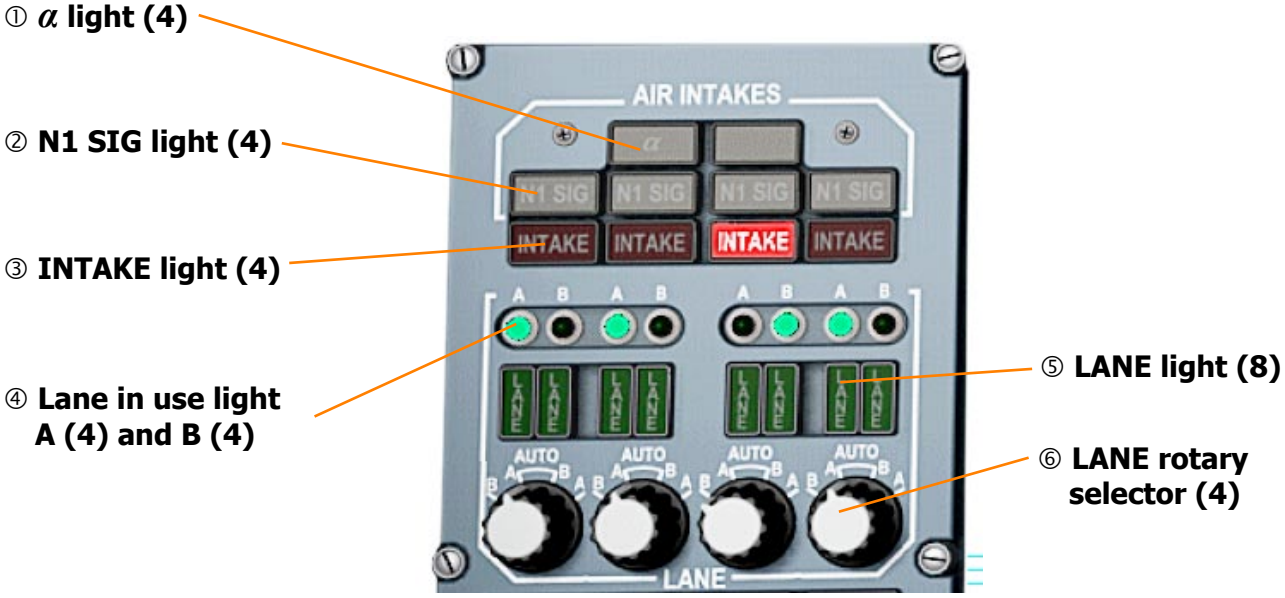
GREEN and BLUE - selects the appropriate hydraulic system with no automatic changeover facility.

⑧ **Aux inlet MI**

Shows the position of the auxiliary inlet vane.

Controls and Indications





① **α light (Amber)**
ON - Indicates a failure of the aircraft incidence signal of one or more of the intake control units in use.
Accompanied by the MWS INT light (AMBER).

② **N1 SIG light (Amber)**
ON - Indicates a failure of the LP spool speed signal to the intake control unit in use.
Accompanied by the MWS INT light (AMBER).

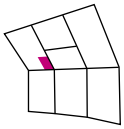
③ **INTAKE light (Red)**
ON - Indicates that the air intake ramp and spill doors are not under the control of the air intake automatic control system.
Accompanied by the MWS INT light (RED).

④ **Lane in use light (Green)**
ON - Indicates the lane controlling the intake.

⑤ **LANE light (Amber)**
ON - Indicates a failure of the associated intake lane A or B, whether it is in use or not.
Accompanied by the MWS INT light (AMBER).

⑥ **LANE rotary selector**
There are two identical control lanes per intake identified as A and B. Either may be used as the first selection. With AUTO A or AUTO B selected failure of the lane causes automatic changeover to the other lane. The non-auto positions A and B are selections of the appropriate lane with no auto-change capability.

Controls and Indications



① Secondary air door MI
Indicates the position of secondary air doors.

② SECONDARY AIR DOORS selector
AUTO - opening of the secondary air doors is controlled by ADC signals. The doors for engines 1, 2 and 3 are opened at speeds in excess of M=0.26 and those of engine 4 at speeds in excess of 220 knots.

- closing of the secondary air doors of engine 4 is by ADC signal at speeds less than M-0.26 providing that the landing gear is down and those of engines 1, 2 and 3 on tough down, via weight switches, providing that the speed is less than M=0.26.

OPEN, SHUT - overrides the automatic control and commands doors to open or close.

③ SECONDARY NOZZLE instrument
Shows the secondary nozzle bucket position within the range 0-37.5 deg. When the buckets are being used as thrust reversers the instrument is hidden behind the mask.

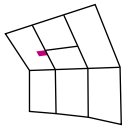
④ FLIGHT REV ARM push button
Arms the flight reverse system, providing the four throttle levers are at idle.
The button is magnetically held in the armed position.
When any of the throttle levers is advanced more than 10% from idle the magnetic latch is released disarming the in-flight reverse system.

⑤ FLIGHT REV ARM OPEN light (Blue)
ON - indicates opening of flight reverse air supply isolation valves.

⑥ NOZZLE light (Yellow)
ON - indicates a loss of one of both NASUs, or, that FLYOVER engine schedule is selected above M=1.0.

⑦ NASU TEST selector
1 - the failure detection circuits of No 1 NASU system are being tested.
2 - the failure detection circuits of No 2 NASU system are being tested.

Controls and Indications



① **F/O light (White)**
ON - indicates that the flyover ENGINE CONTROL SCHEDULE is operating.

② **HI light (White)**
ON - indicates that the high ENGINE CONTROL SCHEDULE is operating.

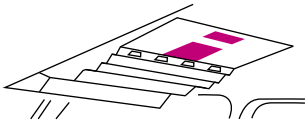
③ **MID light (White)**
ON - indicates that the mid ENGINE CONTROL SCHEDULE is operating.

④ **LO light (Green)**
ON - indicates that the low ENGINE CONTROL SCHEDULE is operating.

⑤ **ENGINE CONTROL SCHEDULE rotary selector**
AT ANY POSITION EXCEPT MID - with the aircraft on the ground, or flying at a speed less than 220 knots, or during reheat operation with the ENG RATING MODE switch at TAKE OFF, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the low engine control schedule.
NORMAL - with the aircraft speed greater than 220 knots, reheat cancelled and the ENGINE CONTROL SCHEDULE at AUTO selects the high engine control schedule.
- with the aircraft speed greater than 220 knots, the ENG FLIGHT RATING switch at CLIMB, the ENG RATING MODE switch at FLIGHT, reheat operating and the ENGINE CONTROL SCHEDULE at AUTO selects the mid engine control schedule.
FLYOVER (F/O) - with the aircraft speed greater than 220 knots, but less than M=1.0, reheat cancelled, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the flyover engine control schedule.
- with the aircraft speed greater than M=1.0, reheat cancelled, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the high engine control schedule.
APPROACH (MID) - providing the ENGINE CONTROL SCHEDULE selector is at AUTO the mid engine control schedule is selected except when aircraft on ground.

⑥ **ENGINE CONTROL SCHEDULE selector (All engines)**
HI - selects the high engine control schedule once the conditions demanding and alternative engine control schedule no longer exist; these conditions are;
with the landing gear down the controlling schedule will be LO (low).
With the landing gear up, the ENG RATING MODE switch at TAKE OFF and reheat selector at RHT, the controlling schedule will be LO (low).
With the landing gear up, the ENG RATING MODE switch at FLIGHT and reheat selector at RHT, the controlling schedule will be MID.
AUTO - allows the selection of engine control schedule using the rotary selector.
LO - selects the low engine control schedule.

Controls and Indications



ENG FLIGHT RATING switch (4)

CLIMB - providing the ENG RATING MODE switch is at FLIGHT, the engine N_1, N_2 and EGT will be limited to the climb rating.

CRUISE - providing the ENG RATING MODE switch is at FLIGHT, the engine N_1, N_2 and EGT will be limited to the cruise rating.

① **THROTTLE MASTER selector (4)**

② **AUTO IGNITION switch (4)**

③ **AUTO THROTTLE switch (4)**

④ **ENG RATING MODE switch (4)**

① **THROTTLE MASTER selector**

ALTERN or MAIN - the engine is being controlled by one of two identical throttle control systems.

② **AUTO IGNITION switch**

ON - the auto ignition system is armed.

③ **AUTO THROTTLE switch**

ON - the auto throttle system is armed.

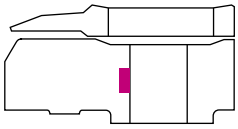
④ **ENG RATING MODE switch**

TAKE OFF - the engine N_1, N_2 and EGT will be limited to the take-off rating.

FLIGHT - the ENGINE FLIGHT ratings are armed.

NOTE: when the main landing gears are locked down the magnetic latches that hold the ENG RATING MODE switches in the FLIGHT position are released, and the switches are spring returned to the TAKE OFF position. Engine 1 and 4 switches are released by the left gear and those for engines 2 and 3 by the right gear.

Controls and Indications

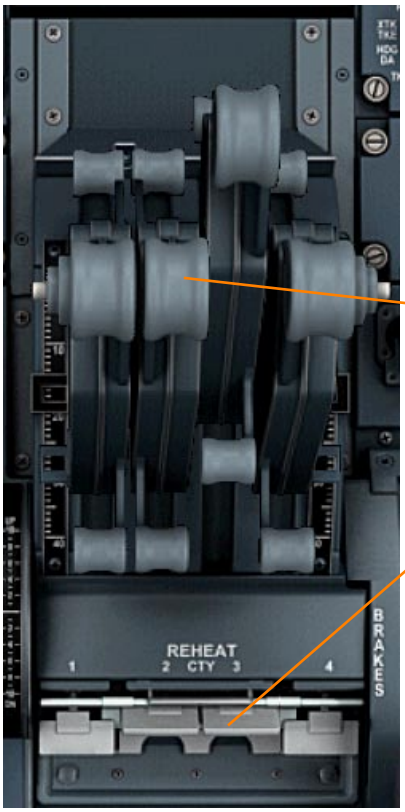


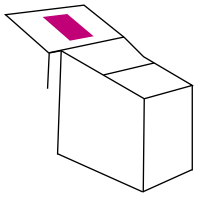
① **CTY (contingency) light (Yellow)**
FLASHING - indicates that a contingency rating is automatically selected. CTY is auto selected if any engine N2 falls below 58% with Engine rating switch at TAKEOFF, Reheat selected on and Takeoff monitor armed. This rises the engine rpm limit to 106.8% N2.

② **T/O (take off) light (White)**
ON - indicates that at least one of the four ENG RATING MODE switches are at TAKE OFF.

③ **CLB (climb) light (White)**
ON - indicates that at least one of the four ENG FLIGHT RATING switches is at CLIMB and its associated ENG RATING MODE switch is at FLIGHT.

④ **CRS (cruise) light (White)**



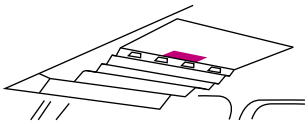


① **Throttle levers (4)**
The throttles can be individually dragged using the mouse. If dragged by pressing RIGHT mouse button, all throttles are moved altogether.

② **Reheat selectors (4)**
RHT (Raised) - reheat circuits are armed.
OFF (Lowered) - stops the reheat fuel flow.

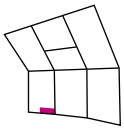
Each of the reheat selectors can be individually toggled by clicking on it. All four selectors can be raised by clicking in the area above the selectors, and lowered by clicking in the area below the selectors.
The default Flight Simulator key combination for toggling reheat (afterburners) is Shift-F4.

Controls and Indications



① **HP VALVE MI (4)**
Indicates the position of HP fuel valve.

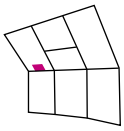
② **HP VALVE switches (4)**
Control the high pressure fuel flow to the engines.
SHUT: fuel flow is cut off.



① **START VALVE MI (4)**
Indicates the position of air starter valve.

② **RELIGHT/START selector (4)**
Master selector for engine starting.

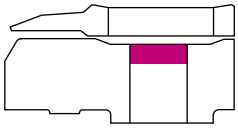
RELIGHT - providing the throttle lever is at idle and the HP VALVE switch is at OPEN, the start electrical fuel pump will run and both engine igniters will be energized.
START - opens an air valve to allow air to turn the engine via an air starter. It also energizes the start fuel pump and ignitors.
The selector is magnetically held at START until 25% N_2, then it returns to OFF.



① **FUEL HEATERS selector (4)**
ON - AUTO position overridden and the heater is supplied with hot air.
AUTO - the fuel heater is supplied with hot air when the fuel inlet temperature is less than +5°C. There is no positive indication of operation.

② **ENGINE RECIRCULATION VALVES switch (4)**
OPEN - the recirculation valves allow the recirculation of fuel from downstream of the engine and CSD oil coolers back to the engine feed tanks. This maintains the cooling flow of fuel across these coolers when engine feed flow is reduced by the engine's low demand for fuel.
SHUT - recirculation of the fuel back to the collector tank is stopped.

Controls and Indications



② **GO Power management light (4)**

③ **CON Power management light (4)**

④ **REV Power management light (4)**

⑤ **N_2 instrument (4)**

① **T/O MONITOR control button**

① **T/O MONITOR control button**

PUSH ARM - arms the clear to go (green) lights for monitoring the engine thrust during the takeoff run.

PULL INHIB - disarms the clear to go (green) lights.

② **GO Power management light (Green)**

ON - indicates that the secondary nozzle buckets are positioned within limits, the CON light is off and the set bug values of P_7 and FUEL FLOW have been achieved, and the ENG 4 T/O N_1 LIMITER has returned to NORMAL position.

③ **CON Power management light (Amber)**

ON - with no decrease in N_2, indicates loss of reheat thrust.
- with reverse thrust selected indicates that the primary nozzle is greater than 15%.

④ **REV Power management light (Blue)**

FLASHING - indicates that the buckets are in transit.

ON - indicates that the buckets are closed.

OFF - indicates that the buckets are within the forward thrust range.

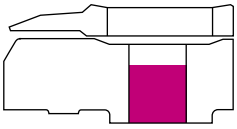
⑤ **N_2 instrument**

Indicates a percentage rpm of the high pressure spool on the dial scale and digital counter.

The instrument incorporates an overlimit pointer which remains at 110% or the highest value the main pointer has indicated.

Loss of electric power supply to the instrument is shown by a red and black striped flag across the digital counter.

Controls and Indications



① N_1 instrument
Indicates a percentage rpm of the low pressure spool on the dial scale and digital counter.
It incorporates an overlimit pointer which remains at 108.5% or the highest value the main pointer has indicated.
Loss of electric power supply to the instrument is shown by a red and black striped flag across the digital counter.

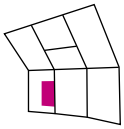
② Fuel Flow instrument
Indicates the fuel flow rate in kg/hr x 1000 on the dial scale and lower digital counter.
The setting knob adjusts the bug and upper digital counter to the required take-off value.
The bug setting also forms part of the take-off monitoring system.
Loss of electric power supply to the instrument is shown by a red and black striped flag across the lower digital counter.

③ Exhaust Gas Temperature (EGT) gauge
Indicates the gas temperature in the jet pipe on the dial scale and digital counter.
Loss of electric power supply to the instrument is shown by a red and black striped flag across the digital counter.

④ REHEAT SELECTED light (White)
ON - indicates that the reheat selector is away from the OFF position.

⑤ AREA instrument
Indicates the primary nozzle exhaust gas discharge area as a percentage of the range between minimum and maximum area.
Loss of electric power supply to the instrument is shown by a red and black striped flag.
White sector on each instrument indicates correct reheat operation. Range 70-100% all engines.
Additional yellow sector (Engine No.4 only) indicates correct reheat operation below 60 kts. Range 60-70%.

Controls and Indications



① **TCA HIGH TEMP light (4)**

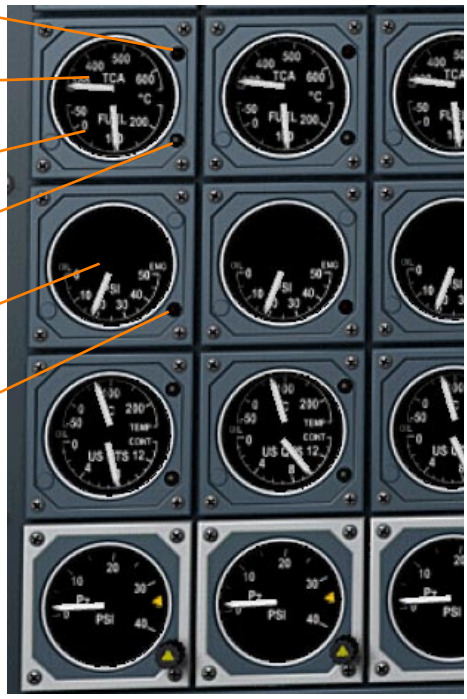
② **Turbine cooling air (TCA) TEMP instrument (4)**

③ **FUEL TEMP instrument (4)**

④ **FUEL HIGH TEMP light (4)**

⑤ **OIL ENG instrument (4)**

⑥ **OIL ENG LOW PRESSURE light (4)**



① **TCA HIGH TEMP light (Red)**
ON - indicates that a high temperature exists in the turbine cooling air system.
Accompanied by a MWS ENG light (red) and audio (gong).

② **Turbine cooling air (TCA) TEMP instrument**
Shows the temperature of the cooling air after it has passed across the face of the HP turbine.

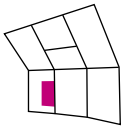
③ **FUEL TEMP instrument**
Shows the temperature of the fuel at the fuel burner manifold

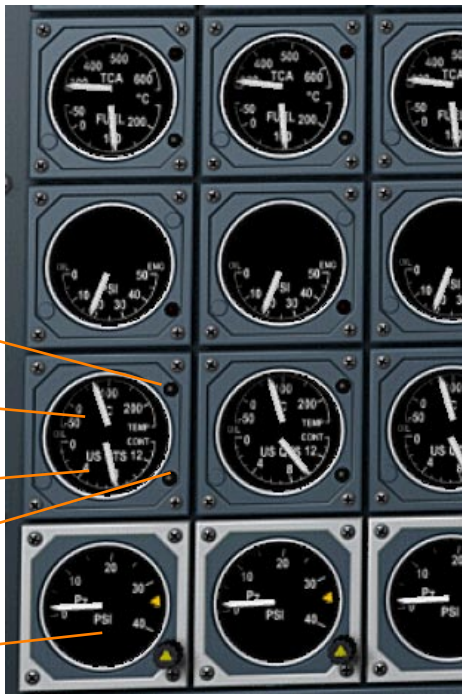
④ **FUEL HIGH TEMP light (Amber)**
ON - indicates that a high fuel temperature exists in the fuel burner manifold.
Accompanied by a MWS ENG light (amber) and audio (gong).

⑤ **OIL ENG instrument**
Shows the pressure in the engine oil system.

⑥ **OIL ENG LOW PRESSURE light**
ON - indicates that the oil pressure is less than 15 psi.
Accompanied by a MWS ENG light (red) and audio (gong).

Controls and Indications





① **OIL TEMP instrument warning light (4)**

② **OIL TEMP instrument (4)**

③ **OIL CONT instrument (4)**

④ **OIL CONT instrument warning light (4)**

⑤ **P_7 instrument (4)**

① **OIL TEMP instrument warning light (Amber)**
On - indicates that a high temperature exists in the engine oil entering the oil pressure pump.
Accompanied by a MWS ENG light (amber) and audio (gong).

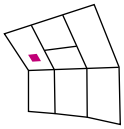
② **OIL TEMP instrument**
Shows the temperature of the engine oil entering the oil pressure pump.

③ **OIL CONT instrument**
Shows the content in the engine oil tank.

④ **OIL CONT instrument warning light (Yellow)**
ON - indicates that a the content of the engine oil tank is greater than 14 U.S.quarts.

⑤ **P_7 instrument**
Shows the pressure in the jet pipe. The setting knob adjusts the bug and upper digital counter to the required take-off value.
The bug setting also forms part of the take-off monitoring system.
A red and black striped flag across the lower digital counter shows loss of electrical power supply or failure of the instrument servo system.

Controls and Indications



① **ENGINE O/HEAT light (4)**

② **START PUMP light (4)**

③ **WIND DOWN light (4)**

④ **REHEAT FAULT light (4)**

⑤ **NAC/WING O/HEAT light (4)**

⑥ **FUEL FILTER light (4)**

① **ENGINE O/HEAT light (Red)**
Indicates that a high temperature exists at one of the engine temperature sensors.

② **START PUMP light (Yellow)**
ON - indicates that an electrically driven fuel start pump is running.

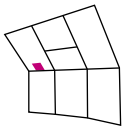
③ **WIND DOWN light (Yellow)**
ON - indicates that the wind down system has operated. *Not modelled.*

④ **REHEAT FAULT light (Yellow)**
ON - indicates a fault in the reheat system.

⑤ **NAC/WING O/HEAT light**
Refer to FIRE PROTECTION.

⑥ **FUEL FILTER light (Amber)**
ON - indicates an excess differential pressure across the engine fuel filter. Accompanied by MWS ENG (amber).

Controls and Indications



① **ENGINE 4 T/O N_1 LIMITER switch**

NORM - engine control is normal.

88% - the N1 of number 4 engine is limited to a maximum value of 88%. This is necessary because airflow parameters within number 4 intake below 60 knots with the N1 above 88% causes airflow distortion at the engine face leading to LP compressor blade vibration. 88% position is magnetically latched at speeds below 60 knots.

With the switch at 88% the GO light for number 4 engine is inhibited.

② **GRD IDLE switch (2)**

HI - fuel flow is normal.

LO - fuel flow to the engine is reduced thereby enabling lower engine thrust to be obtained for use during taxiing. LO is magnetically latched at speeds below 60 knots.

This function is not modelled in this simulation.

Warning System

Overview

The flight compartment warning concept includes an audio system, a master warning system and individual warnings and indications within associated systems. The warnings and indications are divided into four categories.

Class 1. Warnings of serious faults or emergency requiring to be brought to the immediate attention of the crew. Immediate action is generally required.
Class 2. Warnings of less serious faults or abnormal conditions requiring to be brought to the immediate attention of the crew. Immediate action not generally required.
Class 3. Abnormal or fault conditions requiring monitoring which may, if left unattended, result in a class 2 warning.
Class 4. Miscellaneous indications.

The Class 1 and 2 warnings are presented by the audio and master warning system display panels.

Audio Warnings

A number of distinctive audio warnings are used to give an audible indication of class 1 and 2 warnings. The audio warnings are relayed via the flight compartment loudspeaker system. Facilities are provided to cancel certain warnings but others can only be cancelled by rectification of the fault condition..

Visual Warnings

The colour of the warnings and indications given is determined by the classification of the warning/indication:

Class 1	Red
Class 2	Amber
Class 3	Yellow
Class 4	Blue, Green or White

Master Warning System

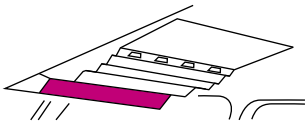
The Master Warning System (MWS) gives visual warning and system identification of Class 1 and Class 2 failures. A single stroke gong calls attention to a master warning light.

Each master warning light on the MWS panel monitors a number or warning sources. The light can be cancelled by rectifying the fault or, by pressing the light, the CANCEL/LTS TEST push button or the MWS CANCEL push button. The gong will operate for each fault whether or not the associated MWS has been cancelled. If any red MWS light remains on and is unrecognized, a further single stroke gong will sound every ten seconds.

The MWS amber lights, certain red lights and the associated primary gong, can be inhibited from the MWS panel. A recall facility is provided which relights a MWS warning light that has previously been cancelled or inhibited but is still receiving a fault signal.

Individual system fault indication lights associated with the master warning system, having a letter T engraved in the bottom left corner, can be pressed to test the light and its associated master warnings.

Controls and Indications



① INHIBIT push button

PRESS - inhibits all master warnings with the exception of the following red lights and associated audios (gong):
ADS, TRIM, PFC, ENG 1, ENG 2, ENG 3, ENG 4.

② INHIBIT light (Amber)

ON - indicates the inhibit function is operating.

③ RECALL push button

PRESS - reinstates all valid master warning lights and cancels the INHIBIT function but does not recall the associated MWS primary gong.

④ Master Warning Lights

Pressing the relevant light cancels the existing warning and keeps the light available for other warnings from that system.
The system panel lights will remain on until the malfunction is corrected.

⑤ CANCEL/LTS TEST push button

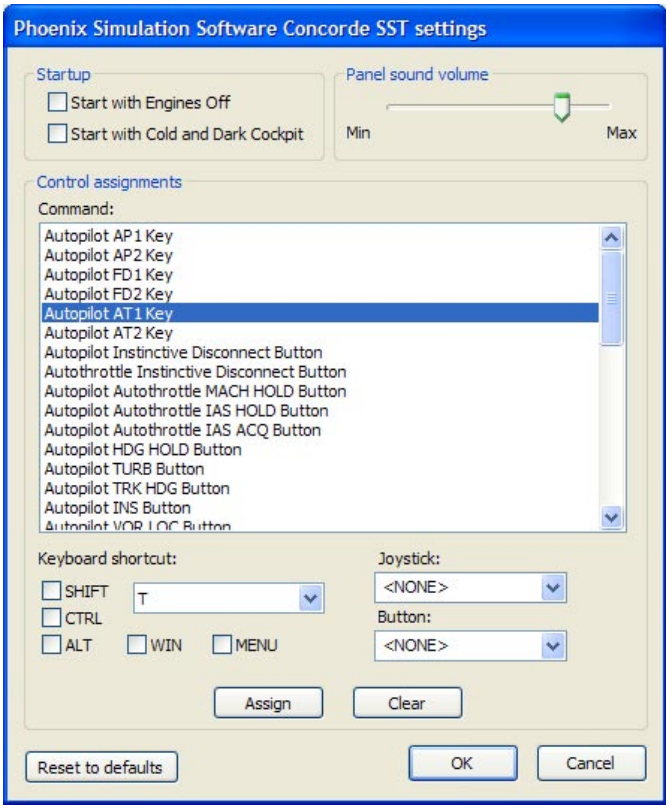
PRESS - tests the master warning lights filaments.

RELEASE - causes complete cancellation of the master warning lights.

Panel Configuration Utility

Overview

Your PSS Concorde installation includes a Panel Configuration Utility. It allows to assign keyboard shortcuts or joystick buttons to the numerous panel functions, customize startup options and set the volume of panel-generated sounds such as warnings.



Startup tab

The two options define the initial panel state when PSS Concorde aircraft is loaded into Flight Simulator:

Start with Engines Off: The engines will be shut down upon panel load

Start with Cold and Dark cockpit: The engines will be shut down, power sources disconnected and cockpit controls set according to total aircraft shutdown and securing. This allows to perform the entire aircraft startup procedure.

Panel Sound Volume tab

The slider controls the volume of sounds generated by the panel, as their volume cannot be set from Flight Simulator options.

Control Assignments tab

Many controls on the PSS Concorde panel can be assigned a keyboard shortcut or a joystick button.

The **Command** list displays all available panel functions. Selecting any entry in the list displays currently assigned keyboard shortcut or button, if it is defined. If no shortcut is defined, the **Keyboard shortcut** combo box shows **<NONE>**.

To assign a new shortcut, select a desired key and shift keys. Windows keyboard WIN and MENU keys can be used as shift keys. A joystick button can also be assigned.

After a key shortcut or button is selected, push the **Assign** button.

To clear a shortcut, push the **Clear** button.

Configuration file

The panel configuration is stored in a `config.pnl` file located in `PSS/Concorde` folder in your Flight Simulator installation folder.