X-PLANE 11 GUIDE
FLIGHT FACTOR
767-300ER

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Special thanks to Paul "Goldwolf" Whittingham for creating the guide icons.

The **Boeing 767** is a mid- to large-size, mid- to long-range, wide-body twin-engine jet airliner built by Boeing Commercial Airplanes. It was Boeing's first wide-body twinjet and its first airliner with a two-crew glass cockpit. The aircraft has two turbofan engines, a conventional tail, and, for reduced aerodynamic drag, a supercritical wing design. Designed as a smaller wide-body airliner than earlier aircraft such as the 747, the 767 has a seating capacity for 181 to 375 people, and a design range of 3,850 to 6,385 nautical miles (7,130 to 11,825 km), depending on variant. Development of the 767 occurred in tandem with a narrow-body twinjet, the 757, resulting in shared design features which allow pilots to obtain a common type rating to operate both aircraft.

In the late 1970s, operating cost replaced capacity as the primary factor in airliner purchases. As a result, the 767's design process emphasized fuel efficiency from the outset. Boeing targeted a 20 to 30 percent cost saving over earlier aircraft, mainly through new engine and wing technology. As development progressed, engineers used computer-aided design for over a third of the 767's design drawings, and performed 26,000 hours of wind tunnel tests. Design work occurred concurrently with the 757 twinjet, leading Boeing to treat both as almost one program to reduce risk and cost. Both aircraft would ultimately receive shared design features, including avionics, flight management systems, instruments, and handling characteristics. Combined development costs were estimated at $3.5 to $4 billion.

United Airlines first placed the 767 in commercial service in 1982. The aircraft was initially flown on domestic and transcontinental routes, during which it demonstrated the reliability of its twinjet design. In 1985, the 767 became the first twin-engine airliner to receive regulatory approval for extended overseas flights. The aircraft was then used to expand non-stop service on medium- to long-haul intercontinental routes. In 1986, Boeing initiated studies for a higher-capacity 767, ultimately leading to the development of the 777, a larger wide-body twinjet. In the 1990s, the 767 became the most frequently used airliner for transatlantic flights between North America and Europe.

The 767 is the first twinjet wide-body type to reach 1,000 aircraft delivered. As of August 2018, Boeing has received 1,224 orders for the 767 from 74 customers with 1,118 delivered. A total of 742 of these aircraft were in service in July 2018. The most popular variant is the 767-300ER with 583 delivered. Delta Air Lines is the largest operator with 77 aircraft. Competitors have included the Airbus A300, A310, and A330-200. Non-passenger variants of the 767 remain in production as of 2018 while the passenger variant's successor, the 787, entered service in 2011.

The 767 was the first Boeing wide-body to be designed with a two-crew digital glass cockpit. Cathode ray tube (CRT) color displays and new electronics replaced the role of the flight engineer by enabling the pilot and co-pilot to monitor aircraft systems directly. Despite the promise of reduced crew costs, United Airlines initially demanded a conventional three-person cockpit, citing concerns about the risks associated with introducing a new aircraft. The carrier maintained this position until July 1981, when a US presidential task force determined that a crew of two was safe for operating wide-body jets.

To produce the 767, Boeing formed a network of subcontractors which included domestic suppliers and international contributions from Italy's Aeritalia and Japan's CTDC (Civil Transport Development Corporation). The wings and cabin floor were produced in-house, while Aeritalia provided control surfaces, Boeing Vertol made the leading edge for the wings, and Boeing Wichita produced the forward fuselage.

The CTDC provided multiple assemblies through its constituent companies, namely Fuji Heavy Industries (wing fairings and gear doors), Kawasaki Heavy Industries (center fuselage), and Mitsubishi Heavy Industries (rear fuselage, doors, and tail). Components were integrated during final assembly at the Everett factory. For expedited production of wing spars, the main structural member of aircraft wings, the Everett factory received robotic machinery to automate the process of drilling holes and inserting fasteners. This method of wing construction expanded on techniques developed for the 747. Final assembly of the first aircraft began in July 1979.

The 767 has been produced in three fuselage lengths. These debuted in progressively larger form as the 767-200, 767-300, and 767-400ER. Longer-range variants include the 767-200ER and 767-300ER, while cargo models include the 767-300F, a production freighter,[and conversions of passenger 767-200 and 767-300 models.

The 767-300ER, the extended-range version of the 767-300, entered service with American Airlines in 1988. The type's increased range was made possible by greater fuel tankage and a higher MTOW of 407,000 lb (185,000 kg). Design improvements allowed the available MTOW to increase to 412,000 lb (187,000 kg) by 1993. Power is provided by Pratt & Whitney PW4000, General Electric CF6, or Rolls-Royce RB211 engines. Typical routes for the type include Los Angeles to Frankfurt. The combination of increased capacity and range offered by the 767-300ER has been particularly attractive to both new and existing 767 operators. It is the most successful version of the aircraft, with more orders placed than all other variants combined.

Flight Factor, StepToSky and VMAX modelled the 767 to an impressive extent: all engine variants with different avionic options available from their custom EFB (Electronic Flight Bag). Flight Factor also put an emphasis on other aspects of the aircraft that are often neglected by developers such as requiring doors to be open and stairs to be installed to load/unload passengers, a center of gravity optimization function, custom checklists (normal, amplified and abnormal procedures), audio PA (Passenger Address) announcements, and much more. All these little things add a lot to the immersion and I have to say… flying their 767 feels like a complete and gratifying experience.

TUTORIAL STRUCTURE

Before you even step foot in your virtual cockpit, you need to know where you are, where you are going, how you will get there, what you need to get there. This document is structured like a short tutorial flight.

The flight tutorial is structured as follows:

- Familiarize yourself with the cockpit layout
- Plan your flight
  - Determine the flight route, fuel & cargo loads
  - Spawn the aircraft and set it in a Cold & Dark state
  - Provide aircraft with power
  - Program the FMC (Flight Management Computer)
- Start–up the aircraft and make it ready for flight
- Taxi
- Takeoff
- Climb and cruise
- Explore autopilot capabilities
- Descend, approach and land

BEST RESOURCES

DISCLAIMER: Do not use this guide for real life flying. I mean it.

Flight Factor 767 FCOM (Flight Crew Operations Manual)

Boeing 757-767 Study Guide, 2018 Edition by Rick Townsend

Boeing 757-767 – CiteSeerX Study Guide
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.698.871&rep=rep1&type=pdf

B767 Flightdeck and Avionics
https://www.scribd.com/doc/110643380/B767-Flightdeck-and-Avionics

767-300ER Flight Deck (Jerome Meriweather)
http://meriweather.com/flightdeck/767/767-fd.html

Boeing 767-300 CBT (Computer-Based Training)
https://www.youtube.com/watch?v=JcKl85mbvFw&list=PLpNS2WzxM5y3ljGKXCMIXAmcKGeXtlMaj

Cold and Dark Start by Jon Fly (Youtube)
Part 1: https://youtu.be/IudKoBHQBq8 Part 2: https://youtu.be/4wNsI3W7TY0

VMAX Boeing 767 to Dallas by Jeff Favignano
https://youtu.be/dkRNhFGgNIo

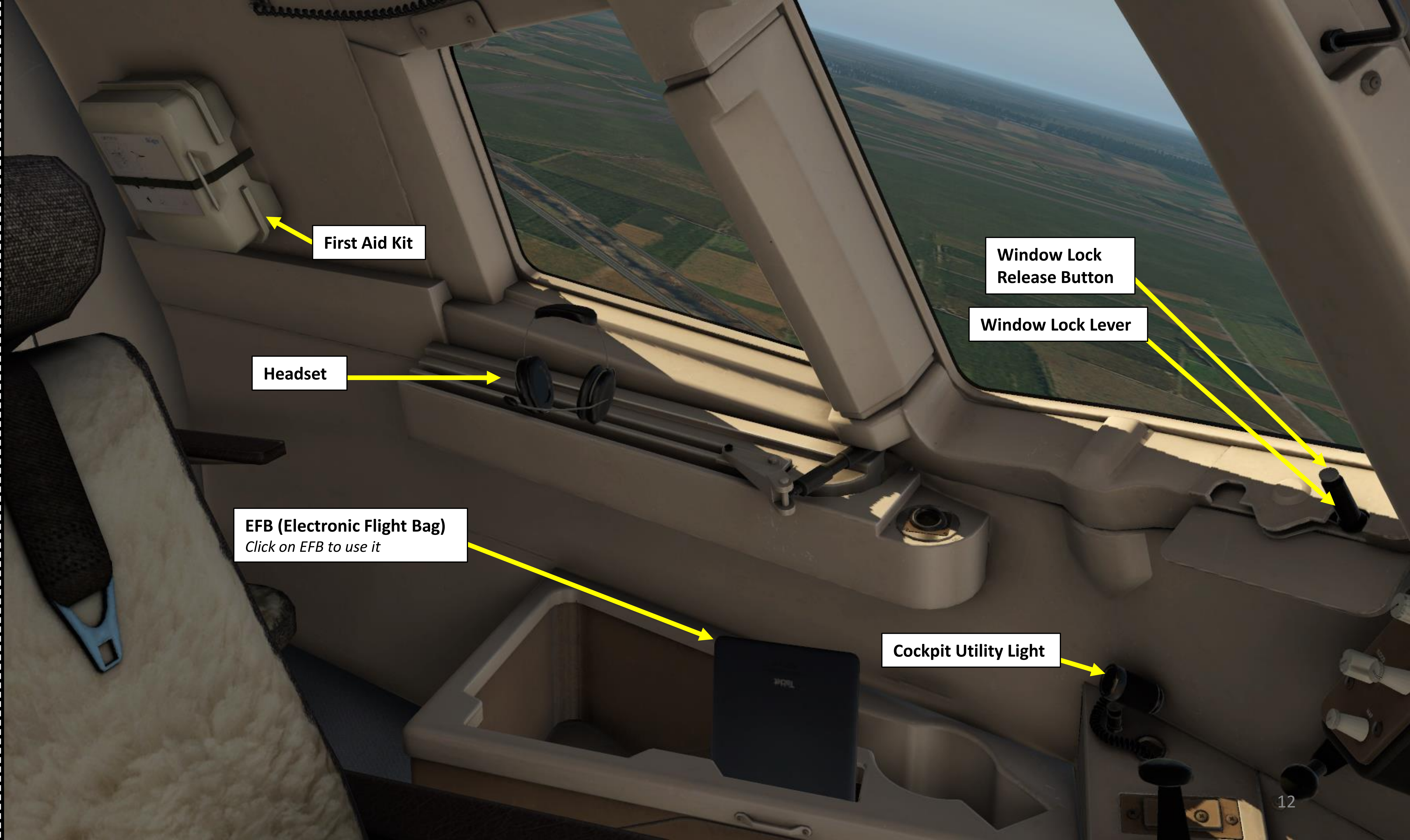
VMAX/FF Boeing 767 Professional Tutorial Extended Version by Simulation Channel Deluxe
https://youtu.be/vAjPajjLkpg

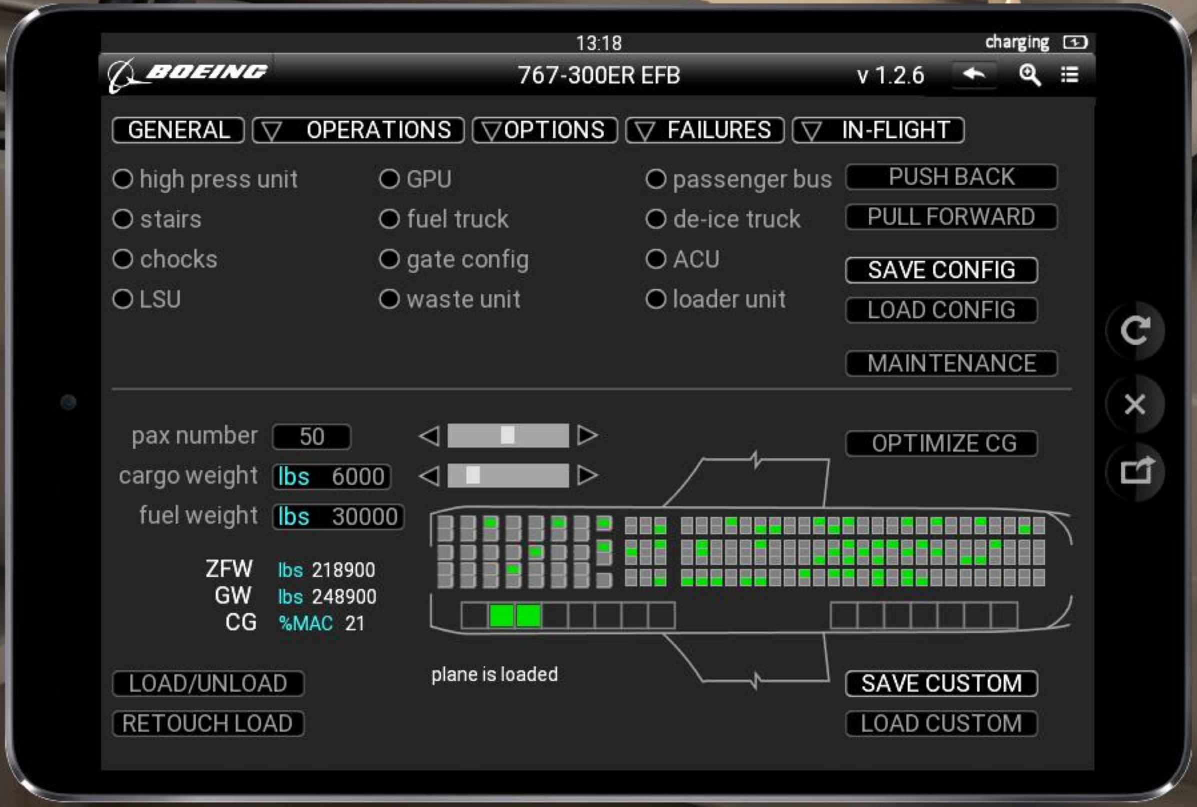

FLOTATION CUSHION
PULL TO REMOVE


DATA TRANSFER UNIT RECEPTACLE
DATA LOAD SELECTOR
FLOTATION CUSHION PULL TO REMOVE
LIFE VEST
FLOTATION CUSHION PULL TO REMOVE
FLOTATION CUSHION PULL TO REMOVE


FLOTATION CUSHION
PULL TO REMOVE


Front Flight Deck


First Aid Kit
Headset
EFB (Electronic Flight Bag)
Click on EFB to use it
Window Lock Release Button
Window Lock Lever
Cockpit Utility Light

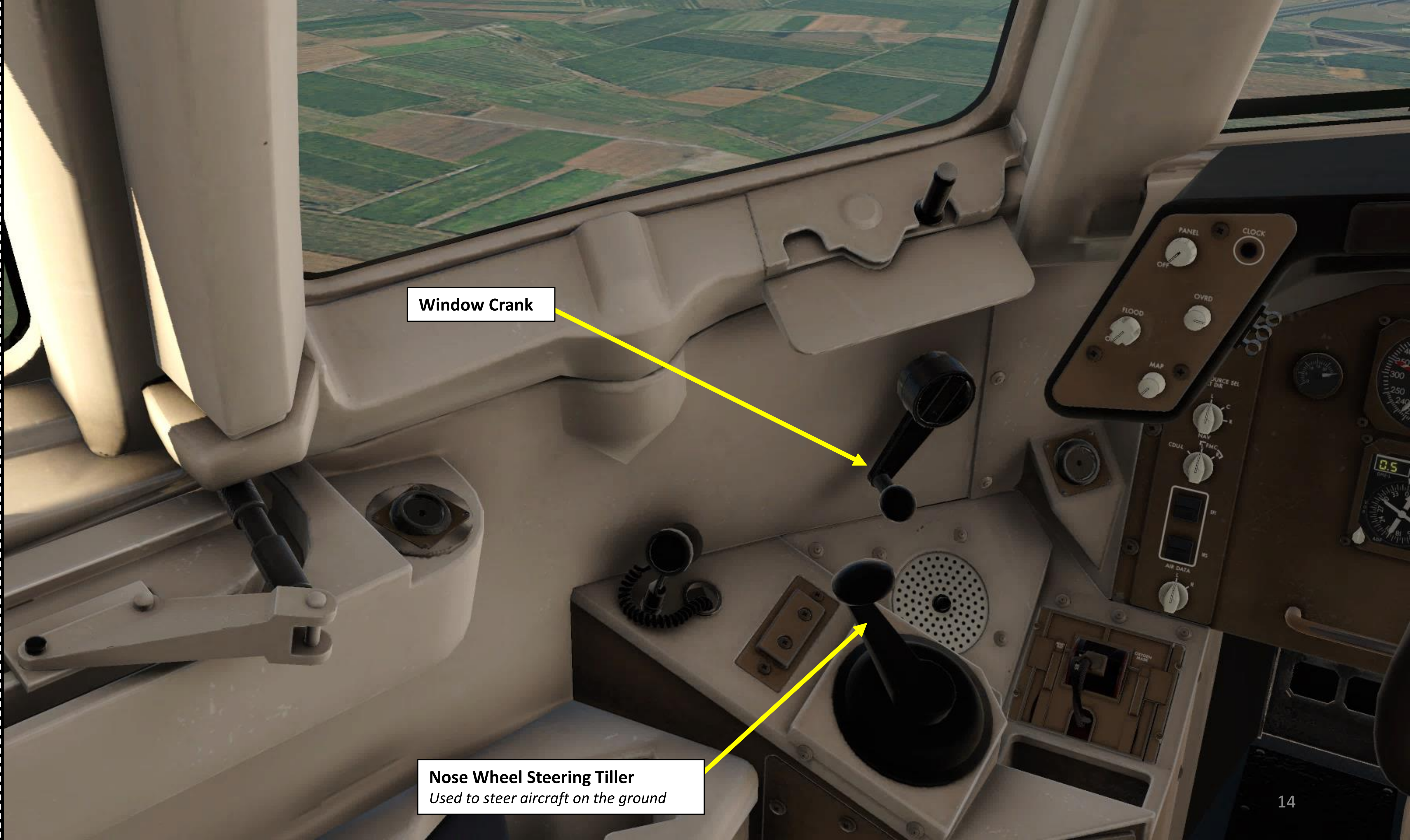


EFB (Electronic Flight Bag)

In real life, an electronic flight bag is an electronic information management device that helps flight crews perform flight management tasks more easily and efficiently with less paper. It is a general purpose computing platform intended to reduce, or replace, paper-based reference material often found in the pilot's carry-on flight bag, including the aircraft operating manual, flight-crew operating manual, and navigational charts (including moving map for air and ground operations). In addition, the EFB can host purpose-built software applications to automate other functions normally conducted by hand, such as performance take-off calculations.

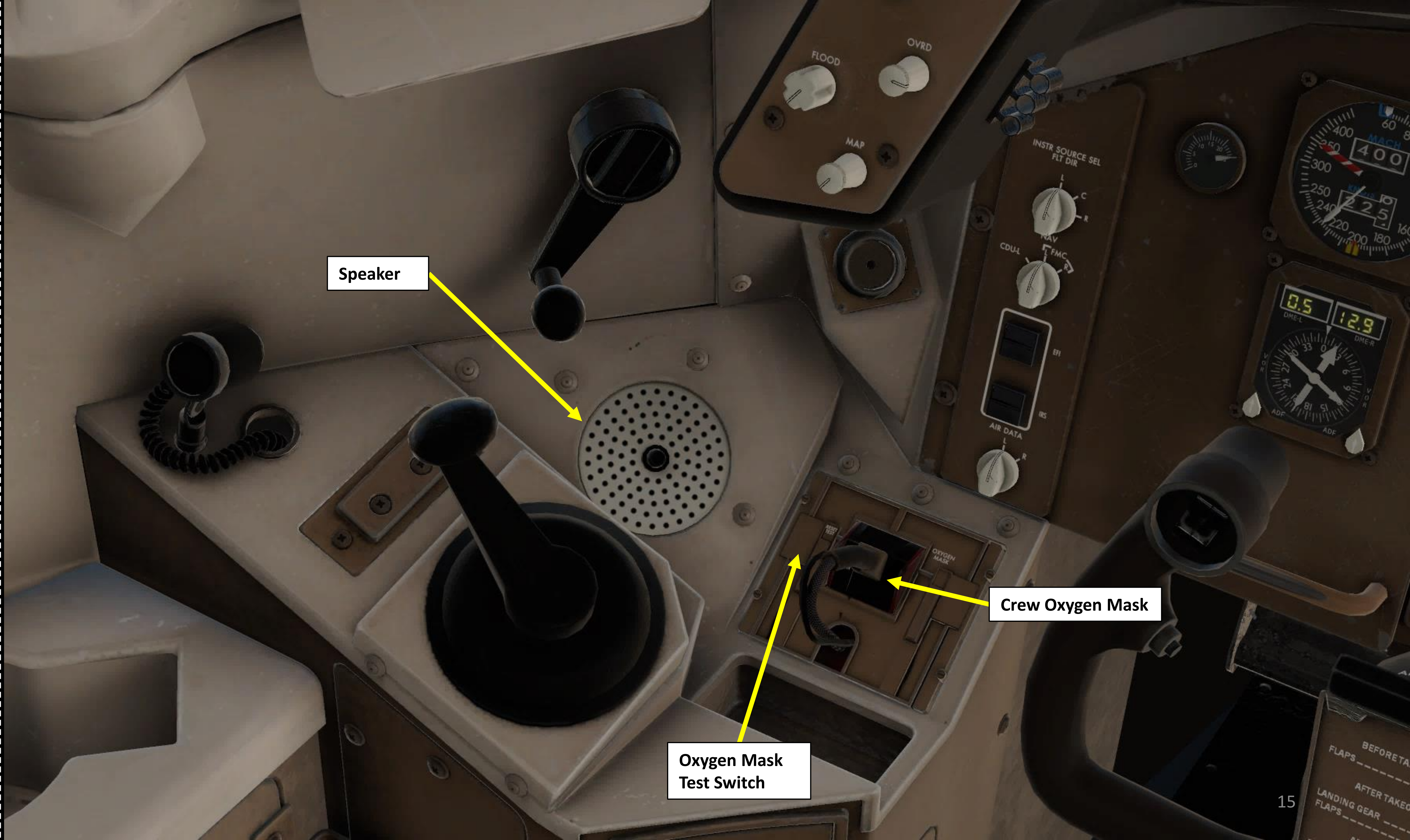
In the simulation world, an electronic flight bag is used as a user interface to change fuel loadout, cargo setup, interact with ground crews (like using ground power units, fuel trucks, de-icing trucks, pushback, etc.), consult checklists, and set different simulation options.

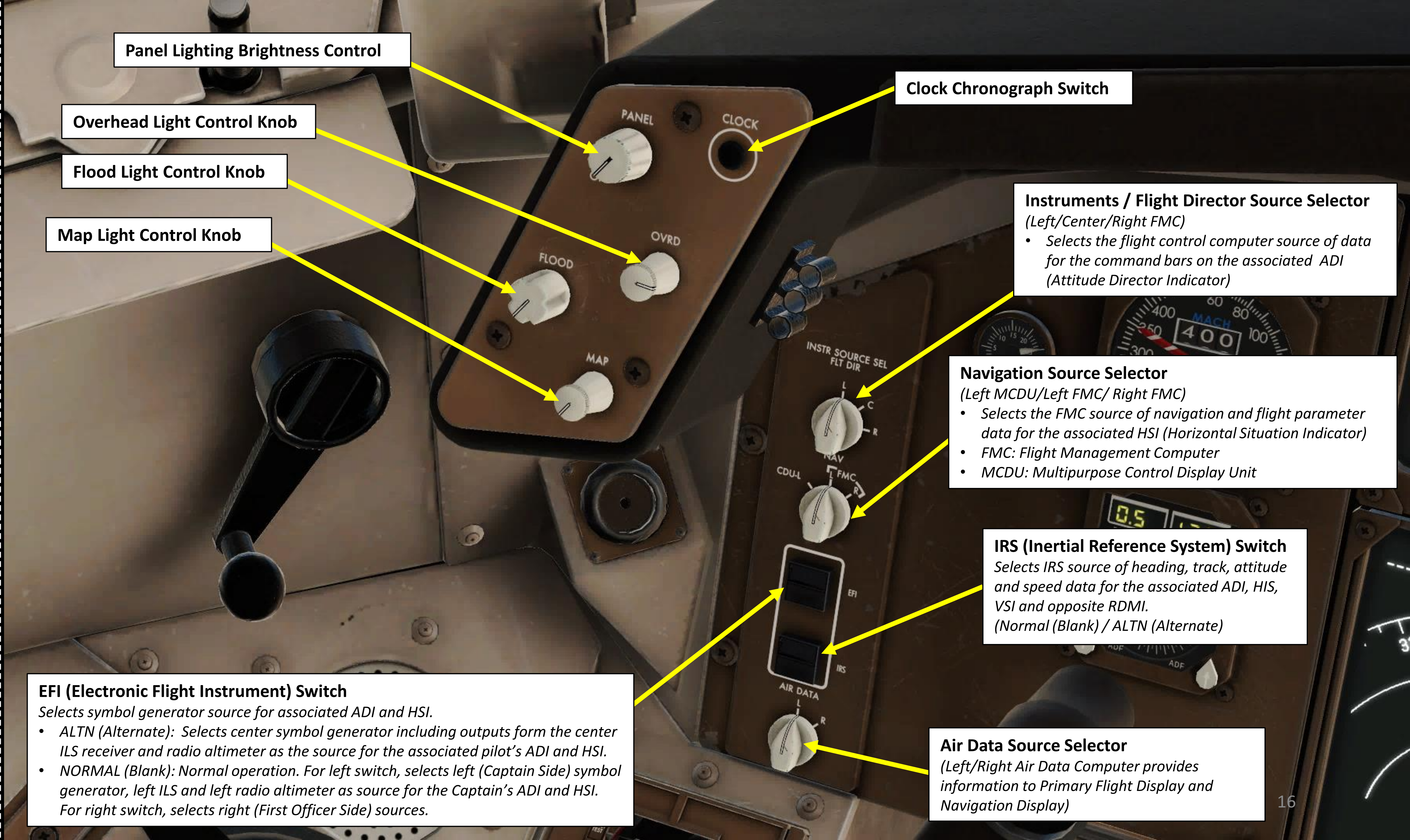
To use an EFB, just click on the tablet in the cockpit and the EFB overlay will appear.



Window Crank

Nose Wheel Steering Tiller
Used to steer aircraft on the ground


Speaker
Crew Oxygen Mask
Oxygen Mask Test Switch
FLOOD
OVRD
MAP
INSTR SOURCE SEL FLT DIR
AIR DATA
OXYGEN MASK



Panel Lighting Brightness Control

Overhead Light Control Knob

Flood Light Control Knob

Map Light Control Knob

Clock Chronograph Switch

Instruments / Flight Director Source Selector
(Left/Center/Right FMC)
- *Selects the flight control computer source of data for the command bars on the associated ADI (Attitude Director Indicator)*

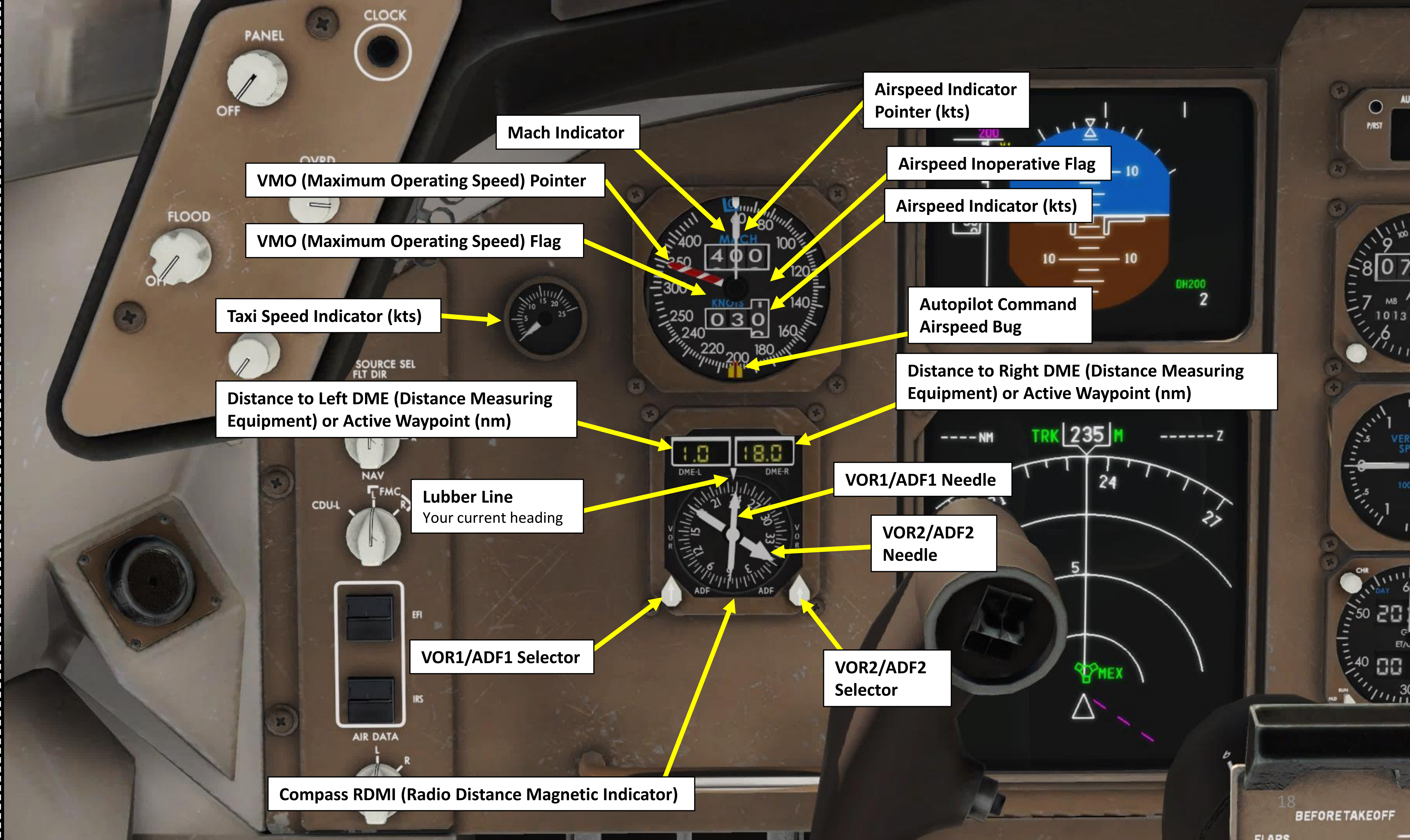
Navigation Source Selector
(Left MCDU/Left FMC/ Right FMC)
- *Selects the FMC source of navigation and flight parameter data for the associated HSI (Horizontal Situation Indicator)*
- *FMC: Flight Management Computer*
- *MCDU: Multipurpose Control Display Unit*

IRS (Inertial Reference System) Switch
Selects IRS source of heading, track, attitude and speed data for the associated ADI, HIS, VSI and opposite RDMI.
(Normal (Blank) / ALTN (Alternate)

EFI (Electronic Flight Instrument) Switch
Selects symbol generator source for associated ADI and HSI.
- *ALTN (Alternate): Selects center symbol generator including outputs form the center ILS receiver and radio altimeter as the source for the associated pilot's ADI and HSI.*
- *NORMAL (Blank): Normal operation. For left switch, selects left (Captain Side) symbol generator, left ILS and left radio altimeter as source for the Captain's ADI and HSI. For right switch, selects right (First Officer Side) sources.*

Air Data Source Selector
(Left/Right Air Data Computer provides information to Primary Flight Display and Navigation Display)


Stabilizer Trim (Nose Up / Nose Down)
Aileron Trim Indicator
Control Wheel / Yoke
Autopilot Disengage Button
Control Column
AILERON TRIM
BEFORE TAKEOFF
AFTER TAKEOFF
APPROACH

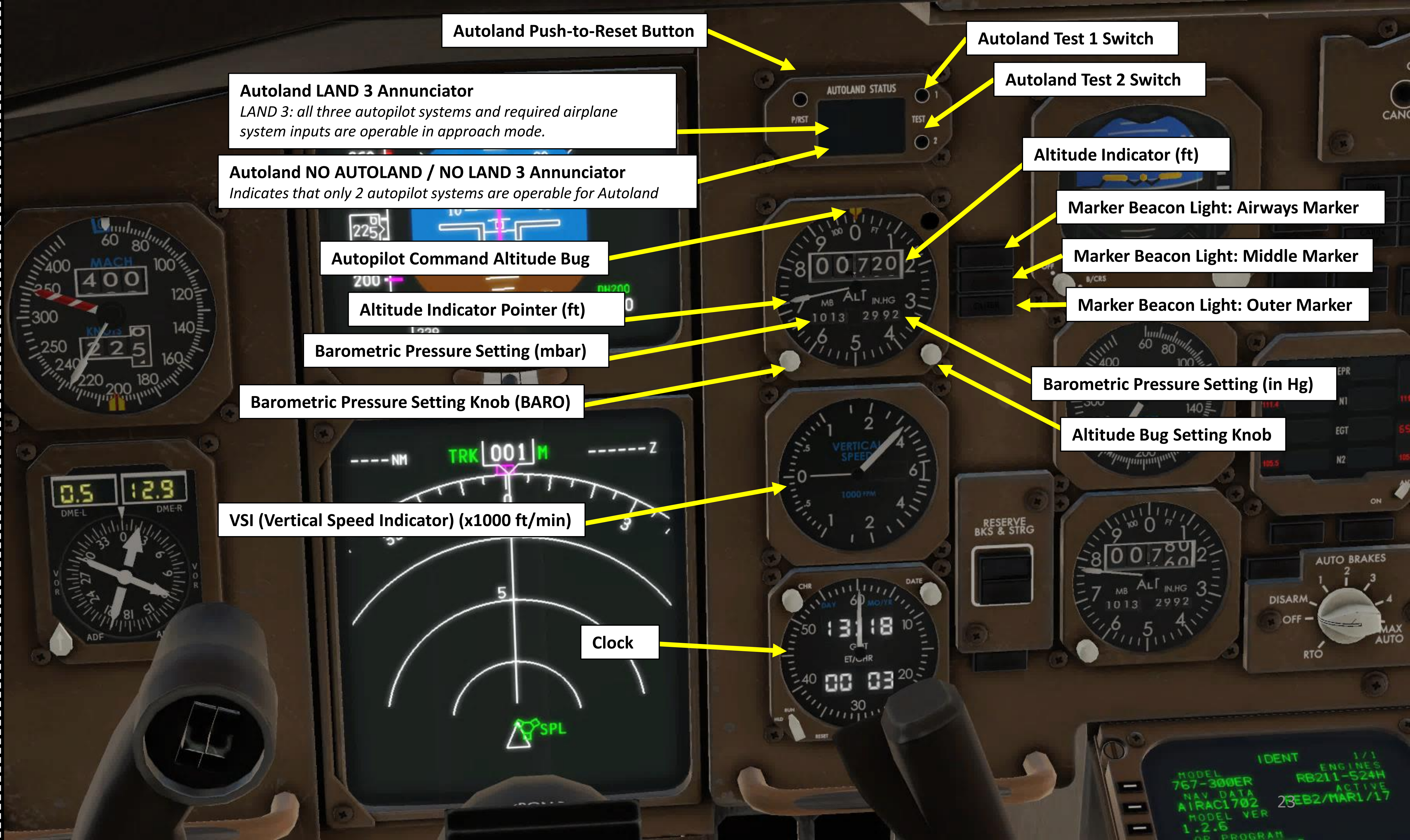

Mach Indicator
Airspeed Indicator Pointer (kts)
Airspeed Inoperative Flag
Airspeed Indicator (kts)
VMO (Maximum Operating Speed) Pointer
VMO (Maximum Operating Speed) Flag
Taxi Speed Indicator (kts)
Autopilot Command Airspeed Bug
Distance to Left DME (Distance Measuring Equipment) or Active Waypoint (nm)
Distance to Right DME (Distance Measuring Equipment) or Active Waypoint (nm)
Lubber Line
Your current heading
VOR1/ADF1 Needle
VOR2/ADF2 Needle
VOR1/ADF1 Selector
VOR2/ADF2 Selector
Compass RDMI (Radio Distance Magnetic Indicator)

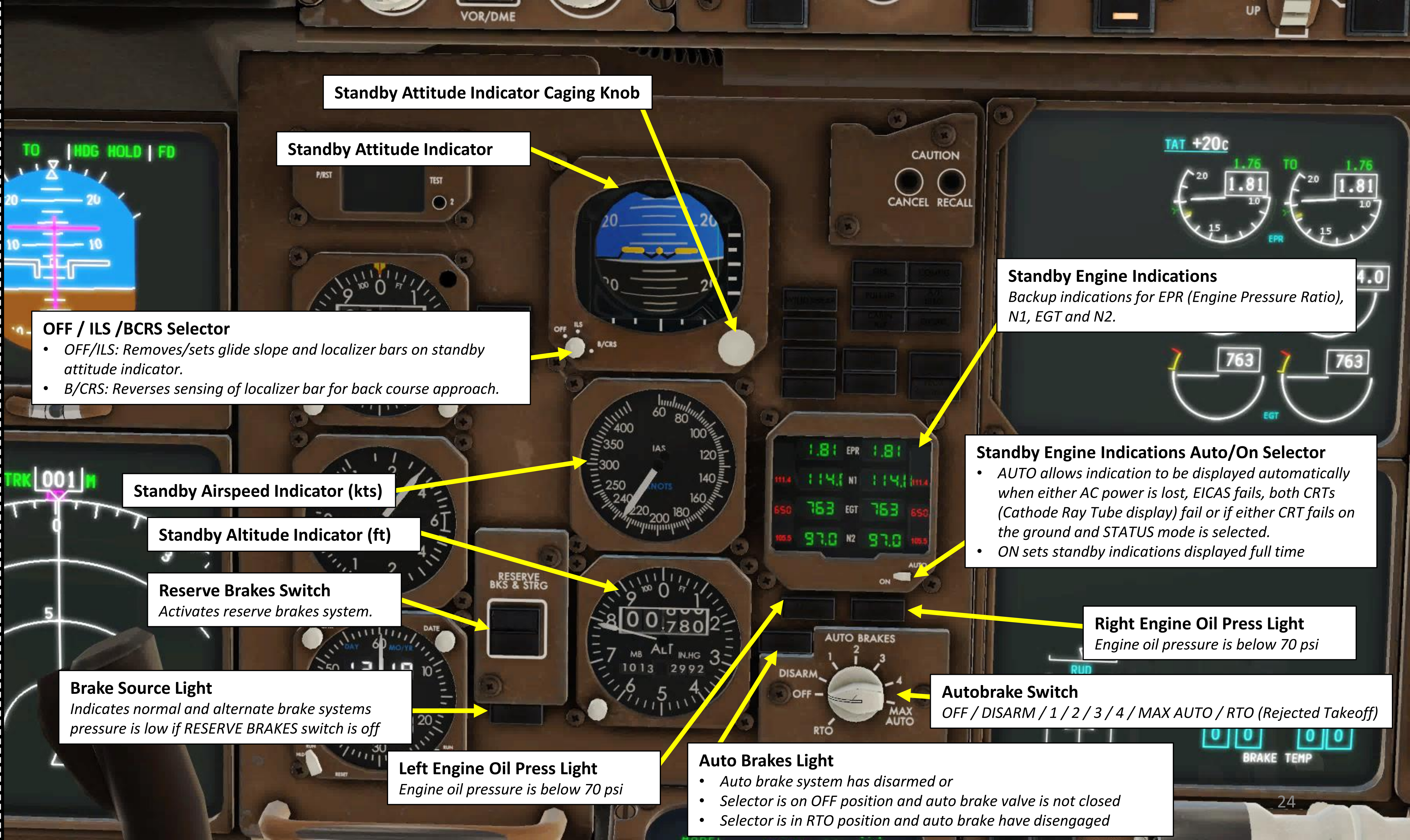

Captain's PFD
(Primary Flight Display)
Captain's ND
(Navigation Display)

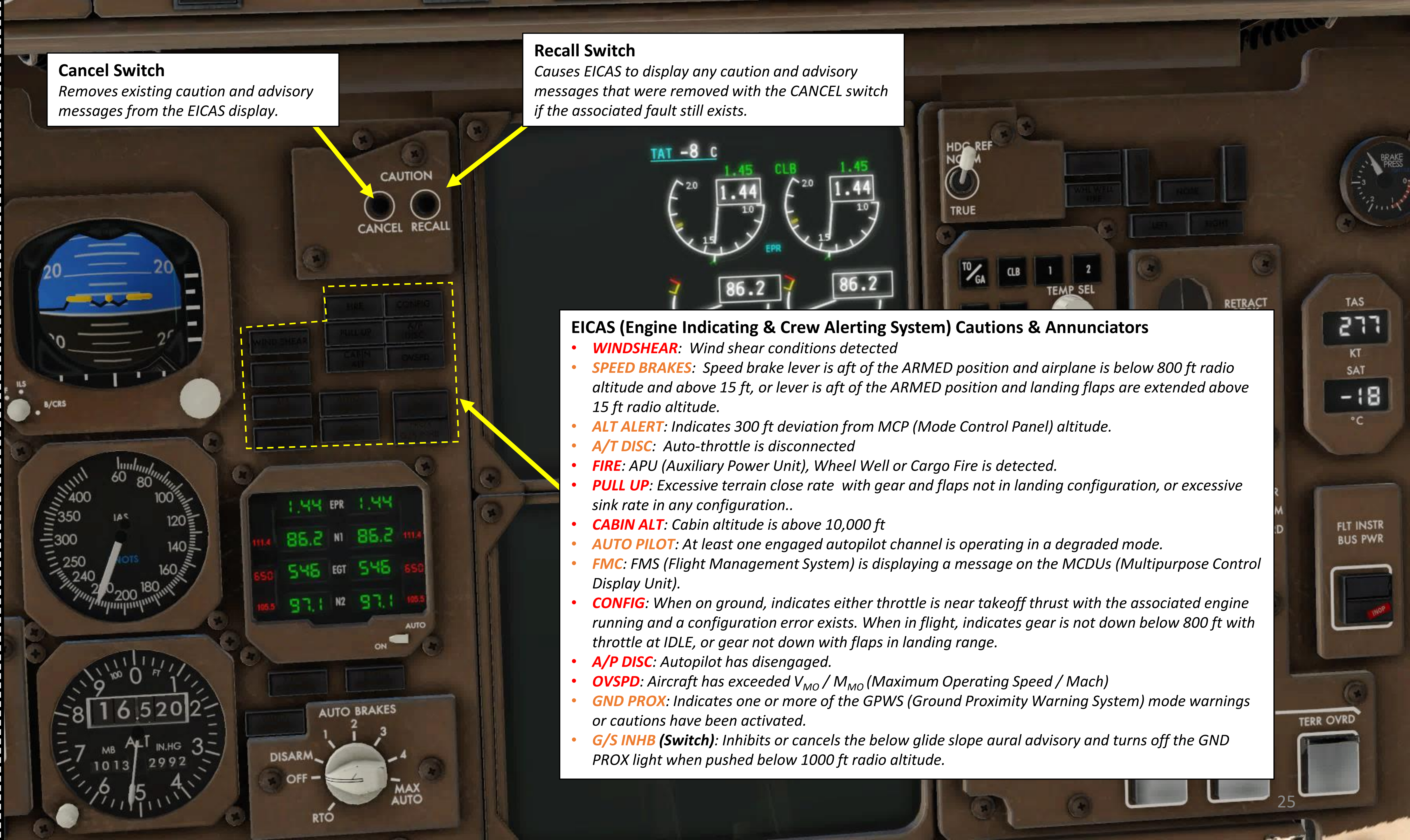

Captain's PFD
(Primary Flight Display)
Autopilot Pitch Mode
Autopilot Roll Mode
Flight Mode Annunciator
Autopilot Status
Autothrottle Thrust/Speed Mode
Bank Angle Scale
Flight Director
Magenta Lines
Calibrated Airspeed
Indicator (kts)
Decision Height (ft)
Pitch Angle Scale (deg)
Radar Altitude (ft)
Altitude Above Ground Level
Ground Speed (kts)
Turn & Slip Indicator
Attitude Indicator
SPD
V/S
HDG HOLD
CMD
DH200
1470
GS
188

Note: the PFD (Primary Flight Display) can come equipped with different options that are customizable via the EFB (Electronic Flight Bag).


Track Angle
Heading Indicator (Triangle)
Heading Scale
Distance to next waypoint (nm)
Range Scale (nm)
Captain's ND (Navigation Display)


Autoland Push-to-Reset Button
Autoland Test 1 Switch
Autoland Test 2 Switch
Autoland LAND 3 Annunciator
LAND 3: all three autopilot systems and required airplane system inputs are operable in approach mode.
Autoland NO AUTOLAND / NO LAND 3 Annunciator
Indicates that only 2 autopilot systems are operable for Autoland
Altitude Indicator (ft)
Marker Beacon Light: Airways Marker
Marker Beacon Light: Middle Marker
Marker Beacon Light: Outer Marker
Autopilot Command Altitude Bug
Altitude Indicator Pointer (ft)
Barometric Pressure Setting (mbar)
Barometric Pressure Setting Knob (BARO)
Barometric Pressure Setting (in Hg)
Altitude Bug Setting Knob
VSI (Vertical Speed Indicator) (x1000 ft/min)
Clock


Standby Attitude Indicator Caging Knob
Standby Attitude Indicator
OFF / ILS /BCRS Selector
• OFF/ILS: Removes/sets glide slope and localizer bars on standby attitude indicator.
• B/CRS: Reverses sensing of localizer bar for back course approach.
Standby Engine Indications
Backup indications for EPR (Engine Pressure Ratio), N1, EGT and N2.
Standby Engine Indications Auto/On Selector
• AUTO allows indication to be displayed automatically when either AC power is lost, EICAS fails, both CRTs (Cathode Ray Tube display) fail or if either CRT fails on the ground and STATUS mode is selected.
• ON sets standby indications displayed full time
Standby Airspeed Indicator (kts)
Standby Altitude Indicator (ft)
Reserve Brakes Switch
Activates reserve brakes system.
Right Engine Oil Press Light
Engine oil pressure is below 70 psi
Autobrake Switch
OFF / DISARM / 1 / 2 / 3 / 4 / MAX AUTO / RTO (Rejected Takeoff)
Brake Source Light
Indicates normal and alternate brake systems pressure is low if RESERVE BRAKES switch is off
Left Engine Oil Press Light
Engine oil pressure is below 70 psi
Auto Brakes Light
• Auto brake system has disarmed or
• Selector is on OFF position and auto brake valve is not closed
• Selector is in RTO position and auto brake have disengaged



Cancel Switch

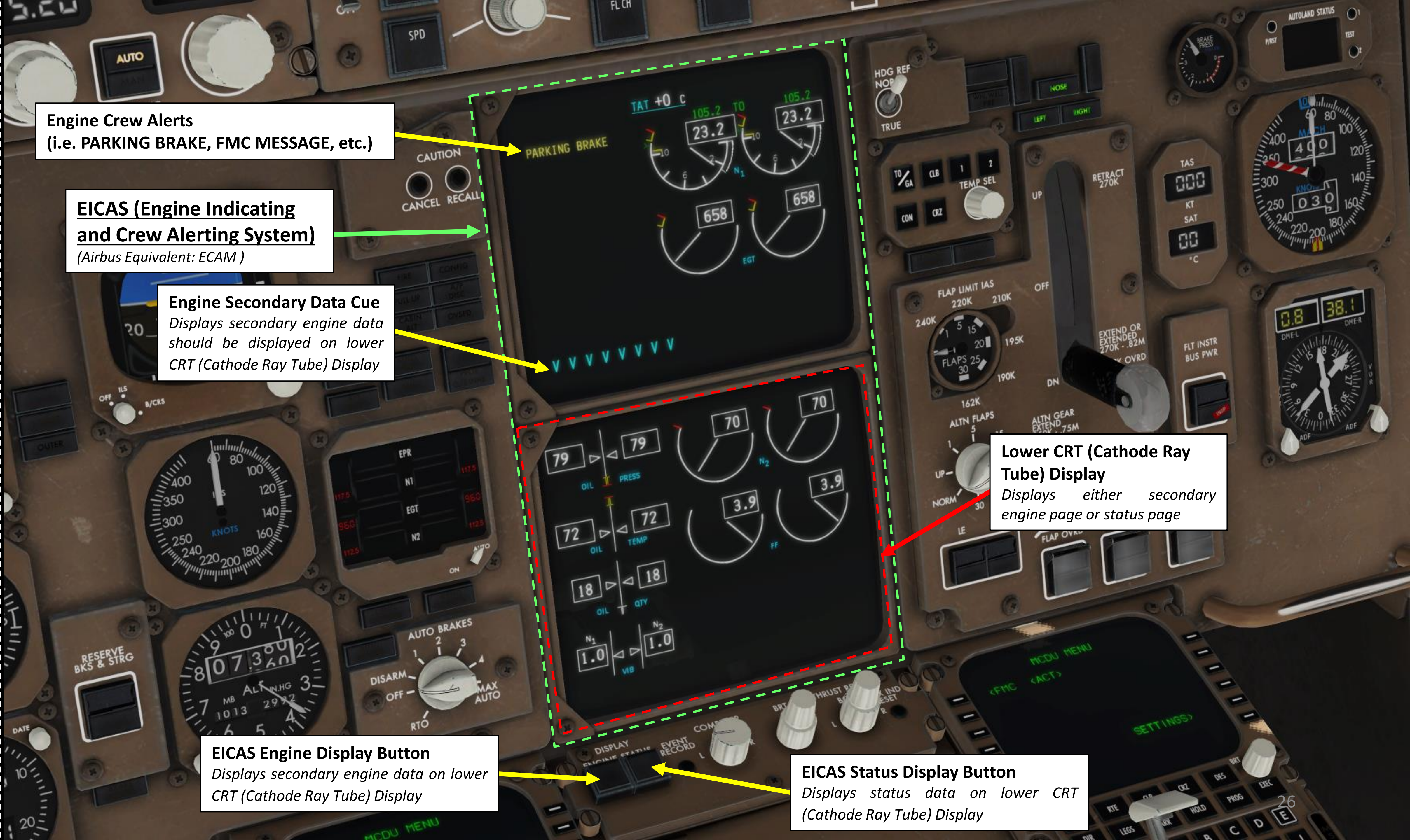
Removes existing caution and advisory messages from the EICAS display.

Recall Switch

Causes EICAS to display any caution and advisory messages that were removed with the CANCEL switch if the associated fault still exists.

EICAS (Engine Indicating & Crew Alerting System) Cautions & Annunciators

- ***WINDSHEAR***: *Wind shear conditions detected*
- ***SPEED BRAKES***: *Speed brake lever is aft of the ARMED position and airplane is below 800 ft radio altitude and above 15 ft, or lever is aft of the ARMED position and landing flaps are extended above 15 ft radio altitude.*
- ***ALT ALERT***: *Indicates 300 ft deviation from MCP (Mode Control Panel) altitude.*
- ***A/T DISC***: *Auto-throttle is disconnected*
- ***FIRE***: *APU (Auxiliary Power Unit), Wheel Well or Cargo Fire is detected.*
- ***PULL UP***: *Excessive terrain close rate with gear and flaps not in landing configuration, or excessive sink rate in any configuration..*
- ***CABIN ALT***: *Cabin altitude is above 10,000 ft*
- ***AUTO PILOT***: *At least one engaged autopilot channel is operating in a degraded mode.*
- ***FMC***: *FMS (Flight Management System) is displaying a message on the MCDUs (Multipurpose Control Display Unit).*
- ***CONFIG***: *When on ground, indicates either throttle is near takeoff thrust with the associated engine running and a configuration error exists. When in flight, indicates gear is not down below 800 ft with throttle at IDLE, or gear not down with flaps in landing range.*
- ***A/P DISC***: *Autopilot has disengaged.*
- ***OVSPD***: *Aircraft has exceeded V_{MO} / M_{MO} (Maximum Operating Speed / Mach)*
- ***GND PROX***: *Indicates one or more of the GPWS (Ground Proximity Warning System) mode warnings or cautions have been activated.*
- ***G/S INHB* (Switch)**: *Inhibits or cancels the below glide slope aural advisory and turns off the GND PROX light when pushed below 1000 ft radio altitude.*



Engine Crew Alerts
(i.e. PARKING BRAKE, FMC MESSAGE, etc.)

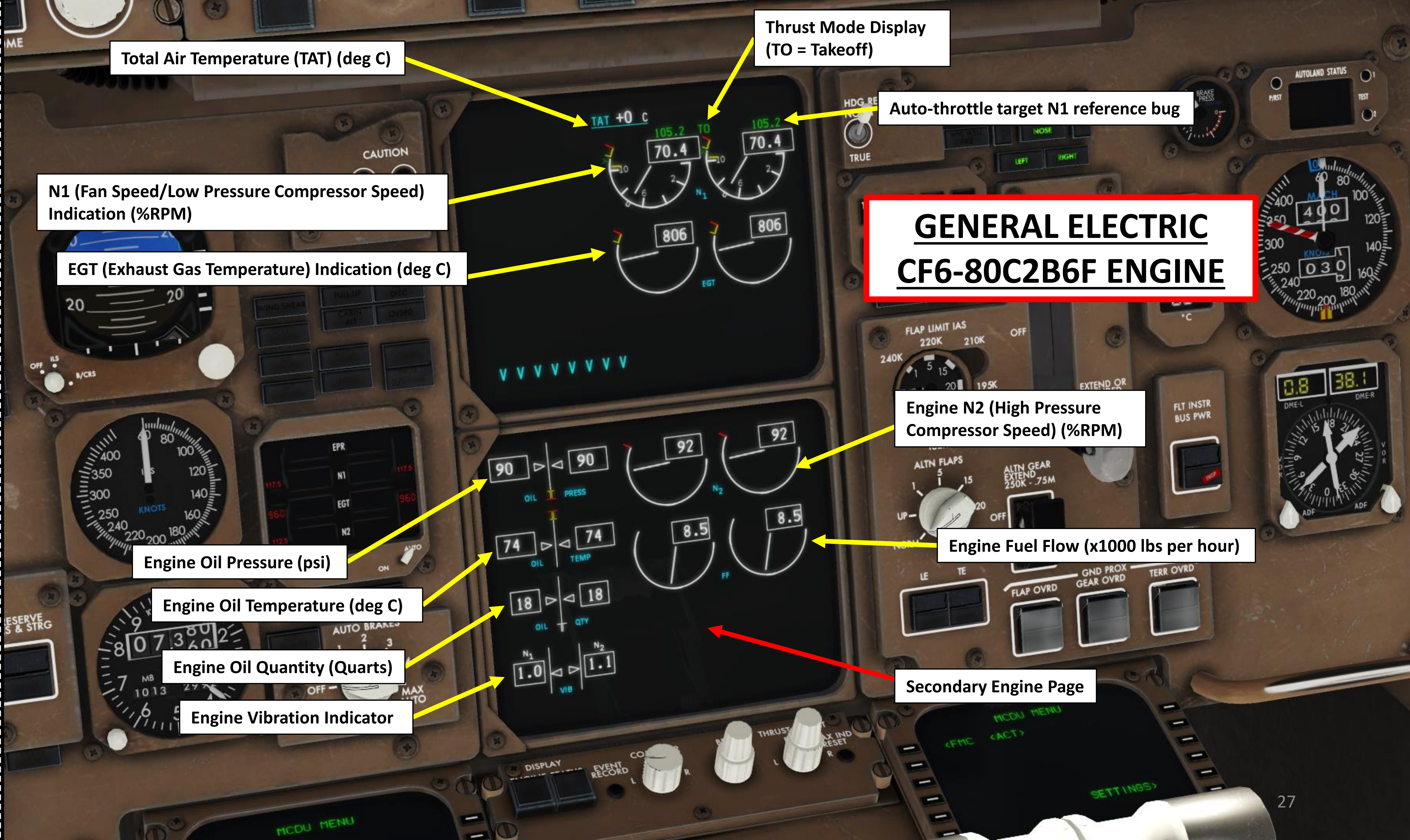
EICAS (Engine Indicating and Crew Alerting System)
(Airbus Equivalent: ECAM)

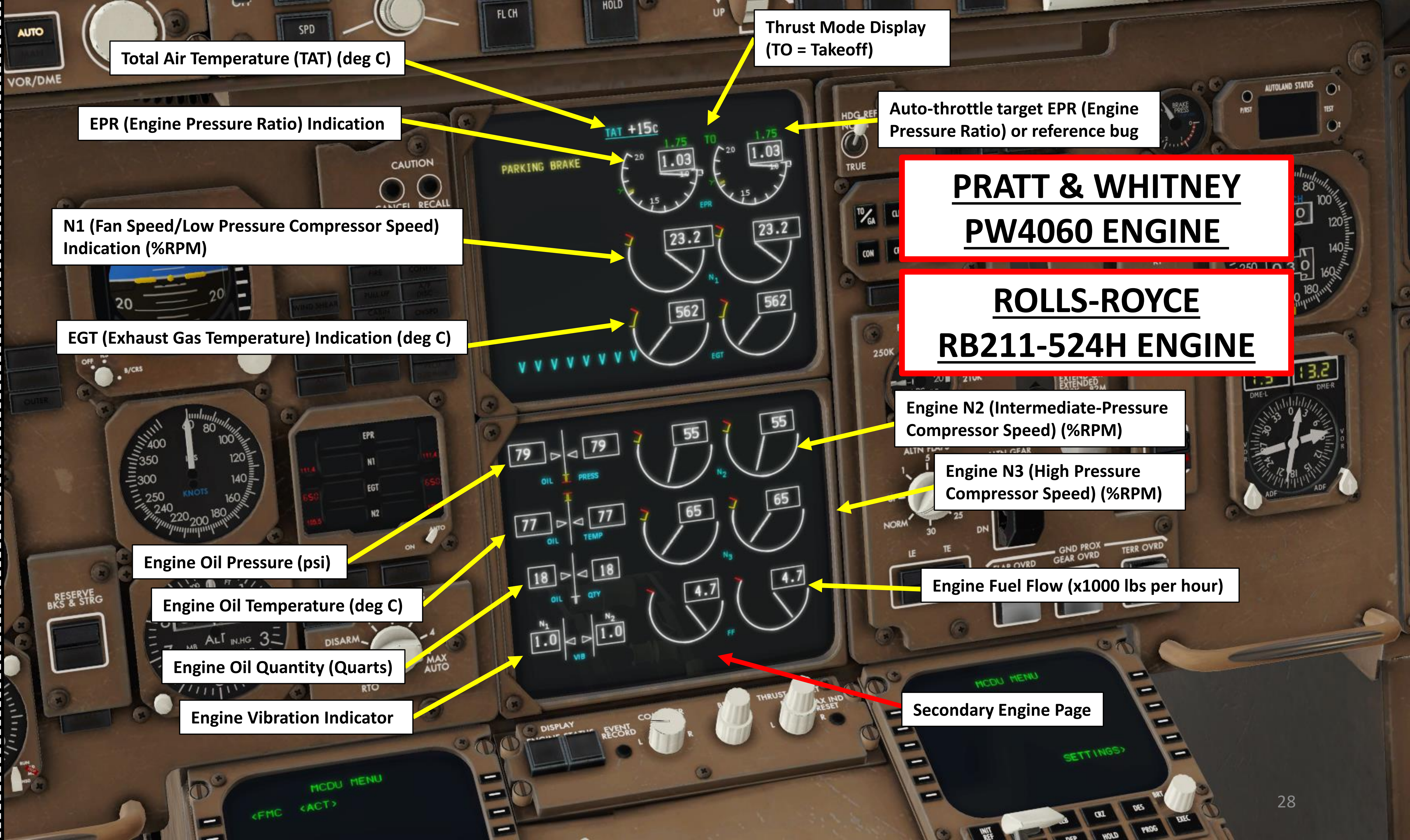
Engine Secondary Data Cue
Displays secondary engine data should be displayed on lower CRT (Cathode Ray Tube) Display

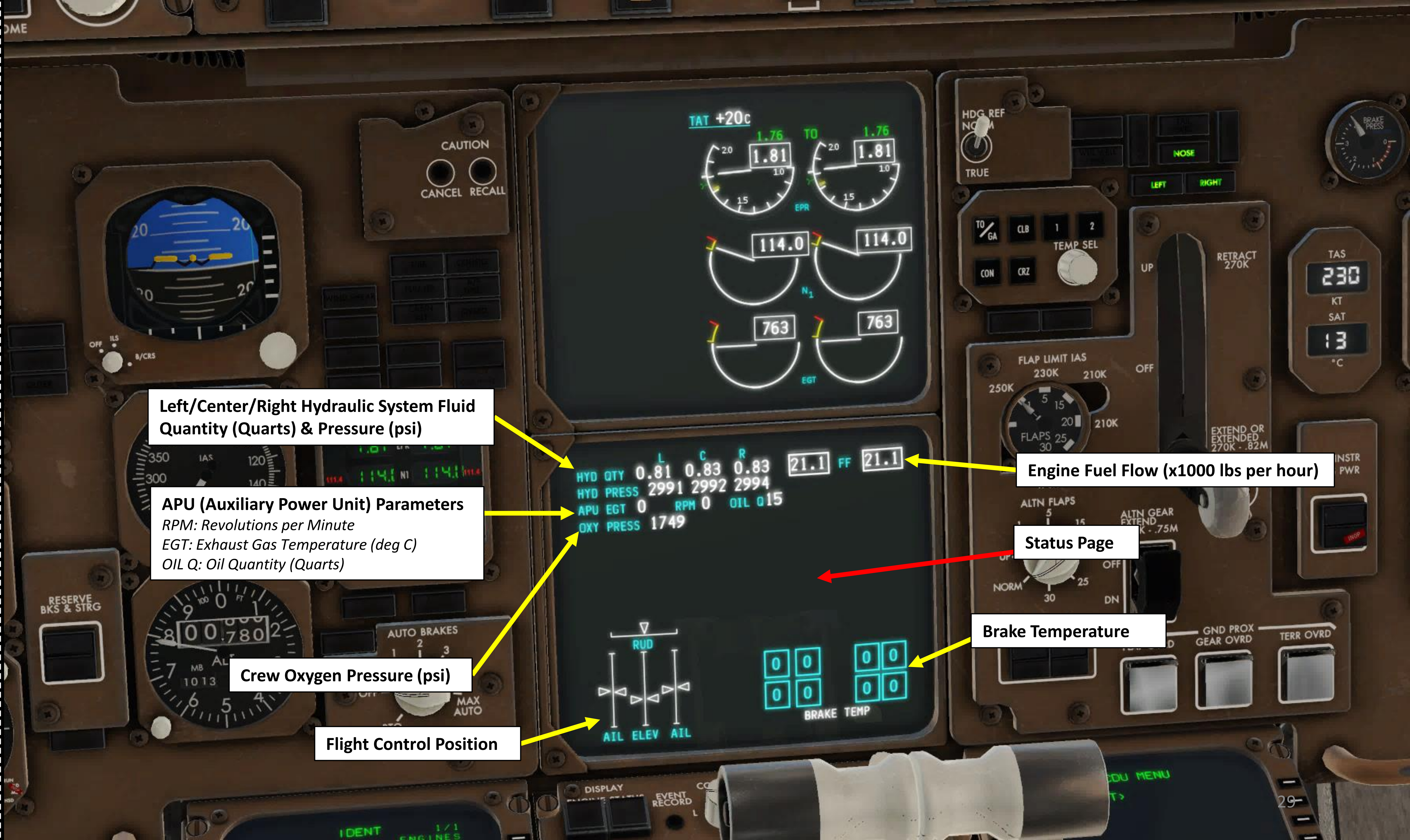
Lower CRT (Cathode Ray Tube) Display
Displays either secondary engine page or status page

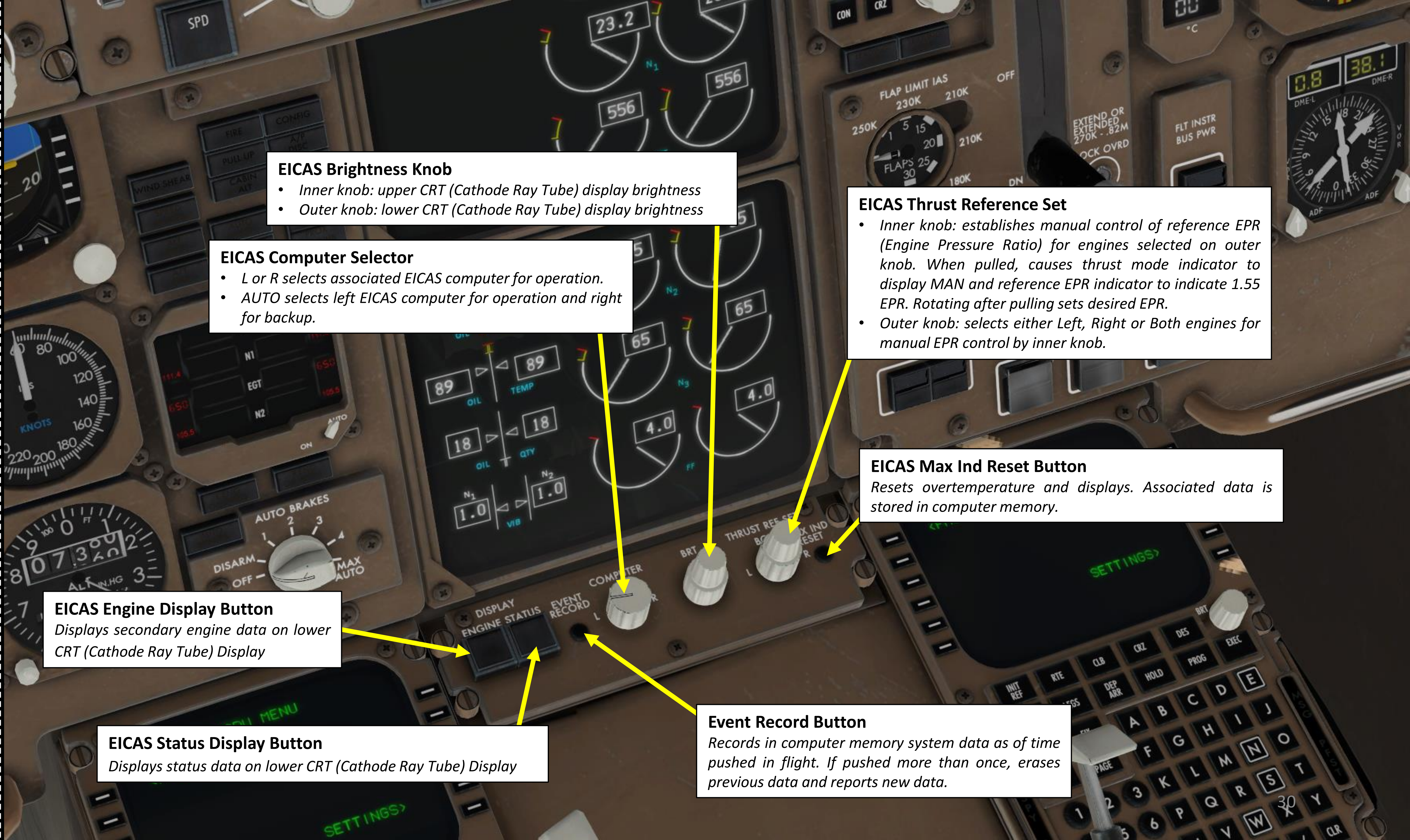
EICAS Engine Display Button
Displays secondary engine data on lower CRT (Cathode Ray Tube) Display

EICAS Status Display Button
Displays status data on lower CRT (Cathode Ray Tube) Display


GENERAL ELECTRIC
CF6-80C2B6F ENGINE
Total Air Temperature (TAT) (deg C)
Thrust Mode Display
(TO = Takeoff)
Auto-throttle target N1 reference bug
N1 (Fan Speed/Low Pressure Compressor Speed) Indication (%RPM)
EGT (Exhaust Gas Temperature) Indication (deg C)
Engine N2 (High Pressure Compressor Speed) (%RPM)
Engine Fuel Flow (x1000 lbs per hour)
Engine Oil Pressure (psi)
Engine Oil Temperature (deg C)
Engine Oil Quantity (Quarts)
Engine Vibration Indicator
Secondary Engine Page


Total Air Temperature (TAT) (deg C)
EPR (Engine Pressure Ratio) Indication
N1 (Fan Speed/Low Pressure Compressor Speed) Indication (%RPM)
EGT (Exhaust Gas Temperature) Indication (deg C)
Thrust Mode Display (TO = Takeoff)
Auto-throttle target EPR (Engine Pressure Ratio) or reference bug
PRATT & WHITNEY PW4060 ENGINE
ROLLS-ROYCE RB211-524H ENGINE
Engine N2 (Intermediate-Pressure Compressor Speed) (%RPM)
Engine N3 (High Pressure Compressor Speed) (%RPM)
Engine Fuel Flow (x1000 lbs per hour)
Engine Oil Pressure (psi)
Engine Oil Temperature (deg C)
Engine Oil Quantity (Quarts)
Engine Vibration Indicator
Secondary Engine Page
TAT +15c
TO
1.75
1.03
PARKING BRAKE
EPR
23.2
N1
562
EGT
79
OIL PRESS
77
TEMP
18
QTY
1.0
VIB
55
N2
65
N3
4.7
FF
MCDU MENU
<FMC
<ACT>
SETTINGS>


Left/Center/Right Hydraulic System Fluid Quantity (Quarts) & Pressure (psi)
APU (Auxiliary Power Unit) Parameters
RPM: Revolutions per Minute
EGT: Exhaust Gas Temperature (deg C)
OIL Q: Oil Quantity (Quarts)
Crew Oxygen Pressure (psi)
Flight Control Position
Engine Fuel Flow (x1000 lbs per hour)
Status Page
Brake Temperature
HYD QTY 0.81 0.83 0.83
HYD PRESS 2991 2992 2994
APU EGT 0 RPM 0 OIL Q 15
OXY PRESS 1749
21.1 FF 21.1
RUD
AIL ELEV AIL
BRAKE TEMP
TAT +20c
EPR
N1
EGT
CAUTION
CANCEL RECALL
AUTO BRAKES
FLAP LIMIT IAS
ALTN FLAPS
TAS
SAT



EICAS Brightness Knob

- *Inner knob: upper CRT (Cathode Ray Tube) display brightness*
- *Outer knob: lower CRT (Cathode Ray Tube) display brightness*

EICAS Computer Selector

- *L or R selects associated EICAS computer for operation.*
- *AUTO selects left EICAS computer for operation and right for backup.*

EICAS Thrust Reference Set

- *Inner knob: establishes manual control of reference EPR (Engine Pressure Ratio) for engines selected on outer knob. When pulled, causes thrust mode indicator to display MAN and reference EPR indicator to indicate 1.55 EPR. Rotating after pulling sets desired EPR.*
- *Outer knob: selects either Left, Right or Both engines for manual EPR control by inner knob.*

EICAS Max Ind Reset Button

Resets overtemperature and displays. Associated data is stored in computer memory.

EICAS Engine Display Button

Displays secondary engine data on lower CRT (Cathode Ray Tube) Display

EICAS Status Display Button

Displays status data on lower CRT (Cathode Ray Tube) Display

Event Record Button

Records in computer memory system data as of time pushed in flight. If pushed more than once, erases previous data and reports new data.

EPR OR N1? WHAT? WHY? HOW?!?

You may be wondering… but why would an engine use different units for power settings like N1 and EPR?

Pratt & Whitney and Rolls-Royce use the Engine Pressure Ratio (EPR) for engines like the PW4060, while GE Aviation (General Electric) uses the engine Fan Speed (N1) for engines like the CF6. This difference originates from the way the two companies want the pilot to define his thrust reference.

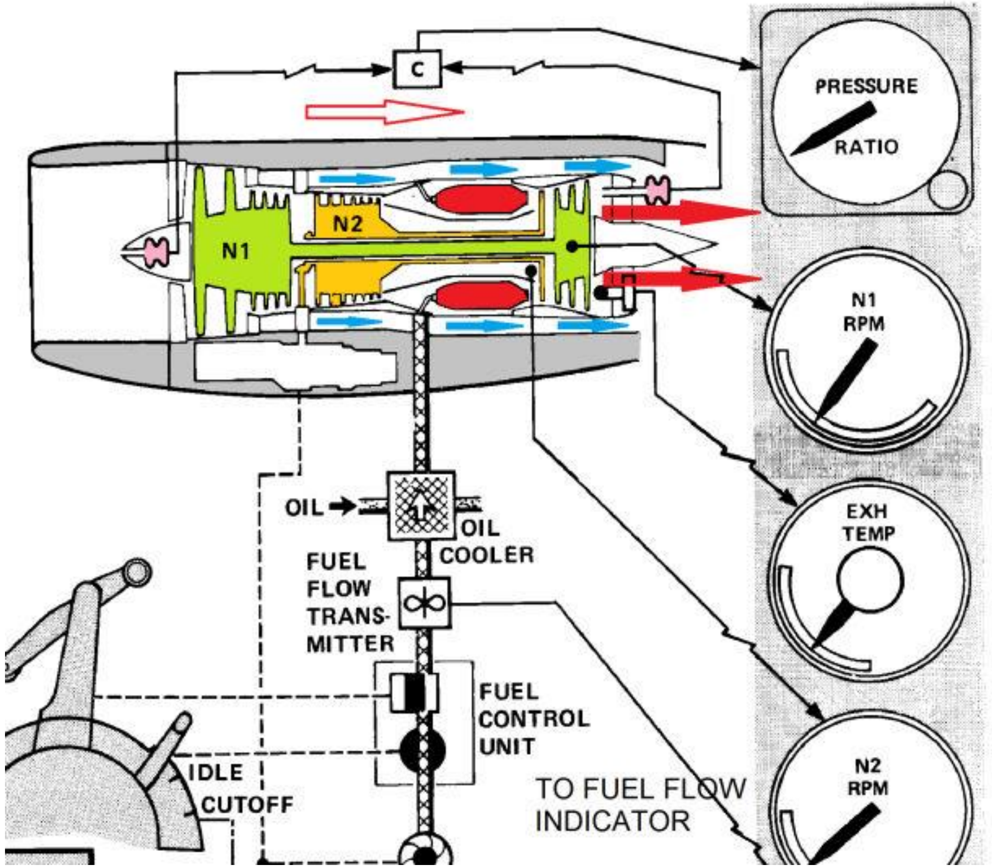
EPR is defined as the ratio between the pressure at the engine outlet and the engine inlet, and is dependent on the prevailing atmospheric conditions as pressure is affected by temperature and aircraft altitude.

- This is a somewhat more accurate indication of thrust reference since it's the result of simple physics: Thrust = Pressure x Area of Application.
  No matter the condition of the engine, a given EPR in the same atmospheric conditions is guaranteed to deliver the same amount of thrust.
- EPR relies on two pitot probes, and they are susceptible to foreign object damage, such as insects, icing, clogging… which can lead to faulty EPR readings. In multi-spool engines, there is also an issue of stability in control of thrust since filtering of noise from sensors delays response time.

N1 is defined as the speed of the engine compressor or fan, which is independent of the prevailing local atmospheric conditions.

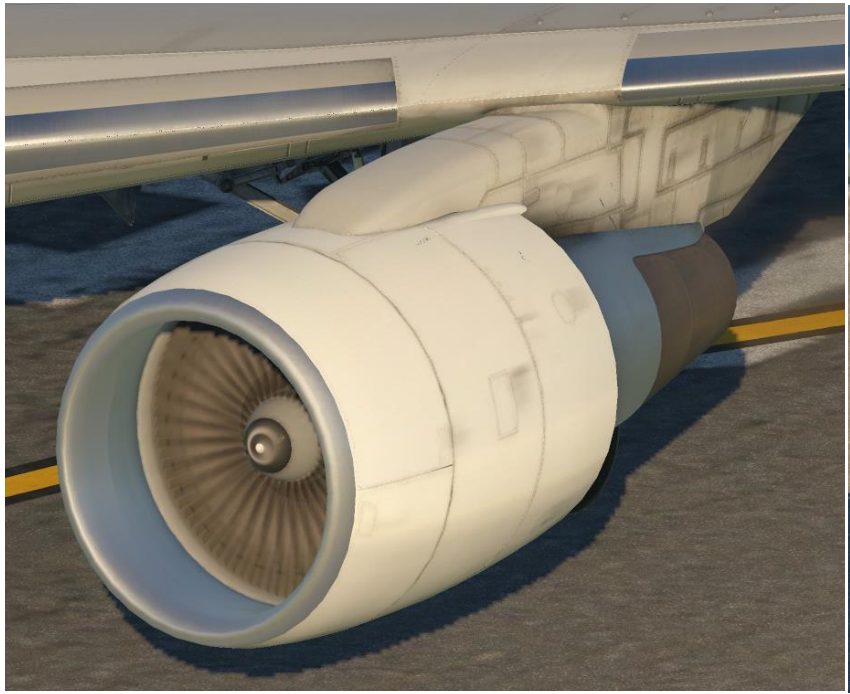
- The N1 sensors are not prone to failure, are more reliable and provide a much better response time. The measurement of speed is a lot more accurate, which allows for excellent stability in control. The N readings do not fluctuate with atmospheric variations, unlike EPR. For this reason, when penetrating a turbulent region in flight, N1 values are used as reference, even if EPR readings are available.
- N1 is a less accurate indication of thrust since it does not take into account engine degradation, which can generate less thrust for the same N1 . However, the presence of an N1 indication can allow the crew to recognize performance degradation.

Check out "The Flying Engineer" website for more information:
http://theflyingengineer.com/flightdeck/cockpit-design-epr-vs-n1-indication/

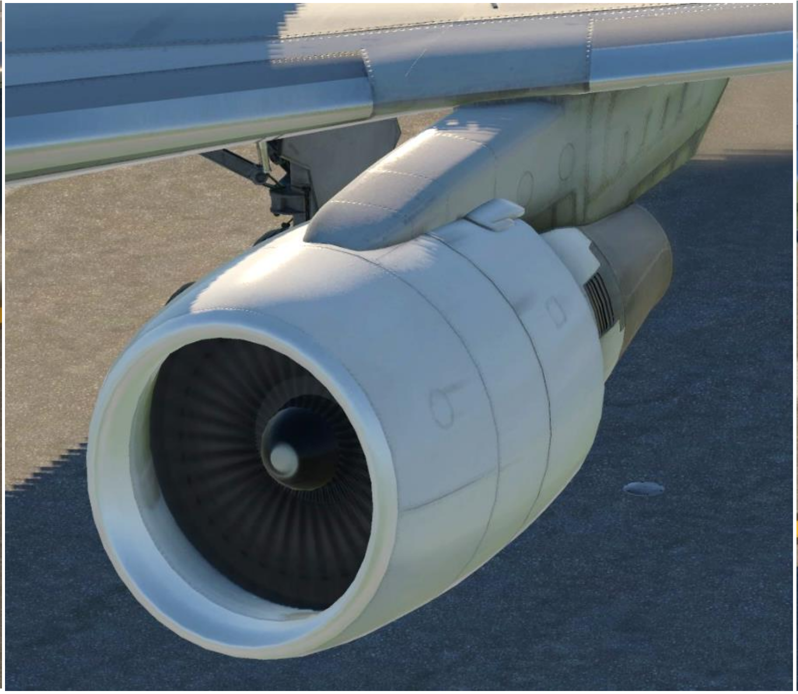


ENGINE TYPES INSTALLED ON THE 767-300ER

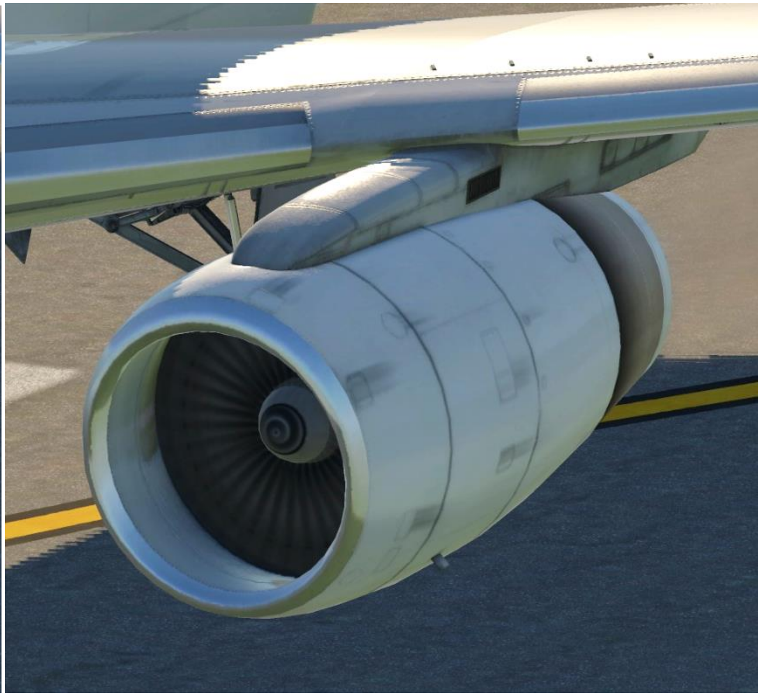
GENERAL ELECTRIC CF6-80C2B6F ENGINE



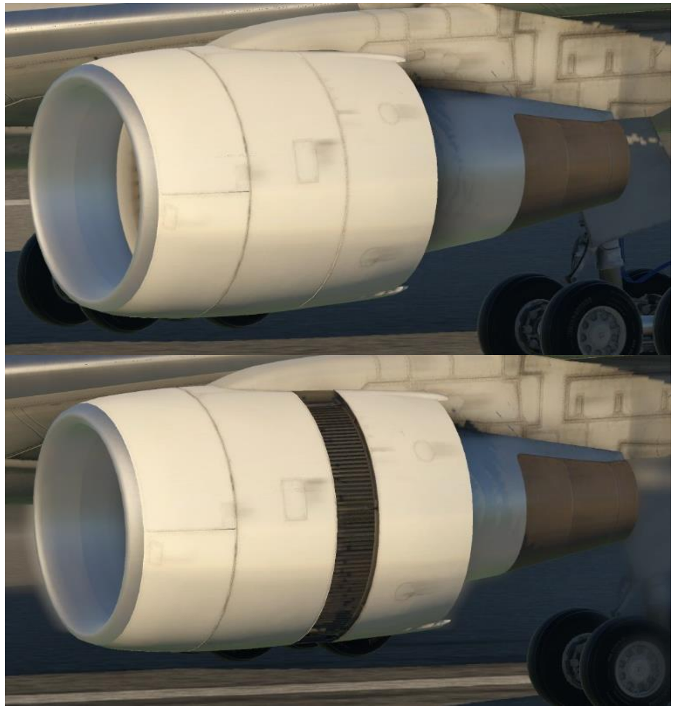
PRATT & WHITNEY PW4060 ENGINE



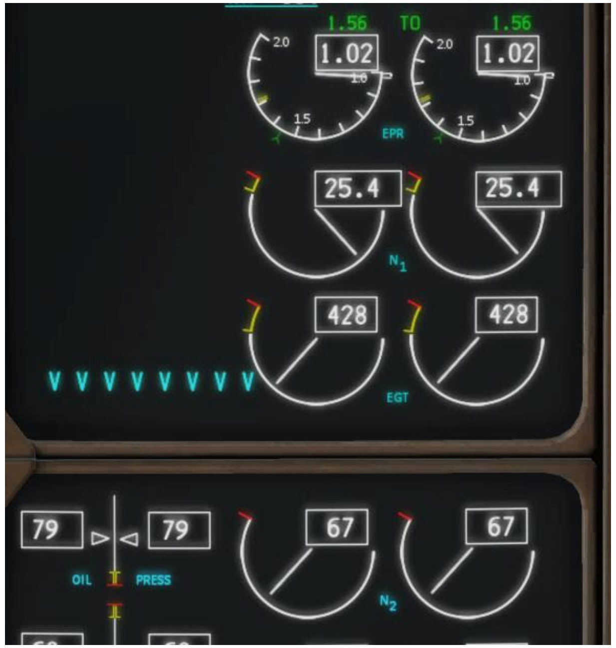
ROLLS-ROYCE RB211-524H ENGINE

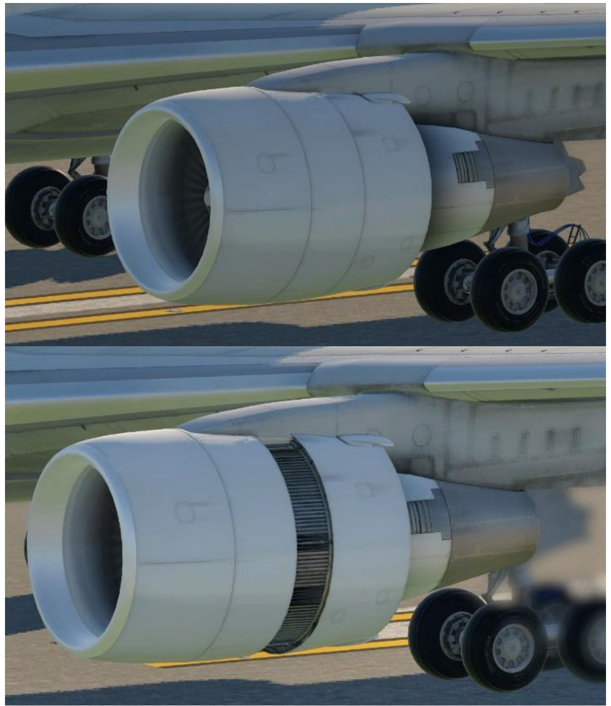


GENERAL ELECTRIC CF6-80C2B6F ENGINE

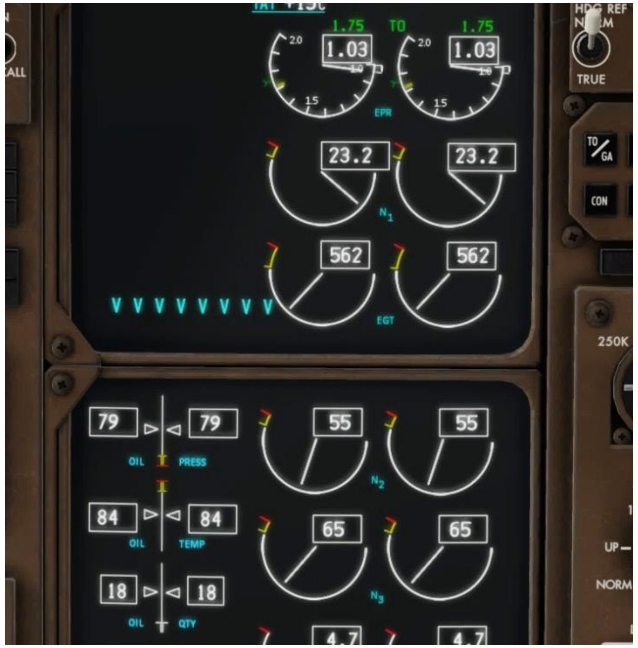


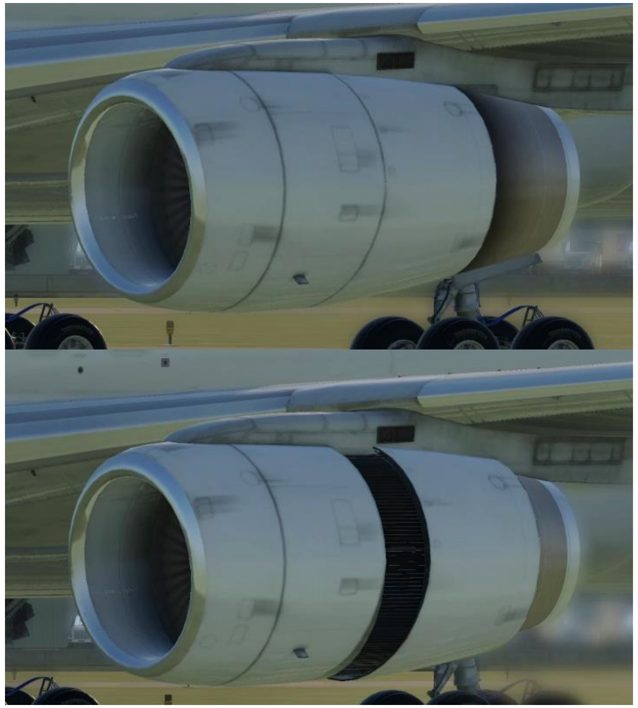
PRATT & WHITNEY PW4060 ENGINE



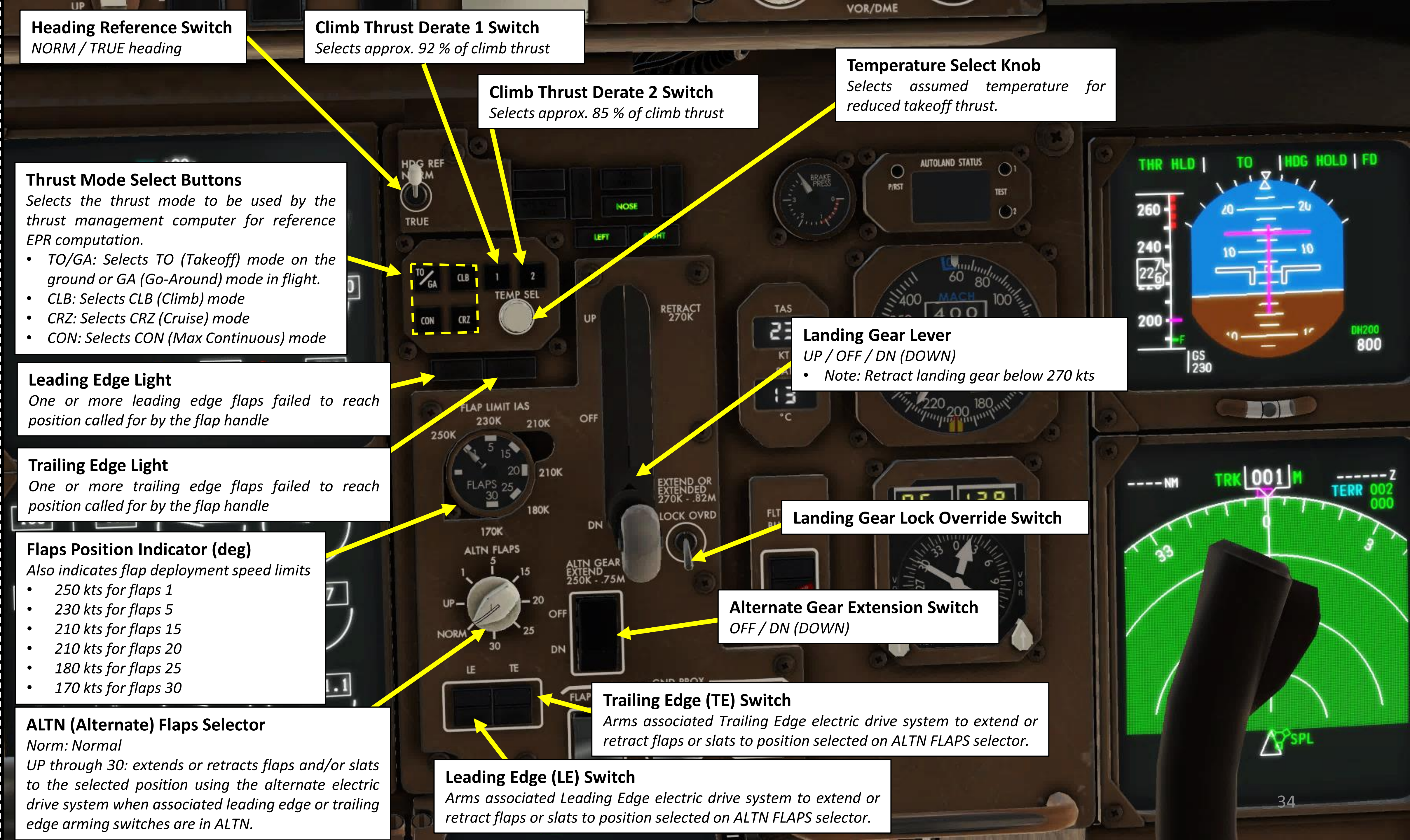


ROLLS-ROYCE RB211-524H ENGINE





Note:
The PW4060 and CF6 engines are two-spool turbofan engines, while the RB211 engine is a three-spool engine. This is why there is an additional "N3" indication on the Rolls-Royce engine page. We will further elaborate what N1, N2 and N3 mean in the Engine Start Procedure section.



Heading Reference Switch
NORM / TRUE heading

Climb Thrust Derate 1 Switch
Selects approx. 92 % of climb thrust

Climb Thrust Derate 2 Switch
Selects approx. 85 % of climb thrust

Temperature Select Knob
Selects assumed temperature for reduced takeoff thrust.

Thrust Mode Select Buttons
Selects the thrust mode to be used by the thrust management computer for reference EPR computation.
- *TO/GA: Selects TO (Takeoff) mode on the ground or GA (Go-Around) mode in flight.*
- *CLB: Selects CLB (Climb) mode*
- *CRZ: Selects CRZ (Cruise) mode*
- *CON: Selects CON (Max Continuous) mode*

Leading Edge Light
One or more leading edge flaps failed to reach position called for by the flap handle

Trailing Edge Light
One or more trailing edge flaps failed to reach position called for by the flap handle

Landing Gear Lever
UP / OFF / DN (DOWN)
- *Note: Retract landing gear below 270 kts*

Landing Gear Lock Override Switch

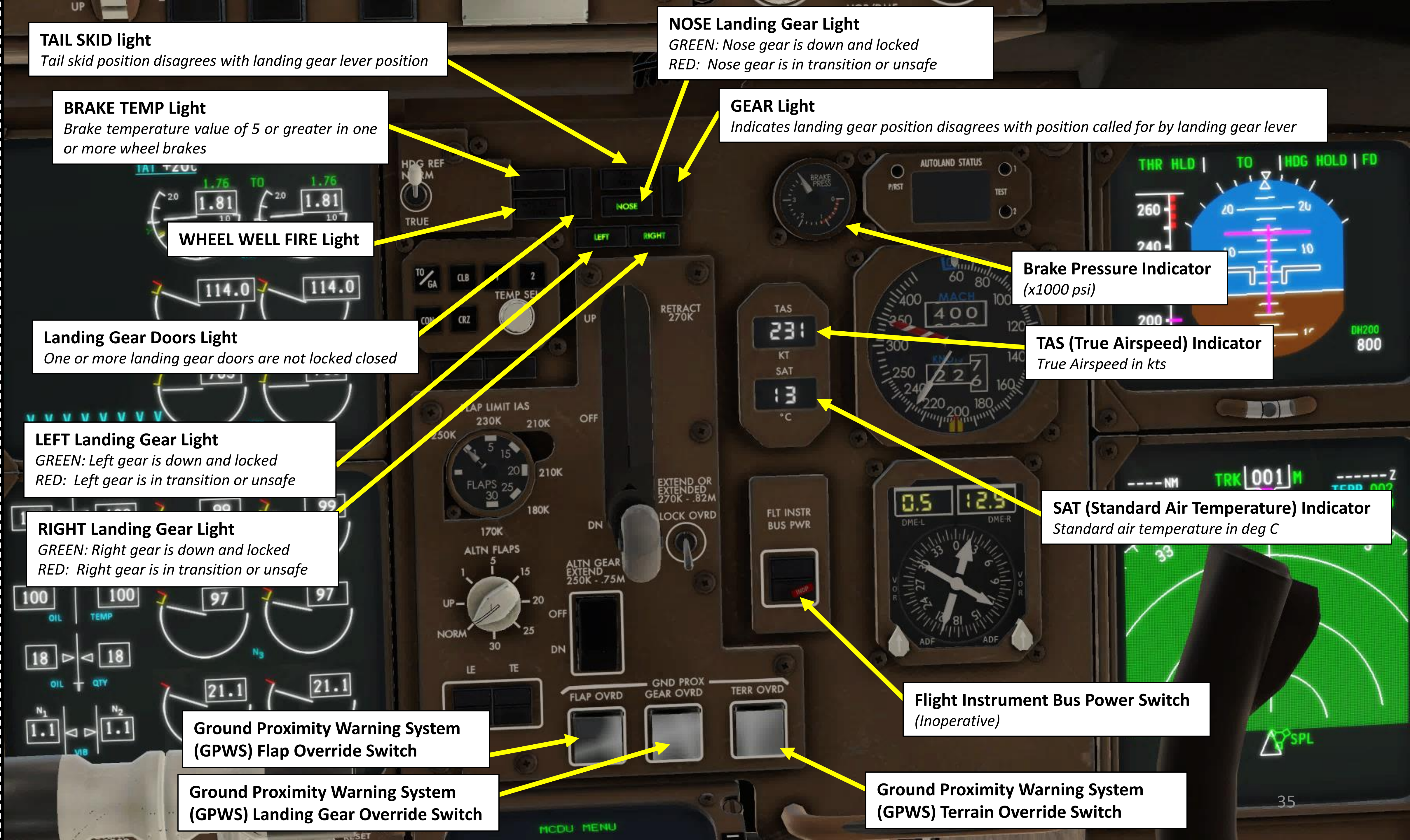
Flaps Position Indicator (deg)
Also indicates flap deployment speed limits
- *250 kts for flaps 1*
- *230 kts for flaps 5*
- *210 kts for flaps 15*
- *210 kts for flaps 20*
- *180 kts for flaps 25*
- *170 kts for flaps 30*

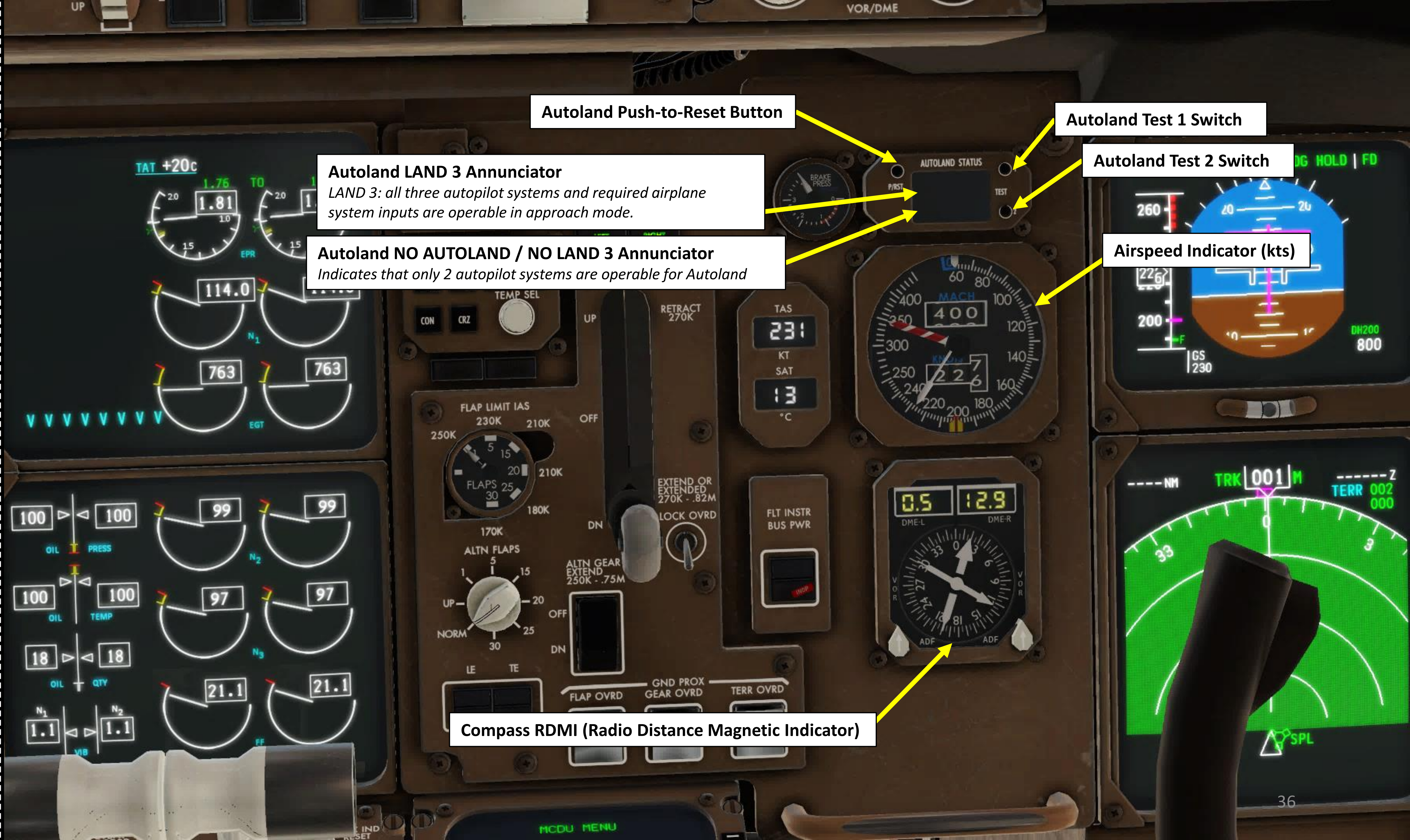
Alternate Gear Extension Switch
OFF / DN (DOWN)

ALTN (Alternate) Flaps Selector
Norm: Normal
UP through 30: extends or retracts flaps and/or slats to the selected position using the alternate electric drive system when associated leading edge or trailing edge arming switches are in ALTN.

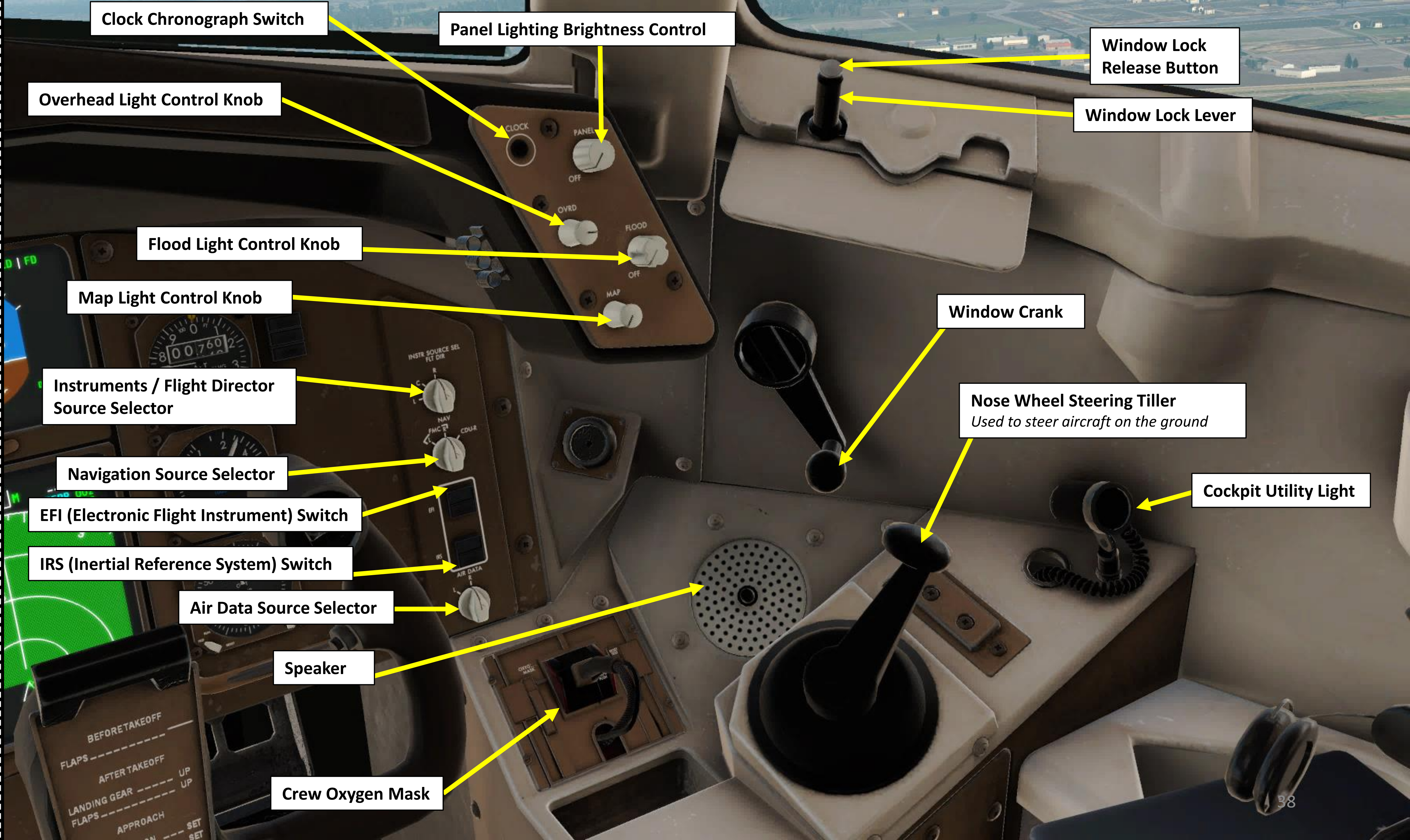
Trailing Edge (TE) Switch
Arms associated Trailing Edge electric drive system to extend or retract flaps or slats to position selected on ALTN FLAPS selector.

Leading Edge (LE) Switch
Arms associated Leading Edge electric drive system to extend or retract flaps or slats to position selected on ALTN FLAPS selector.

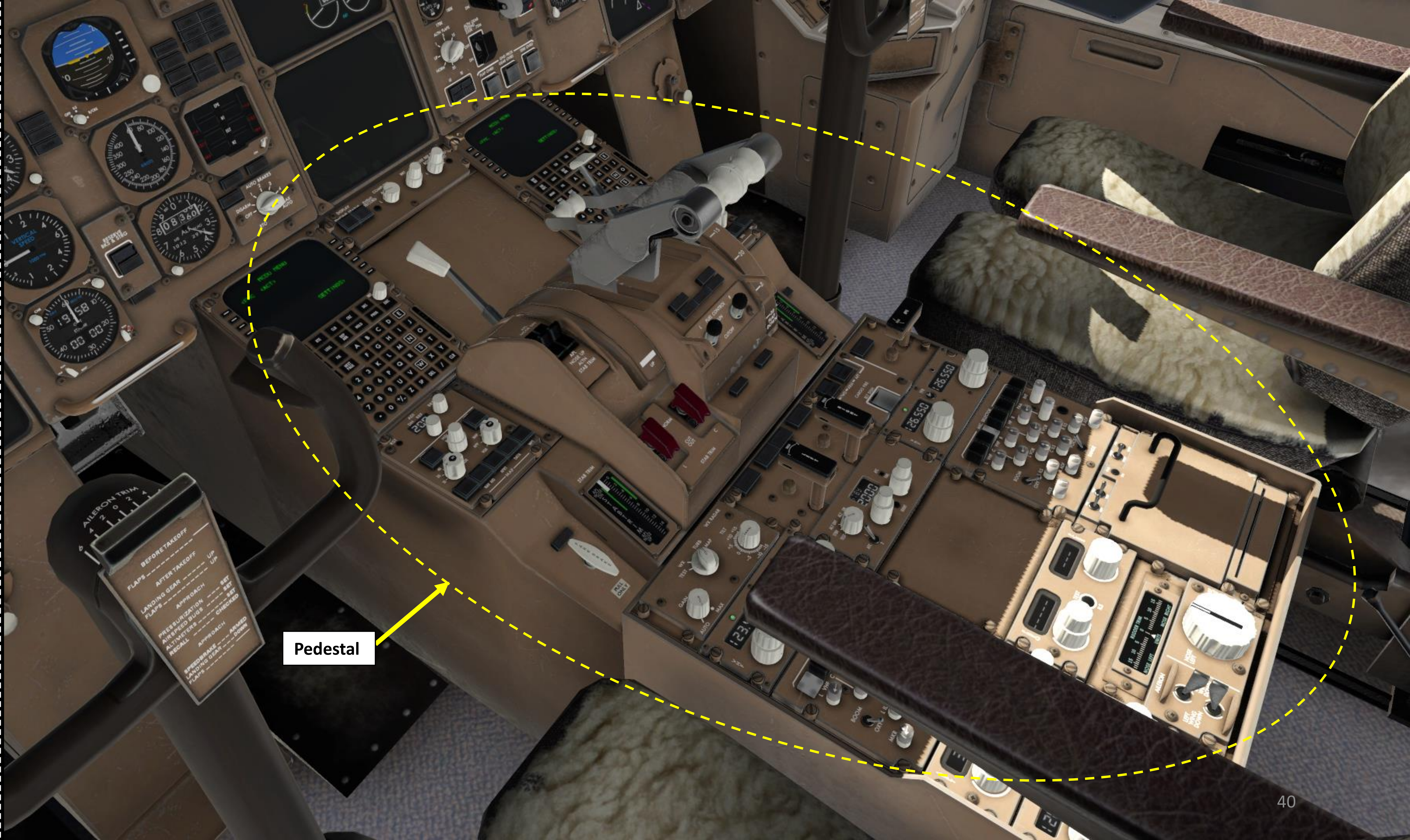

TAIL SKID light
Tail skid position disagrees with landing gear lever position
BRAKE TEMP Light
Brake temperature value of 5 or greater in one or more wheel brakes
WHEEL WELL FIRE Light
Landing Gear Doors Light
One or more landing gear doors are not locked closed
LEFT Landing Gear Light
GREEN: Left gear is down and locked
RED: Left gear is in transition or unsafe
RIGHT Landing Gear Light
GREEN: Right gear is down and locked
RED: Right gear is in transition or unsafe
Ground Proximity Warning System (GPWS) Flap Override Switch
Ground Proximity Warning System (GPWS) Landing Gear Override Switch
NOSE Landing Gear Light
GREEN: Nose gear is down and locked
RED: Nose gear is in transition or unsafe
GEAR Light
Indicates landing gear position disagrees with position called for by landing gear lever
Brake Pressure Indicator
(x1000 psi)
TAS (True Airspeed) Indicator
True Airspeed in kts
SAT (Standard Air Temperature) Indicator
Standard air temperature in deg C
Flight Instrument Bus Power Switch
(Inoperative)
Ground Proximity Warning System (GPWS) Terrain Override Switch

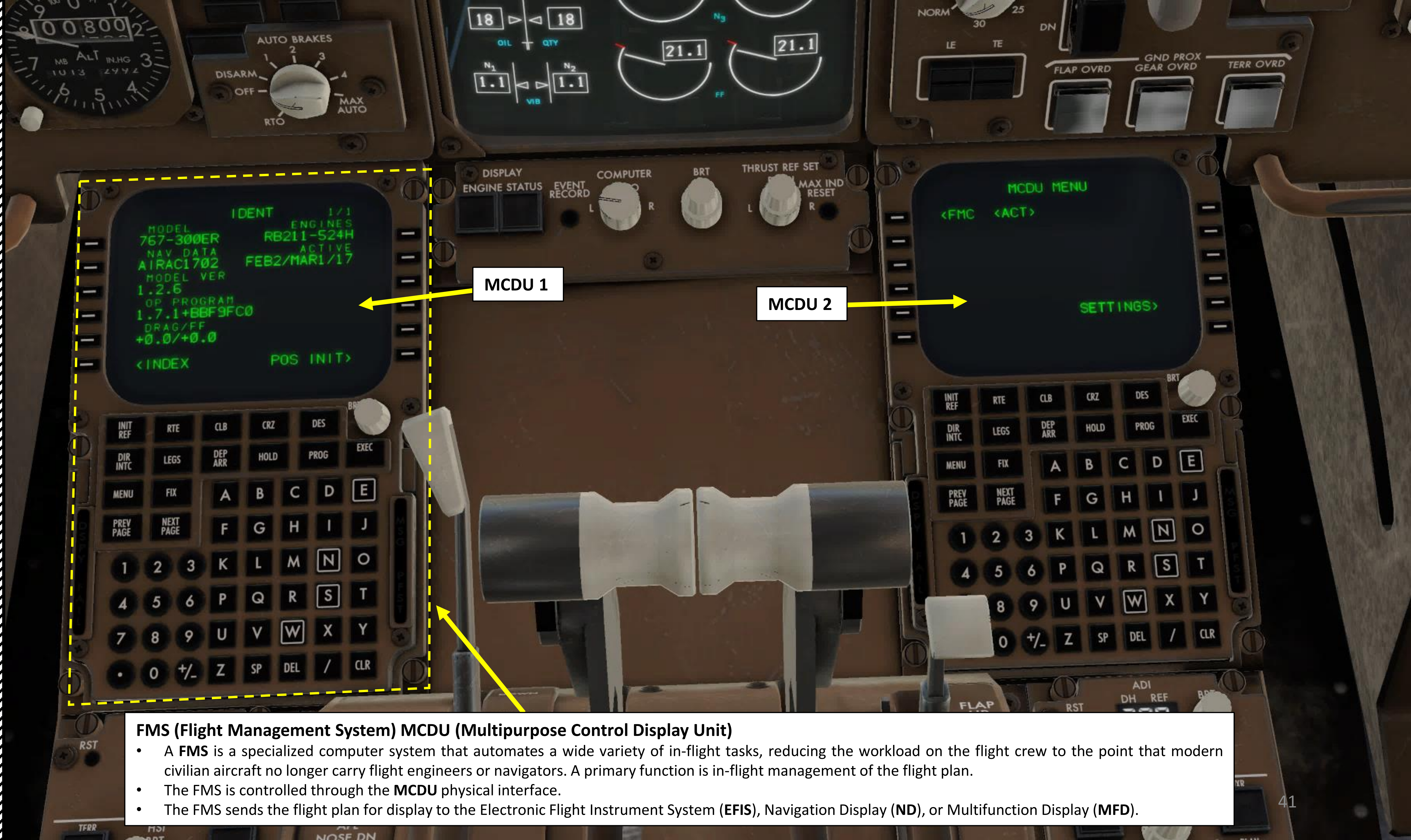

Autoland Push-to-Reset Button
Autoland Test 1 Switch
Autoland Test 2 Switch
Autoland LAND 3 Annunciator
LAND 3: all three autopilot systems and required airplane system inputs are operable in approach mode.
Autoland NO AUTOLAND / NO LAND 3 Annunciator
Indicates that only 2 autopilot systems are operable for Autoland
Airspeed Indicator (kts)
Compass RDMI (Radio Distance Magnetic Indicator)


First Officer's PFD (Primary Flight Display)
Altitude Indicator (ft)
Marker Beacon Light: Airways Marker
Marker Beacon Light: Middle Marker
Marker Beacon Light: Outer Marker
VSI (Vertical Speed Indicator) (x1000 ft/min)
Clock
First Officer's ND (Navigation Display)


Clock Chronograph Switch
Panel Lighting Brightness Control
Window Lock Release Button
Window Lock Lever
Overhead Light Control Knob
Flood Light Control Knob
Map Light Control Knob
Window Crank
Instruments / Flight Director Source Selector
Nose Wheel Steering Tiller
Used to steer aircraft on the ground
Navigation Source Selector
Cockpit Utility Light
EFI (Electronic Flight Instrument) Switch
IRS (Inertial Reference System) Switch
Air Data Source Selector
Speaker
Crew Oxygen Mask

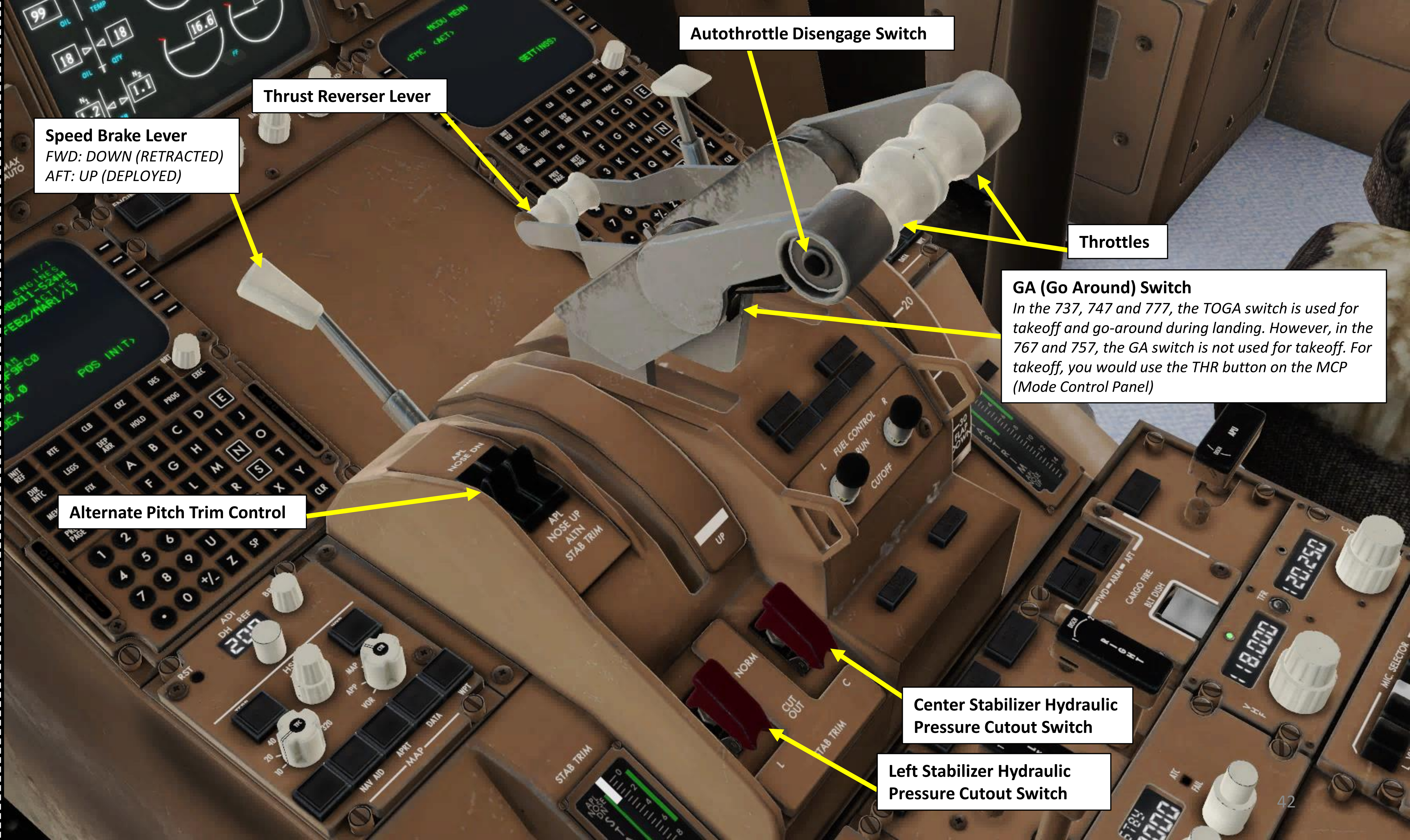

Headset
EFB (Electronic Flight Bag)
Click on EFB to use it
HOT BATTERY BUS
DC BATTERY BUS
SERVICE OUTLET
28V DC

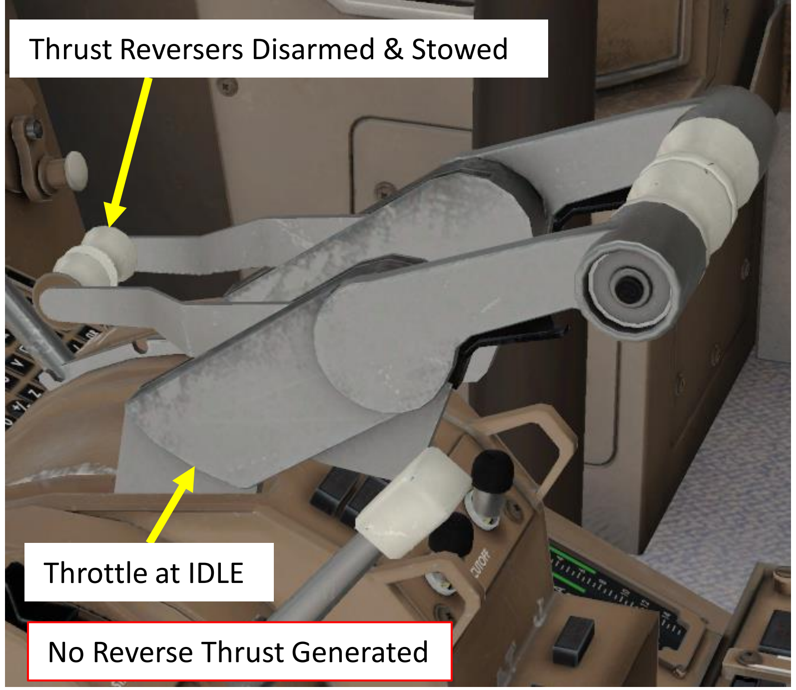

Pedestal

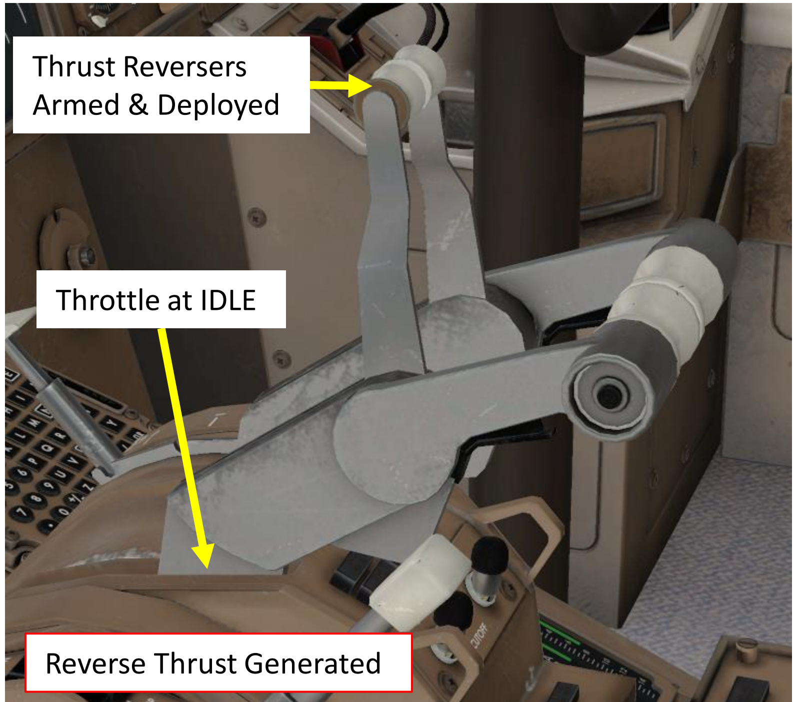


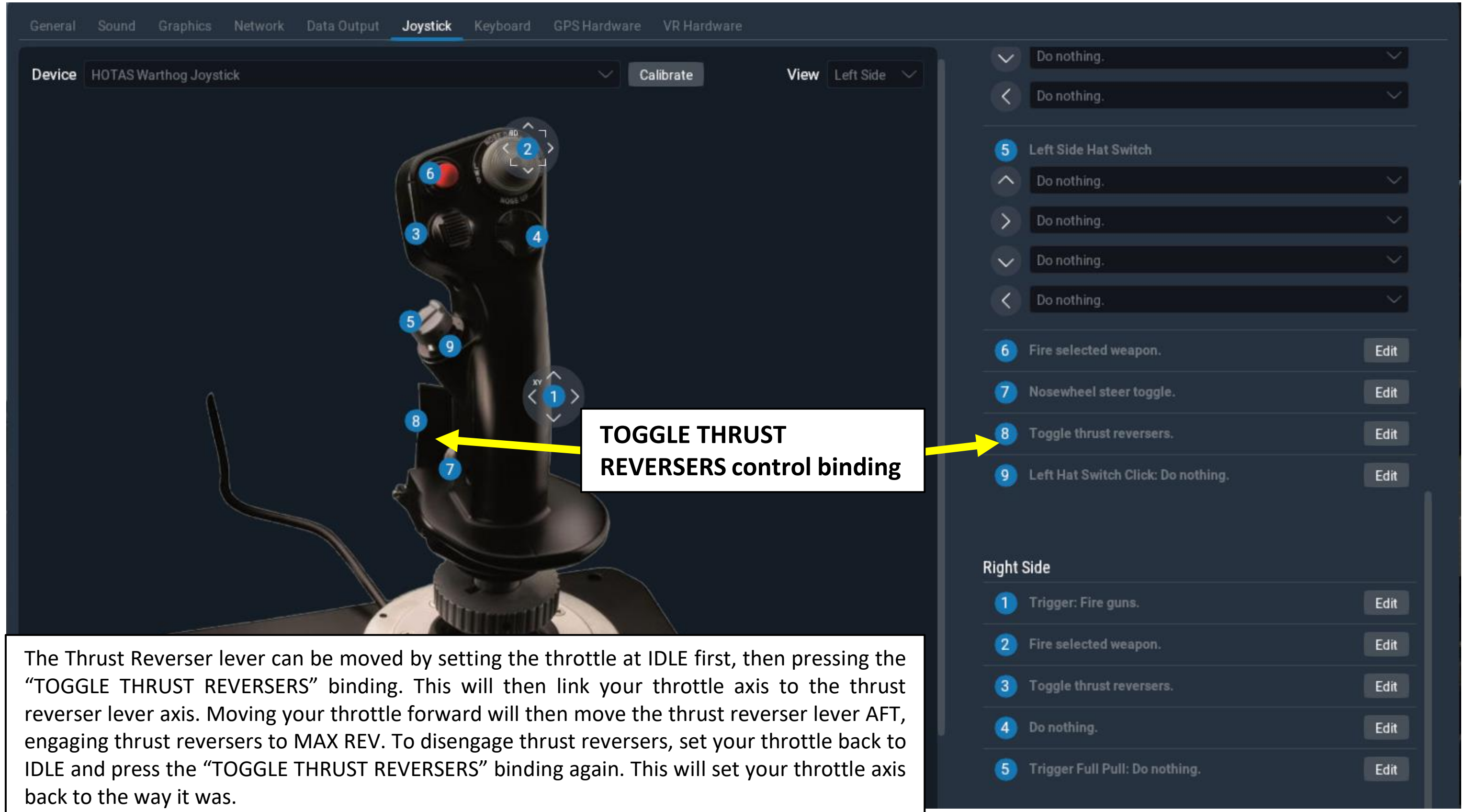
FMS (Flight Management System) MCDU (Multipurpose Control Display Unit)

- A **FMS** is a specialized computer system that automates a wide variety of in-flight tasks, reducing the workload on the flight crew to the point that modern civilian aircraft no longer carry flight engineers or navigators. A primary function is in-flight management of the flight plan.
- The FMS is controlled through the **MCDU** physical interface.
- The FMS sends the flight plan for display to the Electronic Flight Instrument System (**EFIS**), Navigation Display (**ND**), or Multifunction Display (**MFD**).


Autothrottle Disengage Switch
Thrust Reverser Lever
Speed Brake Lever
FWD: DOWN (RETRACTED)
AFT: UP (DEPLOYED)
Throttles
GA (Go Around) Switch
In the 737, 747 and 777, the TOGA switch is used for takeoff and go-around during landing. However, in the 767 and 757, the GA switch is not used for takeoff. For takeoff, you would use the THR button on the MCP (Mode Control Panel)
Alternate Pitch Trim Control
Center Stabilizer Hydraulic Pressure Cutout Switch
Left Stabilizer Hydraulic Pressure Cutout Switch

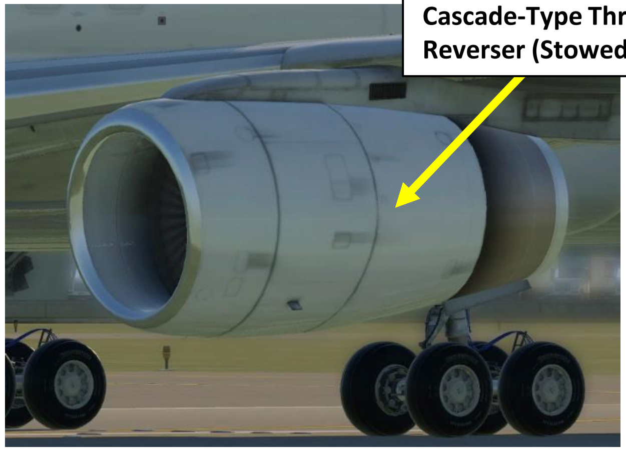


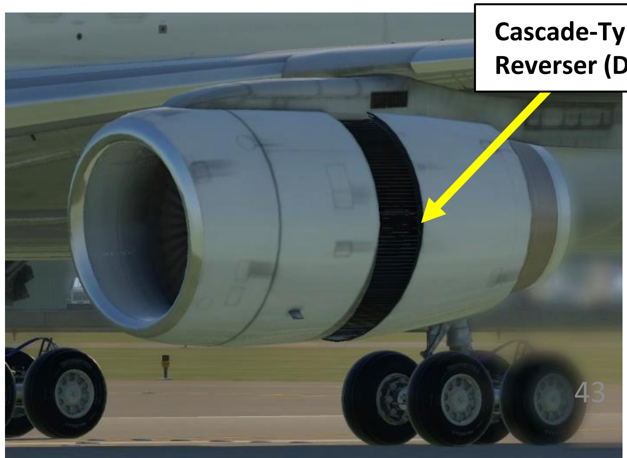


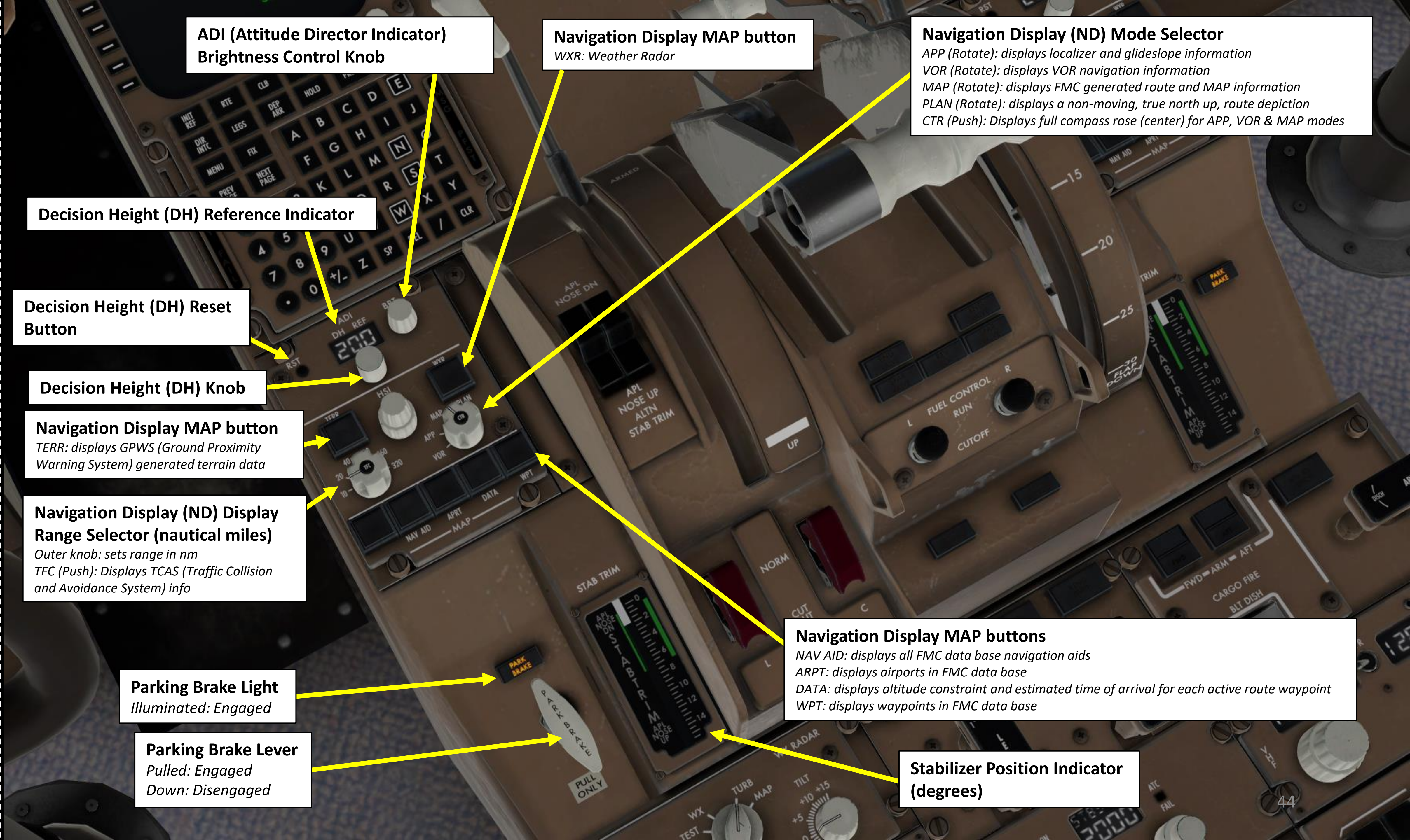


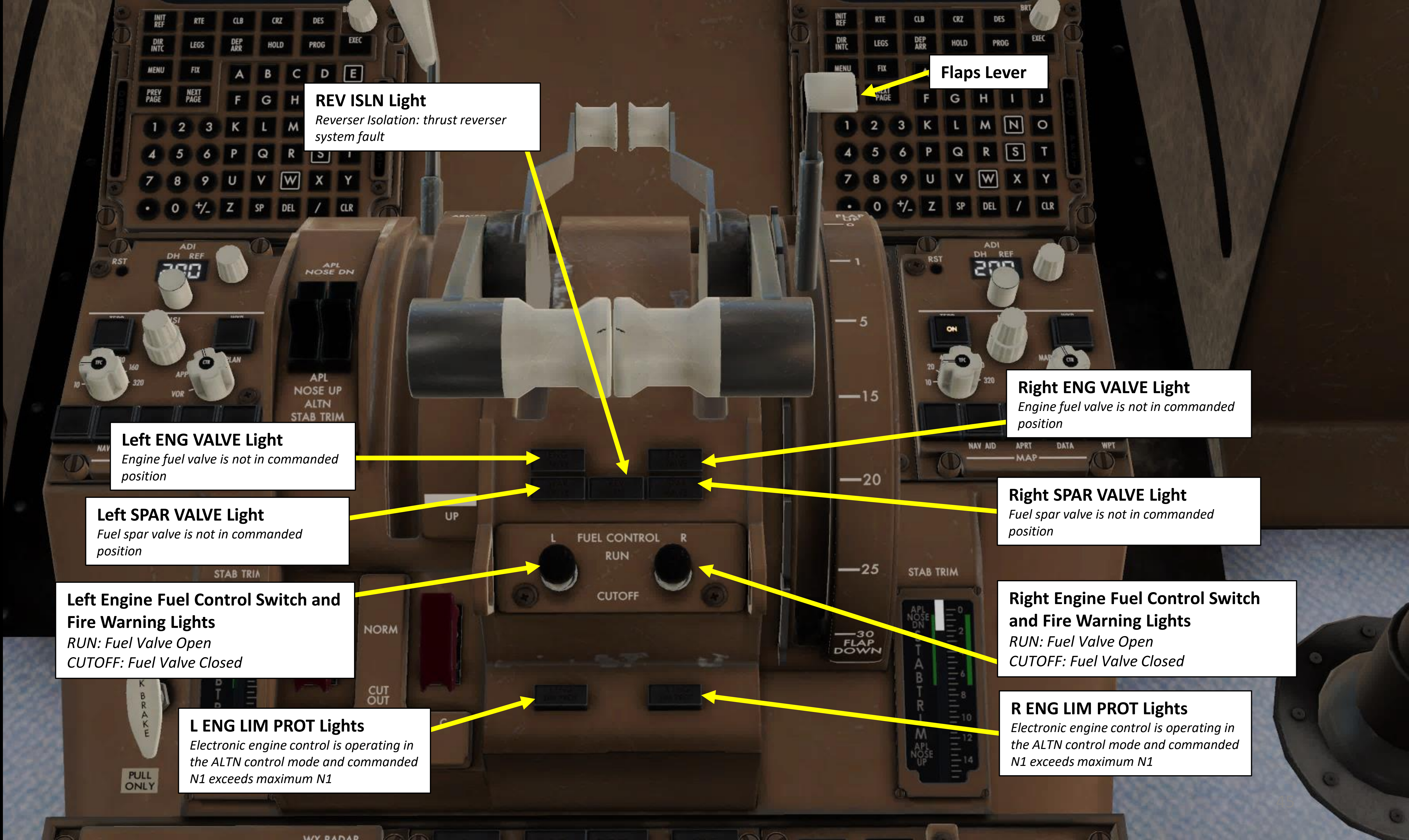
The Thrust Reverser lever can be moved by setting the throttle at IDLE first, then pressing the "TOGGLE THRUST REVERSERS" binding. This will then link your throttle axis to the thrust reverser lever axis. Moving your throttle forward will then move the thrust reverser lever AFT, engaging thrust reversers to MAX REV. To disengage thrust reversers, set your throttle back to IDLE and press the "TOGGLE THRUST REVERSERS" binding again. This will set your throttle axis back to the way it was.

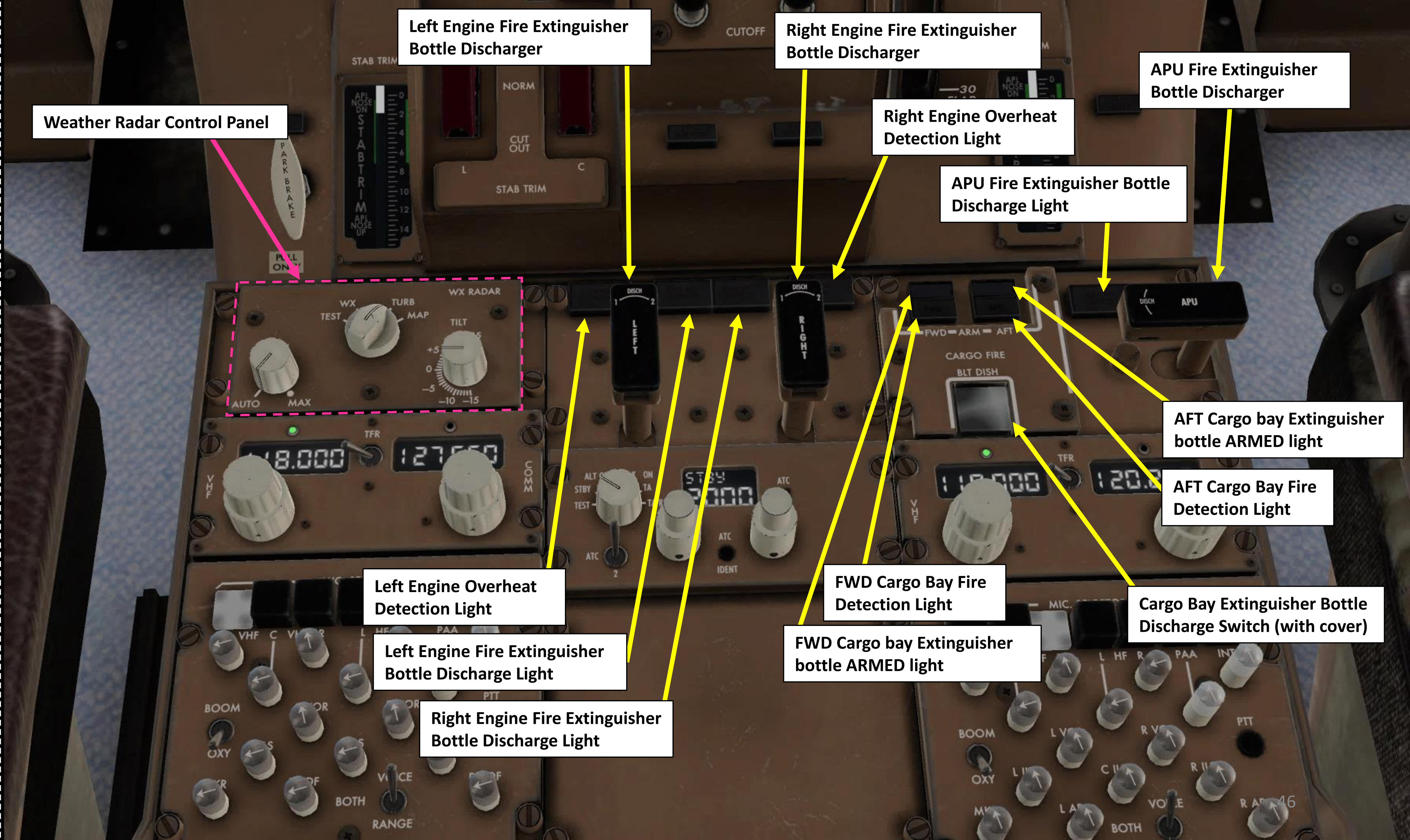
Take note that the Reverse Thrust lever can only be engaged if your throttle is at IDLE. The reason for that is a mechanical stopper that prevents you from engaging thrust reversers at high throttle settings.

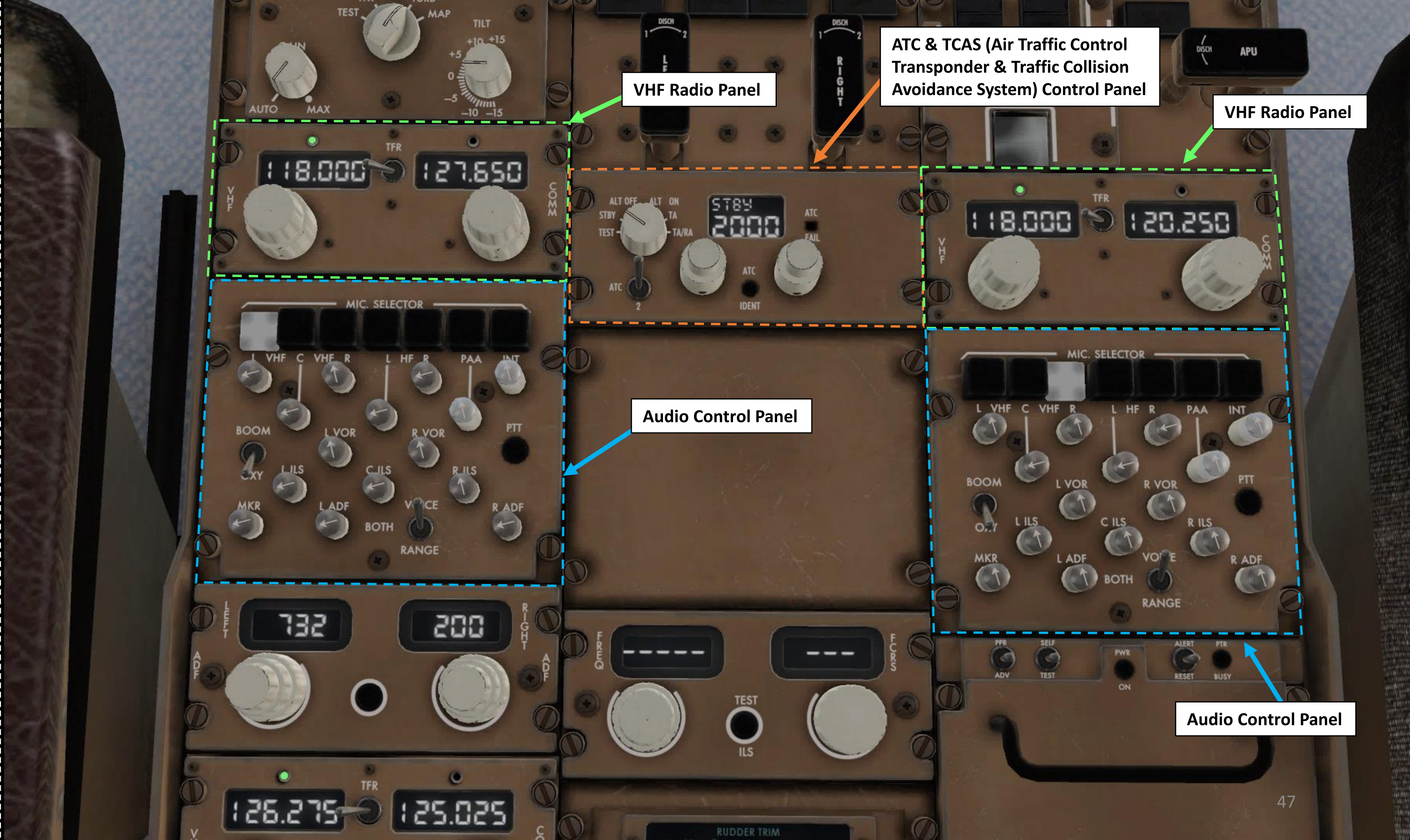


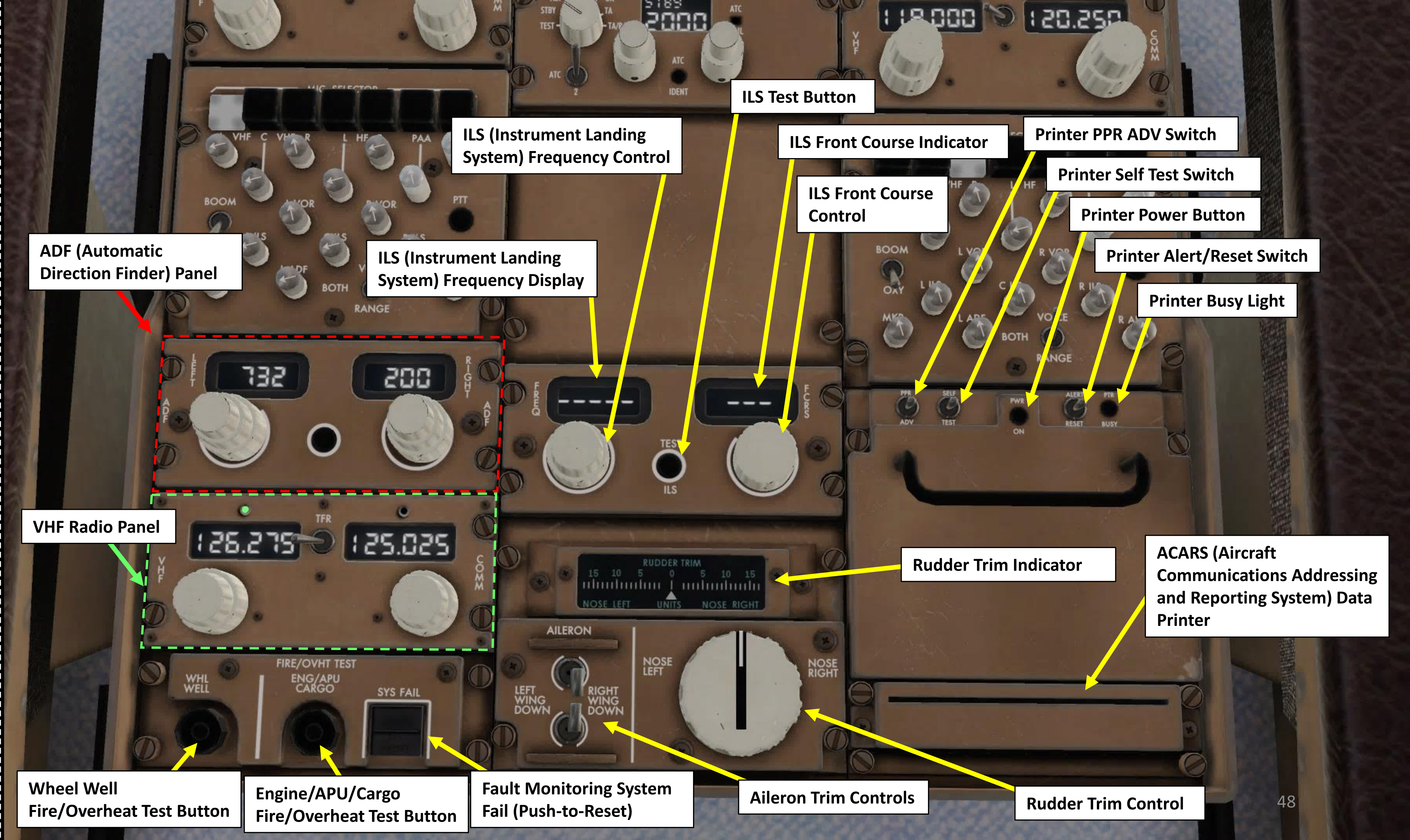



ADI (Attitude Director Indicator) Brightness Control Knob
Navigation Display MAP button
WXR: Weather Radar
Navigation Display (ND) Mode Selector
APP (Rotate): displays localizer and glideslope information
VOR (Rotate): displays VOR navigation information
MAP (Rotate): displays FMC generated route and MAP information
PLAN (Rotate): displays a non-moving, true north up, route depiction
CTR (Push): Displays full compass rose (center) for APP, VOR & MAP modes
Decision Height (DH) Reference Indicator
Decision Height (DH) Reset Button
Decision Height (DH) Knob
Navigation Display MAP button
TERR: displays GPWS (Ground Proximity Warning System) generated terrain data
Navigation Display (ND) Display Range Selector (nautical miles)
Outer knob: sets range in nm
TFC (Push): Displays TCAS (Traffic Collision and Avoidance System) info
Navigation Display MAP buttons
NAV AID: displays all FMC data base navigation aids
ARPT: displays airports in FMC data base
DATA: displays altitude constraint and estimated time of arrival for each active route waypoint
WPT: displays waypoints in FMC data base
Parking Brake Light
Illuminated: Engaged
Parking Brake Lever
Pulled: Engaged
Down: Disengaged
Stabilizer Position Indicator (degrees)

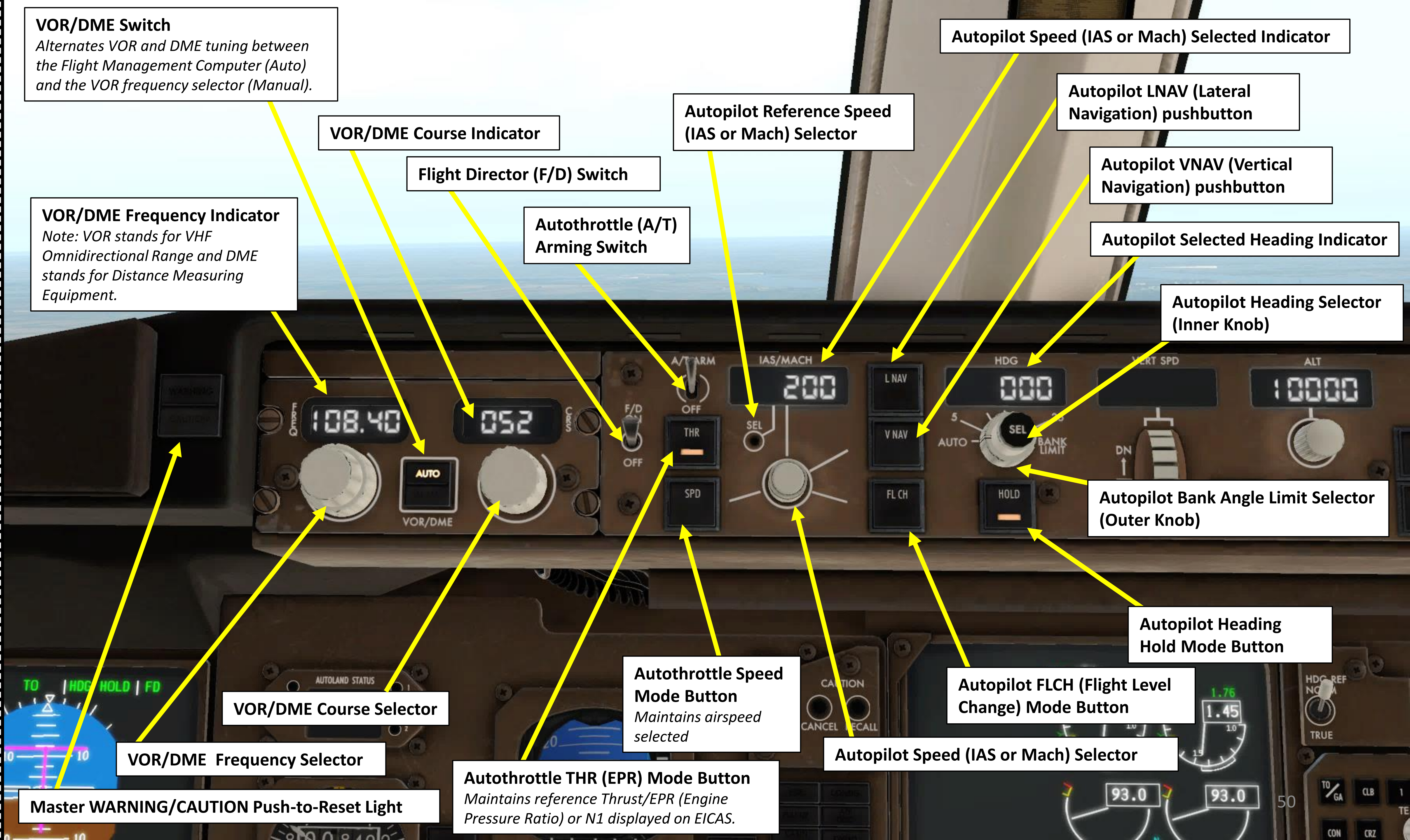

Flaps Lever
REV ISLN Light
Reverser Isolation: thrust reverser system fault
Left ENG VALVE Light
Engine fuel valve is not in commanded position
Left SPAR VALVE Light
Fuel spar valve is not in commanded position
Left Engine Fuel Control Switch and Fire Warning Lights
RUN: Fuel Valve Open
CUTOFF: Fuel Valve Closed
L ENG LIM PROT Lights
Electronic engine control is operating in the ALTN control mode and commanded N1 exceeds maximum N1
Right ENG VALVE Light
Engine fuel valve is not in commanded position
Right SPAR VALVE Light
Fuel spar valve is not in commanded position
Right Engine Fuel Control Switch and Fire Warning Lights
RUN: Fuel Valve Open
CUTOFF: Fuel Valve Closed
R ENG LIM PROT Lights
Electronic engine control is operating in the ALTN control mode and commanded N1 exceeds maximum N1
FUEL CONTROL
L
R
RUN
CUTOFF
STAB TRIM
NORM
CUT OUT
APL NOSE UP
ALTN
STAB TRIM
FLAP DOWN
PULL ONLY

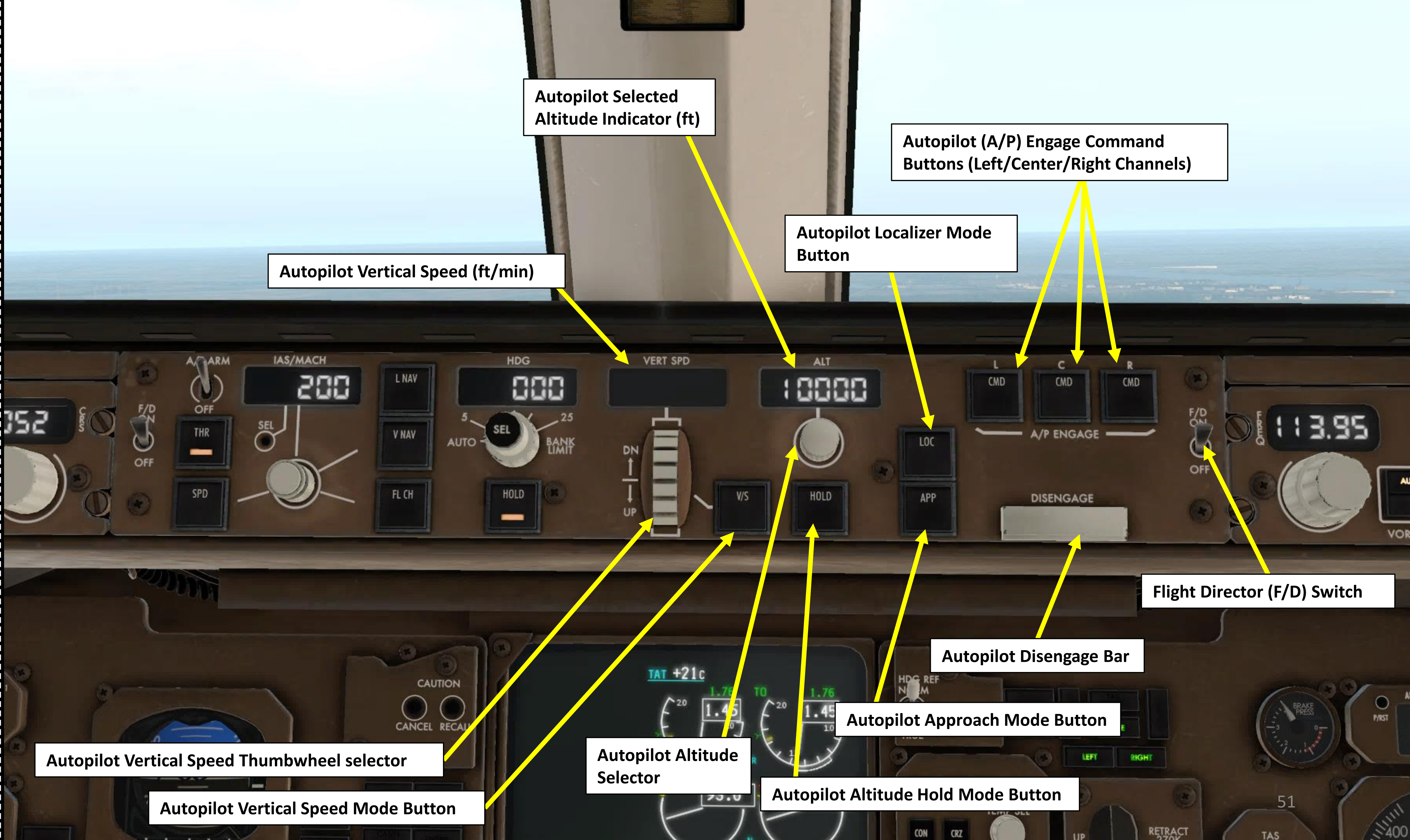

Left Engine Fire Extinguisher Bottle Discharger
Right Engine Fire Extinguisher Bottle Discharger
APU Fire Extinguisher Bottle Discharger
Weather Radar Control Panel
Right Engine Overheat Detection Light
APU Fire Extinguisher Bottle Discharge Light
AFT Cargo bay Extinguisher bottle ARMED light
AFT Cargo Bay Fire Detection Light
Left Engine Overheat Detection Light
Left Engine Fire Extinguisher Bottle Discharge Light
Right Engine Fire Extinguisher Bottle Discharge Light
FWD Cargo Bay Fire Detection Light
FWD Cargo bay Extinguisher bottle ARMED light
Cargo Bay Extinguisher Bottle Discharge Switch (with cover)

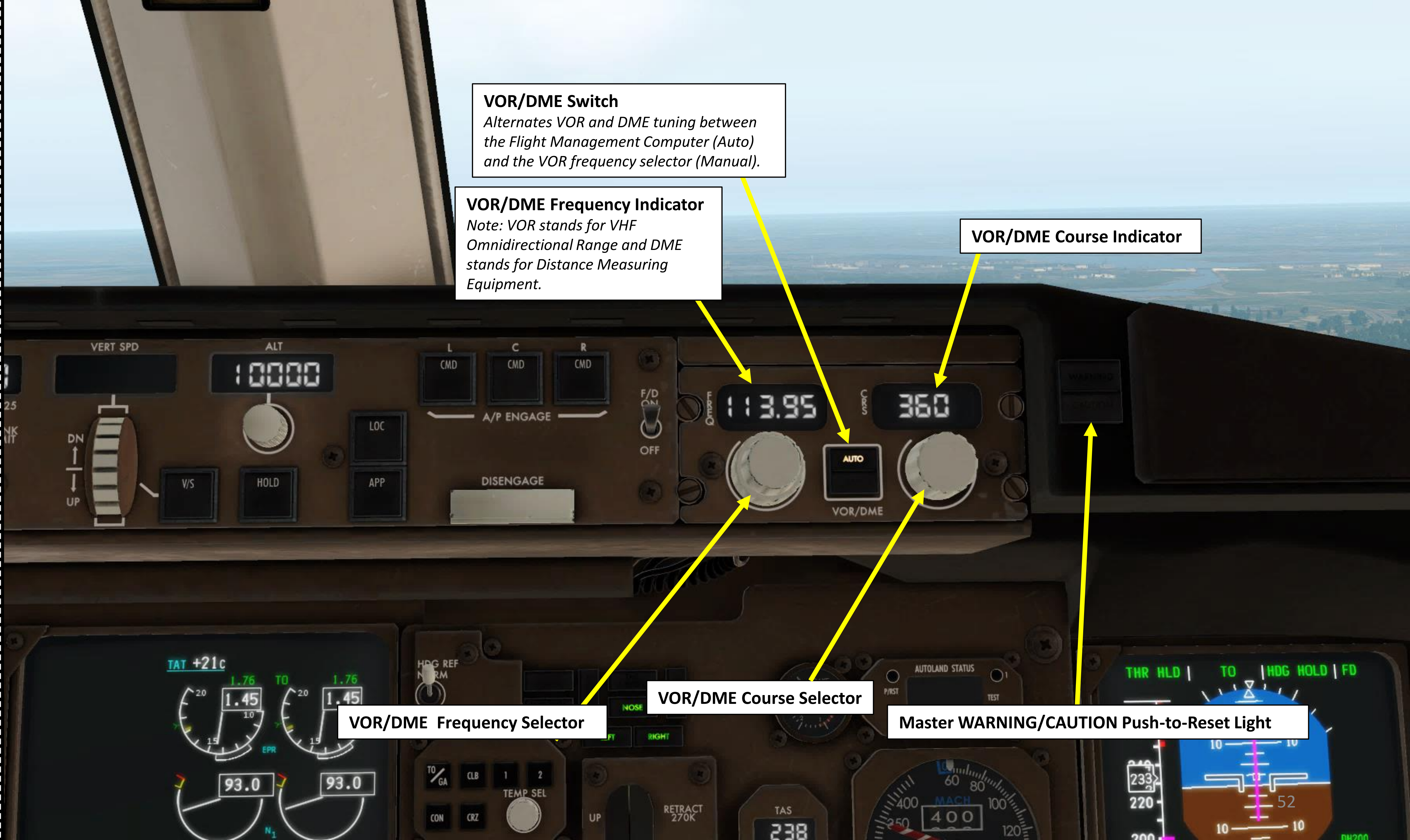

VHF Radio Panel
ATC & TCAS (Air Traffic Control Transponder & Traffic Collision Avoidance System) Control Panel
VHF Radio Panel
Audio Control Panel
Audio Control Panel
MIC. SELECTOR
RUDDER TRIM

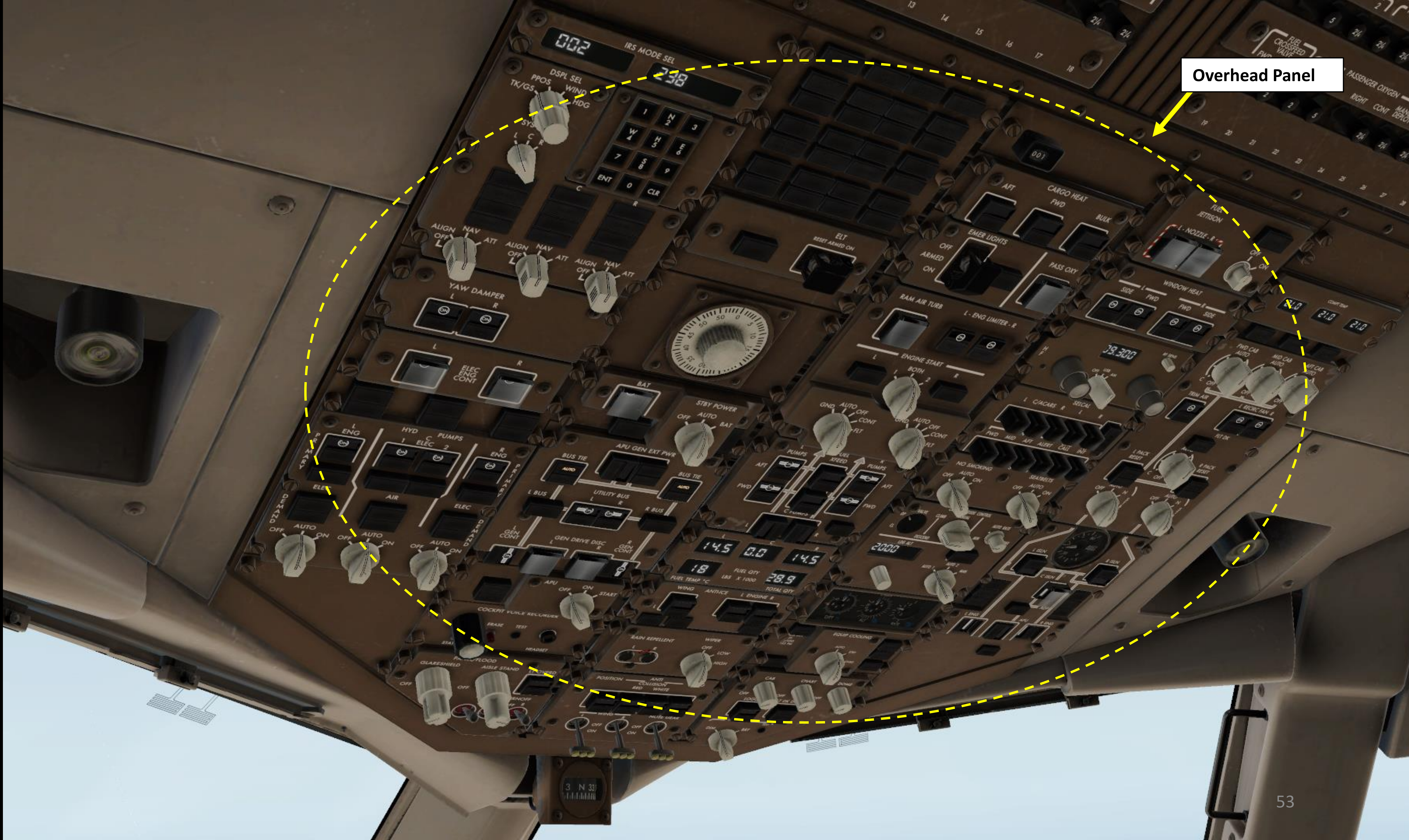

ILS Test Button
ILS (Instrument Landing System) Frequency Control
ILS Front Course Indicator
Printer PPR ADV Switch
Printer Self Test Switch
ILS Front Course Control
Printer Power Button
Printer Alert/Reset Switch
ADF (Automatic Direction Finder) Panel
ILS (Instrument Landing System) Frequency Display
Printer Busy Light
VHF Radio Panel
Rudder Trim Indicator
ACARS (Aircraft Communications Addressing and Reporting System) Data Printer
Wheel Well Fire/Overheat Test Button
Engine/APU/Cargo Fire/Overheat Test Button
Fault Monitoring System Fail (Push-to-Reset)
Aileron Trim Controls
Rudder Trim Control

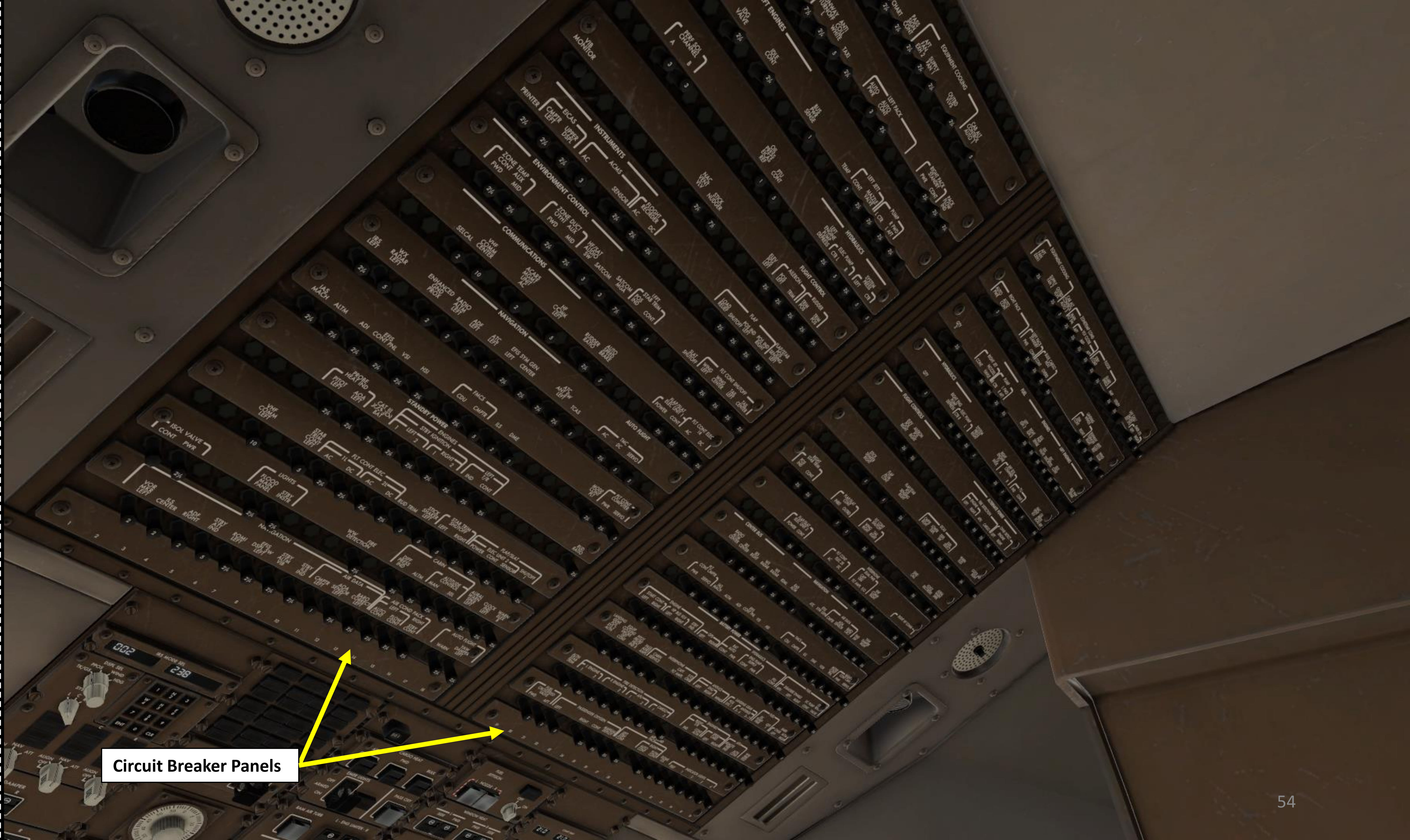

MCP (Mode Control Panel)
Autopilot Controls

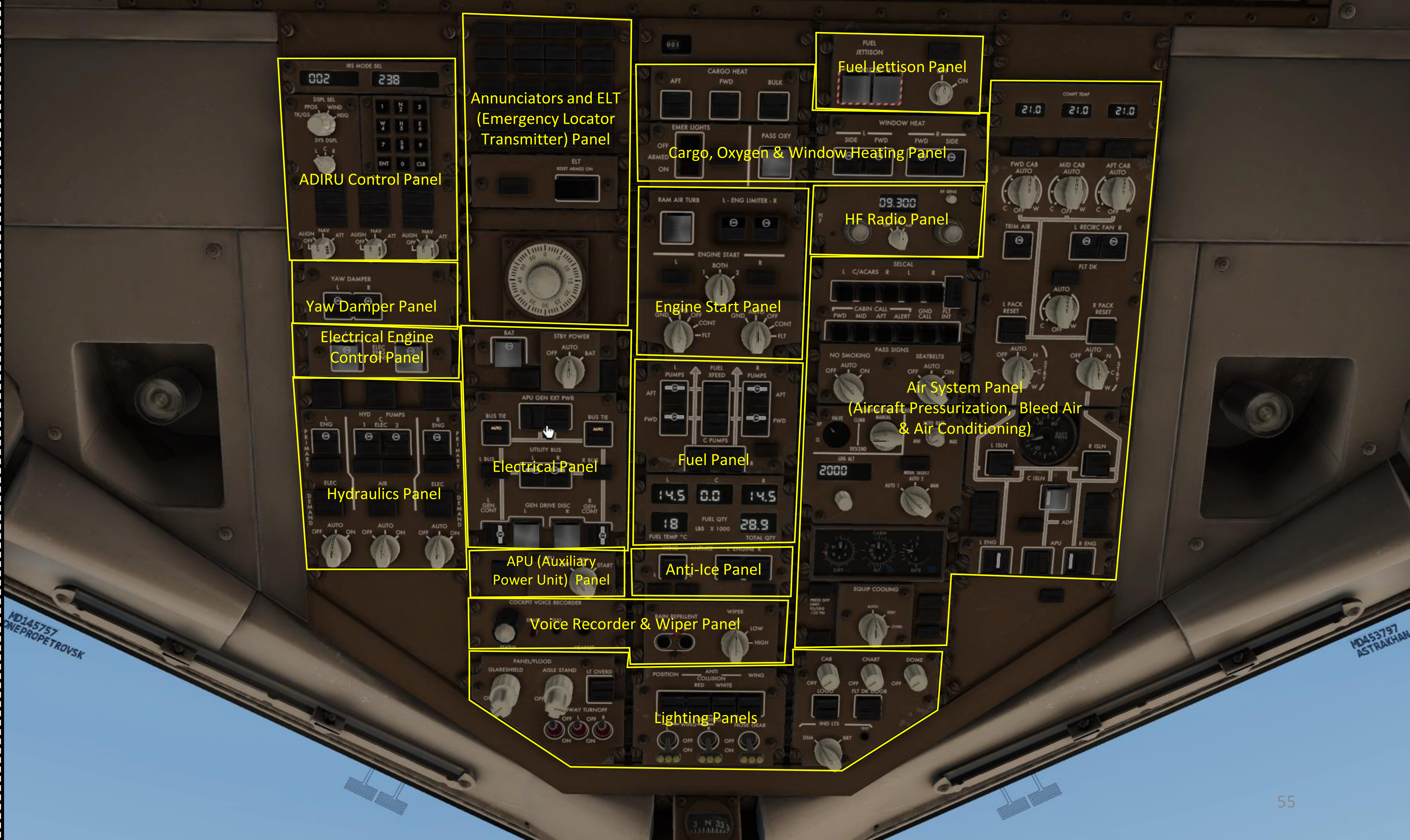

VOR/DME Switch
Alternates VOR and DME tuning between the Flight Management Computer (Auto) and the VOR frequency selector (Manual).
VOR/DME Course Indicator
Flight Director (F/D) Switch
VOR/DME Frequency Indicator
Note: VOR stands for VHF Omnidirectional Range and DME stands for Distance Measuring Equipment.
Autothrottle (A/T) Arming Switch
Autopilot Reference Speed (IAS or Mach) Selector
Autopilot Speed (IAS or Mach) Selected Indicator
Autopilot LNAV (Lateral Navigation) pushbutton
Autopilot VNAV (Vertical Navigation) pushbutton
Autopilot Selected Heading Indicator
Autopilot Heading Selector (Inner Knob)
Autopilot Bank Angle Limit Selector (Outer Knob)
Autopilot Heading Hold Mode Button
Autopilot FLCH (Flight Level Change) Mode Button
Autopilot Speed (IAS or Mach) Selector
Autothrottle Speed Mode Button
Maintains airspeed selected
Autothrottle THR (EPR) Mode Button
Maintains reference Thrust/EPR (Engine Pressure Ratio) or N1 displayed on EICAS.
VOR/DME Course Selector
VOR/DME Frequency Selector
Master WARNING/CAUTION Push-to-Reset Light
A/T ARM
OFF
F/D
ON
IAS/MACH
200
SEL
THR
SPD
L NAV
V NAV
FL CH
HDG
000
AUTO
BANK LIMIT
HOLD
VERT SPD
DN
ALT
10000
108.40
052
FREQ
CRS
AUTO
VOR/DME
AUTOLAND STATUS
CAUTION
CANCEL
RECALL
TO
HDG HOLD
FD
93.0
93.0
TRUE


Autopilot Selected Altitude Indicator (ft)
Autopilot (A/P) Engage Command Buttons (Left/Center/Right Channels)
Autopilot Localizer Mode Button
Autopilot Vertical Speed (ft/min)
Flight Director (F/D) Switch
Autopilot Disengage Bar
Autopilot Approach Mode Button
Autopilot Vertical Speed Thumbwheel selector
Autopilot Altitude Selector
Autopilot Vertical Speed Mode Button
Autopilot Altitude Hold Mode Button
A/T ARM
IAS/MACH
HDG
VERT SPD
ALT
L NAV
V NAV
FL CH
THR
SPD
SEL
HOLD
V/S
LOC
APP
CMD
A/P ENGAGE
DISENGAGE
BANK LIMIT
AUTO
F/D
ON
OFF
DN
UP
200
000
10000
113.95
CAUTION
CANCEL
TAT +21c

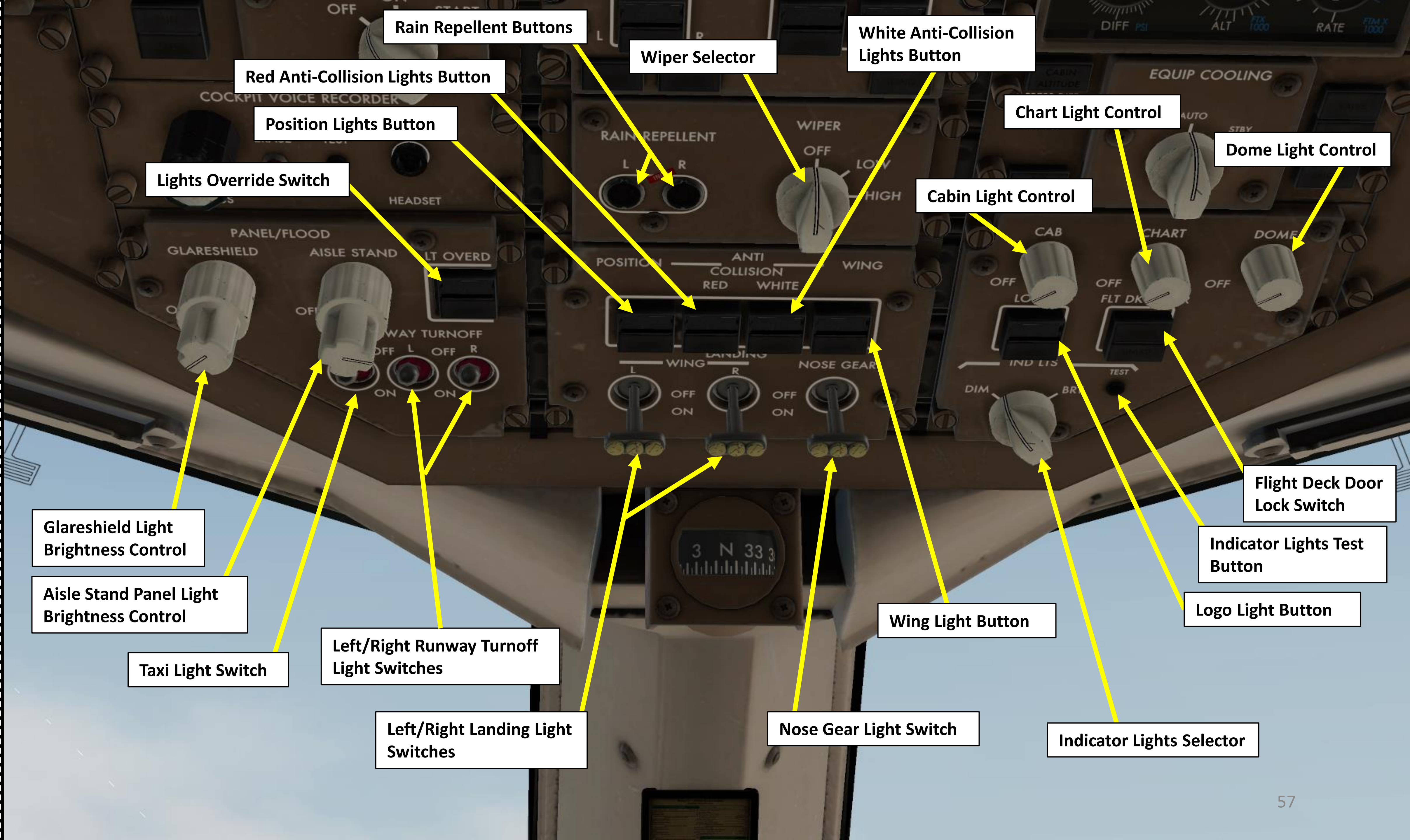

VOR/DME Switch
Alternates VOR and DME tuning between the Flight Management Computer (Auto) and the VOR frequency selector (Manual).
VOR/DME Frequency Indicator
Note: VOR stands for VHF Omnidirectional Range and DME stands for Distance Measuring Equipment.
VOR/DME Course Indicator
VOR/DME Frequency Selector
VOR/DME Course Selector
Master WARNING/CAUTION Push-to-Reset Light


Overhead Panel

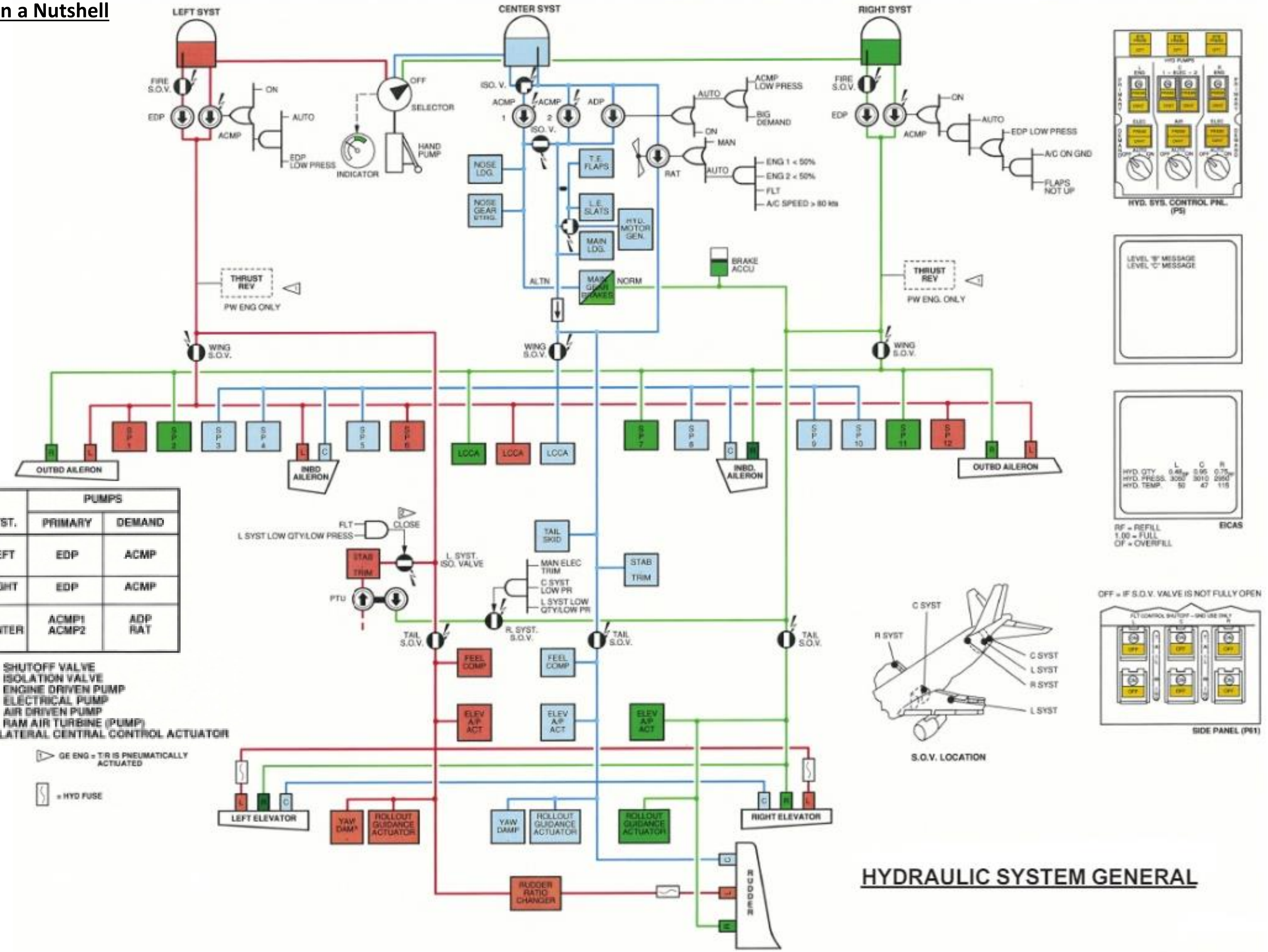

Circuit Breaker Panels


ADIRU Control Panel
Annunciators and ELT (Emergency Locator Transmitter) Panel
Cargo, Oxygen & Window Heating Panel
Fuel Jettison Panel
HF Radio Panel
Engine Start Panel
Yaw Damper Panel
Electrical Engine Control Panel
Hydraulics Panel
Electrical Panel
Fuel Panel
Air System Panel (Aircraft Pressurization, Bleed Air & Air Conditioning)
APU (Auxiliary Power Unit) Panel
Anti-Ice Panel
Voice Recorder & Wiper Panel
Lighting Panels


Standby Magnetic Compass
ERASE
TEST
HEADSET
L
R
INOP
OFF
LOW
HIGH
OVRD
PANEL/FLOOD
GLARESHIELD
AISLE STAND
LT OVERD
POSITION
ANTI
COLLISION
RED
WHITE
WING
CAB
CHART
DOME
OFF
OFF
OFF
LANDING
WING
NOSE GEAR
OFF
ON
OFF
ON
OFF
ON
IND LTS
TEST
DIM
BRT
3 N 33

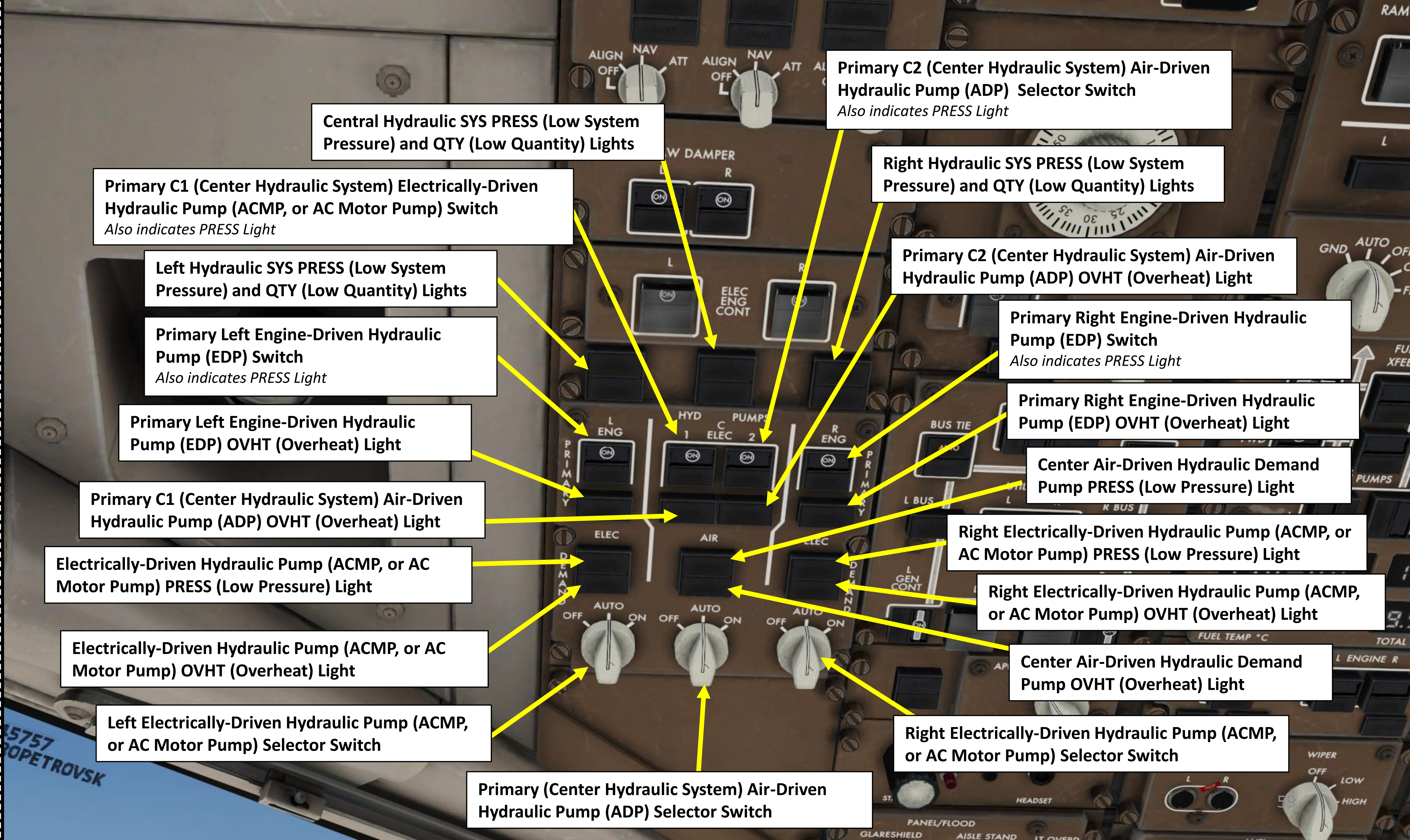

Rain Repellent Buttons
Red Anti-Collision Lights Button
Position Lights Button
Lights Override Switch
Wiper Selector
White Anti-Collision Lights Button
Chart Light Control
Dome Light Control
Cabin Light Control
Glareshield Light Brightness Control
Aisle Stand Panel Light Brightness Control
Taxi Light Switch
Left/Right Runway Turnoff Light Switches
Left/Right Landing Light Switches
Nose Gear Light Switch
Wing Light Button
Indicator Lights Selector
Logo Light Button
Indicator Lights Test Button
Flight Deck Door Lock Switch
COCKPIT VOICE RECORDER
HEADSET
PANEL/FLOOD
GLARESHIELD
AISLE STAND
LT OVERD
RAIN REPELLENT
WIPER
OFF
LOW
HIGH
POSITION
ANTI COLLISION
RED
WHITE
WING
NOSE GEAR
EQUIP COOLING
CAB
CHART
DOME
FLT DK
DIM
TEST

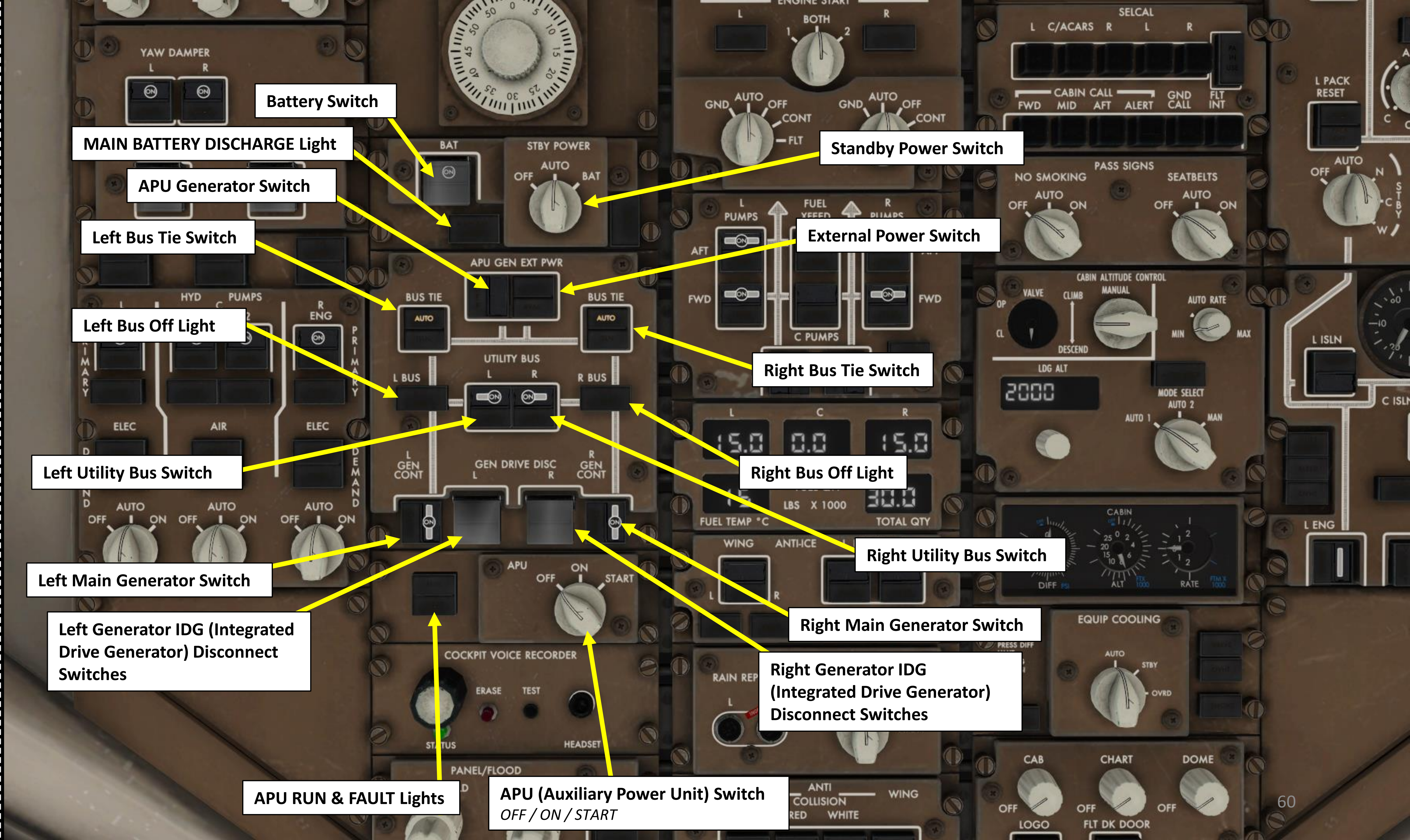
Hydraulic Systems in a Nutshell

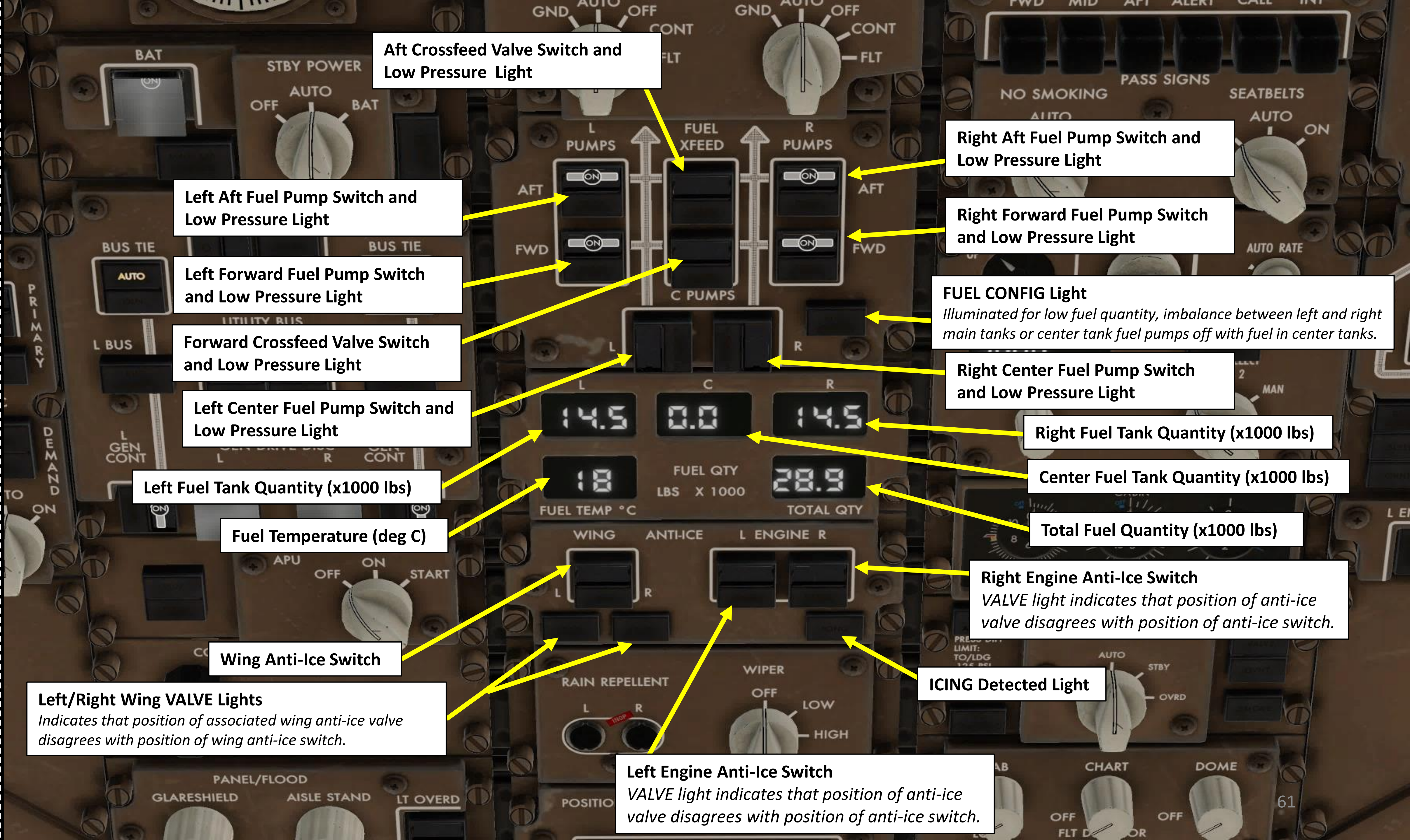


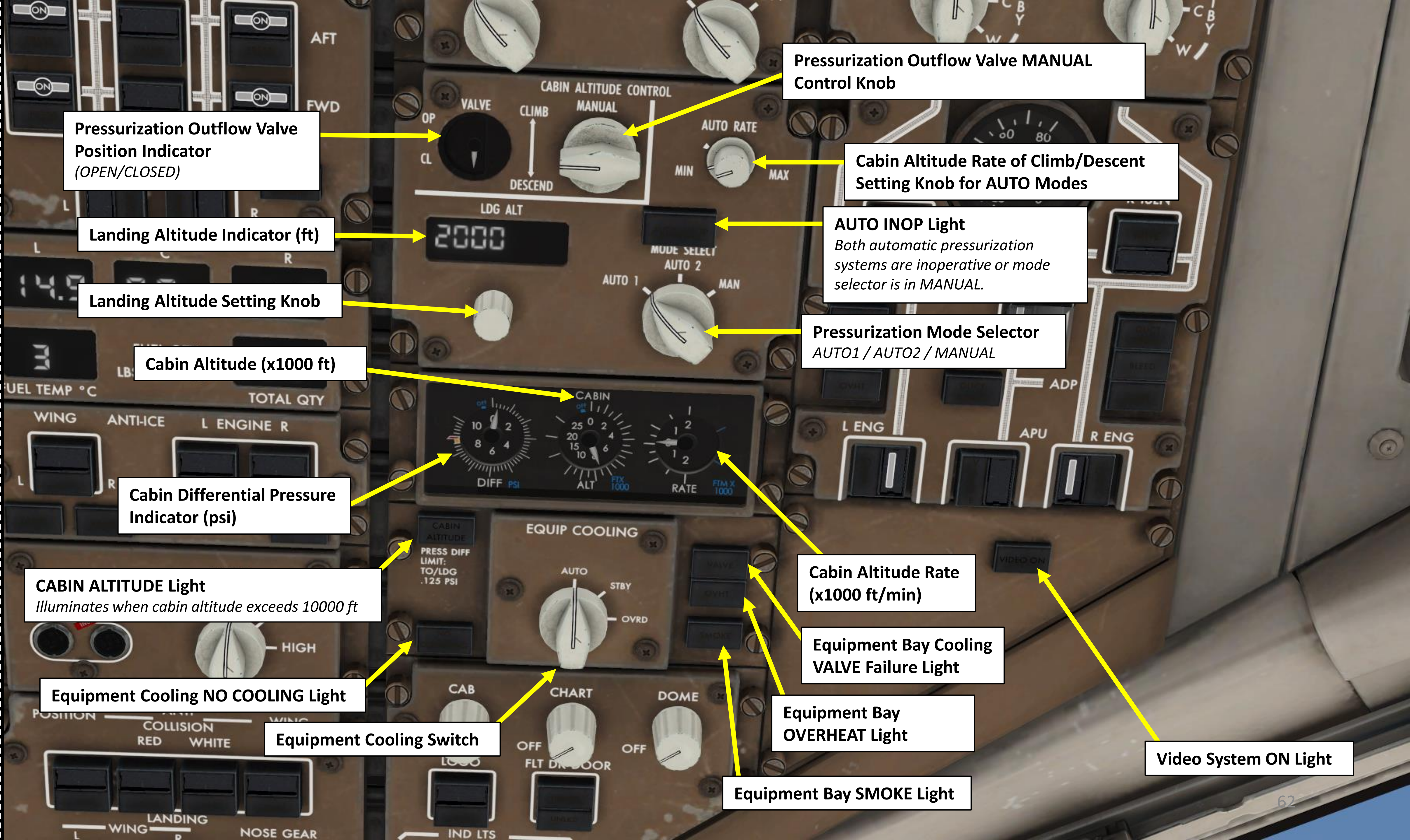
SYST.	PUMPS PRIMARY	PUMPS DEMAND
LEFT	EDP	ACMP
RIGHT	EDP	ACMP
CENTER	ACMP1 ACMP2	ADP RAT

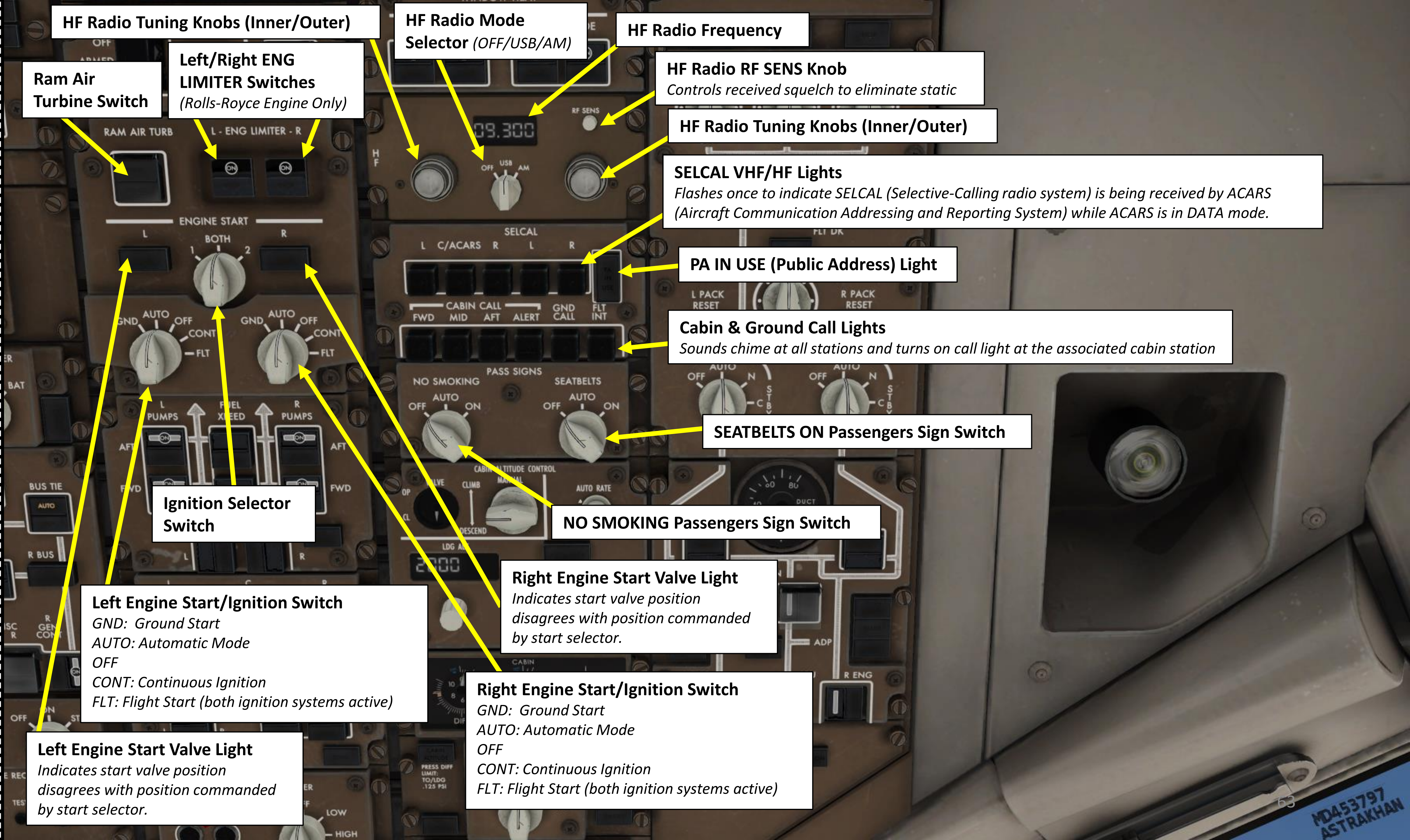
S.O.V. = SHUTOFF VALVE
ISOV = ISOLATION VALVE
EDP = ENGINE DRIVEN PUMP
ACMP = ELECTRICAL PUMP
ADP = AIR DRIVEN PUMP
RAT = RAM AIR TURBINE (PUMP)
LCCA= LATERAL CENTRAL CONTROL ACTUATOR

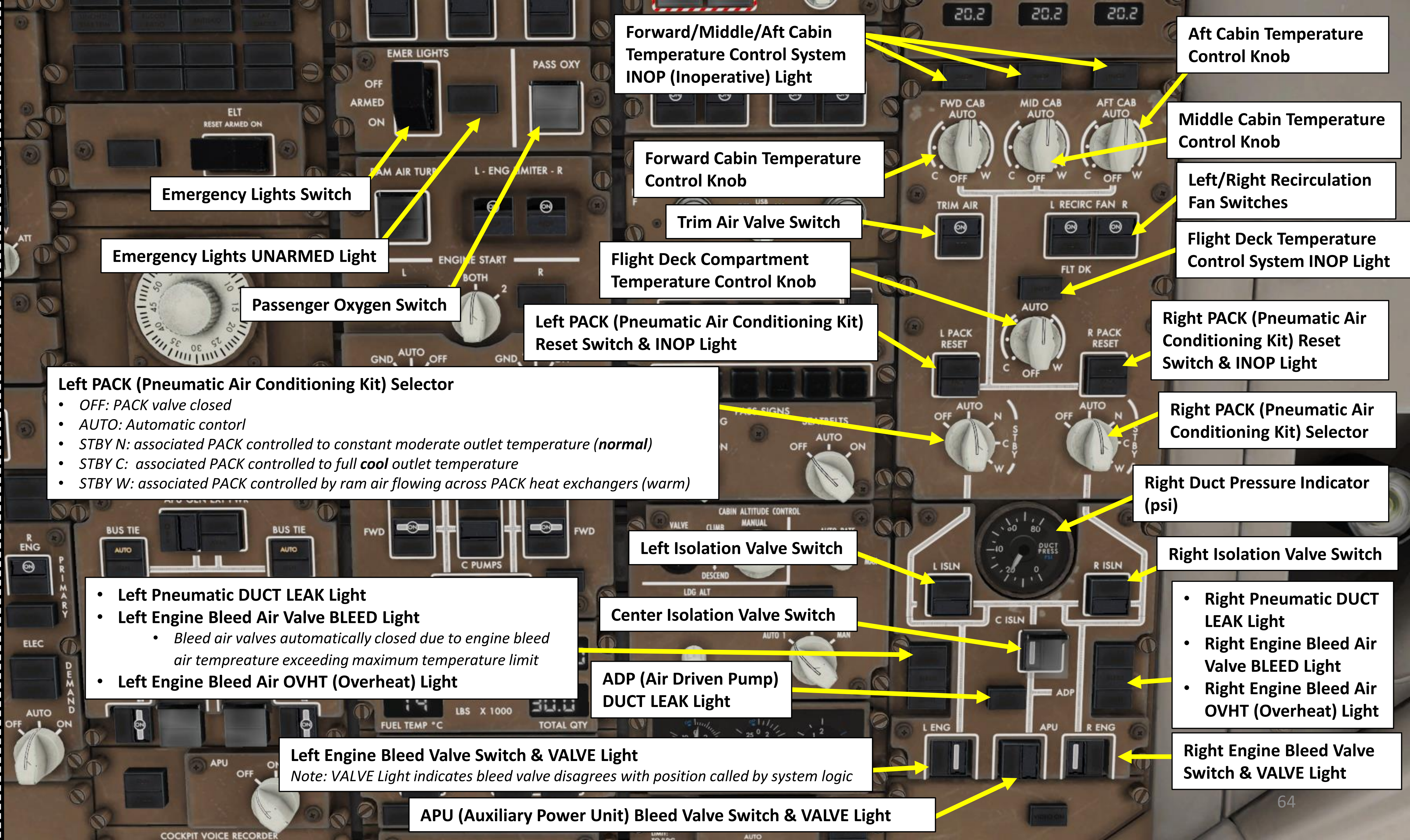

Primary C2 (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) Selector Switch
Also indicates PRESS Light
Central Hydraulic SYS PRESS (Low System Pressure) and QTY (Low Quantity) Lights
Right Hydraulic SYS PRESS (Low System Pressure) and QTY (Low Quantity) Lights
Primary C1 (Center Hydraulic System) Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Switch
Also indicates PRESS Light
Primary C2 (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) OVHT (Overheat) Light
Left Hydraulic SYS PRESS (Low System Pressure) and QTY (Low Quantity) Lights
Primary Right Engine-Driven Hydraulic Pump (EDP) Switch
Also indicates PRESS Light
Primary Left Engine-Driven Hydraulic Pump (EDP) Switch
Also indicates PRESS Light
Primary Right Engine-Driven Hydraulic Pump (EDP) OVHT (Overheat) Light
Primary Left Engine-Driven Hydraulic Pump (EDP) OVHT (Overheat) Light
Center Air-Driven Hydraulic Demand Pump PRESS (Low Pressure) Light
Primary C1 (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) OVHT (Overheat) Light
Right Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) PRESS (Low Pressure) Light
Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) PRESS (Low Pressure) Light
Right Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) OVHT (Overheat) Light
Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) OVHT (Overheat) Light
Center Air-Driven Hydraulic Demand Pump OVHT (Overheat) Light
Left Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Selector Switch
Right Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Selector Switch
Primary (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) Selector Switch


Battery Switch
MAIN BATTERY DISCHARGE Light
APU Generator Switch
Left Bus Tie Switch
Left Bus Off Light
Left Utility Bus Switch
Left Main Generator Switch
Left Generator IDG (Integrated Drive Generator) Disconnect Switches
APU RUN & FAULT Lights
APU (Auxiliary Power Unit) Switch
OFF / ON / START
Standby Power Switch
External Power Switch
Right Bus Tie Switch
Right Bus Off Light
Right Utility Bus Switch
Right Main Generator Switch
Right Generator IDG (Integrated Drive Generator) Disconnect Switches


Aft Crossfeed Valve Switch and Low Pressure Light
Left Aft Fuel Pump Switch and Low Pressure Light
Left Forward Fuel Pump Switch and Low Pressure Light
Forward Crossfeed Valve Switch and Low Pressure Light
Left Center Fuel Pump Switch and Low Pressure Light
Left Fuel Tank Quantity (x1000 lbs)
Fuel Temperature (deg C)
Wing Anti-Ice Switch
Left/Right Wing VALVE Lights
Indicates that position of associated wing anti-ice valve disagrees with position of wing anti-ice switch.
Right Aft Fuel Pump Switch and Low Pressure Light
Right Forward Fuel Pump Switch and Low Pressure Light
FUEL CONFIG Light
Illuminated for low fuel quantity, imbalance between left and right main tanks or center tank fuel pumps off with fuel in center tanks.
Right Center Fuel Pump Switch and Low Pressure Light
Right Fuel Tank Quantity (x1000 lbs)
Center Fuel Tank Quantity (x1000 lbs)
Total Fuel Quantity (x1000 lbs)
Right Engine Anti-Ice Switch
VALVE light indicates that position of anti-ice valve disagrees with position of anti-ice switch.
ICING Detected Light
Left Engine Anti-Ice Switch
VALVE light indicates that position of anti-ice valve disagrees with position of anti-ice switch.
FUEL XFEED
L PUMPS
R PUMPS
AFT
FWD
C PUMPS
FUEL QTY
LBS X 1000
FUEL TEMP °C
TOTAL QTY
14.5
0.0
14.5
18
28.9
WING
ANTI-ICE
L ENGINE R
WIPER
RAIN REPELLENT
PASS SIGNS
NO SMOKING
SEATBELTS
STBY POWER
BAT
BUS TIE


Pressurization Outflow Valve MANUAL Control Knob
Pressurization Outflow Valve Position Indicator
(OPEN/CLOSED)
Cabin Altitude Rate of Climb/Descent Setting Knob for AUTO Modes
Landing Altitude Indicator (ft)
AUTO INOP Light
Both automatic pressurization systems are inoperative or mode selector is in MANUAL.
Landing Altitude Setting Knob
Pressurization Mode Selector
AUTO1 / AUTO2 / MANUAL
Cabin Altitude (x1000 ft)
Cabin Differential Pressure Indicator (psi)
CABIN ALTITUDE Light
Illuminates when cabin altitude exceeds 10000 ft
Cabin Altitude Rate (x1000 ft/min)
Equipment Bay Cooling VALVE Failure Light
Equipment Cooling NO COOLING Light
Equipment Bay OVERHEAT Light
Equipment Cooling Switch
Video System ON Light
Equipment Bay SMOKE Light
CABIN ALTITUDE CONTROL
VALVE
OP
CL
CLIMB
DESCEND
MANUAL
AUTO RATE
MIN
MAX
LDG ALT
2000
MODE SELECT
AUTO 1
AUTO 2
MAN
CABIN
DIFF
ALT
RATE
EQUIP COOLING
AUTO
STBY
OVRD
PRESS DIFF LIMIT: TO/LDG .125 PSI
AFT
FWD
FUEL TEMP °C
TOTAL QTY
WING
ANTI-ICE
L ENGINE R
ADP
L ENG
APU
R ENG
CAB
CHART
DOME
OFF
FLT DK DOOR
COLLISION
RED
WHITE
LANDING
NOSE GEAR
IND LTS


HF Radio Tuning Knobs (Inner/Outer)
HF Radio Mode Selector (OFF/USB/AM)
HF Radio Frequency
HF Radio RF SENS Knob
Controls received squelch to eliminate static
HF Radio Tuning Knobs (Inner/Outer)
Ram Air Turbine Switch
Left/Right ENG LIMITER Switches (Rolls-Royce Engine Only)
SELCAL VHF/HF Lights
Flashes once to indicate SELCAL (Selective-Calling radio system) is being received by ACARS (Aircraft Communication Addressing and Reporting System) while ACARS is in DATA mode.
PA IN USE (Public Address) Light
Cabin & Ground Call Lights
Sounds chime at all stations and turns on call light at the associated cabin station
SEATBELTS ON Passengers Sign Switch
NO SMOKING Passengers Sign Switch
Ignition Selector Switch
Right Engine Start Valve Light
Indicates start valve position disagrees with position commanded by start selector.
Left Engine Start/Ignition Switch
GND: Ground Start
AUTO: Automatic Mode
OFF
CONT: Continuous Ignition
FLT: Flight Start (both ignition systems active)
Right Engine Start/Ignition Switch
GND: Ground Start
AUTO: Automatic Mode
OFF
CONT: Continuous Ignition
FLT: Flight Start (both ignition systems active)
Left Engine Start Valve Light
Indicates start valve position disagrees with position commanded by start selector.
RAM AIR TURB
L - ENG LIMITER - R
ENGINE START
BOTH
SELCAL
PASS SIGNS
NO SMOKING
SEATBELTS
CABIN ALTITUDE CONTROL



Forward/Middle/Aft Cabin Temperature Control System INOP (Inoperative) Light

Aft Cabin Temperature Control Knob

Middle Cabin Temperature Control Knob

Forward Cabin Temperature Control Knob

Left/Right Recirculation Fan Switches

Trim Air Valve Switch

Flight Deck Temperature Control System INOP Light

Flight Deck Compartment Temperature Control Knob

Emergency Lights Switch

Emergency Lights UNARMED Light

Passenger Oxygen Switch

Left PACK (Pneumatic Air Conditioning Kit) Reset Switch & INOP Light

Right PACK (Pneumatic Air Conditioning Kit) Reset Switch & INOP Light

Left PACK (Pneumatic Air Conditioning Kit) Selector

- *OFF: PACK valve closed*
- *AUTO: Automatic contorl*
- *STBY N: associated PACK controlled to constant moderate outlet temperature (**normal**)*
- *STBY C: associated PACK controlled to full **cool** outlet temperature*
- *STBY W: associated PACK controlled by ram air flowing across PACK heat exchangers (warm)*

Right PACK (Pneumatic Air Conditioning Kit) Selector

Right Duct Pressure Indicator (psi)

Left Isolation Valve Switch

Right Isolation Valve Switch

- Left Pneumatic DUCT LEAK Light
- Left Engine Bleed Air Valve BLEED Light
  - *Bleed air valves automatically closed due to engine bleed air tempreature exceeding maximum temperature limit*
- Left Engine Bleed Air OVHT (Overheat) Light

Center Isolation Valve Switch

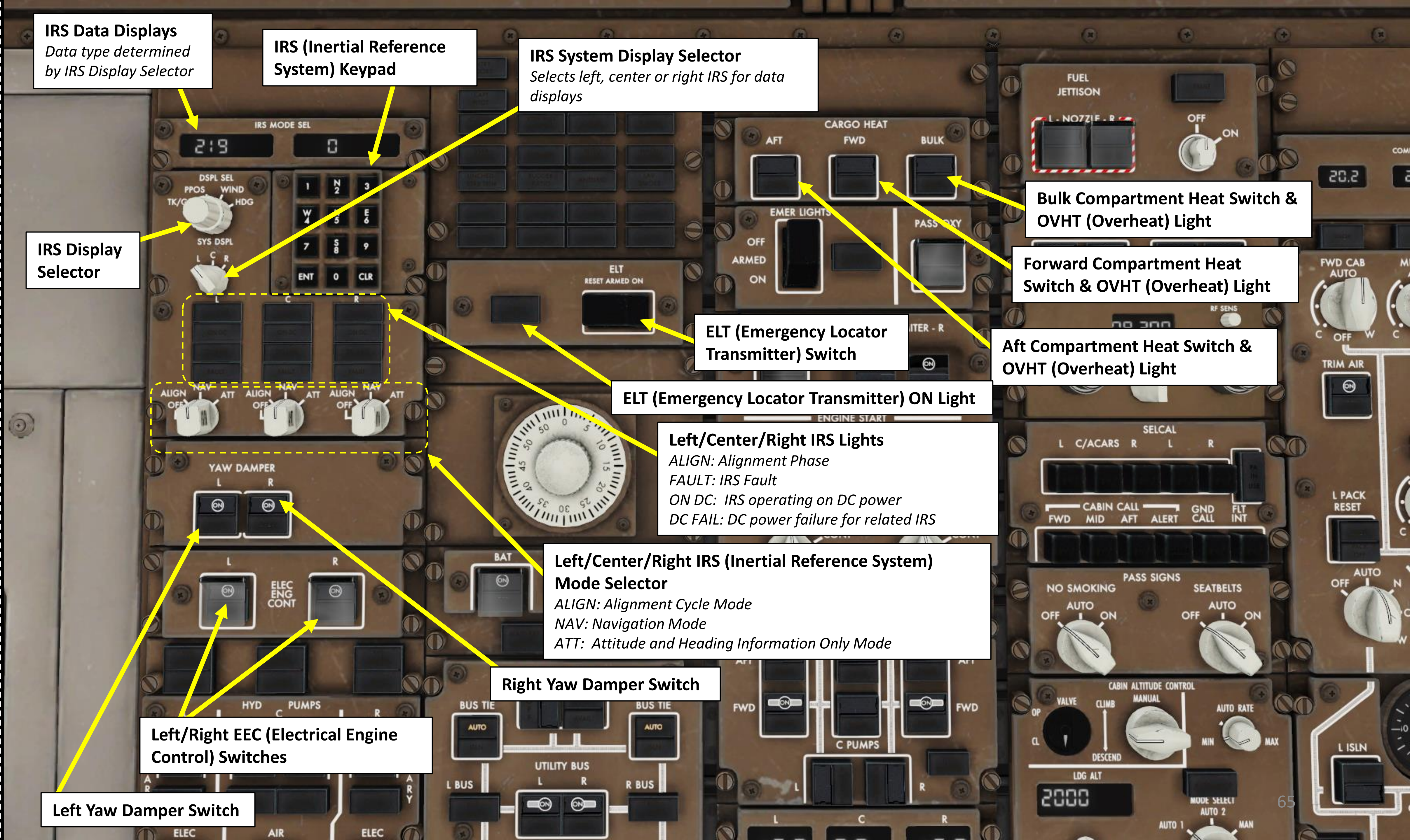
- Right Pneumatic DUCT LEAK Light
- Right Engine Bleed Air Valve BLEED Light
- Right Engine Bleed Air OVHT (Overheat) Light

ADP (Air Driven Pump) DUCT LEAK Light

Left Engine Bleed Valve Switch & VALVE Light
Note: VALVE Light indicates bleed valve disagrees with position called by system logic

Right Engine Bleed Valve Switch & VALVE Light

APU (Auxiliary Power Unit) Bleed Valve Switch & VALVE Light

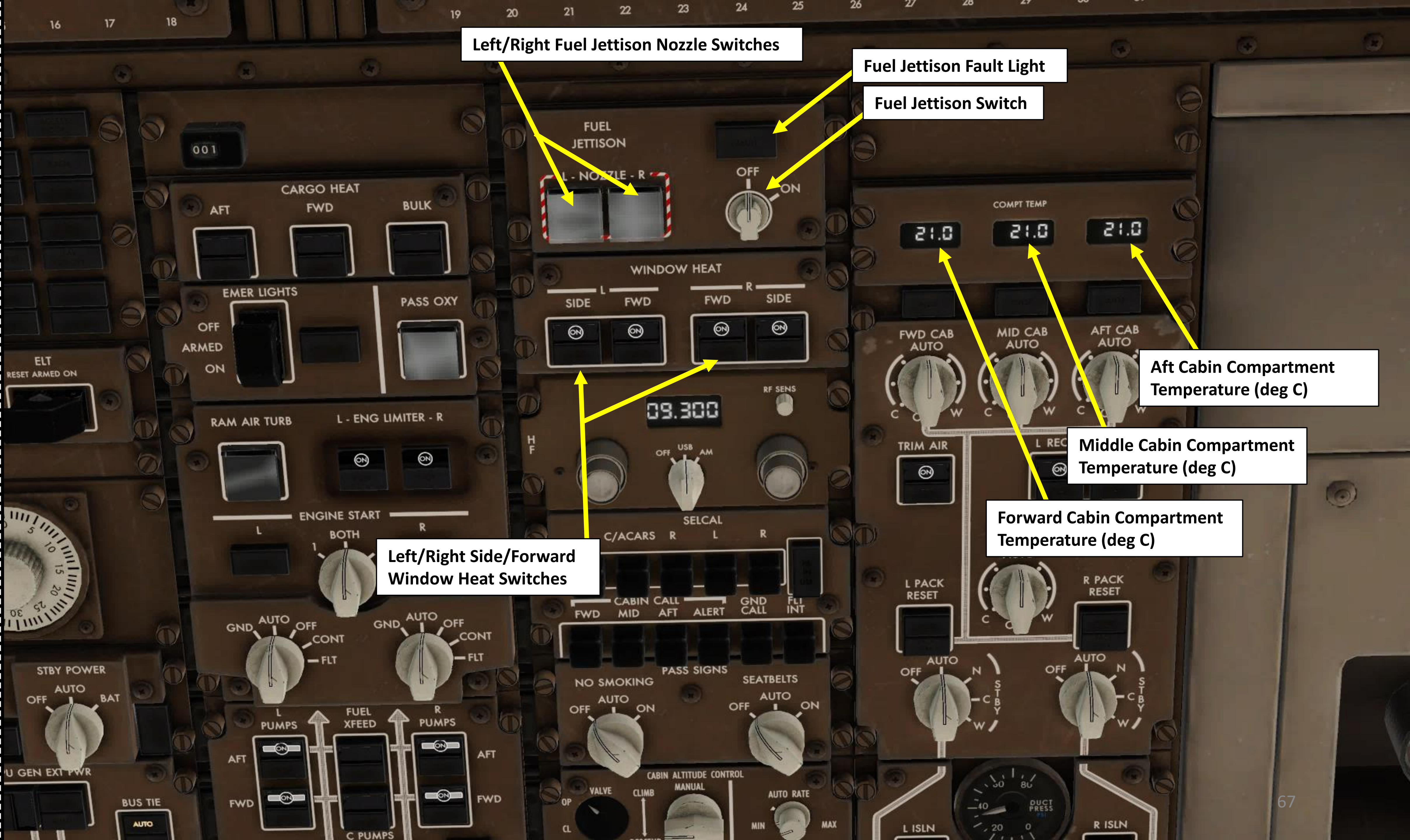

IRS Data Displays
Data type determined by IRS Display Selector
IRS (Inertial Reference System) Keypad
IRS System Display Selector
Selects left, center or right IRS for data displays
IRS Display Selector
Bulk Compartment Heat Switch & OVHT (Overheat) Light
Forward Compartment Heat Switch & OVHT (Overheat) Light
ELT (Emergency Locator Transmitter) Switch
Aft Compartment Heat Switch & OVHT (Overheat) Light
ELT (Emergency Locator Transmitter) ON Light
Left/Center/Right IRS Lights
ALIGN: Alignment Phase
FAULT: IRS Fault
ON DC: IRS operating on DC power
DC FAIL: DC power failure for related IRS
Left/Center/Right IRS (Inertial Reference System) Mode Selector
ALIGN: Alignment Cycle Mode
NAV: Navigation Mode
ATT: Attitude and Heading Information Only Mode
Right Yaw Damper Switch
Left/Right EEC (Electrical Engine Control) Switches
Left Yaw Damper Switch

Advisories

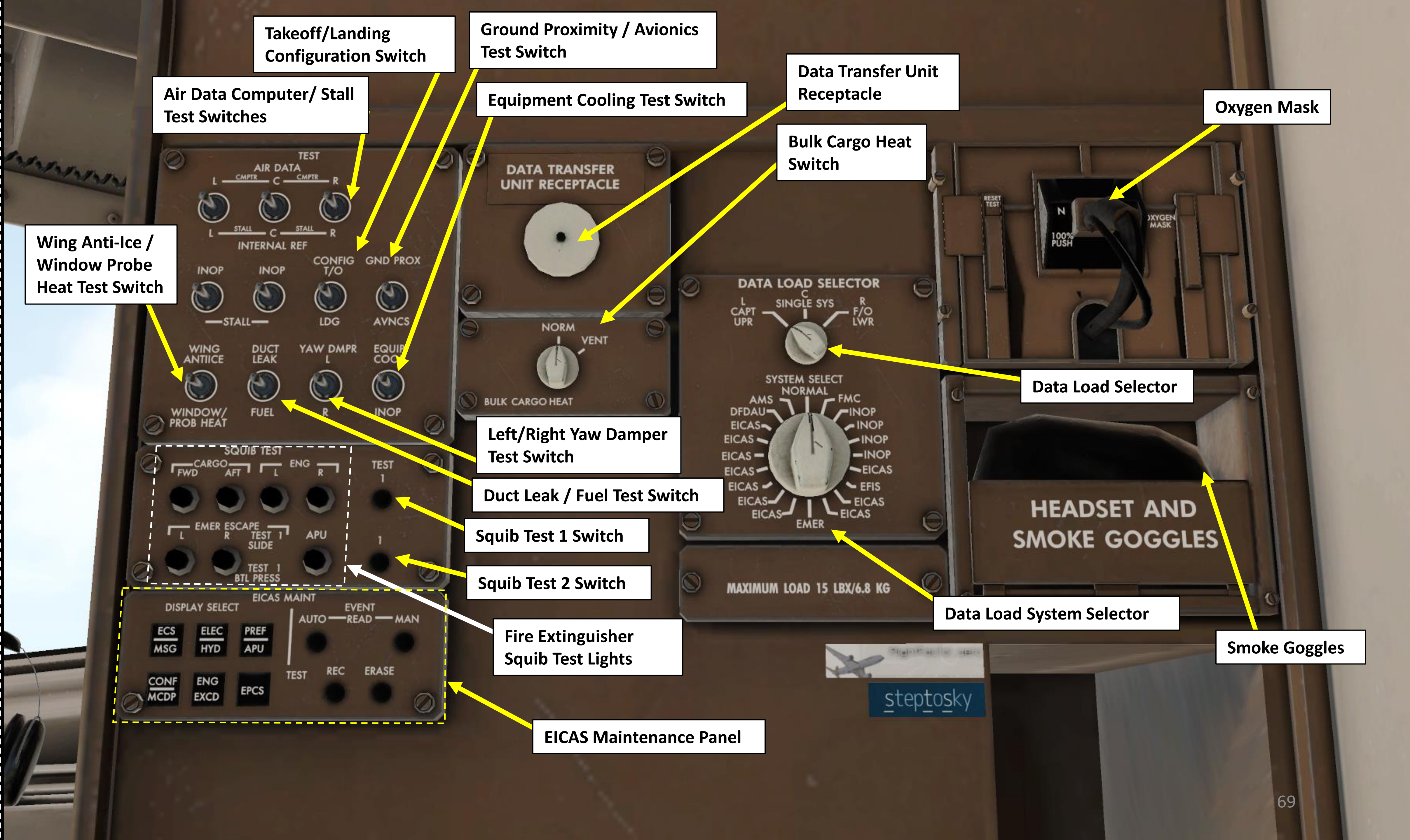
ENTRY DOORS Entry Doors Open	**EMER DOORS** Emergency Doors Open	**CARGO DOORS** Cargo Doors Open	**ACCESS DOORS** Access Doors Open
CAPT PITOT Captain side pitot probe not being heated in flight	**FO PITOT** First officer side pitot probe not being heated in flight	**L AOA** Left angle of attack probe not being heated in flight	**R AOA** Right angle of attack probe not being heated in flight
C ADIRU PITOT Center ADIRU pitot probe not being heated in flight	**STBY INST PITOT** Standby instrument pitot probe not being heated in flight	**L TAT** Left total air temperature probe not being heated in flight	**R TAT** Left total air temperature probe not being heated in flight
STAB TRIM Electric or alternate stabilizer trim rate is one-half the normal control wheel stabilizer trim switch rate	**SPOILERS** One or more spoiler pairs are inoperative	**AUTO SPD BRK** Fault detected in automatic speed brake system	**MACH SPD TRIM** Fault detected in Mach speed trim system
UNSCHED STAB TRIM Unscheduled stabilizer motion detected	**RUDDER RATIO** Rudder ratio system failed	**ANTISKID** Fault detected in anti-skid system	**LAV SMOKE** Smoke detected in lavatory

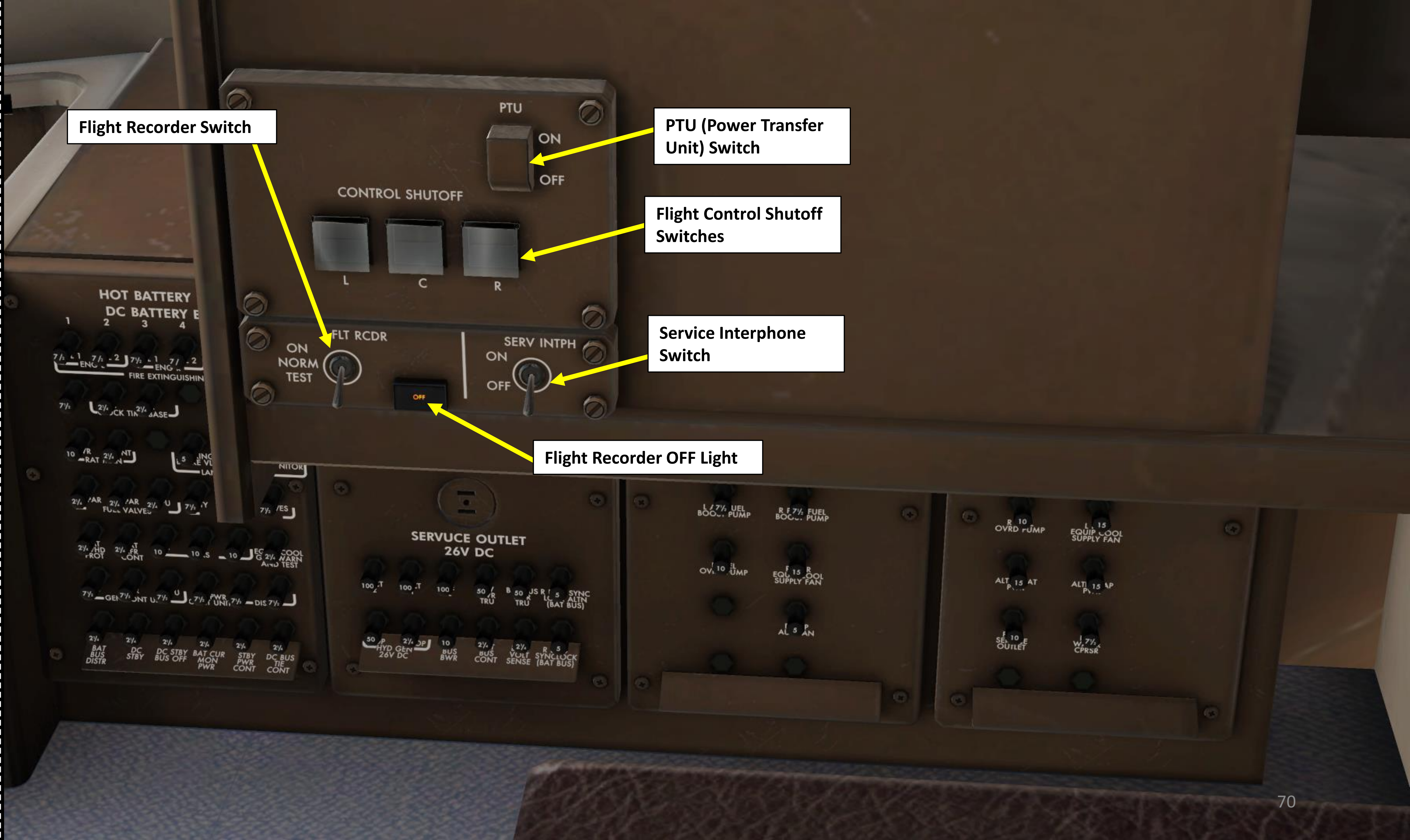
Timer
Mainly used to remind pilots about certain tasks (fuel re-balancing or position reports during transpacific or transatlantic flights)

PART 2 – COCKPIT LAYOUT

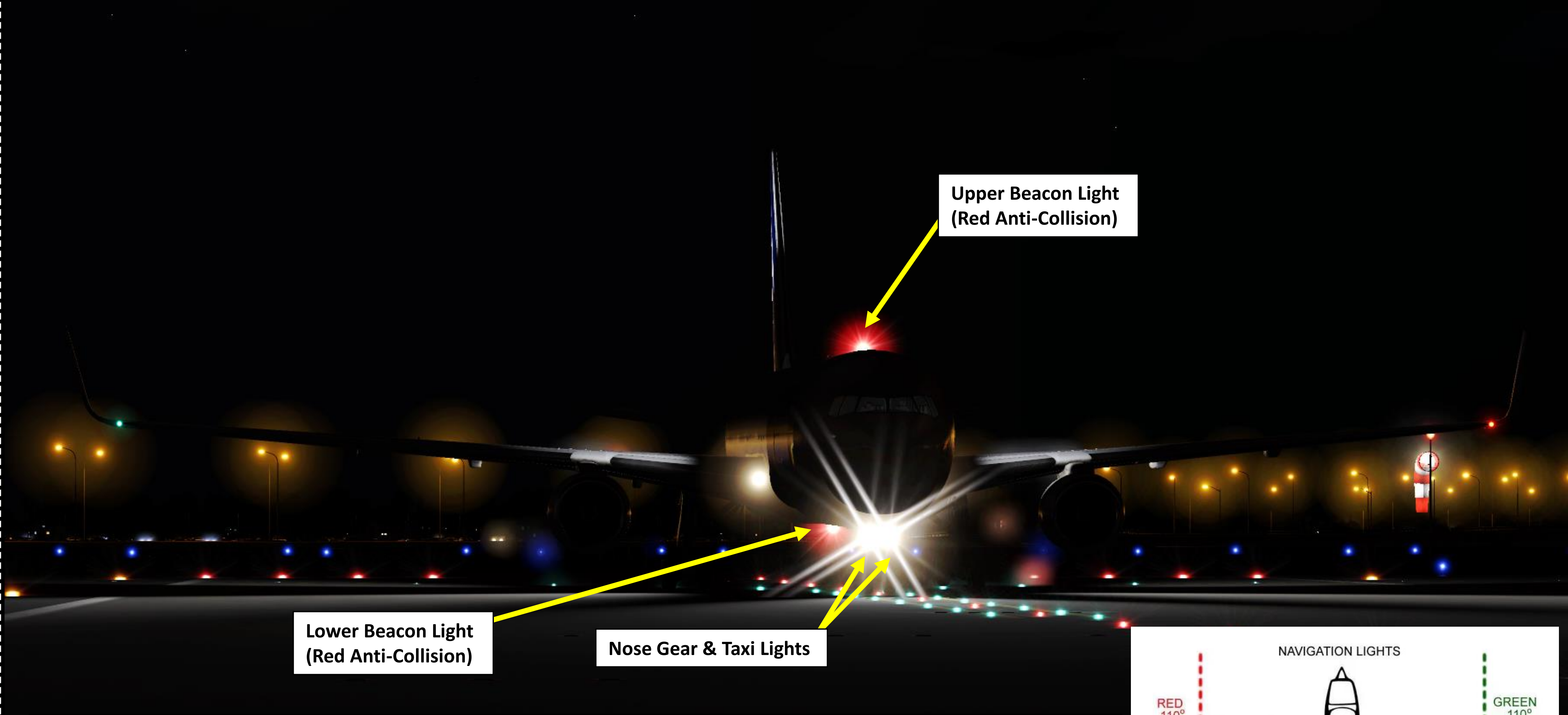


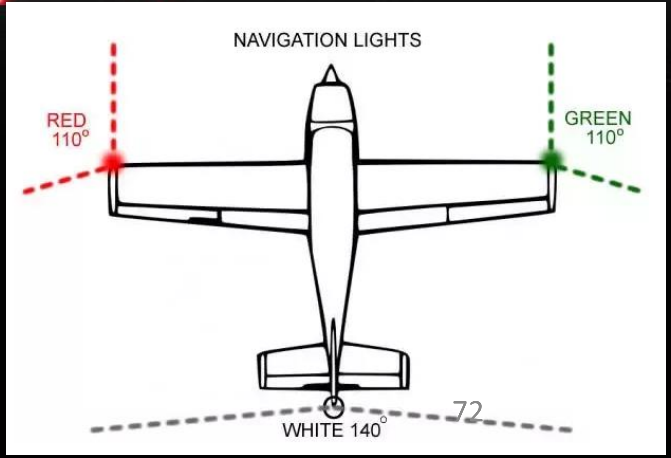

DATA TRANSFER
UNIT RECEPTACLE
TEST
AIR DATA
INTERNAL REF
INOP
CONFIG T/O
GND PROX
STALL
LDG
AVNCS
WING ANTIICE
DUCT LEAK
YAW DMPR
EQUIP COOL
WINDOW/ PROB HEAT
FUEL
SQUIB TEST
EMER ESCAPE
APU
EICAS MAINT
DISPLAY SELECT
ECS MSG
ELEC HYD
PERF APU
CONF MCDP
ENG EXCD
EPCS
AUTO
EVENT READ
MAN
REC
ERASE
NORM
VENT
BULK CARGO HEAT
DATA LOAD SELECTOR
SINGLE SYS
SYSTEM SELECT
NORMAL
EMER
MAXIMUM LOAD 15 LBX/6.8 KG
HEADSET AND
SMOKE GOGGLES
FLOTATION CUSHION
PULL TO REMOVE
PTU
ON
OFF
CONTROL SHUTOFF
FLT RCDR
SERV INTPH
HOT BATTERY
DC BATTERY
SERVUCE OUTLET
26V DC
steptosky


Takeoff/Landing Configuration Switch
Ground Proximity / Avionics Test Switch
Air Data Computer/ Stall Test Switches
Equipment Cooling Test Switch
Data Transfer Unit Receptacle
Oxygen Mask
Bulk Cargo Heat Switch
Wing Anti-Ice / Window Probe Heat Test Switch
Data Load Selector
Left/Right Yaw Damper Test Switch
Duct Leak / Fuel Test Switch
Squib Test 1 Switch
Squib Test 2 Switch
Fire Extinguisher Squib Test Lights
Data Load System Selector
Smoke Goggles
EICAS Maintenance Panel
DATA TRANSFER UNIT RECEPTACLE
DATA LOAD SELECTOR
SYSTEM SELECT
BULK CARGO HEAT
SQUIB TEST
EICAS MAINT
DISPLAY SELECT
MAXIMUM LOAD 15 LBX/6.8 KG
HEADSET AND SMOKE GOGGLES
steptosky


Flight Recorder Switch
PTU (Power Transfer Unit) Switch
Flight Control Shutoff Switches
Service Interphone Switch
Flight Recorder OFF Light
PTU
ON
OFF
CONTROL SHUTOFF
L
C
R
FLT RCDR
ON
NORM
TEST
OFF
SERV INTPH
ON
OFF
HOT BATTERY
SERVUCE OUTLET
26V DC

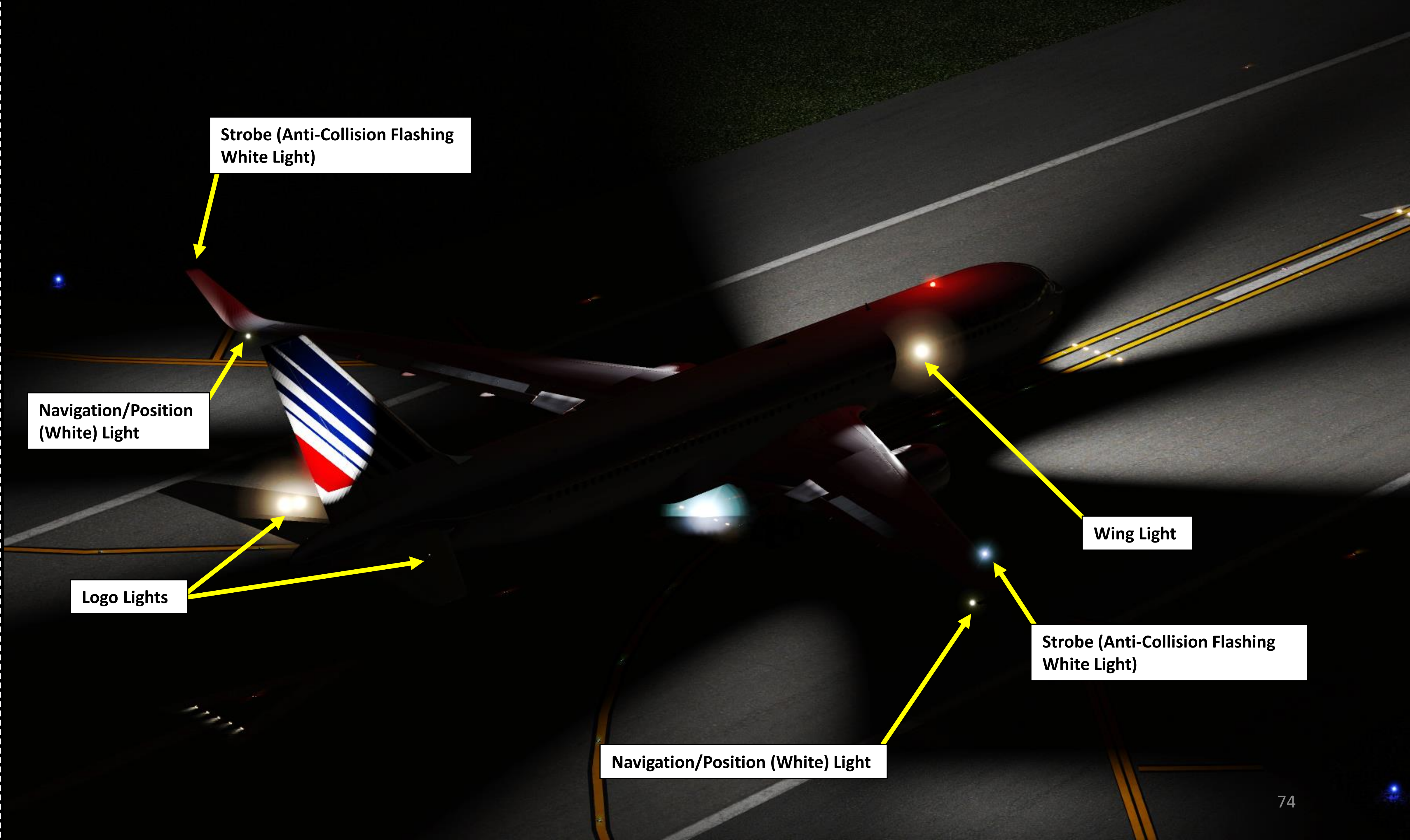

APU (Auxiliary Power Unit) Exhaust
W2 D→
F-GHGI





- **Landing** Lights: used to illuminate runway during landing
- **Runway Turnoff** Lights: used to aid the crew in seeing the turn in the taxiway/runway
- **Taxi** Lights: used to illuminate area in front of nosewheel during taxi
- **Beacon (Anti-Collision)** Lights: flashing red light used to prevent collisions and warn others that aircraft is active and engines are running
- **Navigation (Position)** Lights: red, green and white lights help you know the direction of an aircraft (red is on the left, green on the right, white on the tail).
- **Strobe (Anti-Collision)** Lights: pulsating white lights used when aircraft enters a runway in use to increase visibility
- **Wing** Lights: used to check wing at night (i.e. verify if there is ice accumulation on the wing)
- **Logo** Light: used to illuminate the airline's logo painted on the tail


Landing Wing Light
Runway Turnoff Light
Navigation/Position (Red) Light
Navigation/Position (Green) Light


Strobe (Anti-Collision Flashing White Light)
Navigation/Position (White) Light
Logo Lights
Wing Light
Strobe (Anti-Collision Flashing White Light)
Navigation/Position (White) Light

PLANNING THE FLIGHT

In real life, you cannot just fly a 767 wherever and whenever you please. Just like on land, the sky is littered with an intricate network of waypoints and aerial highways. Therefore, it is necessary to plan your flight route and to determine how much fuel you will need to carry in order to reach your destination.

In order to do this, we will use a tool called "Online Flight Planner" available here: http://onlineflightplanner.org/

There are a number of fuel planners available online. These estimates may or may not be very accurate. There are specific charts created by Boeing to come up with accurate fuel estimates which are unfortunately not available to the public. Therefore, for the sake of simplicity we will just use a rule of thumb that's good enough for the purpose of this tutorial.

Airways:

EHAM *SID* ***GORLO*** *UL980* ***LOGAN*** *STAR* ***EGLL***

Provided by RouteFinder

METAR:

Departure: EHAM 110225Z 33004KT 8000 NSC 12/11 Q1018 BECMG 7000
Destination: EGLL 110220Z AUTO 03005KT 360V070 9999 OVC009 14/12 Q1023 TEMPO BKN012

Provided by CheckWX API

Fuel quantity for Boeing 767-300

	Fuel	Time
Fuel Usage	9780 lbs	00:52
Reserve Fuel	14089 lbs	01:15
Fuel on Board	23868 lbs	02:07

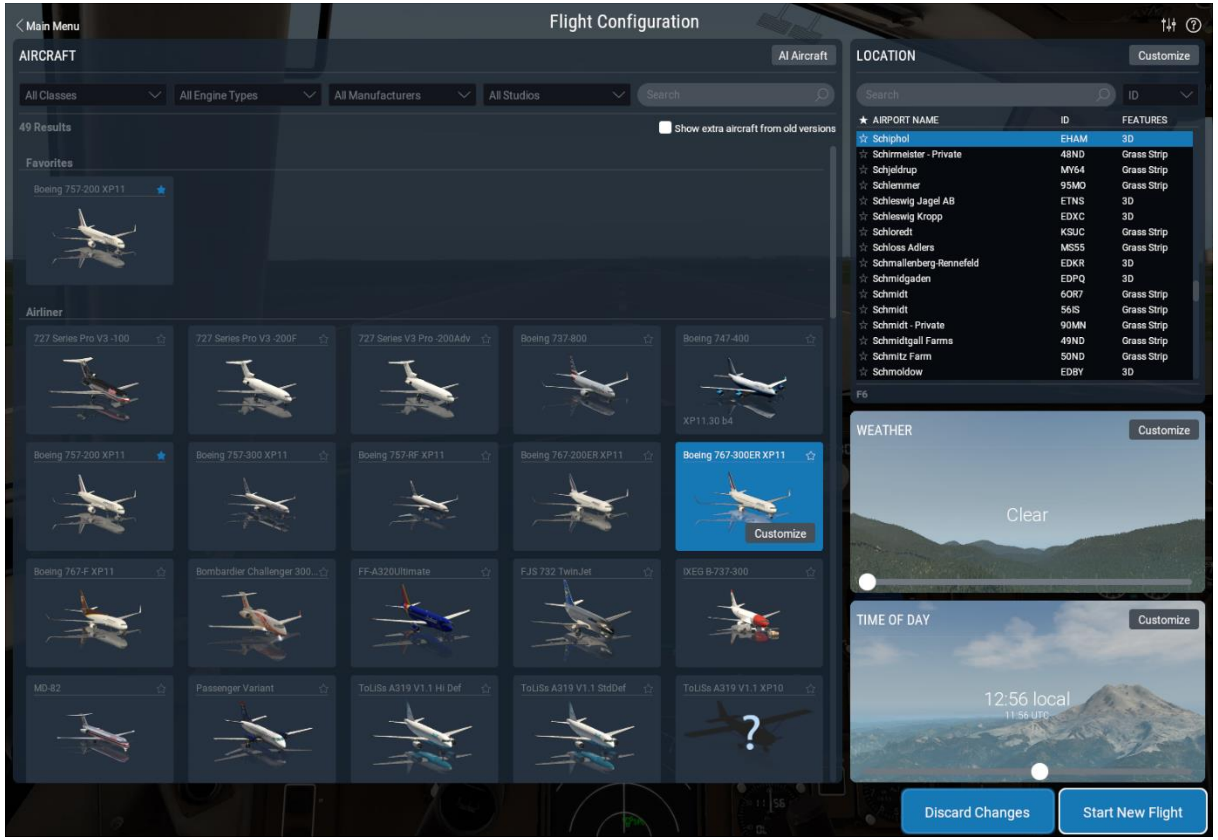
Provided by Fuelplanner.com

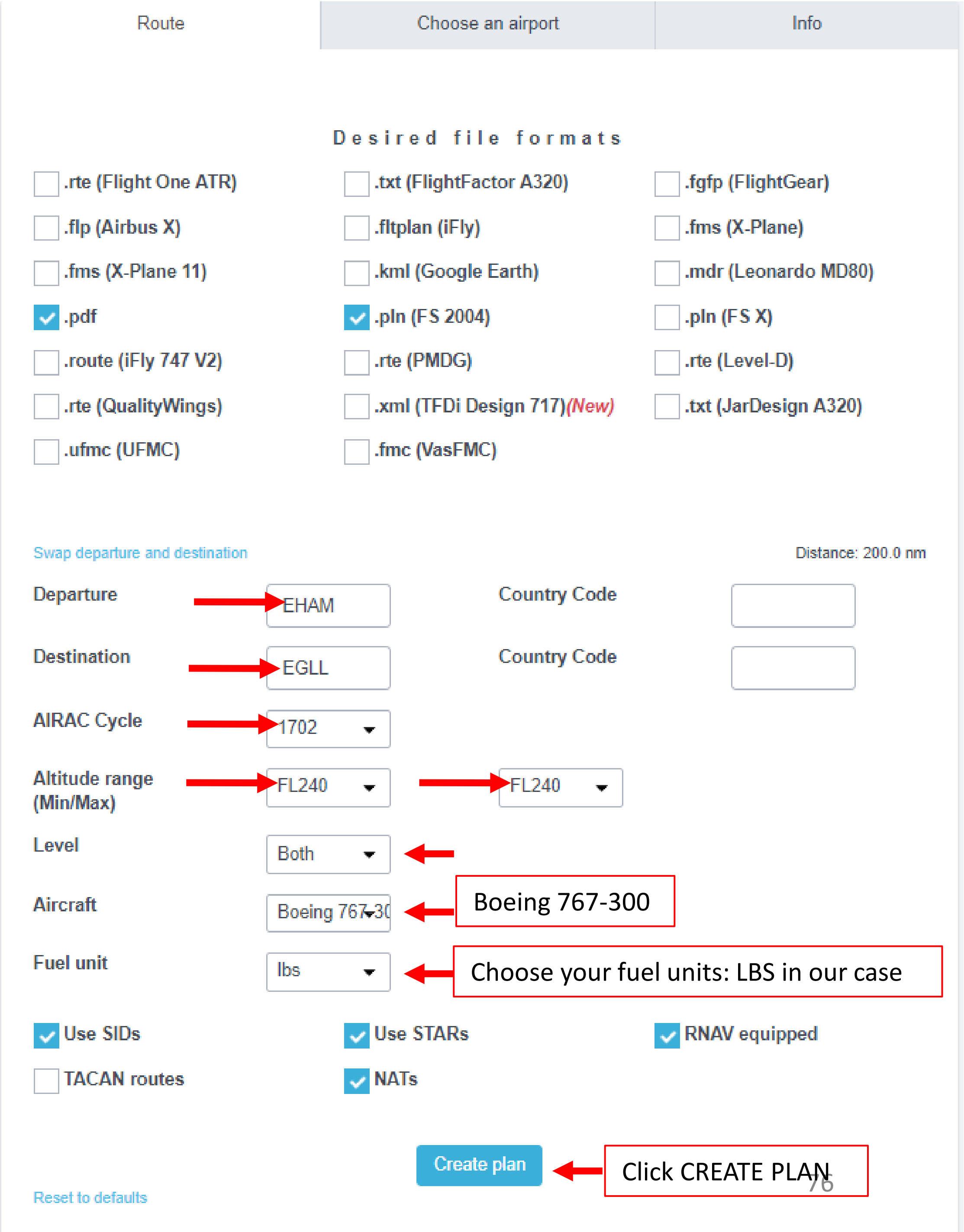
PLANNING THE FLIGHT

Today's flight will start from **AMSTERDAM-SCHIPHOL (EHAM)** and our destination will be **LONDON-HEATHROW (EGLL).**

Using the "Online Flight Planner" available here: http://onlineflightplanner.org/ we will enter the Departure airport (EHAM), the Destination airport (EGLL) and the AIRAC Cycle desired (we will use the **AIRAC cycle 1702** as explained on the next page).

Click on CREATE PLAN to generate a flight plan.





PLANNING THE FLIGHT

In aviation, an **Aeronautical Information Publication** (or **AIP**) is defined by the International Civil Aviation Organization as a publication issued by or with the authority of a state and containing aeronautical information of a lasting character essential to air navigation. It is designed to be a manual containing thorough details of regulations, procedures and other information pertinent to flying aircraft in the particular country to which it relates. It is usually issued by or on behalf of the respective civil aviation administration. AIPs are kept up-to-date by regular revision on a fixed cycle. For operationally significant changes in information, the cycle known as the **AIRAC (Aeronautical Information Regulation And Control)** cycle is used: revisions are produced every 56 days (double AIRAC cycle) or every 28 days (single AIRAC cycle). These changes are received well in advance so that users of the aeronautical data can update their flight management systems (FMS). (Source: https://en.wikipedia.org/wiki/Aeronautical_Information_Publication)

In other words, some Youtube tutorials might show you flight routes with certain waypoints that got changed with more recent AIRAC updates. Some waypoints or even airports may not exist anymore. Therefore, you have two options:

1. Plan your flight using the default AIRAC cycle programmed in the FMC when it was first coded by Flight Factor during early February, 2017 (period **02)** 20**17** (AIRAC cycle **1702**), which is what we will do for this tutorial. This option is free and simple if you fly alone. However, if you fly with online ATCs in multiplayer that use the latest AIRAC database, you should go for the second option.
2. Plan your flight using the latest AIRAC cycle. You will need to update your AIRAC, SID and STAR database by using a paid subscription service called "Navigraph", which is available here https://www.navigraph.com/FmsDataManualInstall.aspx .

AIRAC effective dates (28-day cycle) [edit]

The current AIRAC cycle is 1605 (effective 28 Apr 2016).

#	2003	2004*	2005	2006	2007	2008*	2009	2010	2011	2012*	2013	2014	2015	2016*	2017	2018	2019	2020*
01	23 Jan	22 Jan	20 Jan	19 Jan	18 Jan	17 Jan	15 Jan	14 Jan	13 Jan	12 Jan	10 Jan	9 Jan	8 Jan	7 Jan	5 Jan	4 Jan	3 Jan	2 Jan
02	20 Feb	19 Feb	17 Feb	16 Feb	15 Feb	14 Feb	12 Feb	11 Feb	10 Feb	9 Feb	7 Feb	6 Feb	5 Feb	4 Feb	2 Feb	1 Feb	31 Jan	30 Jan
03	20 Mar	18 Mar	17 Mar	16 Mar	15 Mar	13 Mar	12 Mar	11 Mar	10 Mar	8 Mar	7 Mar	6 Mar	5 Mar	3 Mar	2 Mar	1 Mar	28 Feb	27 Feb
04	17 Apr	15 Apr	14 Apr	13 Apr	12 Apr	10 Apr	9 Apr	8 Apr	7 Apr	05 Apr	4 Apr	3 Apr	2 Apr	31 Mar	30 Mar	29 Mar	28 Mar	26 Mar
05	15 May	13 May	12 May	11 May	10 May	8 May	7 May	6 May	5 May	03 May	2 May	1 May	30 Apr	28 Apr	27 Apr	26 Apr	25 Apr	23 Apr
06	12 Jun	10 Jun	9 Jun	8 Jun	7 Jun	5 Jun	4 Jun	3 Jun	2 Jun	31 May	30 May	29 May	28 May	26 May	25 May	24 May	23 May	21 May
07	10 Jul	8 Jul	7 Jul	6 Jul	5 Jul	3 Jul	2 Jul	1 Jul	30 Jun	28 Jun	27 Jun	26 Jun	25 Jun	23 Jun	22 Jun	21 Jun	20 Jun	18 Jun
08	7 Aug	05 Aug	4 Aug	3 Aug	2 Aug	31 Jul	30 Jul	29 Jul	28 Jul	26 Jul	25 Jul	24 Jul	23 Jul	21 Jul	20 Jul	19 Jul	18 Jul	16 Jul
09	4 Sep	02 Sep	1 Sep	31 Aug	30 Aug	28 Aug	27 Aug	26 Aug	25 Aug	23 Aug	22 Aug	21 Aug	20 Aug	18 Aug	17 Aug	16 Aug	15 Aug	13 Aug
10	2 Oct	30 Sep	29 Sep	28 Sep	27 Sep	25 Sep	24 Sep	23 Sep	22 Sep	20 Sep	19 Sep	18 Sep	17 Sep	15 Sep	14 Sep	13 Sep	12 Sep	10 Sep
11	30 Oct	28 Oct	27 Oct	26 Oct	25 Oct	23 Oct	22 Oct	21 Oct	20 Oct	18 Oct	17 Oct	16 Oct	15 Oct	13 Oct	12 Oct	11 Oct	10 Oct	8 Oct
12	27 Nov	25 Nov	24 Nov	23 Nov	22 Nov	20 Nov	19 Nov	18 Nov	17 Nov	15 Nov	14 Nov	13 Nov	12 Nov	10 Nov	9 Nov	8 Nov	7 Nov	5 Nov
13	25 Dec	23 Dec	22 Dec	21 Dec	20 Dec	18 Dec	17 Dec	16 Dec	15 Dec	13 Dec	12 Dec	11 Dec	10 Dec	8 Dec	7 Dec	6 Dec	5 Dec	3 Dec
14																		31 Dec

Note: * = leap year containing 29 Feb (2004, 2008, 2012, 2016, etc.)

PLANNING THE FLIGHT

FUEL

For a flight of approx. **200 nm**, fuel planning can be estimated with the following formula:

Imperial Units
Fuel for flight = (Number of 100 nm legs) x (4900 lbs)
= 2 x 4900 lbs = **9800 lbs**
Reserve Fuel = **14000 lbs**
Total Fuel = Fuel for Flight + Reserve Fuel = **24800 lbs**

Metric Units
Fuel for flight = (Number of 100 nm legs) x (2200 kg)
= 2 x 2200 kg = 4400 kg
Reserve Fuel = 6400 kg
Total Fuel = Fuel for Flight + Reserve Fuel = 10800 kg

FLIGHT ROUTE

The flight route we will take is:
EHAM SID **GORLO** UL980 **LOGAN** STAR **EGLL**

Write this route down.

But what does it all mean? Here is a breakdown of this route:

- Depart from Schiphol Airport (EHAM)
- Follow the SID (Standard Instrument Departure) route from EHAM to GORLO
- Navigate to GORLO VOR
- Follow UL980 airway
- Navigate to LOGAN VOR
- Follow the STAR (Standard Terminal Arrival Route) from LOGAN to EGLL
- Land at Heathrow Airport (EGLL)

Amsterdam Airport Schiphol (EHAM) ⇒ London Heathrow Airport (EGLL)

ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
EHAM	-	0	0	N52°18'29.00"	E004°45'51.00"	AMSTERDAM/SCHIPHOL
GORLO	-	249	63	N51°55'26.64"	E003°10'18.61"	GORLO
REFSO	-	250	20	N51°48'34.44"	E002°40'00.87"	REFSO
ULKOK	-	264	10	N51°47'43.62"	E002°24'40.76"	ULKOK
XAMAN	-	264	7	N51°47'05.13"	E002°13'27.22"	XAMAN
LOGAN	-	264	23	N51°44'51.00"	E001°36'43.00"	LOGAN
EGLL	-	258	79	N51°28'39.00"	W000°27'41.00"	LONDON HEATHROW

A waypoint can be enabled/disabled by clicking on it (except first two and last two waypoints).

7 fixes, 202 nm.

Airways:
EHAM *SID* ***GORLO*** *UL980* ***LOGAN*** *STAR* ***EGLL***

WHAT IS A **SID** AND A **STAR**?

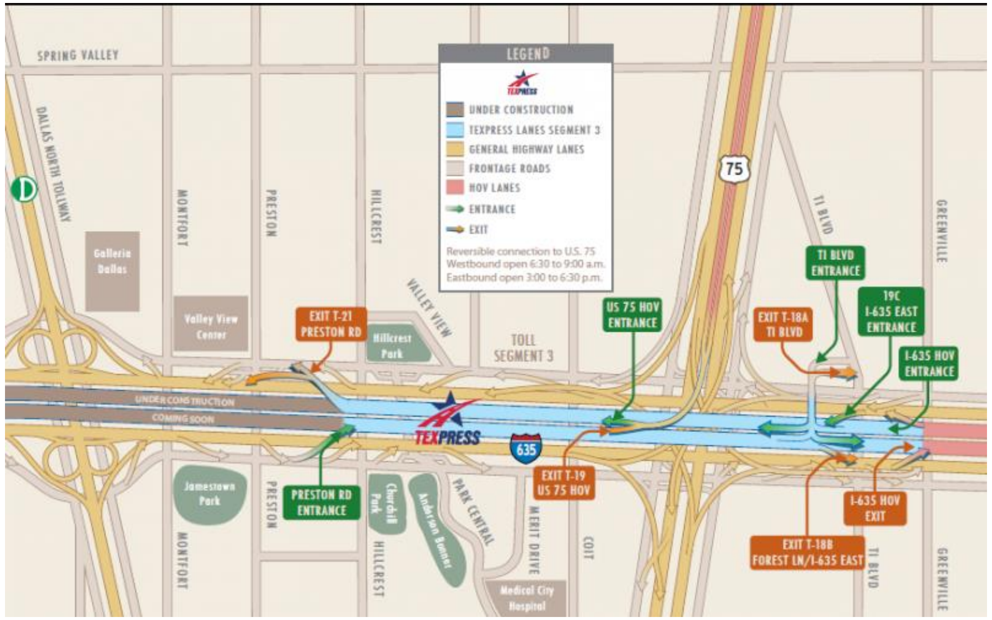
A **SID** (Standard Instrument Departure) is a small initial route which leads an aircraft from the runway they've just taken off from to the first point in his/her intended route. An airport usually has a lot of aircraft departing from it's runways. To save confusion (and for safety), a busy airport will publish standard routes from it's runways to the various routes away from that airport. This way a controller can be sure that even if a steady stream of aircraft is leaving the airport they will all be following in a nice neat line, one behind the other (that's the idea anyhow!).

Standard routes are the preferred method to fly from airport to airport. This is why we use a flight plan generator. Arriving at an airport is just the same. The **STARs** (STandard Arrival Routes) are also published in chart form and allow you to fly into an airport using standard procedures. This way, less communication is again needed with the controllers as (once you have declared your intention or been given a route to fly by name) the controller and you both know exactly how you are going to approach the airport. The end of the STAR route will normally leave your aircraft at a position where controllers can give you final instructions to set you up for a landing.

SIDs and STARs are quite similar to highways; they have speed limits and altitude restrictions at certain waypoints to make sure the air traffic is flying safely and on the same trajectory. The FMC (Advanced Flight Management Computer) will automatically try to respect these restrictions.

In other words, you can see SIDs and STARs like road junctions in the sky that lead to other waypoints and airways from or to your desired airport. One airport has many SIDs and STARs.

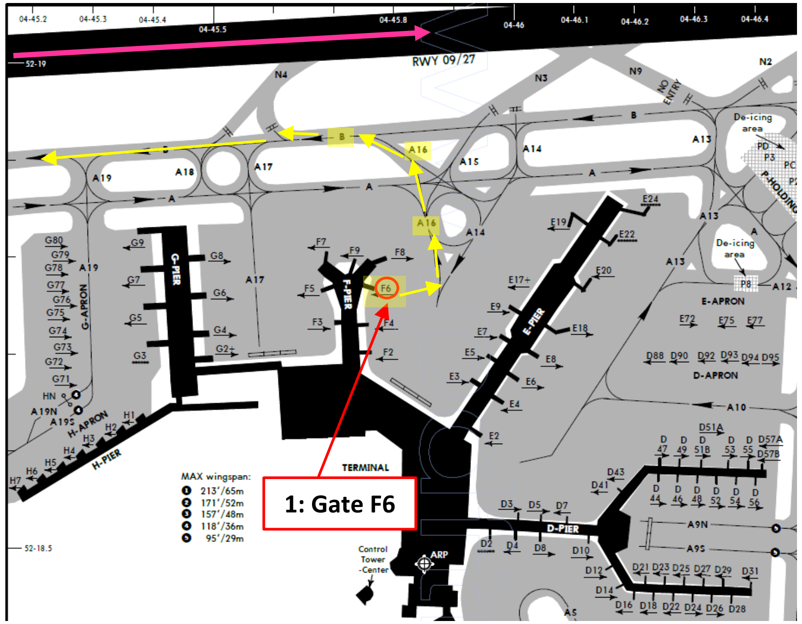
Typically, SIDs and STARs are provided by the ATC (Air Traffic Controller). Since we're doing a tutorial, I will just give you the SID and STAR to plug in the FMC.

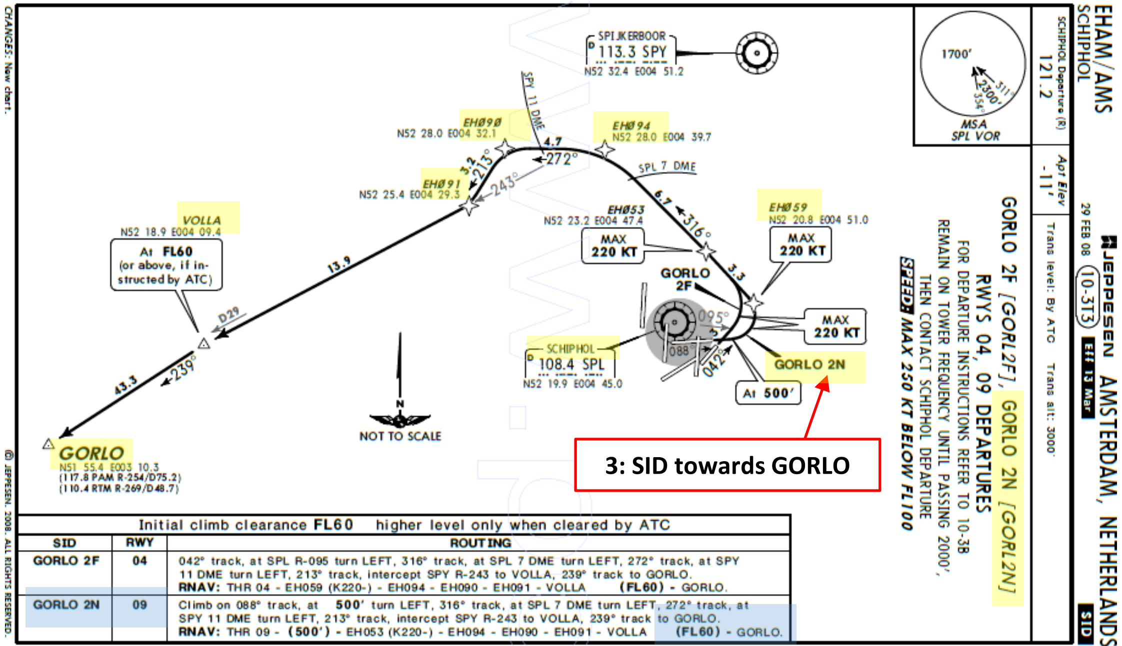


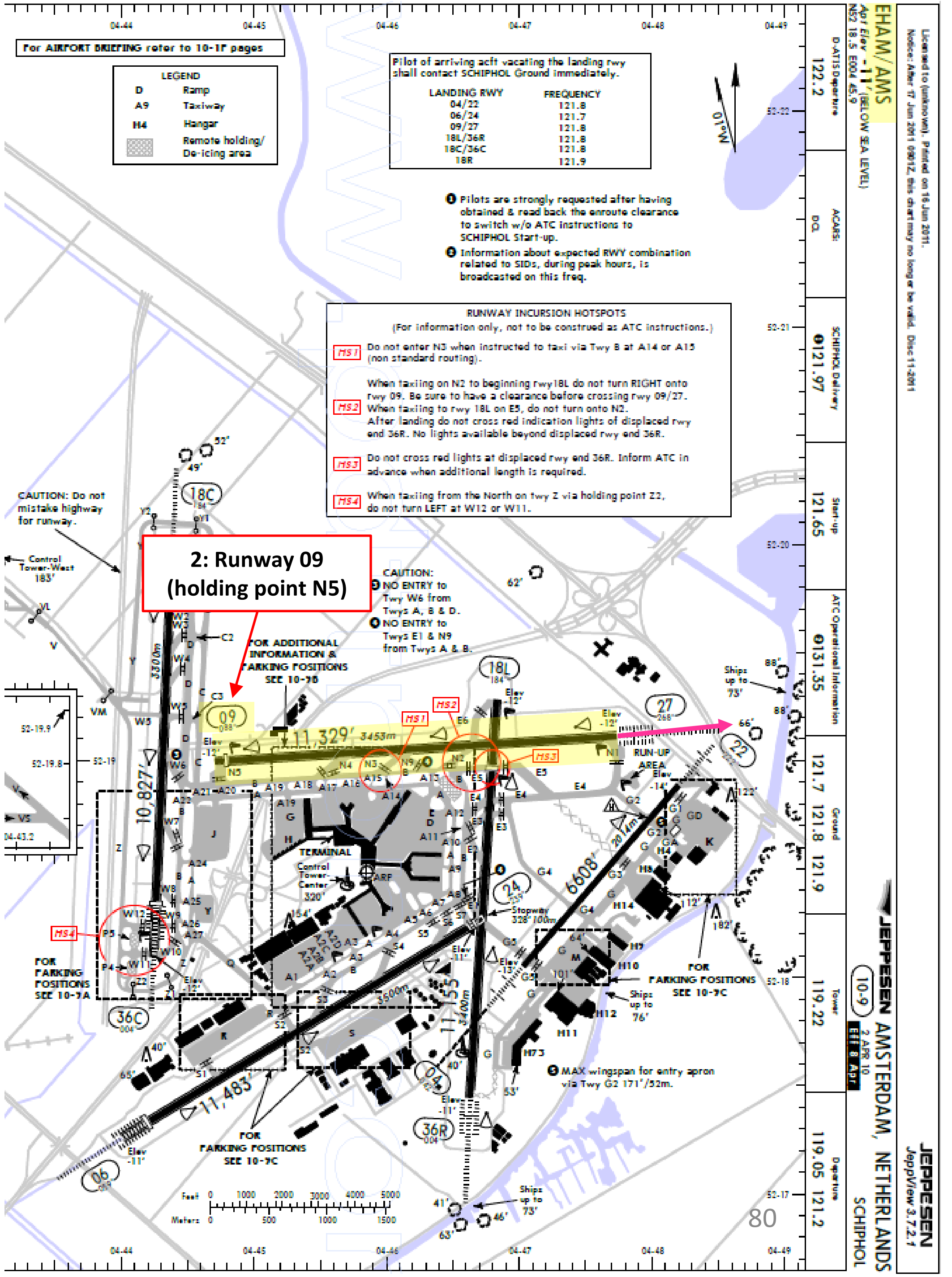
PLANNING THE DEPARTURE - SID

These charts are for the SID (Standard Instrument Departure) from Schiphol (EHAM) to GORLO. We intend to:

1. Spawn at Gate F6 (personal preference)
2. Taxi towards **runway 09** (orientation: 090) using taxiways A16, Bravo (B) and holding point N5.
3. Depart from EHAM using the SID from EHAM to GORLO (GORL2N) to a target altitude of 6000 ft (FL060)
4. Climb to a cruising altitude of 24,000 ft



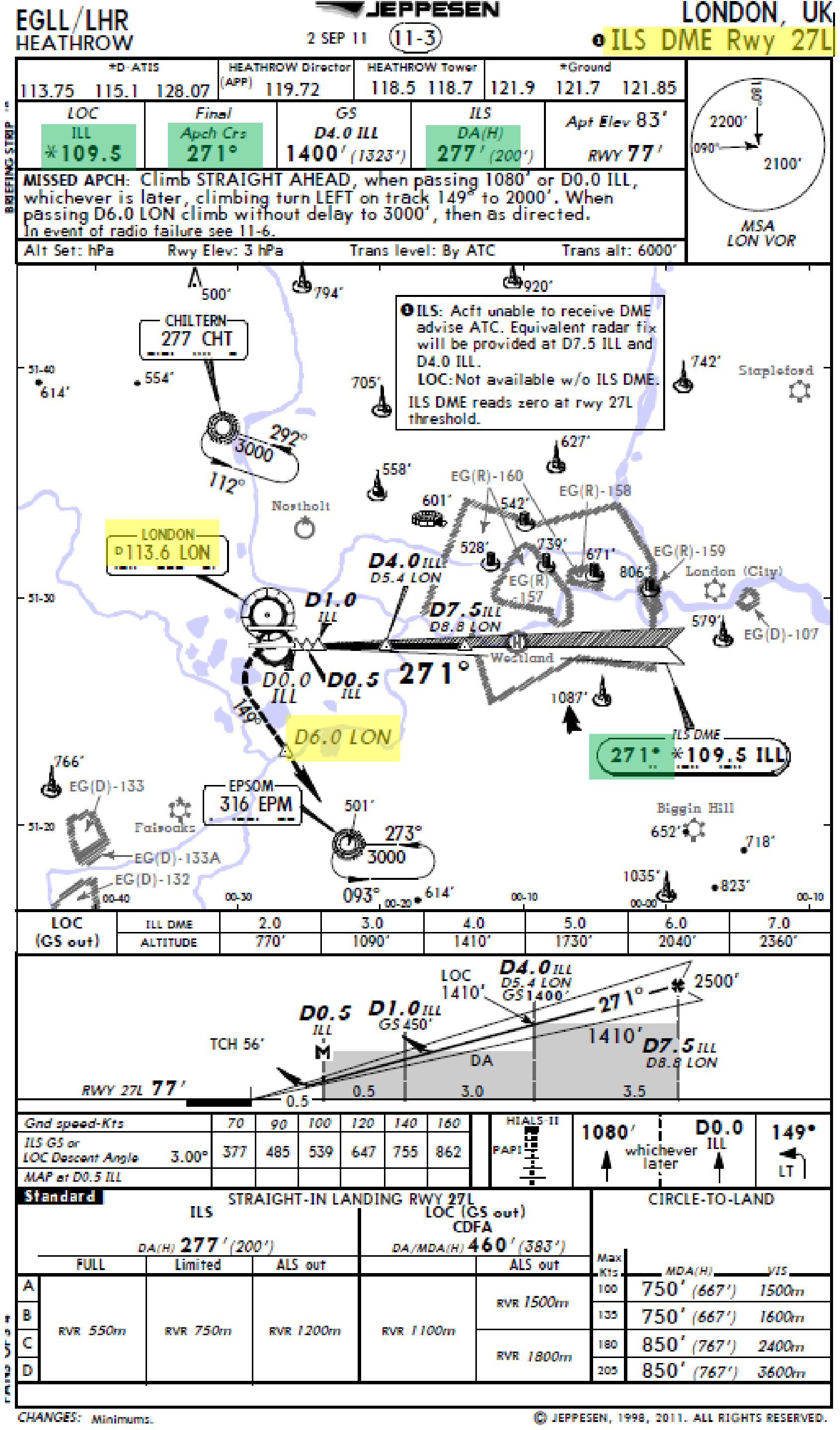


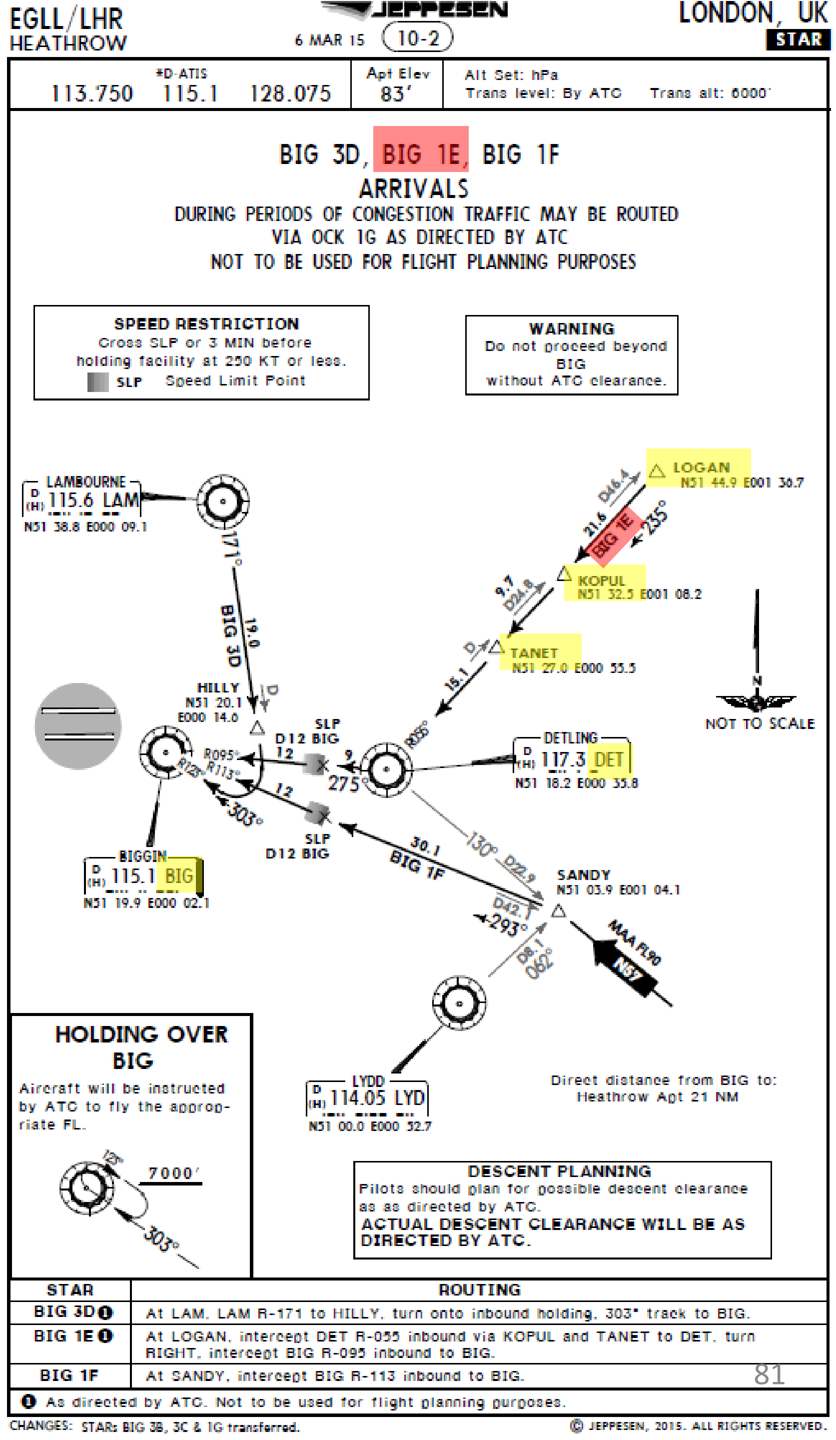


PLANNING THE APPROACH - STAR

These charts are for the STAR (Standard Terminal Arrival Route) from LOGAN to EGLL. We intend to:

1. Come from LOGAN waypoint
2. Fly from LOGAN towards the BIG1E arrival route.
3. Follow the STAR (BIG1E -> KOPUL -> TANET -> DET -> BIG)
4. Select an AIF (Approach Initial Fix) from the FMC database (in our case CI27L) and follow the approach towards the runway, guided by the EGLL airport's ILS (Instrumented Landing System).
5. Land at Heathrow (EGLL) on **runway 27L** (orientation: 270 Left)





PLANNING THE FLIGHT - SUMMARY

So there it is! This is more or less all the information you need to plan your flight!

Flight Plan Input to FMC

Airways:
EHAM SID *GORLO* UL980 *LOGAN* STAR *EGLL*

Provided by RouteFinder

METAR:

Departure: EHAM 110225Z 33004KT 8000 NSC 12/11 Q1018 BECMG 7000
Destination: EGLL 110220Z AUTO 03005KT 360V070 9999 OVC009 14/12 Q1023 TEMPO BKN012

Provided by CheckWX API

Fuel Quantity Input to FMC (taken from an online fuel planner)

Fuel quantity for Boeing 767-300

	Fuel	Time
Fuel Usage	9780 lbs	00:52
Reserve Fuel	14089 lbs	01:15
Fuel on Board	23868 lbs	02:07

Provided by Fuelplanner.com

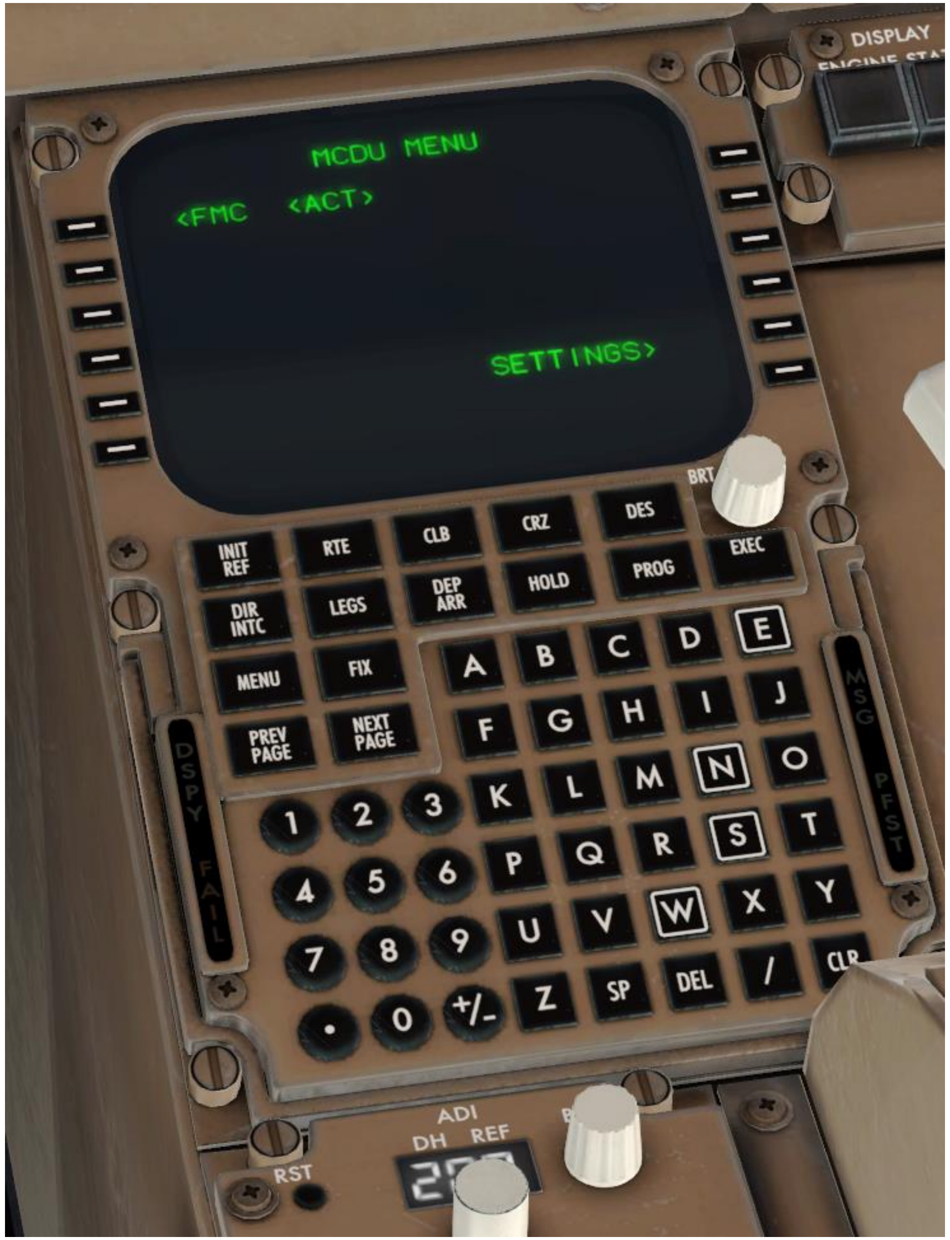
MCDU/FMC IN A NUTSHELL

Most of the aircraft setup and flight planning will be done with the help of the MCDU, which encompasses various systems such as the FMC system.

MCDU: Multipurpose Control Display Unit

MAIN MENU page:

- **FMC** -> Flight Management Computer
    - Fundamental component of a modern airliner's avionics. The FMC is a component of the FMS (Flight Management System), which is a specialized computer system that automates a wide variety of in-flight tasks, reducing the workload on the flight crew to the point that modern civilian aircraft no longer carry flight engineers or navigators. A primary function is in-flight management of the flight plan. All FMS contain a navigation database. The navigation database contains the elements from which the flight plan is constructed. The FMS sends the flight plan for display to the Electronic Flight Instrument System (EFIS), Navigation Display (ND), or Multifunction Display (MFD).
- **SETTINGS**-> Setup various aircraft options
    - Allows you to configure aircraft equipment installed on your current airframe (like the Original or PIP FMS type) and customize parameters like unit systems.



MCDU MAIN MENU PAGE

MCDU/FMC IN A NUTSHELL

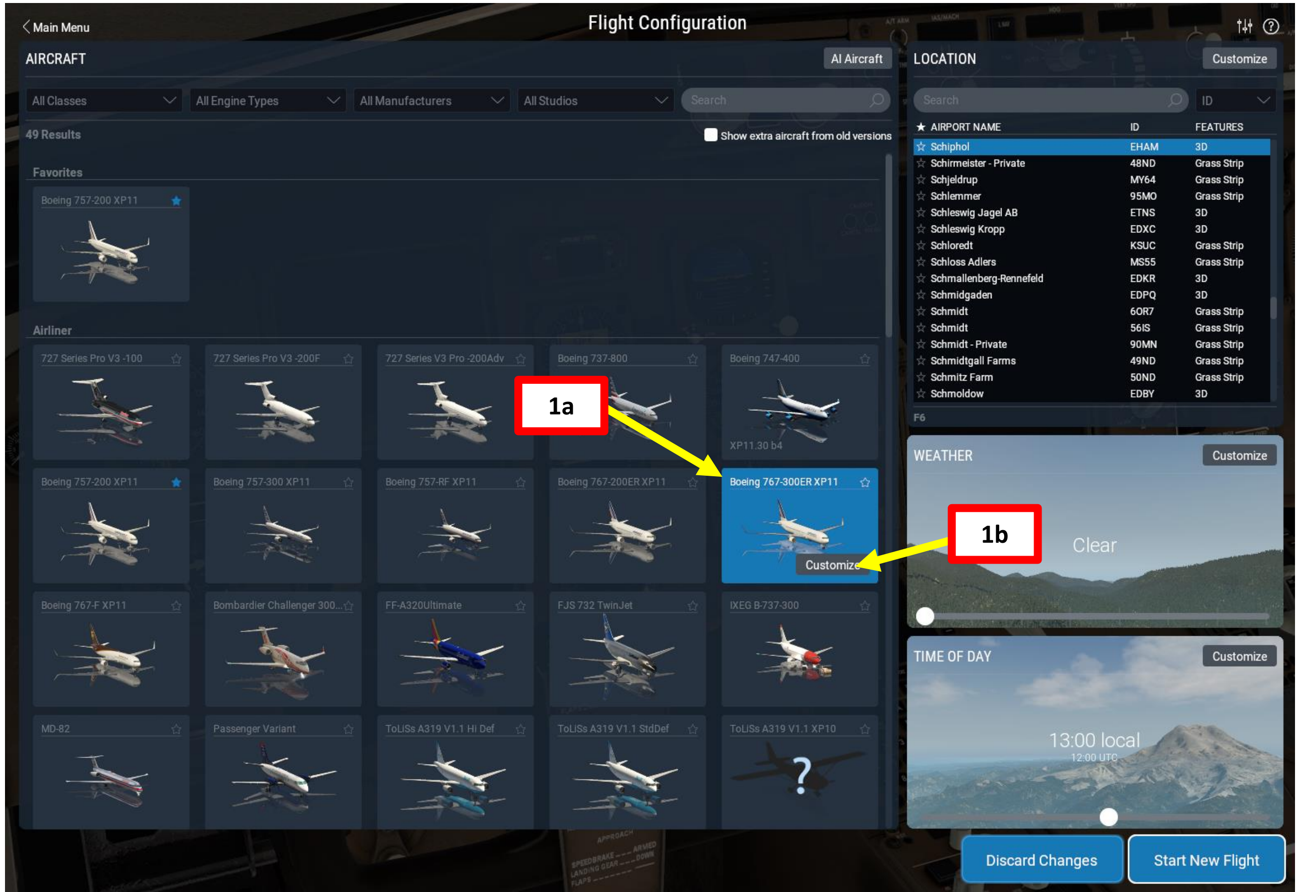
- **FMC** -> Flight Management Computer
  - **INIT REF**: data initialization or for reference data
  - **RTE**: input or change origins, destination or route
  - **CLB**: input for climb phase of flight
  - **CRZ**: input for cruise phase of flight
  - **DES**: input for descent phase of flight
  - **DIR INTC**: Direct Intercept allows you to go directly to a desired waypoint
  - **LEGS**: view or change lateral and vertical data for each leg of the flight plan
  - **DEP ARR**: input or change departure and arrival procedures
  - **HOLD**: create and show holding pattern data
  - **PROG**: shows progression of dynamic flight and navigation data, including waypoint estimated time of arrival, fuel remaining, etc.
  - **FIX**: create reference points (fix) on map display

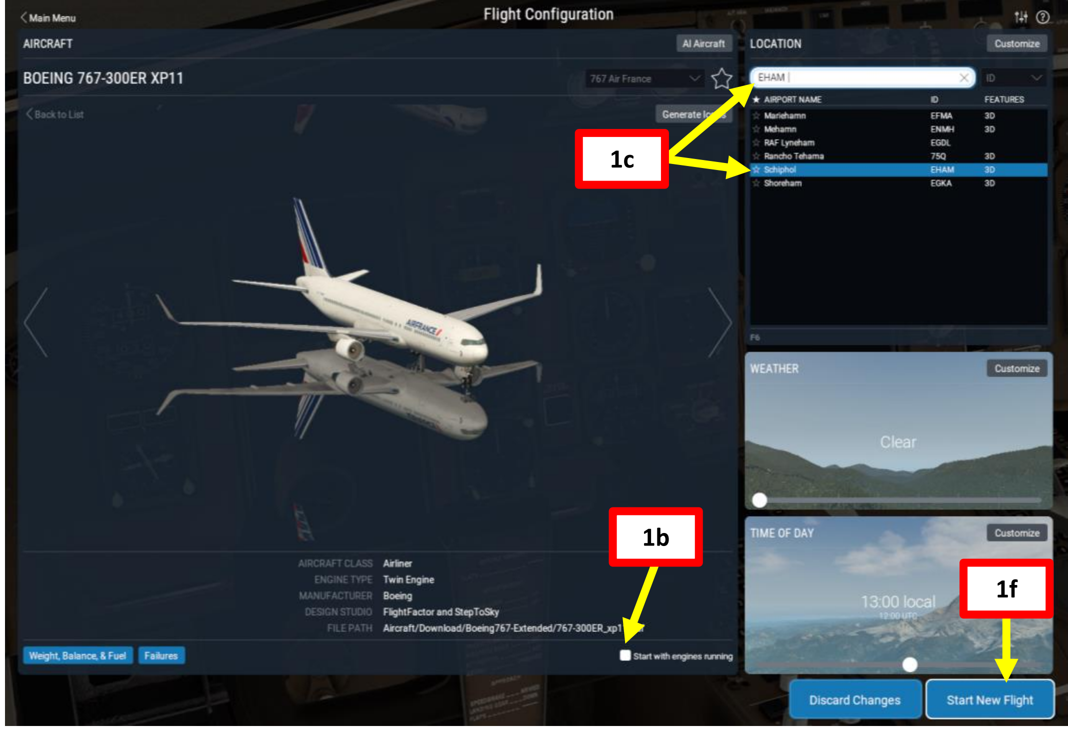
  - **MENU**: view the main menu page (see previous page)
  - **PREV PAGE / NEXT PAGE** : Cycles through previous and next page of selected FMC page
  - **BRT**: knob controls MCDU brightness
  - **EXEC**: makes data modifications active

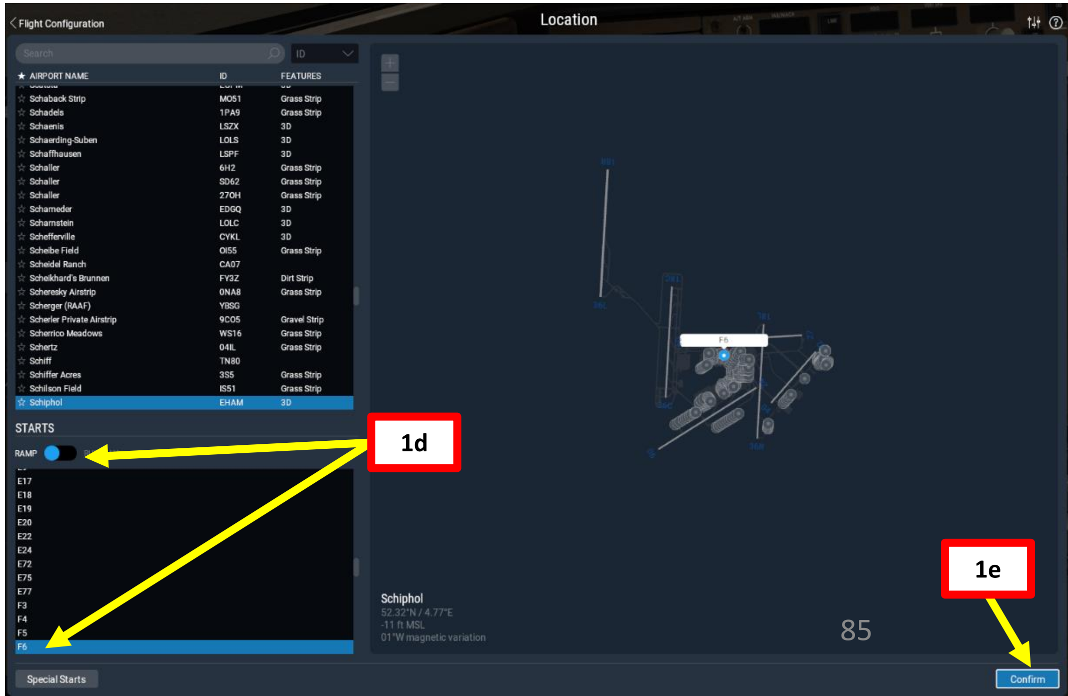
Sounds complicated? Don't worry, it's much simpler than it looks. We'll see how it works in the tutorial section.

SPAWN IN COLD & DARK STATE

1. Spawn like you normally would at Gate F6 in EHAM (departure airport) in the Boeing 767-300ER.
    a) Select the 767-300ER
    b) Click CUSTOMIZE and make sure the "Start with engines running" checkbox is not ticked.
    c) In the LOCATION menu, type EHAM and click on Schiphol.
    d) Click on LOCATION – CUSTOMIZE sub-menu, set the STARTS option to RAMP and select Gate F6.
    e) Click CONFIRM
    f) Click START FLIGHT





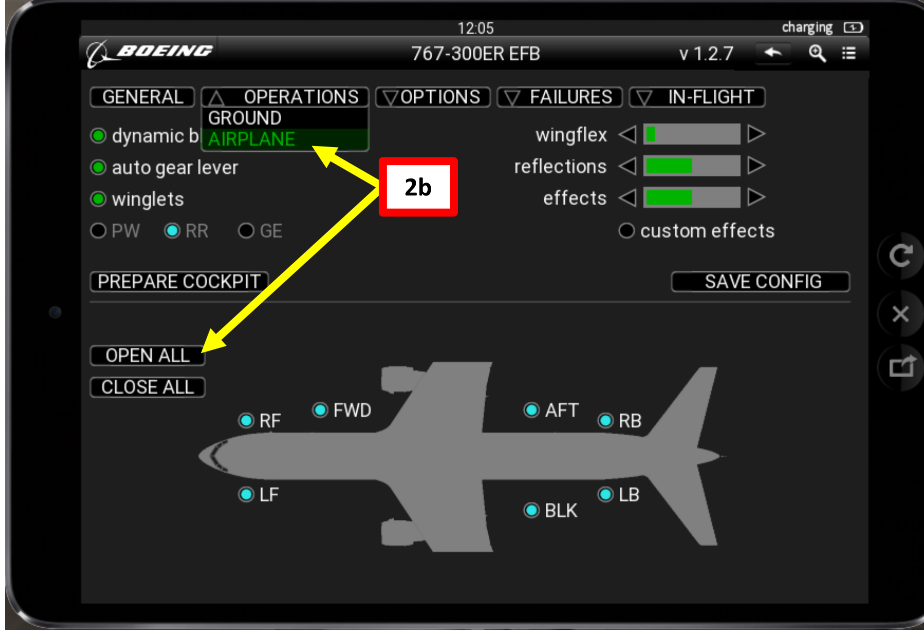


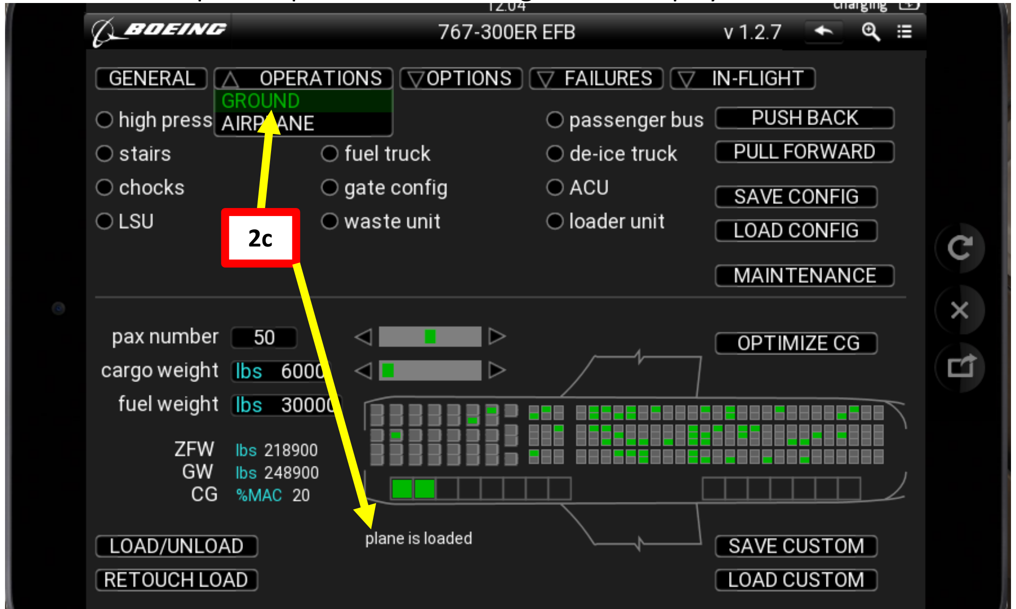
SPAWN IN COLD & DARK STATE

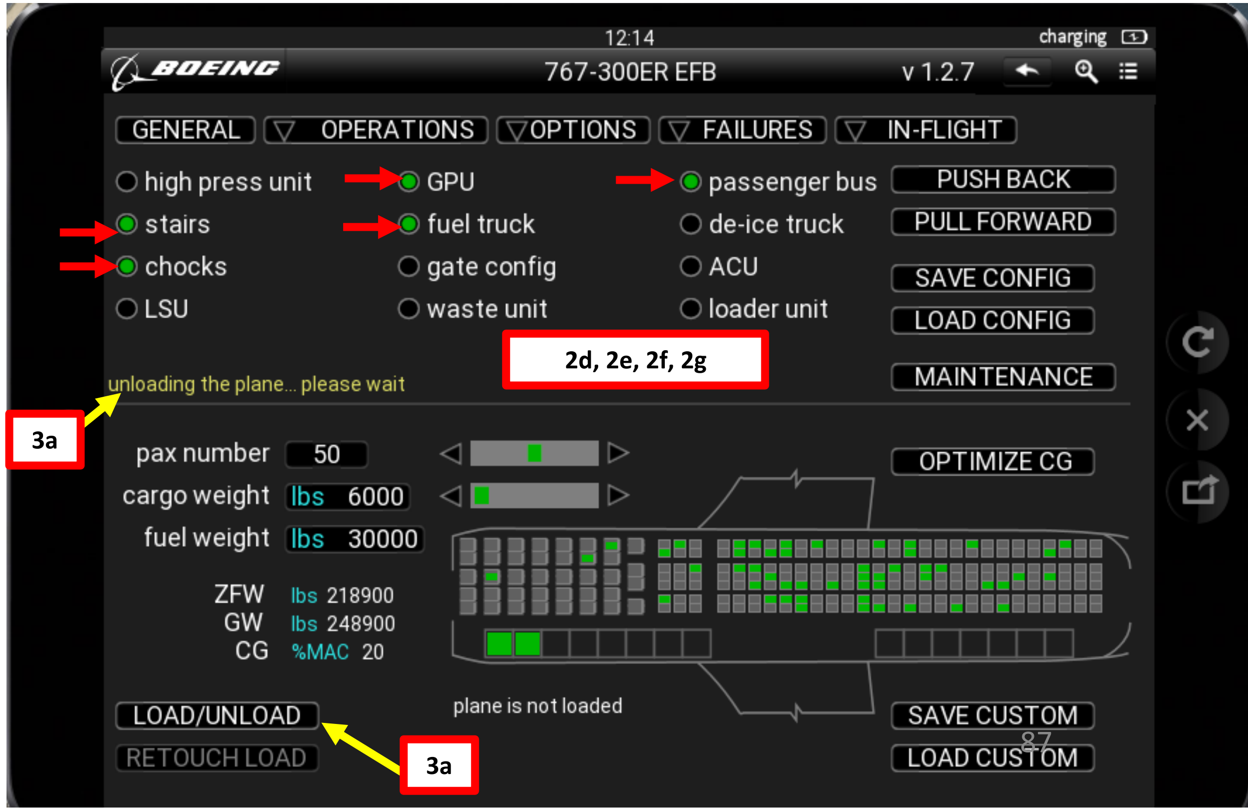
OPEN DOORS & SET GROUND EQUIPMENT

The Flight Factor 767 comes with two FMC variants: the Original (where things like V-speeds need to be entered by hand consulting a chart) or the PIP (Product Improvement Program), which computes certain parameters for you. To change FMC type, make sure that the aircraft is UNLOADED.

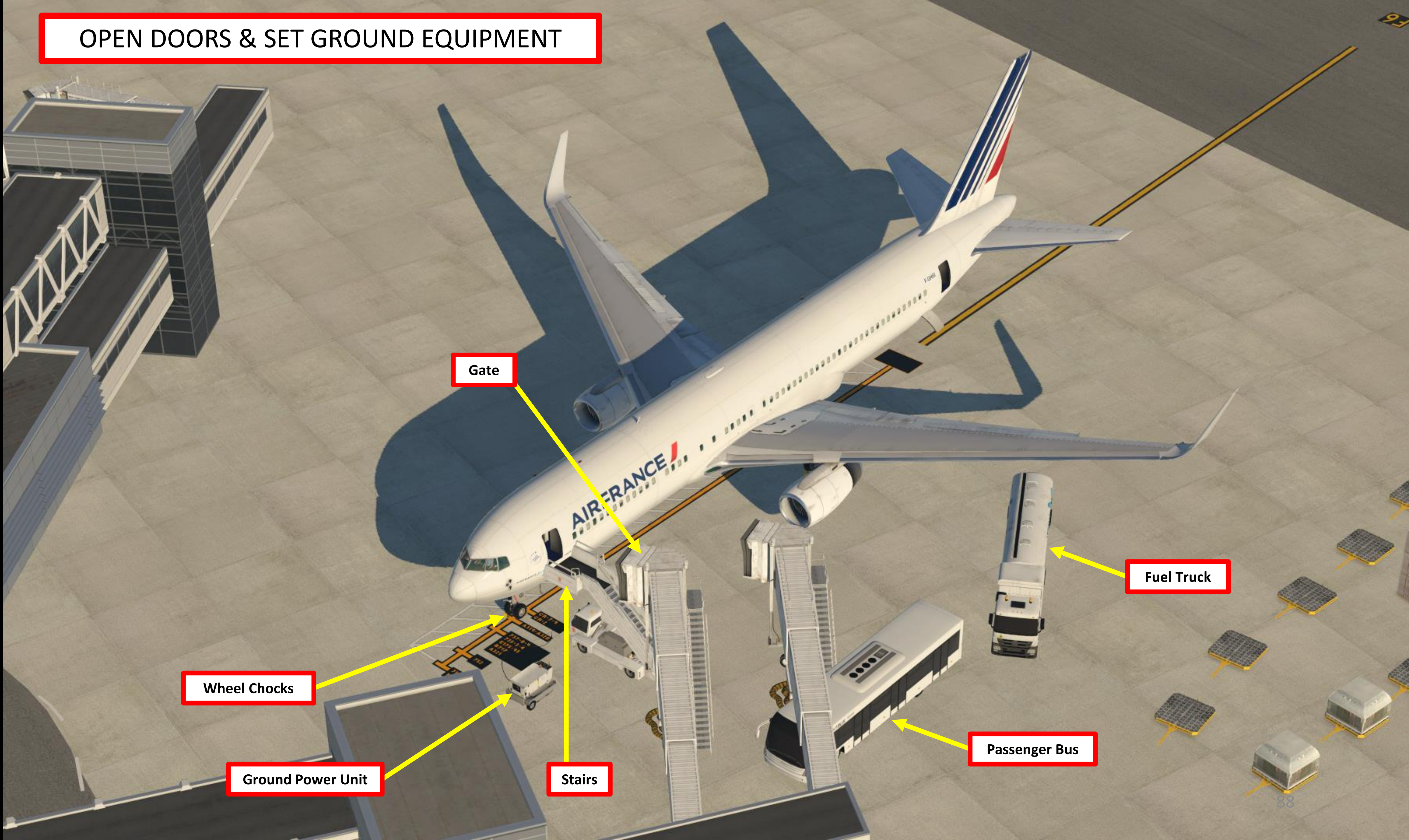
2. Prepare the aircraft ground equipment
    a) Click on the EFB (Electronic Flight Bag)
    b) Select OPERATIONS – AIRPLANE and click on OPEN ALL to open all doors
    c) Select OPERATIONS – GROUND and check if plane is loaded. If it is, we need to unload it.
    d) Select CHOCKS to set chocks
    e) Select STAIRS and PASSENGER BUS to prepare passengers unloading. Alternatively, you can use the GATE CONFIG option.
    f) Select GPU (Ground Power Unit) to connect ground power
    g) Select FUEL TRUCK to prepare fuel loading.
3. Unload aircraft
    a) Click on LOAD/UNLOAD to unload passengers. This process should take a few minutes. In that time, the "unloading the plane – please wait" message will be displayed.







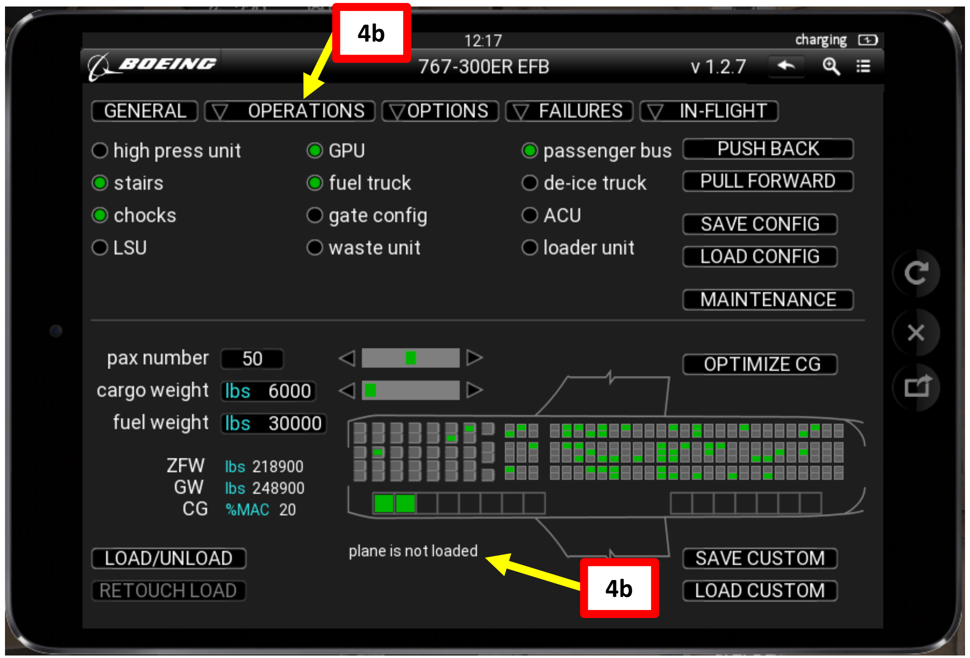
OPEN DOORS & SET GROUND EQUIPMENT



CHECK FMC EQUIPMENT

The Flight Factor 767 comes with two Flight Management Computer variants: the Original (where things like V-speeds need to be entered by hand consulting a chart) or the PIP (Product Improvement Program), which computes certain parameters for you. To change FMC type, make sure that the aircraft is UNLOADED.

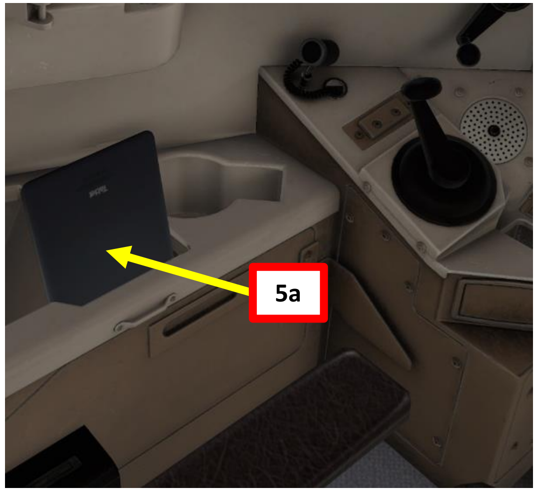
4. Install PIP FMC if necessary (aircraft needs to be unloaded):
   a) Click on the EFB (Electronic Flight Bag)
   b) In the OPERATIONS – GROUND menu, verify that the plane is not loaded. If the “unloading the plane – please wait” message is still there, wait until this message disappears and the unload process is complete.
   c) Select OPTIONS - AVIONICS
   d) Set PIP FMC option to ON (green)
   e) Set GPS EQUIPPED option to ON (green)
   f) Click on SAVE CONFIG

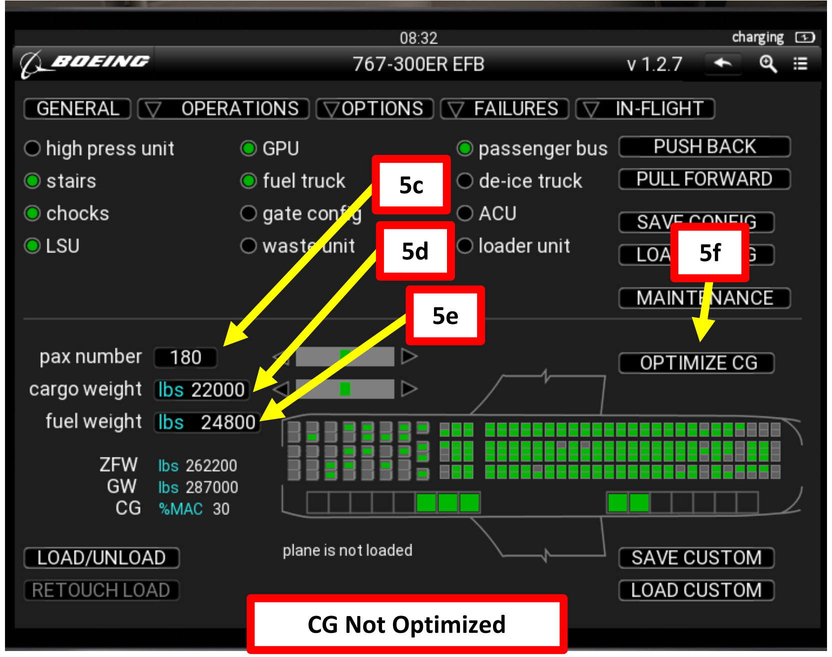


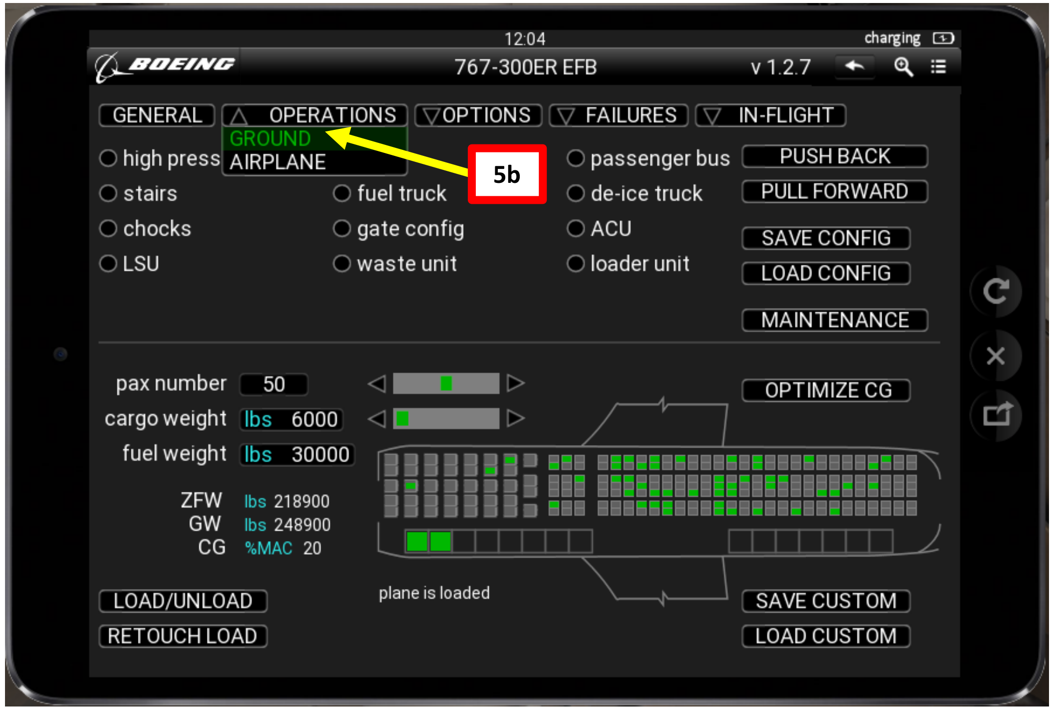
LOAD UP PASSENGERS, CARGO & FUEL

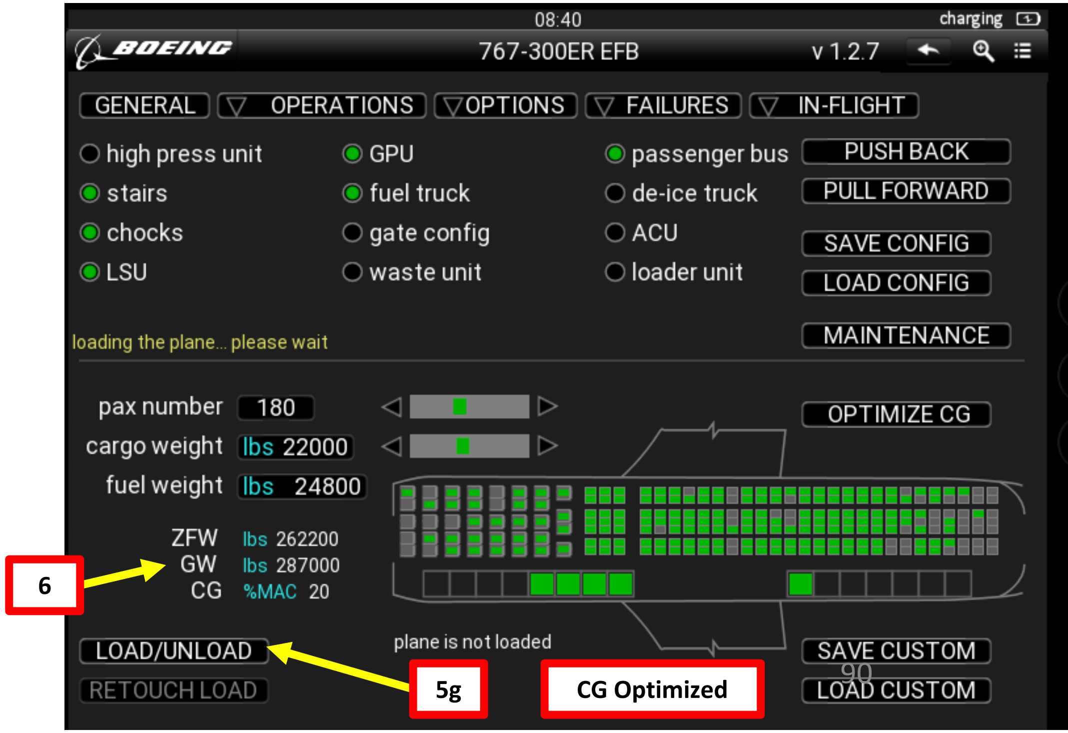
5. Load up passengers, cargo and fuel via the EFB (Electronic Flight Bag)
   a) Click on the EFB (Electronic Flight Bag)
   b) Select OPERATIONS – GROUND menu
   c) Set PAX NUMBER to 180 (arbitrary value)
   d) Set CARGO WEIGHT to 22000 lbs (arbitrary value)
   e) Set FUEL WEIGHT to 24800 lbs (required fuel estimated in the FLIGHT PLANNING section)
   f) Click on OPTIMIZE CG to shift cargo and passengers around to ensure the center of gravity is safe
   g) Click on “LOAD/UNLOAD”. Wait until the “Loading the plane, please wait” message disappears. This means the loading process is complete.

6. Note the following values resulting from our load:
   - **ZFW (Zero Fuel Weight): 262200 lbs**
   - **GW (Gross Weight): 287000 lbs**
   - **CG (Center of Gravity): 20 % MAC (Mean Aerodynamic Chord)**



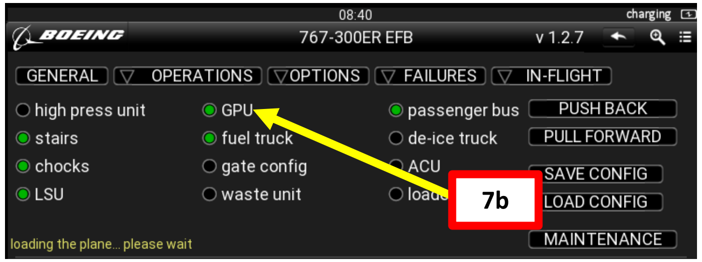


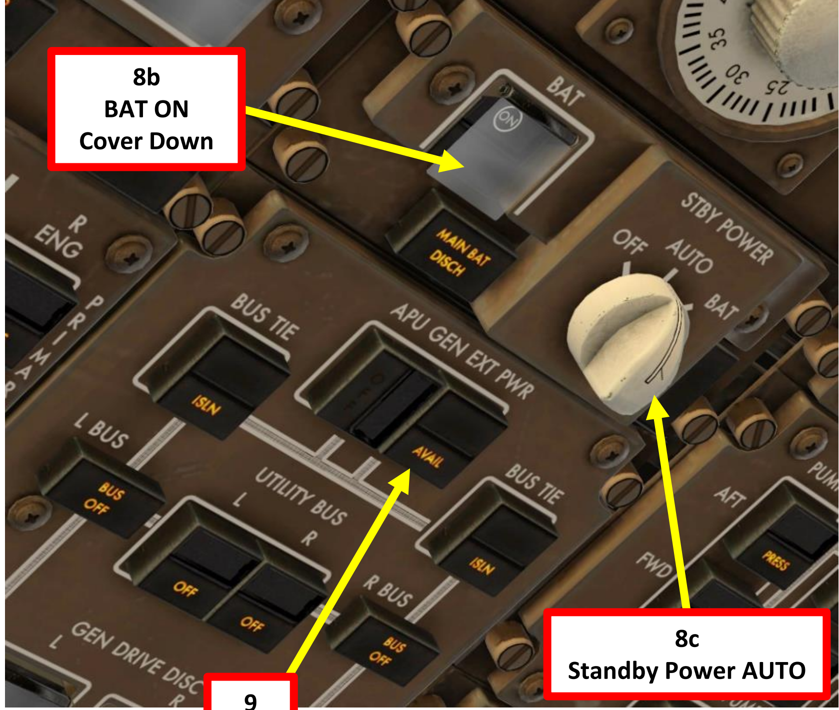


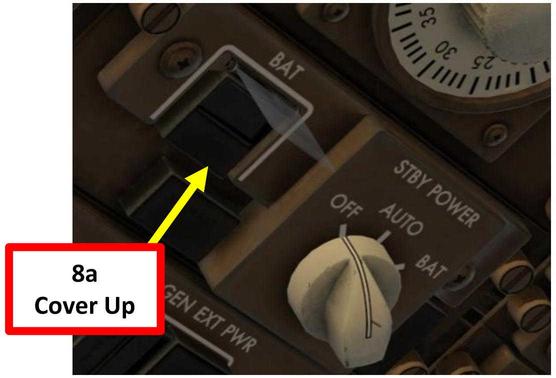


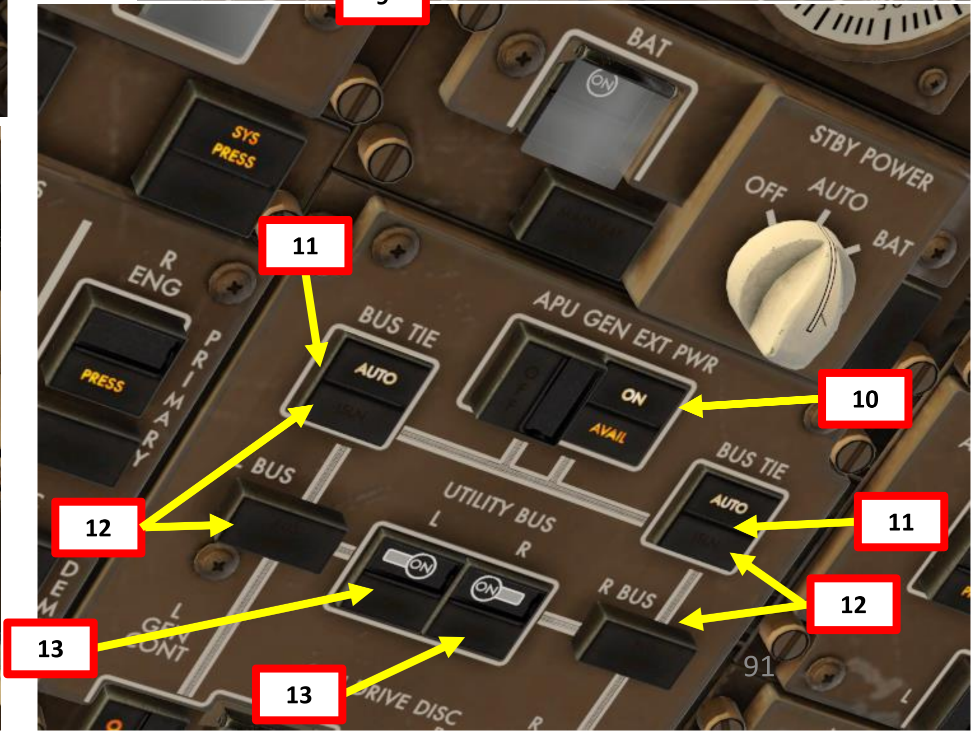
POWER UP AIRCRAFT

7. Confirm that GPU (Ground Power Unit) is plugged in via the EFB (Electronic Flight Bag) OPERATIONS – GROUND page.
8. On Overhead panel, flip the battery cover and set the BATTERY switch to ON. Then, flip the battery cover back down. Then, set the STANDBY POWER switch to AUTO.
9. On Overhead panel, confirm that the "EXT PWR" indication is set to AVAIL
10. Click on the "EXT PWR" switch to power the aircraft. Confirm that indication turns to ON.
11. Set LEFT BUS TIE and RIGHT BUS TIE switches to AUTO (IN).
12. Confirm that the BUS OFF and ISLN lights are extinguished.
13. Set LEFT UTILITY BUS and RIGHT UTILITY BUS switches to ON (IN)



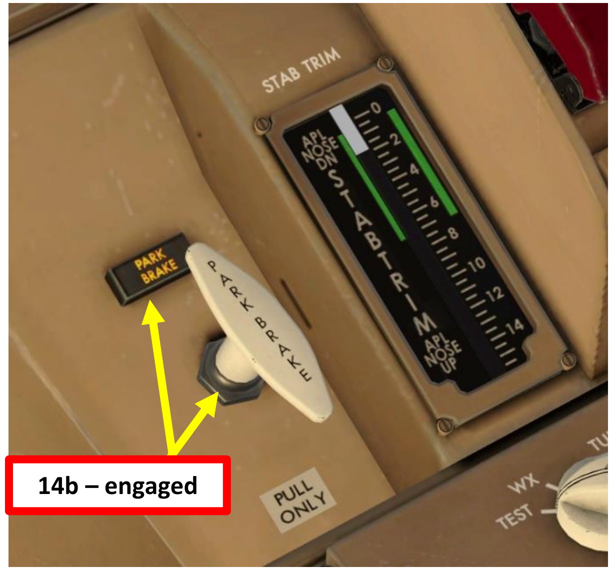


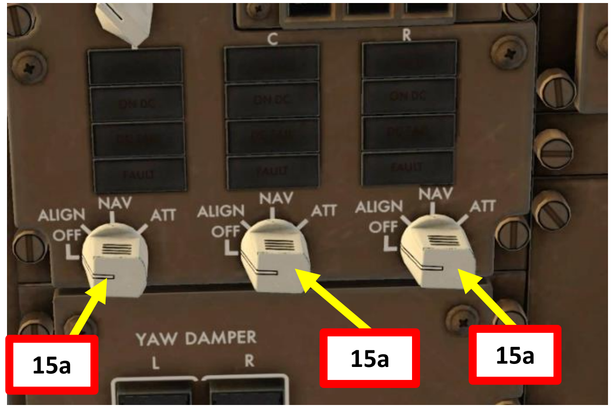


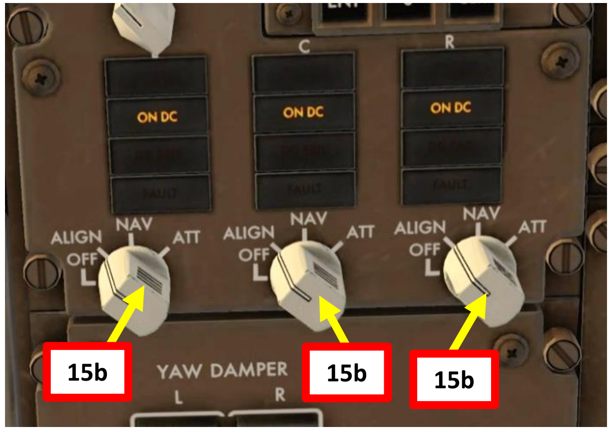


START IRS ALIGNMENT

14. Engage Parking Brake (aircraft movement can screw up your navigation system alignment)
15. On Overhead panel, set all three IRS (Inertial Reference System) switches to ALIGN, and then to NAV by scrolling mousewheel.
16. This alignment phase usually takes between 6 and 7 minutes. IRS alignment is complete once a full PFD (Primary Flight Display) and ND (Navigation Display) are displayed on your display units.

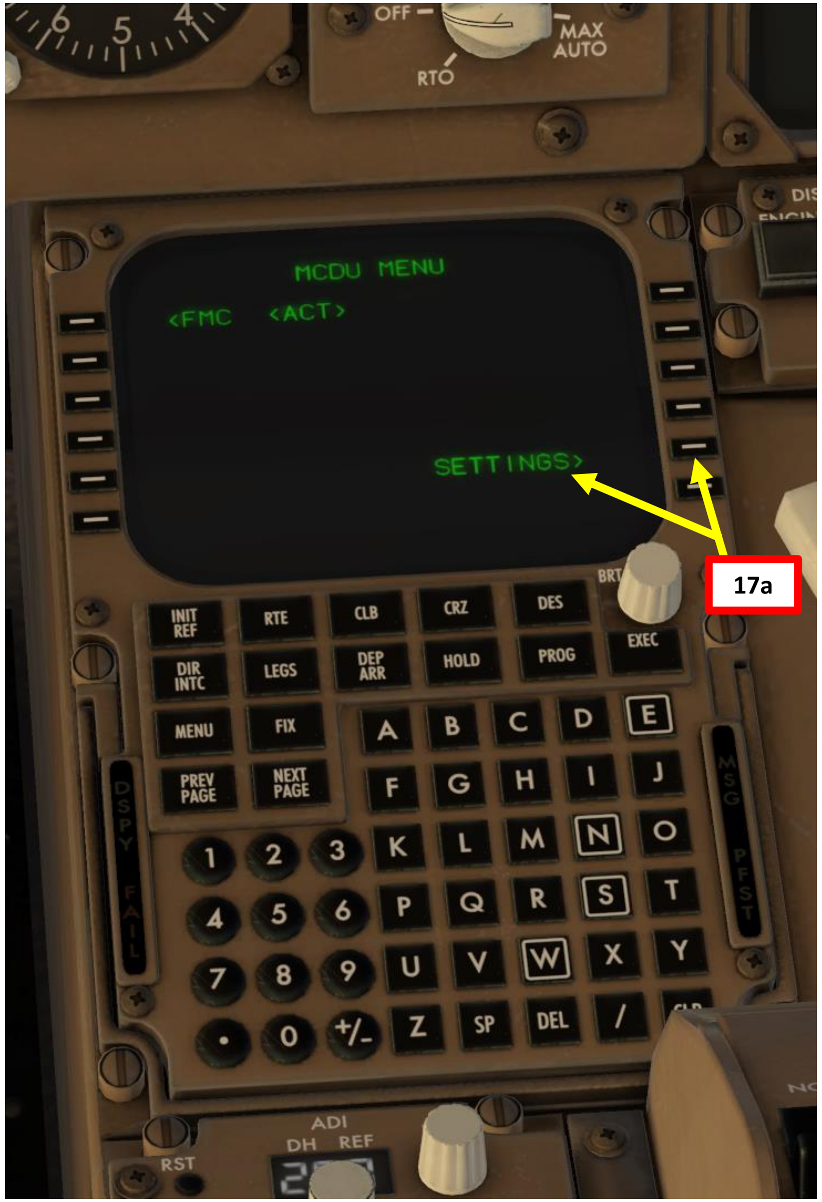


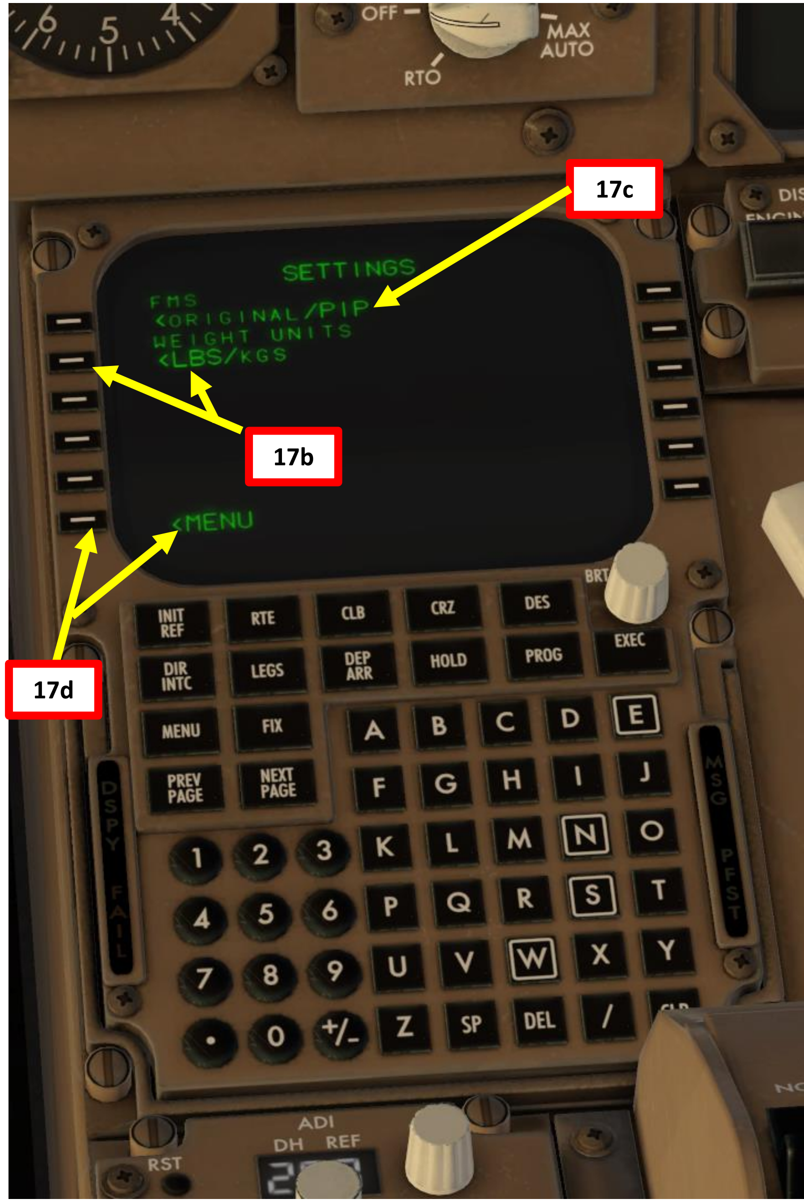




FMC SETUP - UNITS

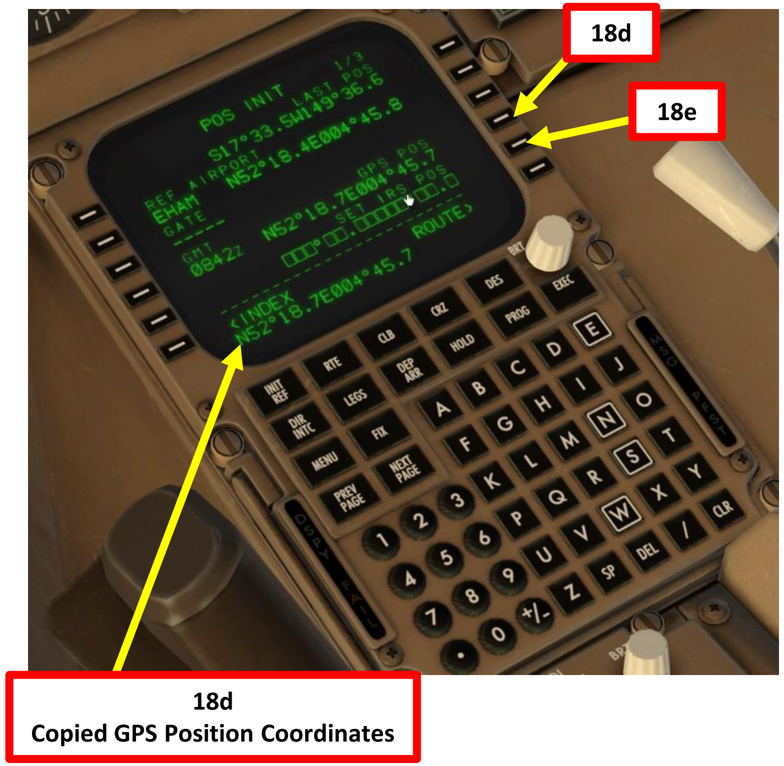
17. Go on MCDU main menu and set aircraft fuel weight units to your desired system (lbs or kg). We will choose Lbs, even though in Europe you would typically use kgs.
    a) Select SETTINGS
    b) Select LBS
    c) You can also confirm that we have the PIP FMC installed
    d) Return to main MENU. You can either click the LSK (Line Select Key) next to <MENU or press on the MENU button on the MCDU keypad.





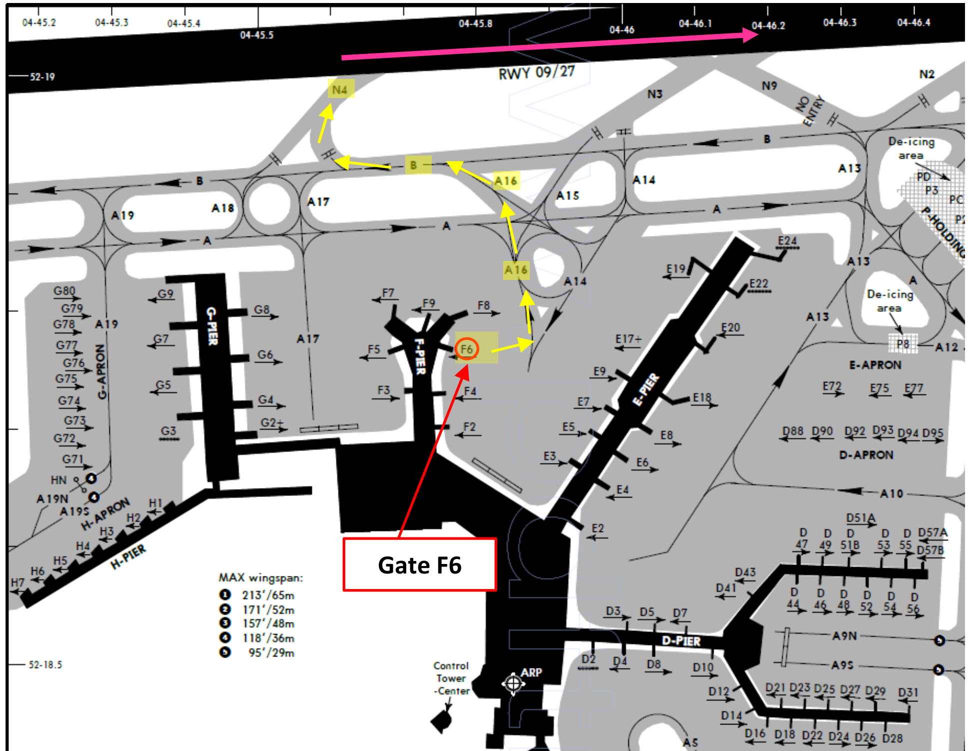
FMC SETUP - POSITION

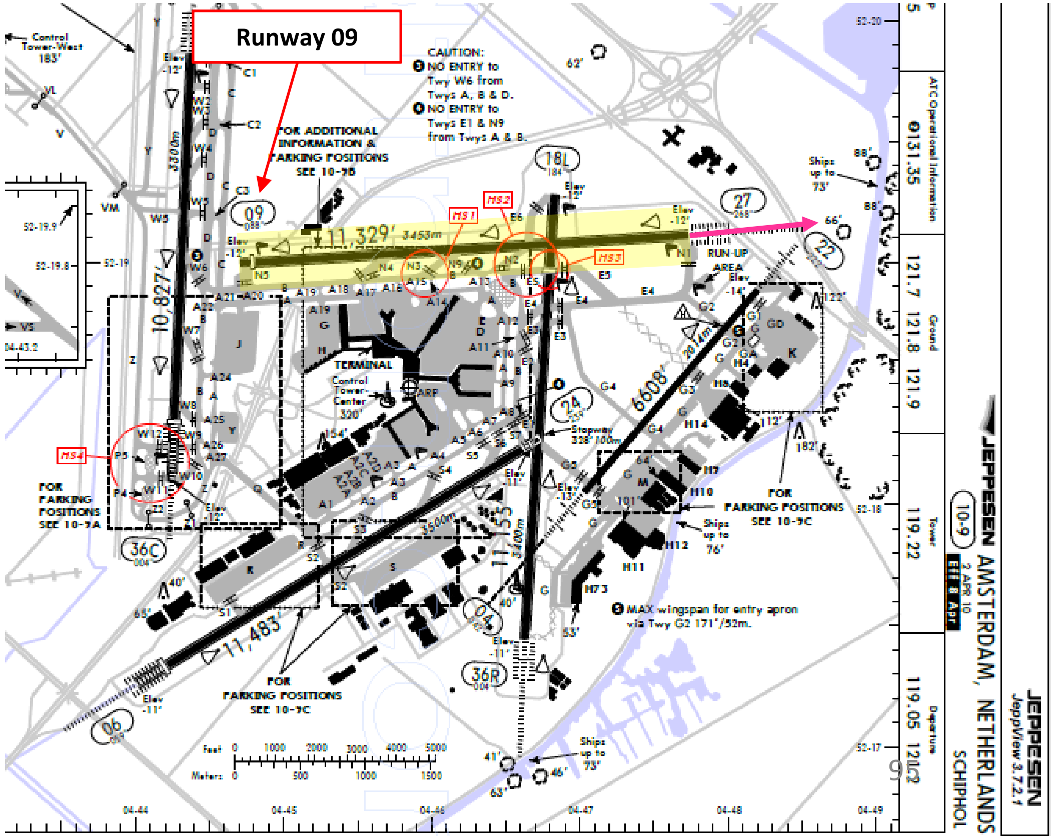
18. Go on FMC (Flight Management Computer) and set initial position for the IRS. We will assume a GPS is installed on the aircraft, which can give us our current position coordinates right away.
    a) Select FMC
    b) Select POS INIT
    c) Type "EHAM" on the MCDU keypad and select LSK (Line Select Key) next to REF AIRPORT since we spawned at Schiphol Airport (EHAM)
    d) Click on the LSK next to GPS POS line to copy the GPS coordinates to your keypad
    e) Click on the LSK next to SET IRS POS to paste the coordinates, setting your IRS (Inertial Reference System) your initial reference position.
    f) Congratulations! Your aircraft's navigation system now knows where you are.



FMC SETUP - ROUTE

19. Go on FMC (Flight Management Computer) and set aircraft route
    a) In POS INIT menu, select ROUTE menu
    b) Type "EHAM" on the MCDU keypad and click 'ORIGIN" to set EHAM (Schiphol) as your takeoff airport.
    c) Consult navigation chart of EHAM (Schiphol) Airport and find runway from which you will takeoff from (Runway 09).
    d) Type "09" (for Runway 090) on MCDU keypad and click on RUNWAY.
    e) Type "EGLL" on the MCDU keypad and click on "DEST" to set HEATHROW as your destination
    f) Type your flight number (i.e. Flight No. AFR106) on the MCDU keypad and click on FLT NO.

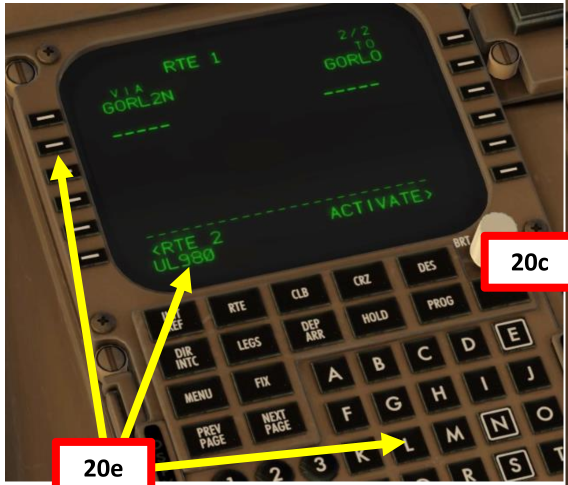


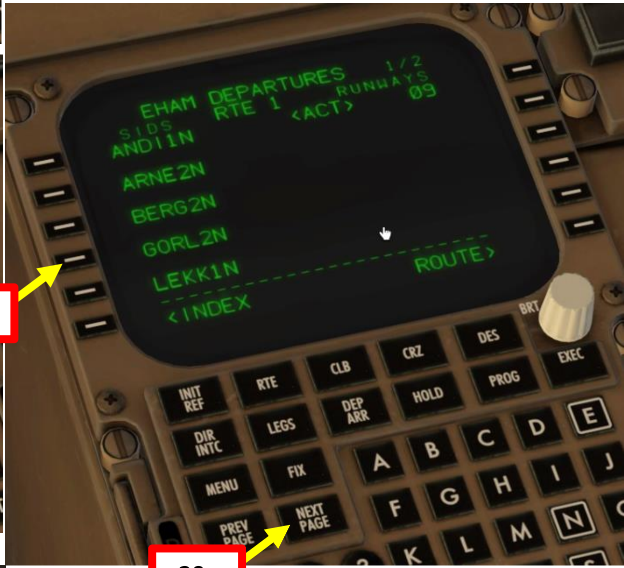


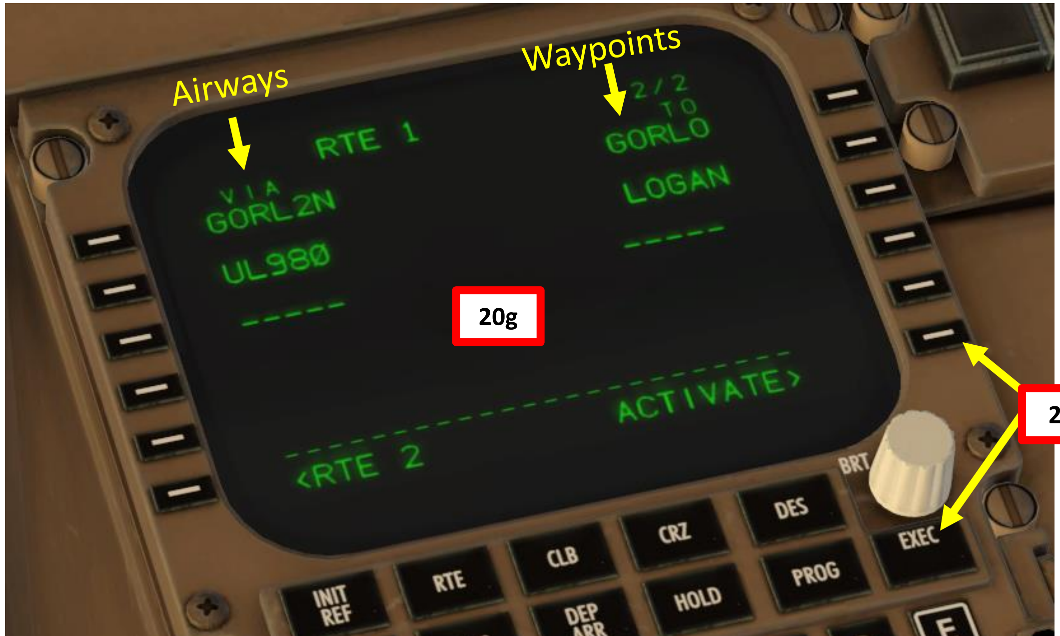
FMC SETUP - WAYPOINTS

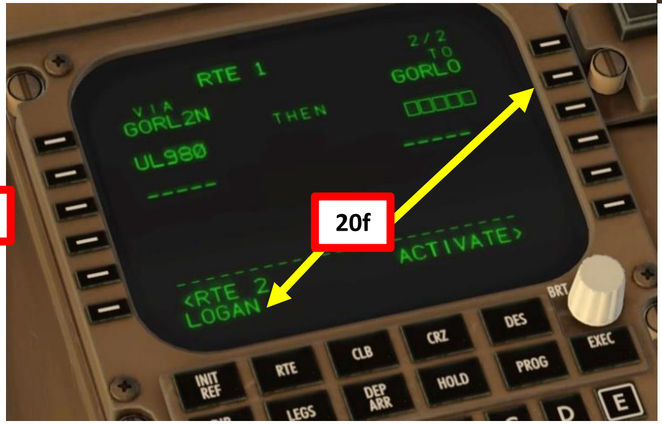
NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

20. Go on FMC (Flight Management Computer) and set flight waypoints and airways
    a) Click on “DEP ARR” (Departure Arrival) and click on “DEP – EHAM” to set Schiphol as our Departure Point
    b) Select Runway 09
    c) Press the “NEXT PAGE” button until you find GORL2N SID (Standard Instrument Departure). Select SID (Standard Instrument Departure) for GORLO2N as determined when we generated our flight plan.
    d) Select ROUTE menu and click “NEXT PAGE” on the MCDU keypad to select the Airway/Waypoint menu.
    e) Type “UL980” on the MCDU keypad and click on the LSK next to the dashed line on the left column (VIA/AIRWAYS) to set your next Airway.
    f) Type “LOGAN” on the MCDU keypad and click on the LSK next to the squared line on the right column (TO/WAYPOINTS) to set your next Waypoint to LOGAN.
    g) See picture to see the final result. We will enter the approach to Heathrow later while in the air.
    h) Select ACTIVATE and click on EXECUTE









FMC SETUP - WAYPOINTS

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

20. Go on FMC (Flight Management Computer) and set flight waypoints and airways
    i) Click on "DEP ARR" (Departure Arrival), then click on the LSK next to INDEX, then click on "EGLL – ARR" to set Heathrow as our Arrival Point
    j) Select ILS 27L as our landing runway
    k) Select STAR (Standard Terminal Arrival Route) for BIG1E as determined when we generated our flight plan.
    l) Click on EXECUTE on the MCDU keypad to activate your flight plan update

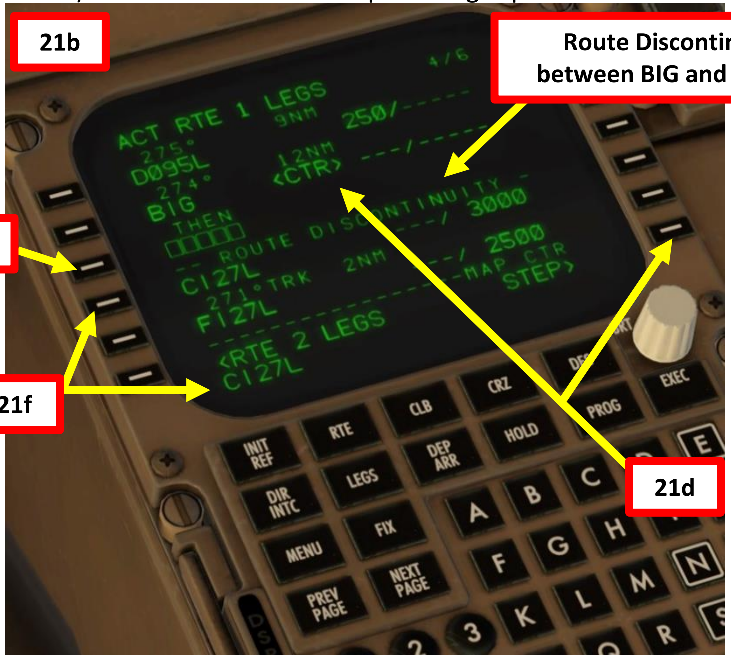
767-300ER

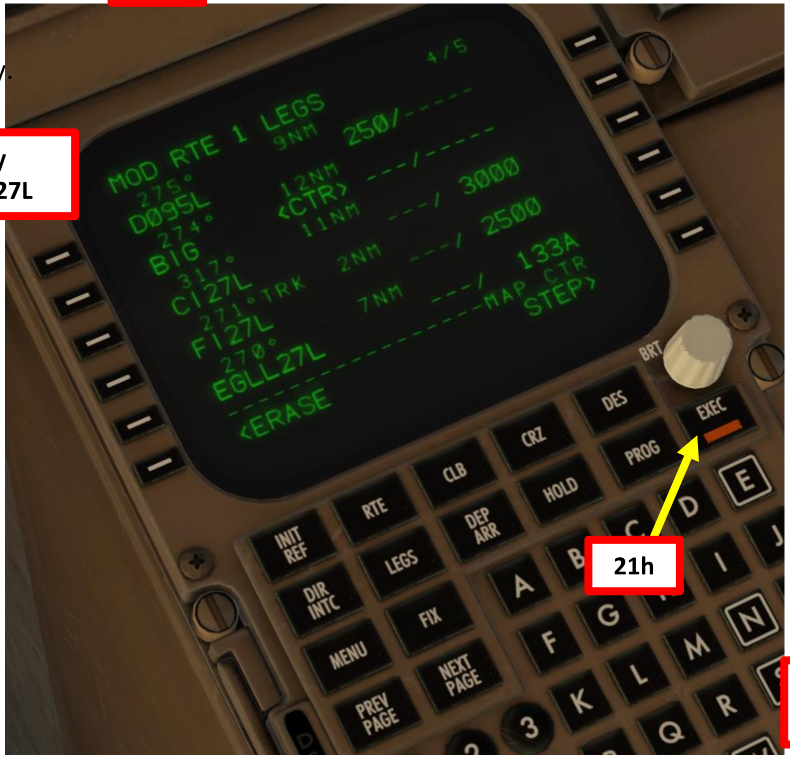
PART 3 – FLIGHT PLAN & PRE-START

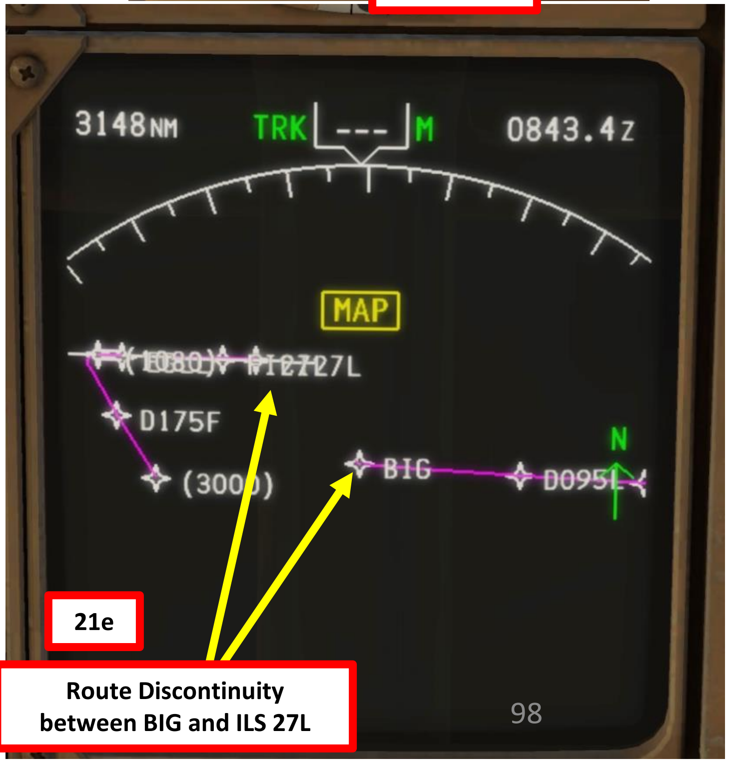
FMC SETUP – WAYPOINT DISCONTINUITIES

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

21. Go on FMC (Flight Management Computer) and verify all waypoints and any look for any discontinuity
    a) Click on "LEGS" and cycle through all different legs pages of the flight using "NEXT" button on FMC.
    b) There is a route discontinuity between the BIG waypoint of our STAR and the ILS 27L runway.
    c) Set ND (Navigation Display) Mode selector to PLAN and adjust ND Display Range as required
    d) Click on STEP until the discontinuity between BIG and CI27L is selected (you should see <CTR> next to BIG).
    e) You can see visually the discontinuity on the Navigation Display
    f) Click on the LSK next to the desired approach fix (in our case "CI27L") to copy it on the FMC screen.
    g) Click on the LSK next to the squared line "THEN" to set approach fix CI27L in order to fix flight plan discontinuity.
    h) Click on EXECUTE to update flight plan







FMC SETUP – WAYPOINT DISCONTINUITIES

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

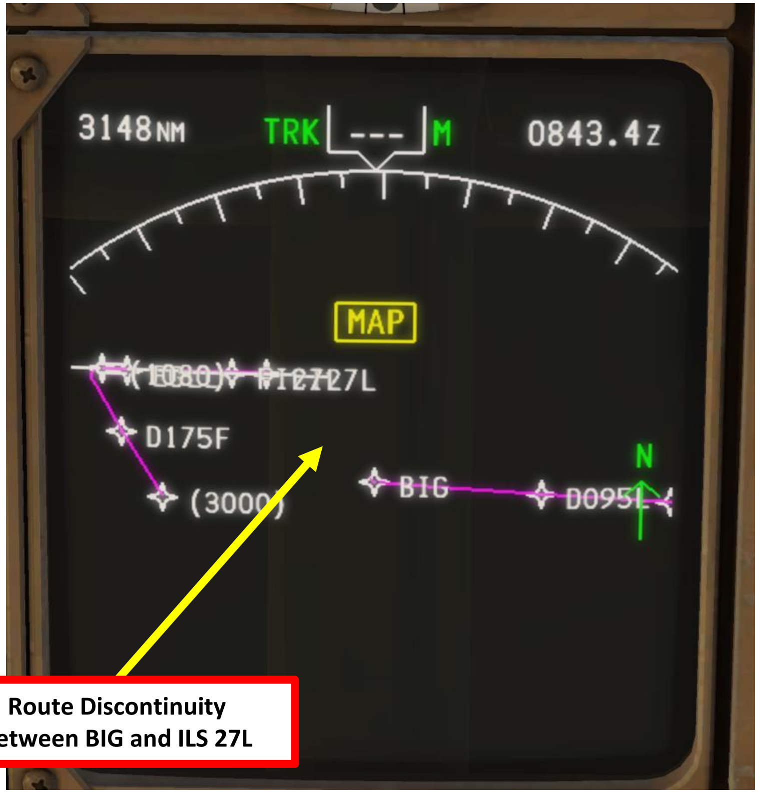
21. Go on FMC (Flight Management Computer) and verify all waypoints and any look for any discontinuity
    - i) Your flight plan discontinuity should now be replaced with a link directly from BIG to the CI27L Approach Fix.
    - j) Set ND Mode back to MAP

14i

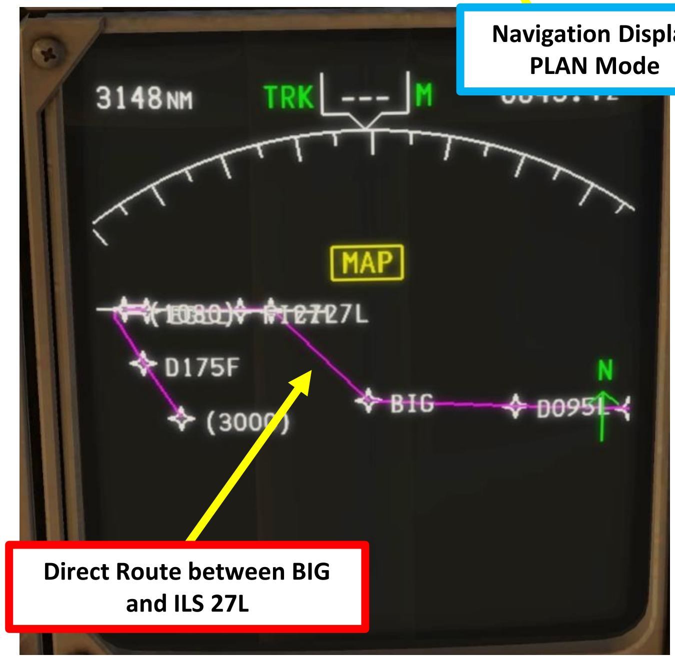
14j

Navigation Display PLAN Mode

Navigation Display MAP Mode



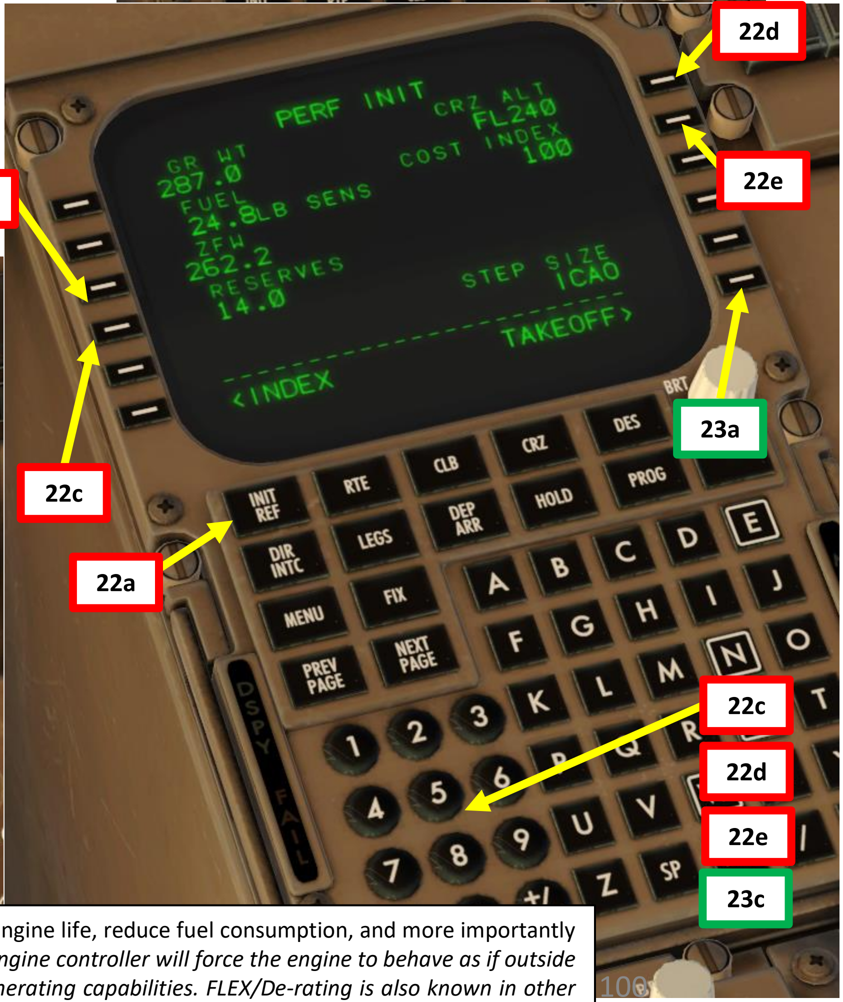
Route Discontinuity between BIG and ILS 27L

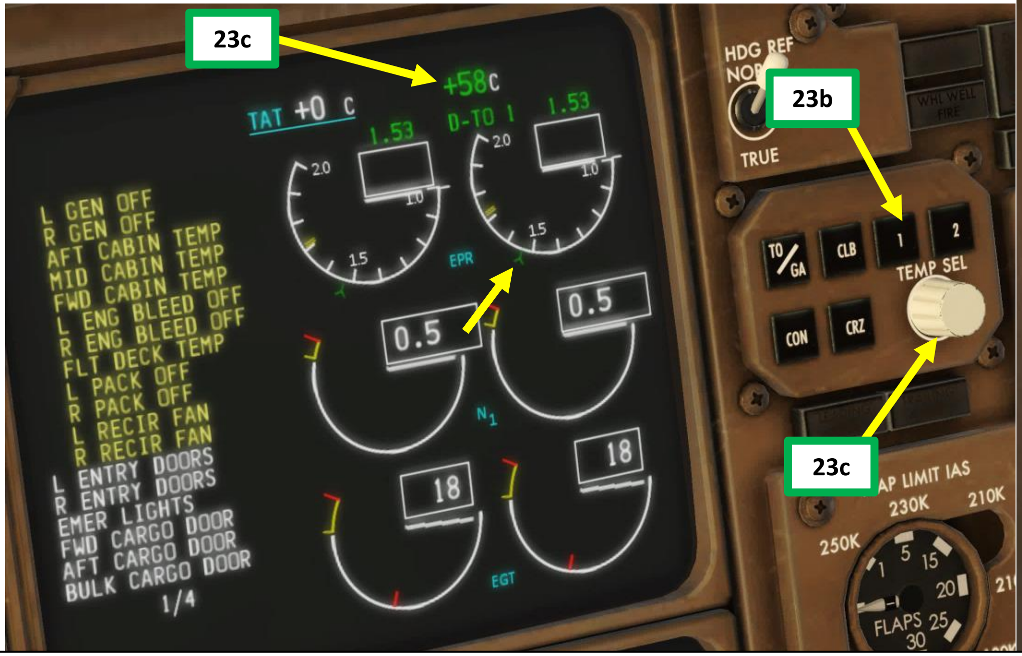


Direct Route between BIG and ILS 27L

FMC SETUP – PERF INIT

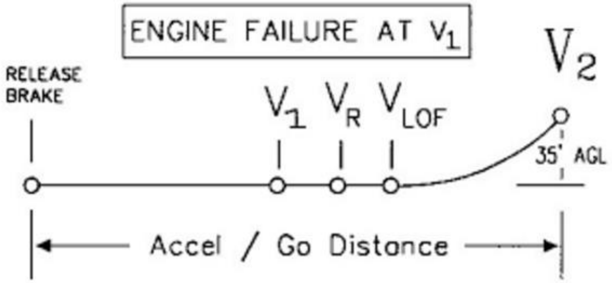
22. Go on FMC (Flight Management Computer) and set aircraft performance parameters
    a) Select "FMC" menu on the MCDU and press the "INIT REF" button to open the PERF INIT page
    b) Double-Click on ZFW (Zero Fuel Weight) button to enter the automatically calculated ZFW and auto-fill GR WT.
    c) Type "14.0" on MCDU keypad and select RESERVES to set reserve fuel weight determined by Fuel Planner tool (14.0 x 1000 for 14000 lbs)
    d) Set cruising altitude to FL240 (24000 ft) by typing "240" on the MCDU keypad and selecting CRZ ALT.
    e) Type "100" on MCDU keypad and select COST INDEX (cost index is generally given to you by the airline company, so you shouldn't really care about it within the scope of this simulation)
23. Select required Engine De-Rating thrust mode in order to limit your engines' thrust.
    a) Select TAKEOFF page
    b) Click on the "TO-1" or "TO-2" EPR Limit to set engine thrust limit. If you want maximum power, select "TO/GA"
    c) You can set an Assumed Temperature of 58 deg C by typing "58" on the MCDU keypad and clicking on the LSK next to SEL or by rotating the TEMP SEL knob. This will automatically set "D-TO-1" (Derated Takeoff) Thrust mode and limit the max engine pressure ratio on takeoff.



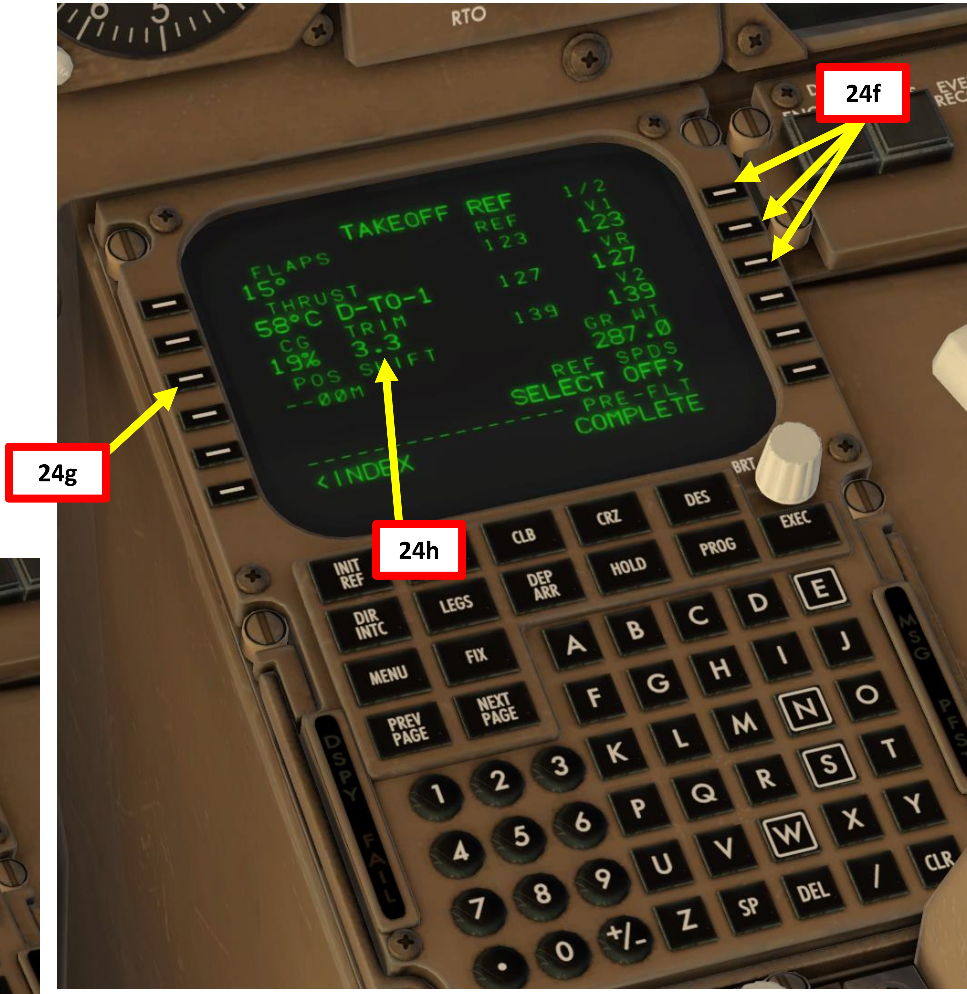


Note: TO, TO-1, and TO-2 are engine de-ratings. De-rating means that the aircraft uses reduced thrust on takeoff in order to reduce engine wear, prolong engine life, reduce fuel consumption, and more importantly comply with noise reduction and runway safety requirements. *Airbus aircraft have a similar concept called "FLEX". "Flexible temperature" means that the engine controller will force the engine to behave as if outside air temperature was higher than it really is, causing the engines to generate less thrust since higher air temperatures diminish an aero-engine's thrust generating capabilities. FLEX/De-rating is also known in other companies as "Assumed Temperature Derate", "Assumed Temperature Thrust Reduction" or "Reduced Takeoff Thrust" or "Factored Takeoff Thrust".*

FMC SETUP – PERF INIT



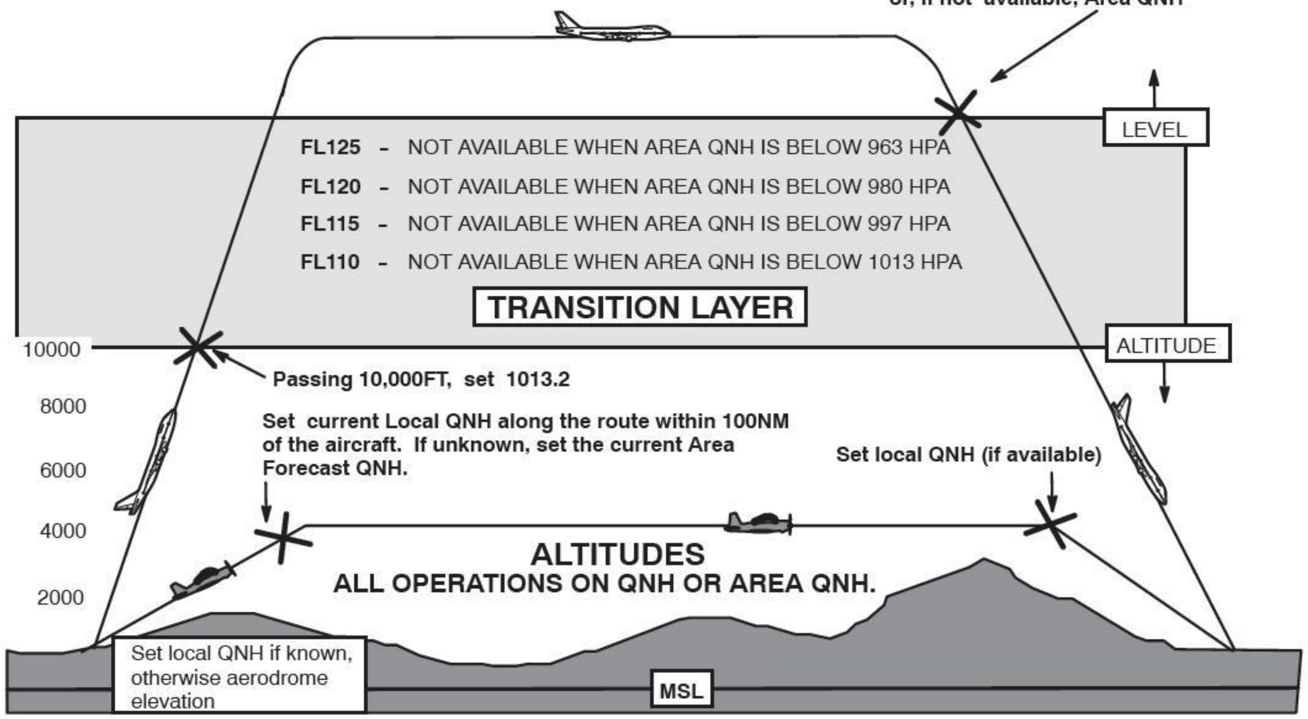
24. Go on FMC (Flight Management Computer) and set TAKEOFF parameters
    a) Go back to the TAKEOFF page
    b) Type "15" on MCDU keypad and select LSK next to "FLAPS" to set takeoff flaps to 15 degrees.
    c) Press the LSK next to REF SPDS – SELECT ON to show automatically computed V-speeds based on the performance data (weight) we just entered
    d) Observe the resulting V1, VR and V2 speeds resulting of this flap setting and current aircraft weight: **V1** is the Decision Speed (minimum airspeed in the takeoff, following a failure of the critical engine at VEF, at which the pilot can continue the takeoff with only the remaining engines), **VR** is the rotation speed (airspeed at which the pilot initiates rotation to obtain the scheduled takeoff performance), and **V2** is Takeoff Safety Speed (minimum safe airspeed in the second segment of a climb following an engine failure at 35 ft AGL).
    e) V1 Speed is 123 kts
    VR Speed is 127 kts
    V2 Speed is 139 kts
    f) Click on the LSKs next to V1, VR and V2 to automatically enter computed V speeds.
    g) Click on the LSK next to CG twice to automatically calculate the **CG position of 19.0 % MAC**, or Mean Aerodynamic Chord.
    h) Observe the resulting **TAKEOFF TRIM setting: +3.3**



FMC SETUP – VNAV (CLIMB & CRUISE)

25. Go on FMC (Flight Management Computer) and set Transition Altitude
    a) Select “FMC” menu on the MCDU and press the “CLB” button to open the Climb Vertical Navigation page
    b) Set transition altitude to 3000 ft by typing “3000” on the MCDU keypad and selecting TRANS ALT (as per Europe norms, but you would use 18000 ft in North America).
26. Go on FMC (Flight Management Computer) and verify that cruising altitude is correct
    a) Select “FMC” menu on the MCDU and press the “CRZ” button to open the Cruise Vertical Navigation page
    b) Confirm that CRZ ALT reads FL240 (24000 ft). If it doesn’t, change the field manually.

Transition Altitude (U.S. system)

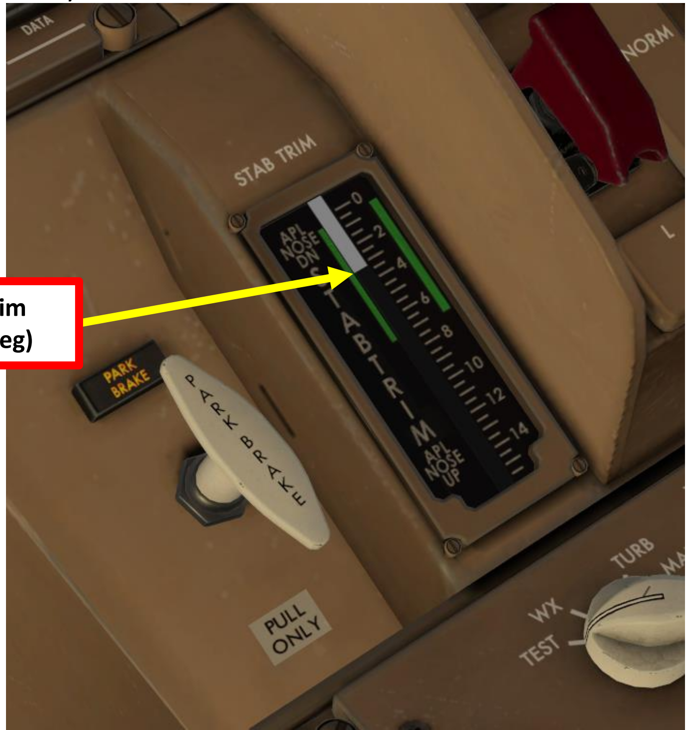


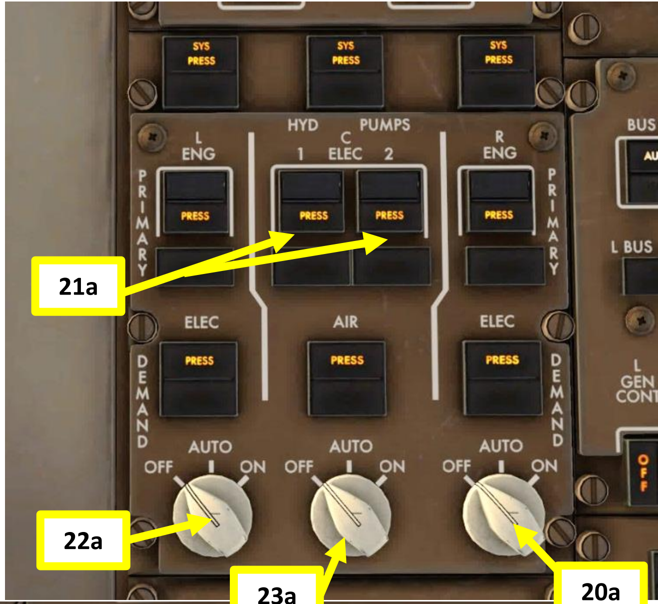
TAKEOFF TRIM & HYDRAULIC POWER SETUP

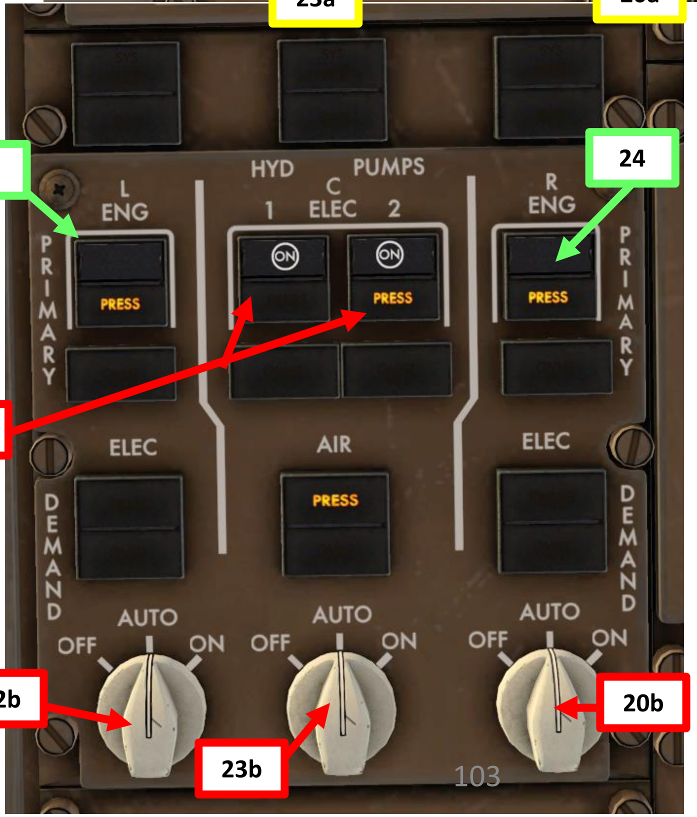
V1 Speed is 123 kts
VR Speed is 127 kts
V2 Speed is 139 kts
Takeoff Trim is +3.3

NOTE: In order to set up our stabilizer takeoff trim, we need hydraulic power. We will use the hydraulic electrically-driven pumps and hydraulic demand pumps for that.

20. Set RIGHT HYDRAULIC DEMAND PUMP switch to AUTO. Wait for the PRESS light to disappear. This pump is electrically-driven.
21. Set CENTER 1 & CENTER 2 HYDRAULIC DEMAND PUMP switches to ON. Wait for the PRESS light to disappear for CENTER 1 pump. The PRESS light will still be displayed for CENTER 2 pump since the engines are not started yet and load shedding logic leaves pump 1 functional only before engine start. Both pumps are electrically-driven.
22. Set LEFT HYDRAULIC DEMAND PUMP switch to AUTO. Wait for the PRESS light to disappear. This pump is electrically-driven.
23. Set CENTER AIR-DRIVEN HYDRAULIC DEMAND PUMP switch to AUTO. The PRESS light will still be displayed since this system uses bleed air and no bleed air is available yet (typically the APU (Auxiliary Power Unit) would be turned on before doing this step).
24. Verify that LEFT & RIGHT HYDRAULIC PRIMARY PUMP switches are OFF. PRESS light should be displayed. Both pumps will need to be turned on eventually, but only after the engines are started.
25. Set Stabilizer Trim to the Takeoff Trim value of +3.3 calculated earlier by the FMC.

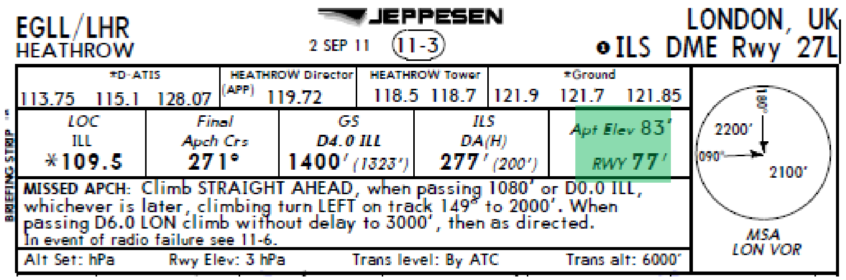




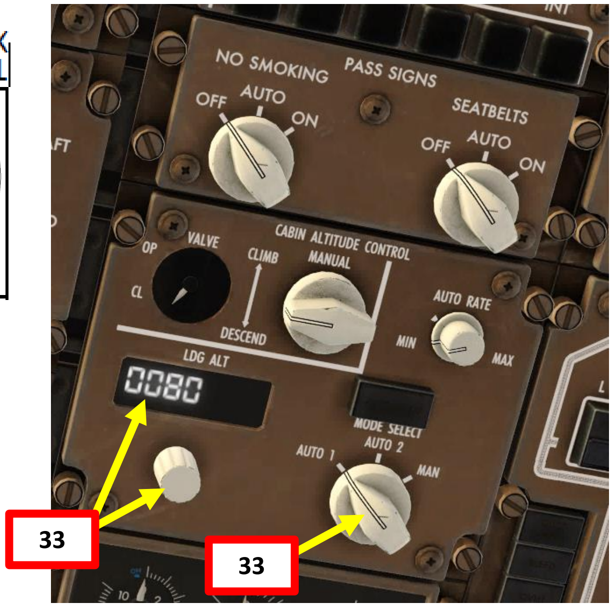


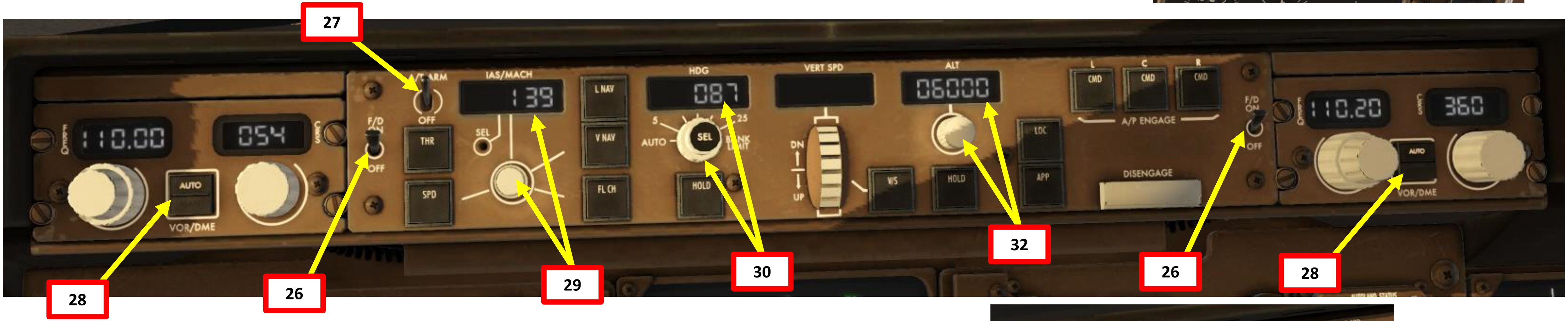
AUTOPILOT & CABIN PRESSURE SETUP

V1 Speed is 123 kts
VR Speed is 127 kts
V2 Speed is 139 kts
Takeoff Trim is +3.3



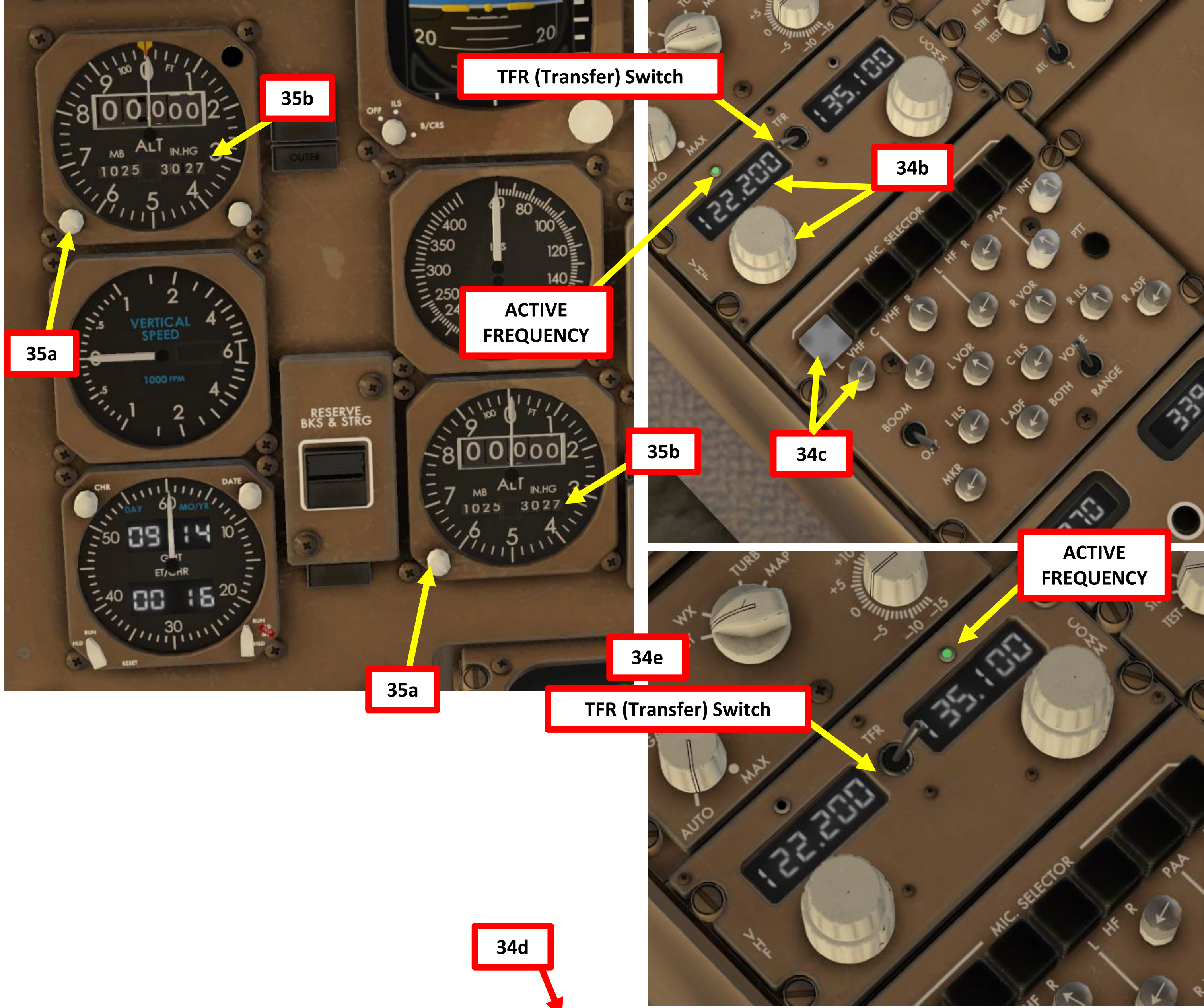
26. Turn on both FD (Flight Director) switches – UP POSITION
27. Turn on A/T ARM (Autothrottle Arm) switch ON (UP)
28. Set all VOR switches – AUTO
29. Set V2 Speed on MCP (Mode Control Panel) by rotating MCP IAS knob on the glareshield until IAS is set to 139 kts (V2 speed)
30. Set HEADING knob to runway QDM (Magnetic) heading 087 as per Jeppesen chart.
31. Set BANK ANGLE LIMIT selector - AUTO
32. As per EHAM SID Chart, set Initial Altitude (FL060, or 6,000 ft) on MCP (Mode Control Panel) by rotating ALTITUDE knob on glareshield until Altitude is set to 6,000 ft
33. As per EGLL ILS chart, Heathrow Airport's elevation is 77 ft. Set LDG ALT to 80 ft and Cabin Pressurization Mode to AUTO 1.

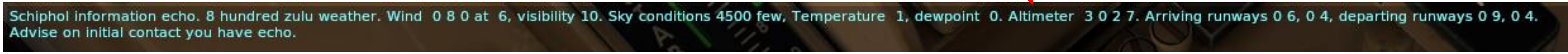




ALTIMETER SETUP

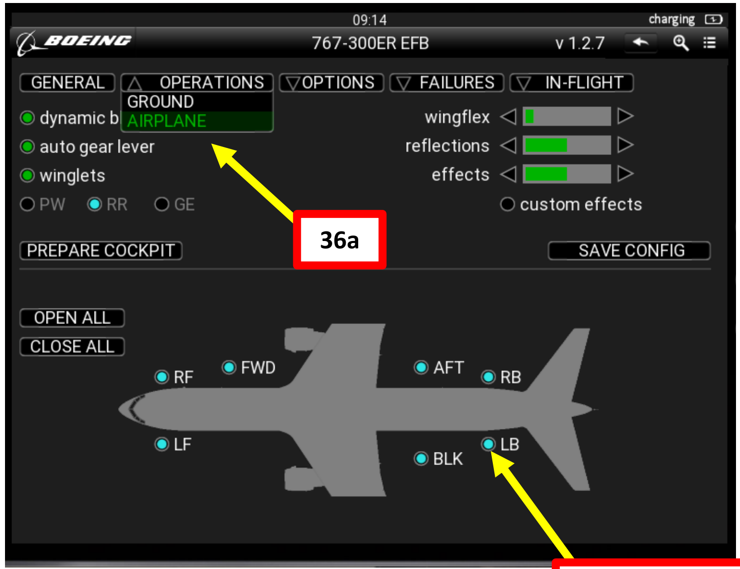
34. You can consult the EHAM ATIS (Automatic Terminal Information Service) system with the radio to get the altimeter setting.
    a) Consult the EHAM chart and find the Schiphol ATIS Frequency (122.200).
    b) Set VHF-1 COMM ACTIVE radio frequency to the ATIS frequency (122.200).
    c) Press the L VHF button on the Audio Select Panel to listen on the VHF-1 active frequency.
    d) You should receive the ATIS automated report on the radio for Schiphol. The reported altimeter setting is 30.27 inches of Hg.
    e) You can click on the TFR (Transfer) button to set the ATIS frequency to the STANDBY frequency once you have the information you need. You will then stop hearing the ATIS broadcast.
35. Set altimeter setting and standby altimeter setting to 3027 (30.27 inches of mercury) by rotating the altimeter BARO knob. Do this for the co-pilot instruments as well. Our altimeters should read roughly 0 ft, which is approximately the airport elevation of EHAM.





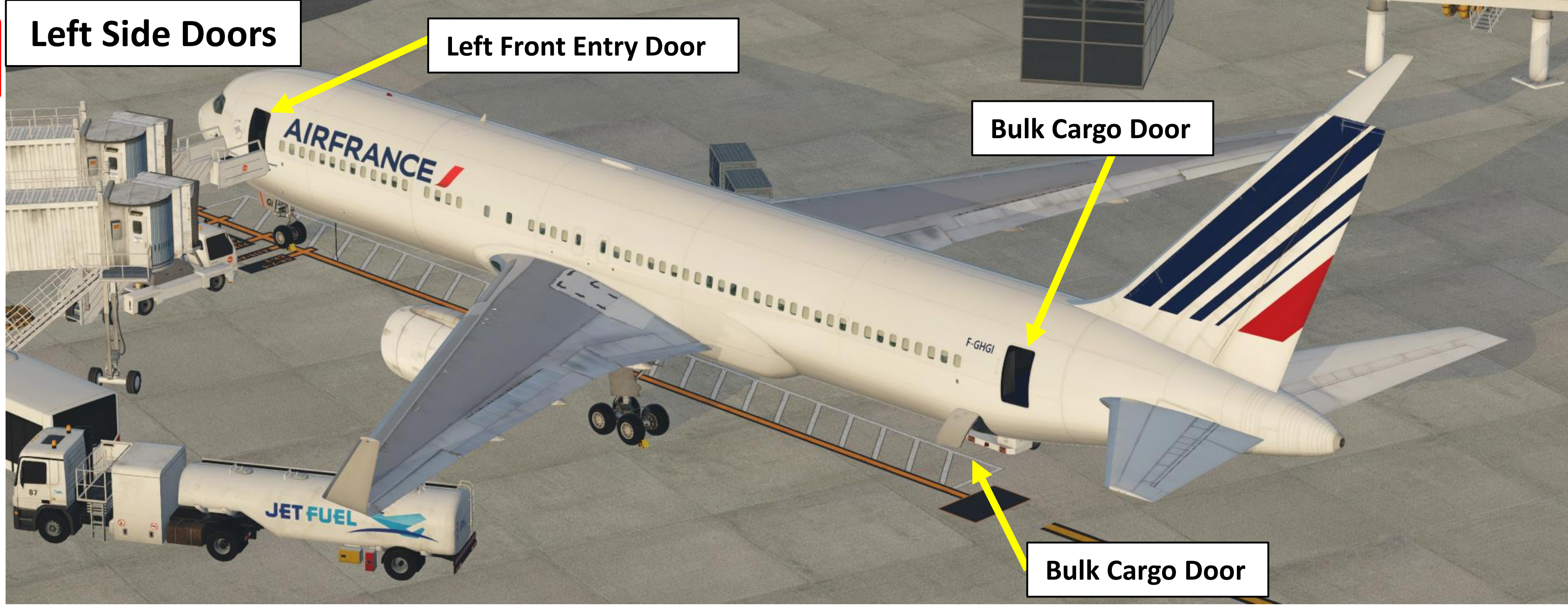
DOORS

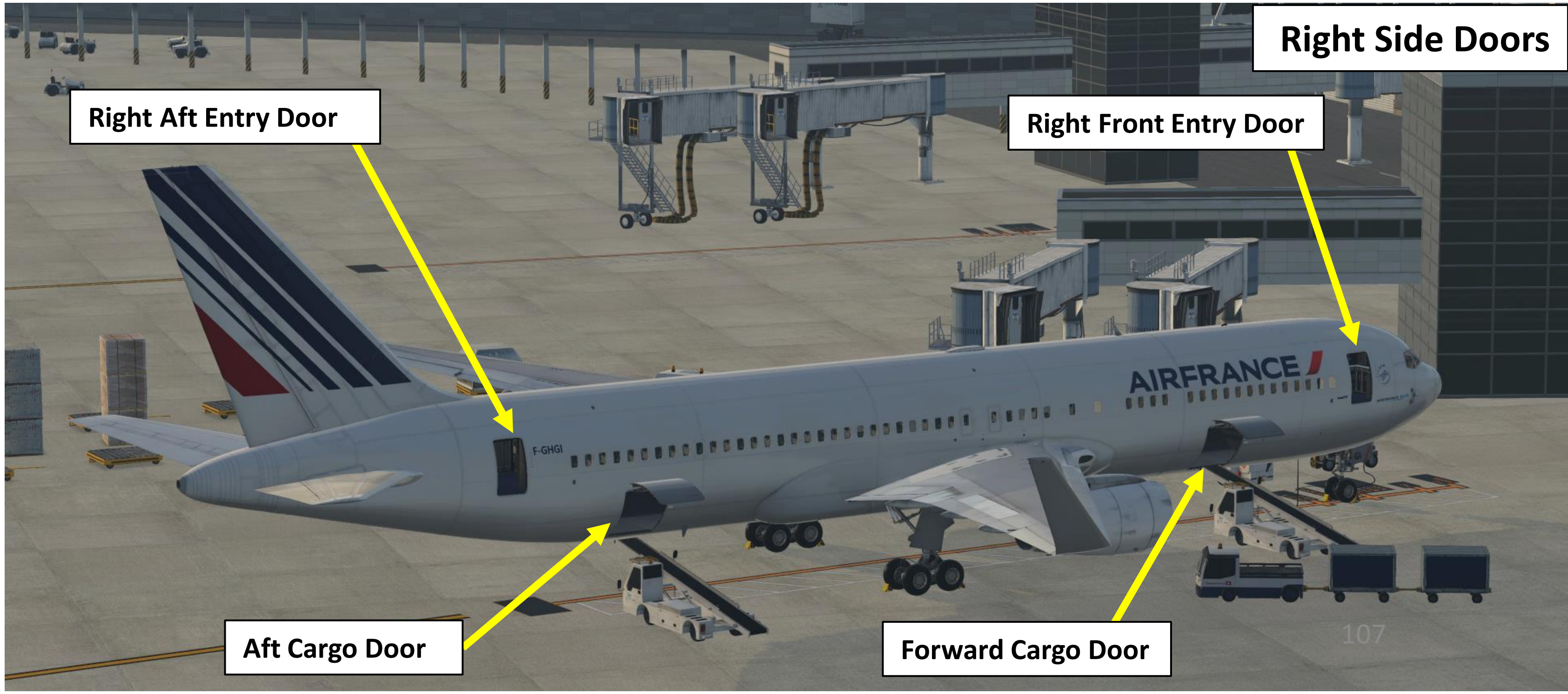
36. Click on EFB (Electronic Flight Bag) and close doors
    a) Select OPERATIONS – AIRPLANE menu
    b) Click on CLOSE ALL



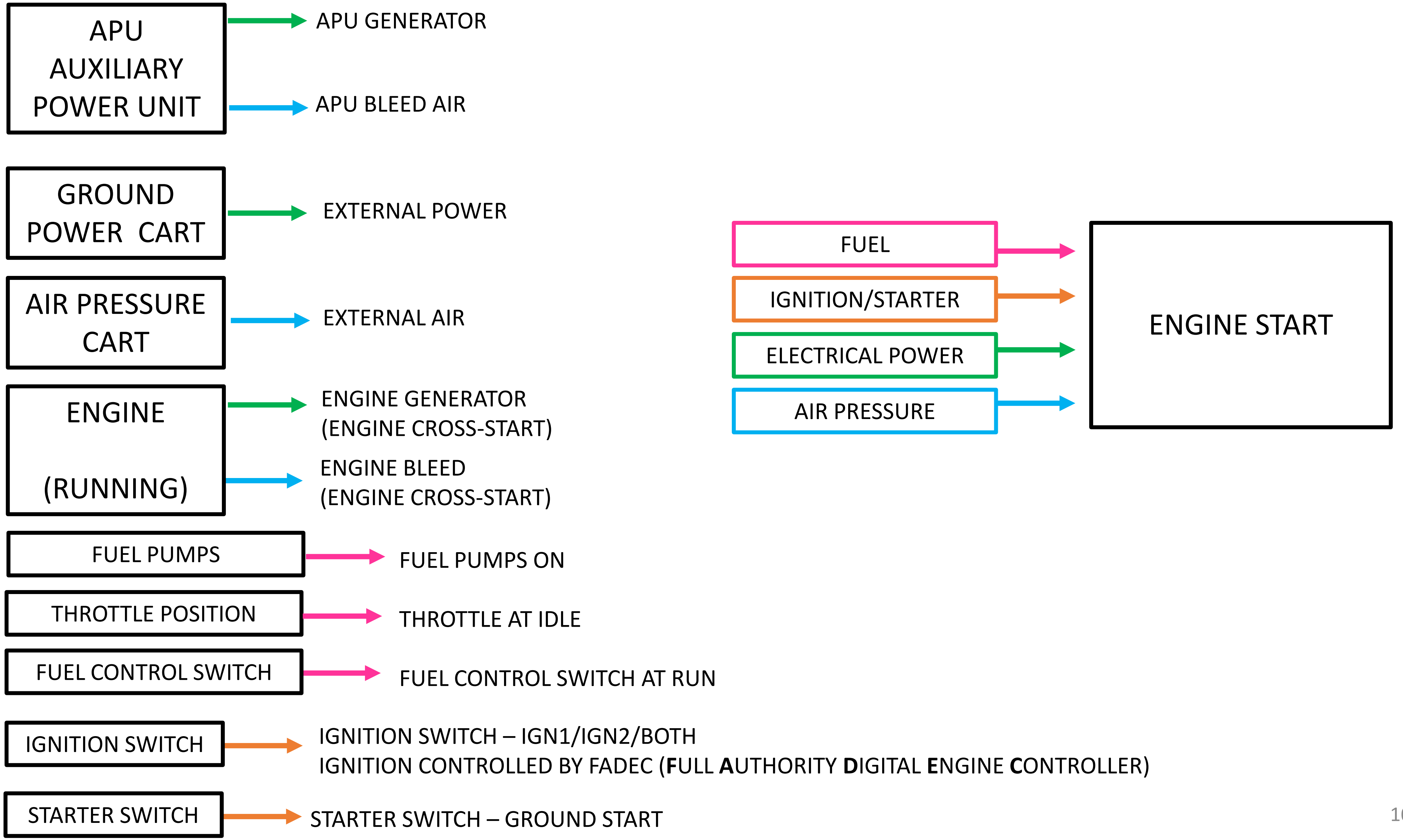
DOORS


OPEN ALL
CLOSE ALL
RF
FWD
AFT
RB
LF
BLK
LB


Left Side Doors
Left Front Entry Door
Bulk Cargo Door
Bulk Cargo Door
AIRFRANCE
JET FUEL

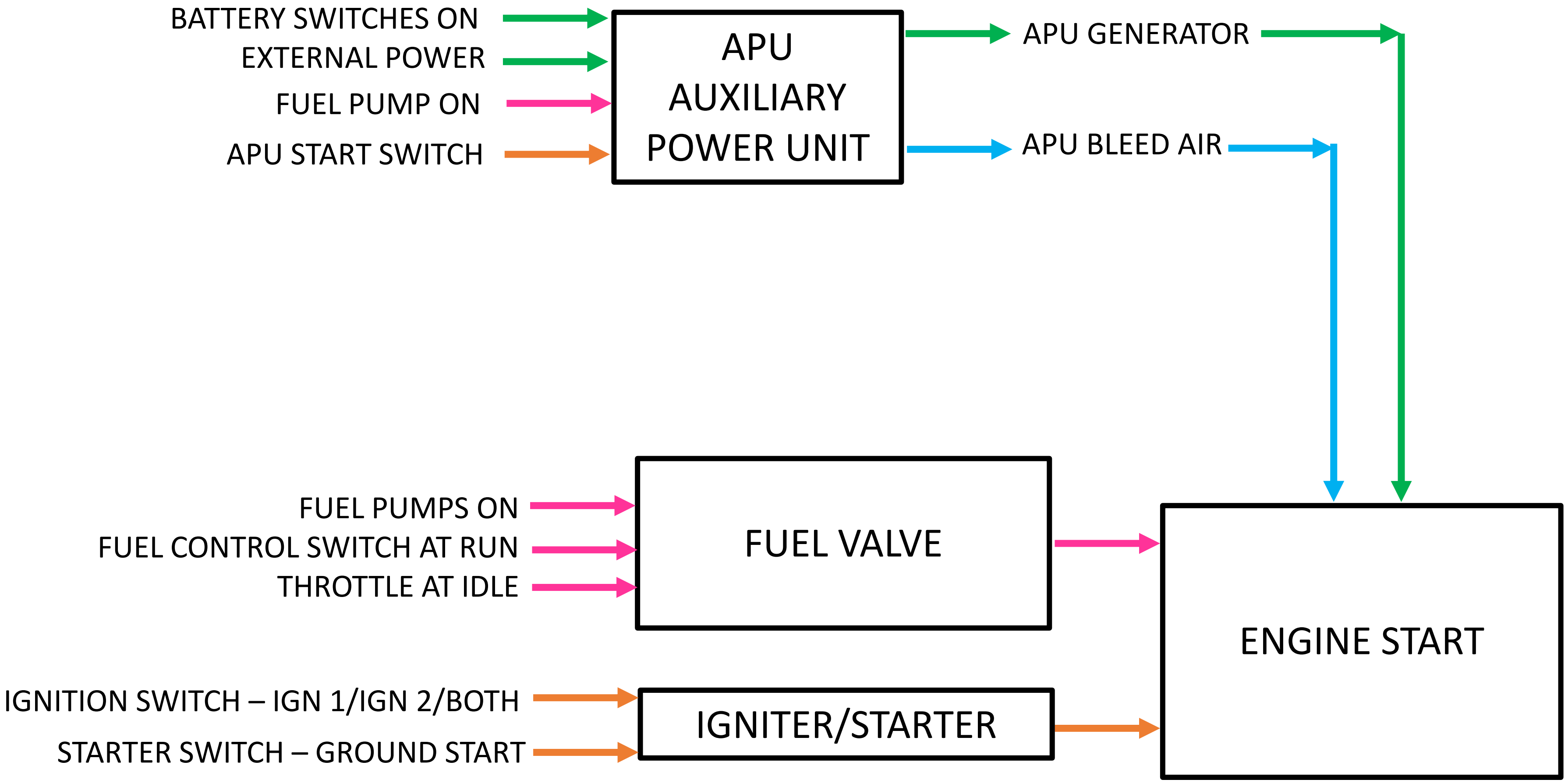

Right Side Doors
Right Aft Entry Door
Right Front Entry Door
AIRFRANCE
Aft Cargo Door
Forward Cargo Door

ENGINE START-UP



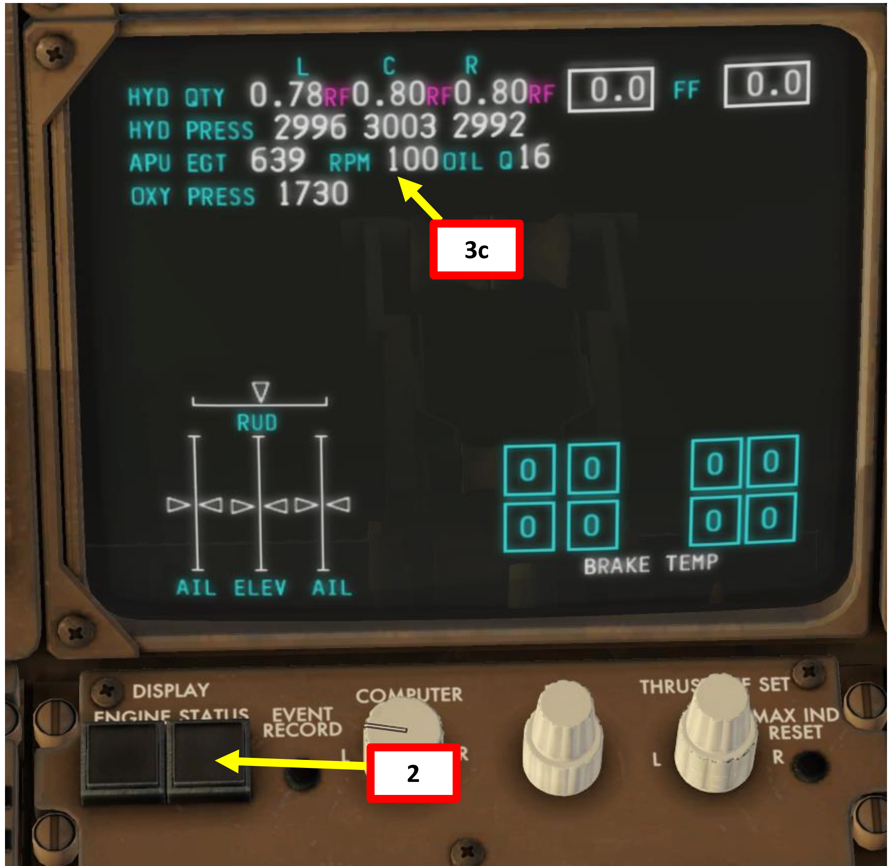
ENGINE START-UP

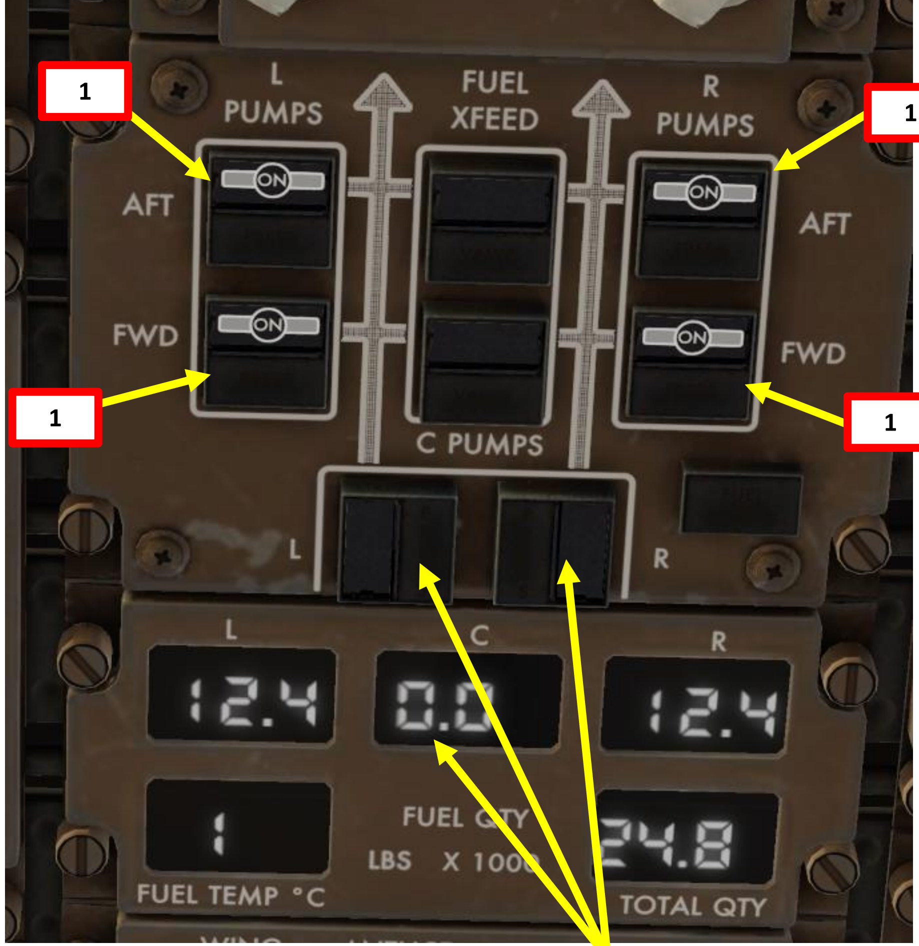
NOTE: It is usually common practice to start your engines during pushback. We will start our engines before that for simplicity.

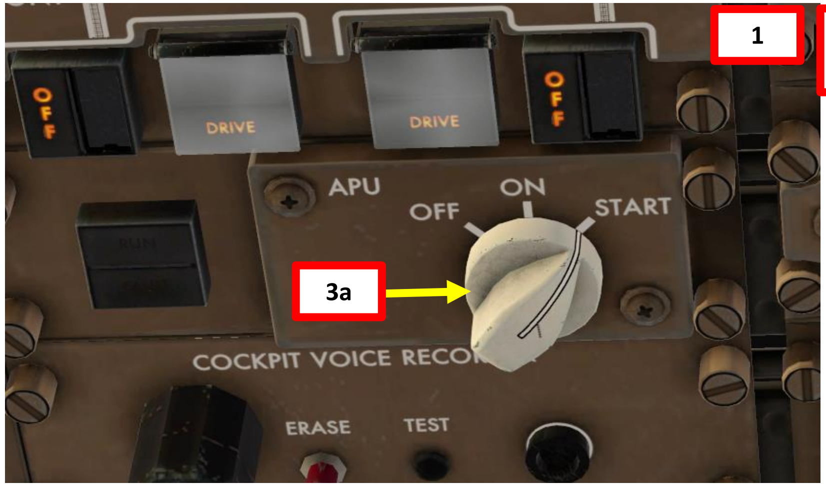


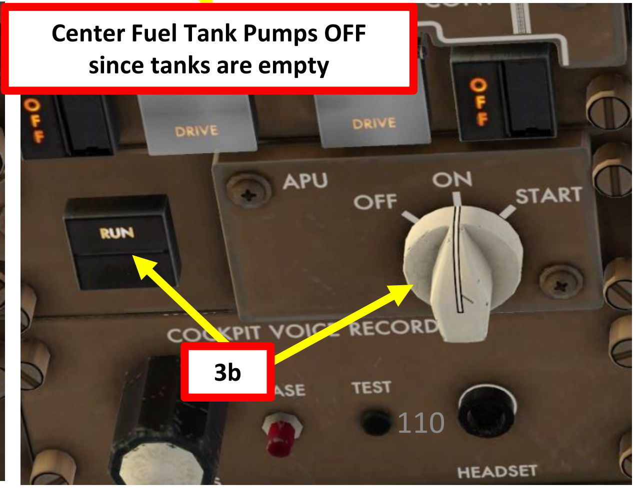
APU (AUXILIARY POWER UNIT) START

1. On Overhead Panel, turn ON the LEFT AFT, LEFT FWD, RIGHT AFT and RIGHT FWD Fuel Pump switches. If you press the Center Pumps switches, the PRESS caution means that there is no fuel in those tanks and that the switches can remain to OFF.
2. Press the STATUS synoptic page button to monitor APU parameters
3. Set and hold APU switch to START to initiate start (scroll mousewheel), then set switch to ON after the RUN light is displayed. The switch springs back to the ON position once the APU is running (around 90 %).



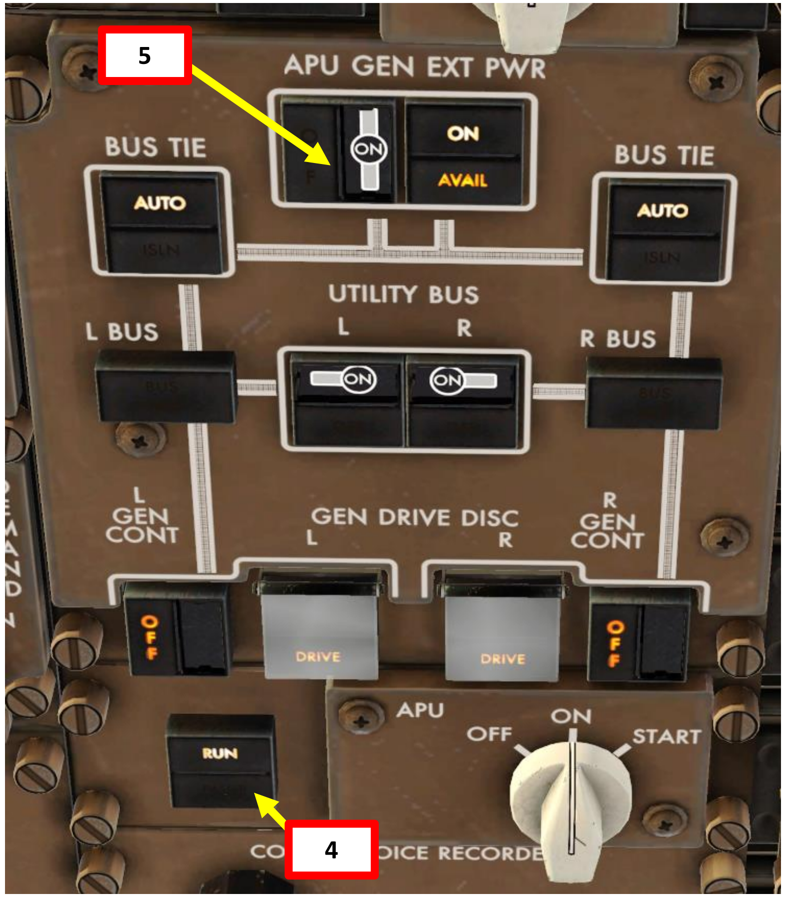


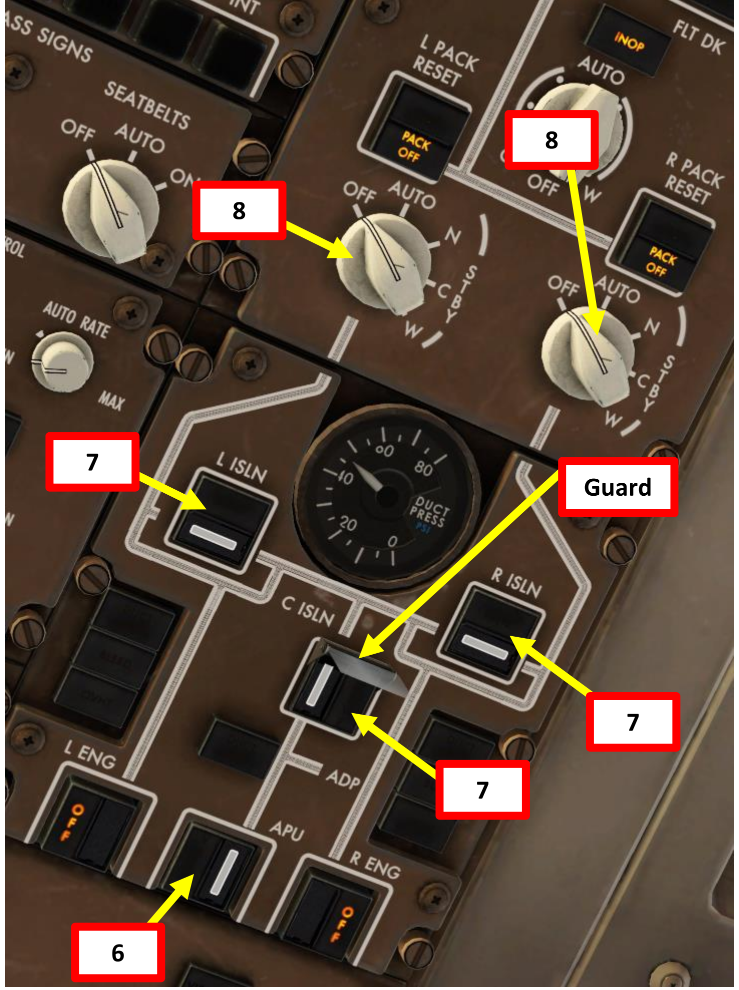


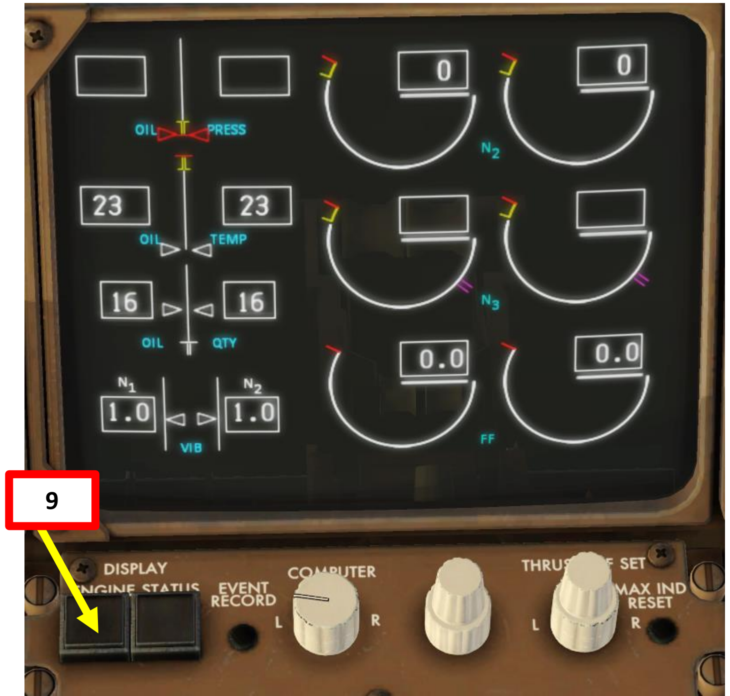


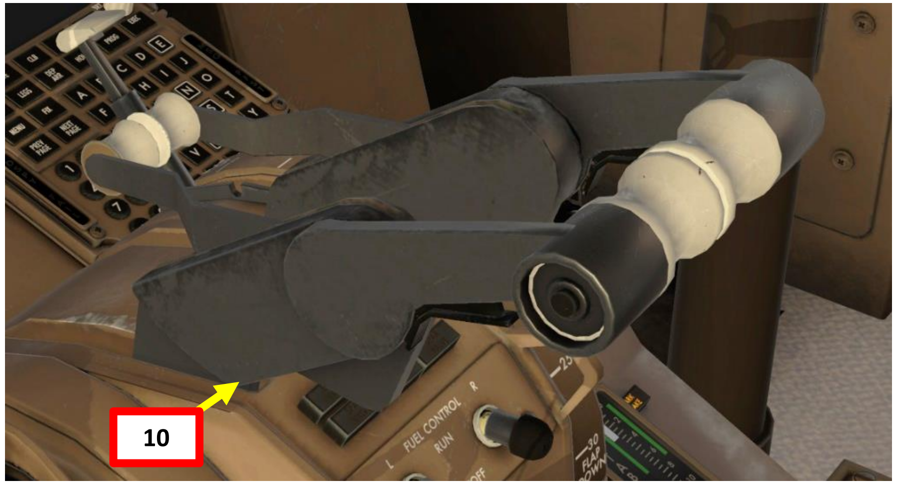
APU (AUXILIARY POWER UNIT) START

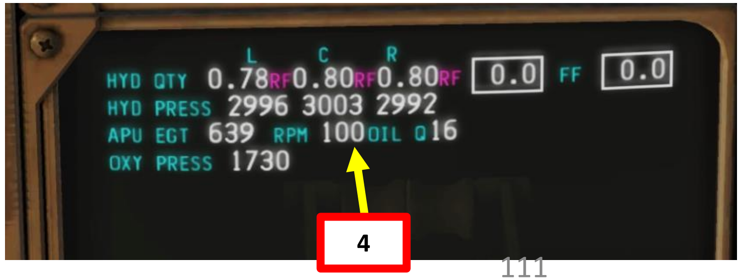
4. Wait until APU RPM reaches 100 % and RUN light is displayed.
5. Set APU GEN switch ON and make sure the EXT PWR indication becomes AVAIL.
6. Make sure the APU BLEED AIR switch is set to ON
7. Make sure the LEFT, RIGHT & CENTER ISOLATION VALVE switches are all set to ON (OPEN). The CENTER switch has a guard that needs to be lifted.
8. Set PACK (Pneumatic Air Conditioning Kit) 1 & 2 switches OFF to ensure enough APU bleed air pressure is available for engine start
9. Push “ENG” button to display the Engine synoptic page
10. Set throttle to IDLE (fully aft).



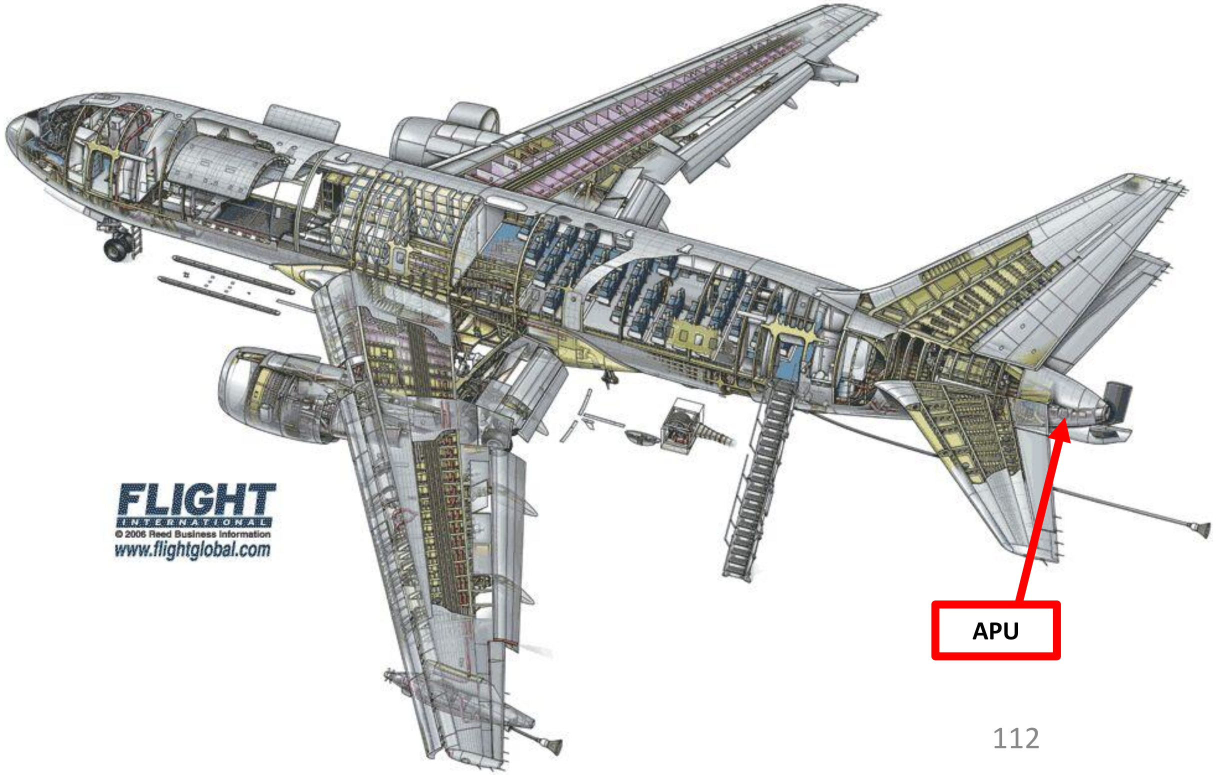






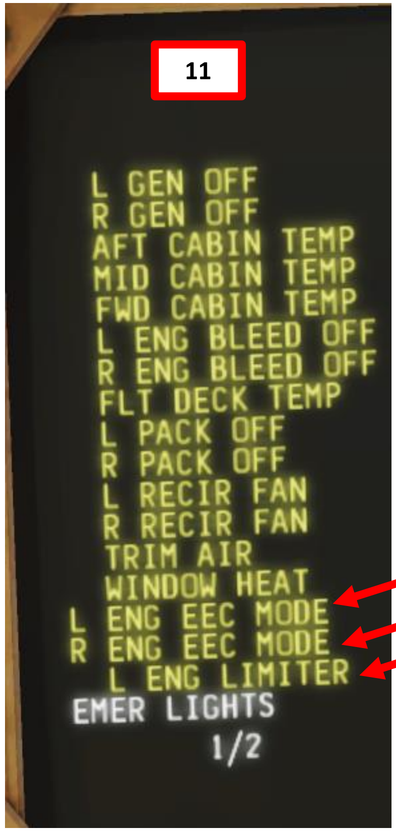


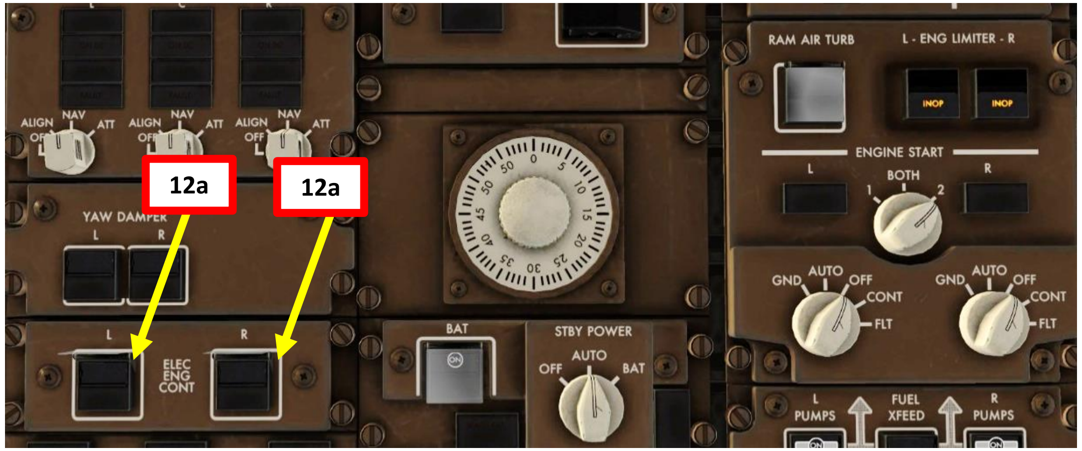
APU RUNNING WITH DOOR OPEN

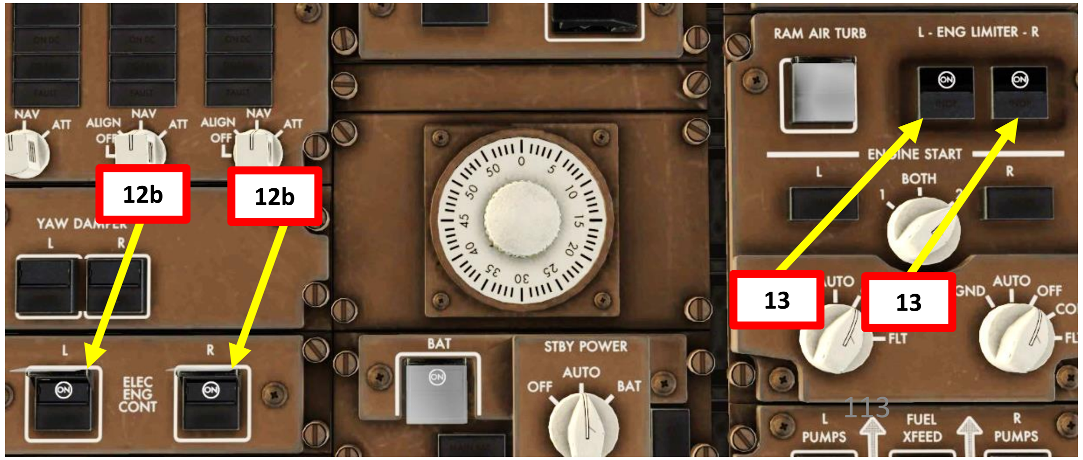


ENGINE START-UP (ROLLS-ROYCE)

11. Raise cover guards for both Left and Right ELEC ENG CONT switches (EEC, Electronic Engine Control)
12. Set both Left and Right ELEC ENG CONT switches – ON
13. Set both Left and Right ENG LIMITER switches – ON
    (ROLLS-ROYCE ENGINES ONLY, NOT PRESENT ON PW & GE ENGINES)
14. Confirm that the L ENG LIMITER (RR only) , R ENG LIMITER (RR only) , L ENG EEC MODE and R ENG EEC MODE indications shown in step 11) are not visible anymore.

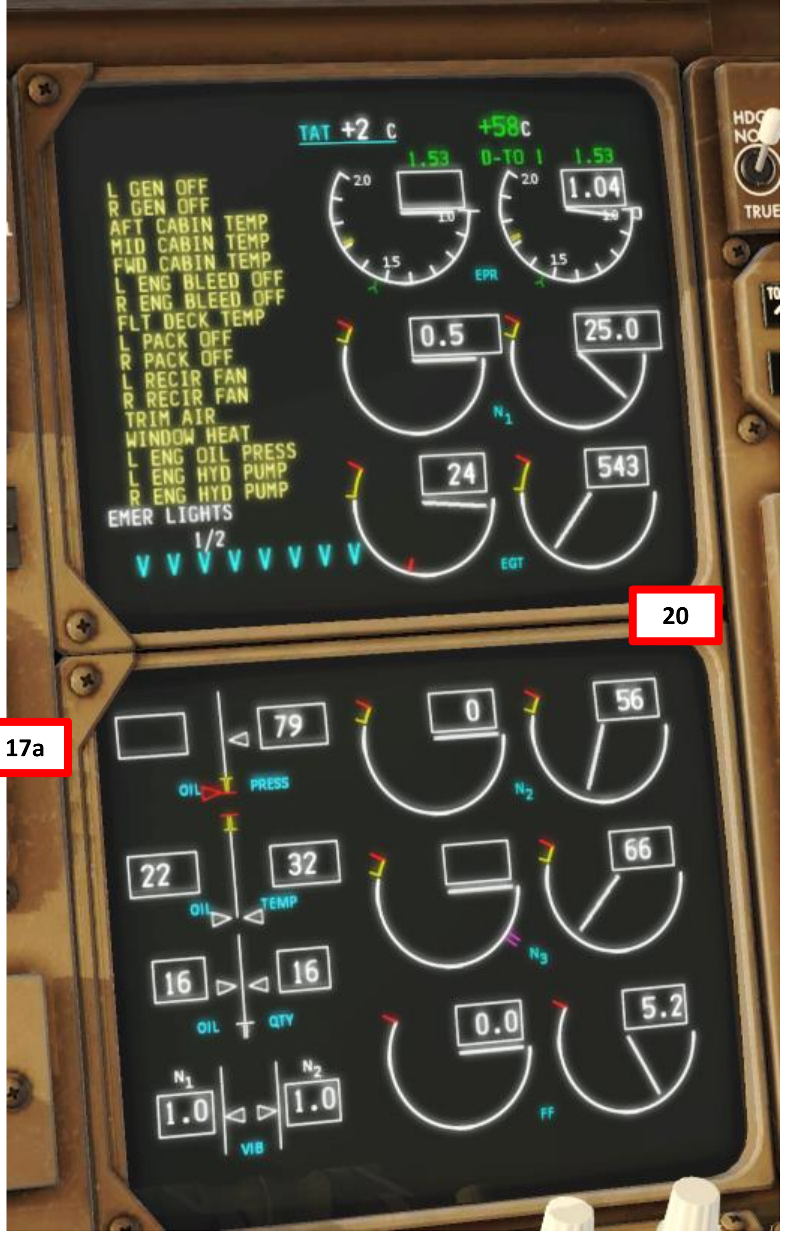


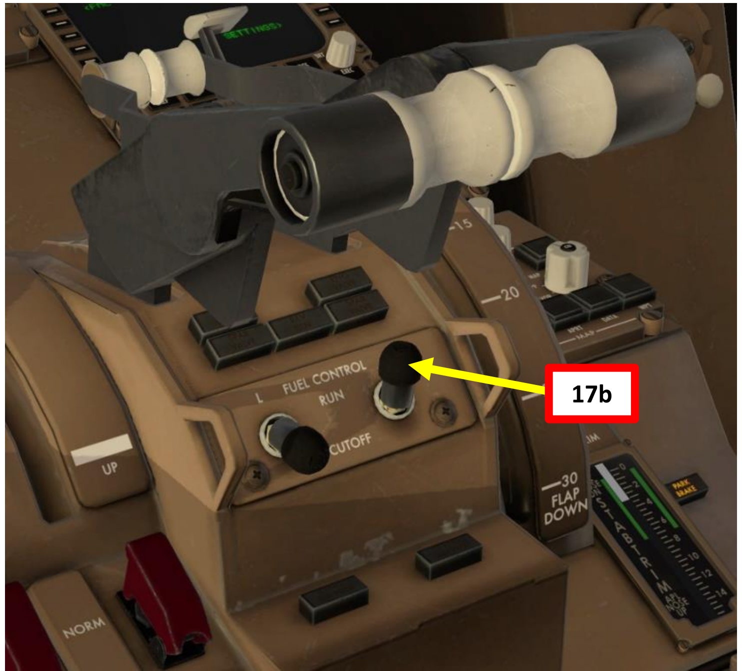




ENGINE START-UP (ROLLS-ROYCE)

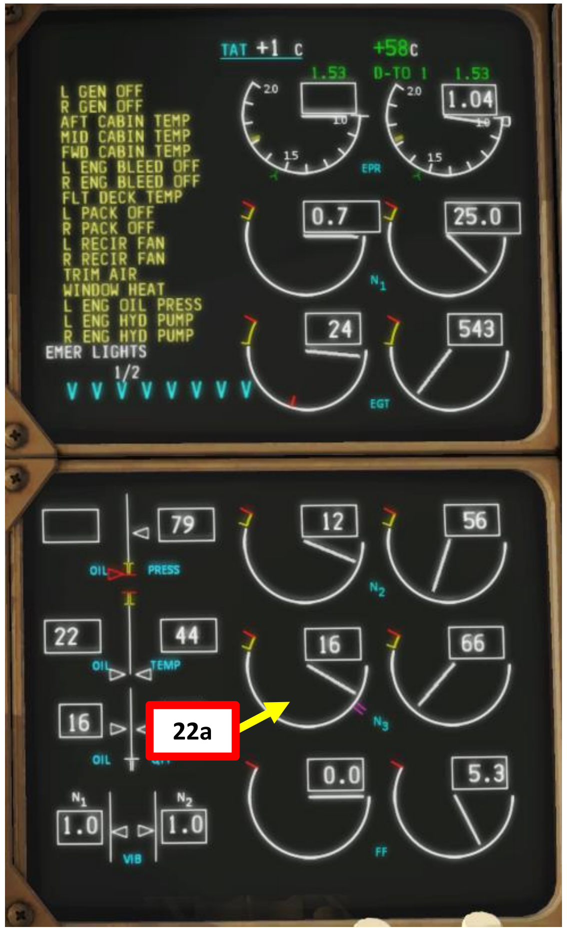
15. Set IGNITION switch to either 1 or 2
16. Set Right STARTER switch to GND (Ground Start)
17. When Right Engine N3 indication (High Pressure Compressor Rotation Speed) reaches 15-20 %, set Right FUEL CONTROL switch to RUN (UP). ***Note**: for GE and Pratt & Whitney engines, use N2 as a reference instead of N3.*
18. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), FF (Fuel Flow) and EGT (Exhaust Gas Temperature), Oil Pressure and Oil Temperature for Right Engine should increase.
19. Right STARTER switch will automatically reset to AUTO once reaching IDLE.
20. Right Engine parameters should stabilize at about 25% N1 and 65 % N3

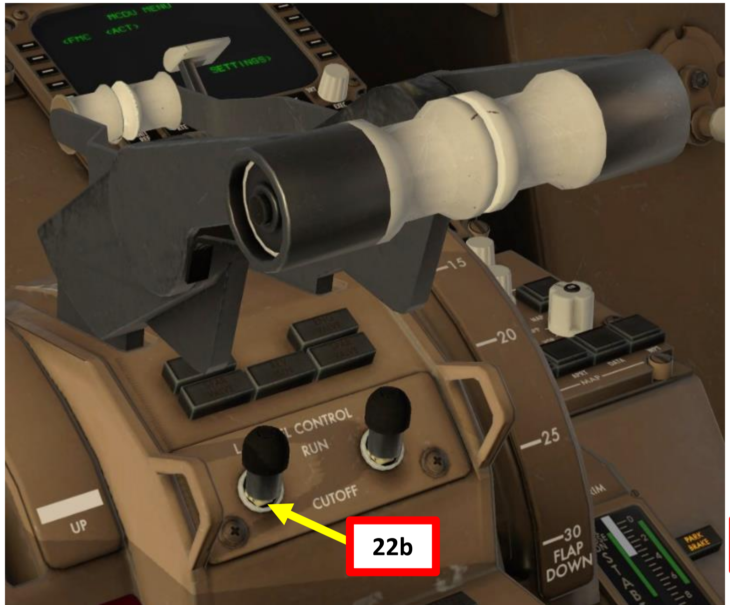




ENGINE START-UP (ROLLS-ROYCE)

21. Set Left STARTER switch to GND (Ground Start)
22. When Left Engine N3 indication (High Pressure Compressor Rotation Speed) reaches 15-20 %, set Left FUEL CONTROL switch to RUN (UP). ***Note**: for GE and Pratt & Whitney engines, use N2 as a reference instead of N3.*
23. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), FF (Fuel Flow) and EGT (Exhaust Gas Temperature), Oil Pressure and Oil Temperature for Left Engine should increase.
24. Left STARTER switch will automatically reset to AUTO once reaching IDLE.
25. Left Engine parameters should stabilize at about 25% N1 and 65 % N3





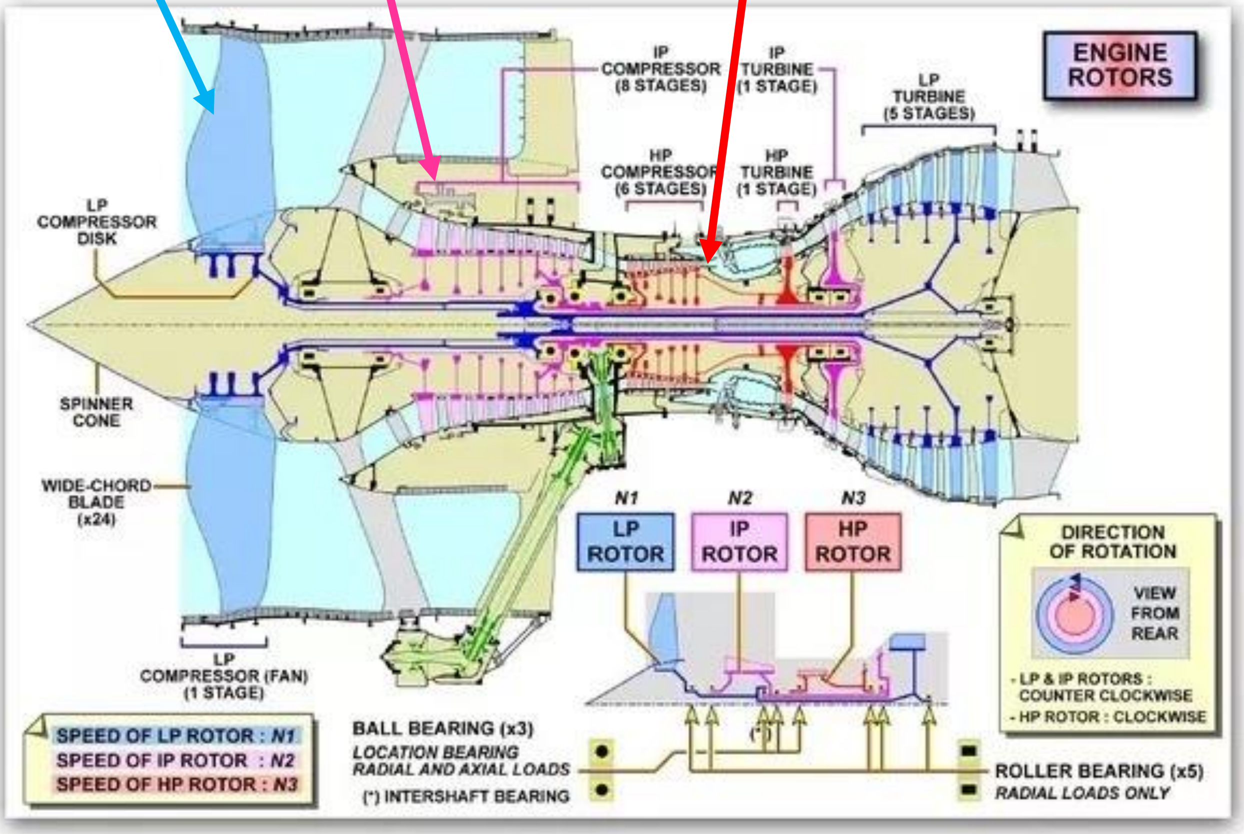
ENGINE START-UP (ROLLS-ROYCE 3-SPOOL ENGINE)

High-pressure compressor and high-pressure turbine are driven by the same shaft. This is N3 speed in percentage of maximum RPM.

N1

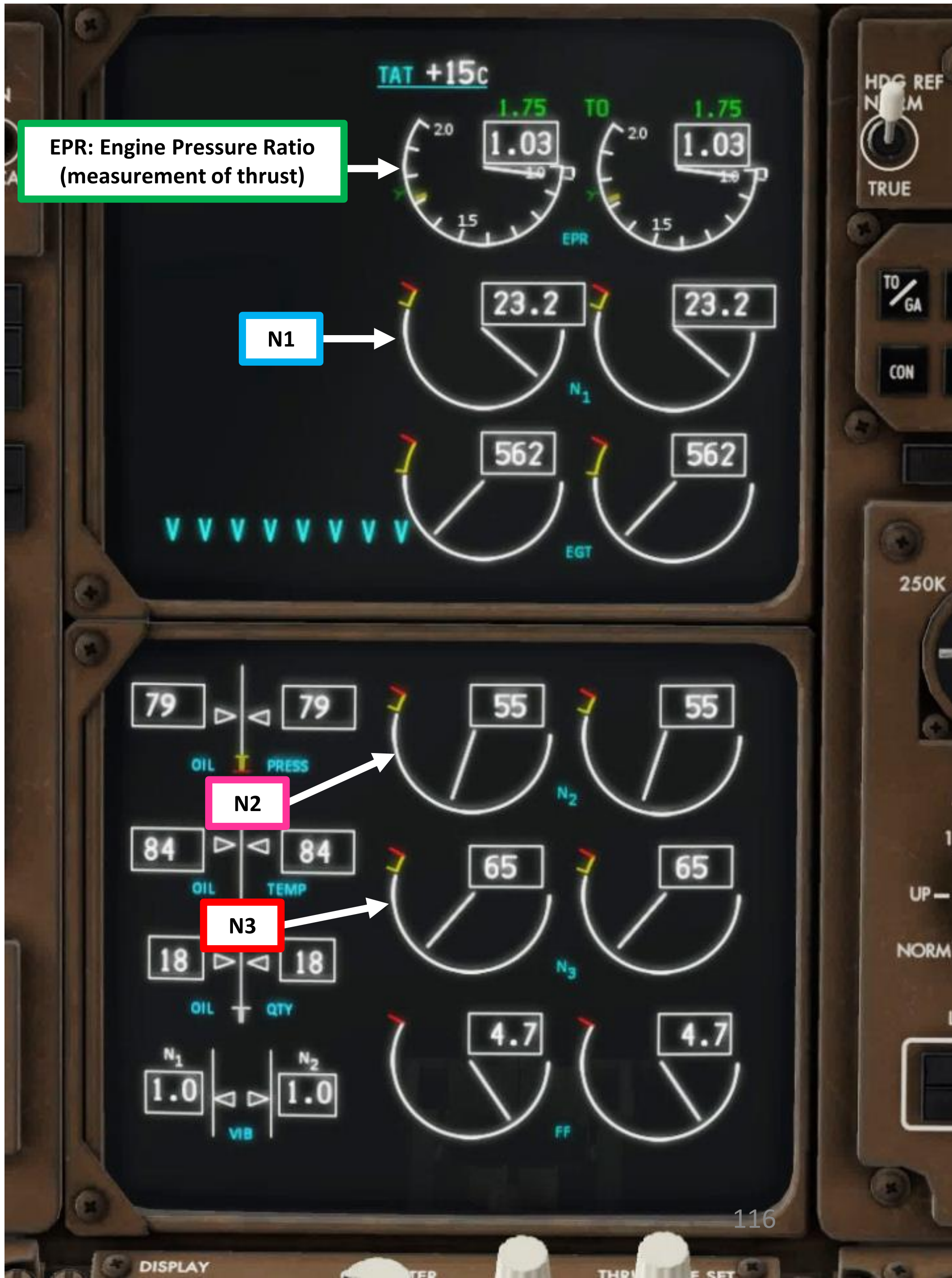
N2

N3



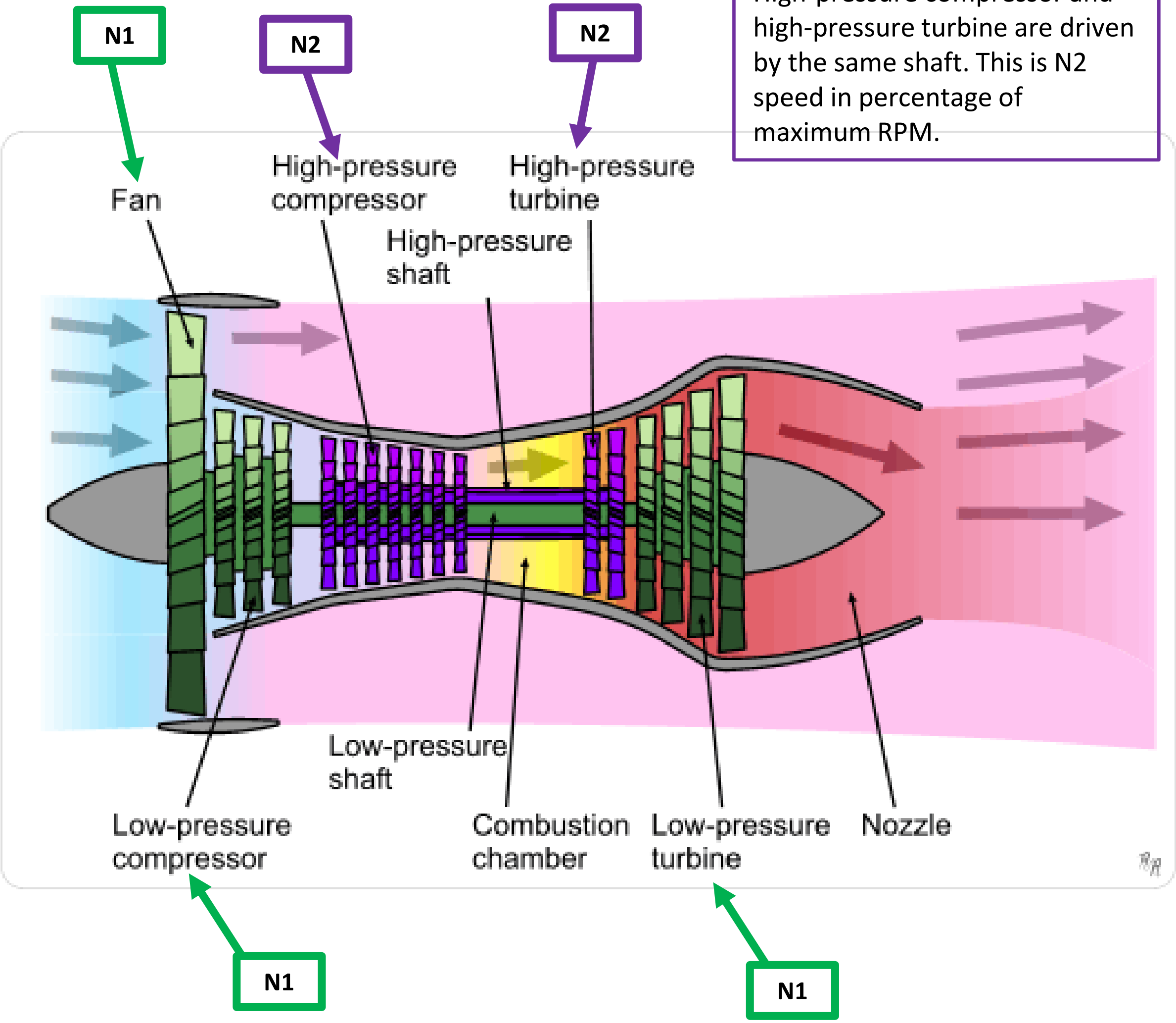
Intermediate-pressure compressor and intermediate-pressure turbine are driven by the same shaft. This is N2 speed in percentage of maximum RPM.

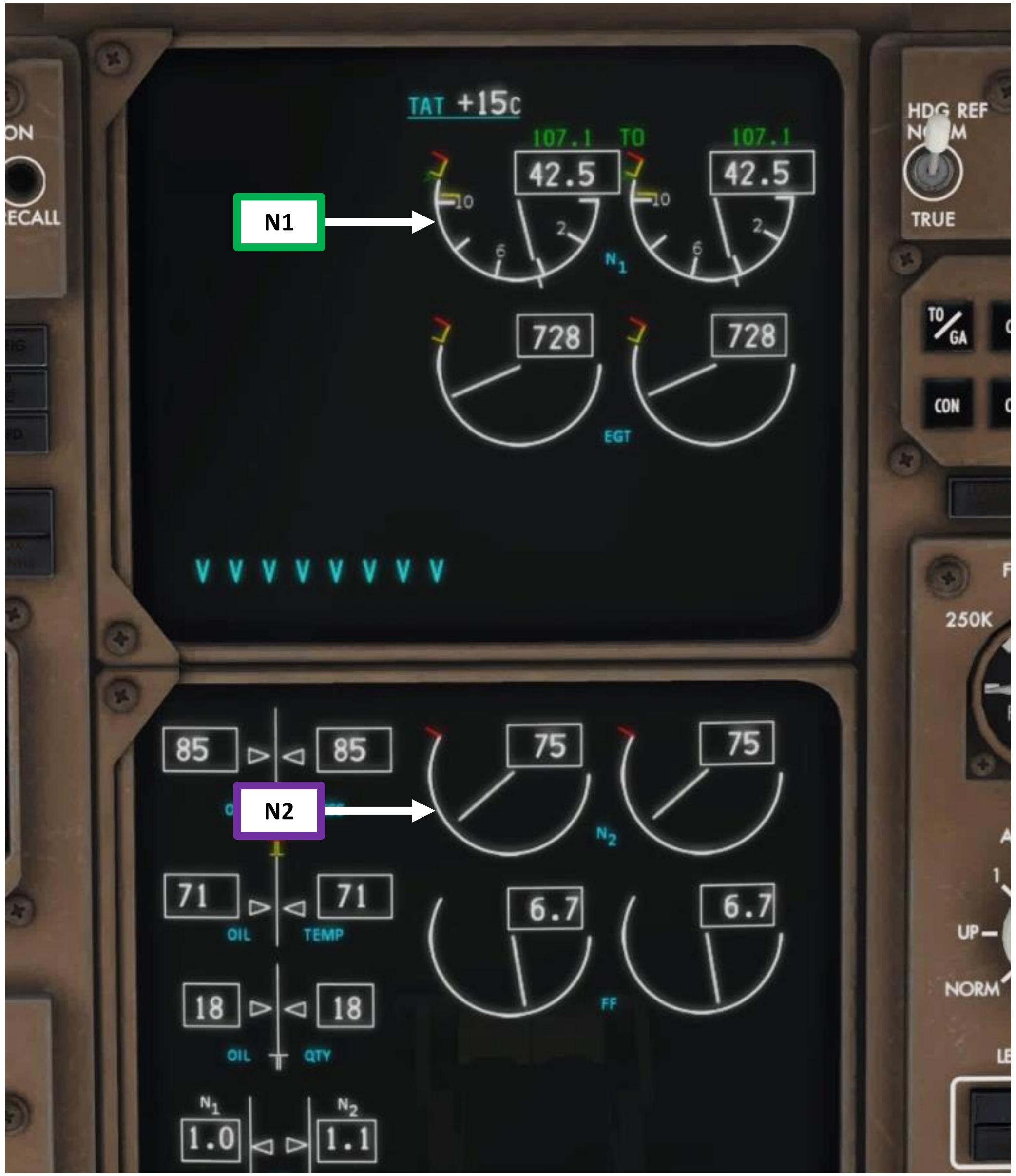
Fan, low-pressure compressor and low-pressure turbine are driven by the same shaft. This is N1 speed in percentage of maximum RPM.



ENGINE START-UP
(GE / PRATT & WHITNEY 2-SPOOL ENGINE)

High-pressure compressor and high-pressure turbine are driven by the same shaft. This is N2 speed in percentage of maximum RPM.



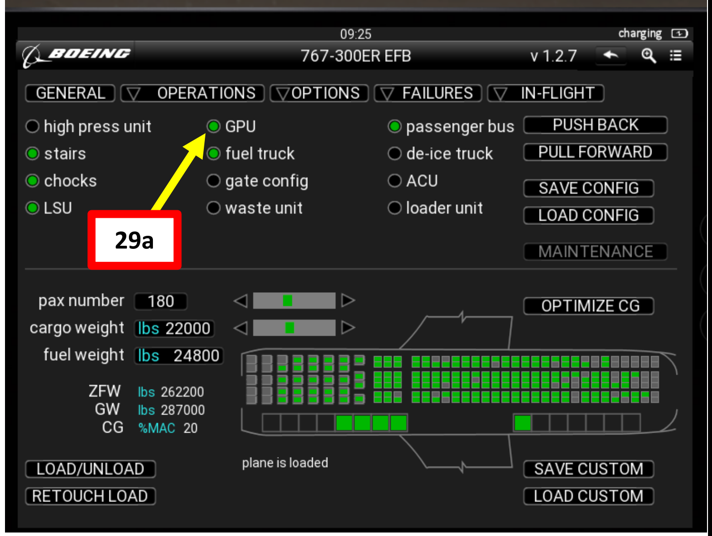


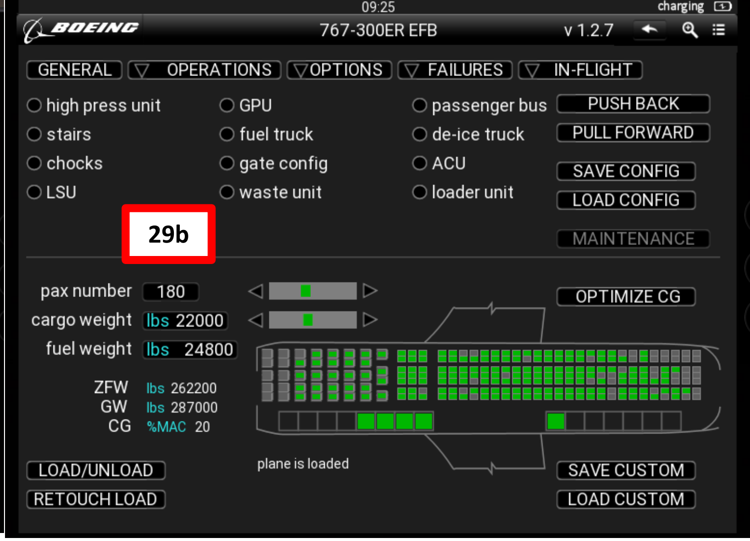
Fan, low-pressure compressor and low-pressure turbine are driven by the same shaft. This is N1 speed in percentage of maximum RPM.

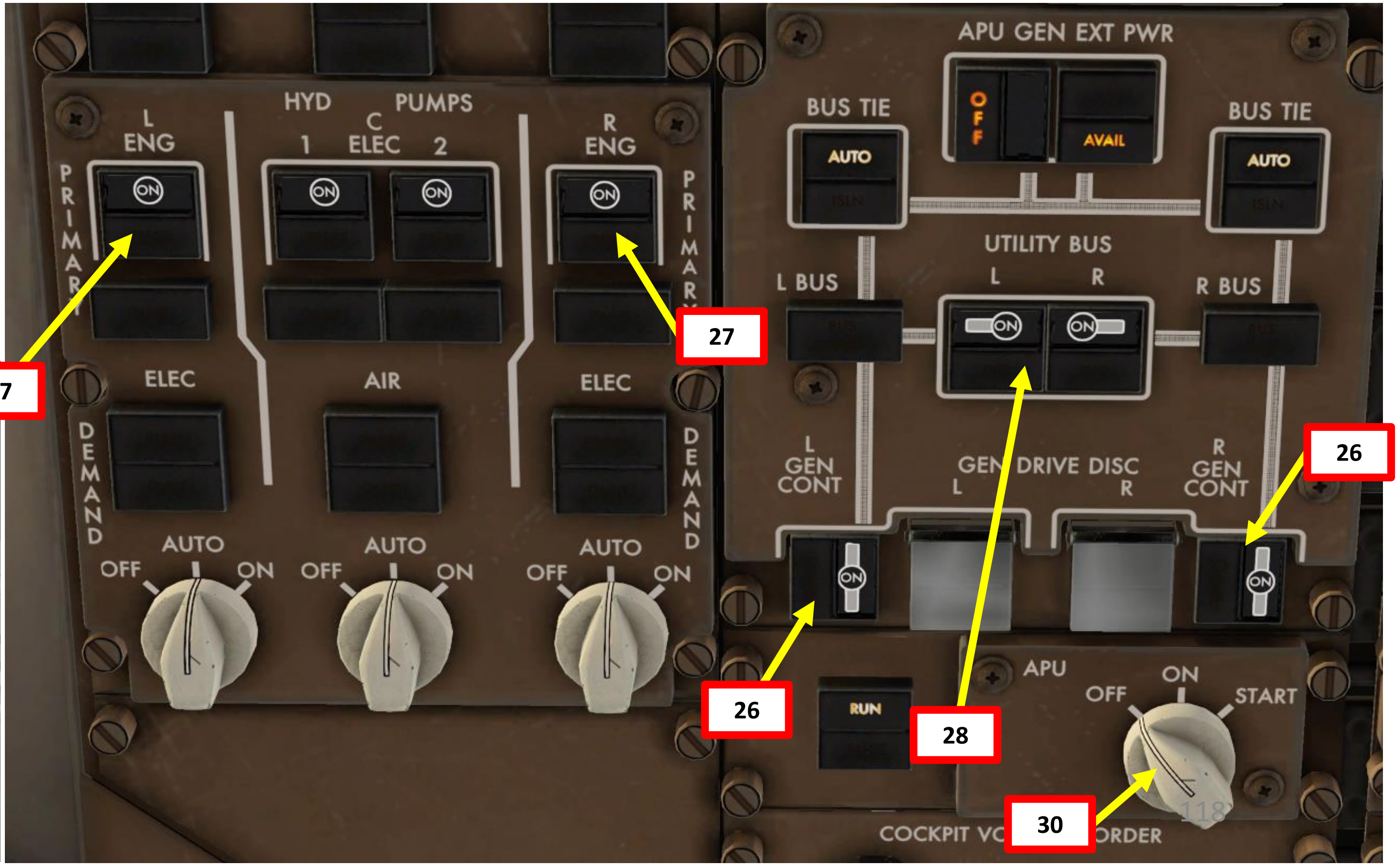
ENGINE START-UP (ROLLS-ROYCE)

26. Set L GEN CONT and R GEN CONT Generator switches to ON. Then, confirm that the EXT PWR indication is AVAIL
27. Set LEFT & RIGHT HYDRAULIC PRIMARY PUMP switches ON. PRESS light should disappear. Both pumps are engine-driven.
28. Verify that the LEFT & RIGHT UTILITY BUS switches are ON
29. Turn OFF ground Power and remove chocks, stairs, fuel truck and passenger bus via the EFB (Electronic Flight Bag)
    - Go in EFB menu OPERATIONS – GROUND
    - Remove all ground connections (not green = removed).
    - Confirm that both EXT PWR indication is extinguished
30. Set APU switch – OFF
    APU cooldown sequence will begin and shutdown will occur automatically once cooldown sequence is complete. You can also set the APU GEN switch OFF, but it will automatically be disengaged when APU shuts down.

    Note: The HYDRAULIC AIR DEMAND PUMP should display a PRESS indication because the APU is shutting down. Don't worry, we'll turn on engine bleed air in the next steps to drive this Air Demand Pump.

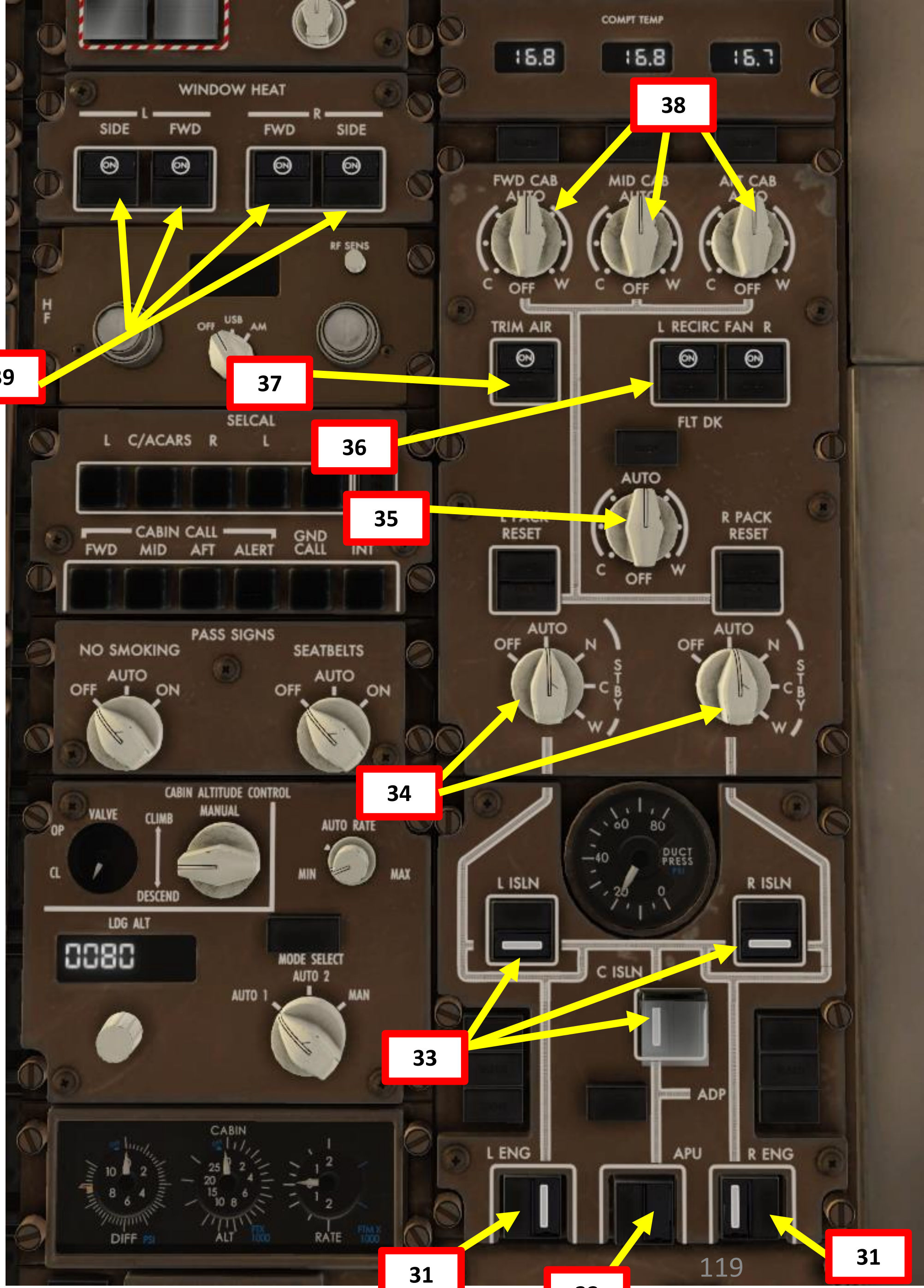






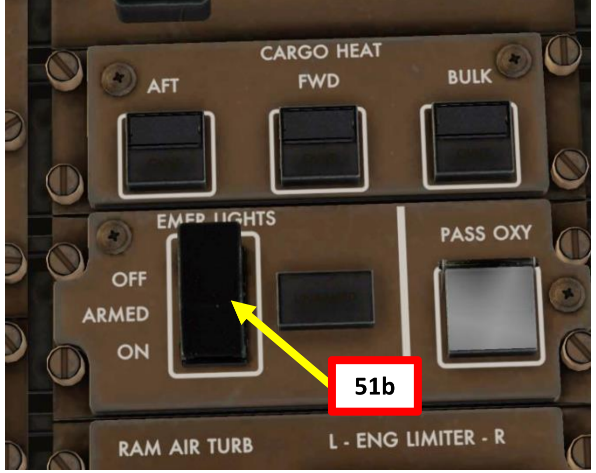
ENGINE START-UP (ROLLS-ROYCE)

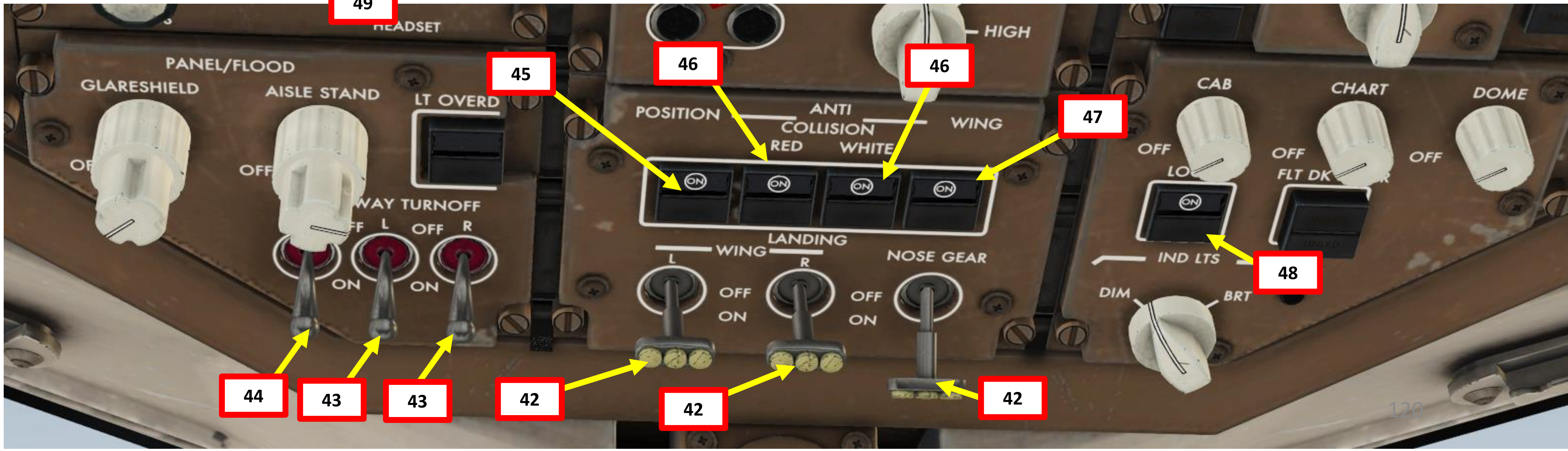
31. Set LEFT & RIGHT ENGINE BLEED switches are ON
32. Set APU BLEED switch – OFF
33. Verify that LEFT, CENTER & RIGHT ISOLATION VALVE switches are set to ON
34. Set PACK (Pneumatic Air Conditioning Kit) 1 & 2 switches – AUTO
35. Set FLIGHT DECK Temperature Control Switch to AUTO
36. Set LEFT and RIGHT RECIRCULATION FAN switches to ON
37. Set TRIM AIR switch to ON
38. Set FWD CAB, MID CAB, AFT CAB Temperature Control Switches to AUTO
39. Set WINDOW HEAT switches to ON
40. Verify that EQUIPMENT COOLING switch is set to AUTO
41. Set Engine Anti-Ice / Wing Anti-Ice – As Required



COMPLETE PRE-FLIGHT

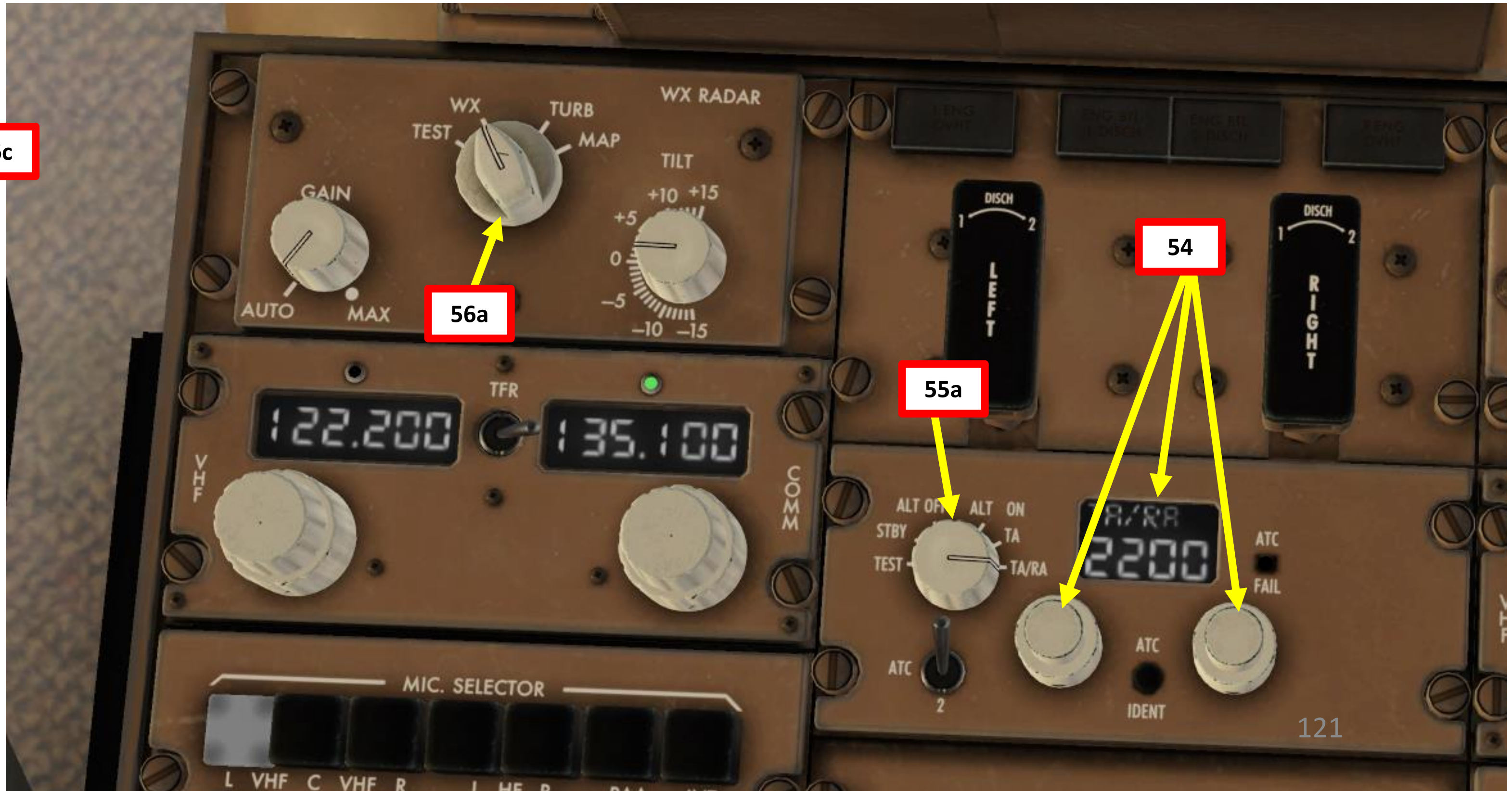
42. Landing Lights switches – OFF
    Nose Gear Light switch – ON
43. Runway Turnoff Lights switches – ON
44. Taxi Light switch – ON
45. Navigation Position Lights switch – ON
46. Anti-Collision Red & White Lights switches – ON
47. Wing Lights switch – ON
48. Logo Light switch – ON
49. Set No Smoking Switch – AUTO
50. Set Seat Belts switch – AUTO
51. Emergency Lights – set switch to ARMED and close cover
52. Set Service Interphone Switch – ON
53. Set Left & Right Yaw Damper switches – ON





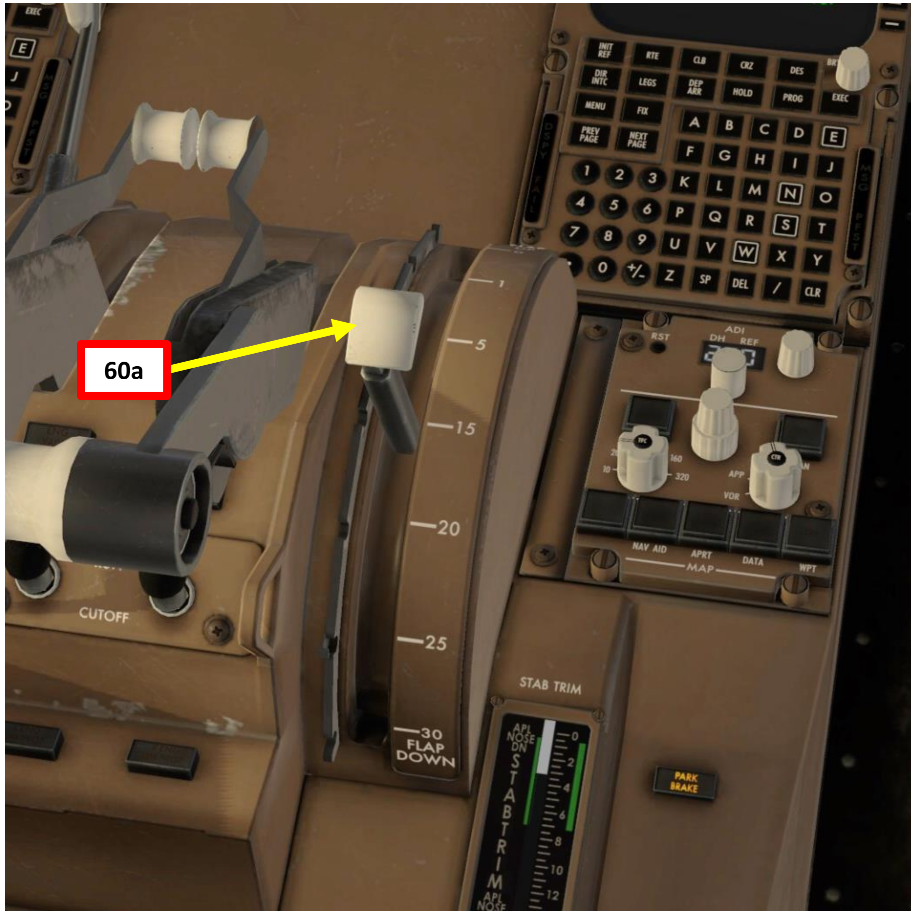
COMPLETE PRE-FLIGHT

54. Set Transponder frequency to 2200 (IFR standard squawk code). 7000 is used for VFR in most of European airspace and 1200 for VFR in North America.
55. Set TCAS (Traffic Collision and Avoidance System) selector to TA/RA (Traffic Advisory/Resolution Advisory)
56. Set Weather Radar to WX and press the WXR button if you want to display the weather radar on the Navigation Display.



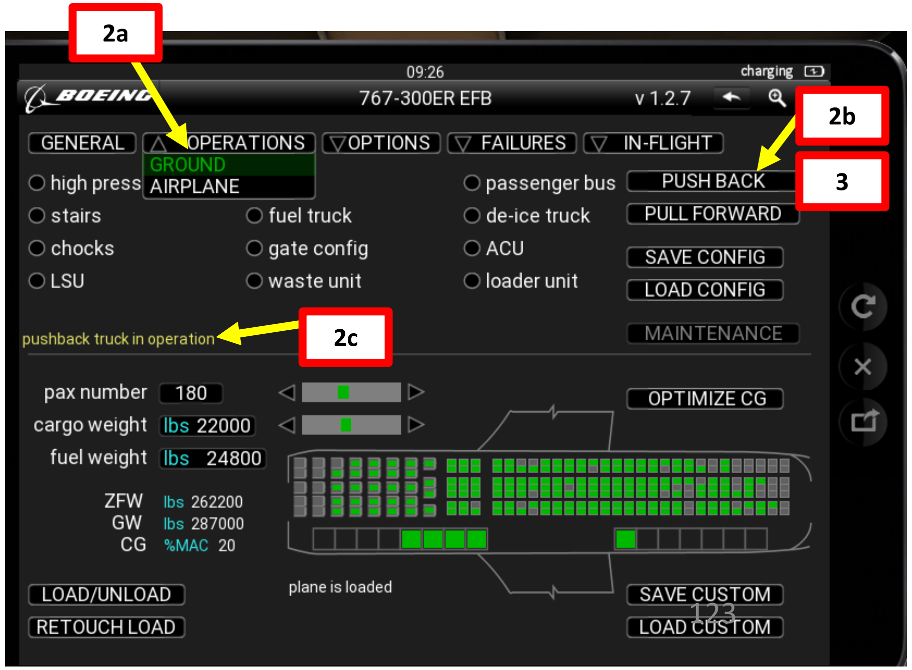
COMPLETE PRE-FLIGHT

57. In real life, you would set PACK 1 and PACK 2 switches to OFF to ensure maximal engine performance during takeoff and prolong engine life, but we don’t need to in this tutorial.
58. Set Autobrake selector to RTO (Rejected Takeoff)
59. Make sure Speed Brake is OFF (NOT ARMED)
60. Set Flaps lever to 15 as specified in the FMC



PUSHBACK

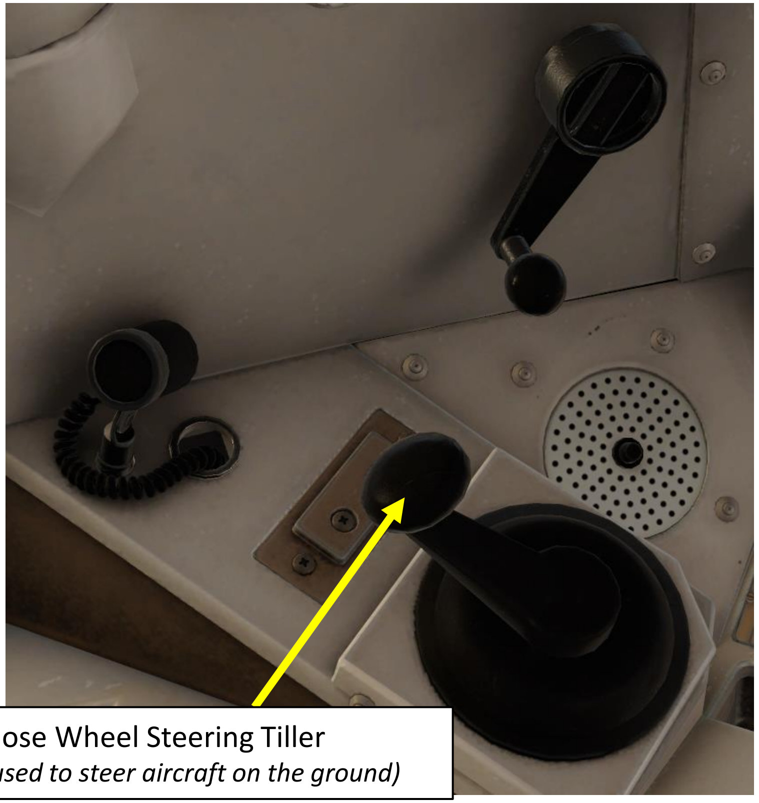
1. Release parking brake
2. Begin Pushback via the EFB (Electronic Flight Bag)
    - Select OPERATIONS – GROUND menu
    - Click on PUSH BACK
    - Wait for the "pushback truck in operation" message to appear
    - X-Plane will allow you to control the pushback cart with your throttle. Throttle up to pushback, throttle down to stop. Use your rudder pedals to turn the aircraft.
3. When in the desired position, click on PUSH BACK again to disconnect pushback cart.



PUSHBACK

TAXI

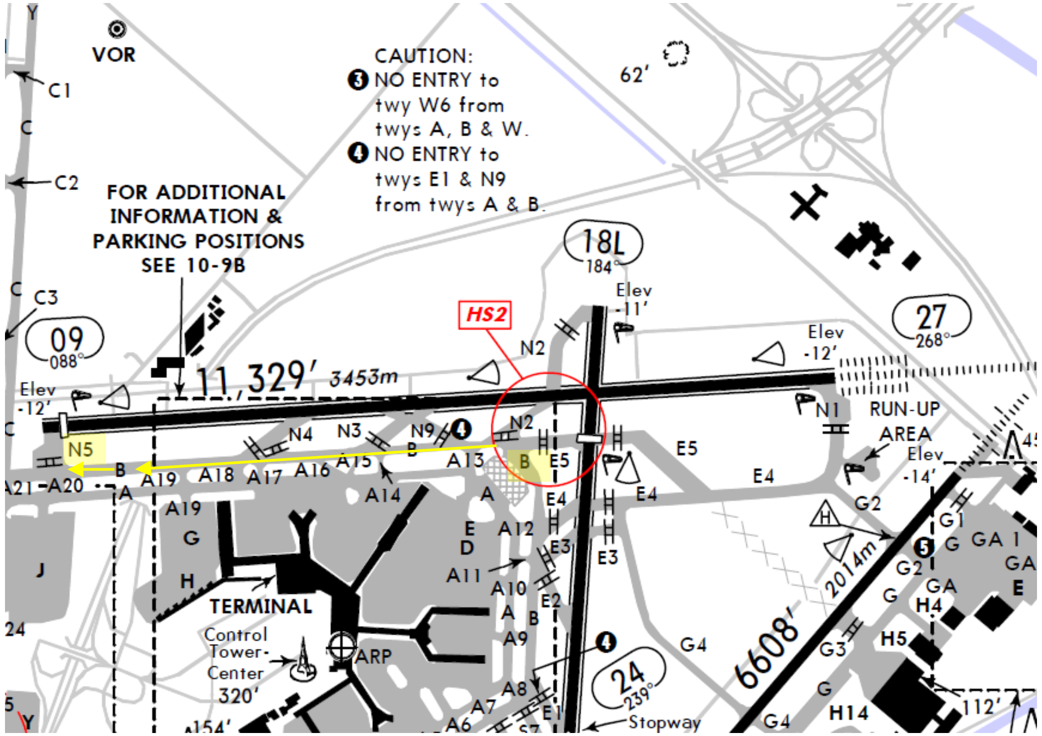
The 767 is steered on the ground by using a tiller. X-Plane allows you to map an axis to the tiller.

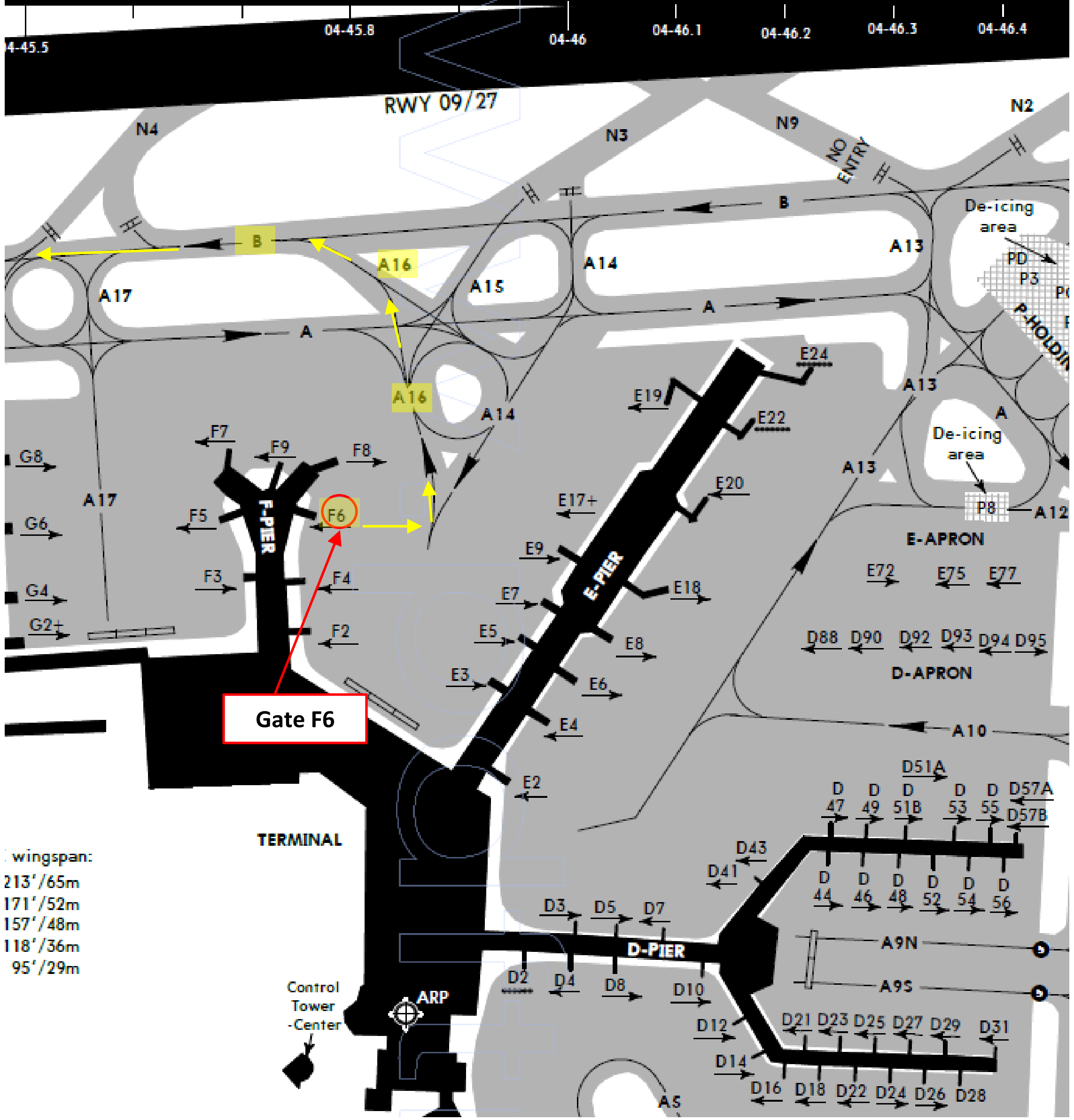


Nose Wheel Steering Tiller
(used to steer aircraft on the ground)

TAXI

- Our Flight Number is AFR106 and we spawned at gate F6.
- After we performed pushback from Gate F6, we would typically contact the tower for guidance by saying “AFR106, requesting taxi.”
- The tower would then grant you taxi clearance by saying “AFR106, taxi to holding position N5 Runway 09 via taxiways Alpha 16 (A16), Bravo (B).
- This means that we will follow the A16 line, then go to B, then turn right to N5 and hold there until we get our clearance for takeoff.
- Throttle up to maintain a taxi speed of 15 kts maximum. Slow down to a maximum of 10 kts before making a 90 deg turn.






AIRFRANCE
←A17 B
B N4→


Check signs to follow the taxi route towards the holding point (N5)
←A20 B N5→
Taxi Speed Indicator (kts)


09
N5

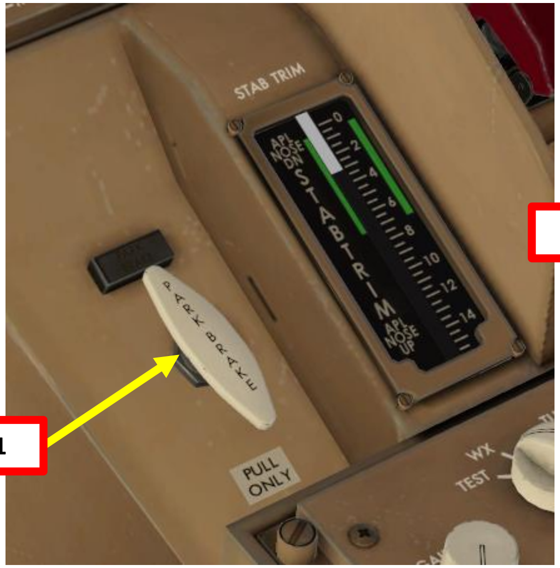
TAKEOFF

TAKEOFF

1. Arm the LNAV (Lateral Navigation) and VNAV (Vertical Navigation) autopilot modes

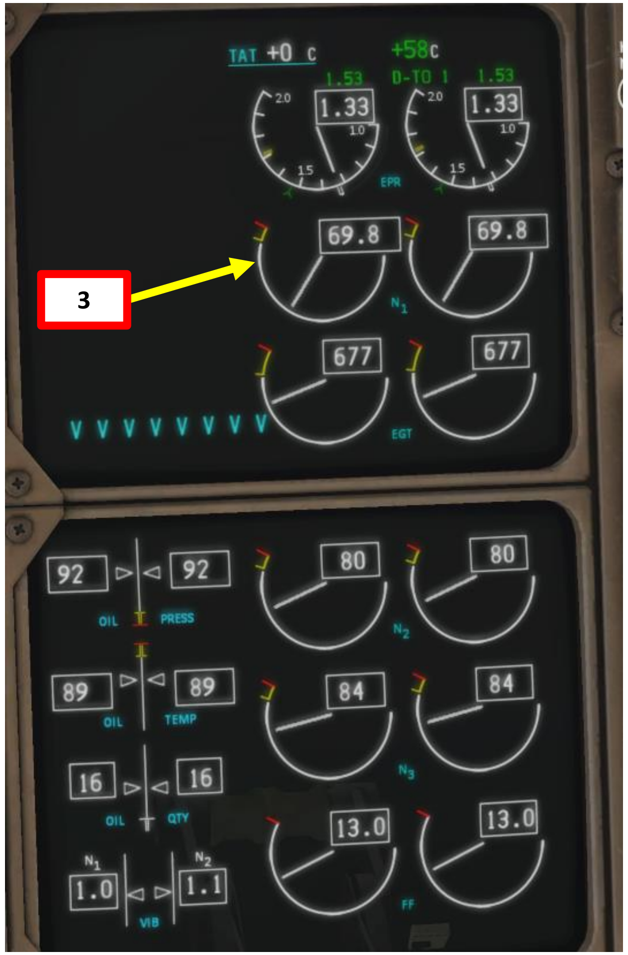
TAKEOFF

2. Line up on the runway and make sure parking brake is disengaged, A/T ARM switch is ON, both F/D switches are ON, and all Autopilot CMD switches are OFF
3. Press and hold pedal brakes
4. Throttle up until engines reach 70 % N1 and stabilize
5. Press the THR switch (or EPR switch on some aircraft) to engage autothrottle and release brakes (alternatively, you can just throttle to max power)



1

5b



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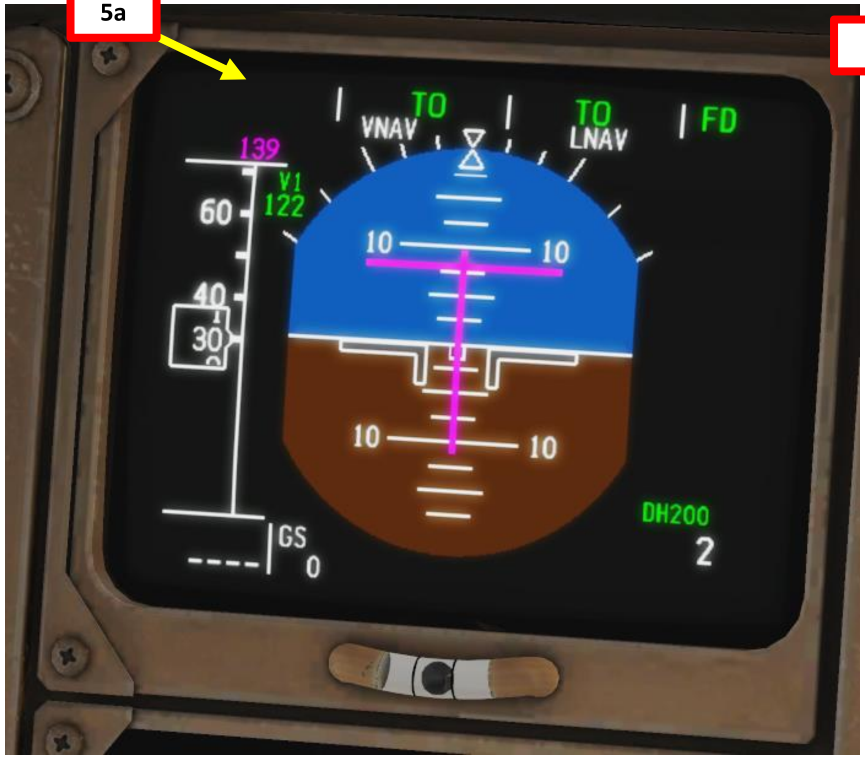

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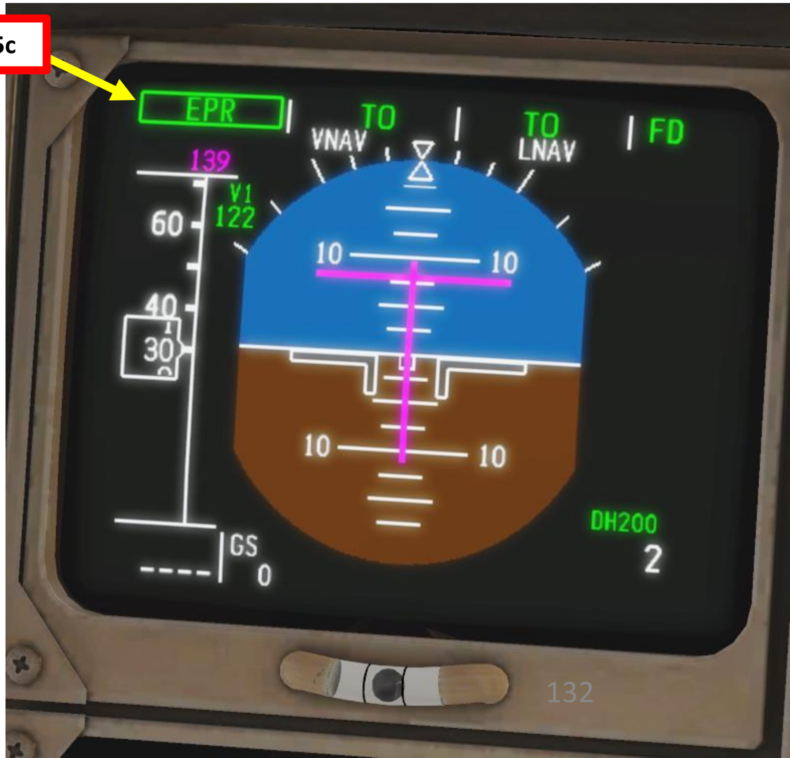
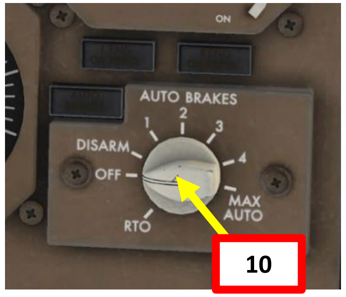
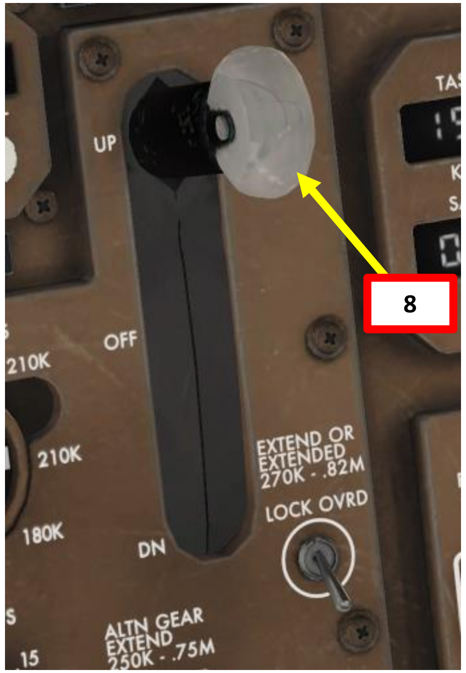


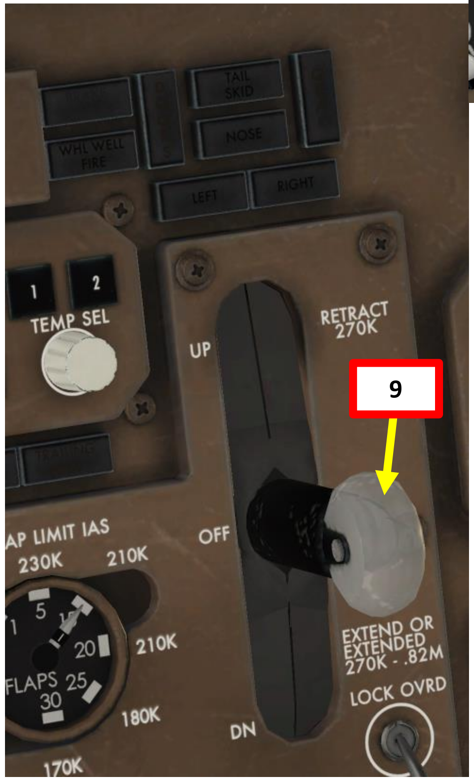
5c

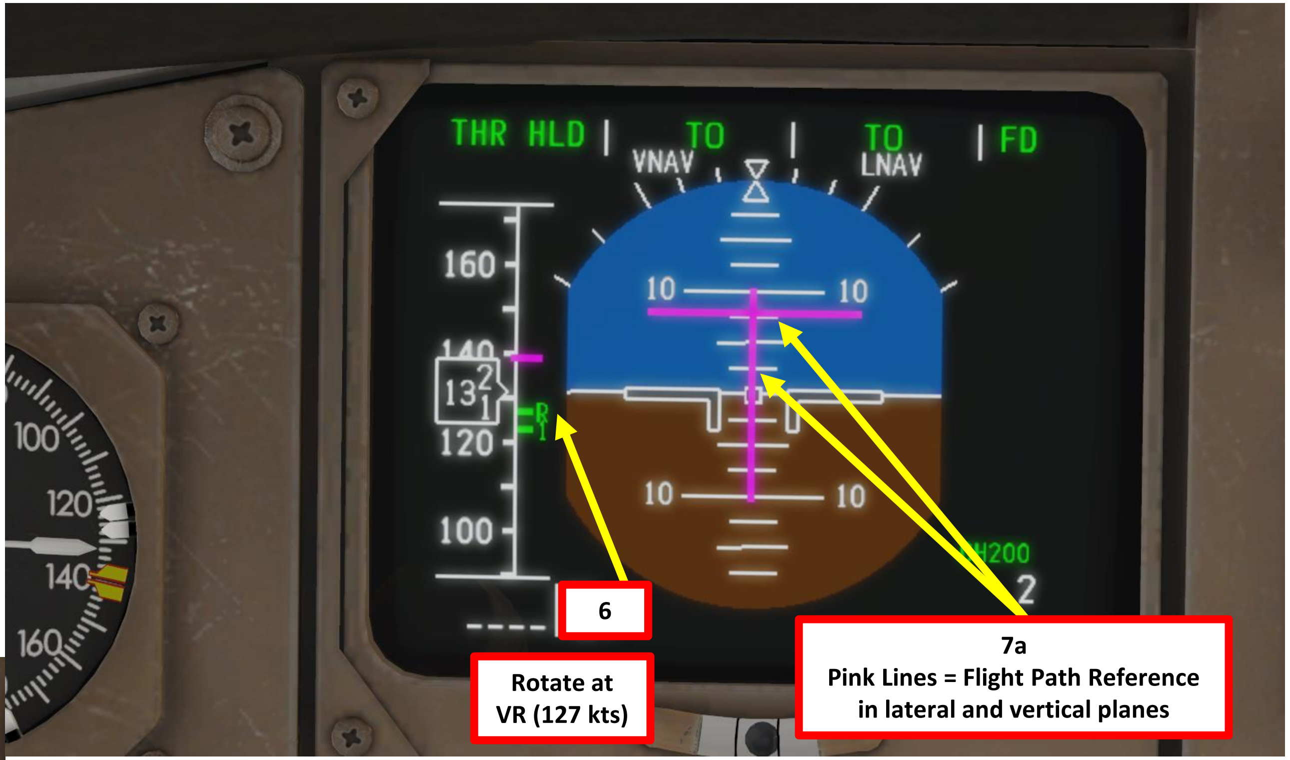
TAKEOFF

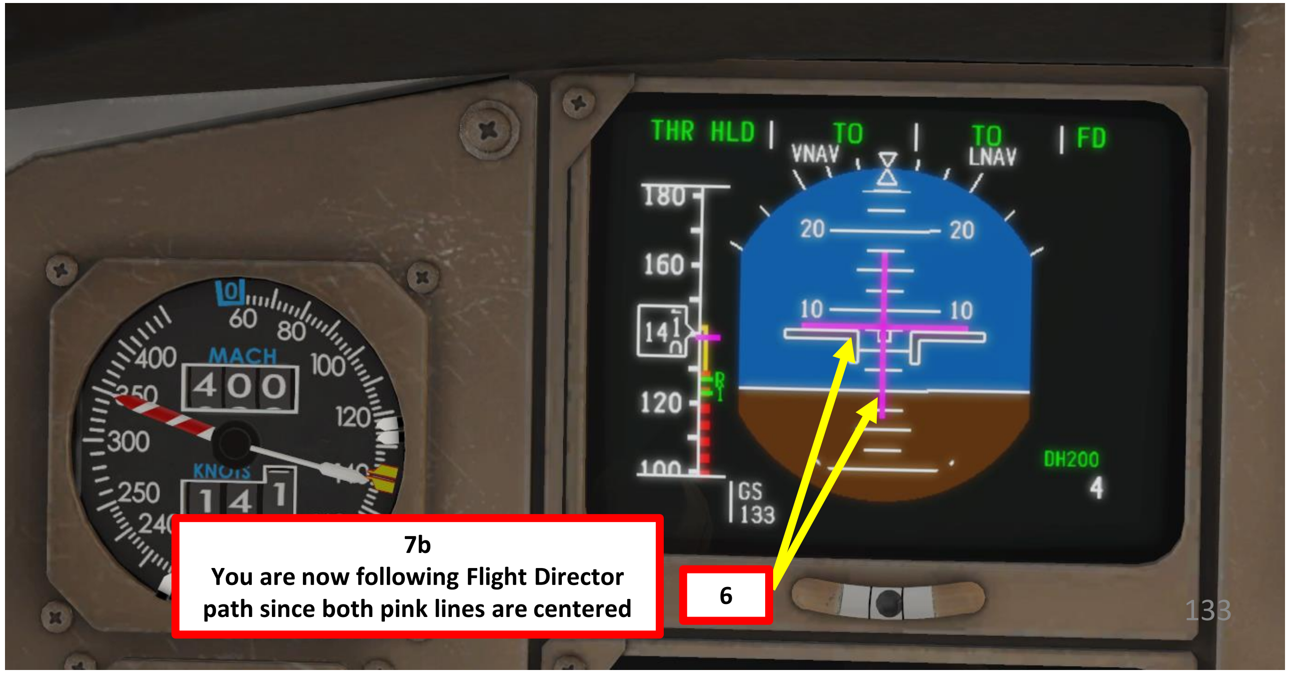
6. Rotate smoothly and continuously when reaching VR (127 kts) until reaching 15 degrees of pitch angle
7. Follow the Flight Director (15 deg pitch)
8. Raise landing gear (right click) by setting landing gear lever to UP (up position)
9. Once landing gear has been fully retracted, set landing gear lever to OFF (middle position)
10. Autobrake switch – OFF









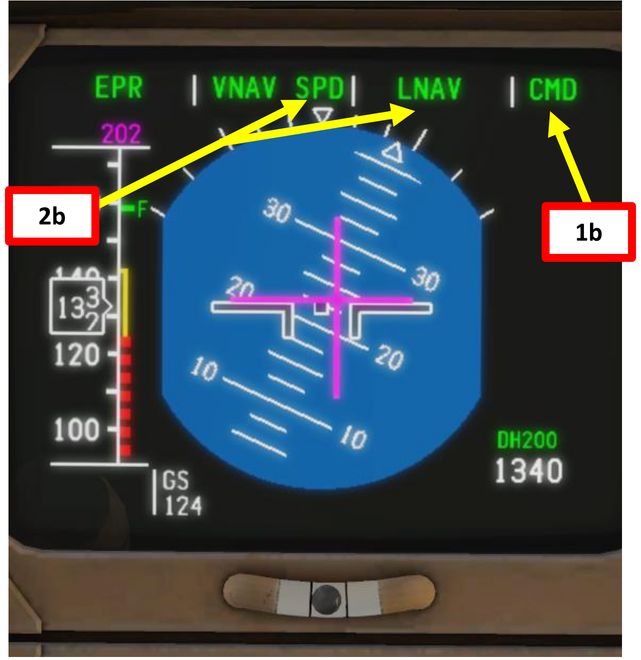


TAKEOFF

TAKEOFF

CLIMB

1. When reaching an altitude of 400 ft, engage autopilot by pressing either the CMD LEFT, CMD CENTER or CMD RIGHT button on the MCP. Your aircraft will now follow the “magenta line” on your navigation display automatically since we already armed the VNAV and LNAV modes.
2. Make sure the VNAV (Vertical Navigation) and LNAV (Lateral Navigation) autopilot mode buttons on the MCP (Mode Control Panel) are engaged
3. Always synchronize your heading using the HEADING knob on the MCP. This will not steer the aircraft, but it is good practice in case you need to engage other autopilot modes quickly.



Autopilot HEADING not aligned with actual flight path

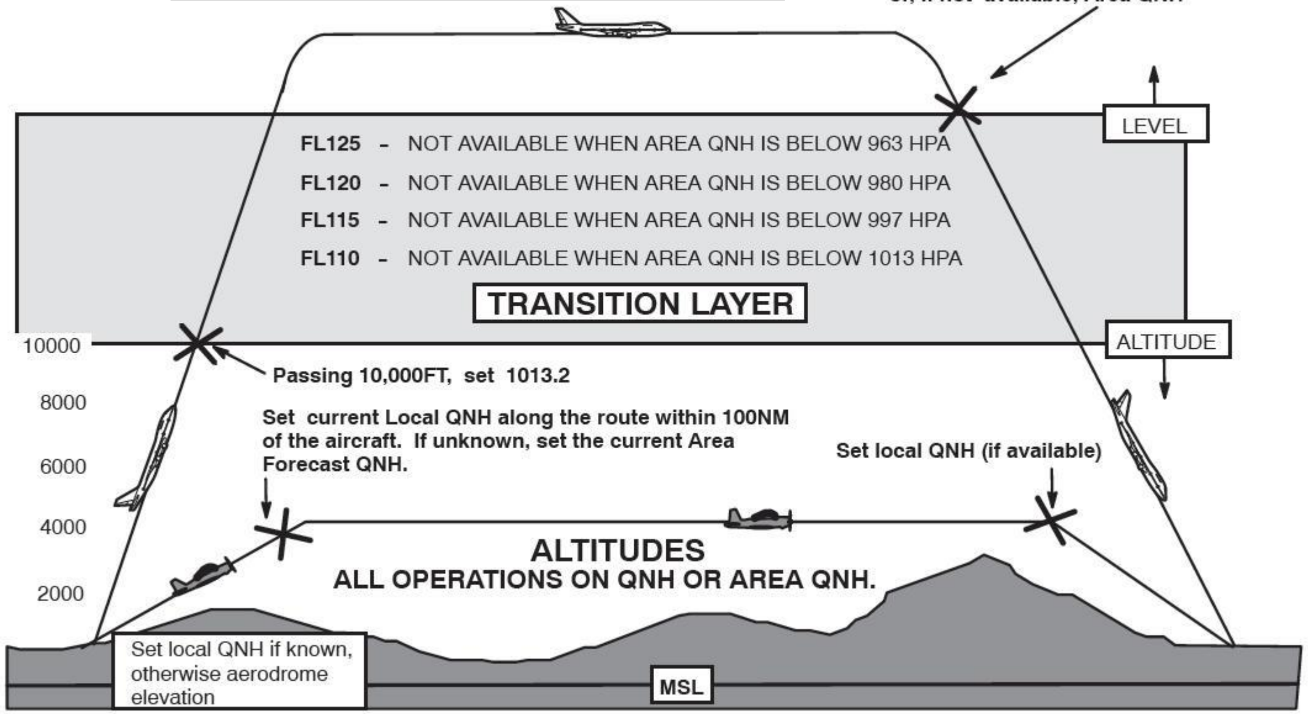
Autopilot HEADING aligned with actual flight path

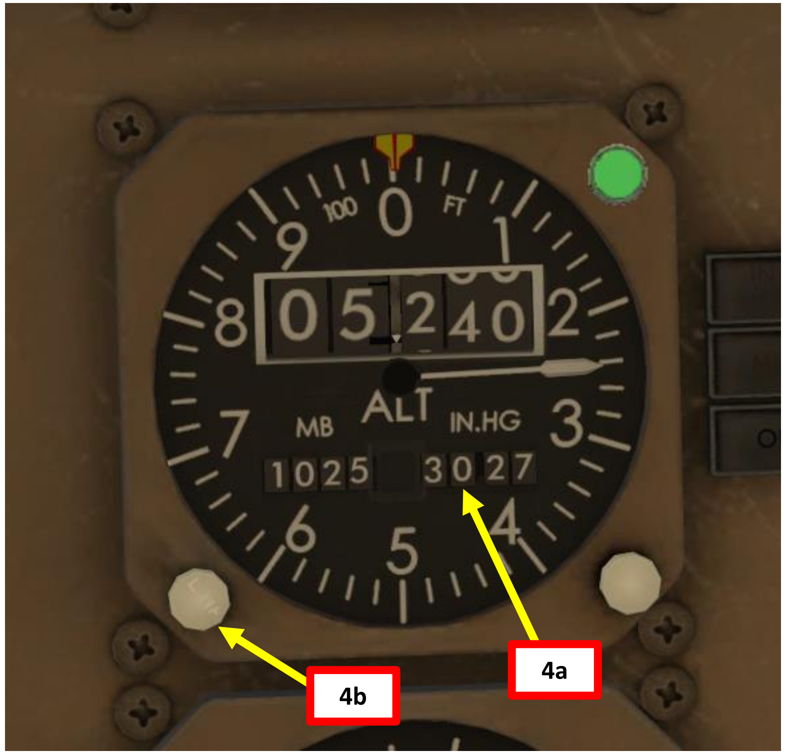
CLIMB

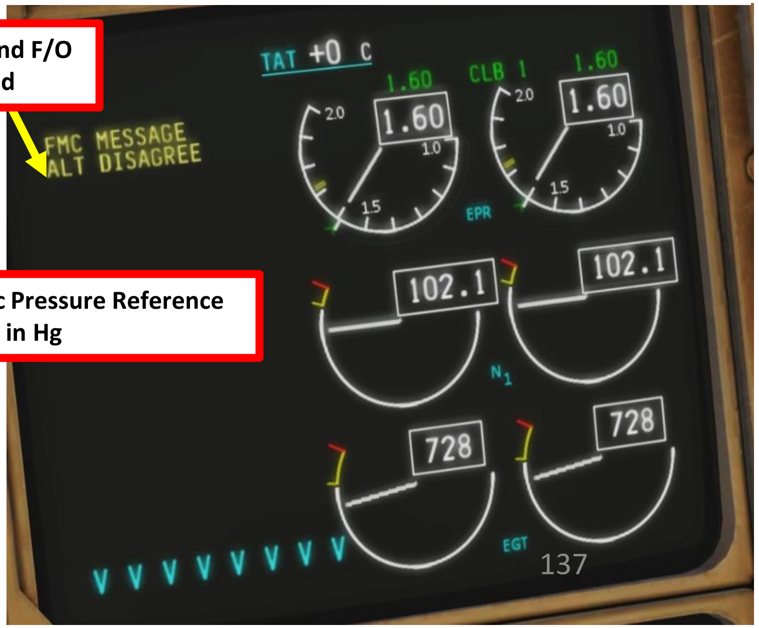
4. Once you pass transition altitude (3000 ft in Europe, 18000 ft in the US), switch barometric pressure to STANDARD pressure (29.92 in Hg, or 1013.25 mbar) in order to use flight levels as a reference. This means you will be using a standard barometric pressure of 29.92 in Hg, which is also used by other aircraft in the airspace instead of a local one given by an Air Traffic Controller. If pilots don't use a "standard" barometric pressure, different aircraft may collide in flight since they don't use the same pressure to define their current altitude. This is why higher altitudes are defined as "flight levels" (i.e. FL250 would be 25000 ft).

Note: Don't forget to set the First Officer Altimeter and Standby Altimeters as well or you will get an ALT DISAGREE message on the EICAS.

Transition Altitude (U.S. system)







CLIMB

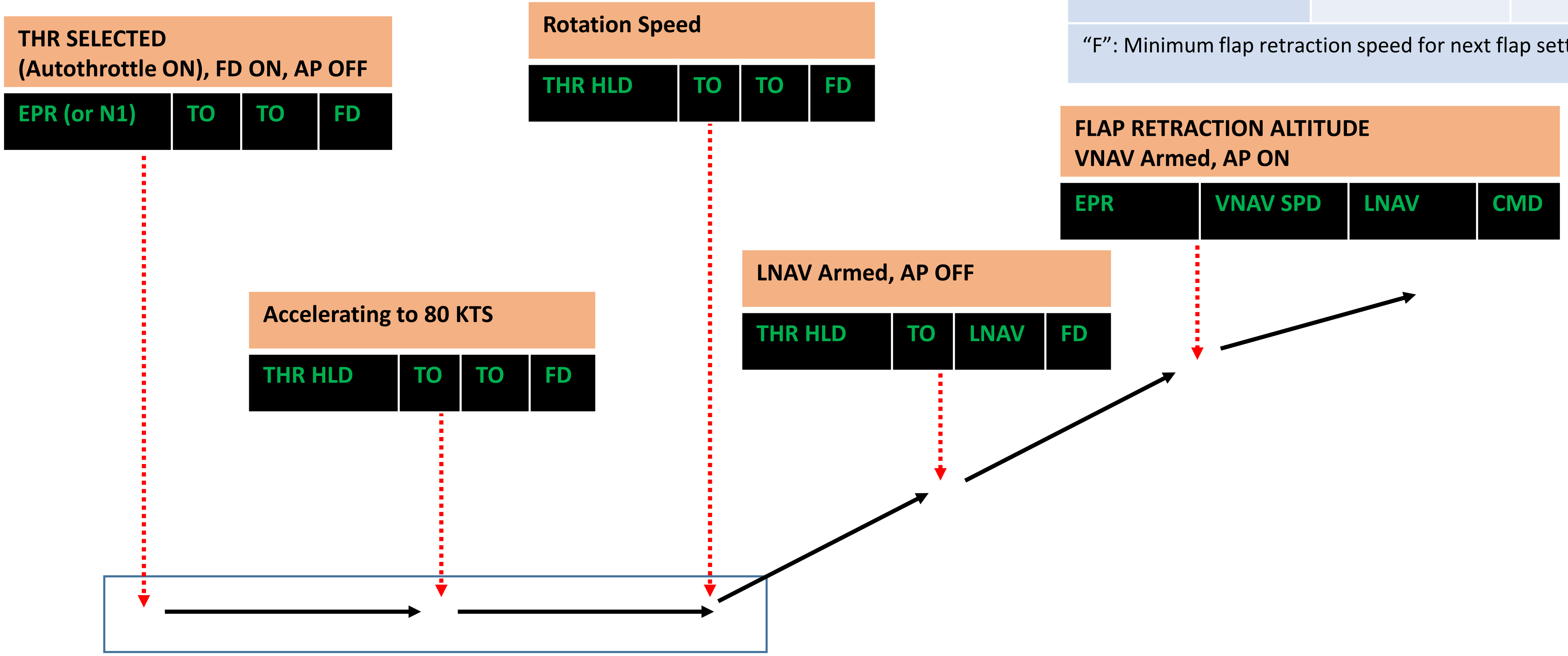
This is roughly what should happen during the takeoff & climb.

Note the FMA (Flight Mode Annunciator) readings summarized below.

FLAP SCHEDULING TABLE

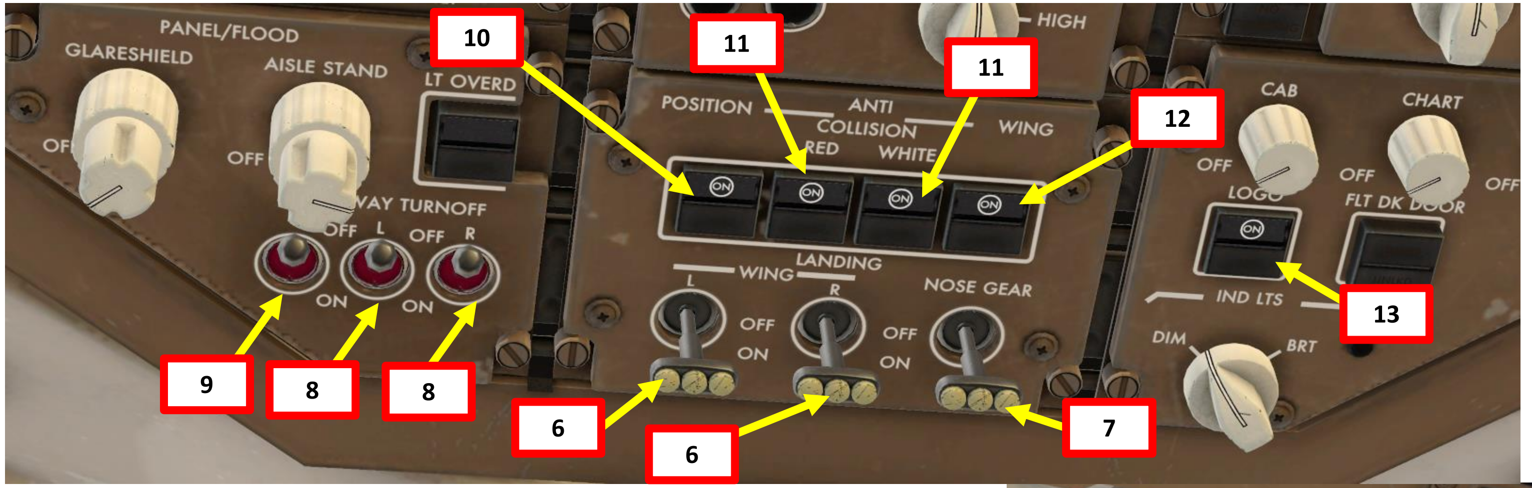
TAKEOFF FLAPS	SELECT FLAPS	AT SPEED (KTS)
Flaps 20 deg or 15 deg	5	VREF 30 +20
	1	“F” (VREF 30 + 40)
	UP	“F” (VREF 30 + 60)
Flaps 5 deg	1	“F” (VREF 30 + 40)
	UP	“F” (VREF 30 + 60)

“F”: Minimum flap retraction speed for next flap setting on speed tape



CLIMB

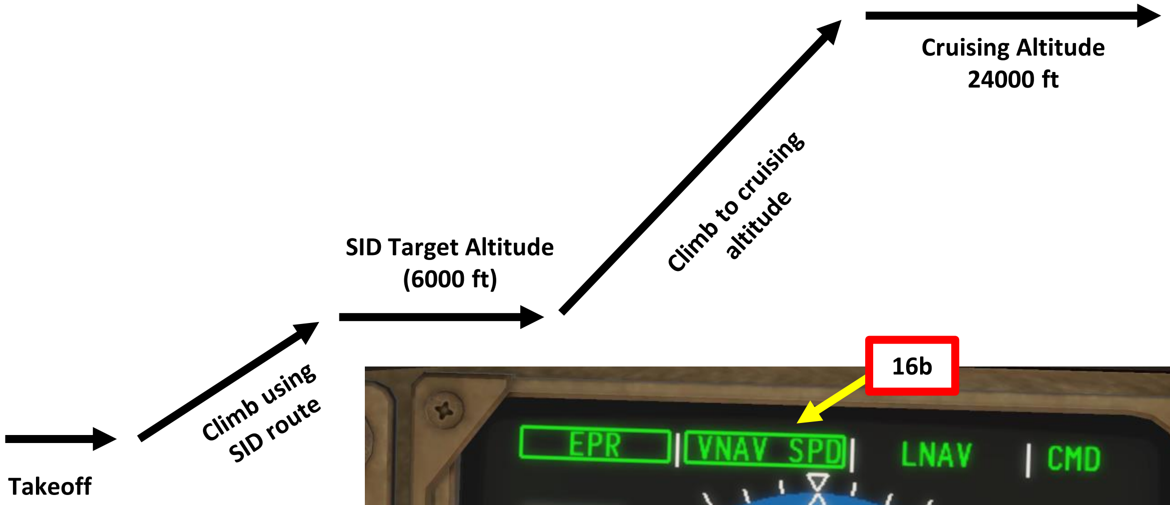
5. Once you have sufficient airspeed, set flaps to UP (scroll mousewheel). You can consult the Takeoff Flaps Retraction Speed chart on the previous page as well.
6. Landing Lights switches – OFF
7. Nose Gear Light switch – OFF
8. Runway Turnoff Lights switches – OFF
9. Taxi Light switch – OFF
10. Navigation Position Lights switch – ON
11. Anti-Collision Red & White Lights switches – ON
12. Wing Lights switch – ON
13. Logo Light switch – ON

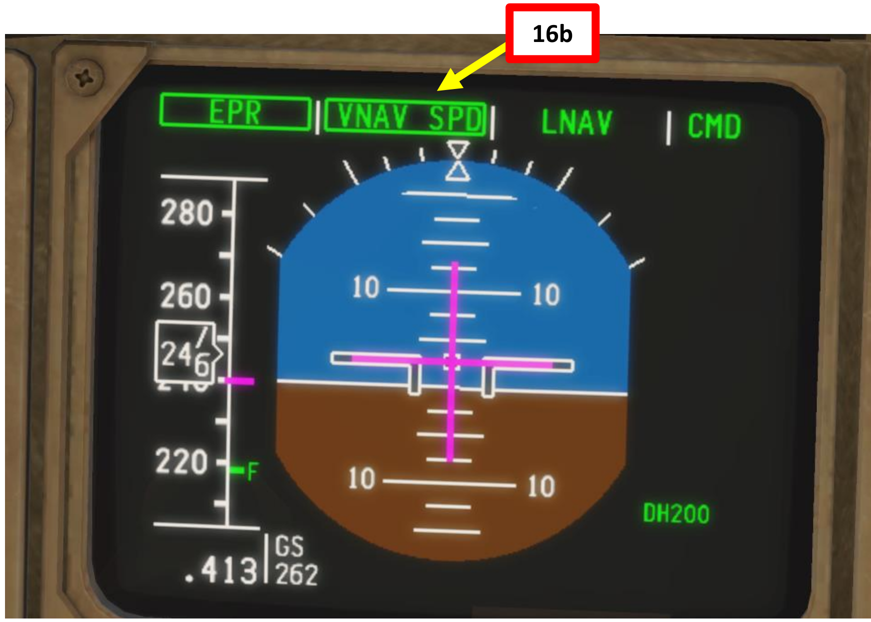


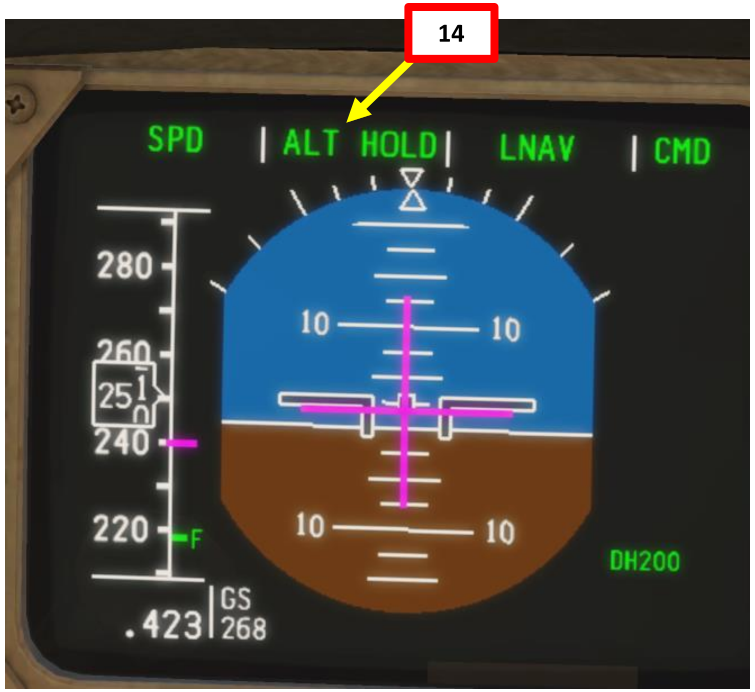
VF is the “manoeuvering speed” for existing flap setting

CLIMB

14. Once we have reached our first SID target altitude of 6000 ft, vertical autopilot mode will maintain 6000 ft (ALT HOLD mode) unless we set our cruising altitude and engage the VNAV SPD mode.
15. We will now begin our climb to our cruising altitude of 24000 ft. Set the ALTITUDE knob on the MCP (Mode Control Panel) to 24000.
16. Press (left click) the VNAV button on the MCP to re-arm the VNAV autopilot mode and set new altitude target to the autopilot. Autopilot will now climb to selected altitude using the VNAV SPD mode.

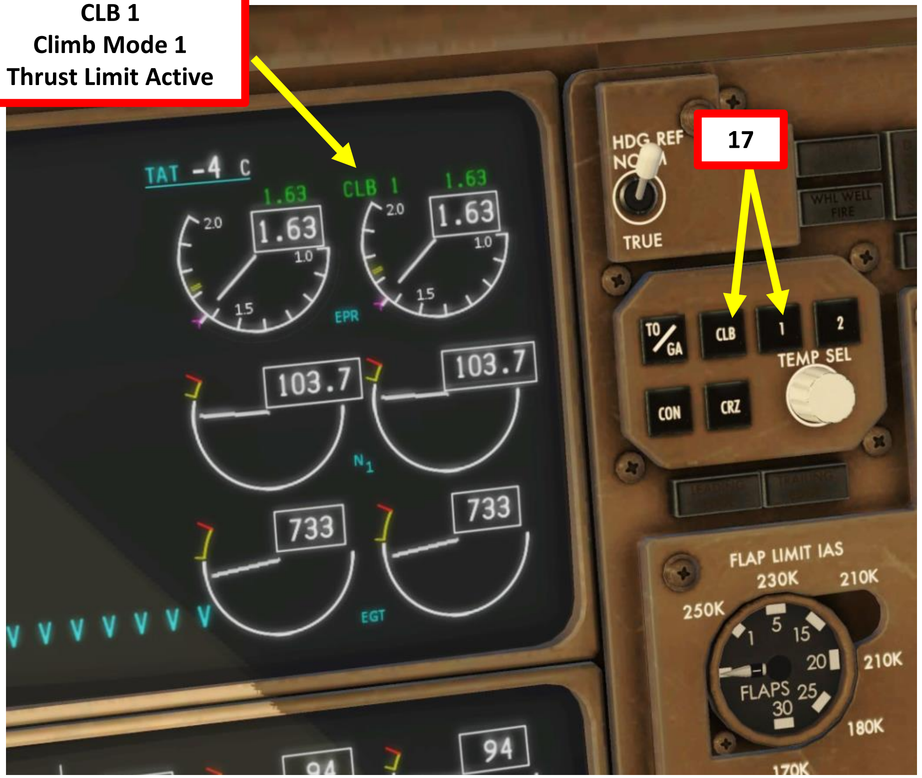






CLIMB

17. The Autothrottle system should automatically select the « CLIMB » thrust limit mode that we select initially (CLB 1).
18. You will reach your “TOP OF CLIMB” point at “T/C” on your navigation display for your cruising altitude (24000 ft)



CLIMB

CLIMB

CRUISE

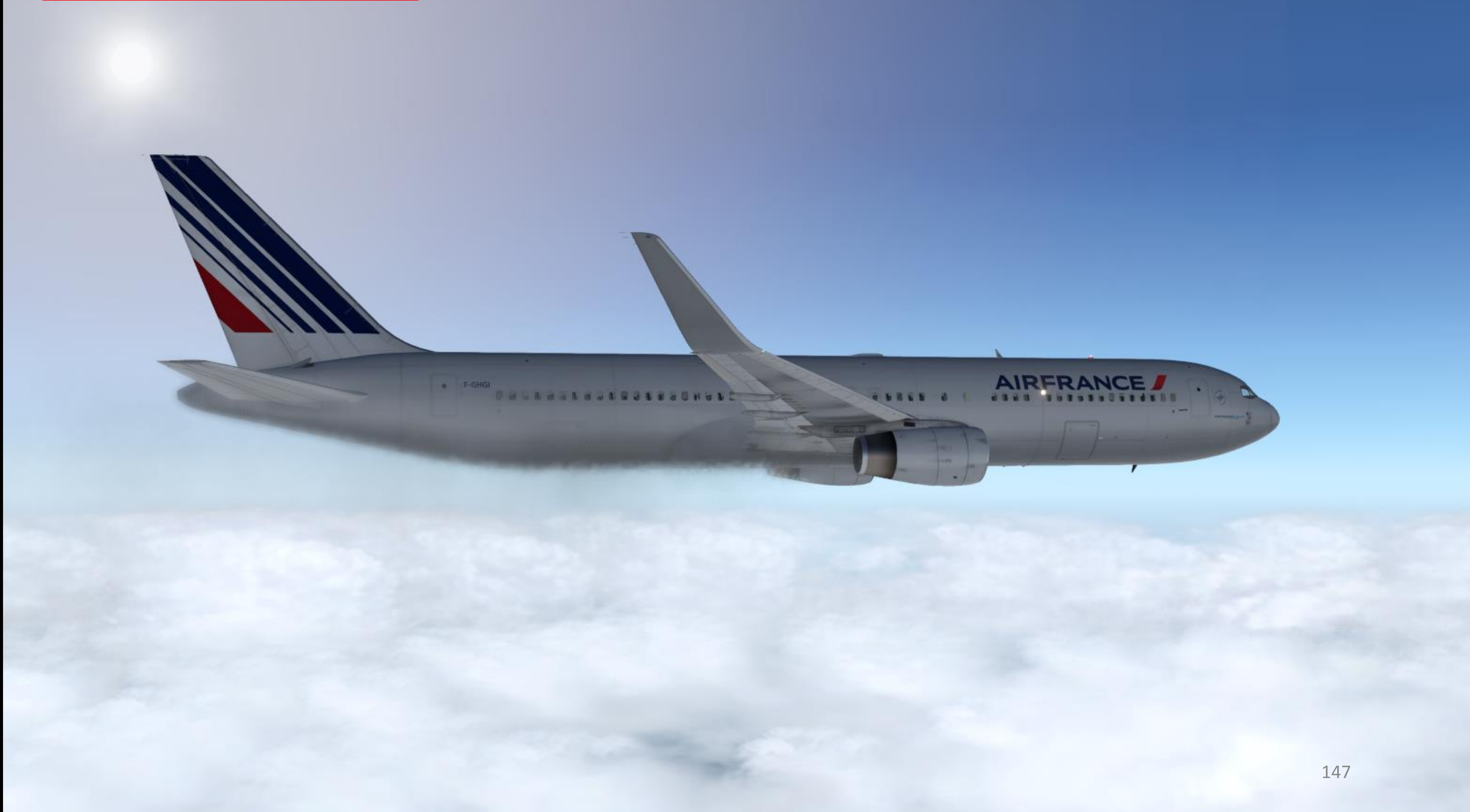
1. When reaching the top of climb, the autopilot will start levelling off.
2. Once levelled off to 24000 ft, the vertical autopilot mode will switch to VNAV PTH (Vertical Navigation Path).
3. The autothrottle system will automatically set the most efficient throttle setting during cruise.
4. You can monitor your progress on the FMC « PROG » (PROGRESS) page and on the « LEGS » page.

CRUISE

5. When arriving at the cruising altitude, the Autothrottle system should automatically select the « CRUISE » thrust limit mode (CRZ).
6. You can check your cruising altitude and cruising speed on the FMC « CRZ » (CRUISE) page. It will display the CRZ ALT to FL240, or Flight Level 240 (24000 ft) and the ECON SPD (best speed to economize fuel) to Mach 0.726.

CRUISE

CRUISE



Introduction to Autopilot

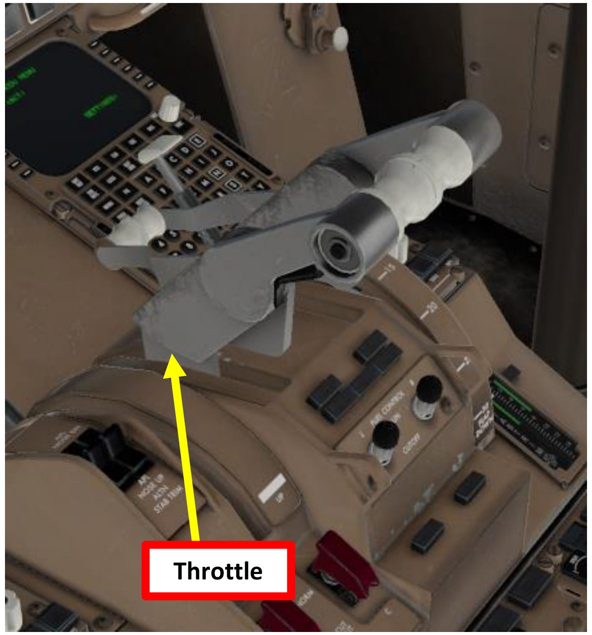
Many newcomers in the flight simulation world have this idea that the autopilot is the answer to EVERYTHING. And I mean: e-v-e-r-y-t-h-i-n-g. Spoiler alert: it's not. The autopilot is a tool to help you fly to reduce your workload, not a tool to replace the pilot. The autopilot should be seen as a system that can make your life easier.

Now, why am I saying this? Because *some* people's knowledge of the autopilot system is summed up in "hit LNAV and VNAV, then go watch an episode of Mayday while the aircraft does all the work". However, there are times where the autopilot can disconnect by itself (i.e. during major turbulence, or when the autopilot is trying to follow a flight profile (SID or STAR) that exceeds safety limitations like bank or pitch angles). The autopilot isn't smart: it will put you in dangerous situations if you ask him to. It will "blindly" follow whatever is set in the FMC. If there are conflicts or errors in the FMC's flight plan, the AP will gladly follow them even if they don't make sense. This is why you need to constantly be able to fly the aircraft manually if need be. The autopilot should be seen as a system that can make your life easier. This is why you need to be familiar with the capabilities of the AFDS (Autopilot Flight Director System) and be able to read what the FMA (flight mode annunciator) is telling you.

Autopilot and Auto-Throttle

The autopilot (AFDS, or Autopilot Flight Director System) is separated in three main components: the flight director, the autopilot itself and the auto-thrust system. Aircraft pitch and attitude will help maintain the aircraft on a certain flight path. The throttle will help maintain the aircraft on a certain speed. Depending on the phase of flight (takeoff, climb, cruise, descent, final approach, etc.), the autopilot will react differently. During a climb, the AP will want to maintain the best, most fuel-efficient climb to save fuel. During a descent, the AP will want to slow down in order to approach the runway in a low-speed high-lift configuration. The Auto-Thrust system will take control over the engines throttles for you: when AT is engaged, you will see the throttle physically move by itself.

The AP has three channels: Left, Center and Right. The only time three autopilot channels will engage simultaneously is during automatic landing (AUTOLAND).



Autopilot Parameter Selectors

- IAS MACH Selector: Sets speed input to aircraft autopilot.
- SEL: Selects/toggles airspeed unit (IAS (indicated airspeed) vs Mach), usually used above FL260, or 26000 ft
- Heading Selector: Sets heading input to aircraft autopilot.
- Bank Angle Limit Selector: Sets autopilot bank angle limit
- Altitude Selector: Sets altitude input to aircraft autopilot.
- Vertical Speed (V/S) Selector: Sets vertical speed input to aircraft autopilot.

Autopilot, Flight Director & Autothrottle Selectors

- Auto-throttle (A/T) ARM Switch : Arms A/T for engagement. Auto-throttle engages automatically when FL CH, V/S, VNAV, ALT HOLD modes are used.
- Flight Director (F/D) Switch: Arms flight director
- CMD L/C/R: Engages selected autopilot channel in selected mode.
- DISENGAGE Bar: Disengages autopilot.

Autoflight – Thrust/Speed Modes

- THR: Engages auto-throttle in Thrust (THR) mode (selects climb thrust after takeoff or go-around). Mode inhibited under 400 ft altitude.
- SPD: Engages auto-throttle in SPEED mode (maintains IAS/MACH value in display). Speed Selector knob must be pushed to override the speed target of the FMC.

Autoflight – Vertical Modes

- VNAV: Vertical Navigation mode will follow the vertical components and restrictions of the flight plan entered in the FMC.
- FL CH (Flight Level Change): Aircraft climbs or descends to selected ALTITUDE at selected IAS/MACH
- V/S: Sets Vertical Speed to selected VERT SPEED.
- ALT HOLD: Aircraft levels off and holds its current altitude.

Autoflight – Lateral Modes

- LNAV: Lateral Navigation mode will follow the lateral components and restrictions of the flight plan entered in the FMC.
- HDG SEL: Heading and Bank Angle selector. Aircraft will roll towards the selected HEADING.
- HDG HOLD: Holds the current aircraft heading.
- LOC: Tracks VHF Ominidirectional Range (VOR) localizer. Aircraft will only be controlled laterally.

Autoflight – Vertical + Lateral Mode

- APP: Tracks localizer and glideslope during approach. Aircraft will be controlled laterally and vertically.

Autopilot Modes

Button	Description
VNAV	Vertical autopilot changes aircraft attitude to follow vertical navigation path determined by the FMS
FL CH	Vertical autopilot changes aircraft attitude to climb or descend to selected ALTITUDE at selected IAS/MACH
V/S	Vertical autopilot changes aircraft attitude to hold vertical speed
ALT HOLD	Vertical autopilot changes aircraft attitude to fly to target altitude
LNAV	Lateral autopilot tracks navigation flight plan determined by the FMS
HDG SEL	Lateral autopilot tracks selected heading
HDG HOLD	Lateral autopilot maintains current heading
LOC	Lateral autopilot arms DFGS to capture and track a selected VOR or LOC course.
APP	Lateral and vertical autopilots track localizer and glide slope targets for approach
CMD (AP)	Engages Autopilot
DISENGAGE BAR	Disengages Autopilot
AUTOTHROTTLE (A/T ARM)	Engages/Disengages Autothrottle

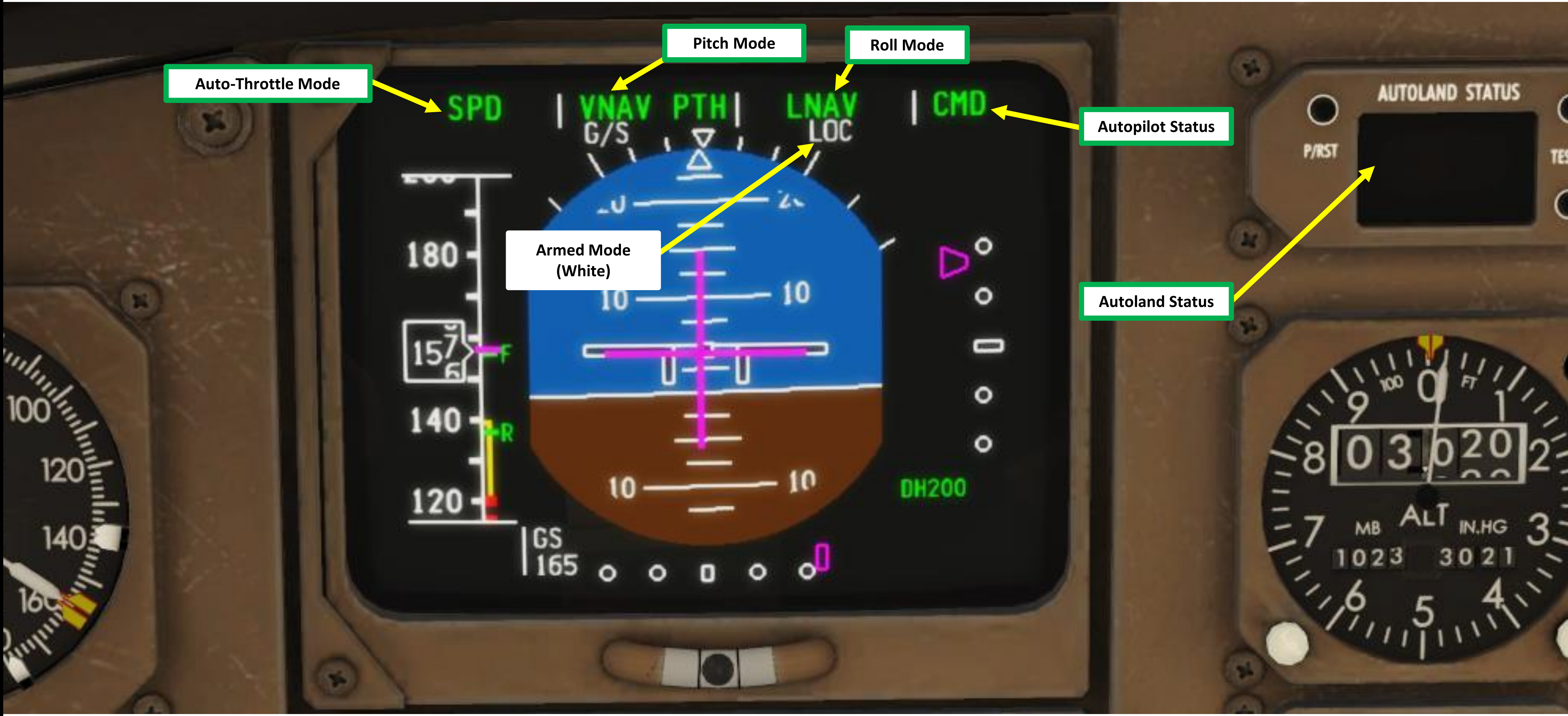
Button	Description
SPD	Autothrottle system will adjust thrust to maintain desired indicated airspeed (kts).
THR	Autothrottle system will adjust thrust to select climb thrust after takeoff or go-around

VERTICAL MODE
LATERAL MODE
VERTICAL & LATERAL MODE
AUTO-THROTTLE MODE

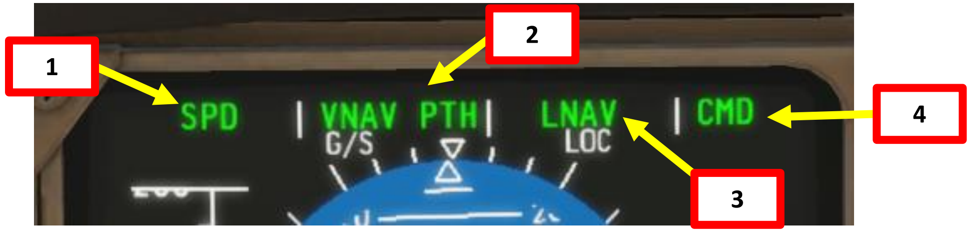
FMA (Flight Mode Annunciator)

The FMA displays the status of the auto-throttle, roll, pitch, and autopilot systems.

Green annunciation is when a mode is **ENGAGED**. **White** annunciation is when a mode is **ARMED**.

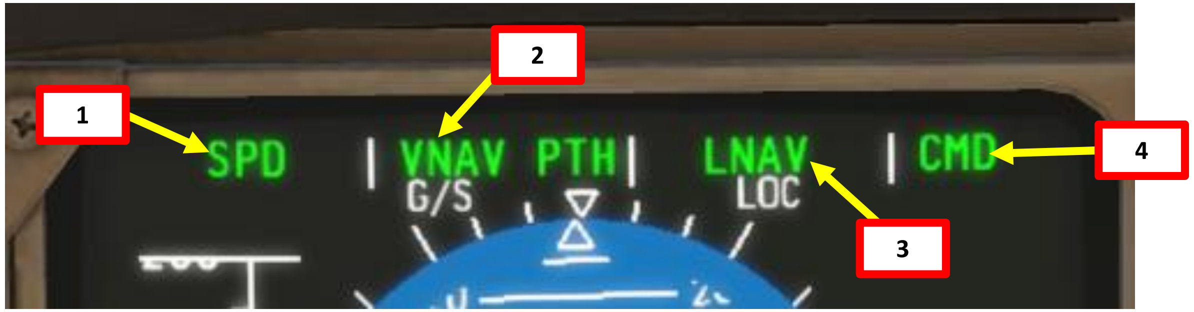


FMA (Flight Mode Annunciator)



1: Autothrottle Mode		2: Pitch Mode	
EPR: displays while autothrottle is controlling engine parameters to select EPR (Engine Pressure Ratio) reference thrust	**N1**: displays while autothrottle is controlling engine parameters to select N1 (Fan Speed) reference thrust	**TO**: annunciates by positioning either flight director switch ON when both flight directors are OF. FD pitch bars indicate an initial pitch of 8 deg upwards.	**GA**: displayed when flaps are out of UP position or glideslope is captured. Commanded speed is the MCP IAS/MACH window or current airspeed, whichever is higher. GA mode armed when pushing the GA switch on the throttle.
IDLE: displays while autothrottle moves thrust lever to IDLE. IDLE mode is followed by HOLD mode.	**SPD**: autothrottle maintains commanded speed, which can be set using the IAS/MACH selected or by the FMC flight plan	**ALT HOLD**: altitude hold mode activated or target altitude is captured	**G/S**: AFDS (Autopilot Flight Director System) follows the ILS (Instrumented Landing System) glideslope.
THR HLD: thrust lever autothrottle servos are inhibited. Levers remain in existing position or where manually placed.	**GA**: displays while autothrottle controls to a max reference thrust to maintain a climb rate of at least 2000 ft/min. GA mode armed when pushing the GA switch on the throttle.	**ALT CAP**: autopilot transition mode when transitioning from a V/S, FLCH or VNAV climb or descent to selected MCP altitude.	**FLARE**: during Autoland, aircraft flare activates at 50 ft RA (radar altimeter). Mode Is armed during Autoland, displays below 1500 ft radio altitude.
FLCH: displays while autothrottle is controlling to a max of the selected mode reference thrust during climb, and to a minimum thrust during descent	**FLAP LIM**: displays when flap speed limit is approached and MCP selected speed or FMC target speed is set to exceed this limit	**VNAV PTH**: Vertical Navigation, AP maintains FMC altitude or descent path with pitch commands	**VNAV SPD**: Vertical Navigation, AP maintains FMC speed with pitch commands
ALPHA: displays when aircraft is approaching maximum angle of attack speed. However, a safe "alpha" (angle of attack) speed will be maintained by the autopilot pitch channel.	**SPD LIM**: displays when aircraft speed limit is approached and MCP selected speed or FMC target speed is set to exceed this limit	**V/S**: autopilot maintains selected vertical speed	**FLAP LIM**: displays when flap speed limit is approached and MCP selected speed or FMC target speed is set to exceed this limit
			SPD LIM: displays when aircraft speed limit is approached and MCP selected speed or FMC target speed is set to exceed this limit

FMA (Flight Mode Annunciator)



3: Roll Mode	4: Autopilot	5: Autoland
HDG HOLD: autopilot maintains current heading	**FD**: flight directors are ON and autopilots are not engaged	**LAND 3**: three autopilot channels engaged and operating normally for an automatic landing
HDG SEL: autopilot maintains heading set on the MCP with the HEADING SELECT knob	**CMD**: autopilot command is engaged	**LAND 2**: autopilot redundancy reduced, only two autopilots available
LNAV: activates Lateral Navigation autopilot roll mode, following FMC flight plan		**NO LAND 3 (amber)**: fault occurs after LAND 3 or LAND 2 annunciates, making AFDS unable to make an automatic landing
LOC: Autopilot captures the localizer course		
ROLLOUT: After touchdown, AFDS uses rudder and nosewheel steering to steer the airplane on the localizer centerline		
TO: annunciates by positioning either flight director switch ON when both flight directors are OFF or in flight at liftoff		
GA: displayed when flaps are out of UP position or glideslope is captured. Roll steering indication provides guidance to maintain ground track present when mode is engaged. GA mode armed when pushing the GA switch on the throttle.		

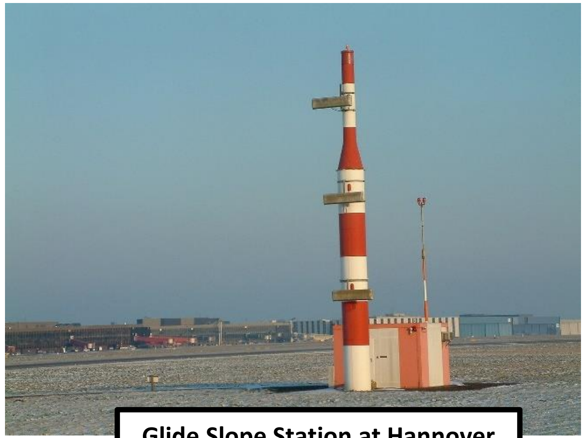
PLANNING DESCENT

So, you've finally made it all the way up to your cruising altitude? Congrats! Now, we have a bit of planning to do.

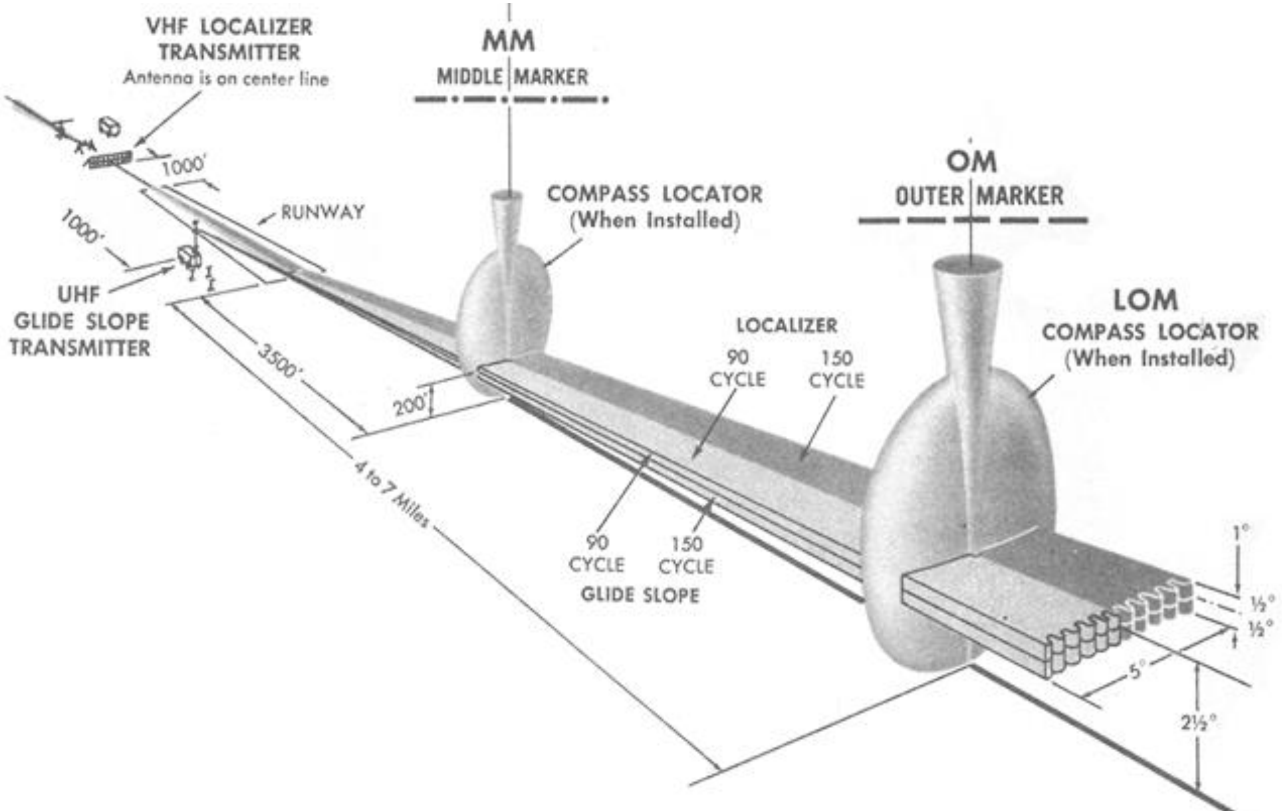
First, let's introduce you to the ILS (Instrument Landing System). This system exists to guide you during your approach.

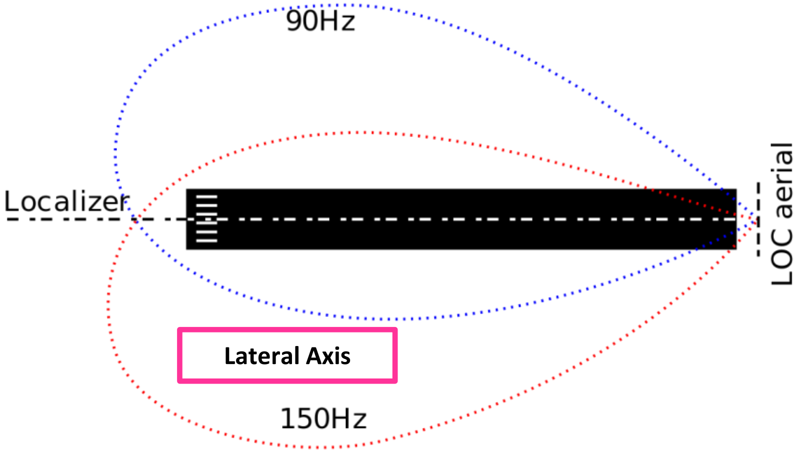
- The Localizer is generally an array of antennas that will give you a lateral reference to the center of the runway.
- The Glide Slope station will help you determine the descent speed you need in order to not smack the runway in a smoldering ball of fire.


Localizer Array Station at Hannover

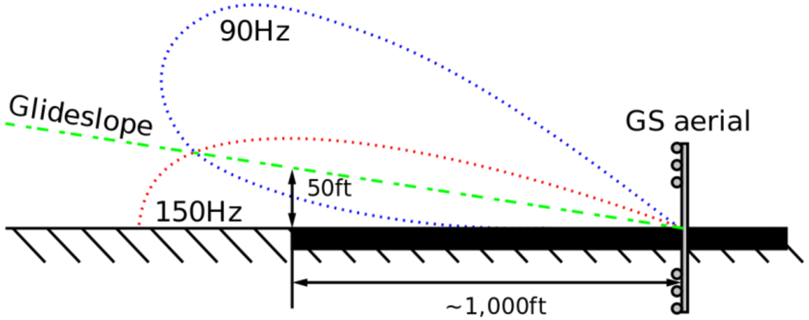

Glide Slope Station at Hannover

Great video explanation of ILS
https://www.youtube.com/watch?v=KVtEfDcNMO8





Lateral Axis

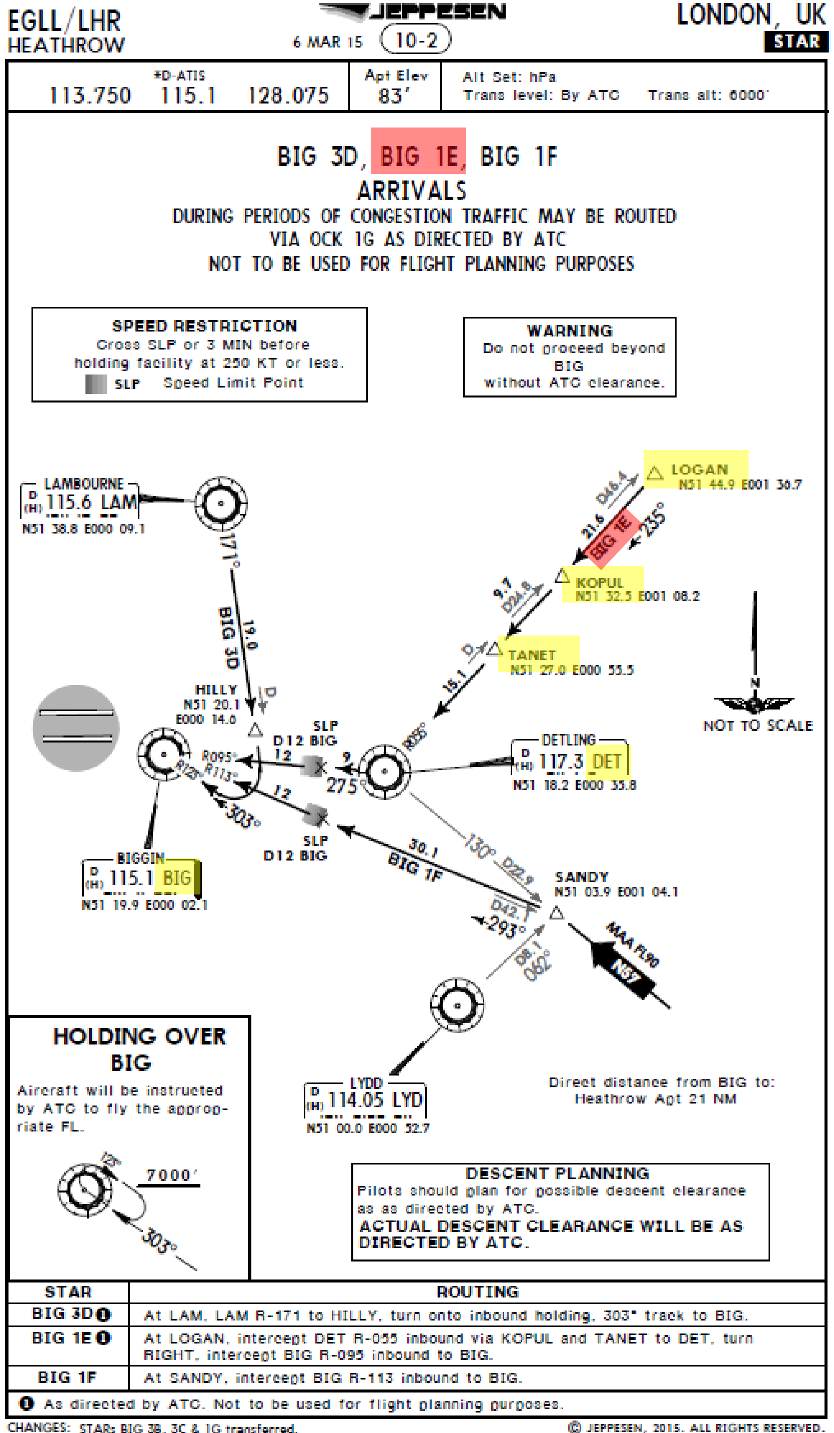


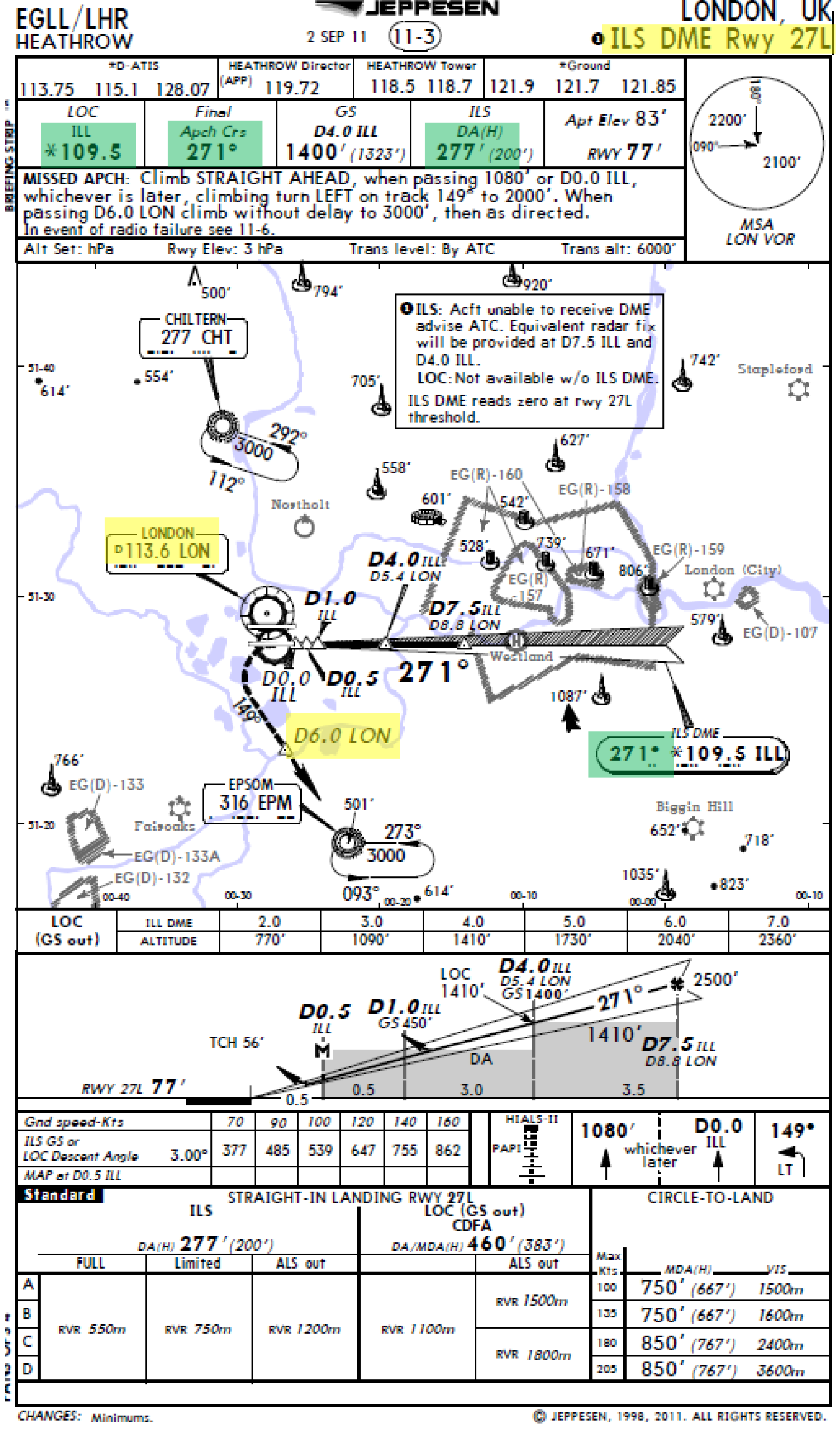
Vertical Axis

PLANNING DESCENT

These charts are for the STAR (Standard Terminal Arrival Route) from LOGAN to EGLL. We intend to:

1. Come from LOGAN waypoint
2. Fly from LOGAN towards the BIG1E arrival route.
3. Follow the STAR (BIG1E -> KOPUL -> TANET -> DET -> BIG)
4. Select an AIF (Approach Initial Fix) from the FMC database (in our case CI27L) and follow the approach towards the runway, guided by the EGLL airport's ILS (Instrument Landing System).
5. Land at Heathrow (EGLL) on **runway 27L** (orientation: 270 Left)





PLANNING DESCENT

Final Approach Course: 271
This is the heading you will take when approaching for final landing.

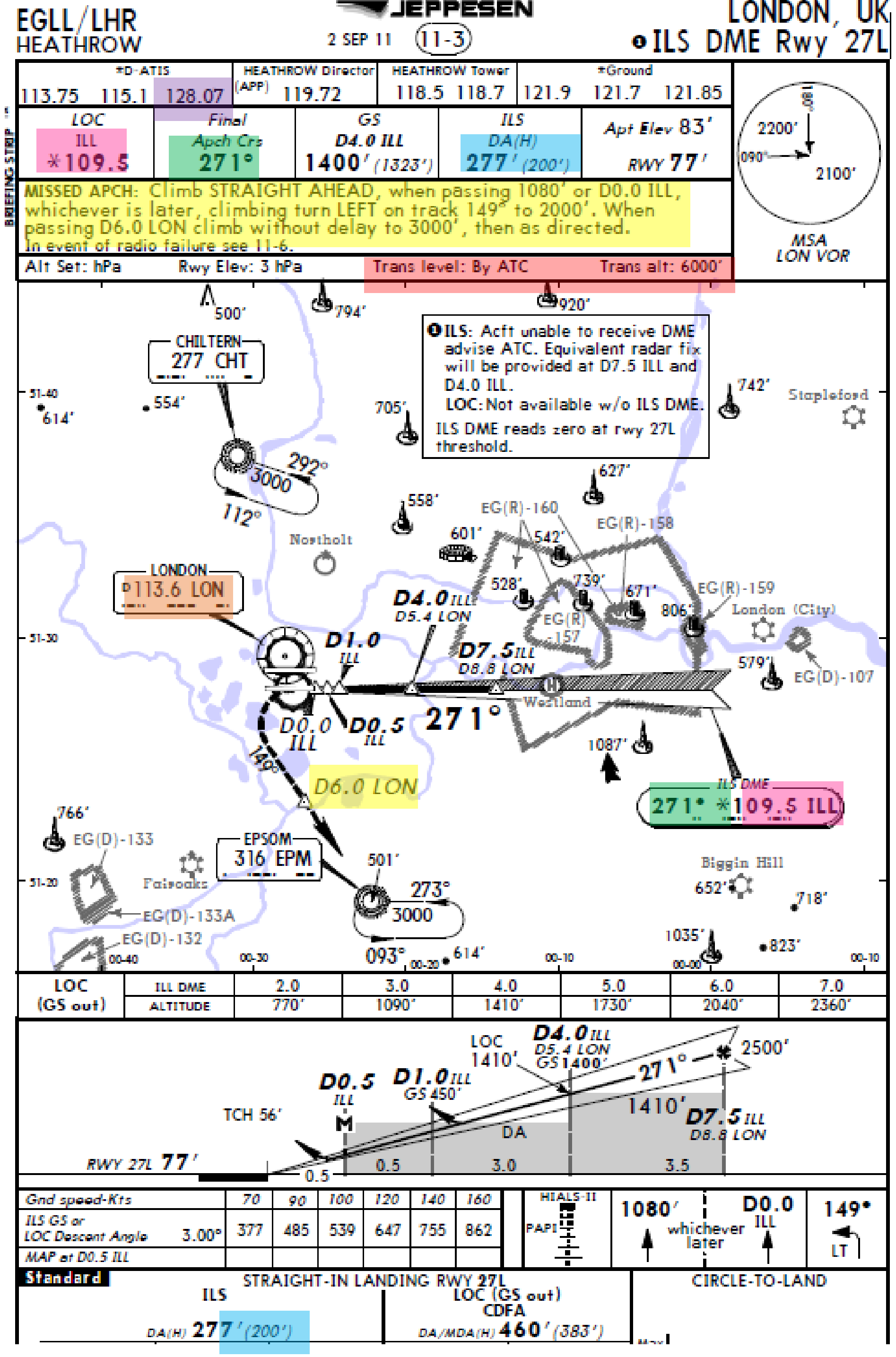
Minimums Decision Height: 200
The minimum "decision altitude" (DA) during landing is also referred to as "decision height" (DH). If you go lower than 277 ft pressure altitude (or 200 ft above ground level), you are committed to land no matter what happens. Above 277 ft (or 200 ft above ground level), you can still miss your approach and go around. The 767 uses a DH setting.

ILS Frequency: 109.50 MHz
This is the ILS system frequency you will track to guide your aircraft for landing.

Missed Approach Standby Frequency: 113.60 MHz
VOR "LONDON" (LON) will be the beacon we will track in case we miss our approach and have to go around.

Missed Approach Procedure
In case we miss our approach, the procedure is to climb straight ahead. When passing 1080 ft, we climb LEFT on heading 149 to 2000 ft. When passing VOR beacon D6.0 LON, we must climb to 3000 ft and wait for instructions from the tower.

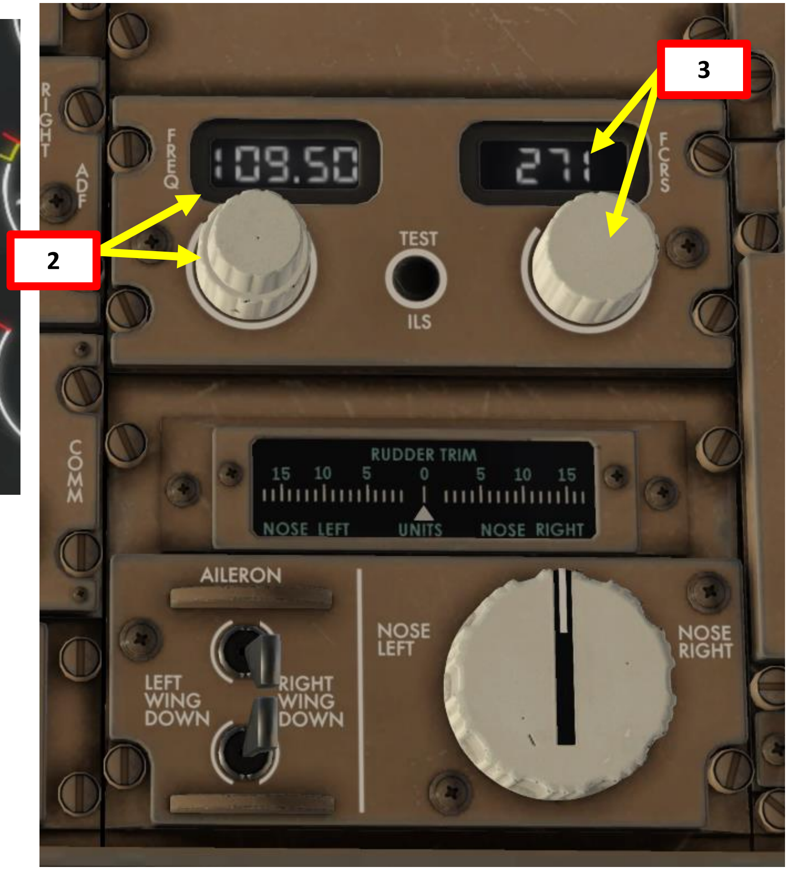
Transition Level & Transition Altitude
The transition altitude is the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes (6000 ft on chart). The transition level is the lowest flight level available for use above the transition altitude. Our transition level is defined "by ATC" (Air Traffic Controller). In that case, a rule of thumb is to add 1000 ft to the transition altitude which give us FL070, or 7000 ft.

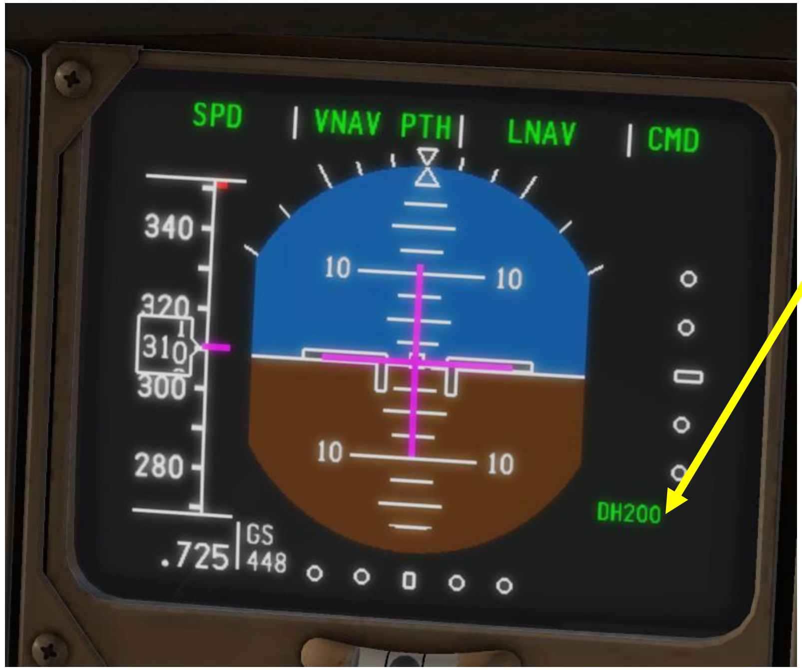


ATIS Frequency: 128.075
The ATIS (Automatic Terminal Information Service) will provide you valuable information including wind direction and speed, and the altimeter setting required for landing.

PLANNING DESCENT

1. We have already selected in our FMC our Arrival runway as ILS27L and our arrival STAR “BIG1E” and our Initial Approach Fix “CI27L” at the beginning. Normally, we do this before we begin our approach. See the “FMC SETUP – WAYPOINTS” section.
2. On the center pedestal, go on the ILS (Instrument Landing System) panel and tune in the ILS frequency of 109.50 for EGLL (Heathrow) Runway 27L as per the ILS chart.
3. Set an ILS FCRS (Front Course) of 271 (runway heading for 27L) as per the ILS chart.
4. Set MINIMUMS on DH (Decision Height) to 200 ft
5. Set AUTOBRAKE to 3

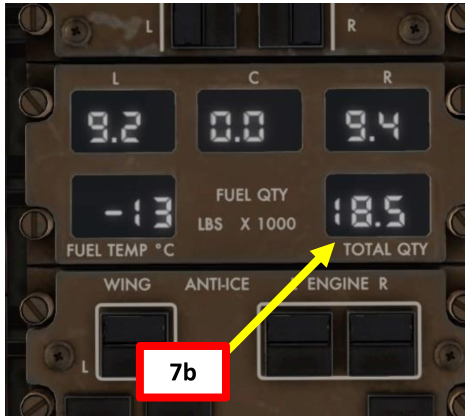


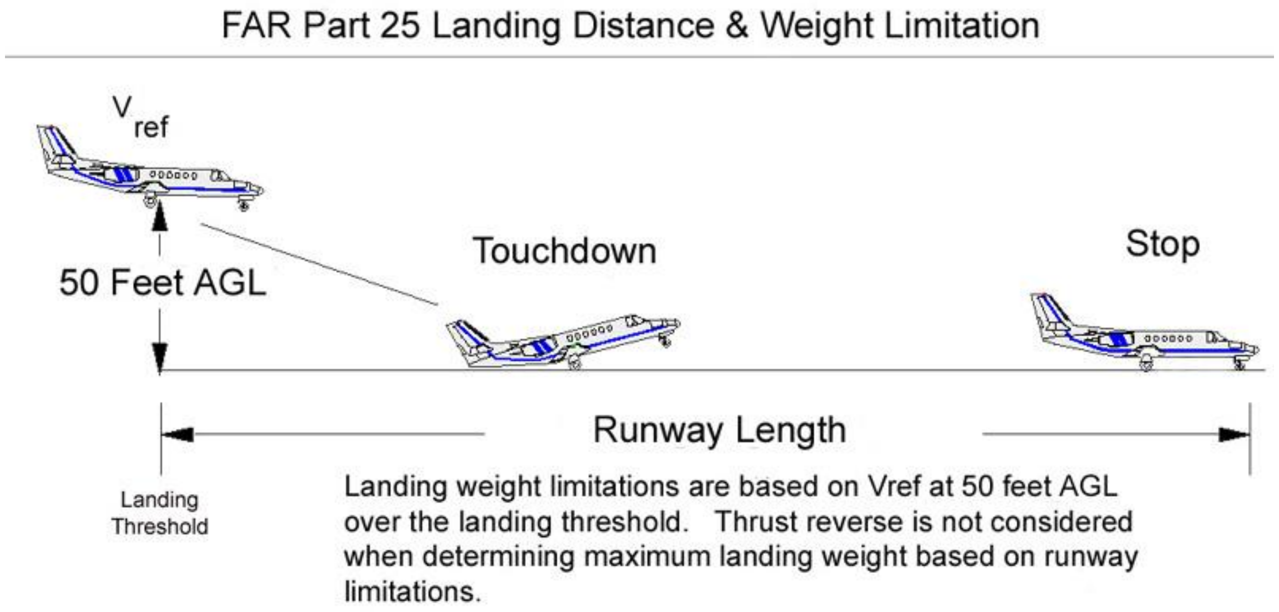


PLANNING DESCENT

6. We must now define VREF for our desired flap setting (reference landing speed over the runway threshold). Luckily, the FMC (Flight Management Computer) can calculate this speed for us. The only input we need is the aircraft's Gross Weight (Sum of the weights of the aircraft, fuel, crew, passengers, and cargo) when reaching EGLL (Heathrow).
7. We will use the following formula to calculate Gross Weight @ Landing:

GW @ Landing = (Current GW) – (Current Fuel – Arrival Fuel) = 278,400 lbs
Arrival Fuel @ EGLL = 16,100 lbs *(see FMC "PROGRESS" page at "EGLL - FUEL")*
Current Fuel = 18,500 lbs *(see TOTAL FUEL QTY indication on overhead panel)*
***Current Gross Weight* = 280,800 lbs** *(see FMC "INIT/APPROACH REF" page at "GROSS WT")*





PLANNING DESCENT

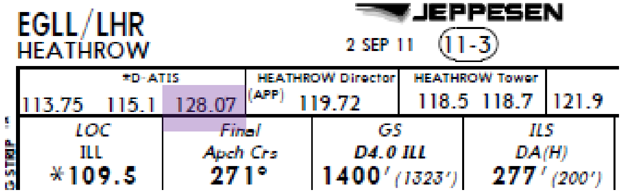
8. On the MCDU keypad, enter the predicted gross weight at landing "278.4" (for 278,400 lbs) and select the LSK next to "GROSS WT" to update the VREF values. You should see them change to lower reference airspeed values.
9. Click on the LSK next to "30° – 137KT" to copy the VREF speed for a Flaps 30 degrees landing configuration.
10. Click on the LSK next to FLAP/SPEED to paste the calculated VREF value.

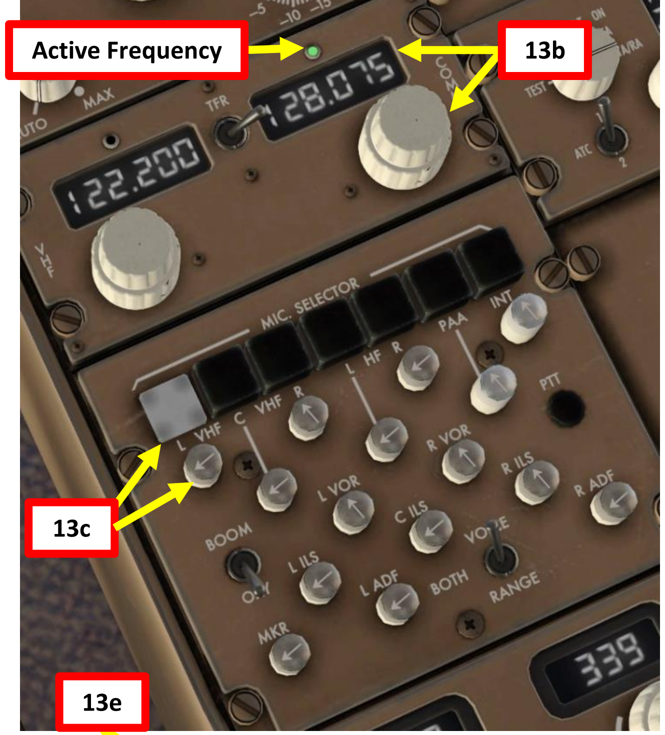
PLANNING DESCENT

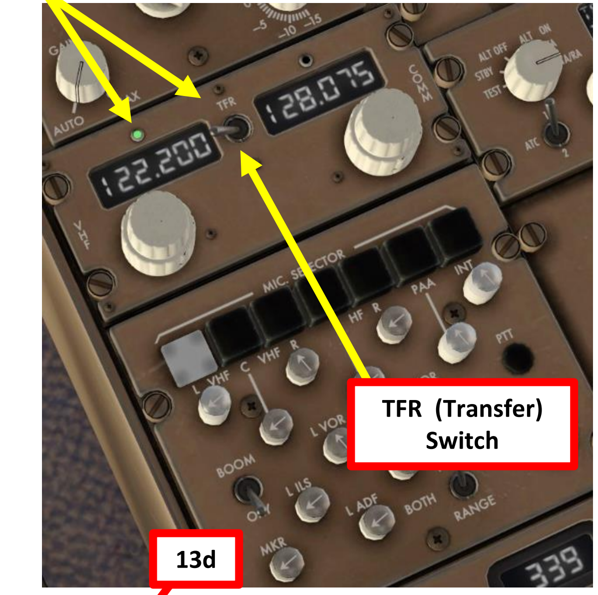
11. On MCP (Mode Control Panel), set Final Descent Altitude to 2000 ft. The aircraft will not start descending yet because it hasn't reached the T/D (Top of Descent) point.
12. Go in the LEGS page of the FMC and make sure that you have enough distance to perform your approach at a 3 deg glide slope. You can use the following rule of thumb:
    <u>Required Descent Distance = (Altitude x 3)/1000 + (10 nm for deceleration)</u>
    = (24000 x 3)/1000 + 10 = 72 + 10 = 82 nm

PLANNING DESCENT

13. You can consult the EGLL ATIS (Automatic Terminal Information Service) system with the radio to get the altimeter setting.
    a) Consult the EGLL chart and find the Heathrow ATIS Frequency (128.075).
    b) Set VHF-1 COMM ACTIVE radio frequency to the ATIS frequency (128.075)
    c) Press the L VHF button on the Audio Select Panel to listen on the VHF-1 active frequency.
    d) You should receive the ATIS automated report on the radio for Heathrow Airport. The reported altimeter setting is 30.21 inches of Hg.
    e) You can click on the TFR (Transfer) button to set the ATIS frequency to the STANDBY frequency once you have the information you need. You will then stop hearing the ATIS broadcast.
14. When reaching the transition level of 7000 ft, Set altimeter setting and standby altimeter setting to 3021 (30.21 inches of mercury) by rotating the altimeter BARO knob. Do this for the co-pilot instruments as well.







London Heathrow information kilo. 8 hundred zulu weather. Wind light and variable, visibility more than 10. Sky conditions 4600 overcast, Temperature 2, dewpoint minus 1. Altimeter 3 0 2 1. Arriving runway 0 9 right, departing runway 0 9 left. Advise on initial contact you have kilo.

PLANNING DESCENT

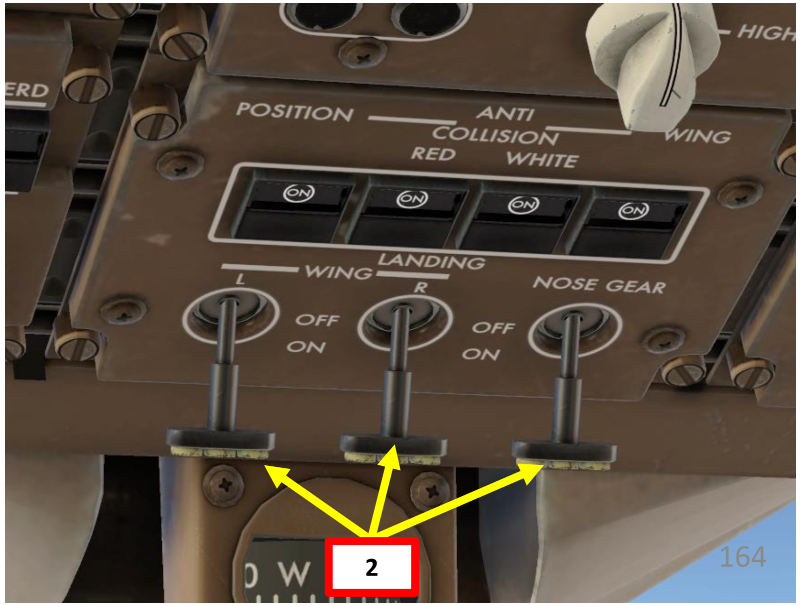
15. We must now set our transition level in the FMC
16. Click on the “DES” FMC page on the MCDU reach Page 3/3: ECON DES.
17. Select LSK next to the “FORECAST” menu.
18. Type “070” for FL070 (7000 ft) on the MCDU keypad and click on the LSK next to “TRANS LVL”.

DESCENT

1. You will automatically start descending when reaching the T/D (Top of Descent) point.

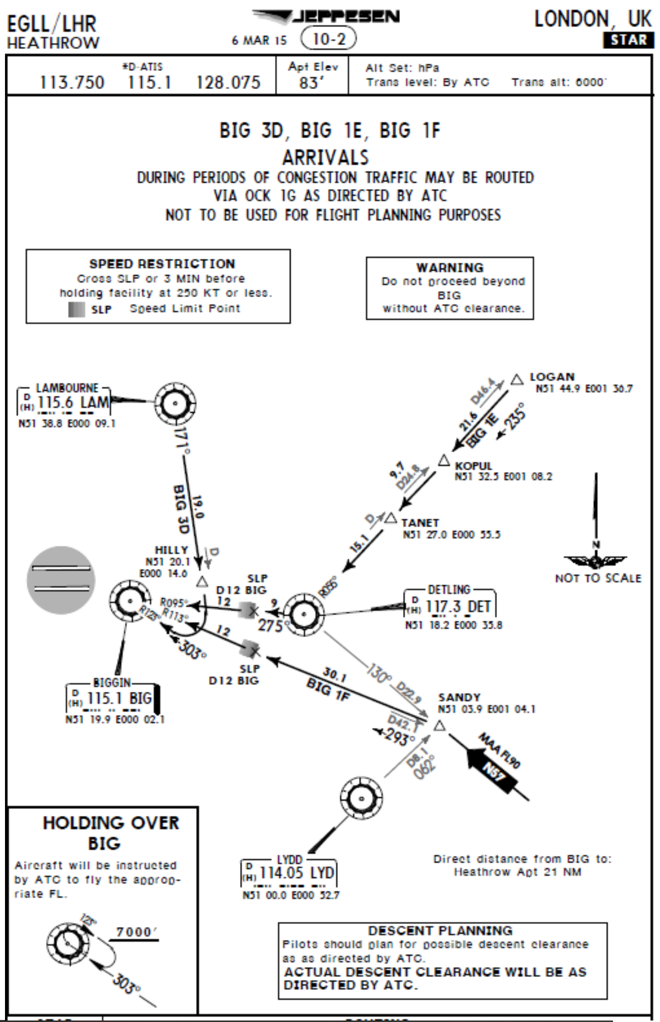
   NOTE: Alternatively, you can also start your descent a bit earlier in order to do a smoother descent that will be more comfortable for passengers by using the "DES NOW" mode. This DES NOW mode starts the plane down at a shallow 1000 FPM (feet per minute) until it intercepts the VNAV path. Going from 0 to 1000 FPM is far less noticeable to the passengers than quickly going from 0 to 3000 FPM is. DES NOW is also what you would press if ATC gave you a descent clearance prior to your T/D.

   ALTERNATIVE PROCEDURE: When you are about 5-10 nm from the Top of Descent point (T/D), click on the "DES" FMC page on the MCDU, go on Page 3/3 ECON DES, then select LSK next to "DES NOW" and click on the EXEC button on the MCDU.
2. When reaching FL100, set Landing Lights to ON.



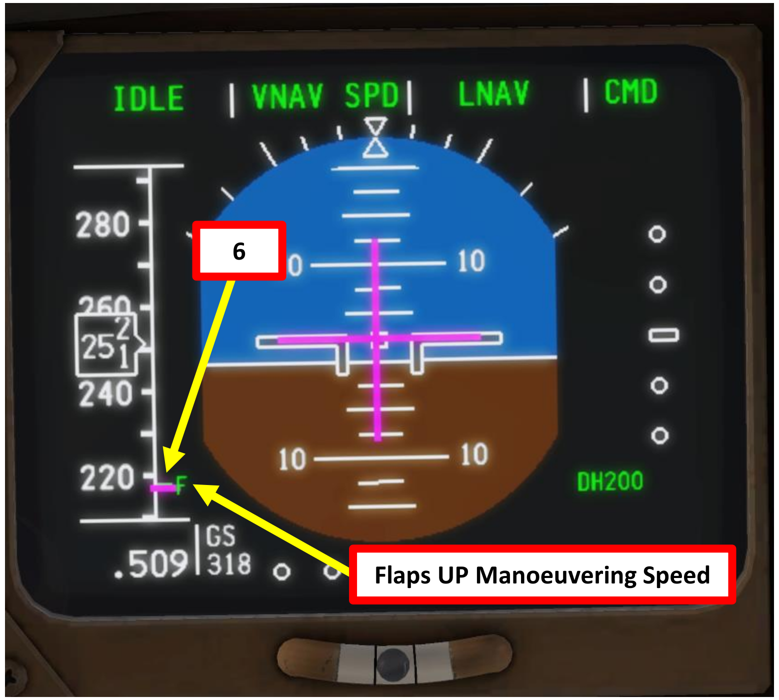
DESCENT

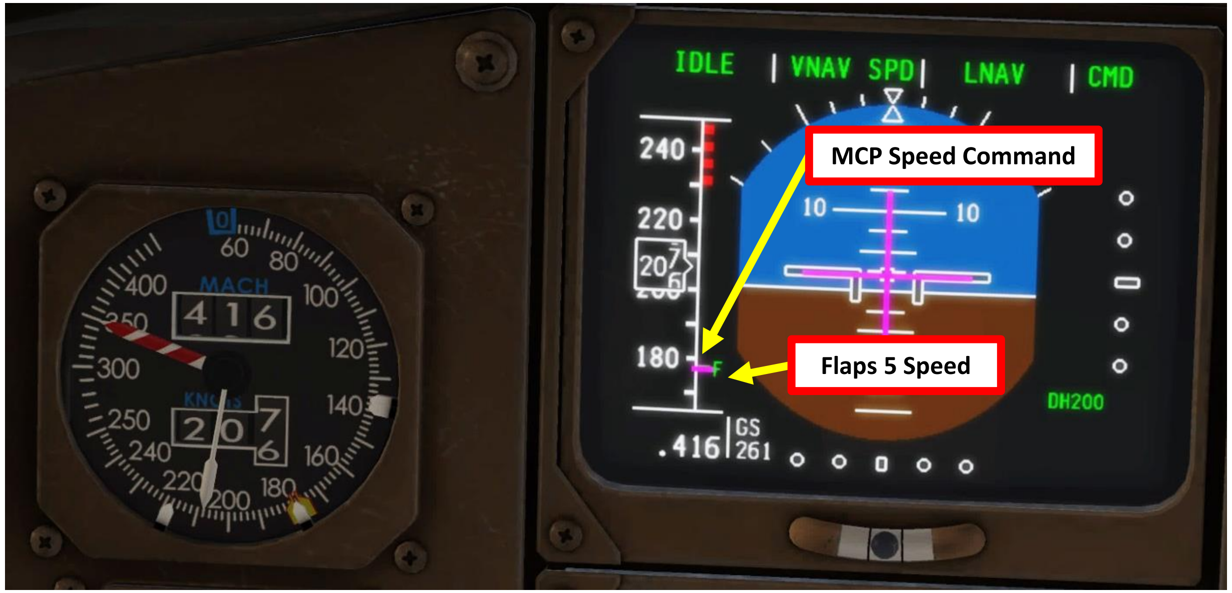
3. Before you reach the last waypoint of the STAR (BIG), the tower should be able to clear us for open descent to 2000 ft. Once you fly over the Deceleration Point (not visible on this aircraft), your aircraft will start losing speed and will begin your approach.
4. Open up the LEGS page on your FMC and look for the speed restriction at BIG. It says that we cannot fly faster than 240 kts.
5. Set autopilot speed to 240 by pressing the MCP Speed Button (Speed Intervention), then turning the knob to 240 kts. Confirm that the altitude target is set to 2000.



DESCENT

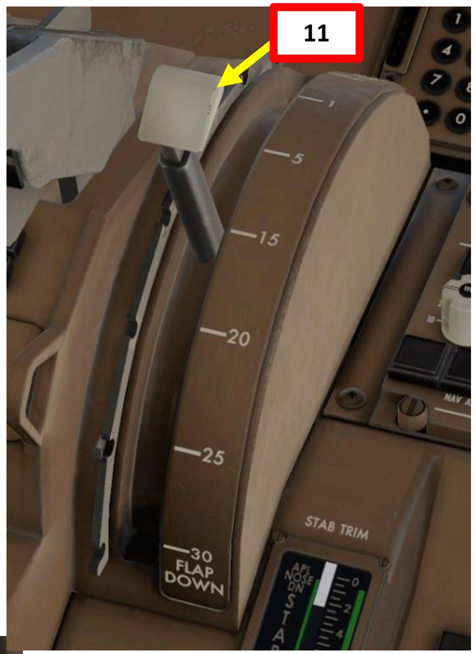
6. Once you are approaching the Approach Fix CI27L, slow down to FLAPS UP Manoeuvering speed of 217 kts (indicated on speed tape by “F”) by setting the autopilot MCP SPEED to 217. Commanded Airspeed is shown as a purple bar. If IAS window is blank, click on the MCP SPEED knob to activate the Speed Intervention functionality.
7. Set Flaps lever to 5 deg
8. Set MCP SPEED to the Flaps 5 Speed (177 kts), as shown on Speed Tape
9. Arm LOC (Localizer) switch. You need to be close enough to the localizer station (about 25 nm) for the mode to arm.

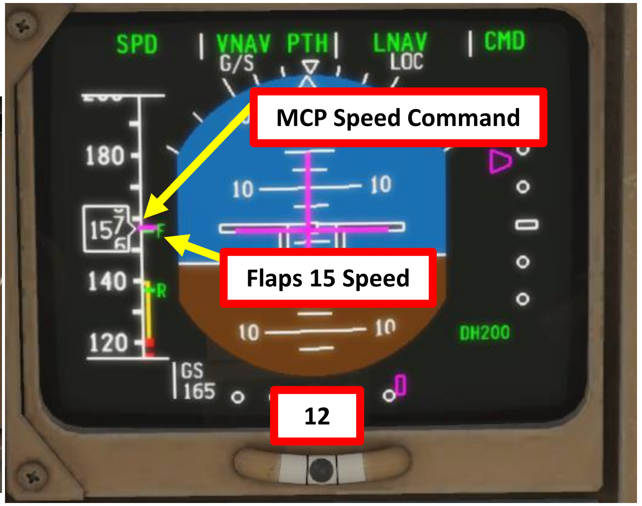


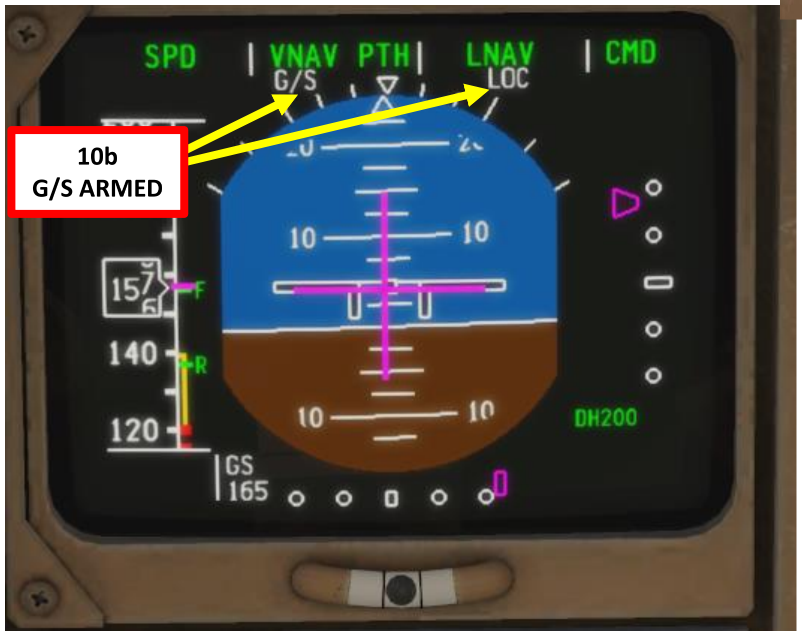


DESCENT

10. Once you are at least 25 nm from ILS approach (a bit before Approach Fix CI27L), press the “APP” autopilot mode to arm both LOC (Localizer) and G/S (Glide Slope) modes. All three autopilot channels (CMD L, CMD C and CMD R) should engage.
11. Set Flaps lever to 15 degrees
12. Once you are at 3000 ft, set MCP SPEED to the FLAPS 15 speed of 157 kts (indicated on speed tape)





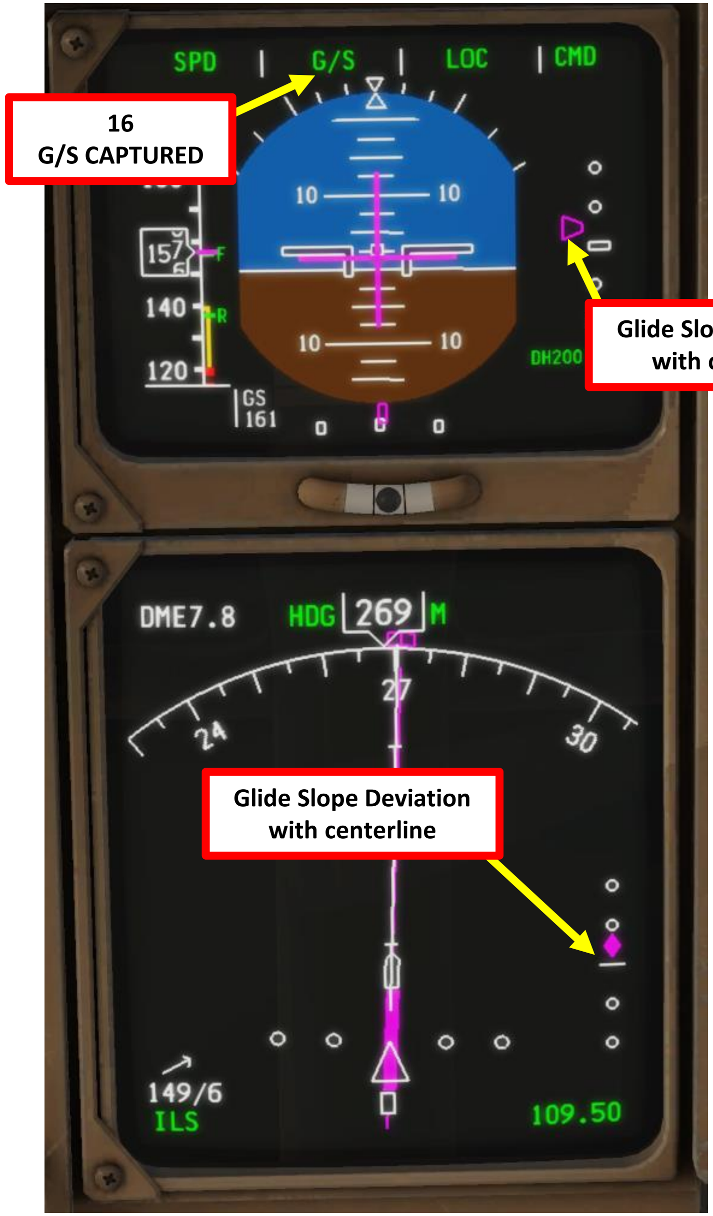


DESCENT

13. Set Navigation Display mode to APP (Approach) to check for ILS localizer and glide slope.
14. When LOC (Localizer) is captured, the PFD will indicate in green that the "LOC" autopilot mode is active.

DESCENT

15. Set HEADING knob to 271, which is the runway QDM (magnetic heading)
16. When glide slope is captured, the PFD will indicate in green that the “G/S” autopilot mode is active.
17. Set Navigation Display mode back to MAP
18. Once localizer (lateral guidance) and glide slope (vertical guidance) are both captured, you can now set your autopilot altitude to the Go-Around Altitude of 3000 .

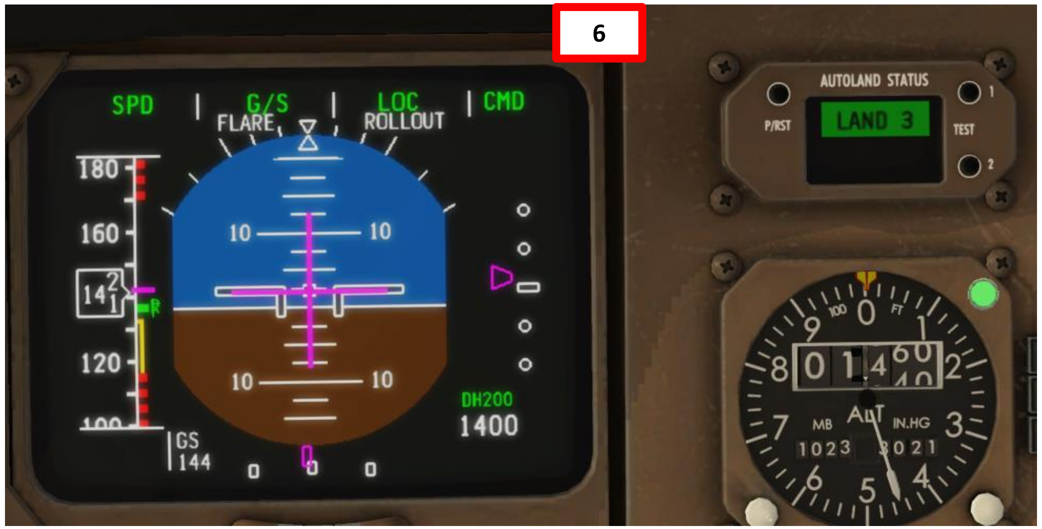


DESCENT

FINAL APPROACH

1. Once you are at 1500 ft on final approach, set landing gear down.
2. Set Flaps Lever to 30 degrees
3. Arm Speed Brake
4. Set MCP SPEED to the VREF+5 speed of (137 + 5) kts (indicated on speed tape). In other words, set the autopilot MCP SPEED to 142.
5. When glide slope is captured, the GA (Go Around) Thrust Limit will be armed automatically as a safety measure to potentially provide all thrust necessary if going around is necessary (aborting landing).
6. This landing will be done with the Autoland (LAND3).
    - When flying at 400 ft, the autopilot will switch to LAND mode in order to set the aircraft in a proper altitude and attitude to flare properly.
    - When flying at 50 ft, the autopilot will switch to FLARE mode in order to flare the aircraft to have a smooth touchdown.
    - On touchdown, the autopilot will switch to ROLLOUT mode. This mode will keep the aircraft on the runway centerline.

NOTE: If for some reason you decide to do a manual landing instead, a good procedure is to disconnect the Autopilot switch and the Autothrottle switches and follow the flight director to the runway by flying manually. You will then land the aircraft visually. Don't follow the flight directors to touchdown: they're not designed to provide accurate design past this DH (decision height).



FINAL APPROACH

LANDING

1. When you hear an audio cue “MINIMUMS”, this means you have reached your minimal decision altitude. You are now committed to land.
2. At 20 ft, pull up slightly to reduce rate of descent
3. At 10 ft, throttle back to IDLE
4. On touchdown, push the nose into the ground to improve adherence with the runway and maximize braking (the Autobrake system will already brake for you)

LANDING

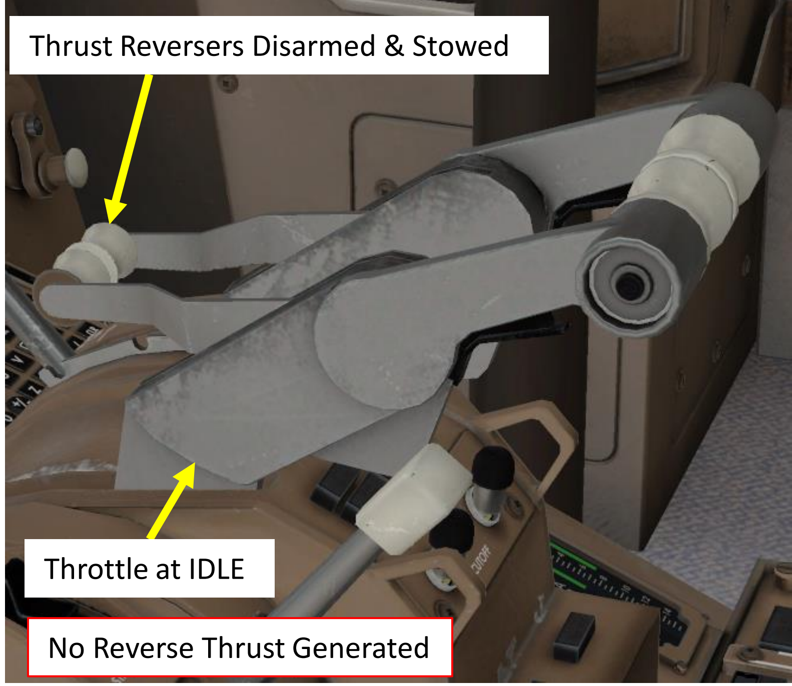
LANDING

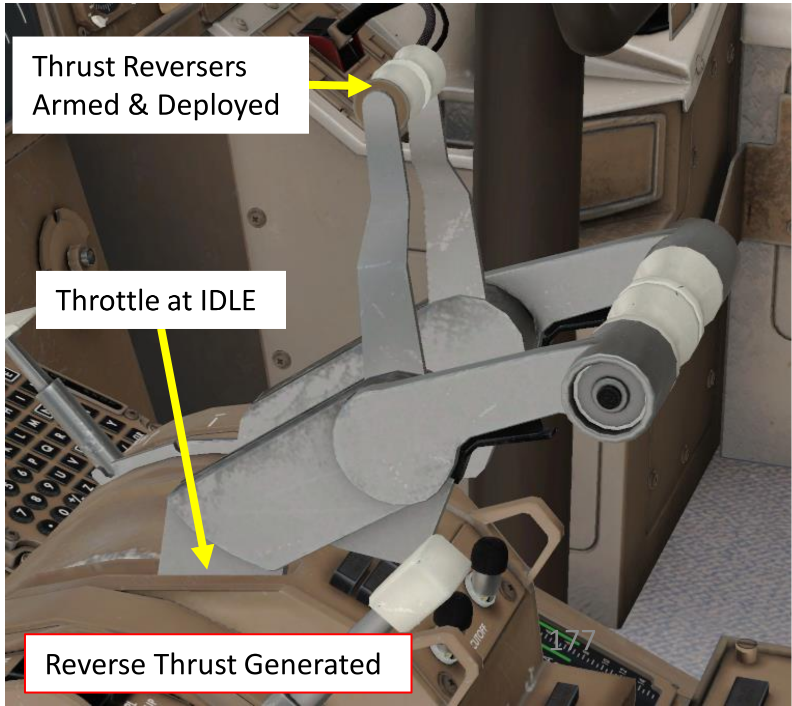

IDLE | FLARE | ROLLOUT | CMD
DH200
GS 137
AUTOLAND STATUS
LAND 3
P/RST
TEST
VOR/DME
MAN
WARNING
CAUTION
115.10
MACH
KNOTS
ALT
VERTICAL SPEED
1.9NM
TRK 270 M
0957.2z
DME-L
DME-R
19.7
8.4

LANDING

LANDING

5. Set the throttle at IDLE first, then press the "TOGGLE THRUST REVERSERS" binding. This will link your throttle axis to the thrust reverser lever axis.
6. Move your throttle forward to move the thrust reverser lever AFT. This will illuminate the REV lights and engage thrust reversers to MAX REV. Deploy thrust reversers until you slow down enough to vacate the runway safely.
7. Once landed safely, set your throttle back to IDLE and press the "TOGGLE THRUST REVERSERS" binding again to reset your throttle axis.
8. Retract flaps and throttle up to taxi towards parking spot.





LANDING

LANDING


AIRFRANCE
BRITISH AIRWAYS
B ←E→