FSX GUIDE

FS LABS A320

By Chuck

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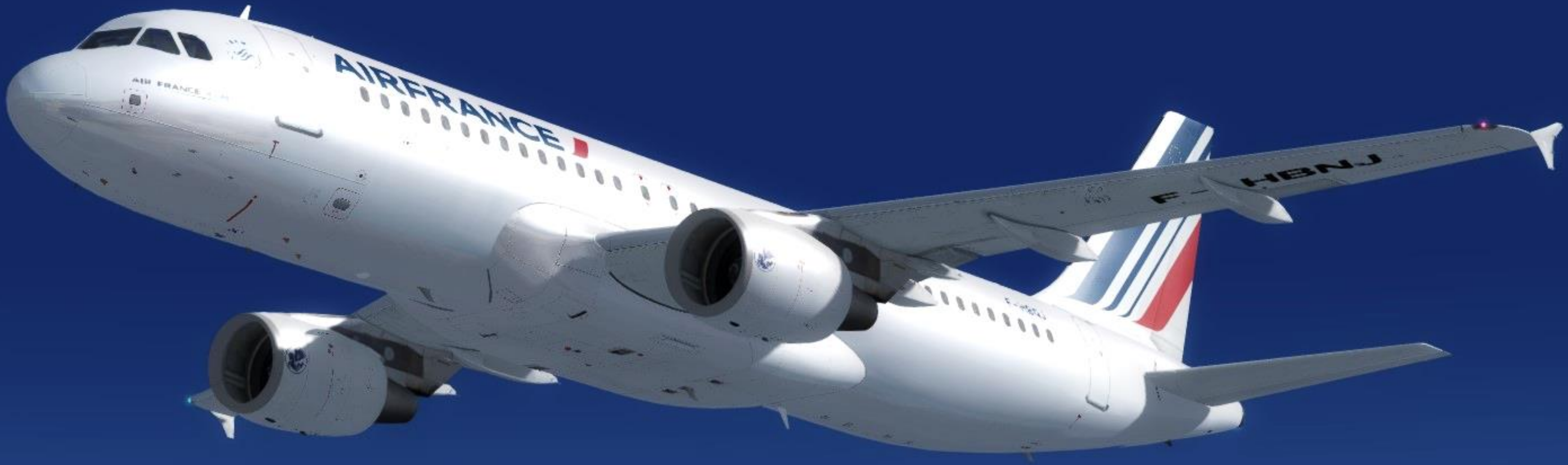

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Special thanks to Paul "Goldwolf" Whittingham for creating the guide icons.

The **Airbus A320** family consists of short- to medium-range, narrow-body, commercial passenger twin-engine jet airliners manufactured by Airbus. The family includes the A318, A319, A320 and A321, as well as the ACJ business jet. Its first flight took place in 1987, therefore it is still a fairly young jet by aviation standards. The A320 family pioneered the use of digital fly-by-wire flight control systems, as well as side-stick controls, in commercial aircraft. There has been a continuous improvement process since introduction.

Other improvements over older aircraft designs included a streamlined and more structured cockpit ergonomically speaking. It was a drastic change from the cockpits of its direct competitor, the Boeing 737. Most switches are logically placed and easy to access. The addition of multiple system monitoring pages allowed a much better and user-friendly way for the pilot to monitor the state of various systems. The A320 has a great level of automation, and at some point you might feel that you are more some sort of “systems operator” instead of an actual pilot. This automation can be a blessing or a curse if someone is not trained properly to know the inner workings of the plane.

The Airbus design philosophy is based on four "Golden Rules" (used to be more, but they cut them down recently):

- Fly, navigate, and communicate, in that order
- Use the correct level of automation for the task at hand.
- Know your Flight Mode Annunciator at all times.
- If things on automation are not going as expected, take over immediately.

Overall, the eternal Boeing vs Airbus rivalry can be summed up like this:
Boeing focuses on the pilot having more authority on the aircraft, while Airbus focuses on system automation to reduce pilot workload and minimize the risk of human error. Both approaches are quite different and offer different solutions to the same problem: how to fly.

In December 2010, Airbus announced a new generation of the A320 family, the A320neo with a new engine option. The A320neo offers new, more efficient engines, combined with airframe improvements and the addition of winglets, named sharklets by Airbus.

A320 first flight in 1987

A320 Neo

Flight Sim Labs offers two engine variants of the A320 “X”: the IAE and the CFM engines.

CFM 56 (CFM56-5-B4):

CFM International is a joint venture between GE Aviation, a division of General Electric and Safran Aircraft Engines (formerly known as SNECMA), a division of Safran. The “CFM56” product line is derived from the two parent companies’ commercial engine designations: GE’s CF6 and SNECMA’s M56. The CFM engine is equipped with a ***clamshell door type thrust reverser*** and uses N1 (fan speed) as its thrust reference on the ECAM (Electronic Centralised Aircraft Monitor).

IAE V2500 (V2527-A5):

“International Aero Engine” (IAE) is a joint venture engine consortium for the V2500 engine program between Pratt & Whitney, Rolls-Royce, Japanese Aero Engines Corporation (Kawasaki Heavy Industries, IHI, Mitsubishi Heavy Industries) and MTU Aero Engines. The IAE engine is equipped with a ***cascade type thrust reverser*** and uses EPR (Engine Pressure Ratio) as its thrust reference on the ECAM.

The CFM and IAE engines are different. The IAE engine has a longer start-up time, is noisier, is more fuel/oil efficient, has a more effective reverse thrust and has a higher idle thrust (more braking needed during taxi). The CFM engine is quieter, starts quicker, has a lower idle thrust, higher reliability but also higher fuel and oil consumption.

CFM Engine

IAE Engine

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

You may be wondering… but why would different engine manufacturers use different units for power settings?

Pratt & Whitney and Rolls-Royce use the Engine Pressure Ratio (EPR) for engines like the IAE V2500 , while GE Aviation (General Electric) uses the engine Fan Speed (N1) for engines like the CFM 56. This difference originates from the way the two companies want the pilot to define his thrust reference.

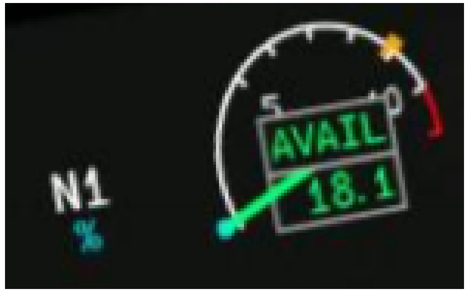
EPR is defined as the ratio between the pressure at the engine outlet and the engine inlet, and is dependent on the prevailing atmospheric conditions as pressure is affected by temperature and aircraft altitude.

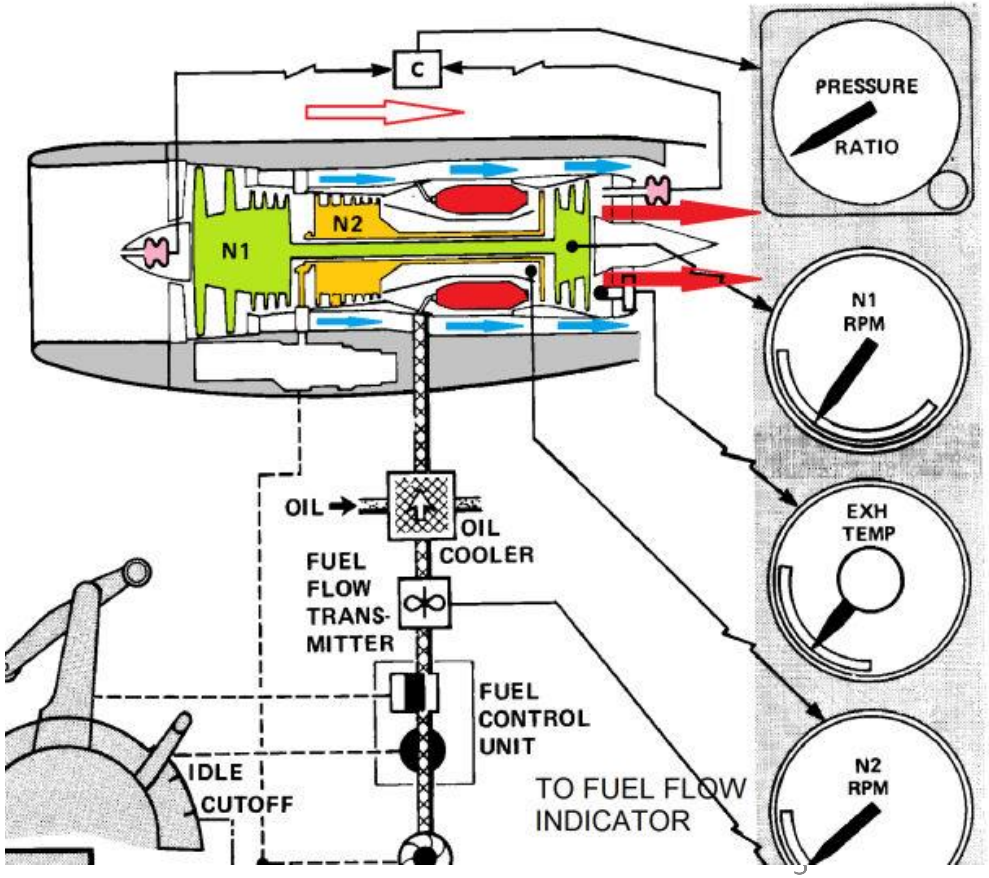
- This is a somewhat more accurate indication of thrust reference since it's the result of simple physics: Thrust = Pressure x Area of Application.
  No matter the condition of the engine, a given EPR in the same atmospheric conditions is guaranteed to deliver the same amount of thrust.
- EPR relies 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/





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
  - Begin navigation system alignment phase
  - Program the FMGC (Flight Management & Guidance Computer)
- Start–up the aircraft and make it ready for flight
- Taxi
- Takeoff
- Climb and cruise
- Introduction to autopilot and flight control laws
- Approach and land

BEST RESOURCES

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

Airbus Driver Website
http://www.airbusdriver.net/

Blackbox711 Youtube Channel
https://www.youtube.com/channel/UCe9fggL9PwEqSyMDrlLubVw

Blackbox711 Basic Training Playlist:
https://www.youtube.com/watch?v=E-PsdxhEs-s&list=PL24XRTIr2OjIe7PvRwS50Lf74nZFUeE9x

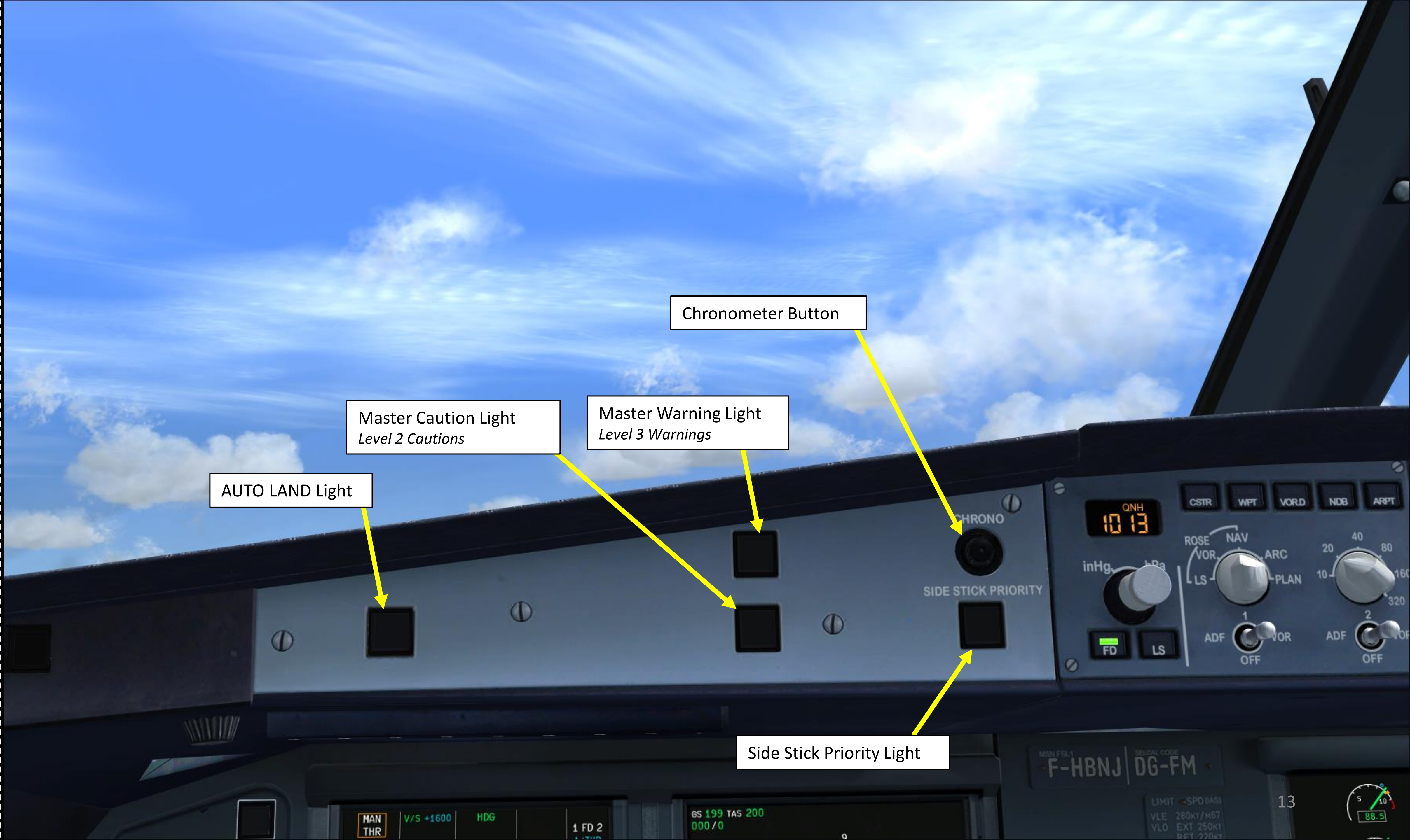
Blackbox711 Advanced Training Playlist:
https://www.youtube.com/watch?v=ts1aoPdSGNY&list=PL24XRTIr2OjIHo36UtqEp5GCge9u_wkFW


Front Flight Deck


Cockpit Window Handle
ON
OFF


Thumb Rest dimple
Nose Wheel Steering Tiller
(used to steer aircraft on the ground)
Side Stick
Takeover Priority Switch
Disconnects Autopilot
Pedal Disconnect Button
PEDAL DISC


Flood Light
Controls


Chronometer Button
Master Caution Light
Level 2 Cautions
Master Warning Light
Level 3 Warnings
AUTO LAND Light
Side Stick Priority Light
CHRONO
SIDE STICK PRIORITY
QNH
inHg
hPa
CSTR
WPT
VOR.D
NDB
ARPT
ROSE
NAV
VOR
ARC
LS
PLAN
FD
LS
ADF
OFF
F-HBNJ
DG-FM
MAN
THR
V/S +1600
HDG
1 FD 2
GS 199 TAS 200

EFIS (Electronic Flight Instrument System) Control Panel

Note 1*: The EFIS is a flight deck instrument display system that displays flight data electronically rather than electromechanically. An EFIS normally consists of a primary flight display (**PFD**), multi-function display (**MFD**), and an Electronic Centralized Aircraft Monitoring (**ECAM**) display.*

Note 2*: The complex electromechanical attitude director indicator (ADI) and horizontal situation indicator (HSI) were the first candidates for replacement by EFIS.*

Data Display Buttons
CSTR: Flight Plan Constraints
WPT: Waypoints
VOR.D: VHF Omnidirectional Range / Doppler
NDB: Non-Directional Beacon
ARPT: Airport

ND (Navigation Display) Mode Selector
Rose ILS
Rose VOR
Rose NAV
ARC NAV-Weather Radar
PLAN

FCU (Flight Control Unit) Panel

Barometric Reference

Barometric Unit Selector (Black Circle)

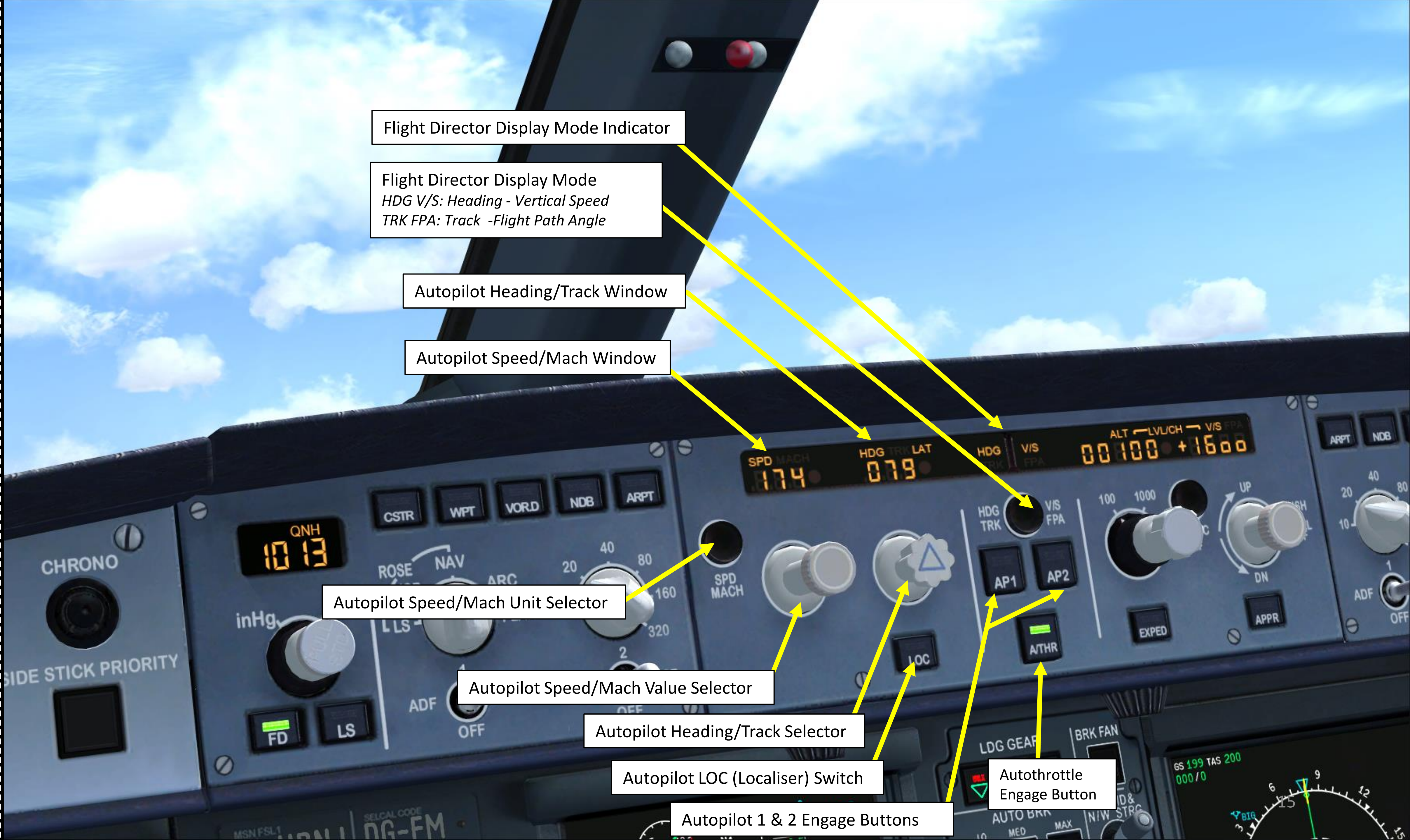
Barometric Setting Selector

ND (Navigation Display) Range Selector (nm)

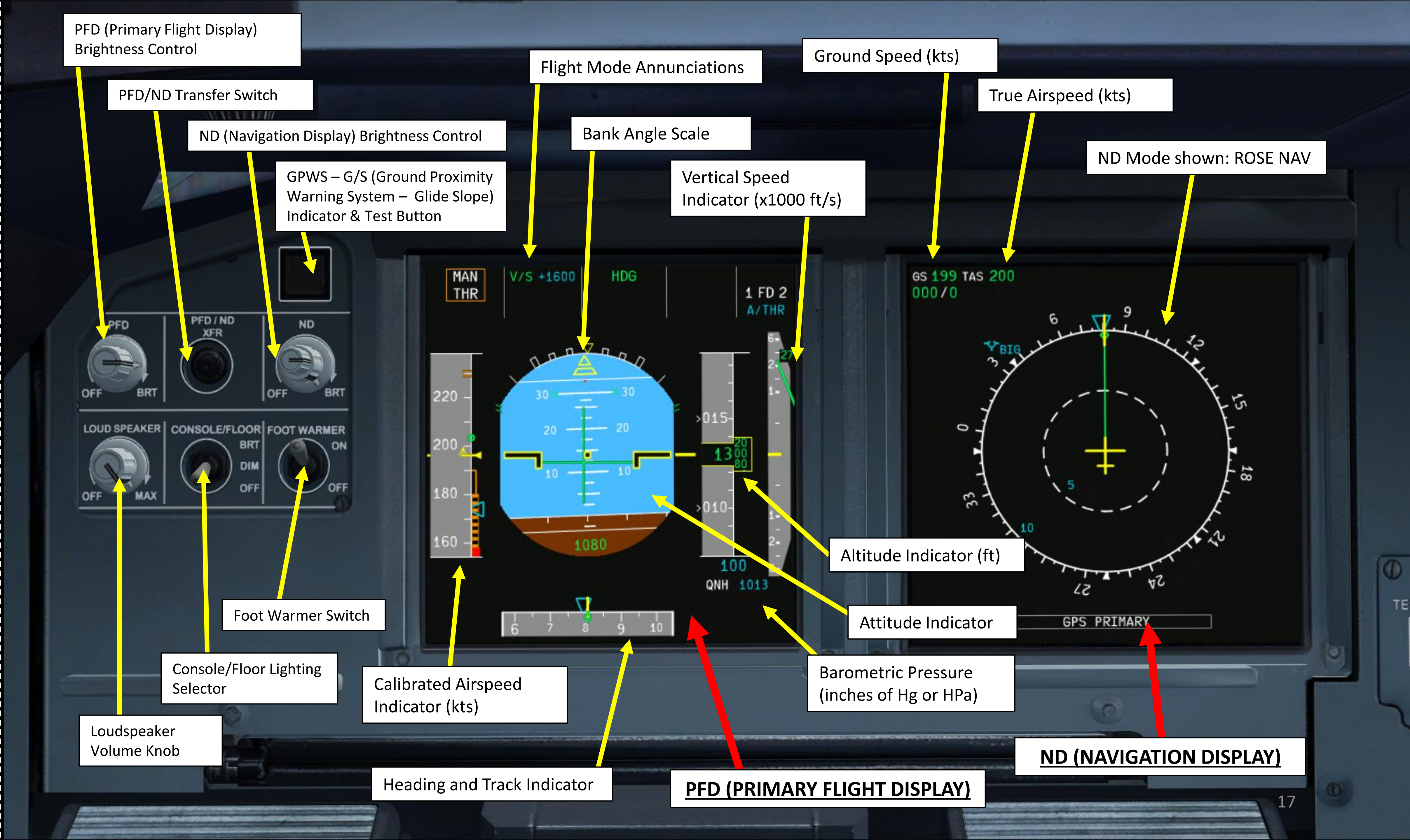
Flight Director Switch

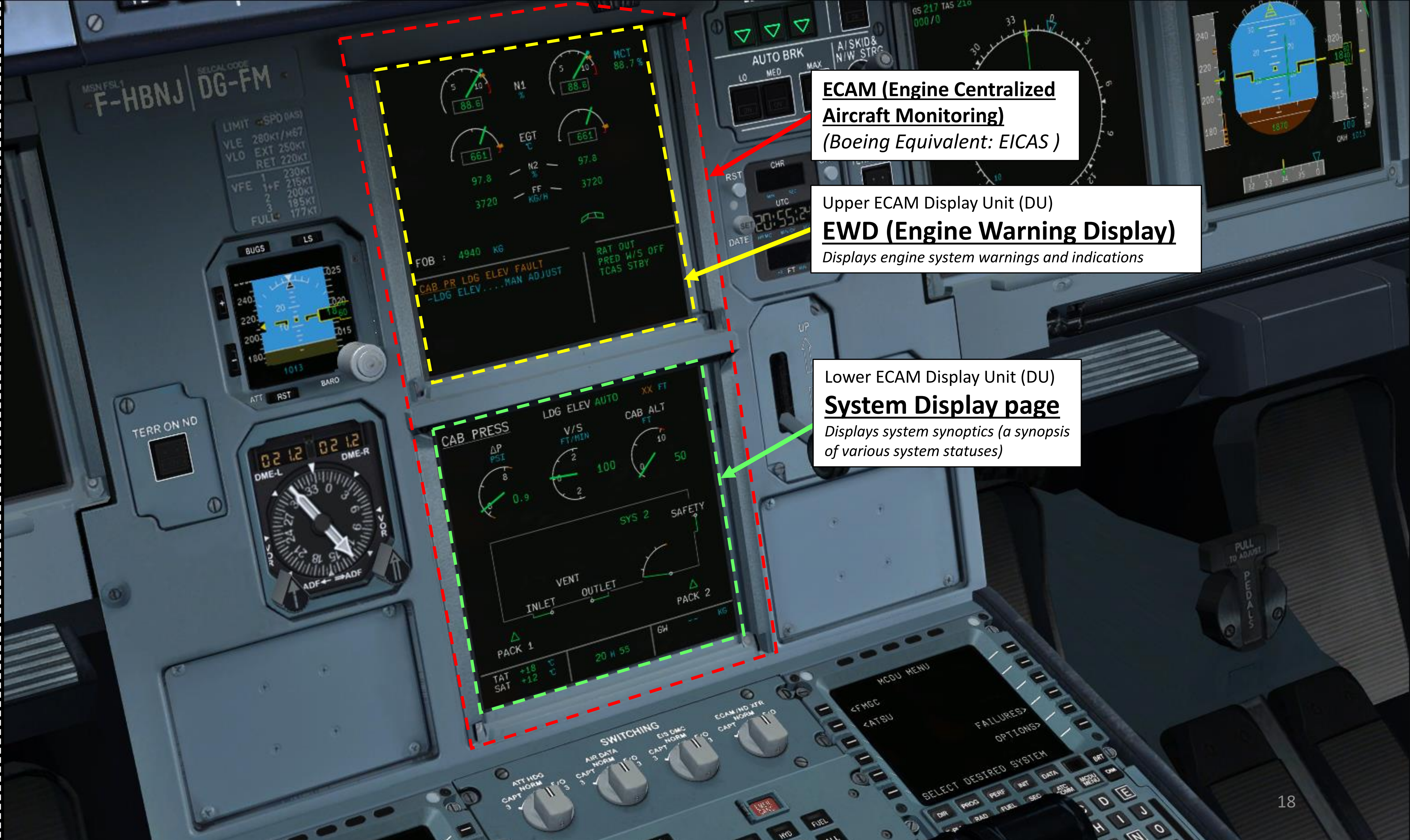
ILS (Instrument Landing System) Switch

VOR/ADF (VHF Omnidirectional Range/ Automated Direction Finder) Selector 1 & 2


Flight Director Display Mode Indicator
Flight Director Display Mode
HDG V/S: Heading - Vertical Speed
TRK FPA: Track -Flight Path Angle
Autopilot Heading/Track Window
Autopilot Speed/Mach Window
Autopilot Speed/Mach Unit Selector
Autopilot Speed/Mach Value Selector
Autopilot Heading/Track Selector
Autopilot LOC (Localiser) Switch
Autopilot 1 & 2 Engage Buttons
Autothrottle Engage Button


Autopilot Altitude Window
Autopilot V/S / FPA (Vertical Speed / Flight Path Angle) Window
Metric Altitude Button
Autopilot Vertical Speed / Flight Path Angle Value Selector
Rotated: *Changes value*
Pushed: *Airplane levels off*
Pulled: *Vertical Speed Engages*
APPR (Approach) Autopilot Mode Button
EXPED (Expedite) Autopilot Mode Button (Maximum Vertical Gradient)
Autopilot Altitude Value Selector
Inner: *Altitude Change*
Outer: *Altitude Change Scale (100 vs 1000 ft)*


PFD (Primary Flight Display) Brightness Control
PFD/ND Transfer Switch
ND (Navigation Display) Brightness Control
GPWS – G/S (Ground Proximity Warning System – Glide Slope) Indicator & Test Button
Flight Mode Annunciations
Bank Angle Scale
Vertical Speed Indicator (x1000 ft/s)
Ground Speed (kts)
True Airspeed (kts)
ND Mode shown: ROSE NAV
Altitude Indicator (ft)
Attitude Indicator
Barometric Pressure (inches of Hg or HPa)
Foot Warmer Switch
Console/Floor Lighting Selector
Loudspeaker Volume Knob
Calibrated Airspeed Indicator (kts)
Heading and Track Indicator
PFD (PRIMARY FLIGHT DISPLAY)
ND (NAVIGATION DISPLAY)
PFD
OFF
BRT
PFD / ND XFR
ND
LOUD SPEAKER
MAX
CONSOLE/FLOOR
DIM
FOOT WARMER
ON
MAN THR
V/S +1600
HDG
1 FD 2
A/THR
QNH 1013
GS 199 TAS 200
000/0
GPS PRIMARY



ECAM (Engine Centralized Aircraft Monitoring)

(Boeing Equivalent: EICAS)

Upper ECAM Display Unit (DU)

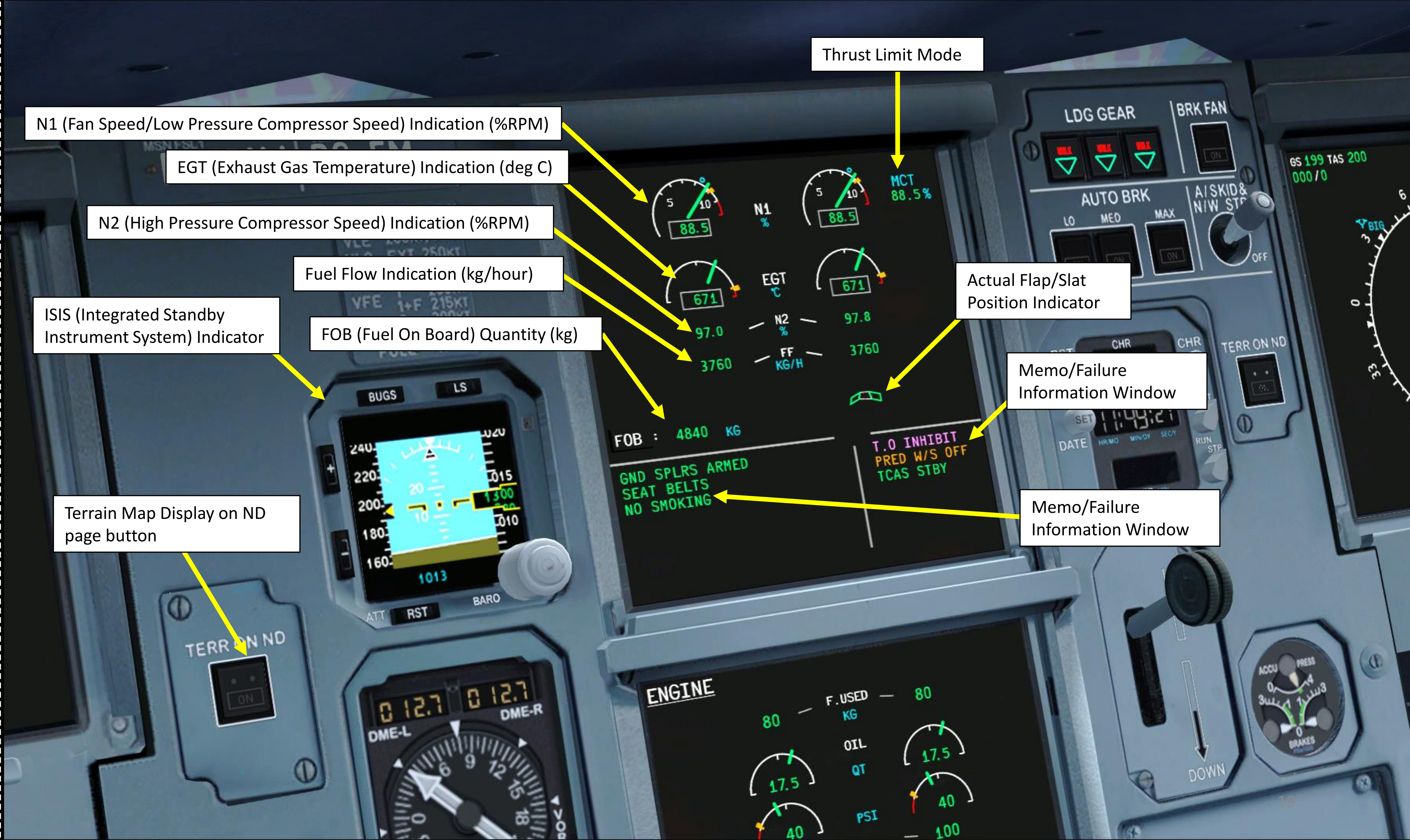
EWD (Engine Warning Display)

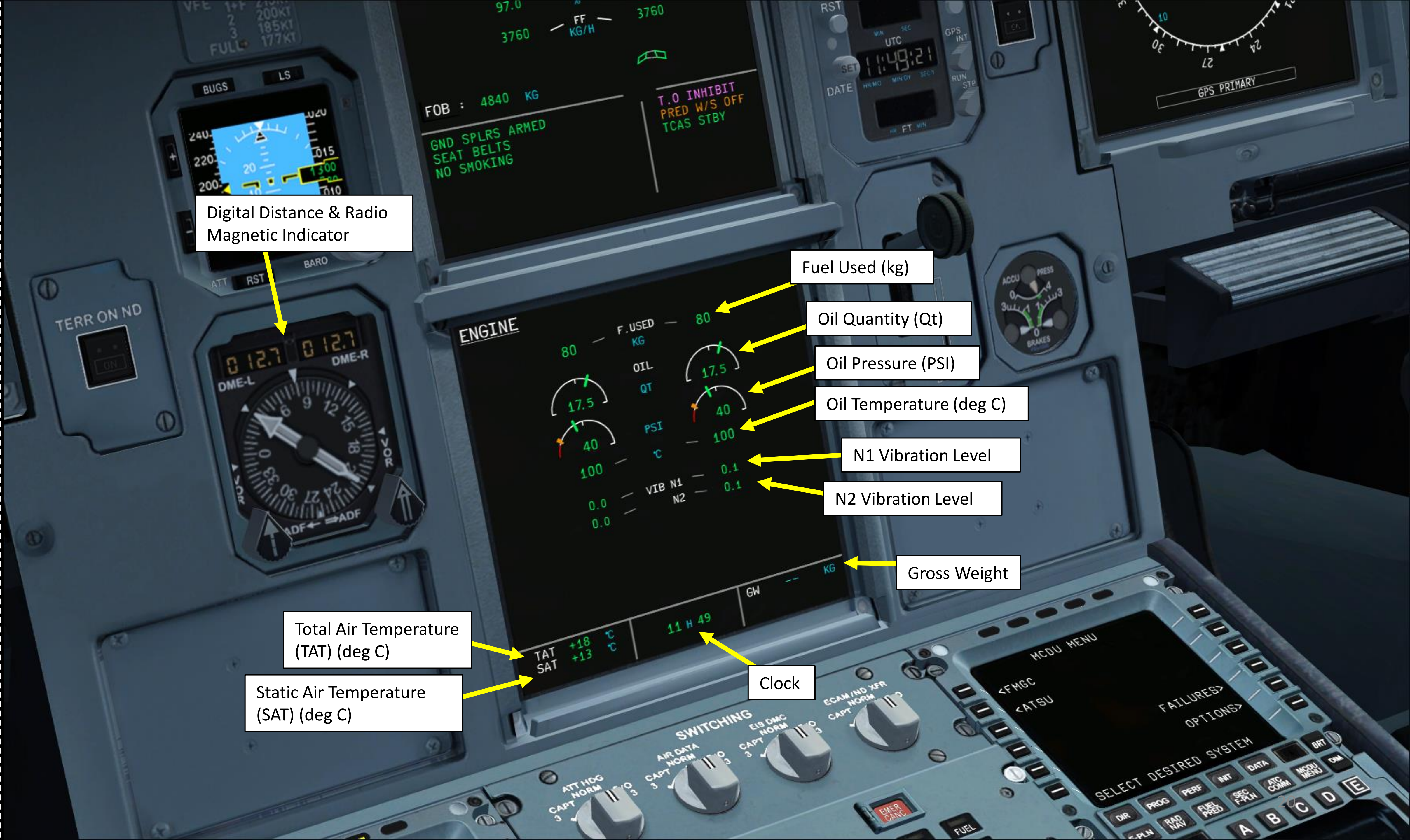
Displays engine system warnings and indications

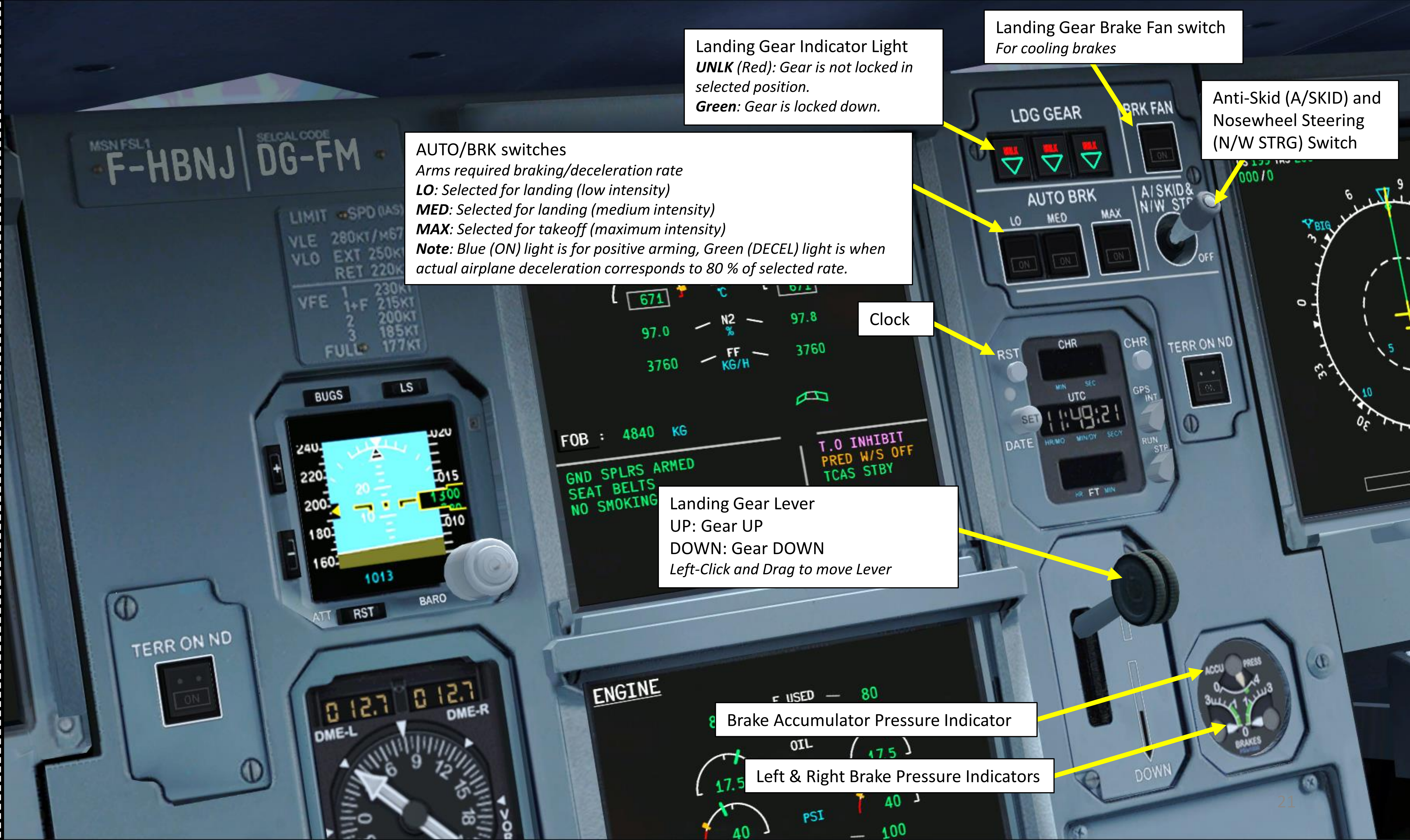
Lower ECAM Display Unit (DU)

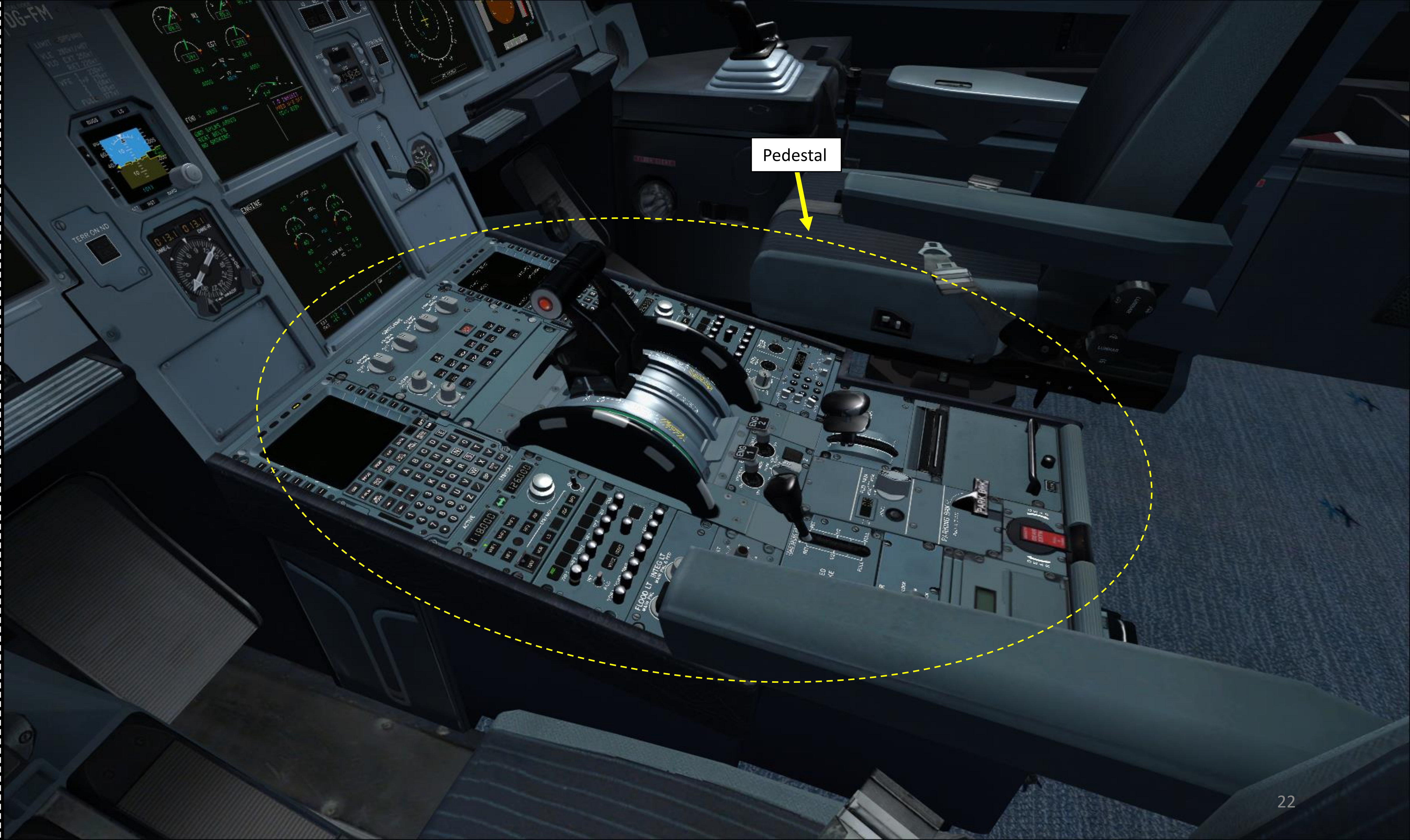
System Display page

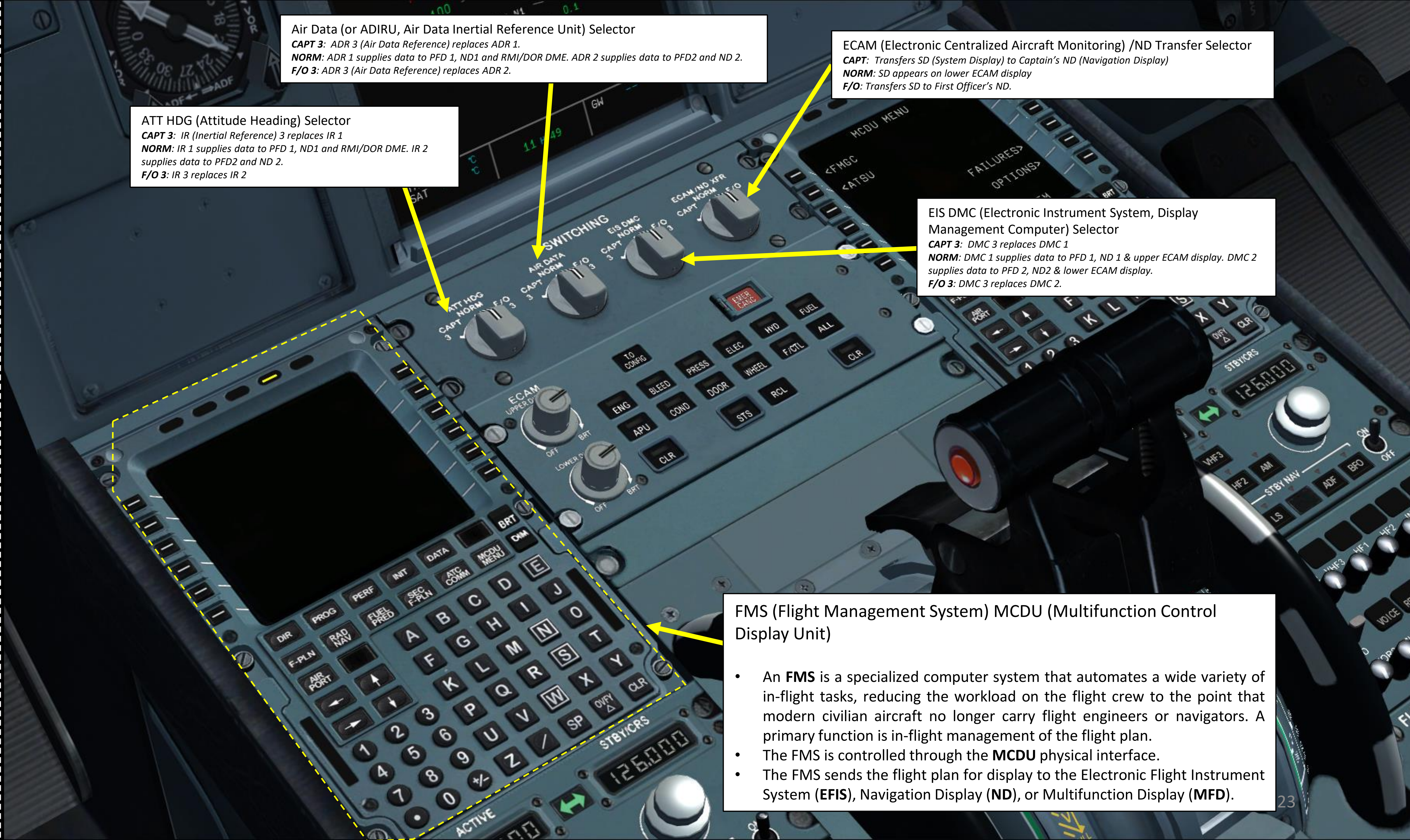
Displays system synoptics (a synopsis of various system statuses)


Thrust Limit Mode
N1 (Fan Speed/Low Pressure Compressor Speed) Indication (%RPM)
EGT (Exhaust Gas Temperature) Indication (deg C)
N2 (High Pressure Compressor Speed) Indication (%RPM)
Fuel Flow Indication (kg/hour)
ISIS (Integrated Standby Instrument System) Indicator
FOB (Fuel On Board) Quantity (kg)
Actual Flap/Slat Position Indicator
Memo/Failure Information Window
Memo/Failure Information Window
Terrain Map Display on ND page button


Digital Distance & Radio Magnetic Indicator
Fuel Used (kg)
Oil Quantity (Qt)
Oil Pressure (PSI)
Oil Temperature (deg C)
N1 Vibration Level
N2 Vibration Level
Gross Weight
Total Air Temperature (TAT) (deg C)
Static Air Temperature (SAT) (deg C)
Clock
ENGINE
F.USED
KG
OIL
QT
PSI
VIB N1
N2
TAT
SAT
GW
FOB : 4840 KG
GND SPLRS ARMED
SEAT BELTS
NO SMOKING
T.O INHIBIT
PRED W/S OFF
TCAS STBY
TERR ON ND
DME-L
DME-R
MCDU MENU
<FMGC
<ATSU
FAILURES>
OPTIONS>
SELECT DESIRED SYSTEM
SWITCHING
GPS PRIMARY


Landing Gear Indicator Light
UNLK (Red): Gear is not locked in selected position.
Green: Gear is locked down.
Landing Gear Brake Fan switch
For cooling brakes
Anti-Skid (A/SKID) and Nosewheel Steering (N/W STRG) Switch
AUTO/BRK switches
Arms required braking/deceleration rate
***LO**: Selected for landing (low intensity)*
***MED**: Selected for landing (medium intensity)*
***MAX**: Selected for takeoff (maximum intensity)*
***Note**: Blue (ON) light is for positive arming, Green (DECEL) light is when actual airplane deceleration corresponds to 80 % of selected rate.*
Clock
Landing Gear Lever
UP: Gear UP
DOWN: Gear DOWN
Left-Click and Drag to move Lever
Brake Accumulator Pressure Indicator
Left & Right Brake Pressure Indicators
F-HBNJ
DG-FM
LDG GEAR
BRK FAN
AUTO BRK
LO
MED
MAX
TERR ON ND


Pedestal



Air Data (or ADIRU, Air Data Inertial Reference Unit) Selector

CAPT 3: *ADR 3 (Air Data Reference) replaces ADR 1.*

NORM: *ADR 1 supplies data to PFD 1, ND1 and RMI/DOR DME. ADR 2 supplies data to PFD2 and ND 2.*

F/O 3: *ADR 3 (Air Data Reference) replaces ADR 2.*

ATT HDG (Attitude Heading) Selector

CAPT 3: *IR (Inertial Reference) 3 replaces IR 1*

NORM: *IR 1 supplies data to PFD 1, ND1 and RMI/DOR DME. IR 2 supplies data to PFD2 and ND 2.*

F/O 3: *IR 3 replaces IR 2*

ECAM (Electronic Centralized Aircraft Monitoring) /ND Transfer Selector

CAPT: *Transfers SD (System Display) to Captain's ND (Navigation Display)*

NORM: *SD appears on lower ECAM display*

F/O: *Transfers SD to First Officer's ND.*

EIS DMC (Electronic Instrument System, Display Management Computer) Selector

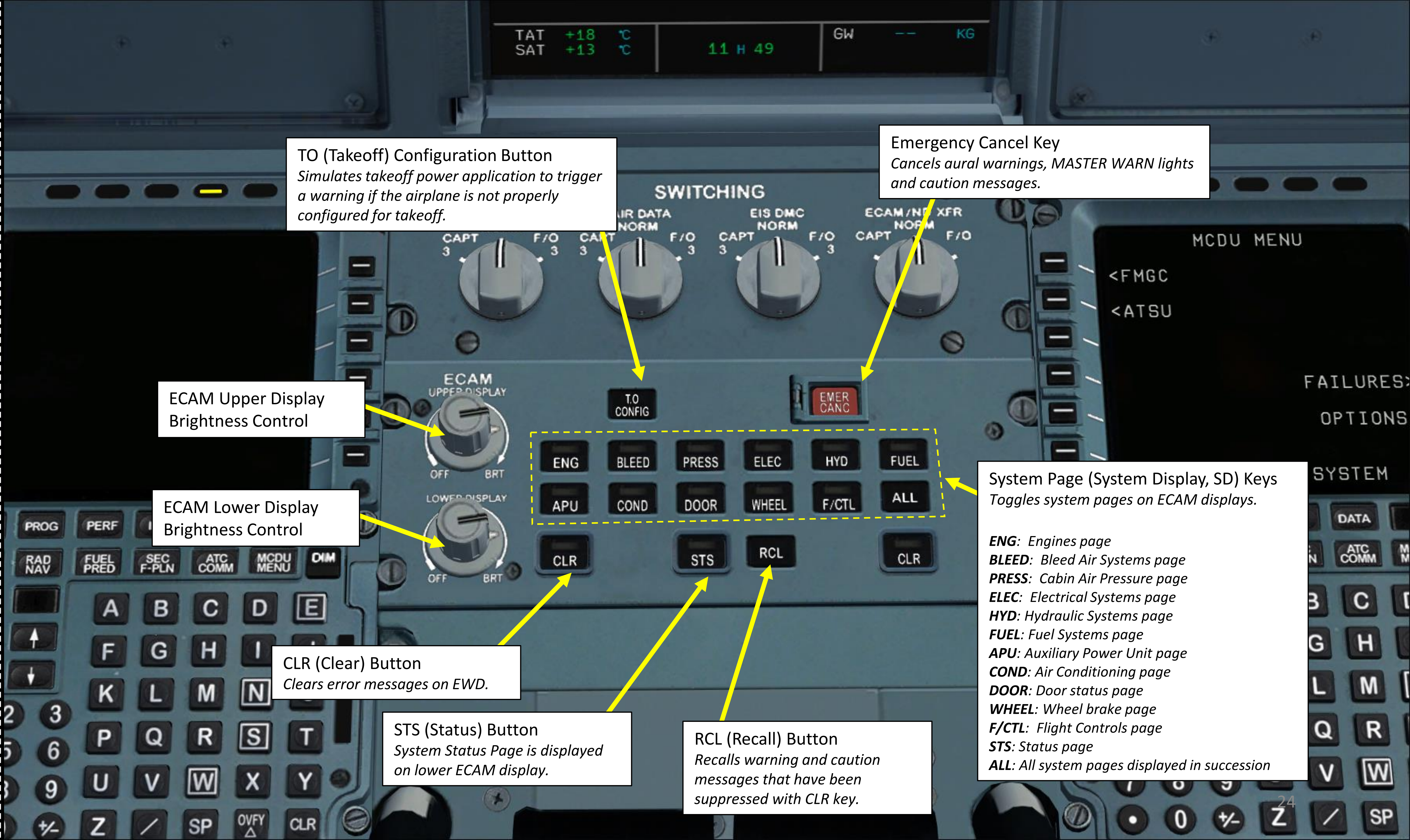
CAPT 3: *DMC 3 replaces DMC 1*

NORM: *DMC 1 supplies data to PFD 1, ND 1 & upper ECAM display. DMC 2 supplies data to PFD 2, ND2 & lower ECAM display.*

F/O 3: *DMC 3 replaces DMC 2.*

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

- An **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**).



TO (Takeoff) Configuration Button
Simulates takeoff power application to trigger a warning if the airplane is not properly configured for takeoff.

Emergency Cancel Key
Cancels aural warnings, MASTER WARN lights and caution messages.

ECAM Upper Display Brightness Control

ECAM Lower Display Brightness Control

System Page (System Display, SD) Keys
Toggles system pages on ECAM displays.

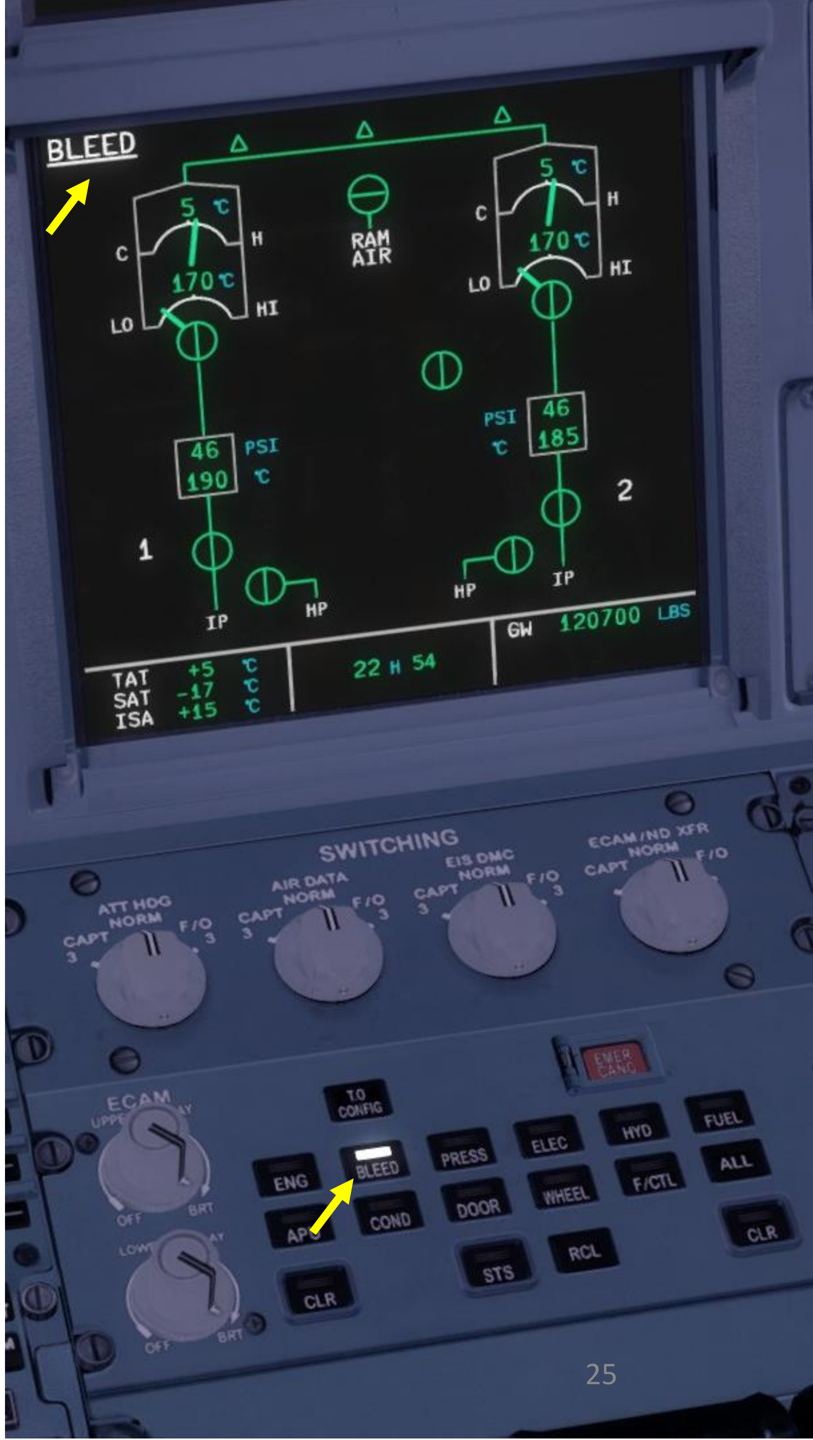
- ***ENG***: *Engines page*
- ***BLEED***: *Bleed Air Systems page*
- ***PRESS***: *Cabin Air Pressure page*
- ***ELEC***: *Electrical Systems page*
- ***HYD***: *Hydraulic Systems page*
- ***FUEL***: *Fuel Systems page*
- ***APU***: *Auxiliary Power Unit page*
- ***COND***: *Air Conditioning page*
- ***DOOR***: *Door status page*
- ***WHEEL***: *Wheel brake page*
- ***F/CTL***: *Flight Controls page*
- ***STS***: *Status page*
- ***ALL***: *All system pages displayed in succession*

CLR (Clear) Button
Clears error messages on EWD.

STS (Status) Button
System Status Page is displayed on lower ECAM display.

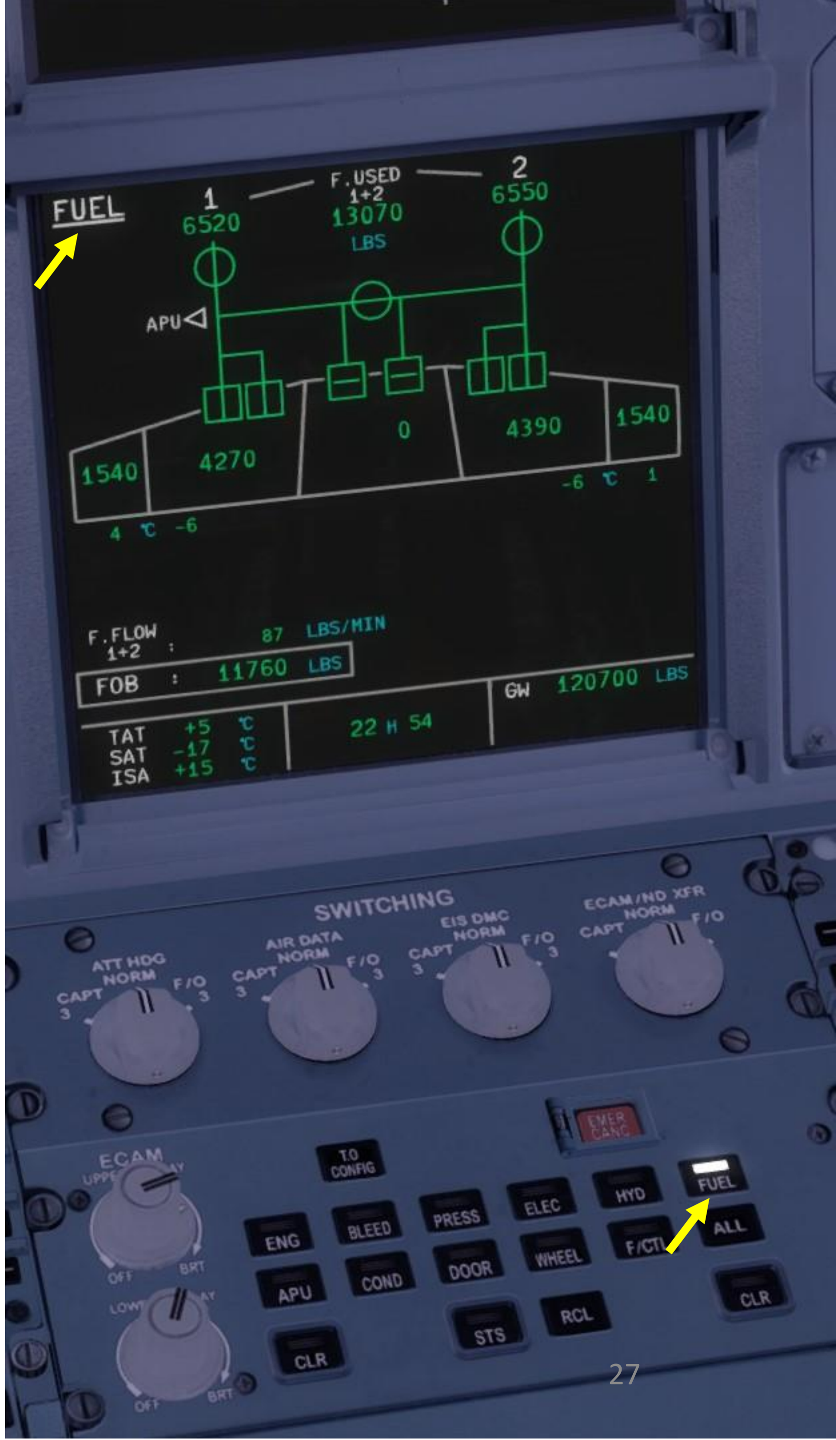
RCL (Recall) Button
Recalls warning and caution messages that have been suppressed with CLR key.

System Page (System Display, SD)
ENG: *Engines page*
BLEED: *Bleed Air Systems page*

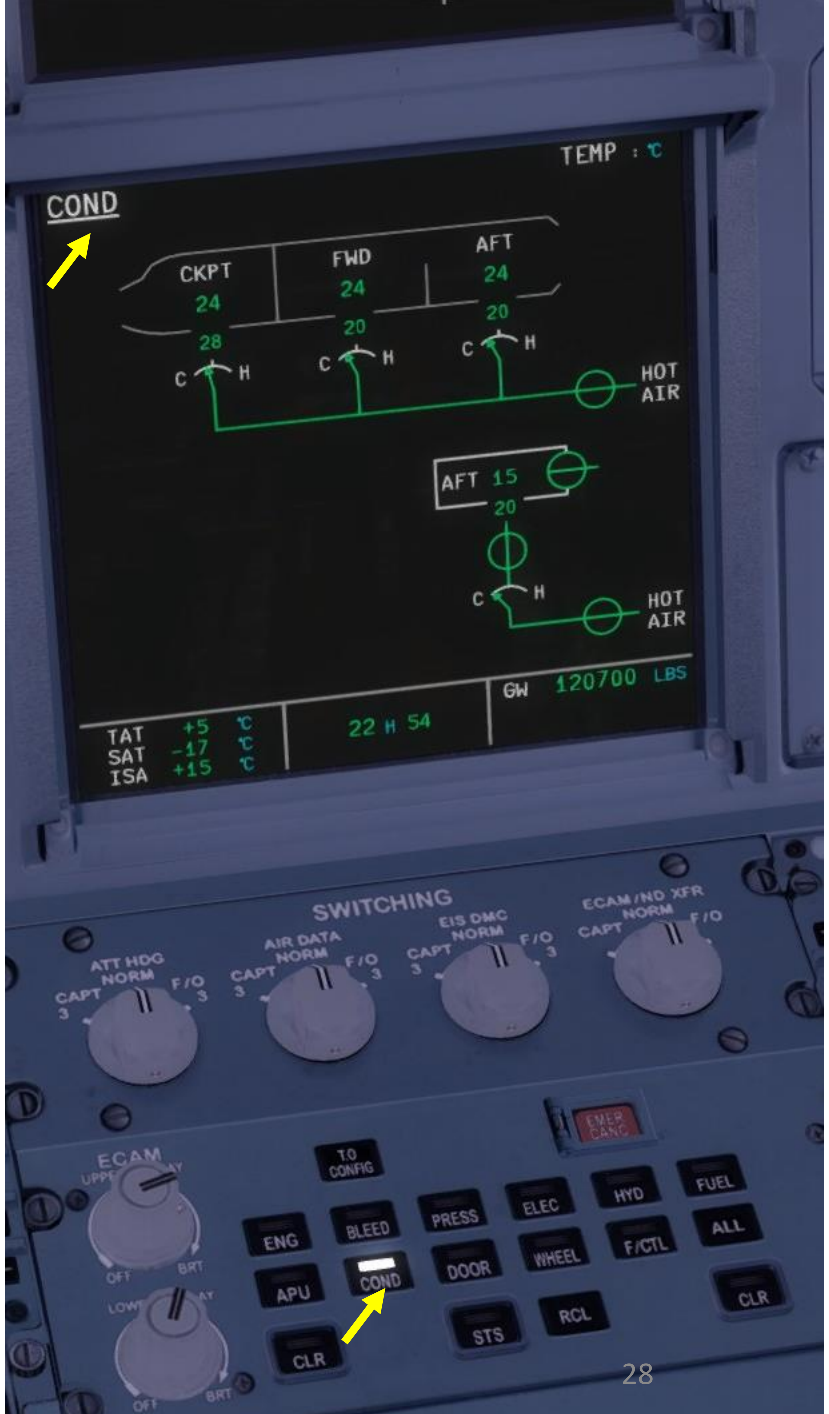


System Page (System Display, SD)
PRESS: *Cabin Air Pressure page*
ELEC: *Electrical Systems page*

System Page (System Display, SD)
HYD: *Hydraulic Systems page*
FUEL: *Fuel Systems page*

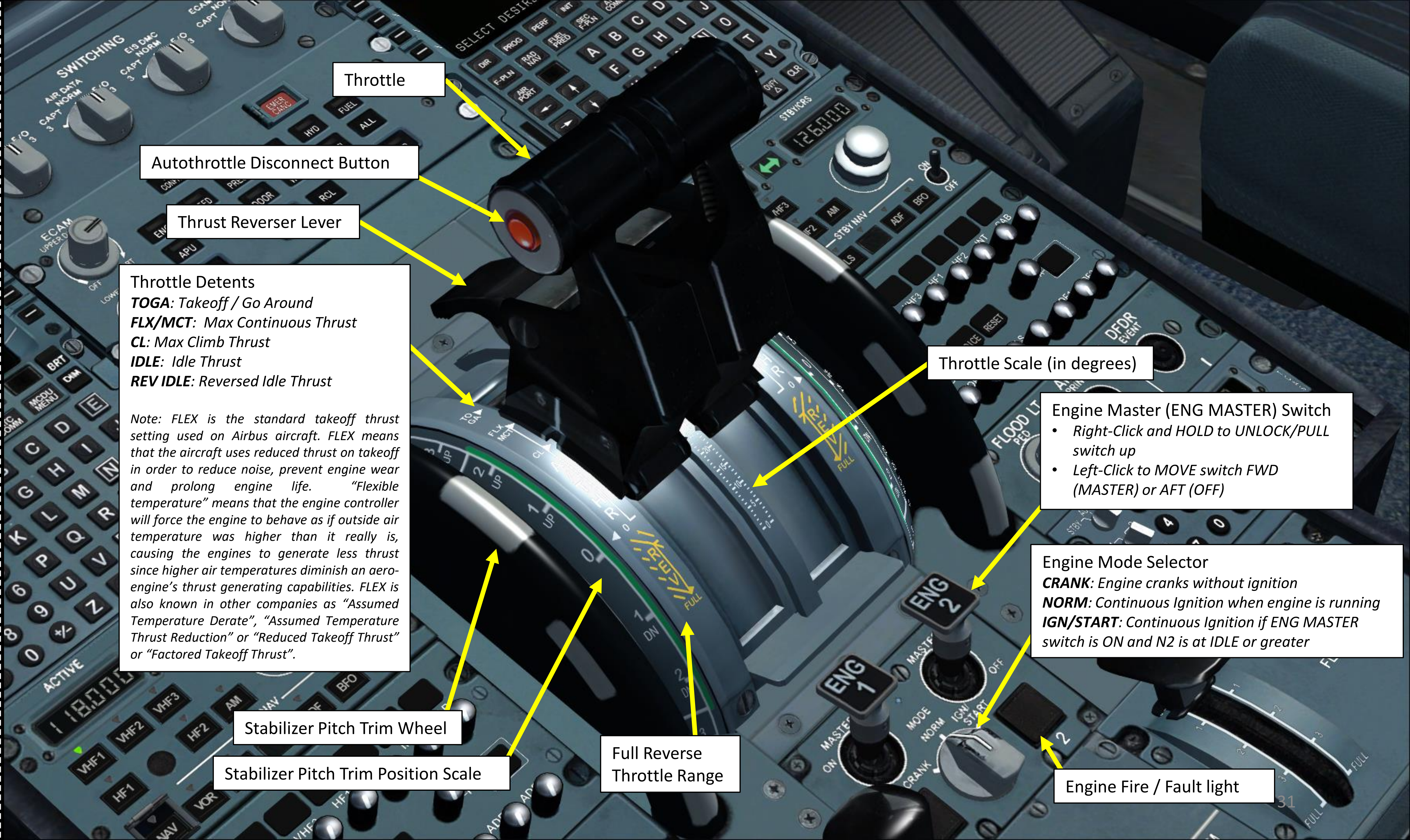


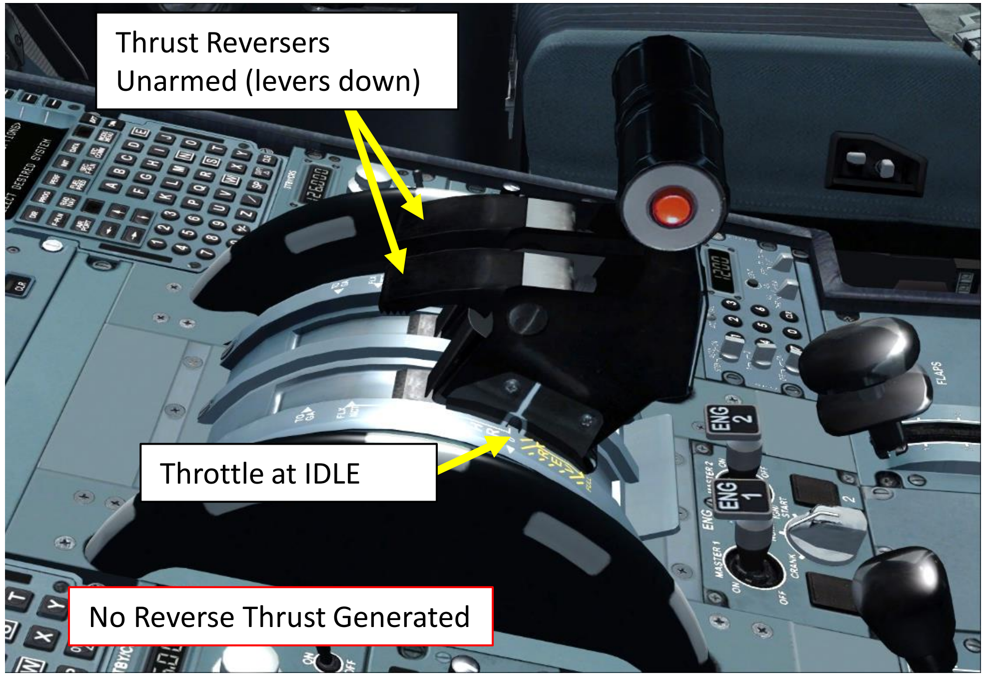
System Page (System Display, SD)
APU: *Auxiliary Power Unit page*
COND: *Air Conditioning page*

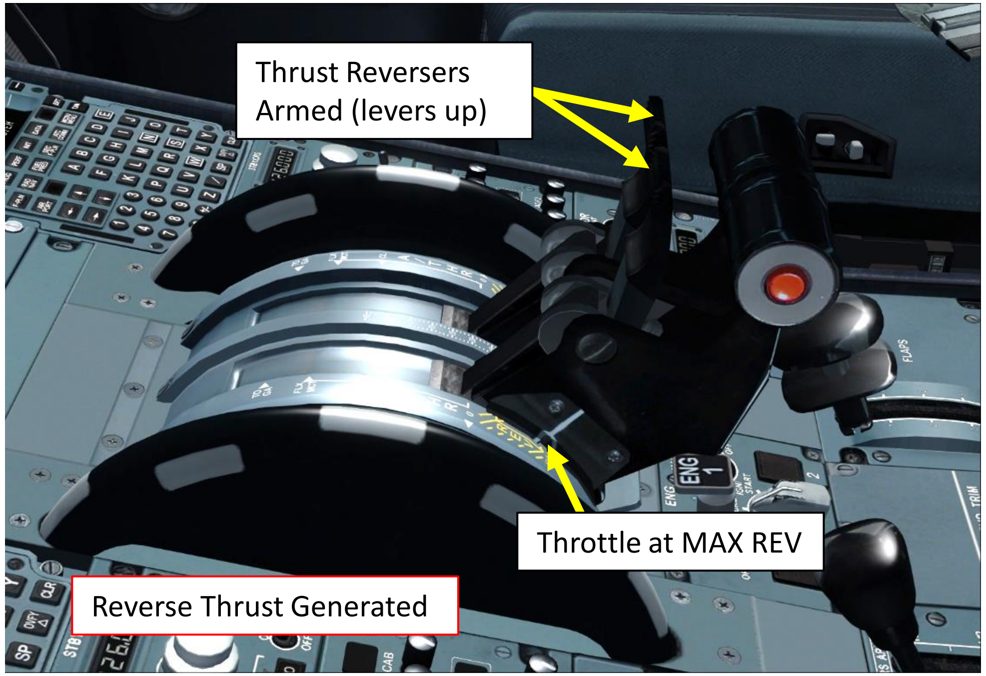


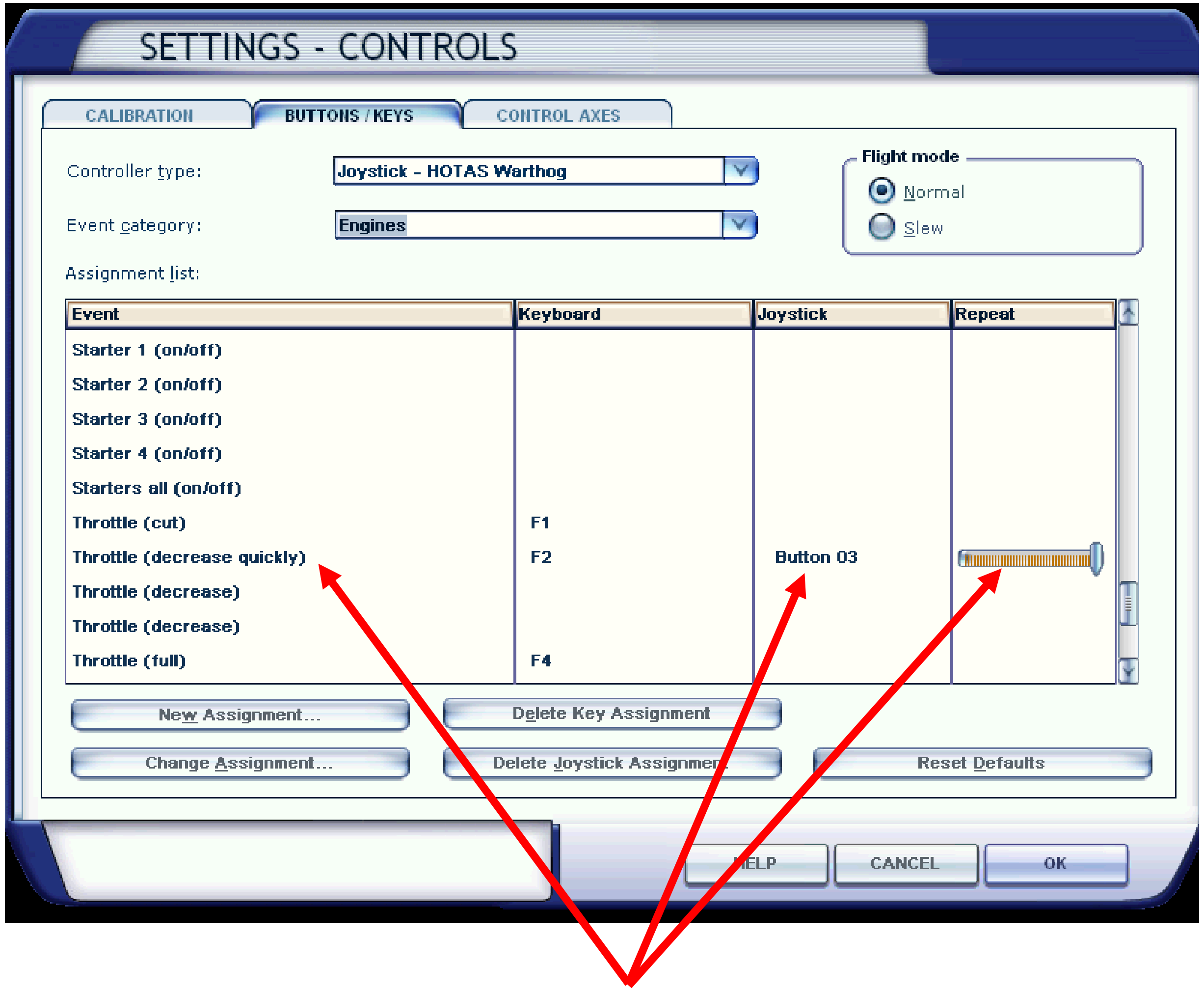
System Page (System Display, SD)
DOOR: *Door status page*
WHEEL: *Wheel brake page*

System Page (System Display, SD)
***F/CTL**: Flight Controls page*
***STS**: Status page*
***ALL**: All system pages displayed in succession*


Throttle
Autothrottle Disconnect Button
Thrust Reverser Lever
Throttle Detents
TOGA: *Takeoff / Go Around*
FLX/MCT: *Max Continuous Thrust*
CL: *Max Climb Thrust*
IDLE: *Idle Thrust*
REV IDLE: *Reversed Idle Thrust*
Note: FLEX is the standard takeoff thrust setting used on Airbus aircraft. FLEX means that the aircraft uses reduced thrust on takeoff in order to reduce noise, prevent engine wear and prolong engine life. "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 is also known in other companies as "Assumed Temperature Derate", "Assumed Temperature Thrust Reduction" or "Reduced Takeoff Thrust" or "Factored Takeoff Thrust".
Throttle Scale (in degrees)
Engine Master (ENG MASTER) Switch
• *Right-Click and HOLD to UNLOCK/PULL switch up*
• *Left-Click to MOVE switch FWD (MASTER) or AFT (OFF)*
Engine Mode Selector
CRANK: *Engine cranks without ignition*
NORM: *Continuous Ignition when engine is running*
IGN/START: *Continuous Ignition if ENG MASTER switch is ON and N2 is at IDLE or greater*
Stabilizer Pitch Trim Wheel
Stabilizer Pitch Trim Position Scale
Full Reverse Throttle Range
Engine Fire / Fault light

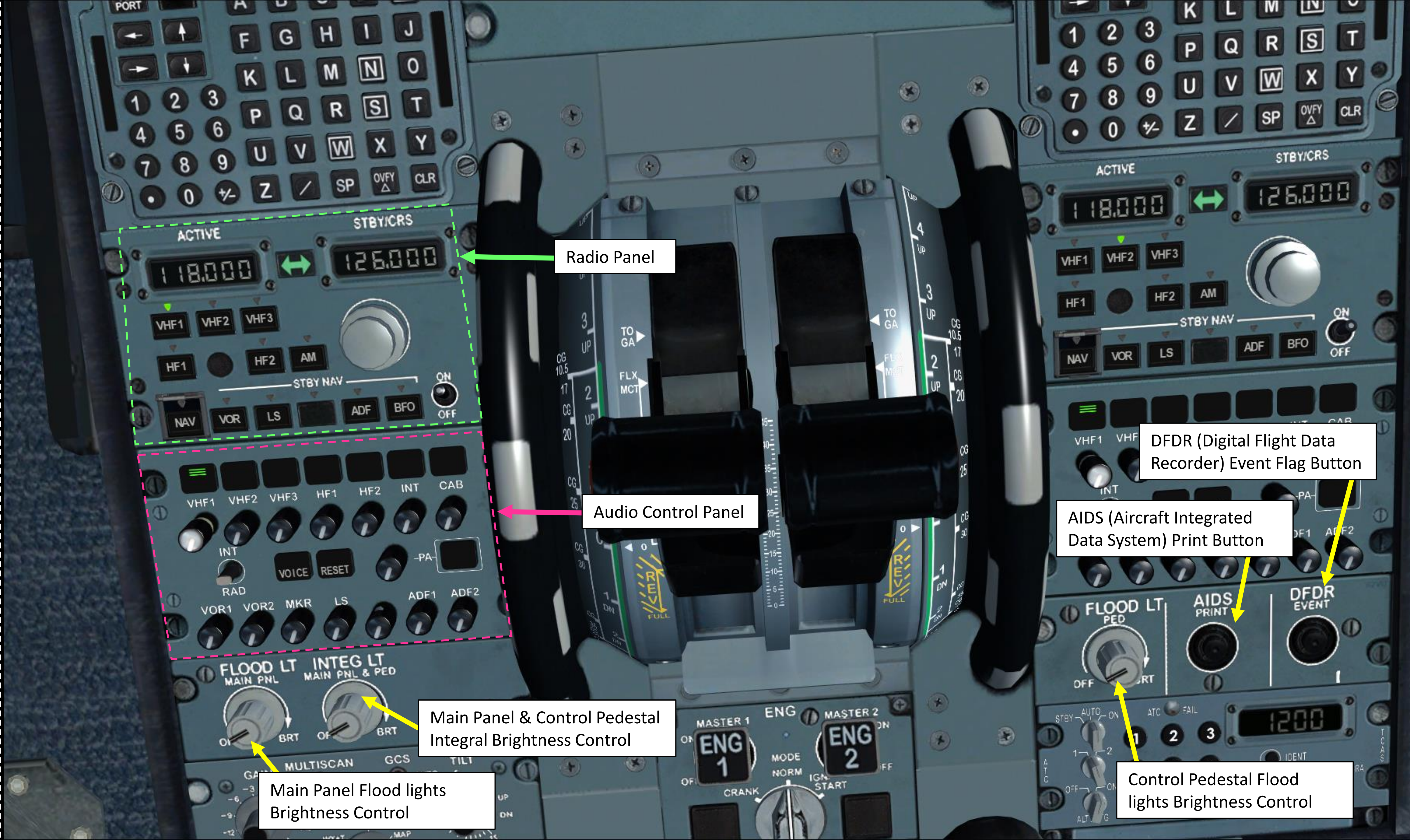


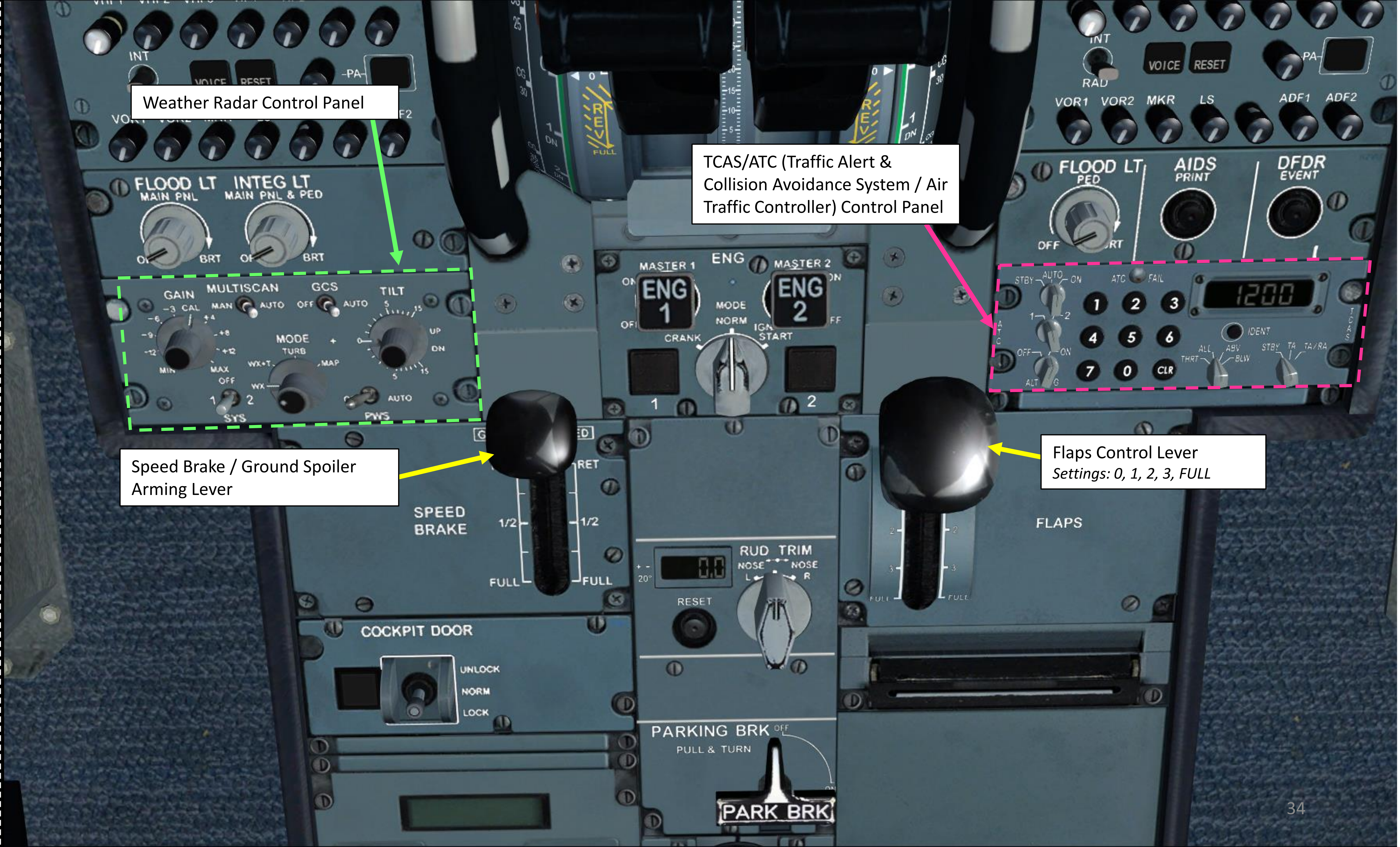




The Thrust Reverser lever can be moved by pressing and holding the “Throttle (decrease quickly)” control mapped to your joystick. Make sure that the “Repeat” slider is set fully to the right. The default key binding is “F2”.

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.


Radio Panel
Audio Control Panel
DFDR (Digital Flight Data Recorder) Event Flag Button
AIDS (Aircraft Integrated Data System) Print Button
Main Panel & Control Pedestal Integral Brightness Control
Main Panel Flood lights Brightness Control
Control Pedestal Flood lights Brightness Control


Weather Radar Control Panel
TCAS/ATC (Traffic Alert & Collision Avoidance System / Air Traffic Controller) Control Panel
Speed Brake / Ground Spoiler Arming Lever
Flaps Control Lever
Settings: 0, 1, 2, 3, FULL

FLAPS & SLATS

Flaps and slats are deployed with the Flaps lever. Flaps and slats are used to create additional lift at low speeds.

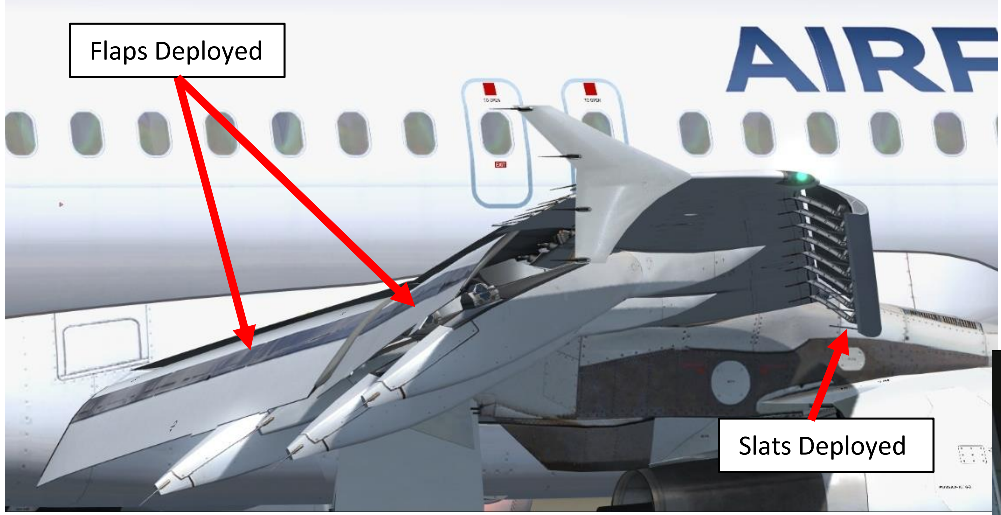
Position	SLATS	FLAPS	Indications on ECAM	
0	0	0	0	CRUISE, HOLD
1	18	0	1	HOLD
		10	1 + F	TAKEOFF
2	22	15	2	TAKEOFF, APPR
3	22	20	3	TAKEOFF, APPR, LDG
FULL	27	40	FULL	LDG

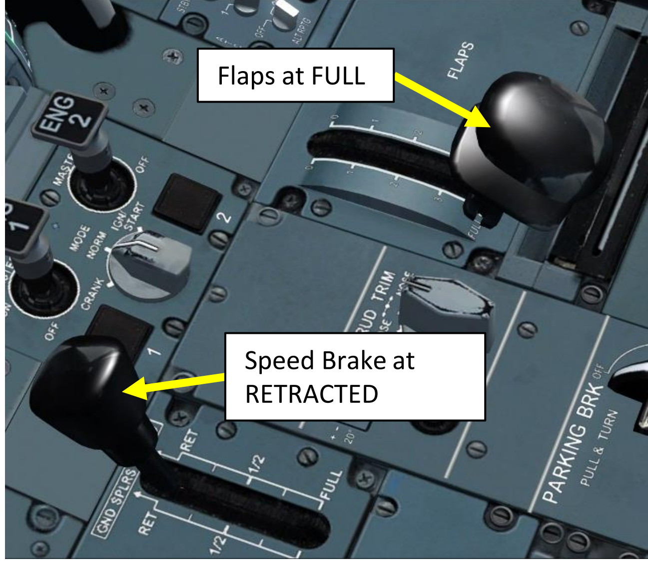
SPEED BRAKES & GROUND SPOILERS

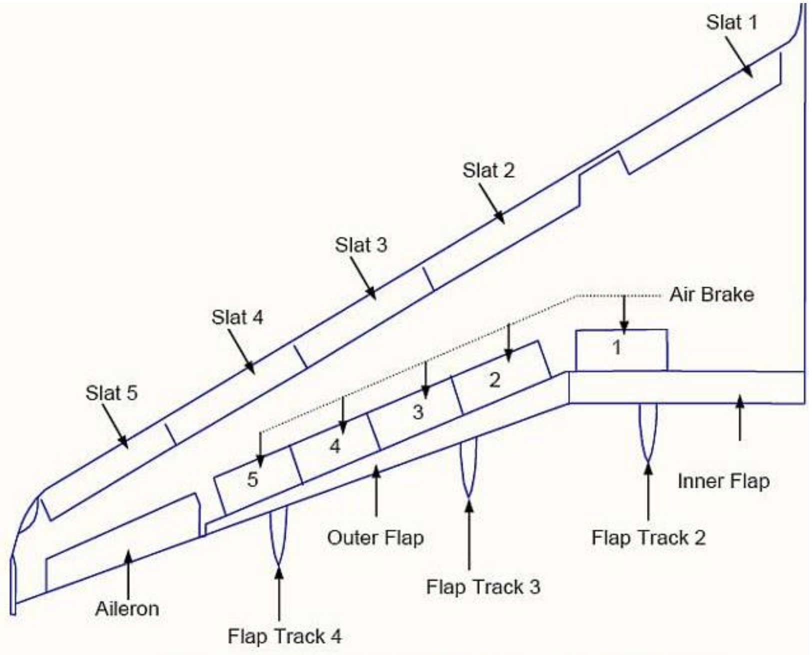
The speed brake and ground spoiler system, however, will be **automatically** deployed **only if certain conditions are respected** (see next page). A "spoiler" is the physical panel, while the "speed brake" and "ground spoiler" expressions are functions of these spoilers. Simply put, spoiler panels have either speed brake or ground spoiler functions. The speed brake function is used to bleed off speed while in the air, while the ground spoiler is used to "dump" lift once you landed and need to bleed off lift as soon as possible.

Speed brakes can be actuated in the air while in certain conditions but they can't be actuated on the ground.

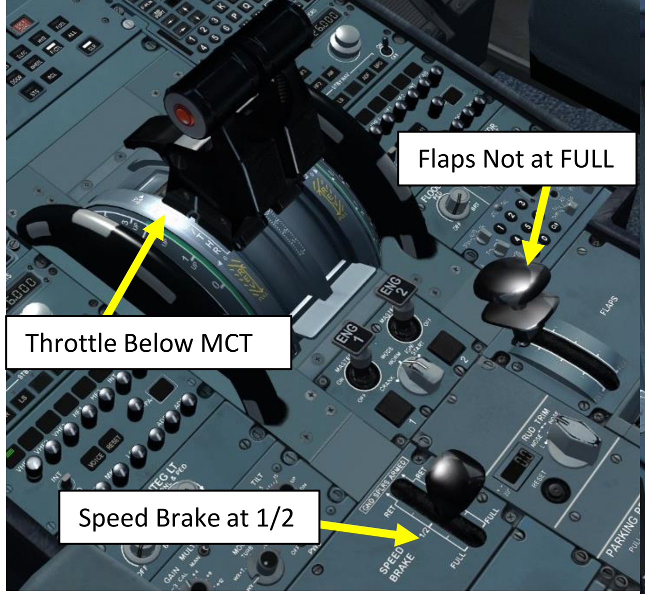
Ground spoilers can only be actuated on the ground (which is why you need to "arm" them first while in the air) and will only actuated if certain conditions are met.





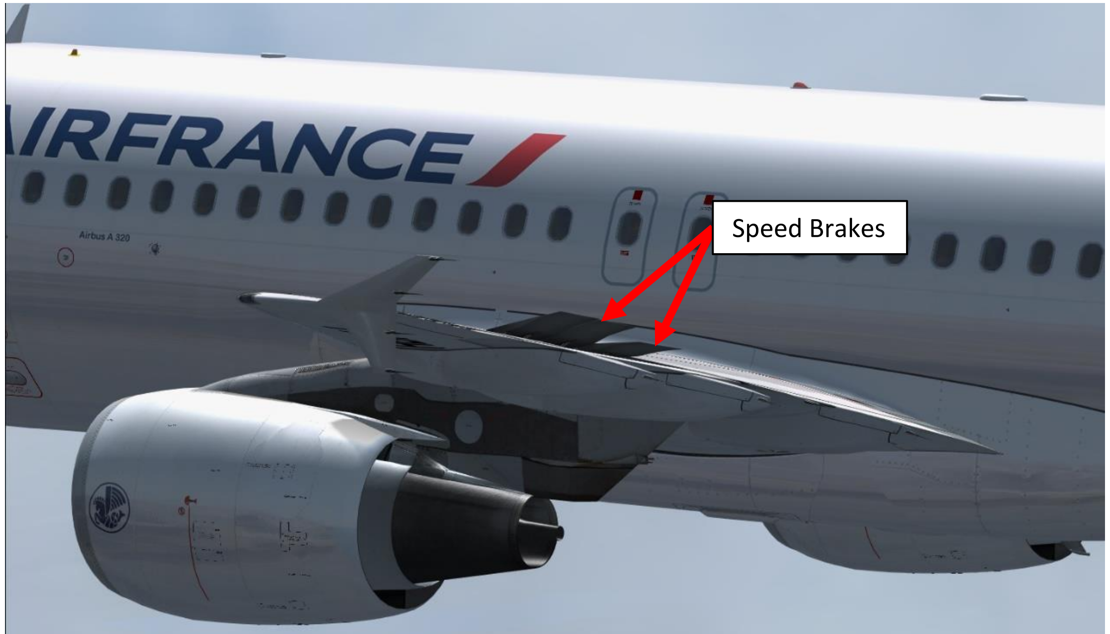


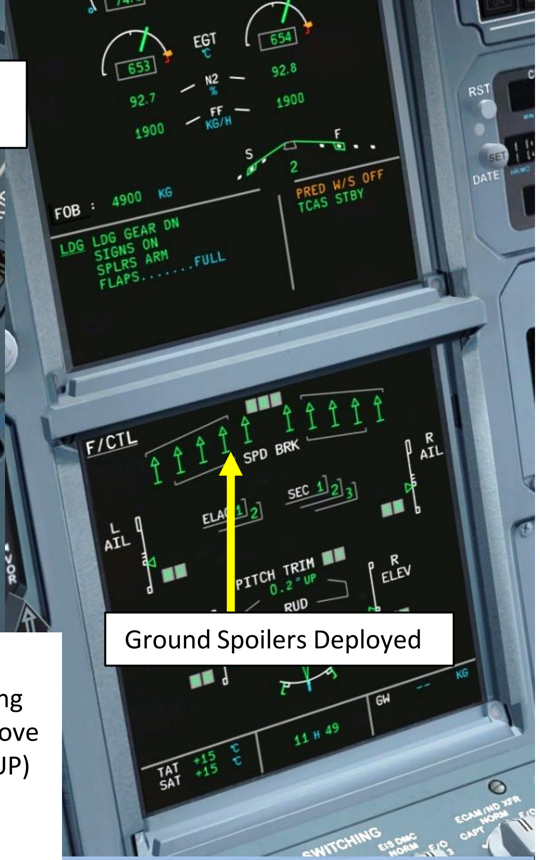
A318/A319/A320 wing shown



SPEED BRAKES (spoilers 2, 3 & 4)

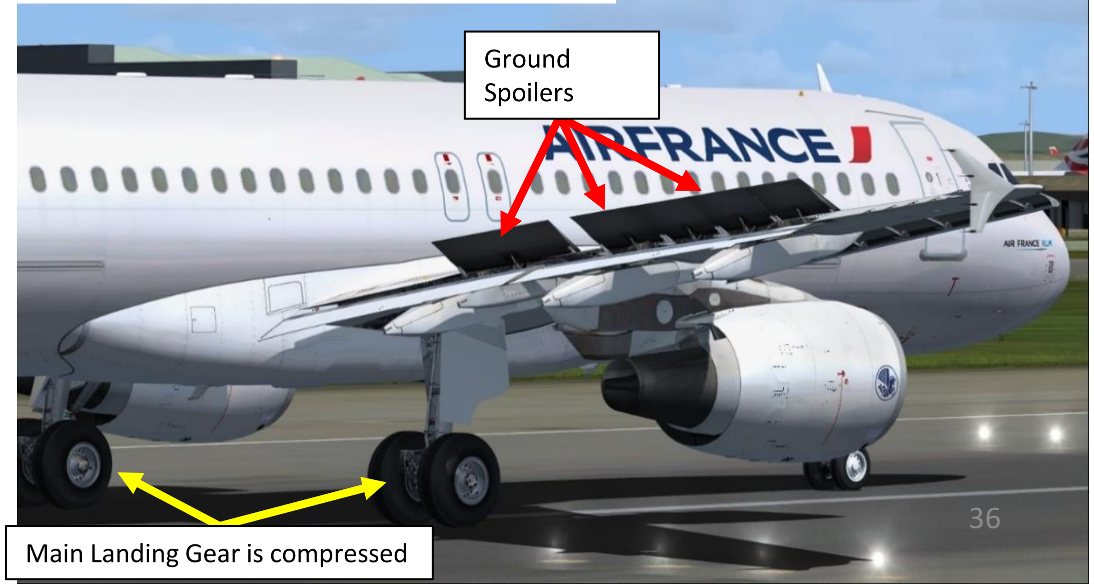
Speed brakes can be deployed in flight if the throttle is below MCT, Flaps are NOT at FULL, if alpha floor protection is not active and if there are no flight control faults.

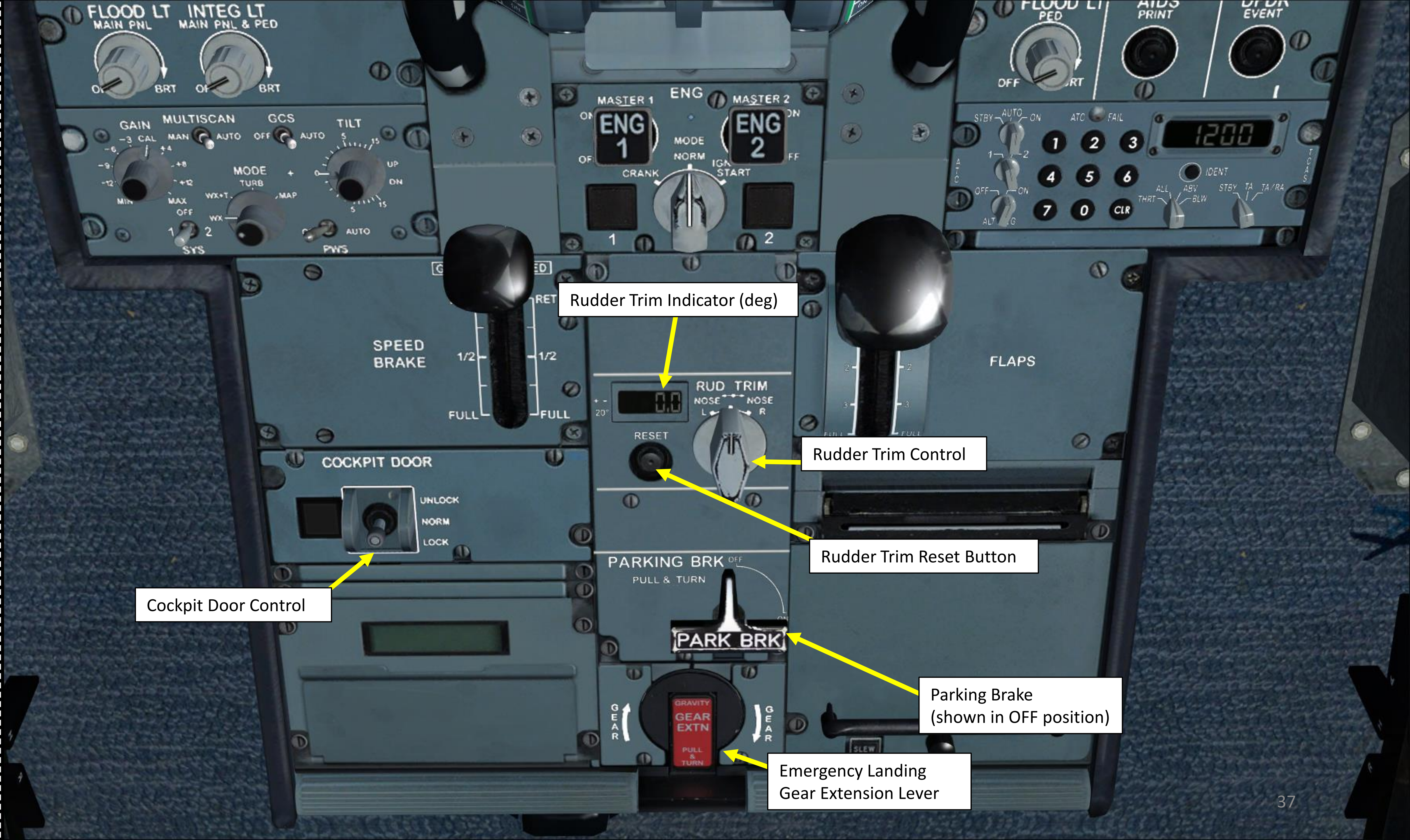


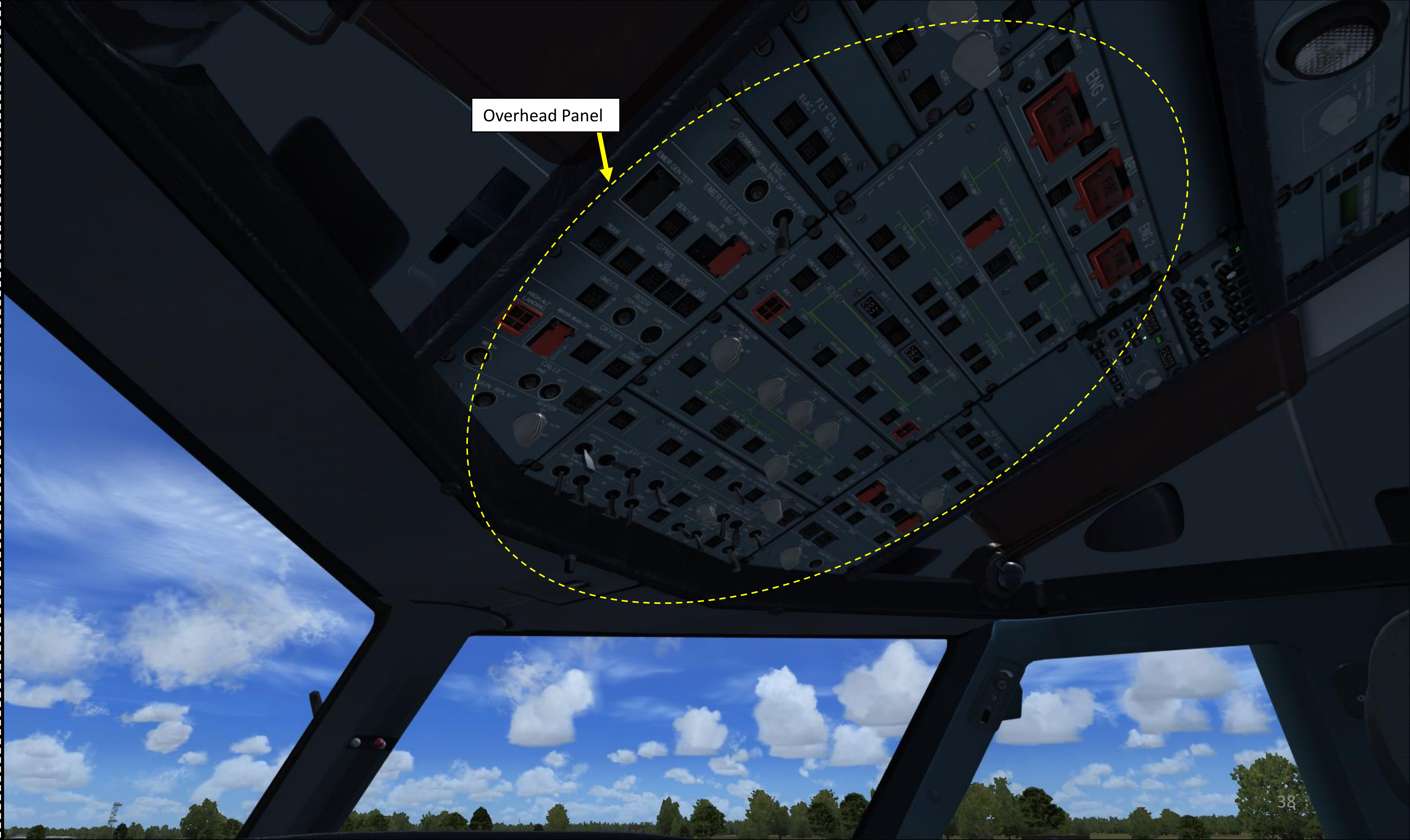


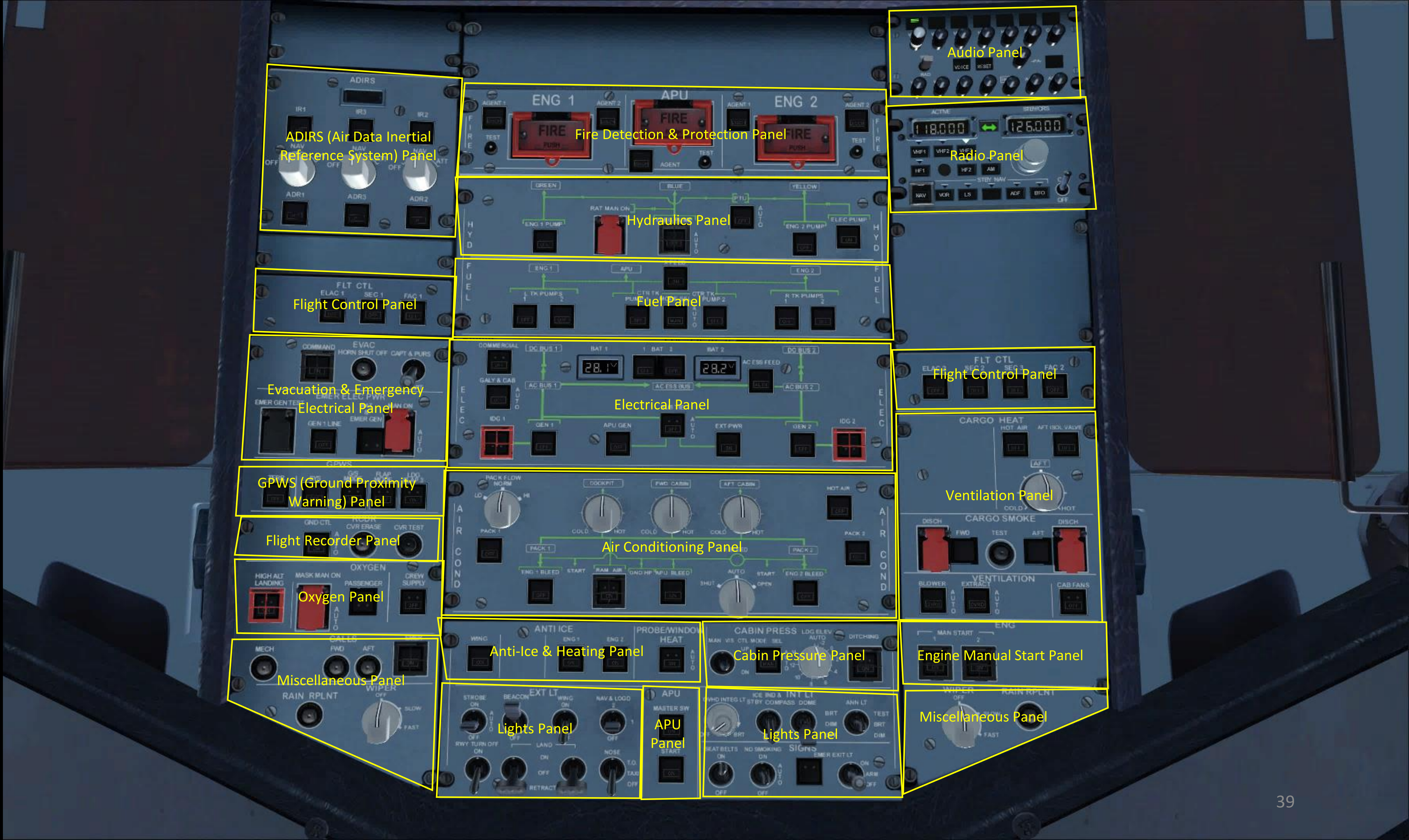
GROUND SPOILERS (all spoilers)

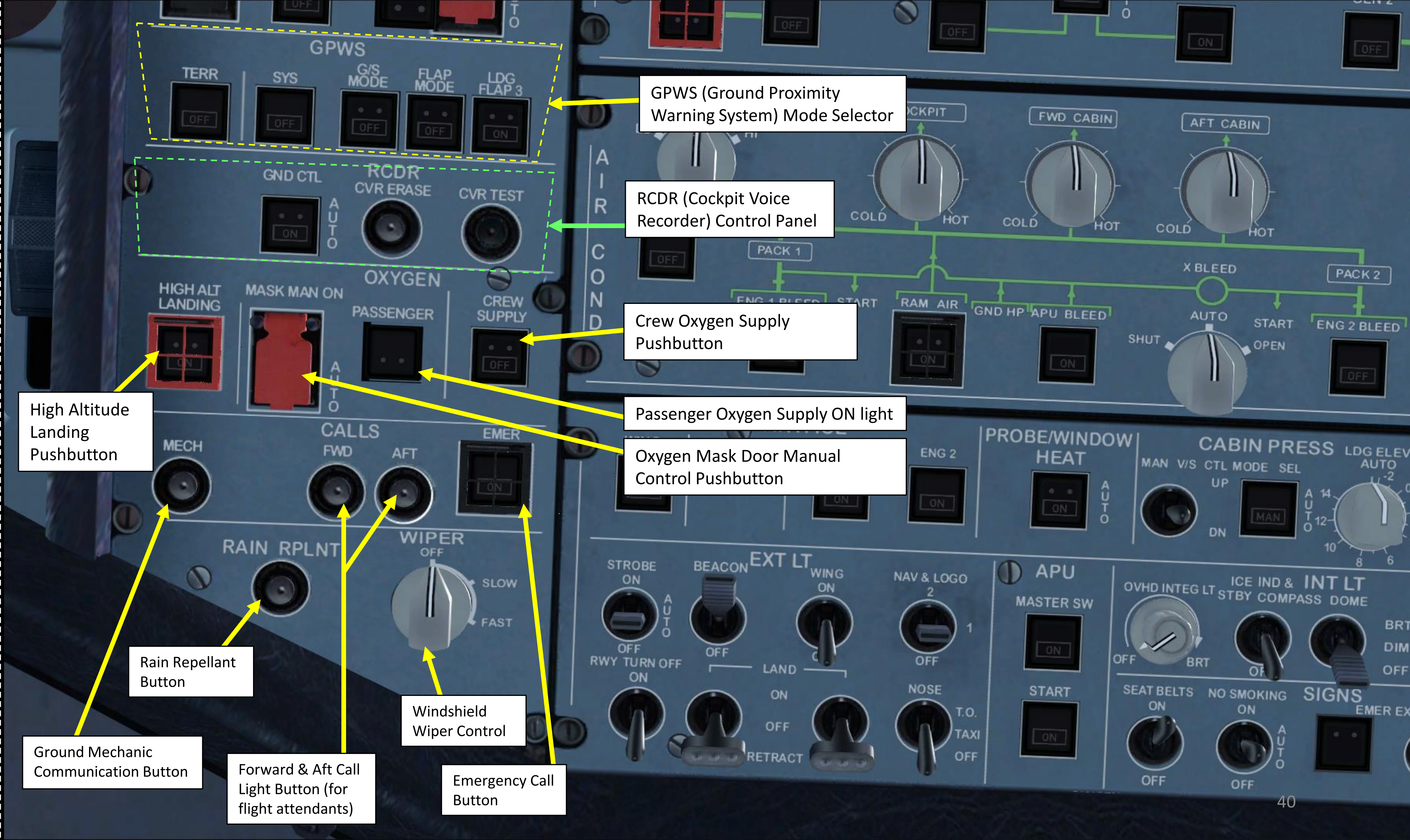
Ground spoilers can only be deployed on landing or during a rejected takeoff (speed must be above 72 kts) if the Ground Spoiler lever is ARMED (UP) and if the landing gears are being compressed (weight on wheels).

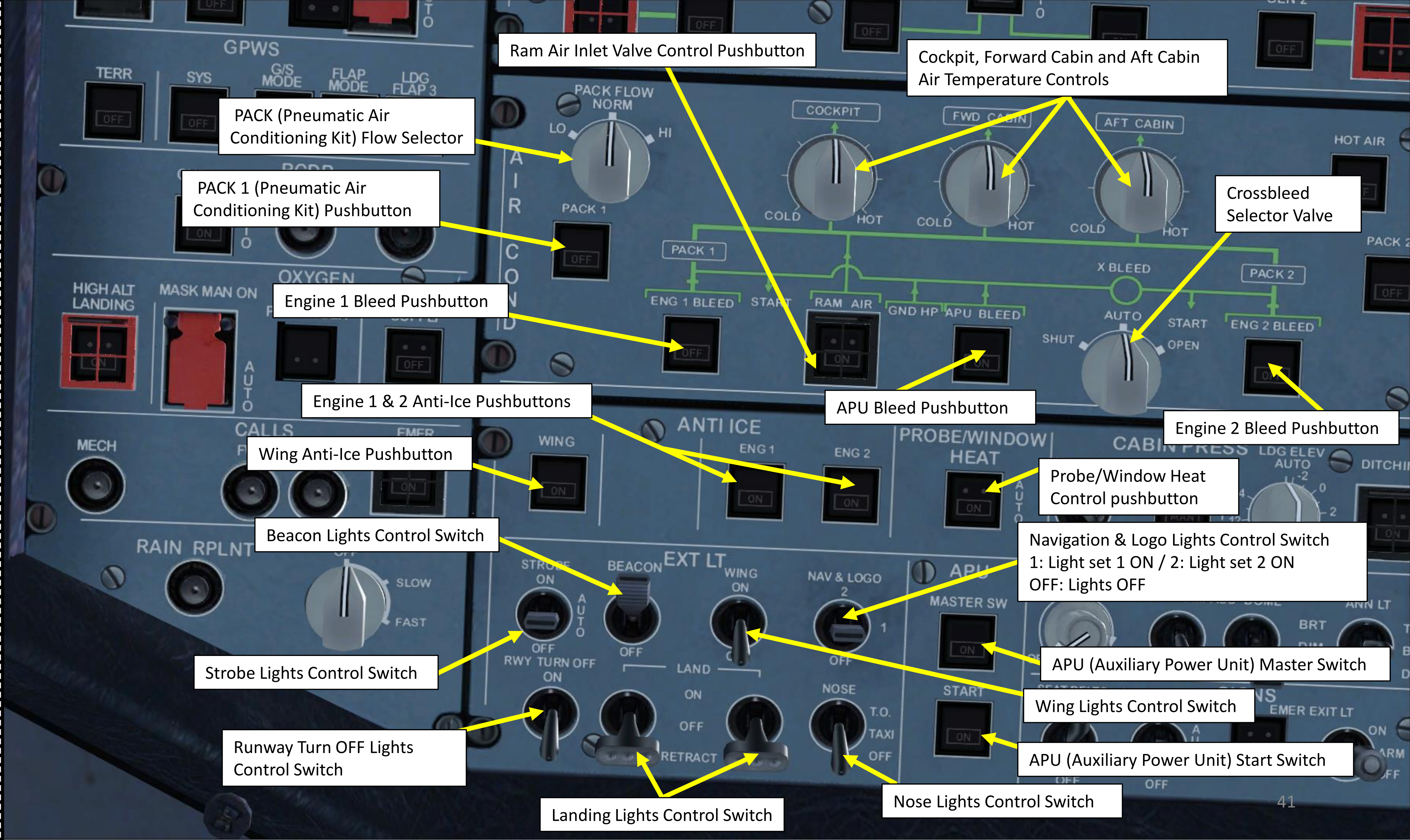


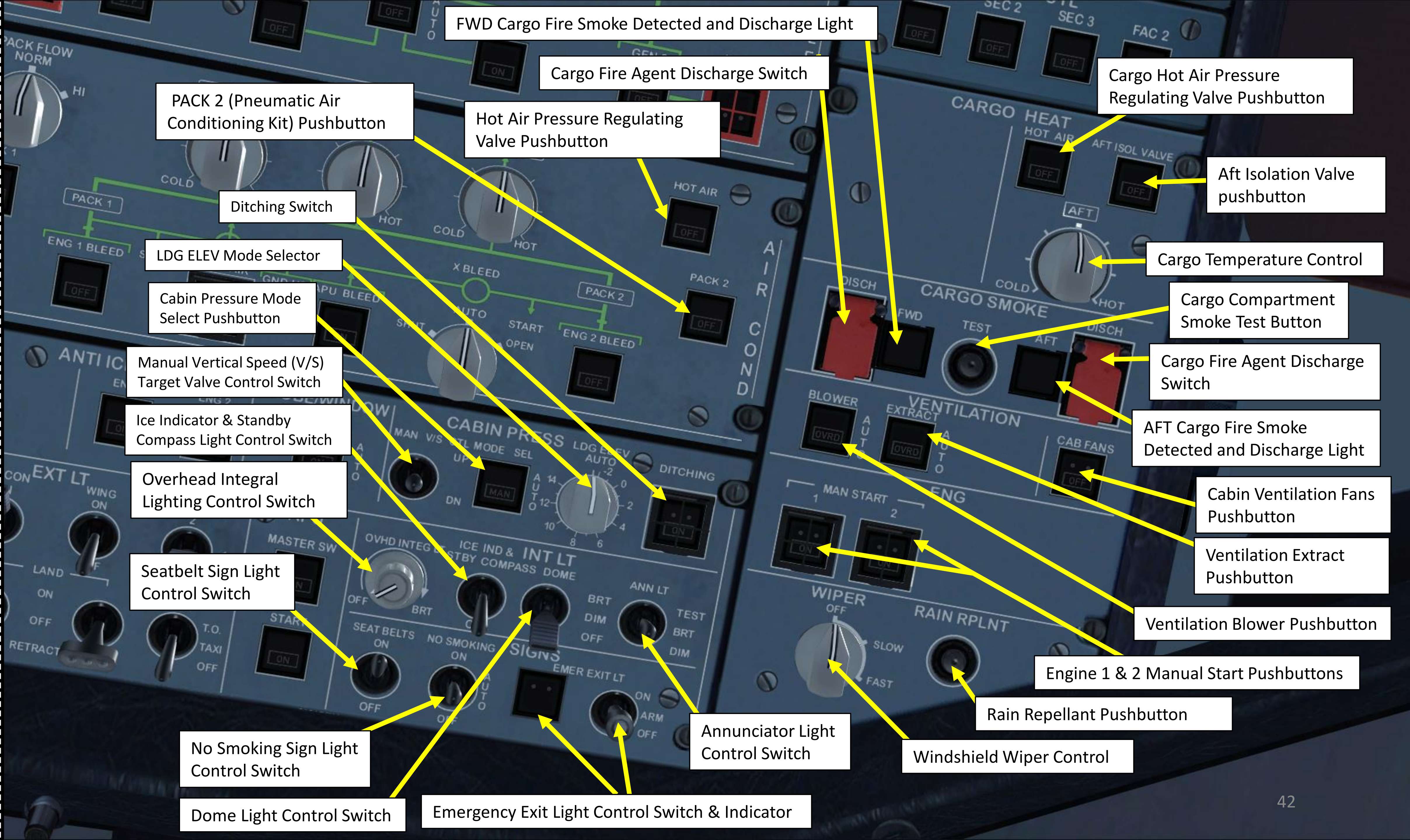

Rudder Trim Indicator (deg)
Rudder Trim Control
Rudder Trim Reset Button
Cockpit Door Control
Parking Brake
(shown in OFF position)
Emergency Landing
Gear Extension Lever

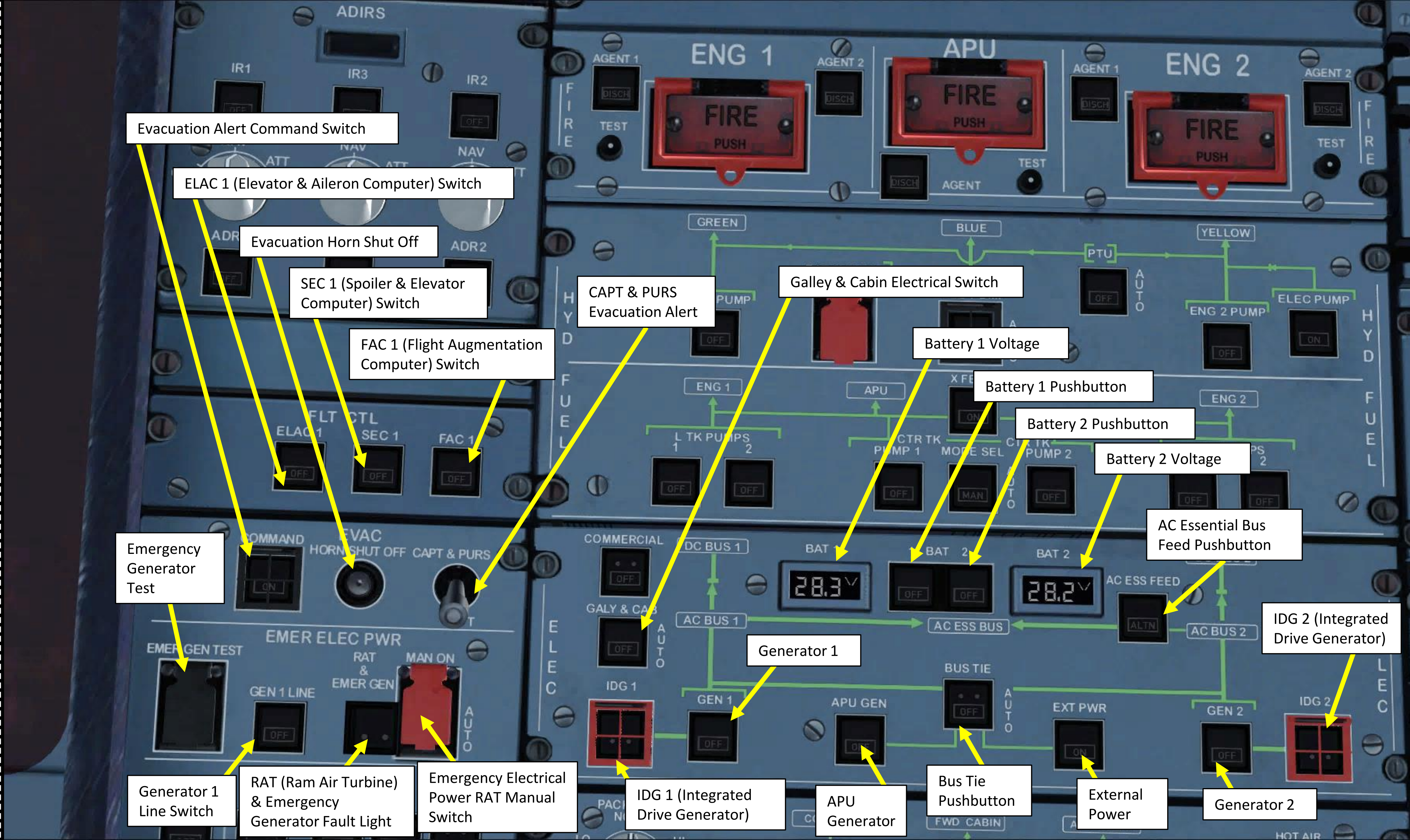

Overhead Panel

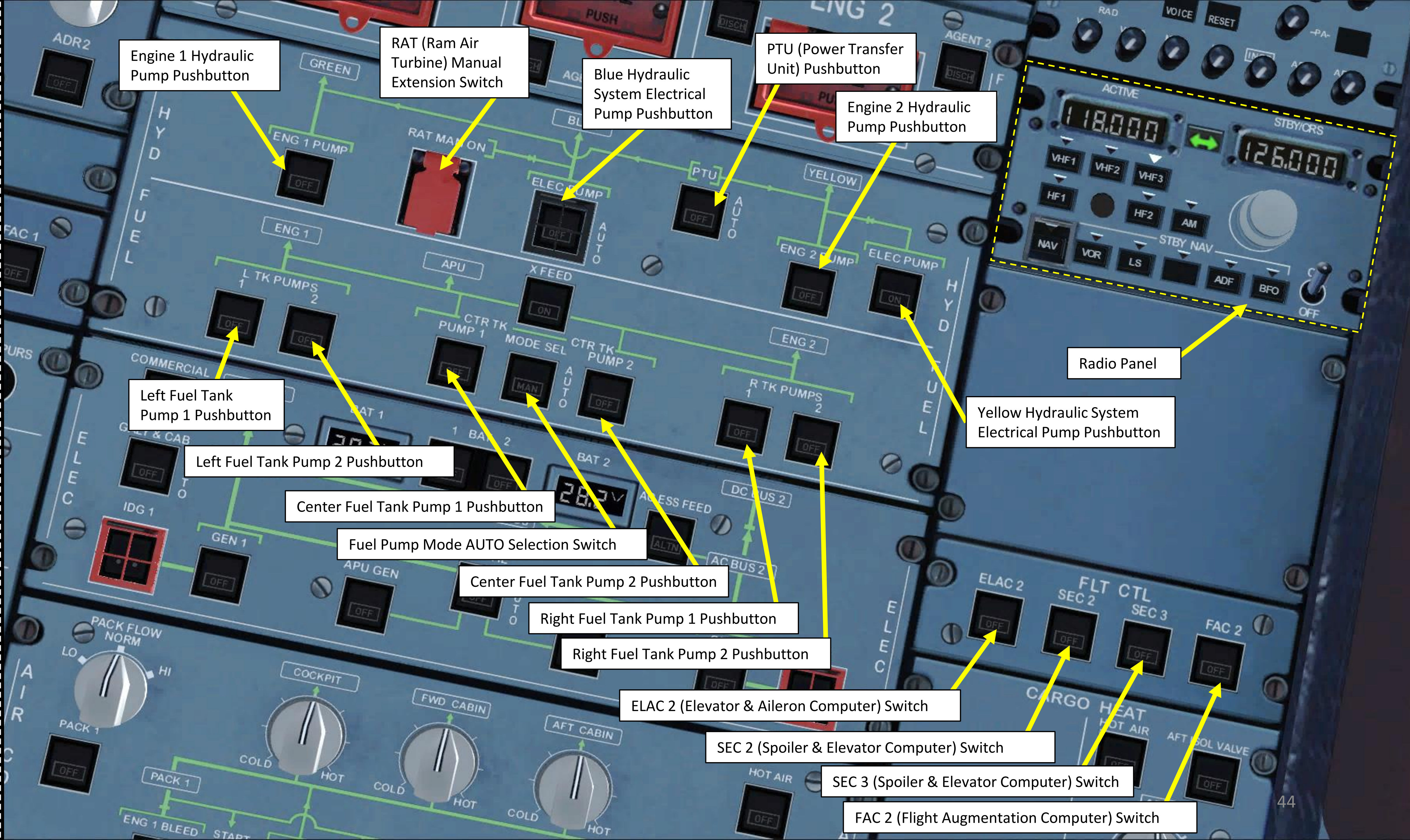

ADIRS (Air Data Inertial Reference System) Panel
Fire Detection & Protection Panel
Audio Panel
Radio Panel
Hydraulics Panel
Flight Control Panel
Fuel Panel
Flight Control Panel
Evacuation & Emergency Electrical Panel
Electrical Panel
Ventilation Panel
GPWS (Ground Proximity Warning) Panel
Flight Recorder Panel
Air Conditioning Panel
Oxygen Panel
Anti-Ice & Heating Panel
Cabin Pressure Panel
Engine Manual Start Panel
Miscellaneous Panel
Lights Panel
APU Panel
Lights Panel
Miscellaneous Panel

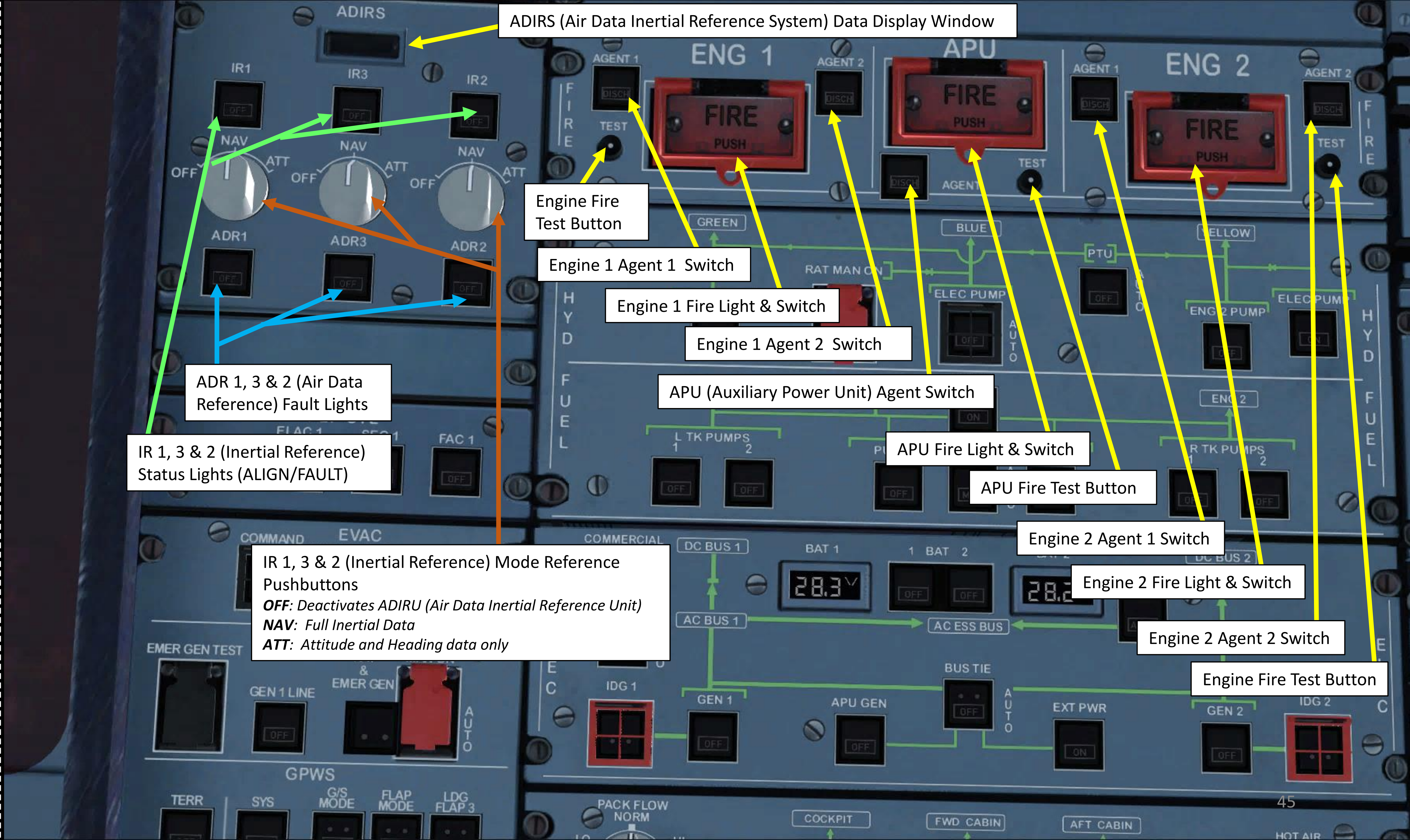

GPWS (Ground Proximity Warning System) Mode Selector
RCDR (Cockpit Voice Recorder) Control Panel
Crew Oxygen Supply Pushbutton
Passenger Oxygen Supply ON light
Oxygen Mask Door Manual Control Pushbutton
High Altitude Landing Pushbutton
Rain Repellant Button
Windshield Wiper Control
Ground Mechanic Communication Button
Forward & Aft Call Light Button (for flight attendants)
Emergency Call Button


Ram Air Inlet Valve Control Pushbutton
Cockpit, Forward Cabin and Aft Cabin Air Temperature Controls
PACK (Pneumatic Air Conditioning Kit) Flow Selector
PACK 1 (Pneumatic Air Conditioning Kit) Pushbutton
Crossbleed Selector Valve
Engine 1 Bleed Pushbutton
Engine 1 & 2 Anti-Ice Pushbuttons
APU Bleed Pushbutton
Engine 2 Bleed Pushbutton
Wing Anti-Ice Pushbutton
Probe/Window Heat Control pushbutton
Beacon Lights Control Switch
Navigation & Logo Lights Control Switch
1: Light set 1 ON / 2: Light set 2 ON
OFF: Lights OFF
Strobe Lights Control Switch
APU (Auxiliary Power Unit) Master Switch
Wing Lights Control Switch
Runway Turn OFF Lights Control Switch
APU (Auxiliary Power Unit) Start Switch
Nose Lights Control Switch
Landing Lights Control Switch

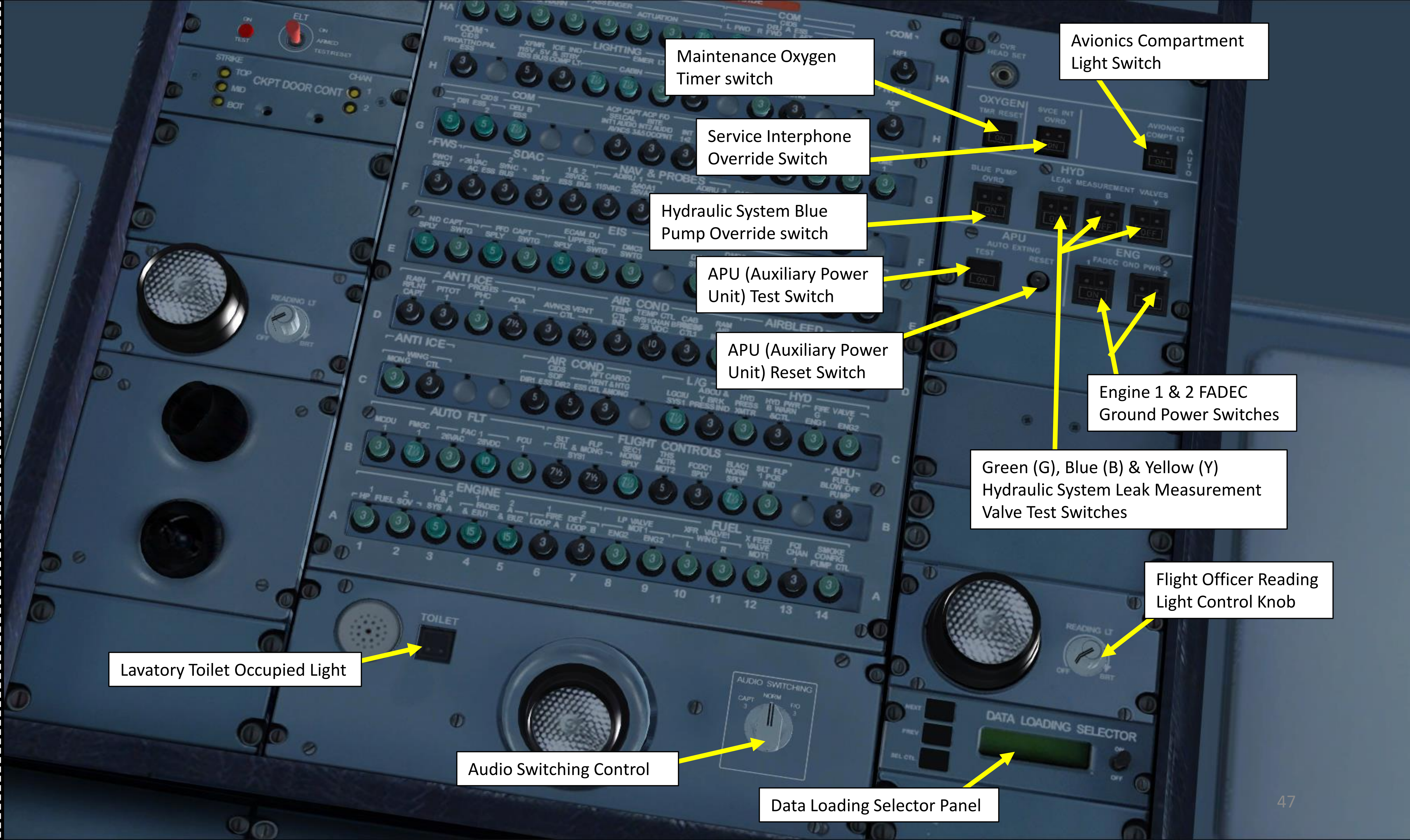

FWD Cargo Fire Smoke Detected and Discharge Light
Cargo Fire Agent Discharge Switch
PACK 2 (Pneumatic Air Conditioning Kit) Pushbutton
Hot Air Pressure Regulating Valve Pushbutton
Cargo Hot Air Pressure Regulating Valve Pushbutton
Aft Isolation Valve pushbutton
Ditching Switch
LDG ELEV Mode Selector
Cabin Pressure Mode Select Pushbutton
Manual Vertical Speed (V/S) Target Valve Control Switch
Ice Indicator & Standby Compass Light Control Switch
Overhead Integral Lighting Control Switch
Seatbelt Sign Light Control Switch
No Smoking Sign Light Control Switch
Dome Light Control Switch
Emergency Exit Light Control Switch & Indicator
Annunciator Light Control Switch
Windshield Wiper Control
Rain Repellant Pushbutton
Engine 1 & 2 Manual Start Pushbuttons
Ventilation Blower Pushbutton
Ventilation Extract Pushbutton
Cabin Ventilation Fans Pushbutton
AFT Cargo Fire Smoke Detected and Discharge Light
Cargo Fire Agent Discharge Switch
Cargo Compartment Smoke Test Button
Cargo Temperature Control

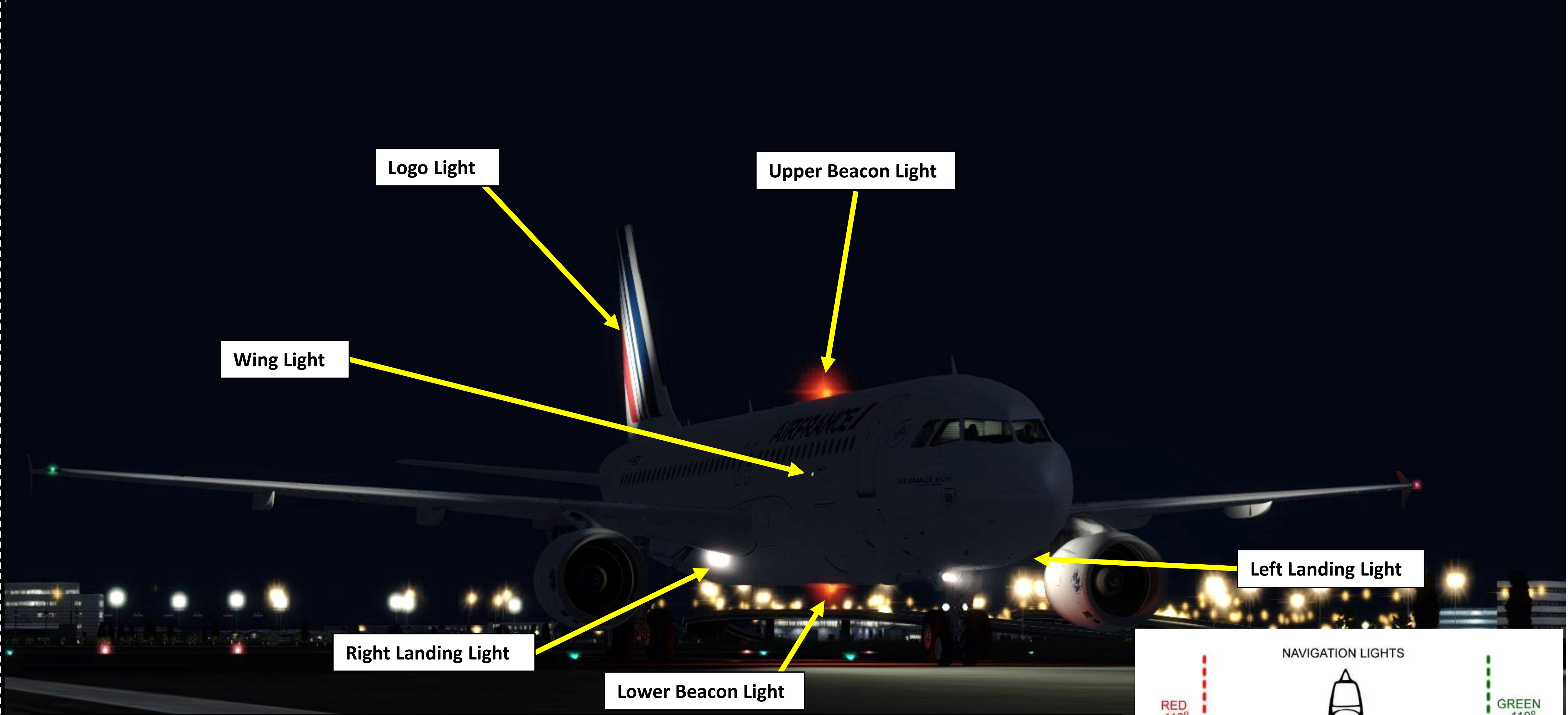

Evacuation Alert Command Switch
ELAC 1 (Elevator & Aileron Computer) Switch
Evacuation Horn Shut Off
SEC 1 (Spoiler & Elevator Computer) Switch
FAC 1 (Flight Augmentation Computer) Switch
CAPT & PURS Evacuation Alert
Galley & Cabin Electrical Switch
Battery 1 Voltage
Battery 1 Pushbutton
Battery 2 Pushbutton
Battery 2 Voltage
AC Essential Bus Feed Pushbutton
IDG 2 (Integrated Drive Generator)
Emergency Generator Test
Generator 1
Generator 1 Line Switch
RAT (Ram Air Turbine) & Emergency Generator Fault Light
Emergency Electrical Power RAT Manual Switch
IDG 1 (Integrated Drive Generator)
APU Generator
Bus Tie Pushbutton
External Power
Generator 2


Engine 1 Hydraulic Pump Pushbutton
RAT (Ram Air Turbine) Manual Extension Switch
Blue Hydraulic System Electrical Pump Pushbutton
PTU (Power Transfer Unit) Pushbutton
Engine 2 Hydraulic Pump Pushbutton
Radio Panel
Yellow Hydraulic System Electrical Pump Pushbutton
Left Fuel Tank Pump 1 Pushbutton
Left Fuel Tank Pump 2 Pushbutton
Center Fuel Tank Pump 1 Pushbutton
Fuel Pump Mode AUTO Selection Switch
Center Fuel Tank Pump 2 Pushbutton
Right Fuel Tank Pump 1 Pushbutton
Right Fuel Tank Pump 2 Pushbutton
ELAC 2 (Elevator & Aileron Computer) Switch
SEC 2 (Spoiler & Elevator Computer) Switch
SEC 3 (Spoiler & Elevator Computer) Switch
FAC 2 (Flight Augmentation Computer) Switch

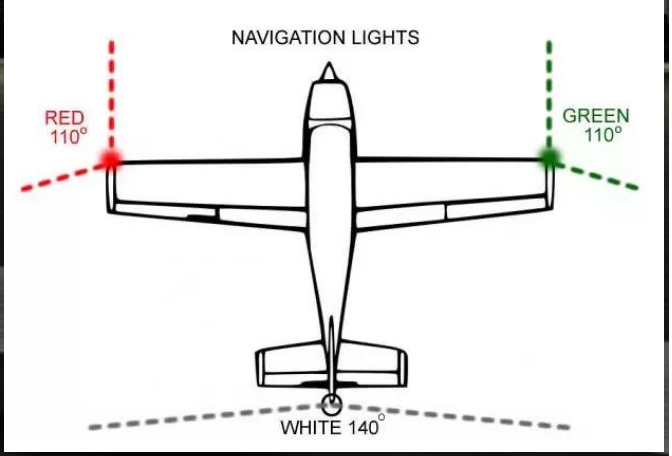

ADIRS (Air Data Inertial Reference System) Data Display Window
Engine Fire Test Button
Engine 1 Agent 1 Switch
Engine 1 Fire Light & Switch
Engine 1 Agent 2 Switch
APU (Auxiliary Power Unit) Agent Switch
APU Fire Light & Switch
APU Fire Test Button
Engine 2 Agent 1 Switch
Engine 2 Fire Light & Switch
Engine 2 Agent 2 Switch
Engine Fire Test Button
ADR 1, 3 & 2 (Air Data Reference) Fault Lights
IR 1, 3 & 2 (Inertial Reference) Status Lights (ALIGN/FAULT)
IR 1, 3 & 2 (Inertial Reference) Mode Reference Pushbuttons
OFF: Deactivates ADIRU (Air Data Inertial Reference Unit)
NAV: Full Inertial Data
ATT: Attitude and Heading data only

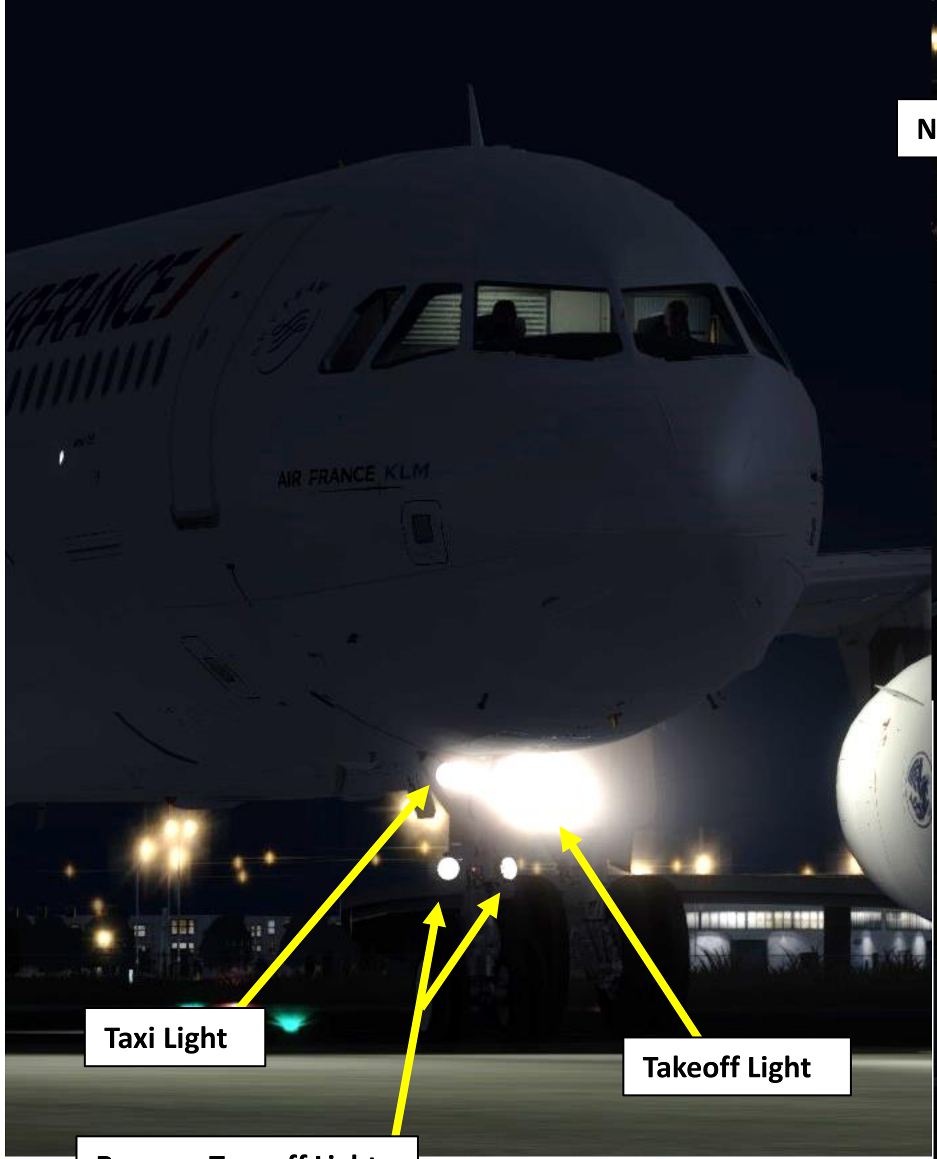

Fuse Panel
Circuit Breakers
Captain Reading
Light Control Knob
HIGH VOLTAGE INSIDE


Maintenance Oxygen Timer switch
Avionics Compartment Light Switch
Service Interphone Override Switch
Hydraulic System Blue Pump Override switch
APU (Auxiliary Power Unit) Test Switch
APU (Auxiliary Power Unit) Reset Switch
Engine 1 & 2 FADEC Ground Power Switches
Green (G), Blue (B) & Yellow (Y) Hydraulic System Leak Measurement Valve Test Switches
Flight Officer Reading Light Control Knob
Lavatory Toilet Occupied Light
Audio Switching Control
Data Loading Selector Panel

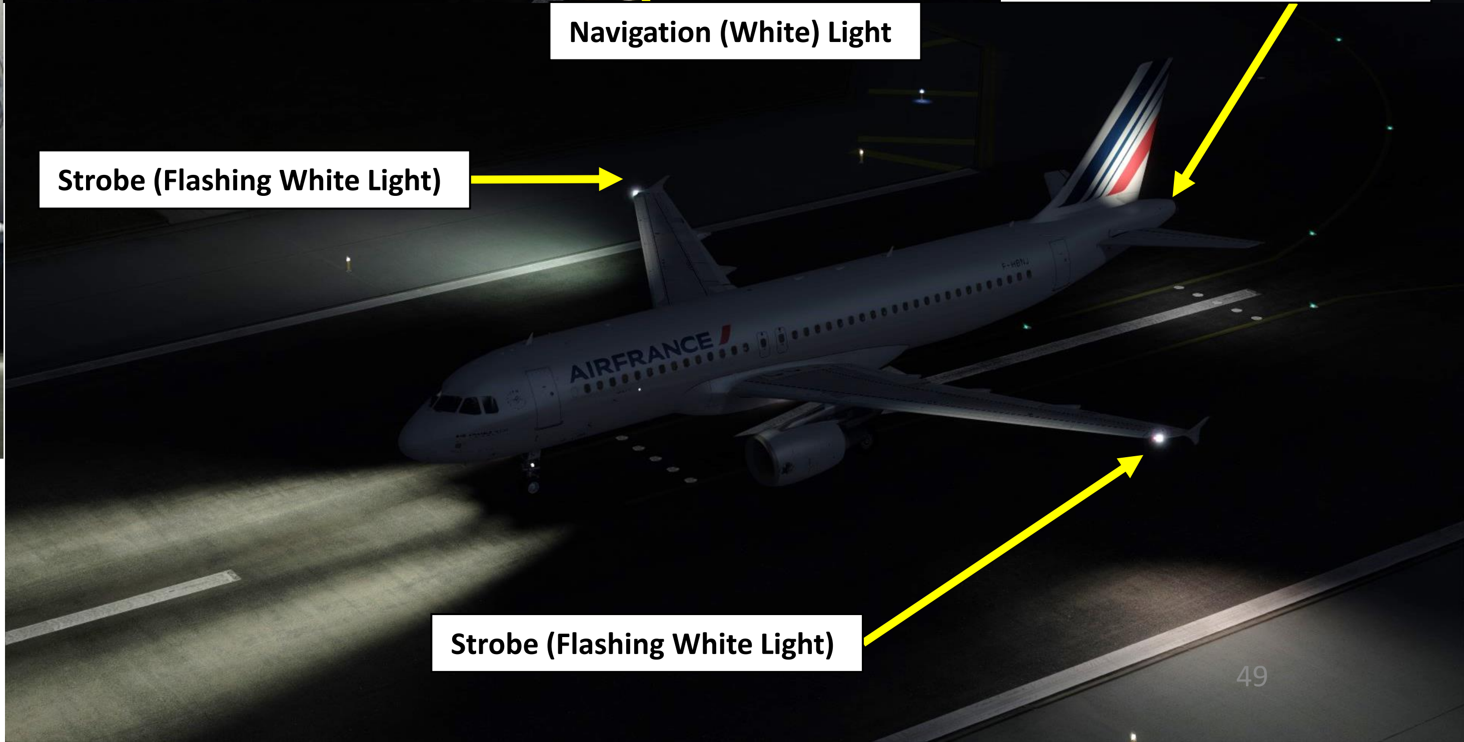


- **Landing** Lights: used to illuminate runway during landing
- **Runway Turnoff** Lights: used to aid the crew in seeing the turn in the taxiway/runway
- **Taxi** Lights: used to illuminate area in front of nosewheel during taxi
- **Beacon (Anti-Collision)** Lights: flashing red light used to prevent 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




AIR FRANCE KLM
Taxi Light
Takeoff Light
Runway Turnoff Lights


Academic License
Navigation (Red) Light
Navigation (Green) Light
Navigation (White) Light


Strobe (Flashing White Light)
Strobe (Flashing White Light)
Strobe (Flashing White Light)
AIRFRANCE

PLANNING THE FLIGHT

In real life, you cannot just fly an A320 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 Airbus 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* ***XAMAN*** *L980* ***LOGAN*** *STAR* ***EGLL***

Provided by RouteFinder

METAR:

Departure: EHAM 290225Z 15002KT 7000 MIFG NSC 16/15 Q1014 NOSIG
Destination: EGLL 290250Z AUTO 16002KT 9999 NCD 17/15 Q1015 NOSIG

Provided by AVIATION WEATHER CENTER

Fuel quantity for Boeing 737-800 (iFly/PMDG)

	Fuel	Time
Fuel Usage	2051 kgs	00:52
Reserve Fuel	2955 kgs	01:15
Fuel on Board	5007 kgs	02:07

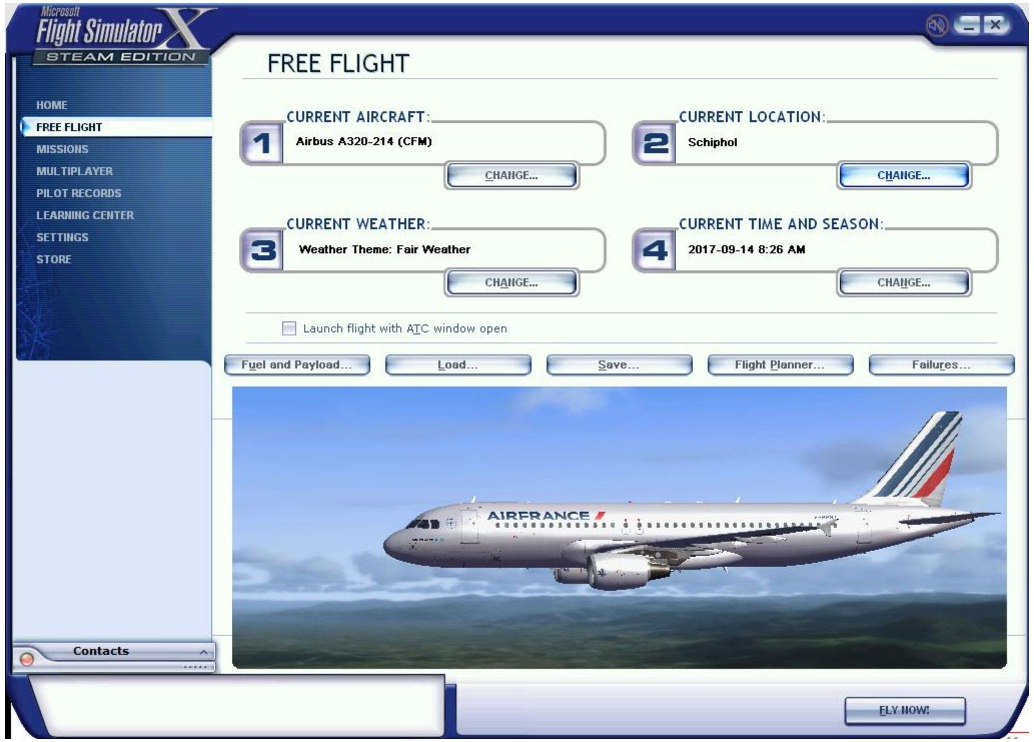
Provided by Fuelplanner.com

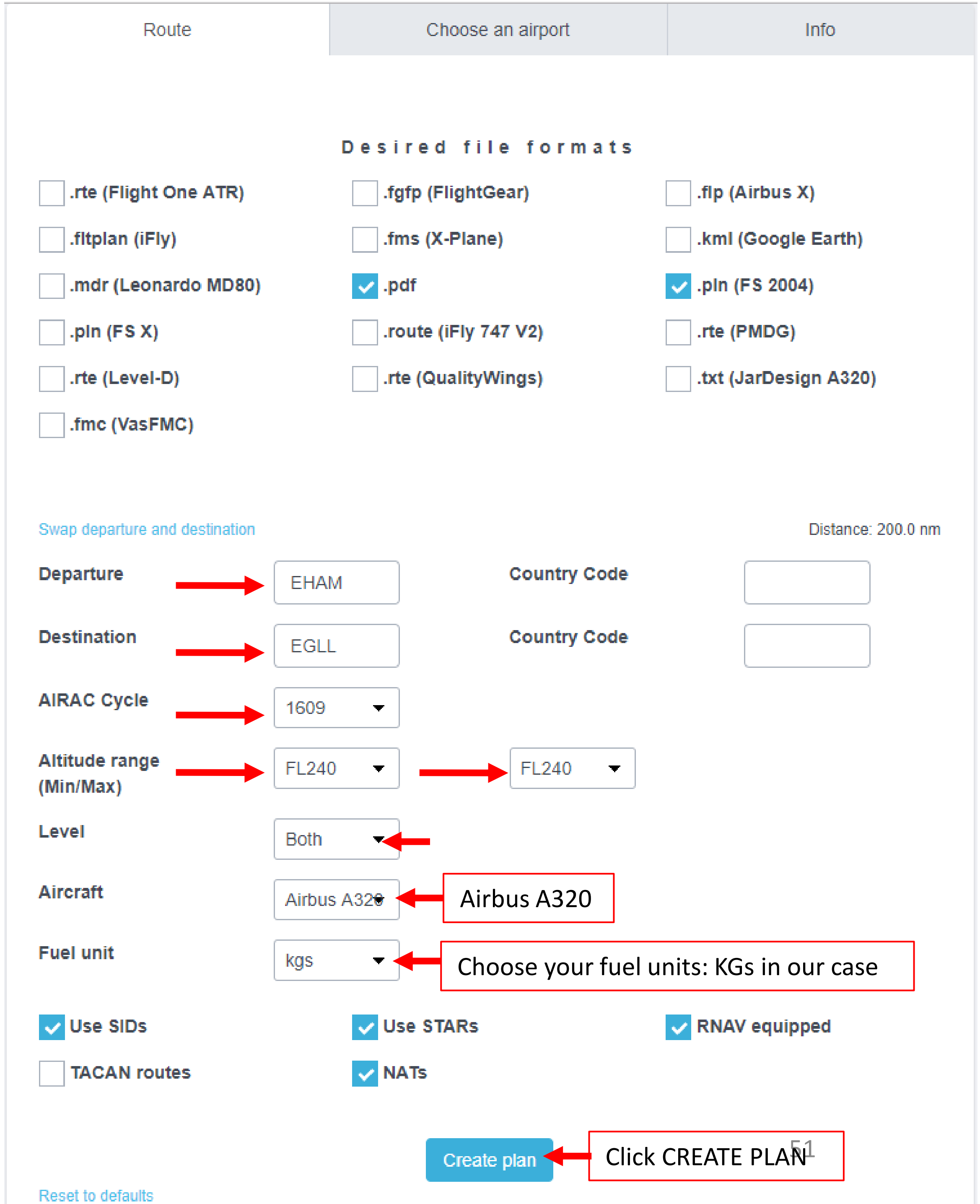
PLANNING THE FLIGHT

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 1609** 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 FMGC when it was first released by FS Labs during late August (period **09)** 20**16** (AIRAC cycle **1609**), 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 (2200 lbs)
= 2 x 2200 lbs = 4400 lbs

Reserve Fuel = 5500 lbs

Total (Block) Fuel = Fuel for Flight + Reserve Fuel = 9900 lbs

Metric Units

Fuel for flight = (Number of 100 nm legs) x (1000 kg)
= 2 x 1000 kg = **2000 kg**

Reserve Fuel = **2500 kg**

Total (Block) Fuel = Fuel for Flight + Reserve Fuel = **4500 kg**

FLIGHT ROUTE

The flight route we will take is:

EHAM SID **GORLO** UL980 **XAMAN** L980 **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 XAMAN VOR
- Follow L980 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
XAMAN	-	264	17	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).

6 fixes, 202 nm.

Airways:

EHAM *SID* ***GORLO*** *UL980* ***XAMAN*** *L980* ***LOGAN*** *STAR* ***EGLL***

Provided by RouteFinder

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

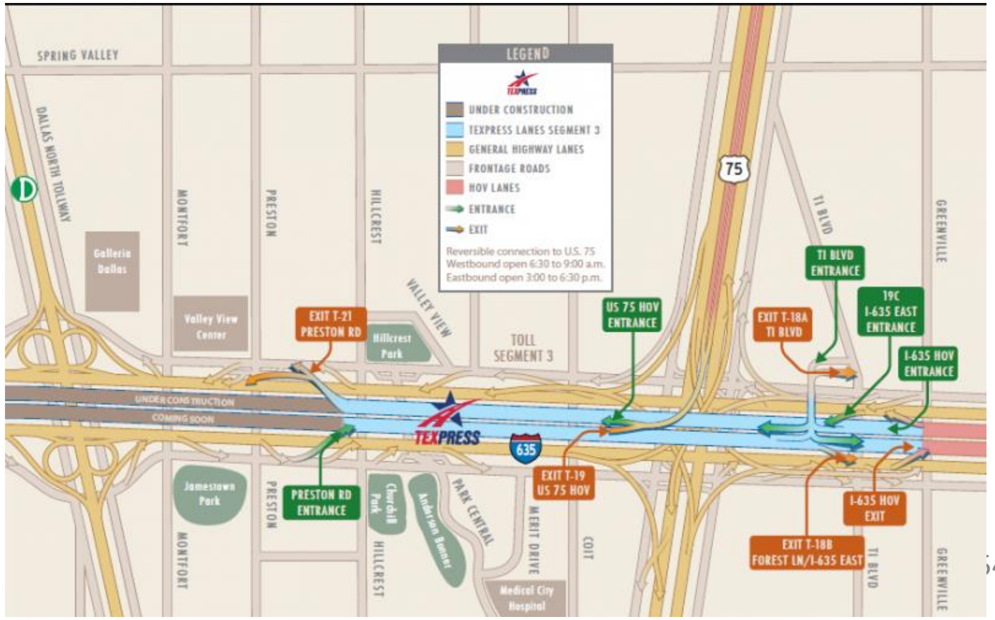
A **SID** (Standard Instrument Departure) is a small initial route which leads an aircraft from the runway they've just taken off from to the first point in his/her intended route. An airport usually has a lot of aircraft departing from it's runways. To save confusion (and for safety), a busy airport 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 FMGC (Flight Management & Guidance 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.

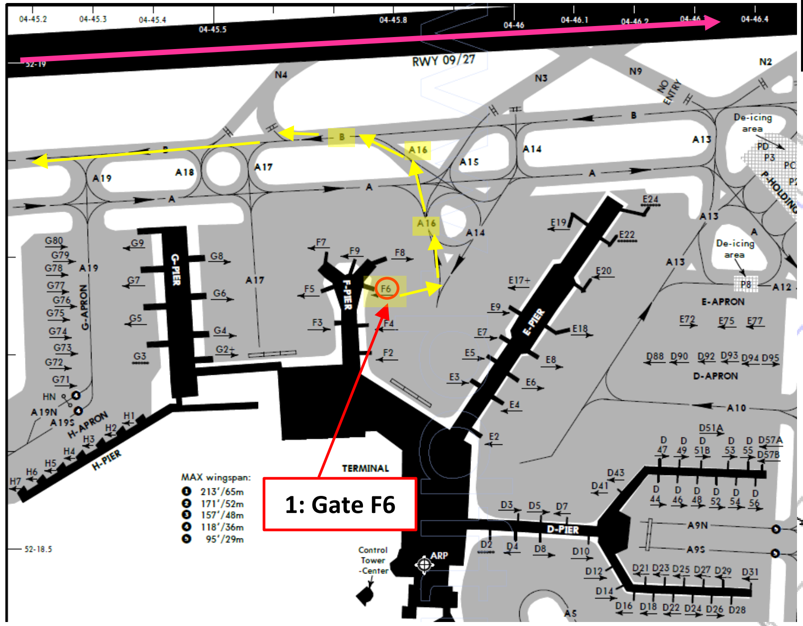
Typically, SIDs and STARs are provided by the ATC (Air Traffic Controller). Since we’re doing a tutorial, I will just give you the SID and STAR to plug in the FMGC.

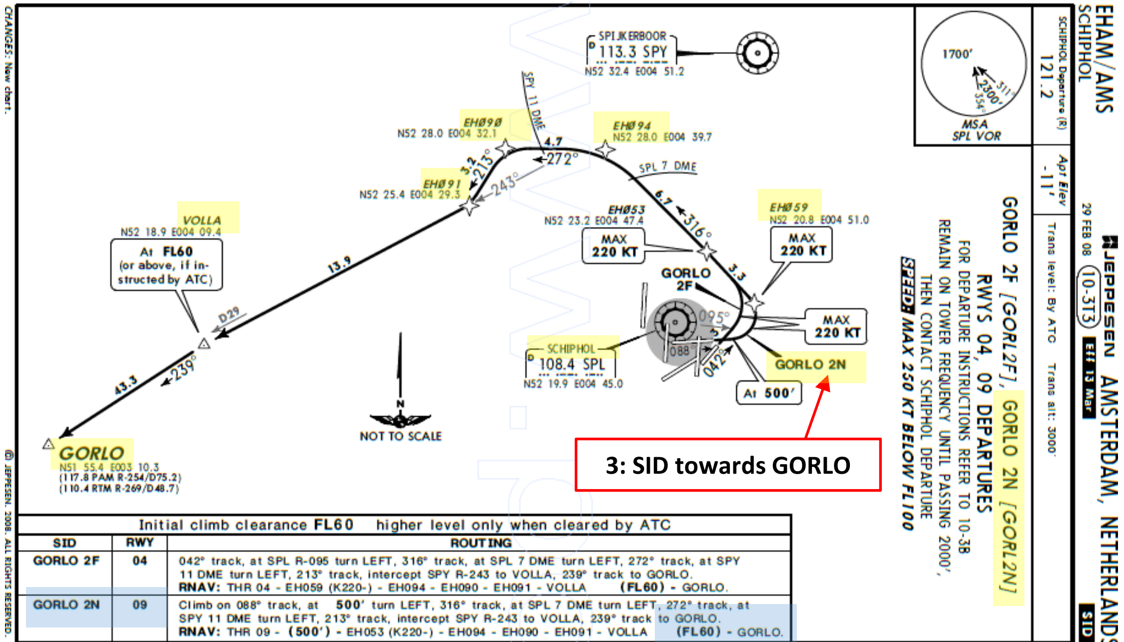


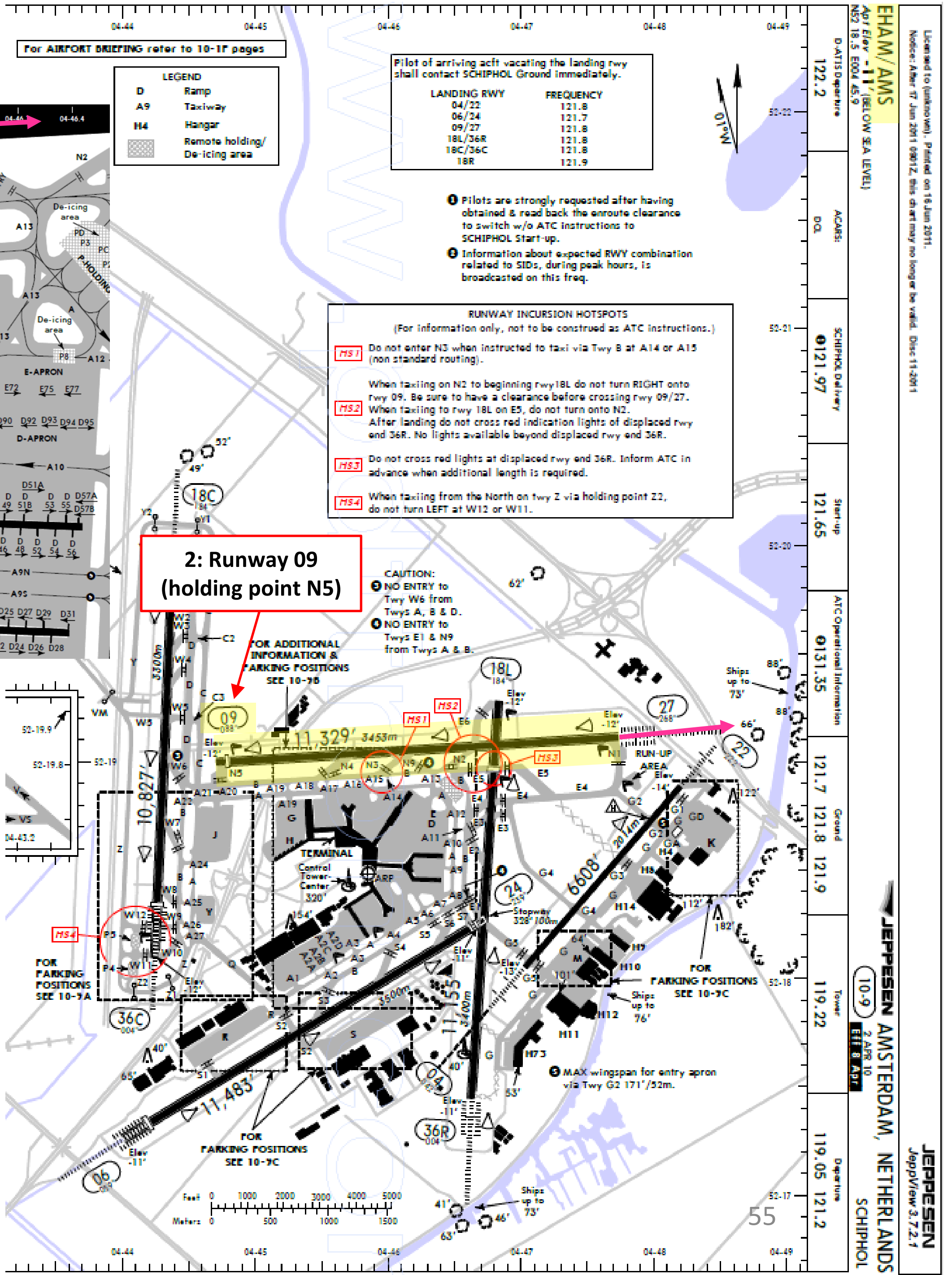
PLANNING THE DEPARTURE - SID

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







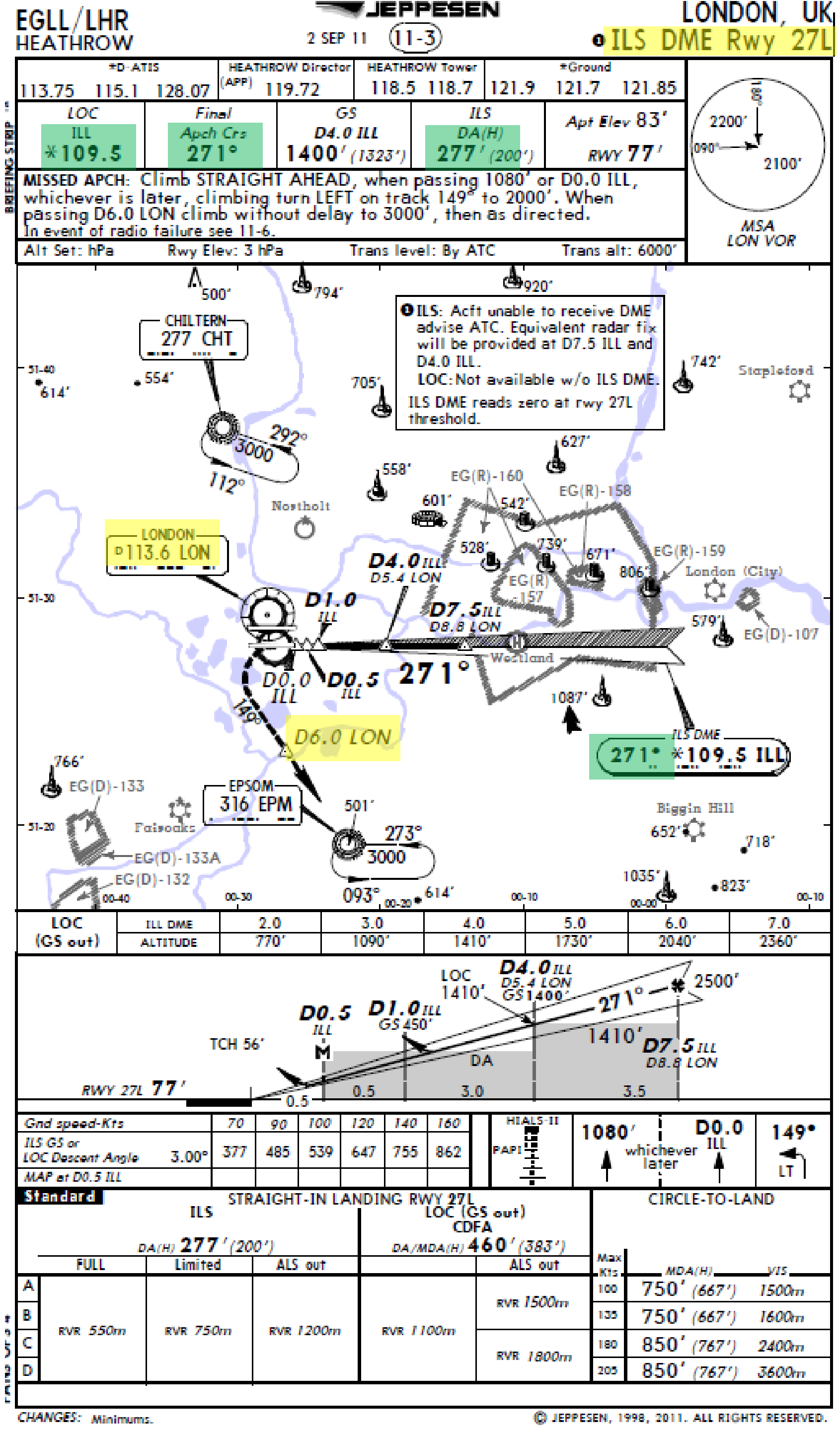
A320

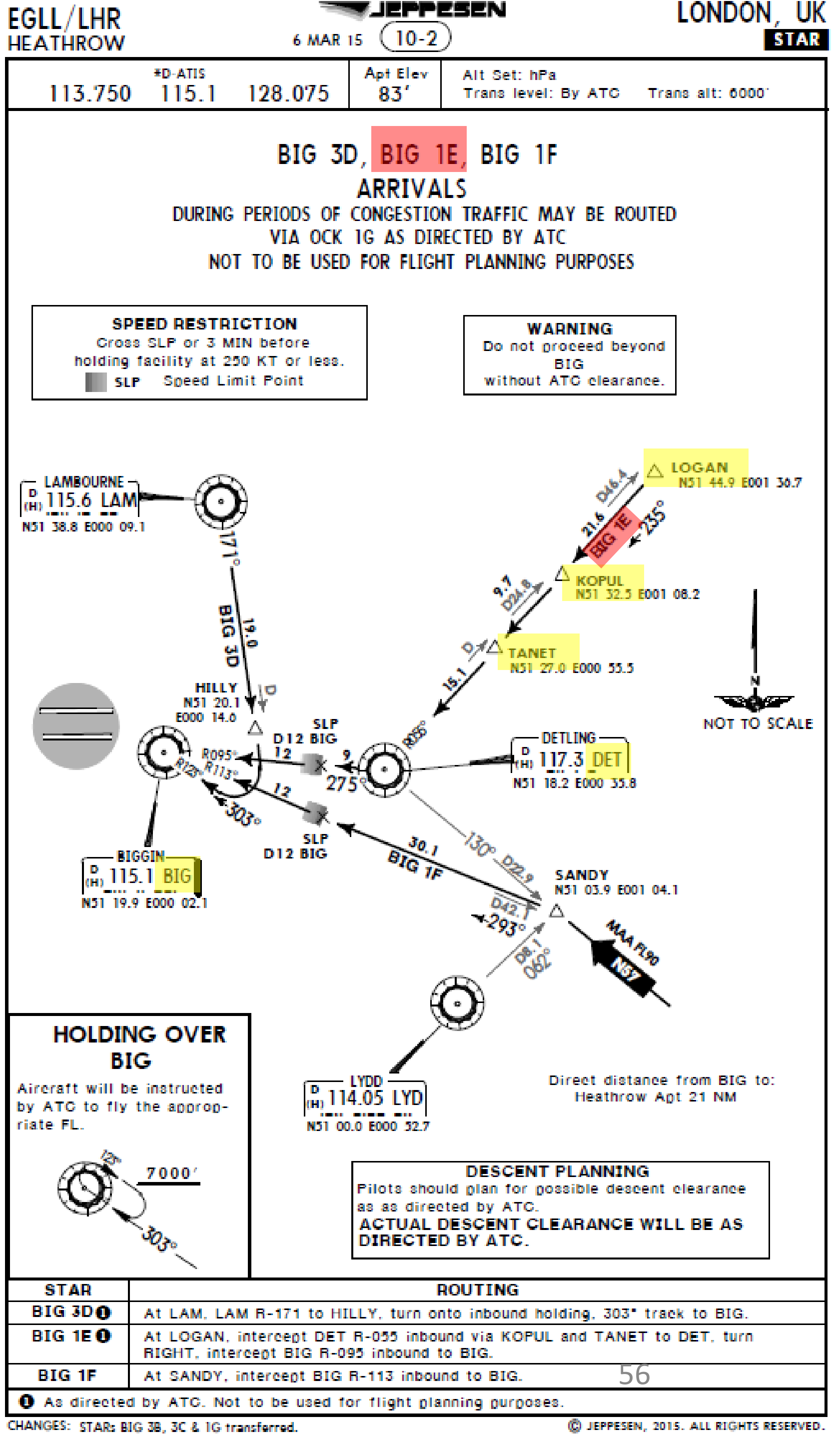
PART 3 – FLIGHT PLAN & PRE-START

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 FMGC 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 FMGC

Airways:

EHAM SID **GORLO** UL980 **XAMAN** L980 **LOGAN** STAR **EGLL**

Provided by RouteFinder

METAR:

Departure: EHAM 290225Z 15002KT 7000 MIFG NSC 16/15 Q1014 NOSIG
Destination: EGLL 290250Z AUTO 16002KT 9999 NCD 17/15 Q1015 NOSIG

Provided by AVIATION WEATHER CENTER

MCDU/FMGC 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 FMGC system.

MCDU: Multifunction Control Display Unit

MAIN MENU page:

- **FMGC** -> Flight Management & Guidance Computer
  - Fundamental component of a modern airliner's avionics. The FMGC is a component of the FMGS (Flight Management & Guidance 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 FMGS sends the flight plan for display to the Electronic Flight Instrument System (EFIS), Navigation Display (ND), or Multifunction Display (MFD).
- **ATSU** -> Air Traffic Services Unit, not fully simulated
  - Digital datalink system for transmission of short messages between aircraft and ground stations via airband radio or satellite.
- **OPTIONS**-> Setup various aircraft options
  - Allows you to change fuel loads, payloads, ground carts for power and air, door controls, cabin lights or pushback controls. This is a fictional custom interface built by FS Labs as a tool for you to work with.
  - Allows you to configure aircraft equipment installed on your current airframe, customize various parameters like display parameters, unit system, ADIRUS alignment time, setup cold & dark and other panel states, and configuration of aircraft malfunctions/failures.
- **FAILURES**-> Flight Simulation Failures
  - Allows you to configure various aircraft malfunctions and failures for training purposes (i.e. engine flameout).

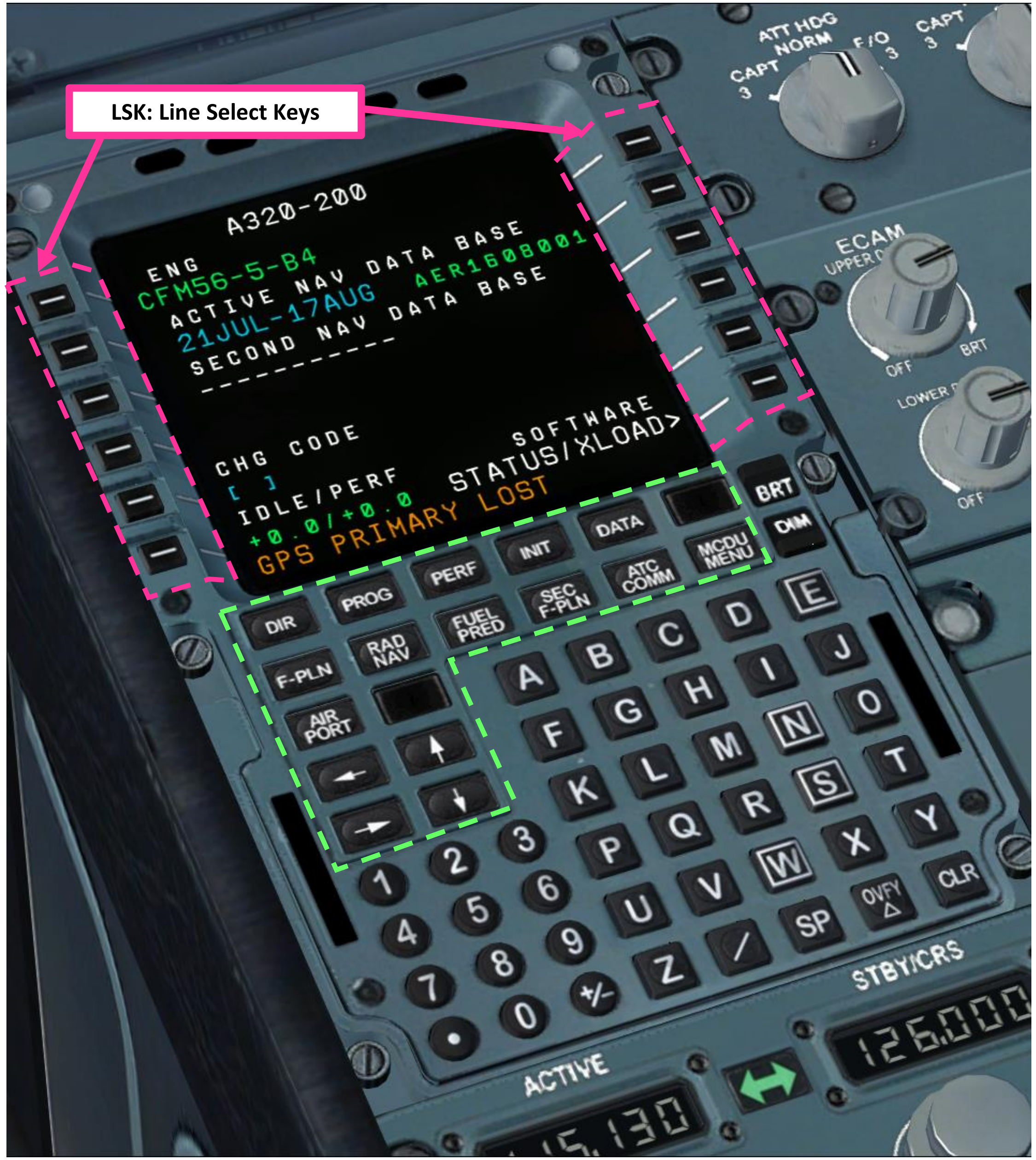
Note: The FMGC and ATSU menus only appear if the aircraft is powered on.

MCDU MAIN MENU PAGE

MCDU/FMGC IN A NUTSHELL

- **FMGC** -> Flight Management & Guidance Computer
  - **DIR** : "Direct to" page modifies the flight plan by creating a direct leg from the aircraft's present position to any selected waypoint
  - **PROG** : "Progress" page displays dynamic flight information and data related to the primary flight plan
  - **PERF** : "Performance" page provides performance data, speeds and various vertical predictions associated with each flight phase
  - **INIT** : Initialization pages INIT A (flight plan initialization, departure point, etc.) and INIT B (zero fuel CG, zero fuel weight, block fuel)
  - **DATA** : navigation data index page
  - **F-PLN** : displays flight plan data
  - **RAD NAV** : "Radio Navigation" page displays NAVAIDS (navigation aids like VOR beacons, NDBs, etc.) tuned by the FMGS or selected by the pilot
  - **FUEL PRED** : fuel and time prediction information and fuel management data
  - **SEC F-PLN** : displays secondary flight plan data
  - **ATC COMM** : displays the ATSU (Air Traffic Service Unit) menu
  - **AIRPORT** : displays the F-PLN page, which includes the next airport along the current flight plan

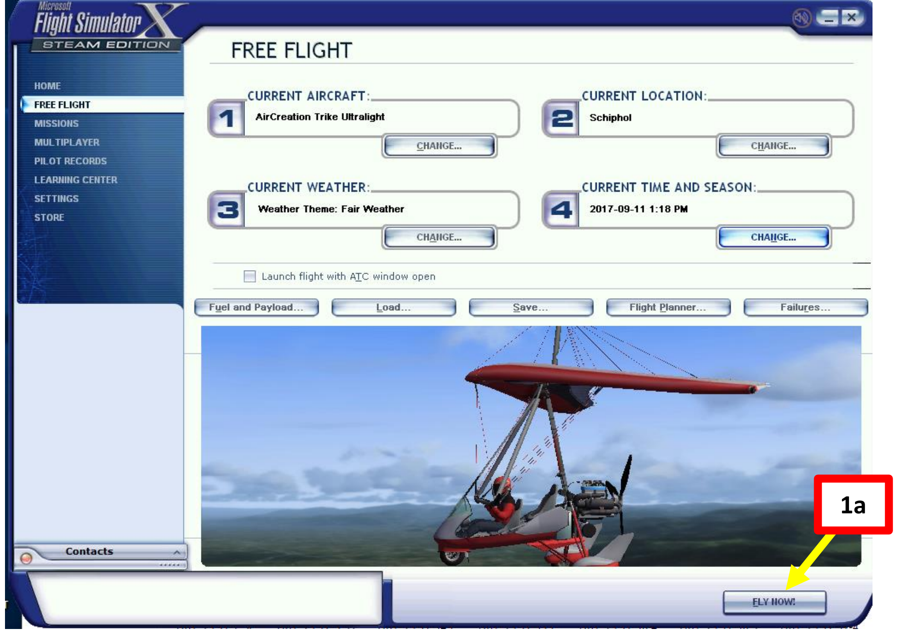
  - **MCDU MENU**: view the main menu page (see previous page)
  - **ARROWS (SLEW KEYS)** : Cycles through previous and next page of selected FMGC page
  - **BRT**: Brightens MCDU page
  - **DIM**: Dims MCDU page
  - **CLR**: Used to clear message or data from the scratchpad or a data field
  - **OVFY**: Overfly key enables the pilot to change the transition from a fly-by to a fly-over, and vice-versa.

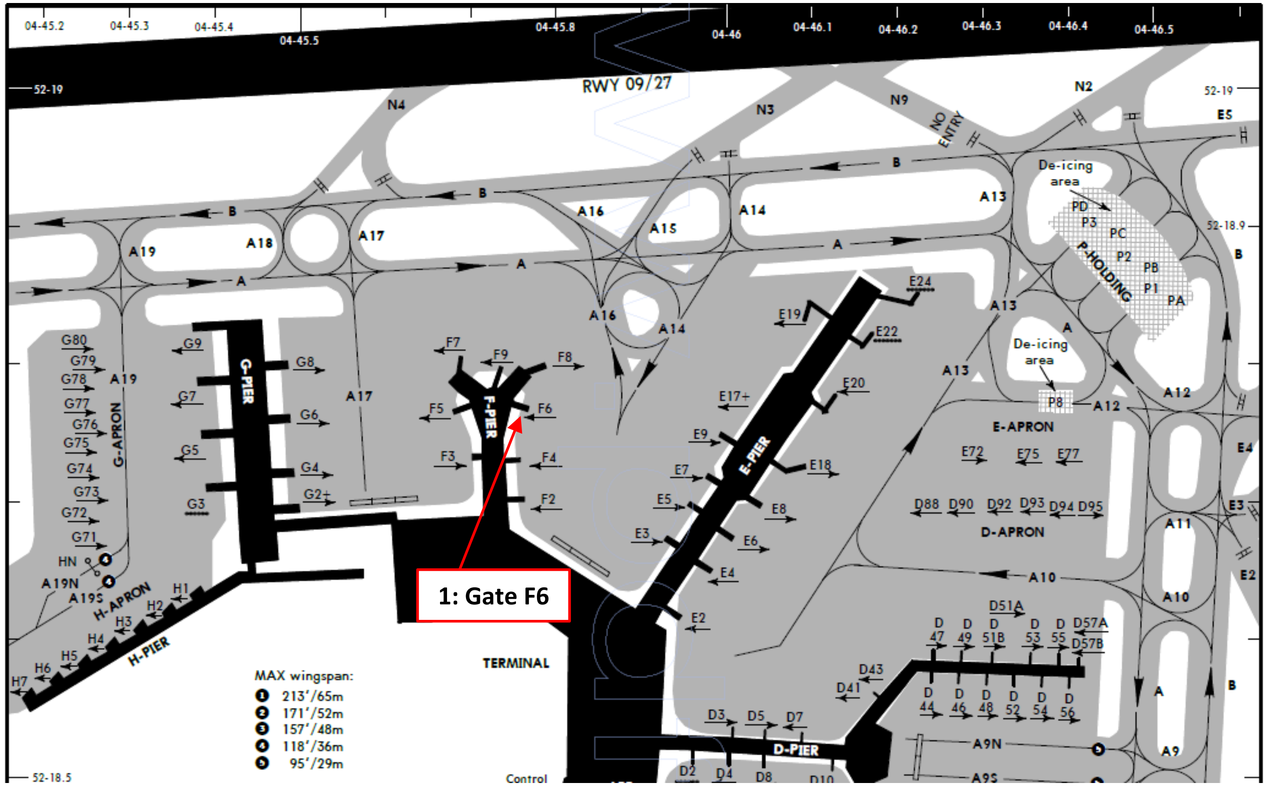


SPAWN COLD & DARK

In FSX, you will generally spawn with your engines running. A "cold & dark" start-up means that your aircraft is in an unpowered state with engines and every other system off. Here is the procedure to spawn in such a state:

1. Spawn like you normally would at Gate F6 in EHAM (departure airport) in the "AirCreation Trike Ultralight". Press and hold "CTRL+SHIFT+F1" to automatically shut down the aircraft
2. Replace Trike Ultralight by the FS Labs A320
    a) Press ALT to open FSX menu
    b) Click on "Aircraft", and then "Select Aircraft"
    c) Select "Flight Sim Labs" tab and choose desired A320
    d) Click "OK"
    e) Aircraft should be set to Cold and Dark configuration as shown





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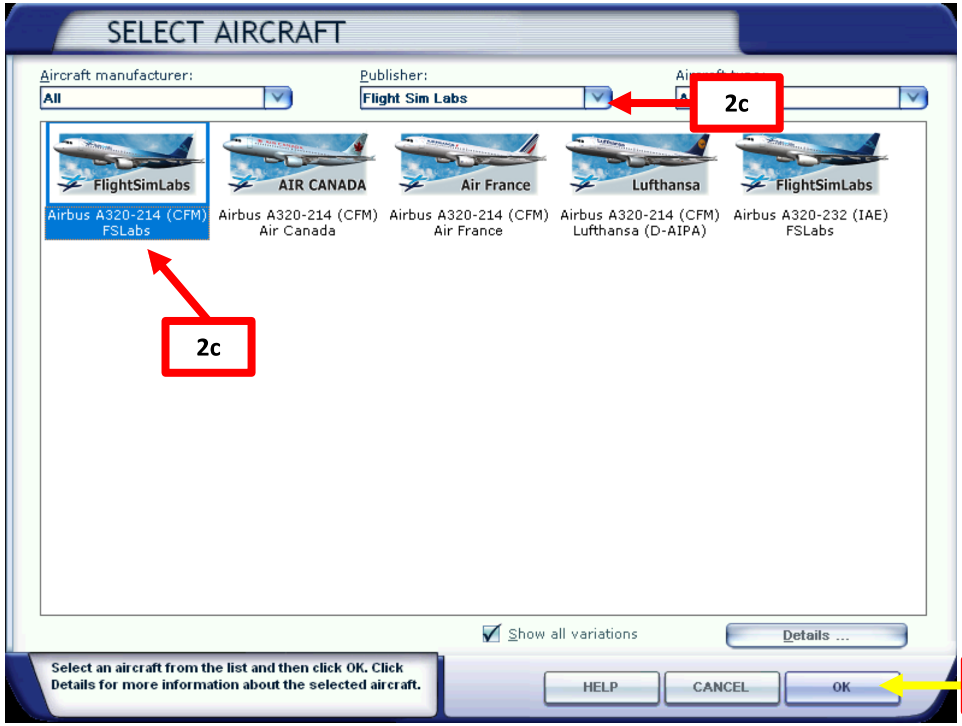
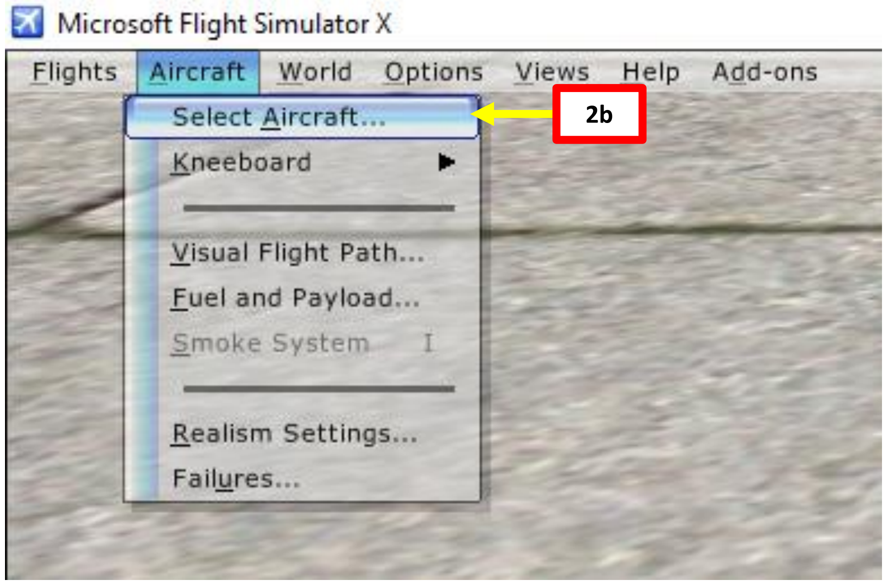
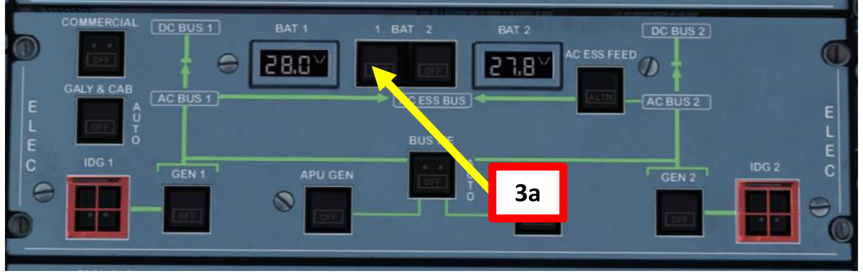
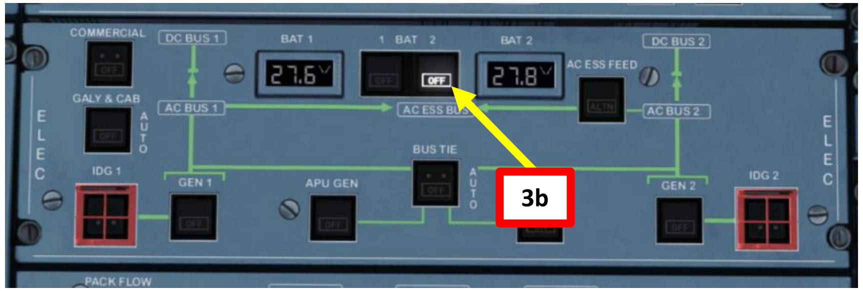


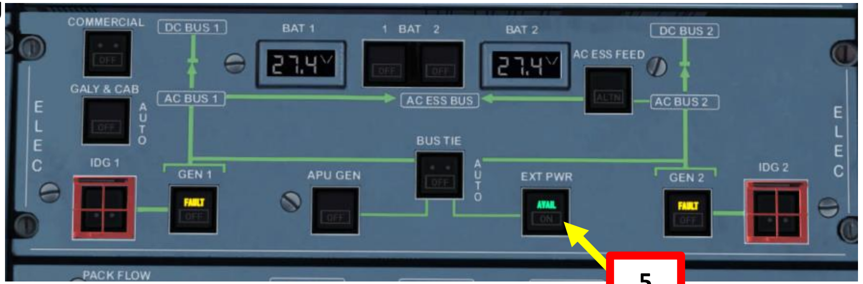


POWER UP AIRCRAFT

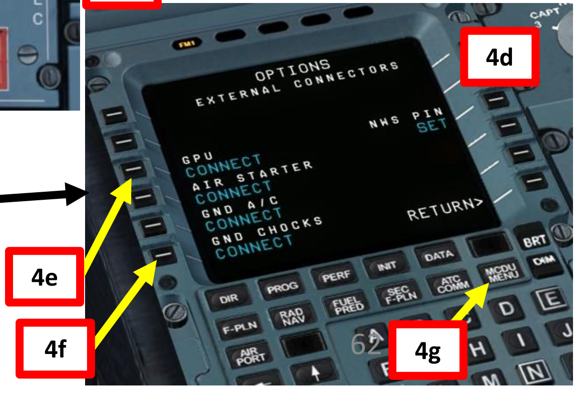
3. On Overhead panel, press the BAT 1 and BAT 2 switches to set battery power
4. Go on MCDU main menu to install wheel chocks, connect ground power unit (GPU) to the aircraft
   a) Power up FMGC by pressing and holding the BRT button on the MCDU
   b) Select OPTIONS menu
   c) Select “EXT CTRLS” (External Controls) menu
   d) Make sure the GPU (Ground Power Unit), Air Starter, GND A/C and GND CHOCKS all display “CONNECT”, which means that they are currently all disconnected.
   e) Click on the “GPU - CONNECT” LSK to set ground power. The MCDU will then display “GPU – DISCONNECT”.
   f) Click on the “GND CHOCKS - CONNECT” LSK to set chocks. The MCDU will then display “GND CHOCKS – DISCONNECT”.
   g) Return to main MCDU MENU
5. On Overhead panel, confirm that the “EXT PWR” indication is illuminated
6. Click on the “EXT PWR” switch to power the aircraft







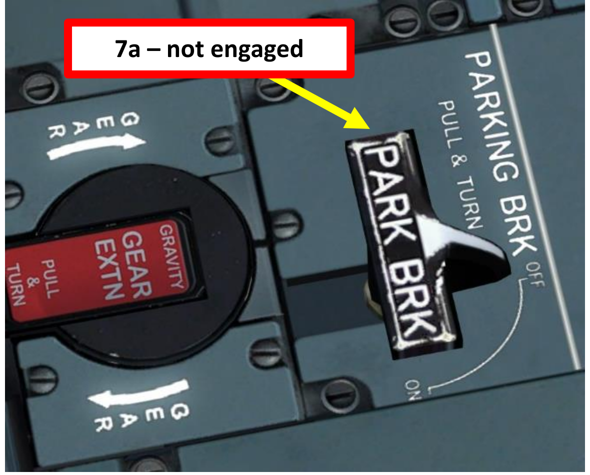
GPU: Ground Power Unit
Air Starter: External pressurized air used for engine start
GND A/C: External air conditioning to the aircraft to control cabin temperature
GND Chocks: places chocks around the nose and main gear

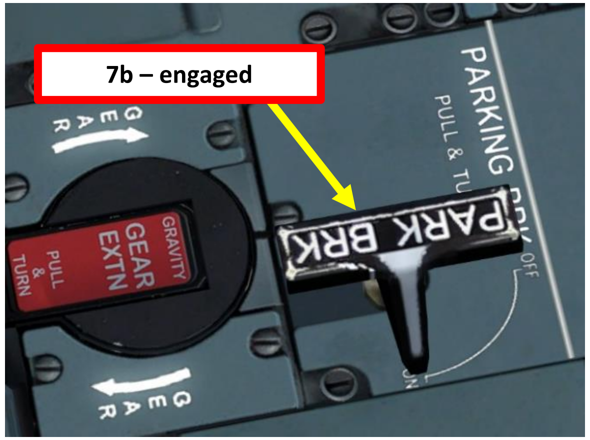


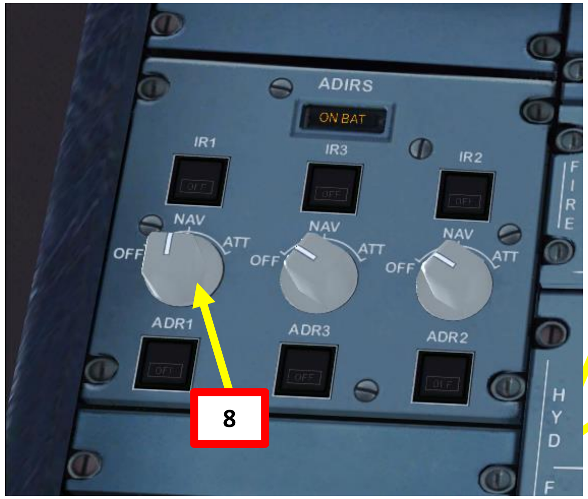
START ADIRS ALIGNMENT

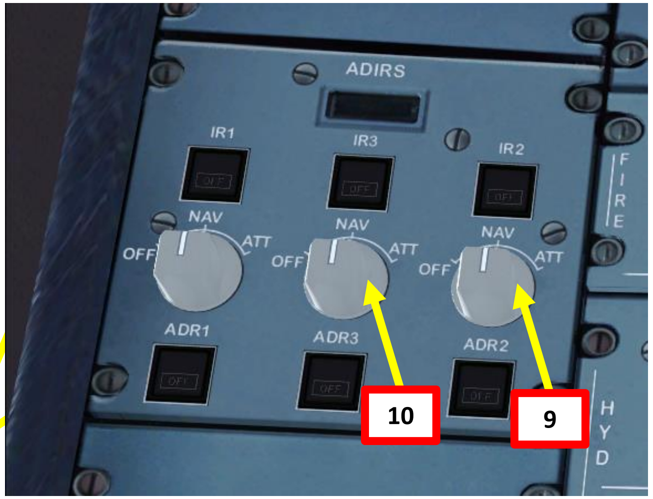
7. Engage Parking Brake (aircraft movement can screw up your navigation system alignment) by right-clicking on the handle to pull it and set it to the ON position. Note that left clicking the handle sets it to OFF while right clicking sets it to ON.
8. On Overhead panel, set ADIRS System 1 (Air Data Inertial Reference System) switch to NAV. The "ON BAT" caution will illuminate during the ADIRU's self-test phase, then extinguish once the self-test is complete.
9. Repeat step 8 for ADIRS System 2.
10. Repeat step 8 for ADIRS System 3.

NOTE: This alignment phase usually takes between 7 and 10 minutes. ADIRS alignment is complete once a full PFD (Primary Flight Display) and ND (Navigation Display) are displayed on your display units. Alignment time remaining is displayed on the EWD (Engine Warning Display) on the upper ECAM display once you cleared the EWD caution messages using the "CLR" button on the MCDU.





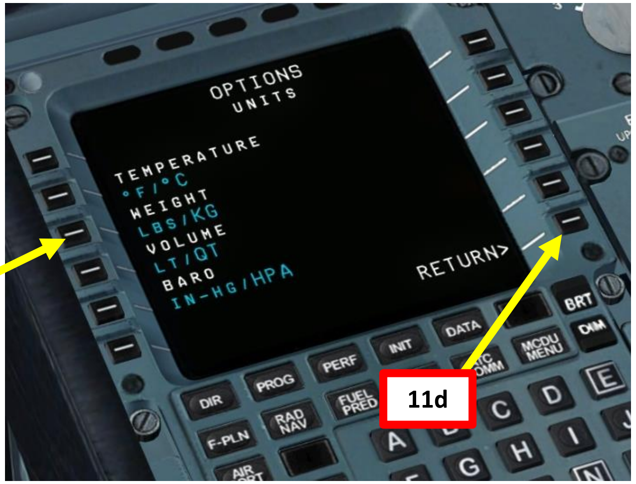


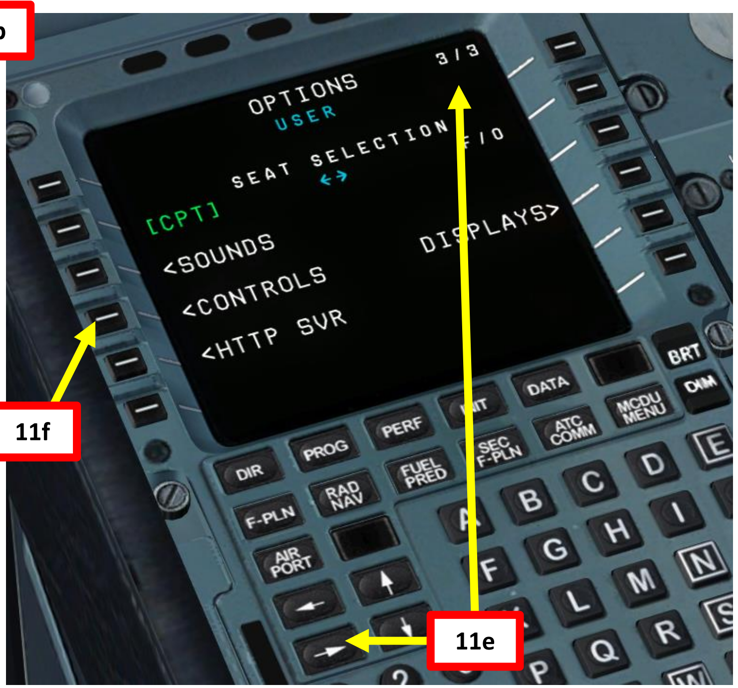


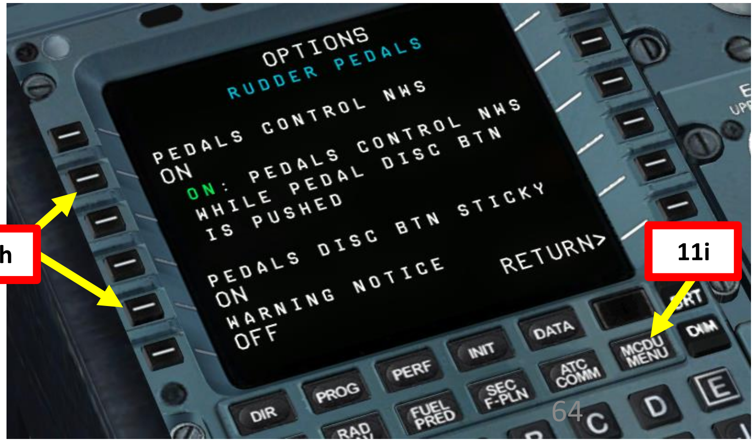
FMGC SETUP – UNITS & TILLER SETUP

11. Go on MCDU main menu and set aircraft fuel weight units to your desired system (lbs or kg) and set desired aircraft tiller axis options. We will choose KGs and a single-axis tiller setup (meaning that you do not want to assign any separate joystick axis for the tiller and want to use the simpler “RUDDER PEDAL DISCONNECT” button mapped to the “Comma” key by default in order to use nosewheel steering).

    a) Select MCDU OPTIONS page
    b) Select UNITS page
    c) Click on LSK next to “WEIGHT LBS/KG” to switch the weight unit system to KG as shown.
    d) Click on LSK next to “RETURN” to return to the OPTIONS menu
    e) Cycle to OPTIONS page 3/3 using the arrow slew keys
    f) Select the CONTROLS page
    g) Select RUDDER PEDALS page
    h) Make sure PEDALS CONTROL NWS is ON and the PEDALS DISC BTN STICKY is ON.
    i) Return to main MCDU MENU





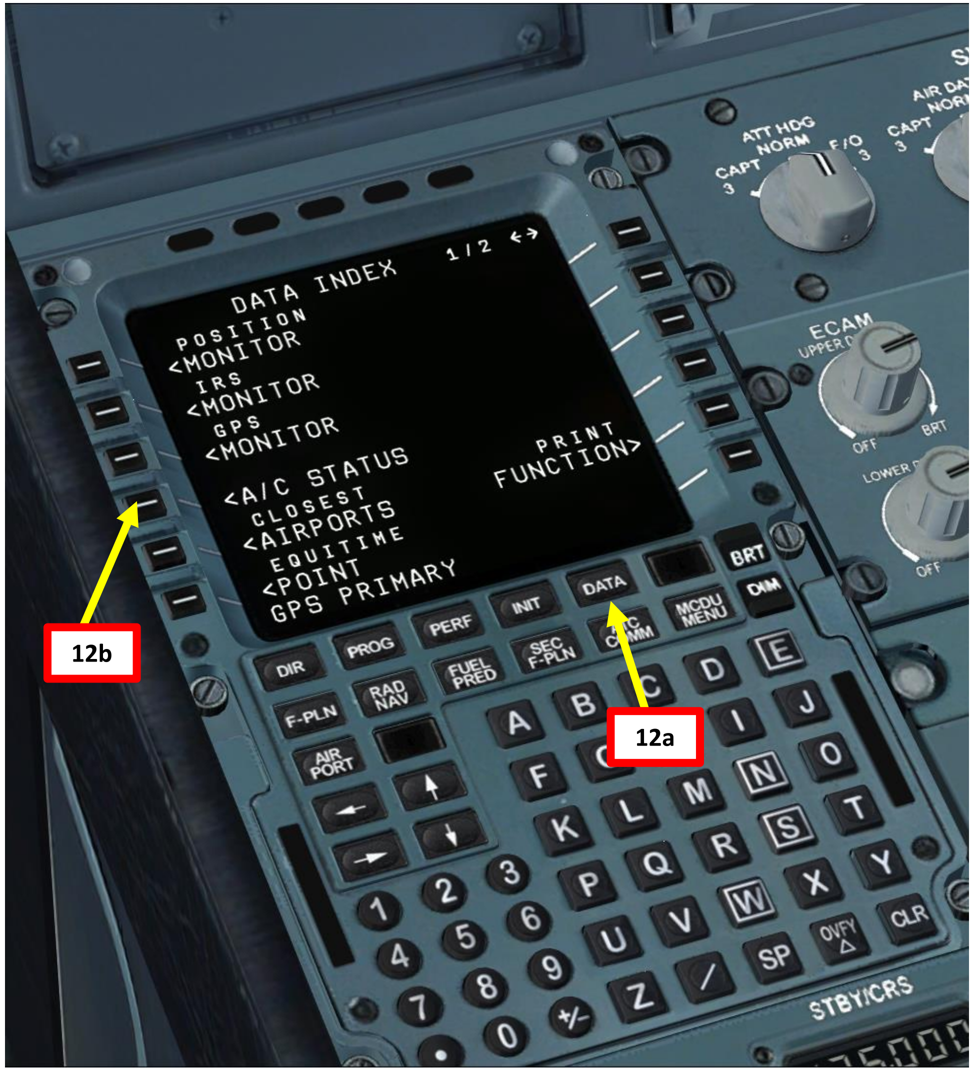


FMGC SETUP – DATA

DIFRIP

NOTE: We will prepare the MCDU using the "**DIFRIP**" flow. DIFRIP is just an acronym to help you remember what to initialize and in what order.
D: DATA
I: INIT
F: F-PLN (Flight Plan)
R: RADIOS
I: INIT ZFG/ZFWCG
P: PERFORMANCE

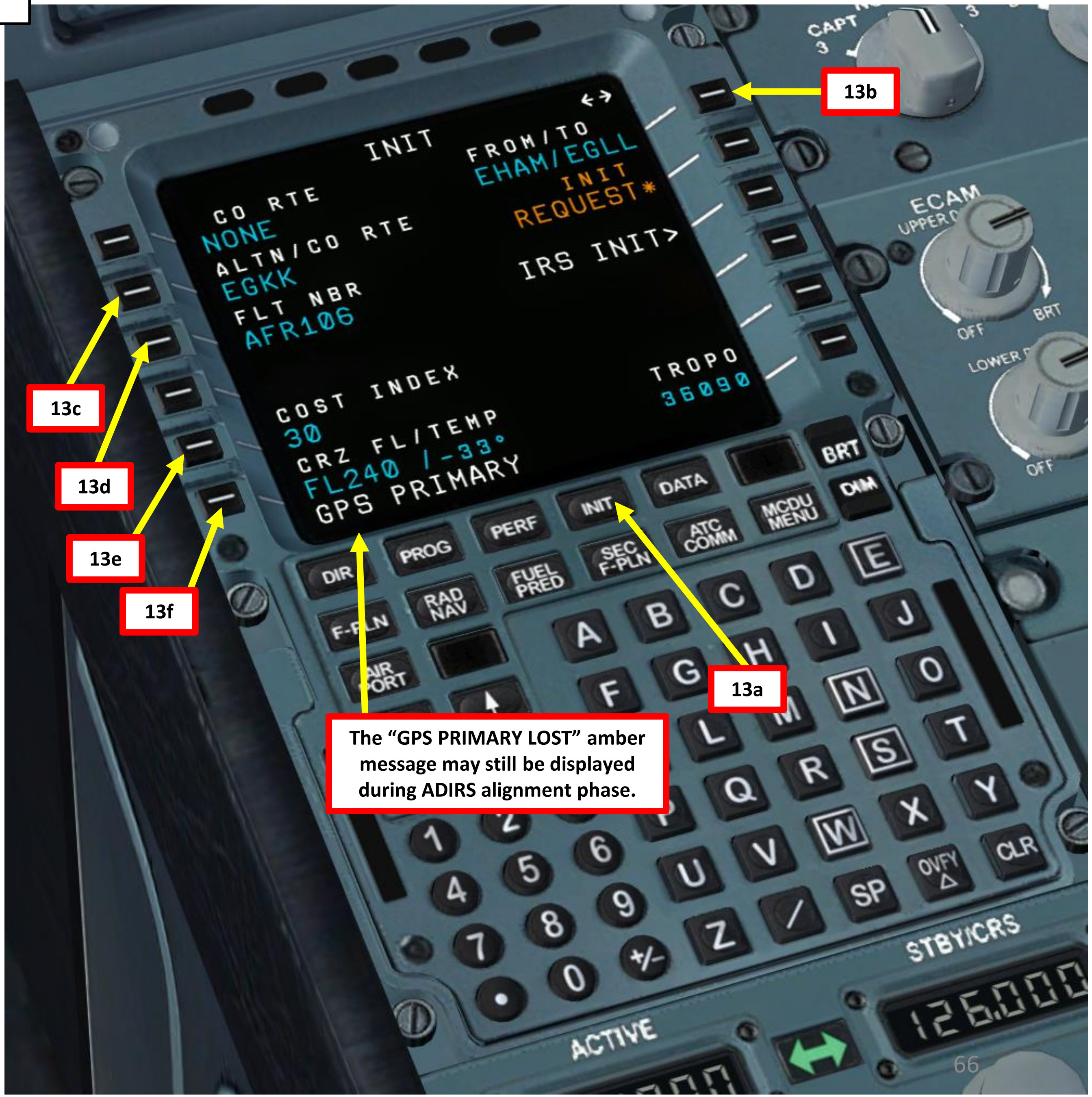
12. Go on FMGC (Flight Management & Guidance Computer) and initialize your flight plan
    a) Press the DATA page button
    b) Select "A/C STATUS" menu
    c) Check that engine type and active navigation database are correct (we will assume that they are).



FMGC SETUP – INIT A

DIFRIP

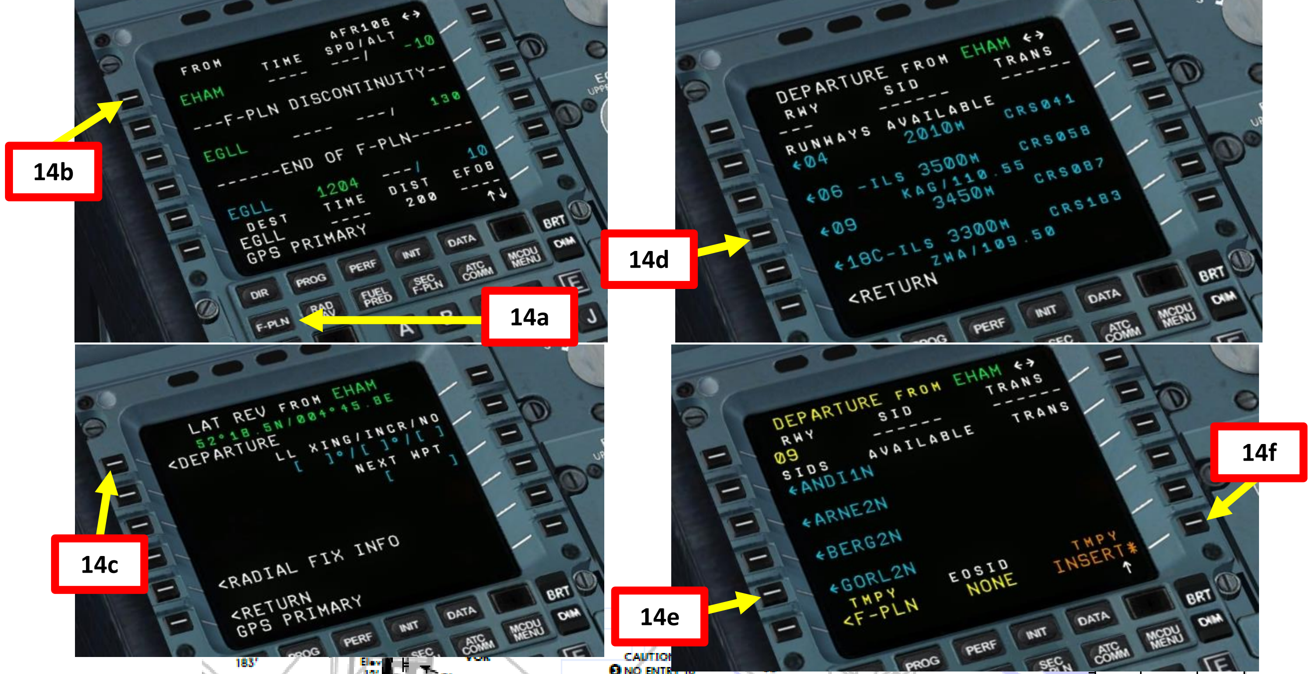
13. Go on FMGC (Flight Management & Guidance Computer) and initialize your flight plan in the INIT A page
    a) Press the INIT page button
    b) Type “EHAM/EGLL” on the MCDU keypad and select LSK next to FROM/TO since we spawned at Schiphol Airport (EHAM) and intend to land at Heathrow (EGLL)
    c) Type “EGKK” (Gatwick Airport) on the MCDU keypad and select LSK next to ALTN/CO RTE (Alternate / Company Route) in order to set an alternate destination (legally required).
    d) Type your flight number (i.e. Flight No. AFR106) on the MCDU keypad and select LSK next to FLR NBR
    e) Type “30” on MCDU keypad and select LSK next to 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)
    f) Set cruising altitude to FL240 (24000 ft) by typing “240” on the MCDU keypad and selecting CRZ FL/TEMP.

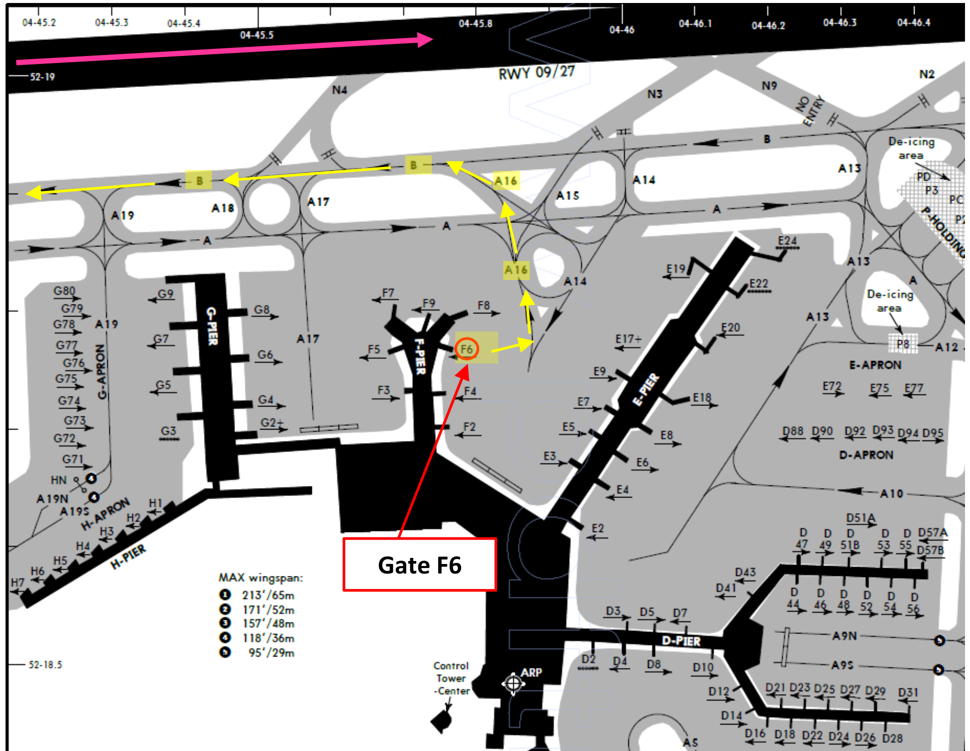


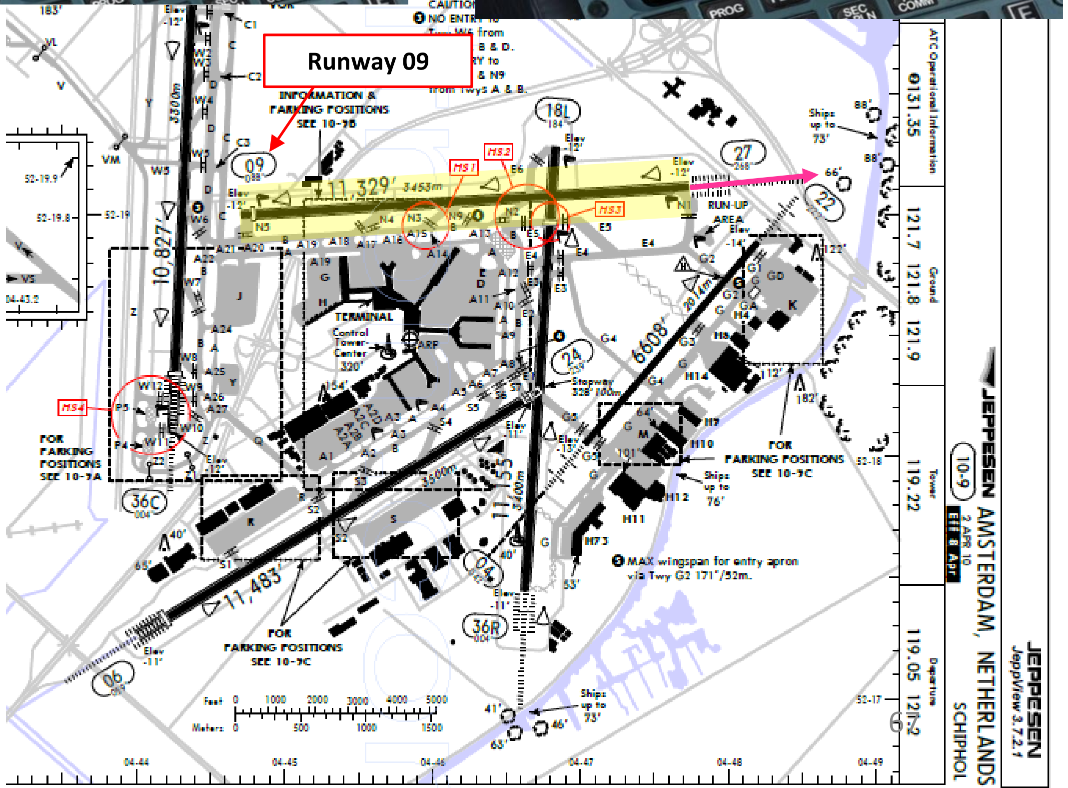
FMGC SETUP – FLIGHT PLAN

DIFRIP

14. Go on FMGC (Flight Management & Guidance Computer) and set flight plan departure and SID
    a) Press the F-PLN page button
    b) Click on the LSK next to EHAM to set Schiphol as your Departure (FROM) airport
    c) Click on the LSK next to the DEPARTURE menu to select your desired departure runway
    d) Click on the LSK next to "09" to select Runway 090 as determined when we generated our flight plan.
    e) Select SID (Standard Instrument Departure) route for GORL2N as determined when we generated our flight plan.
    f) Click on the LSK next to "TMPY INSERT" to insert SID.





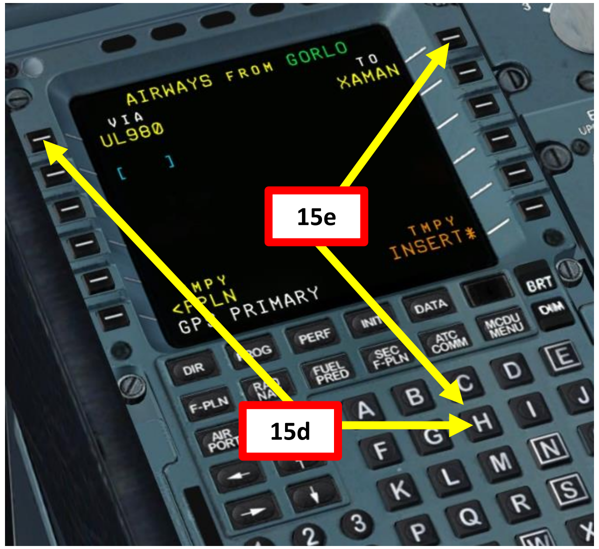


FMGC SETUP – FLIGHT PLAN

DIFRIP

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **XAMAN** L980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

15. Go on FMGC (Flight Management & Guidance Computer) and set flight waypoints and airways
    a) Cycle the list of waypoints towards GORLO using the arrow slew UP key
    b) Select GORLO
    c) Click on AIRWAYS to set up airway followed after GORLO waypoint
    d) Type "UL980" on the MCDU keypad and click on the LSK next to the VIA space on the left column (AIRWAYS) to set your next Airway.
    e) Type "XAMAN" on the MCDU keypad and click on the LSK next to the squared line on the right column (WAYPOINTS) to set your next Waypoint to XAMAN.
    f) Enter remaining Airways and Waypoints as shown in steps d) and e) to complete the flight (L980, LOGAN). See picture to see the final result. We will enter the approach to Heathrow later while in the air.
    g) Click on the LSK next to "TMPY INSERT" to insert flight plan.



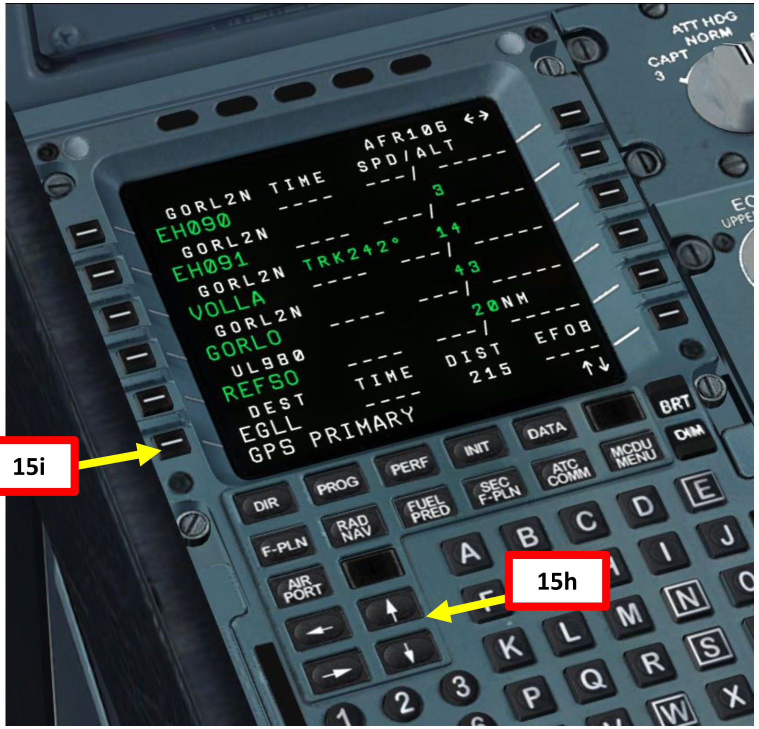
FMGC SETUP – FLIGHT PLAN

DIFRIP

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **XAMAN** L980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

15. Go on FMGC (Flight Management & Guidance Computer) and set flight waypoints and airways
    - h) Cycle the list of waypoints towards the arrival airport EGLL using the arrow slew UP/DOWN keys
    - i) Select EGLL
    - j) Click on ARRIVAL to set up our arrival approach
    - k) Select ILS 27L as our landing runway
    - l) Select STAR (Standard Terminal Arrival Route) for BIG1E as determined when we generated our flight plan.
    - m) Click on the LSK next to “TMPY INSERT” to insert flight plan.

NOTE: by setting the ILS27L runway we will use for our approach via the F-PLN page, the ILS frequency (109.50, course 271) and course are automatically set in the RAD NAV page.



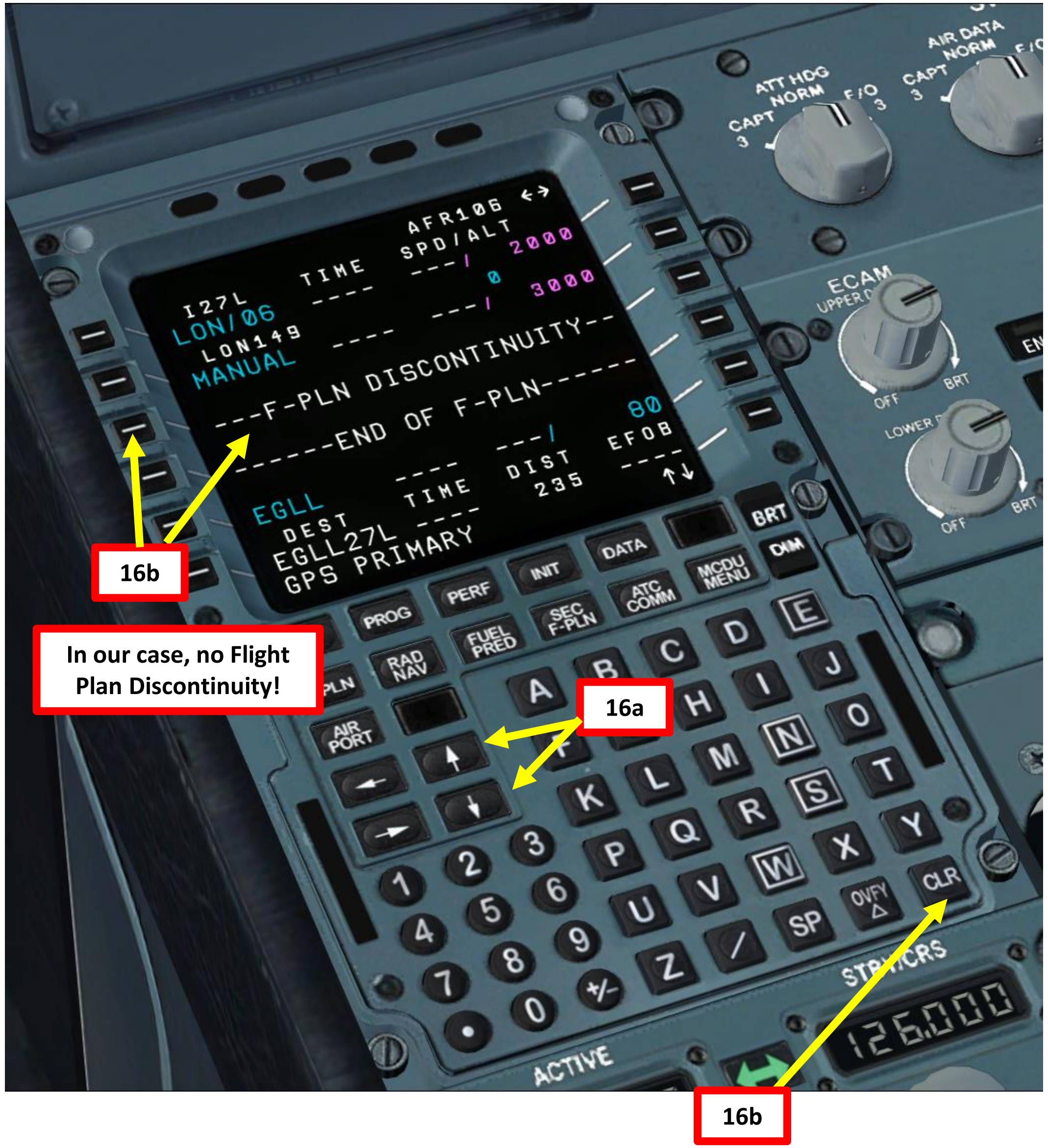
FMGC SETUP – FLIGHT PLAN

DIFRIP

NOTE: Flight Plan = **EHAM** SID **GORLO** UL980 **XAMAN** L980 **LOGAN** STAR **EGLL**
SID: GORL2N STAR: BIG1E

16. Go on FMGC (Flight Management & Guidance Computer) and verify all waypoints and any look for any discontinuity
    a) Cycle the list of waypoints towards the arrival airport EGLL using the arrow slew UP/DOWN keys
    b) If there is a route discontinuity between a waypoint and a SID or STAR, you would need to find the F-PLN DISCONTINUITY section, click CLR on the MCDU keypad and click on the LSK next to the F-PLN DISCONTINUITY line. *This is not the case in this tutorial, so you can skip that step*

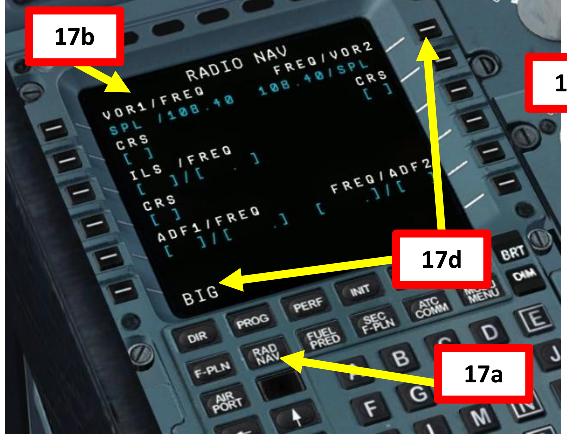
This is what a route discontinuity would look like (between SANDY and ALESO)



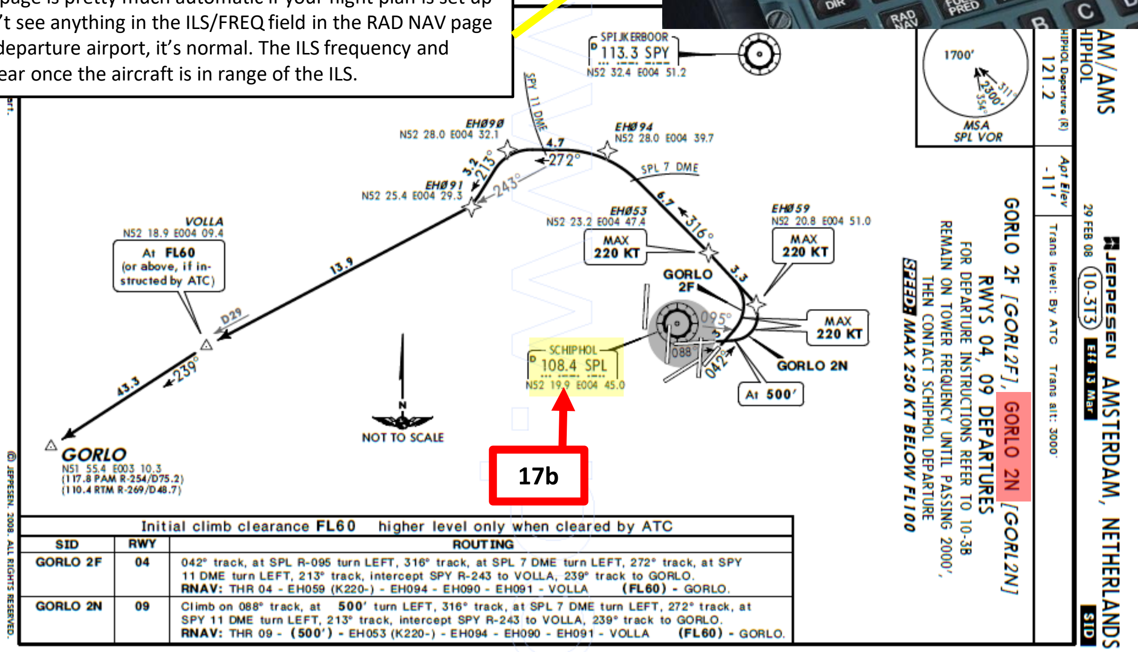
FMGC SETUP – RADIOS

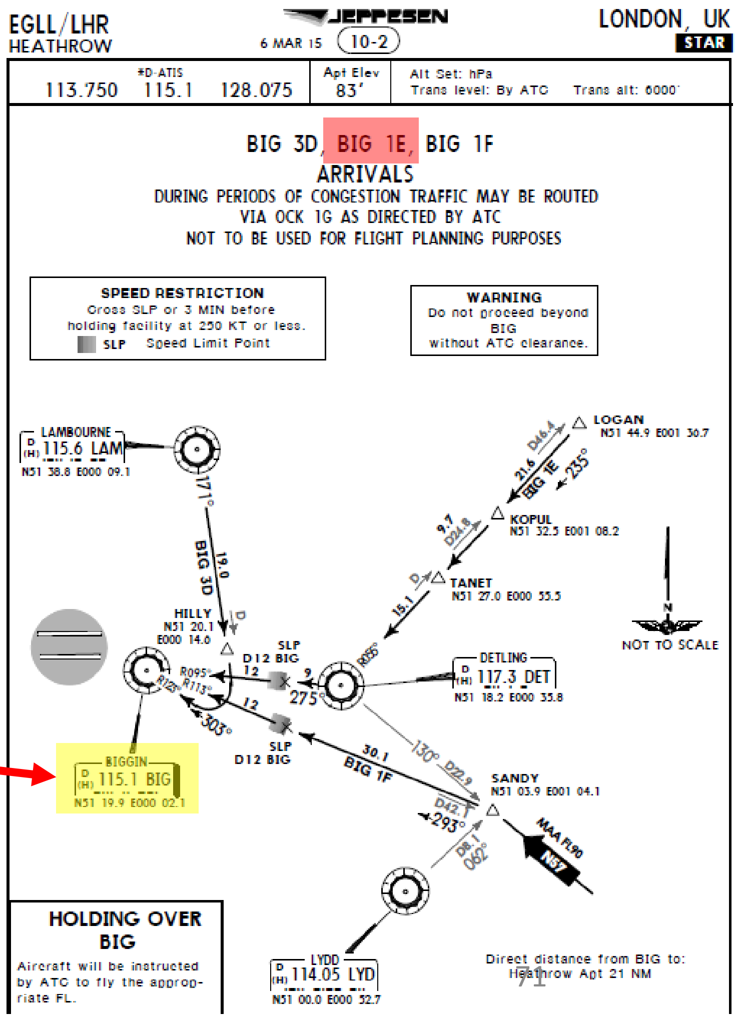
DIFRIP

17. Go on FMGC (Flight Management & Guidance Computer) and verify that radio navigation information is correct.
    a) Press the RAD-NAV page button
    b) VOR1/FREQ is already set automatically to SPL (Schiphol) VOR (VHF Omnidirectional Range) frequency, which is 108.40, as listed on our SID chart.
    c) VOR2/FREQ is also set to SPL. We can leave it as is, or we could set the second one to the BIG VOR in our STAR. The next steps are not obligatory, but we'll do it just for fun.
    d) Type "BIG" on the MCDU keypad and click on the LSK next to VOR2/FREQ to set VOR2 to BIG.
    e) In the list of BIG duplicates, select LSK to set the BIG duplicate that makes the most sense (the one set to a frequency of 115.10 corresponds to the one we have on our BIG 1E STAR chart).
    f) We now have VOR1 set to SPL (Schiphol) VOR and VOR2 set to BIG (Biggin) VOR. Ta-dah! Keep in mind that we set them up to use as backups only.



Note: The RAD NAV page is pretty much automatic if your flight plan is set up correctly. If you don't see anything in the ILS/FREQ field in the RAD NAV page when you're at the departure airport, it's normal. The ILS frequency and course will only appear once the aircraft is in range of the ILS.



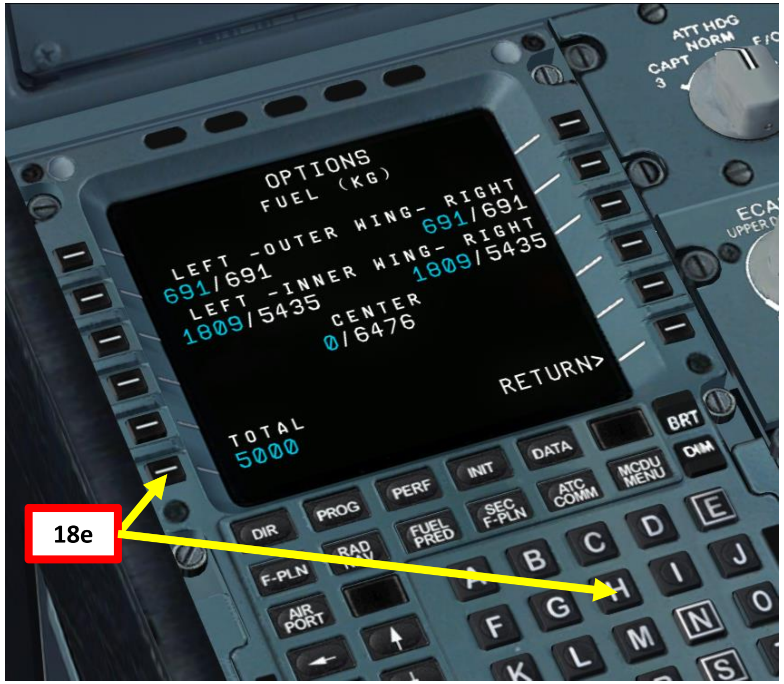


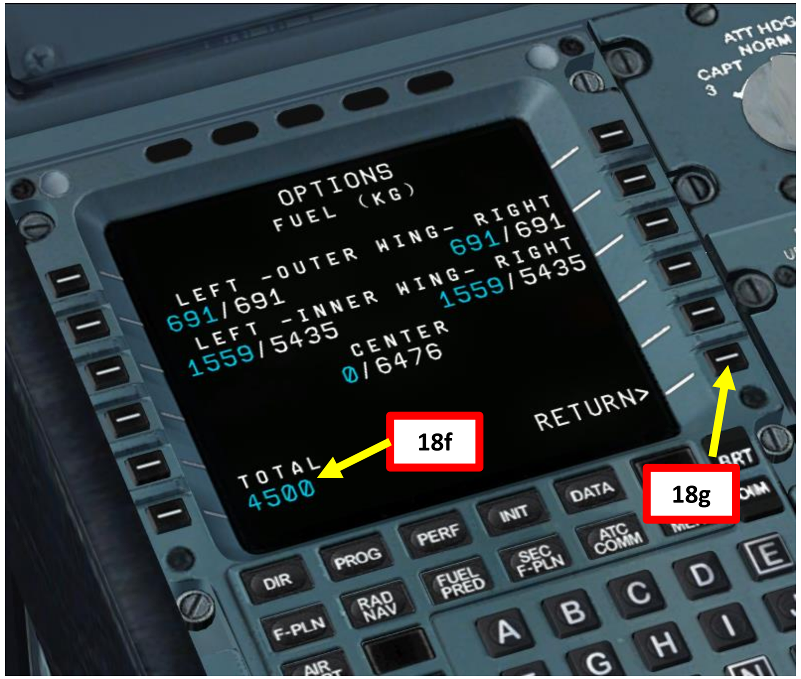
FMGC SETUP – INIT B (SET FUEL)

DIFRIP

NOTE: Remember our fuel calculations of earlier:
Reserve Fuel = **2500 kg**
Total (Block) Fuel = Fuel for Flight + Reserve Fuel = **4500 kg**

18. Go to MCDU Main Menu and set fuel payload
    a) Click on MCDU MENU
    b) Select OPTIONS
    c) Select FUEL
    d) Type “4500” on the MCDU keypad (since we need 4500 kgs)
    e) Click on “TOTAL” menu to set fuel payload
    f) Ta-dah! The aircraft fuel load is now properly set in the sim instead of having to go through the FSX main menu
    g) Click on the LSK next to “RETURN” to return to the OPTIONS menu
    h) Select PAYLOAD
    i) **<u>Write down the ZFW (Zero Fuel Weight) value and ZFW CG (center of gravity), which are 57.0</u>** (57.0 tons, which is 57,000 kg, or 114,000 lbs) **<u>and 27.3 %</u>**.





FMGC SETUP – INIT B

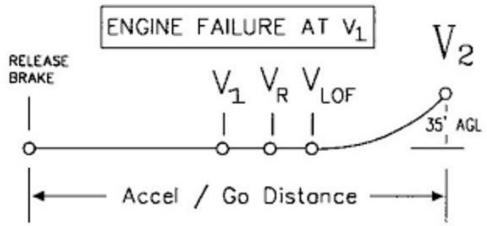
DIFRIP

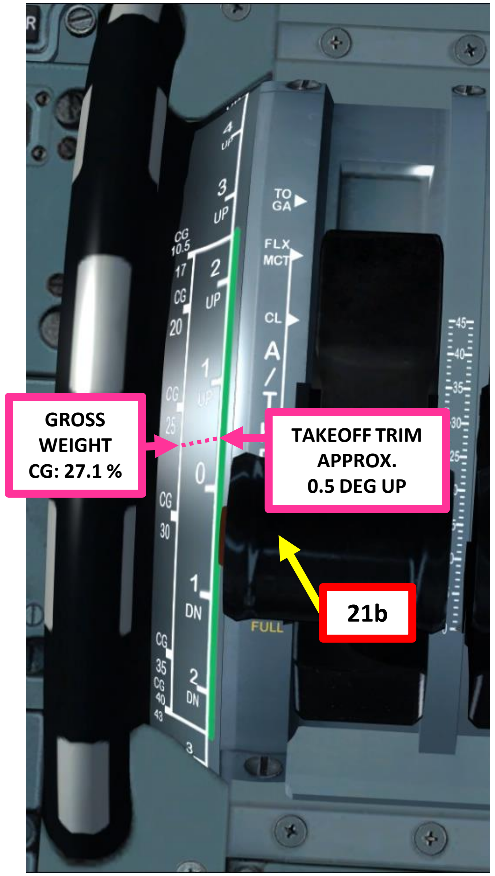
19. Go on FMGC (Flight Management & Guidance Computer) and initialize your Zero Fuel Weight, CG and Fuel parameters
    a) Press the INIT page button and click on the arrow slew RIGHT key to access the INIT B page
    b) On the MCDU keypad, type “57.0/27.3” and click on the LSK next to ZFW/ZFWCG to enter the zero fuel weight (57.0 tons) and the zero fuel weight center of gravity (27.3 %) determined in the previous page with the PAYLOAD page in the OPTIONS menu.
    c) On the MCDU keypad, type “4.5” on MCDU keypad and click on the LSK next to BLOCK to enter the total fuel quantity (Block) required for the flight determined by Fuel Planner tool (4.5 tons of fuel, or 4500 kg)
    d) And there you have it, your fuel predictions are now initialized.

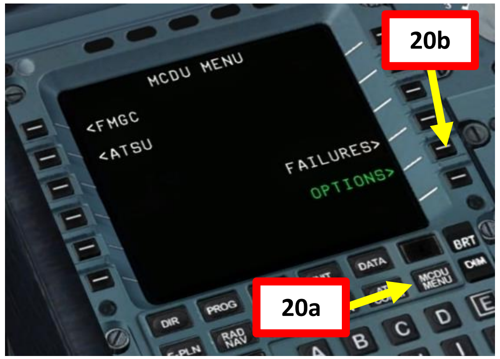
FMGC SETUP – PERFORMANCE

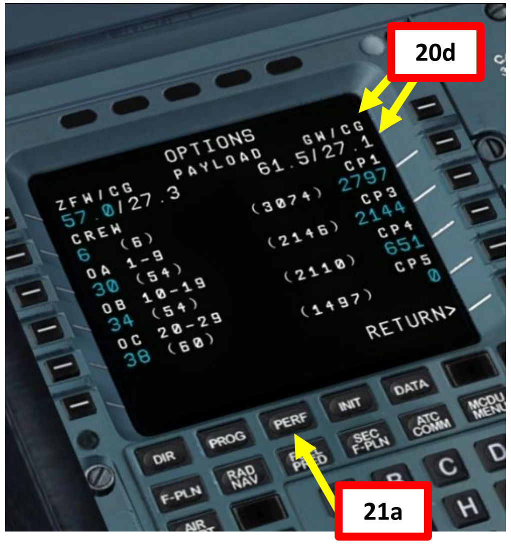
DIFRIP

20. Go to MCDU Main Menu and find out gross weight in order to set takeoff trim setting
    a) Click on MCDU MENU
    b) Select OPTIONS
    c) Select PAYLOAD
    d) <u>Write down the GW CG (Gross Weight Center of Gravity) value, which is 27.1%</u>
21. Go on FMGC (Flight Management & Guidance Computer) and set performance parameters
    a) Press the PERF page button
    b) Check TAKEOFF TRIM scale on the throttle using the GWCG found earlier (27.1 %). We obtain a takeoff trim of approx. 0.5 deg UP.
    c) Type “1/UP0.5” on MCDU keypad and select LSK next to “FLAPS/THS” to set takeoff flaps to 1 degree with a takeoff horizontal stabilizer trim of 0.5 degrees nose up.
    d) Click twice on the LSKs next to V1, VR and V2 to automatically calculate and enter your V speeds.
    e) Observe the resulting V1, VR and V2 speeds resulting of this flap setting and current aircraft weight: **<u>V1</u>** 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), **<u>VR</u>** is the rotation speed (airspeed at which the pilot initiates rotation to obtain the scheduled takeoff performance), and **<u>V2</u>** is Takeoff Safety Speed (minimum safe airspeed in the second segment of a climb following an engine failure at 35 ft AGL).









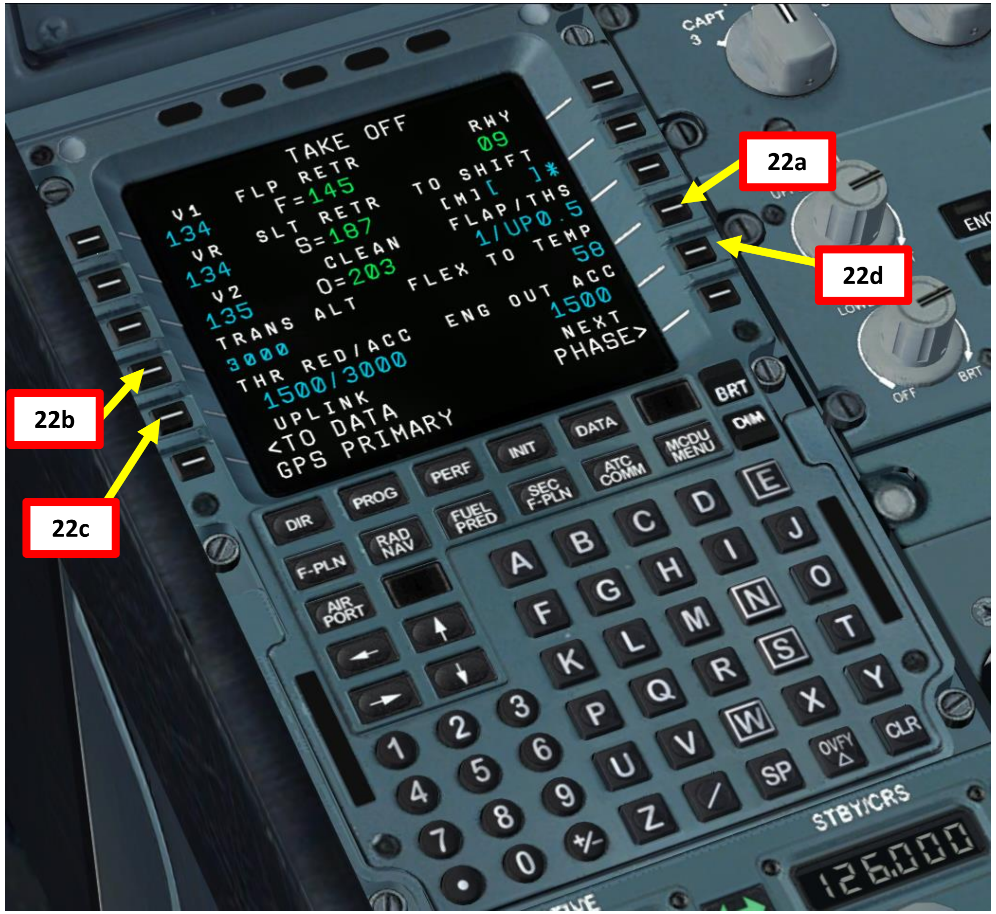
V1 Speed is 134 kts
VR Speed is 134 kts
V2 Speed is 135 kts

FMGC SETUP – PERFORMANCE

DIFRIP

22. Go on FMGC (Flight Management & Guidance Computer) and set remaining performance parameters (FLEX TO TEMP)
    a) Type "58" on MCDU keypad and click on the LSK next to "FLEX TO TEMP" to set your FLEX temperature in order to limit your engines' thrust to 58 degrees C.
    b) Verify that the TRANS ALT (transition altitude) is set to 3,000 ft (transition altitude would be 18,000 ft in North America, and 3,000 ft in Europe). Correct it if necessary.
    c) Type "1500/3000" on the MCDU keypad and click on the LSK next to THR RED/ACC (Thrust Reduction/Acceleration Height) to set valid Thrust Reduction (1500 ft) and Acceleration (3000 ft) Heights in ft.
    d) Type "1500" on the MCDU keypad and click on the LSK next to ENG OUT ACC (Engine Out Acceleration Height)

NOTE: THR RED/ACC and ENG OUT ACC Values are automatically generated. You could leave them as is if you wanted to.



A FLEX takeoff, or "flexible temperature" takeoff is a fancy way of saying that the engine is de-rated during takeoff. 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.

"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. Therefore, the "FLEX TO TEMP" field of 58 deg C in the PERF page is the pilot telling the engine to behave as if the outside air temperature was 58 deg C, which will result in less thrust, less noise, and less fuel consumption.

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".

FMGC SETUP – PERFORMANCE

DIFRIP

NOTE:

The Thrust Reduction and Engine Out Acceleration Heights are automatically generated, but can be modified. These heights may seem like plugging random numbers in a computer at first, but there is a valid reason for that. Special heights for Thrust Reduction/Acceleration Height, and OEI Acceleration more often than not are dependent on whether there is a NAP (Noise Abatement Procedure), or if there are some company SOP (Standard Operating Procedure) for other factors like terrain clearance. You can consult Jeppesen charts to see what these Noise Abatement procedures are for a particular airport. If no particular procedures are listed, you can follow the standard procedures in the following document:
ICAO Document 8168, Vol 1, Section 7 - Noise Abatement Procedures
Link: http://www.chcheli.com/sites/default/files/icao_doc_8168_vol_1.pdf

Like I said before, the main wear on engines, especially turbine engines, is heat. If you reduce heat, the engine will have greater longevity. This is why takeoff power is often time limited and a height established that thrust is reduced. The difference between takeoff thrust and climb thrust may only be a few percent, but the lowering of EGT (Exhaust Gas Temperature) reduces heat and extends engine life significantly. Acceleration Height is the altitude above ground level (AGL) that a pilot accelerates the aircraft by reducing the aircraft's pitch, to allow acceleration to a speed safe enough to raise flaps and slats, and then reach the desired climb speed. The thrust reduction height is where the transition from takeoff to climb thrust takes place.

Acceleration Height (3,000 ft in our case) is when the nose is to be lowered to allow the aircraft to accelerate. When the aircraft starts accelerating is when the flight crew will retract flaps as per the schedule. Our value was taken directly from the Jeppesen document.

Thrust Reduction Height (1,500 ft in our case) is when the autothrottle will decrease the engine power to the preselected climb thrust; thereby reducing engine wear and tear. Both may occur simultaneously or at differing heights above ground level. Both can be configured in the CDU. Our value was taken directly from the Jeppesen document. If no such value was specified, then we'd have to use 800 ft as the minimal value as per the ICAO document.

EO ACCEL HT (1,500 ft in our case) is is the safe altitude that you can lower the nose and start accelerating the aircraft in the event of an engine failure. It is based mainly on company SOP or a prescribed procedure (EO SID, as an example), which, unless someone gave you one, you wouldn't know what the SOP value is. For the purposes of the sim, you can just leave it at 1,500 ft. Some UK pilots add the airport elevation to this value.

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Notice: After 17 Jun 2011 0901Z, this chart may no longer be valid. Disc 11-2011
JEPPESEN
JeppView 3.7.2.1

EHAM/AMS
SCHIPHOL
JEPPESEN 23 APR 10 10-1P14 Eff 6 May
AMSTERDAM, NETHERLANDS
AIRPORT BRIEFING

3.3. NOISE ABATEMENT PROCEDURES

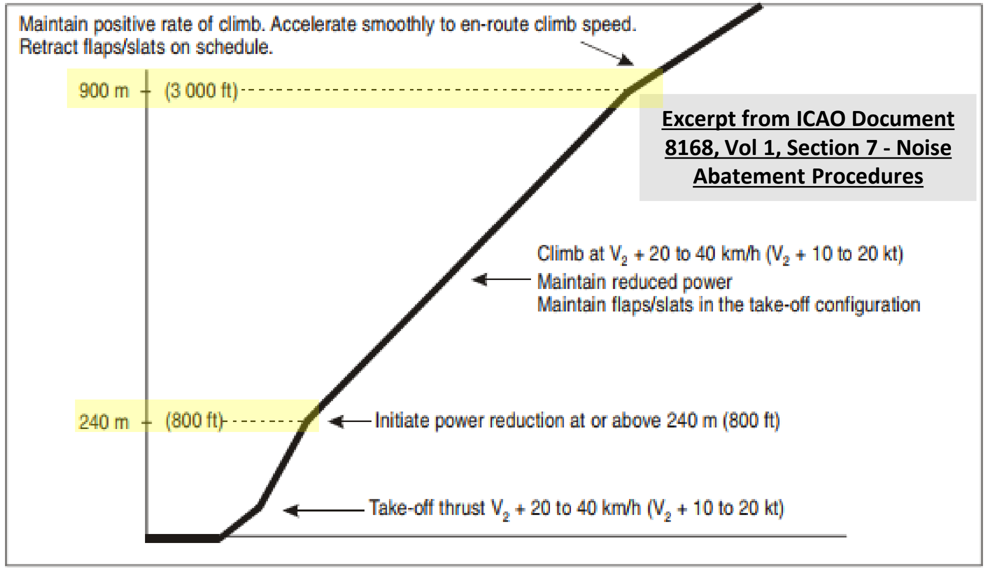
3.3.1. GENERAL

The Standard Instrument Departure routes as shown on Amsterdam SID charts avoid residential areas as much as possible and must be considered as minimum noise routes.

Take-off and climb procedure (jet ACFT only):

Take-off to 1500'	Take-off power Speed at V_2 + 10 KT to 20 KT (or as limited by body angle) Flaps - set as appropriate
1500' - 3000'	Climb power Speed at V_2 + 10 KT to 20 KT Flaps maintain previous setting
After passing 3000'	Retract flaps on schedule and assume normal enroute climb.
3000' - FL 100	MAX 250 KT

Operators/ACFT types unable to comply with the mentioned take-off procedure are requested to inform the APT authority by sending copies of the take-off procedure in use to: Amsterdam Airport Schiphol, Dep. of Capacity Management, P.O. Box 7501, 1118 ZG Schiphol Airport; Fax: +31 (0)20 601 3567.



Excerpt from ICAO Document 8168, Vol 1, Section 7 - Noise Abatement Procedures

Figure I-7-3-App-1. Noise abatement take-off climb — Example of a procedure alleviating noise close to the aerodrome (NADP 1)

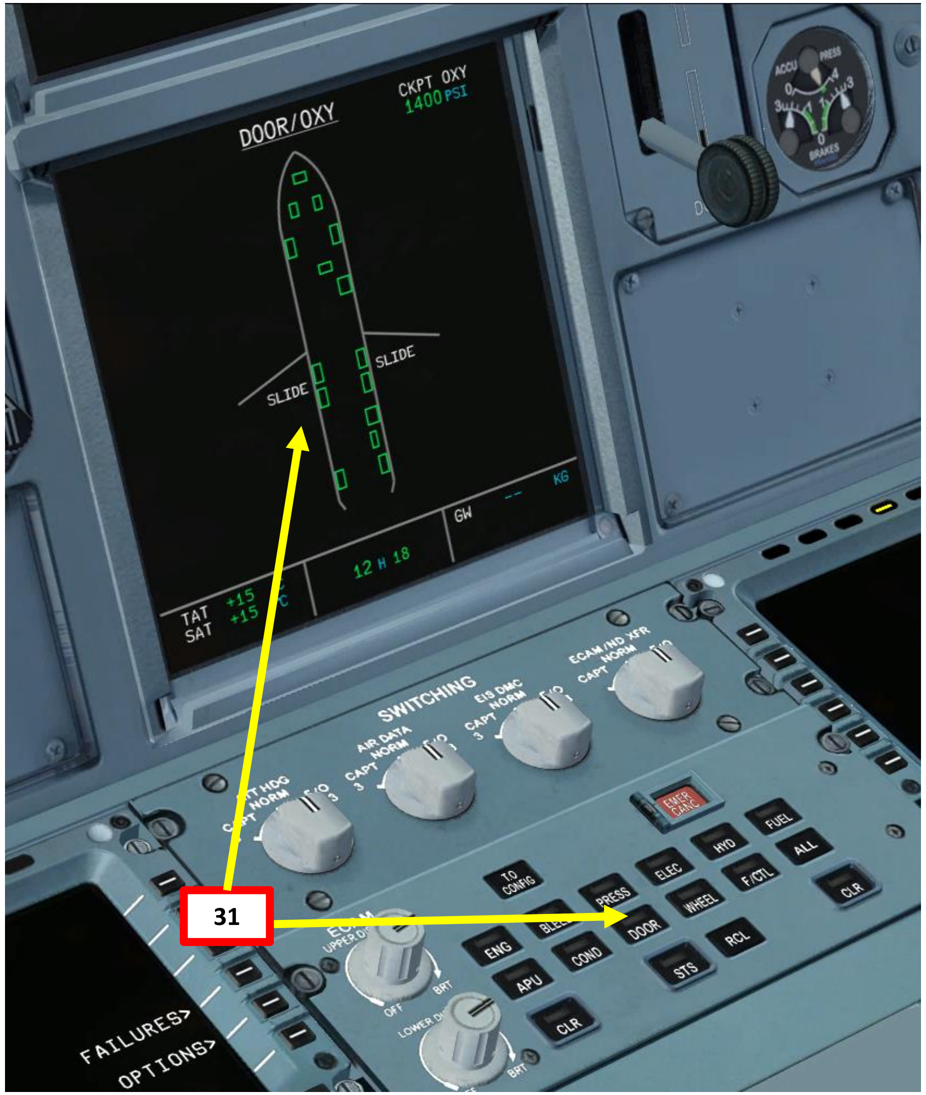
AUTOPILOT SETUP

23. Set QNH mode to desired unit system (hPa in our case)
24. Set both FD (Flight Director) switches ON (illuminated)
25. Set ND (Navigation Display) mode to NAV
26. Set ND range scale to 10 nm
27. Set all ADF/VOR switches to VOR
28. Set FCU (Flight Control Unit) mode to HDG V/S
29. As per EHAM SID Chart, set Initial Altitude (FL060, or 6,000 ft) on FCU panel by rotating ALTITUDE knob on glareshield until Altitude is set to 6,000 ft)

Flight Plan on ND
(Navigation Display)

CABIN PRESSURE & DOORS SETUP

30. On overhead panel, make sure that CREW SUPPLY and PASSENGER oxygen switches are ON (dark)
31. Verify that all doors are closed by monitoring the DOOR SD (System Description) page
32. If any door is still open, go in MCDU MENU -> OPTIONS -> DOORS and shut remaining doors.



ENGINE START-UP

APU AUXILIARY POWER UNIT → APU GENERATOR

APU AUXILIARY POWER UNIT → APU BLEED AIR

GROUND POWER CART → EXTERNAL POWER

AIR PRESSURE CART → EXTERNAL AIR

ENGINE (RUNNING) → ENGINE GENERATOR (ENGINE CROSS-START)

ENGINE (RUNNING) → ENGINE BLEED (ENGINE CROSS-START)

ENGINE MASTER SWITCH & THROTTLE POSITION → MASTER SWITCH ON & THROTTLE AT IDLE
FUEL STARTER VALVE CONTROLS FUEL FLOW
CONTROLLED BY FADEC

ENGINE SELECTION SWITCH → SELECTION SWITCH – IGNITION START
IGNITION CONTROLLED BY FADEC

FUEL → ENGINE START

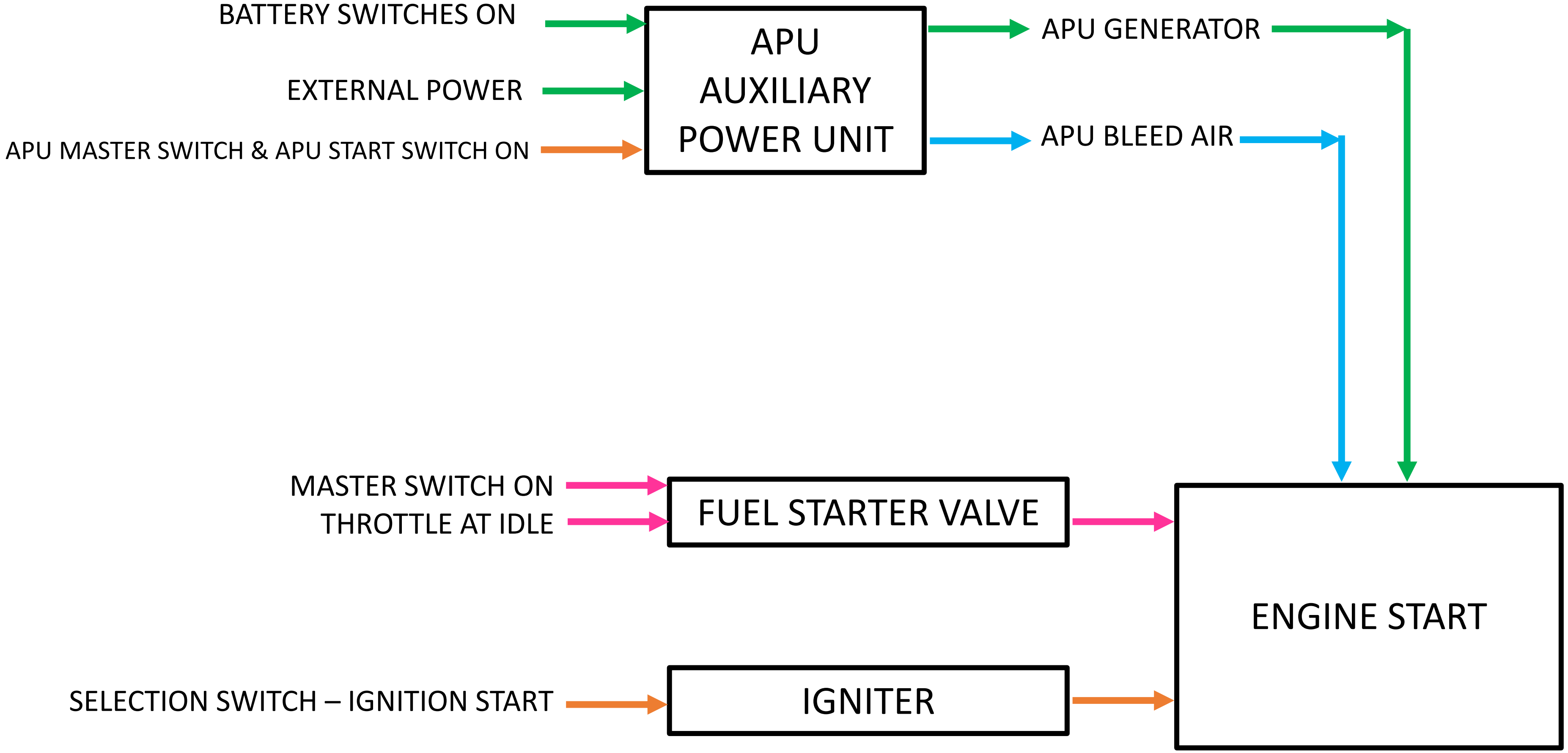
IGNITION → ENGINE START

ELECTRICAL POWER → ENGINE START

AIR PRESSURE → ENGINE START

ENGINE START-UP

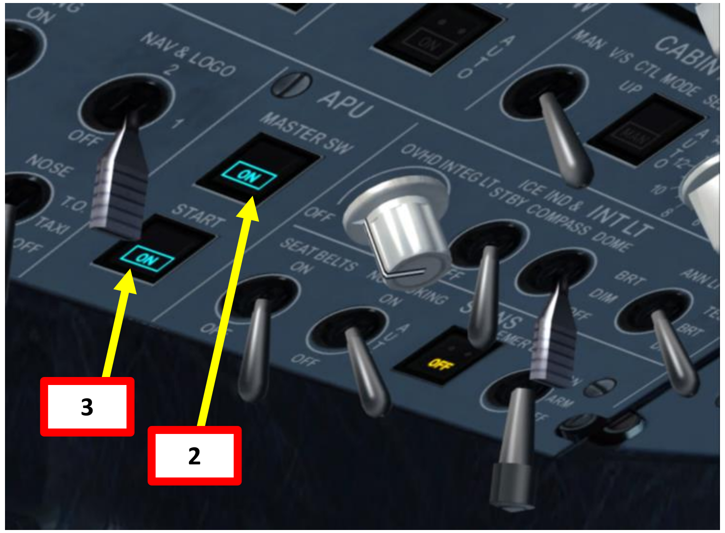
NOTE: It is usually common practice to start your engines during pushback. We will start our engines before that for simplicity.

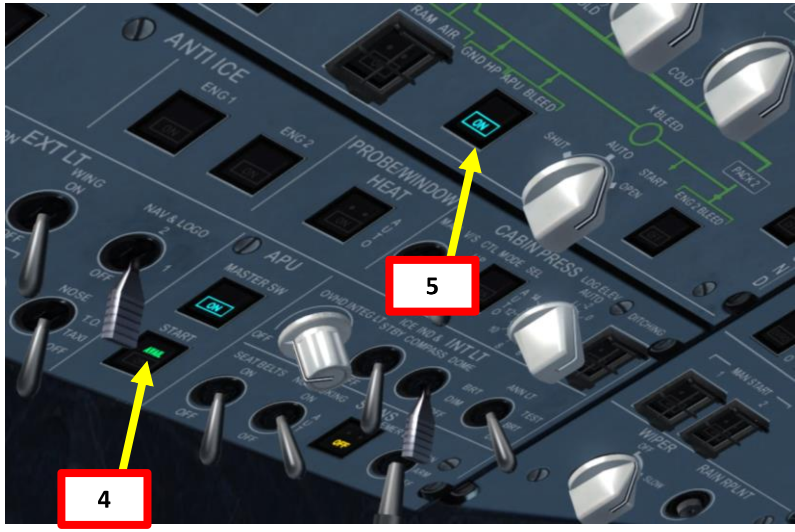


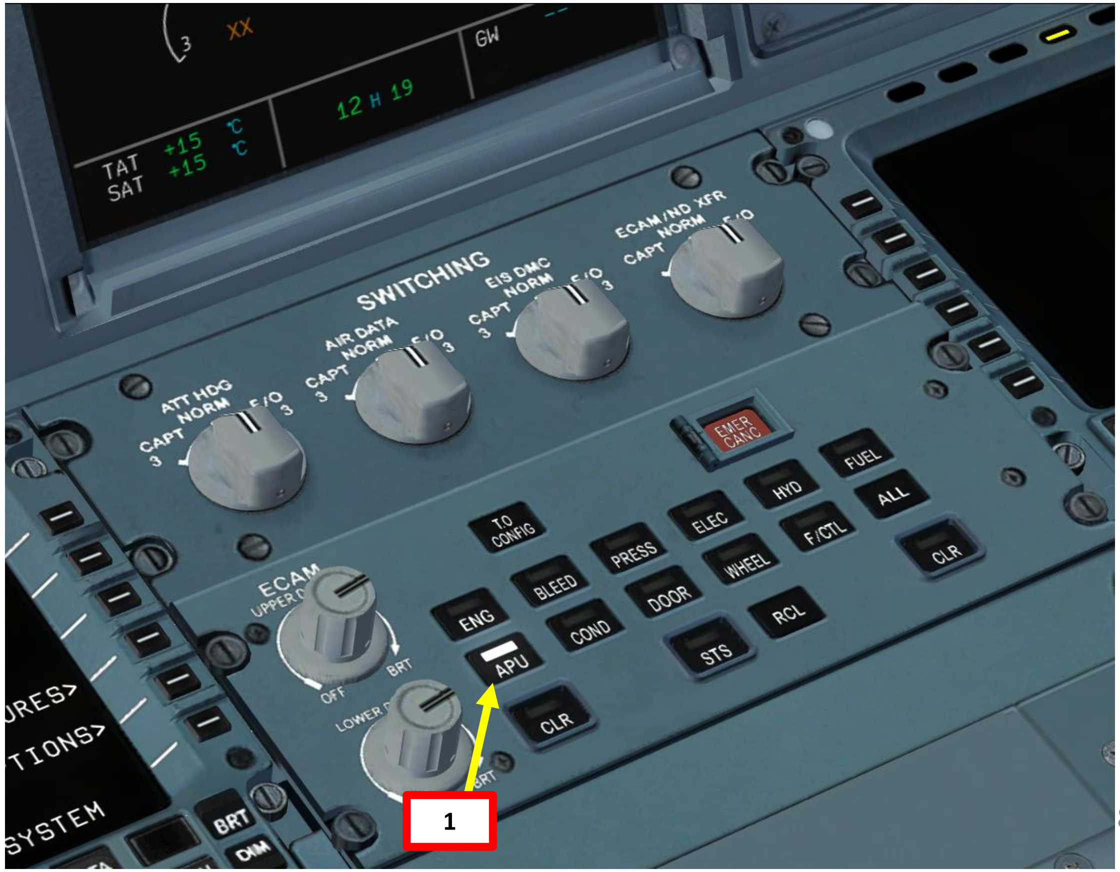
ENGINE START-UP

1. On the Pedestal, select APU (Auxiliary Power Unit) SD page to monitor APU parameters.
2. On Overhead Panel, press on the APU MASTER SW pushbutton
3. When APU MASTER SW light is ON, press the APU START pushbutton to start the APU.
4. Once APU start cycle is finished, the APU AVAIL light will illuminate.
5. Press the APU BLEED pushbutton

Note: You do not need to press the APU GEN pushbutton since it is active by default.



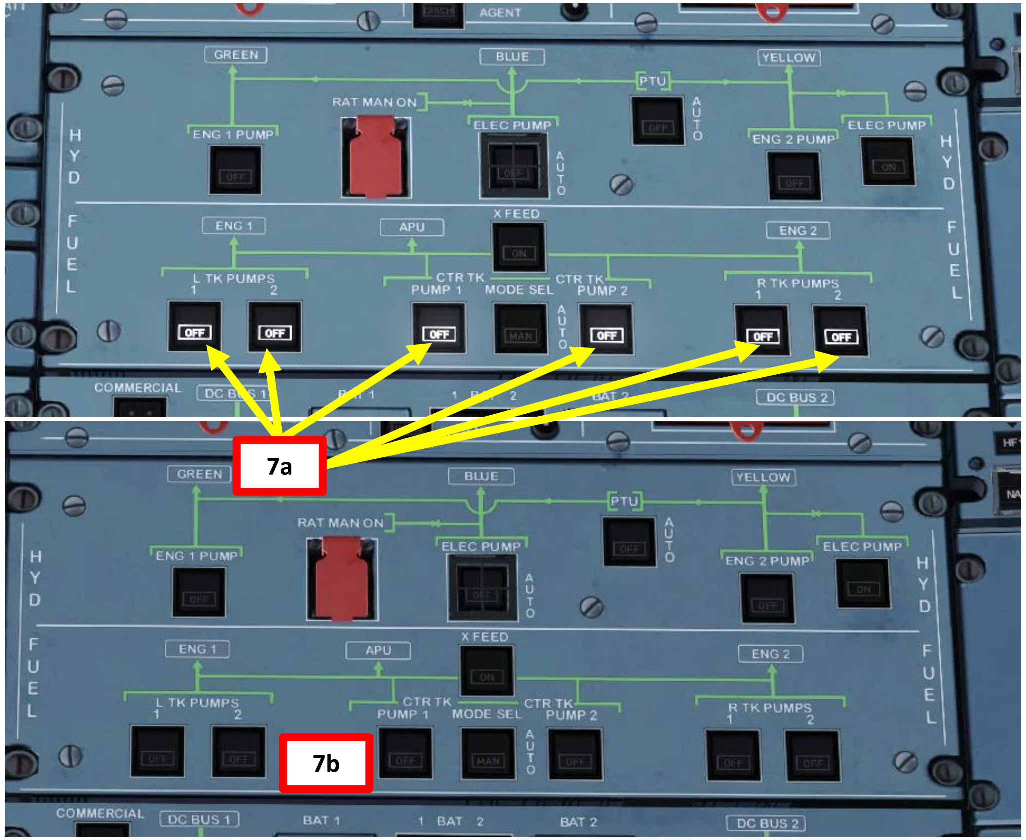


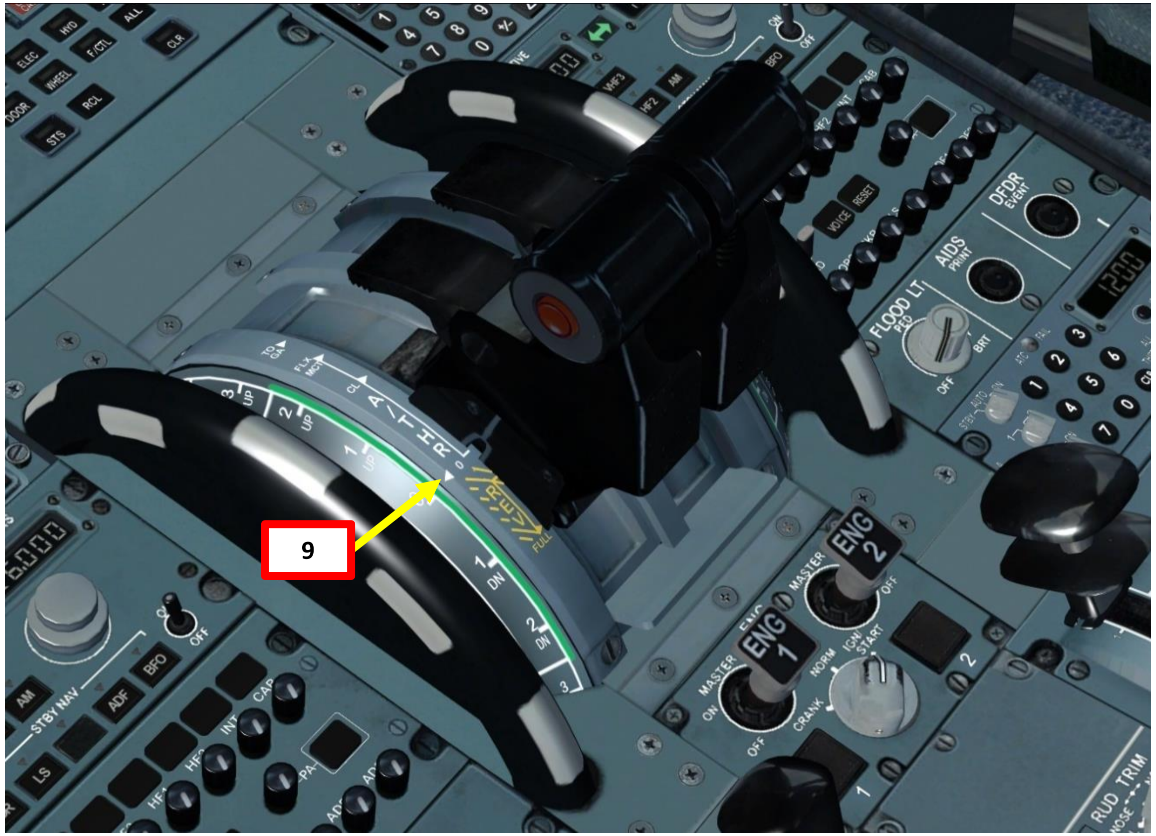


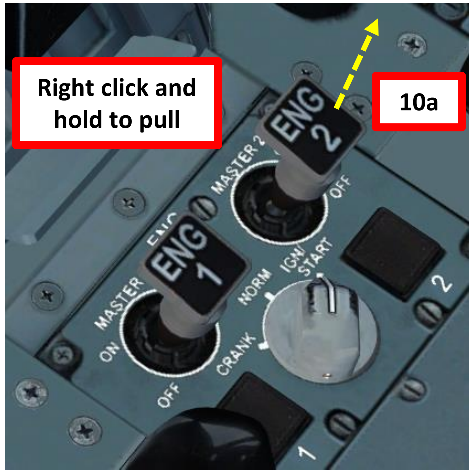
ENGINE START-UP

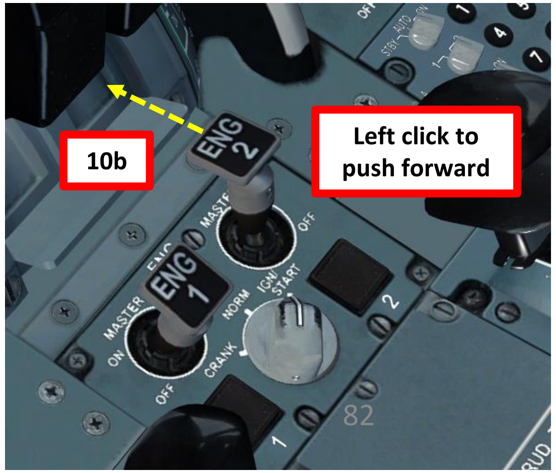
6. On the Pedestal, select the ENG SD page to monitor engine parameters.
7. Press all fuel pump pushbuttons to extinguish the OFF lights
8. Set Engine Selection switch to IGN START
9. Make sure throttle is set to IDLE.
10. Right click and hold on ENG 2 Master Switch to pull it, then left click to push it forward. Engine 2 (right engine) will then start.

Note: You do not need to press the GEN 2 pushbutton since it is active by default.



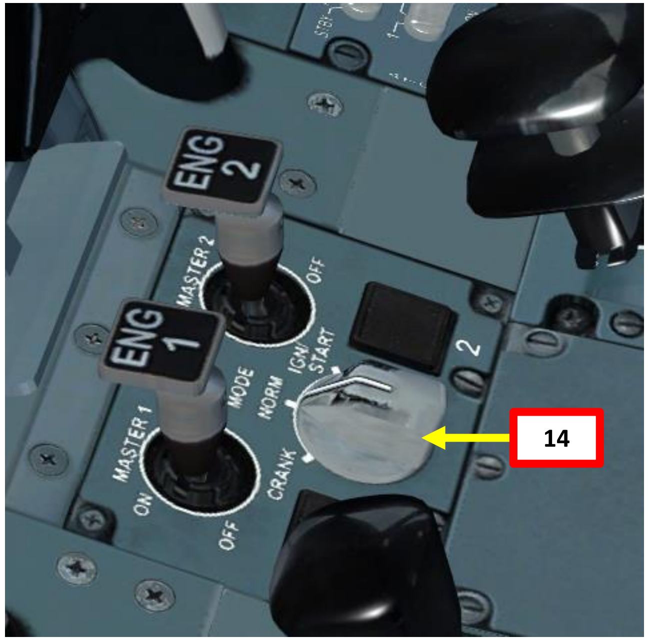






ENGINE START-UP

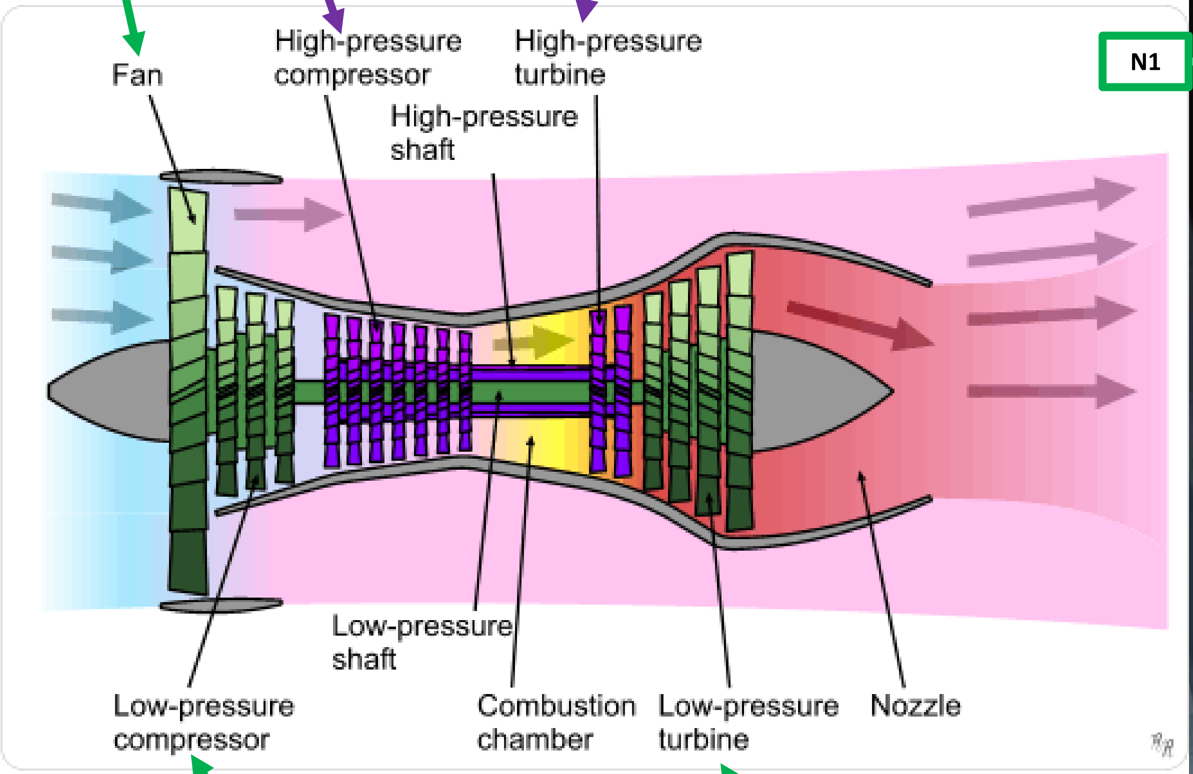
11. Engine 2 will reach IDLE once N2 reaches approx. 59 % and N1 reaches 18 %.
12. Right click and hold on ENG 1 Master Switch to pull it, then left click to push it forward. Engine 1 (left engine) will then start
13. Engine 1 will reach IDLE once N2 reaches approx. 59 % and N1 reaches 18 %.
14. Set the Engine Selection switch to NORM



ENGINE START-UP

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

N1 N2 N2



N1 N1

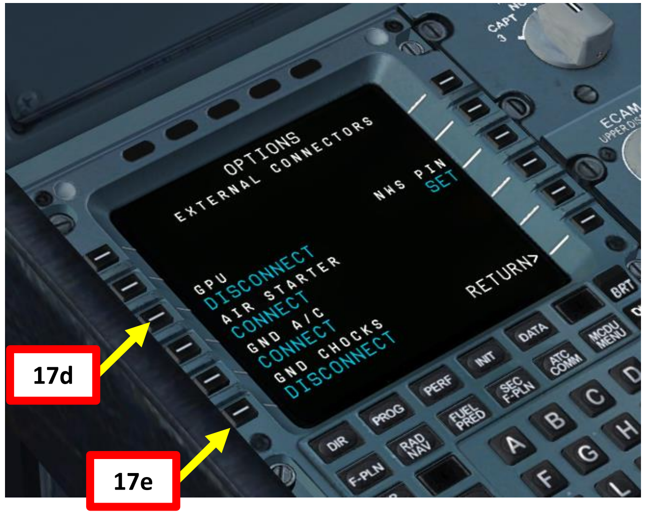
N1

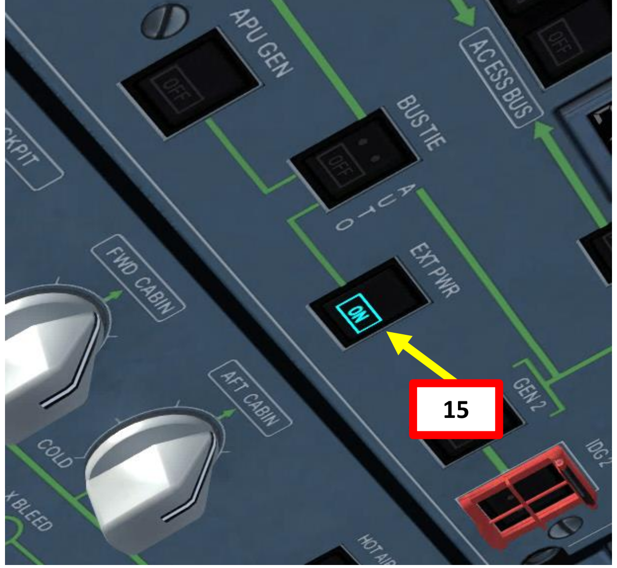
N2

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

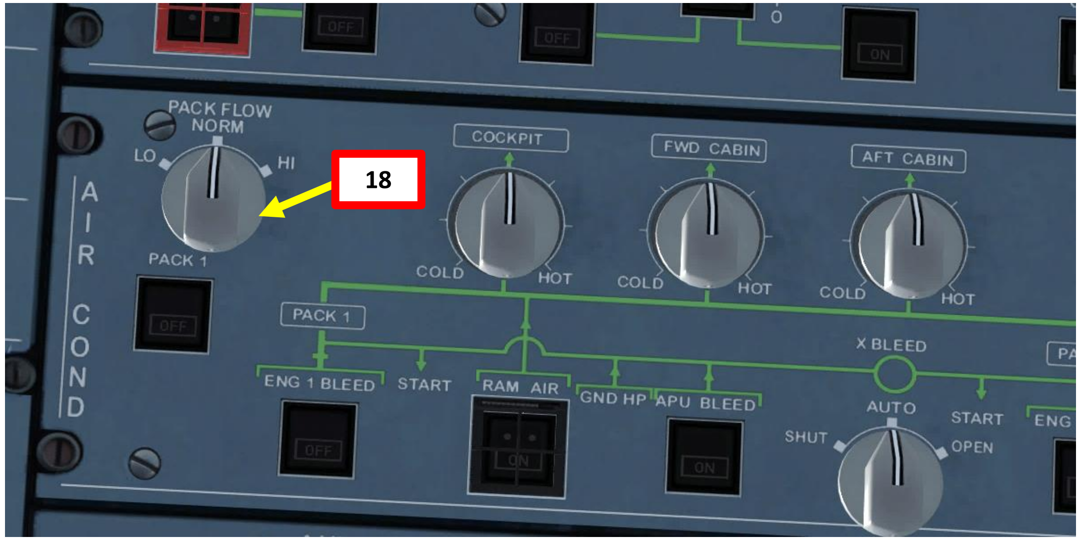
15. Press the "EXT PWR" switch to turn off ground power
16. On Overhead panel, confirm that the "EXT PWR" indication changes from "ON" to "AVAIL"
17. Disconnect ground power cart and remove chocks via the MCDU
    a) Select OPTIONS menu
    b) Select "EXT CTRLS" (External Controls) menu
    c) Make sure the GPU (Ground Power Unit) and GND CHOCKS all display "CONNECT", which means that they are currently all connected.
    d) Click on the "GPU - DISCONNECT" LSK to remove ground power. The MCDU will then display "GPU – CONNECT".
    e) Click on the "GND CHOCKS - DISCONNECT" LSK to remove chocks. The MCDU will then display "GND CHOCKS – CONNECT".
    f) Return to main MCDU MENU

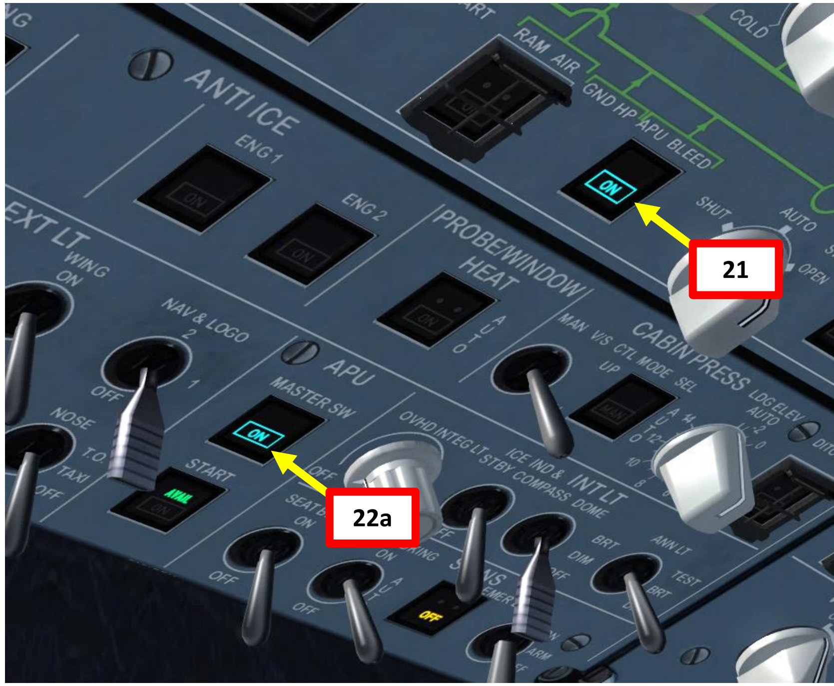




ENGINE START-UP

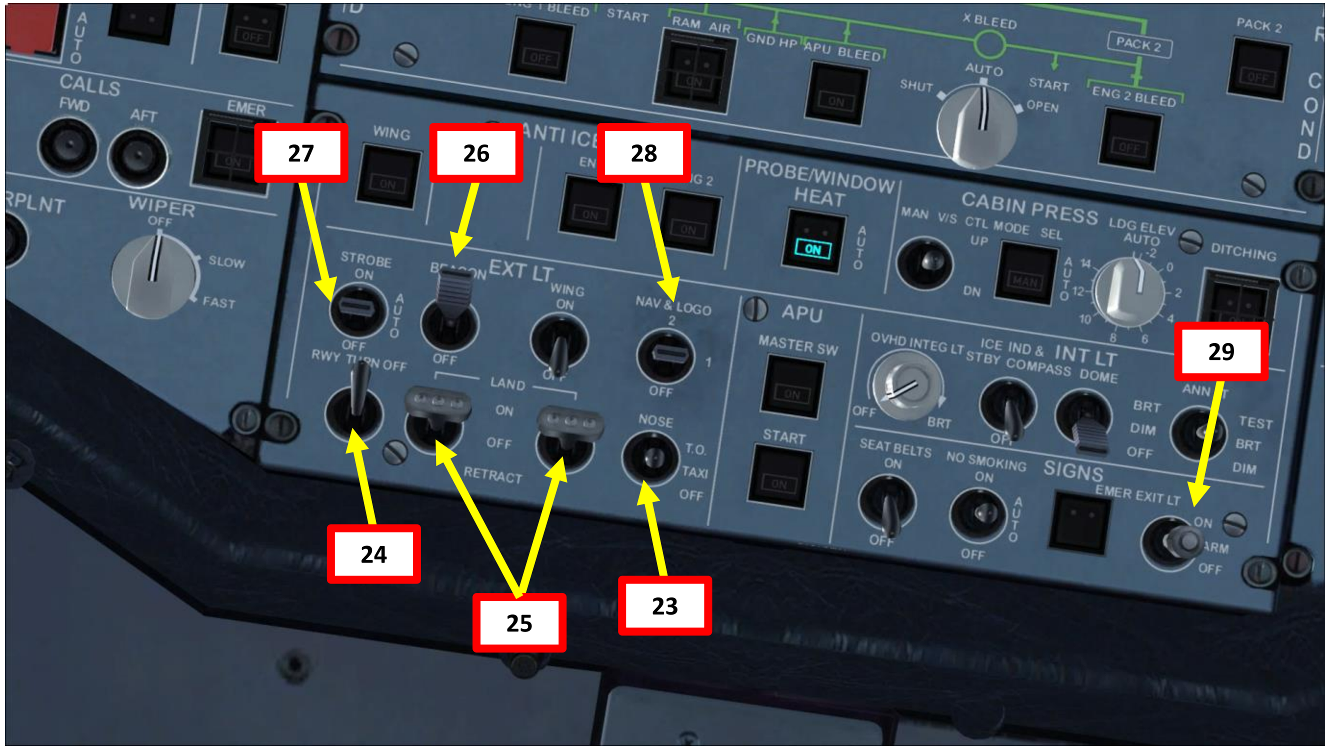
18. PACK FLOW (Pneumatic Air Conditioning Kit) switch – NORMAL
19. Probe/Window Heat Control pushbutton – ON
20. Engine Anti-Ice / Wing Anti-Ice pushbuttons – As Required
21. APU BLEED switch – OFF
22. APU Master switch – OFF

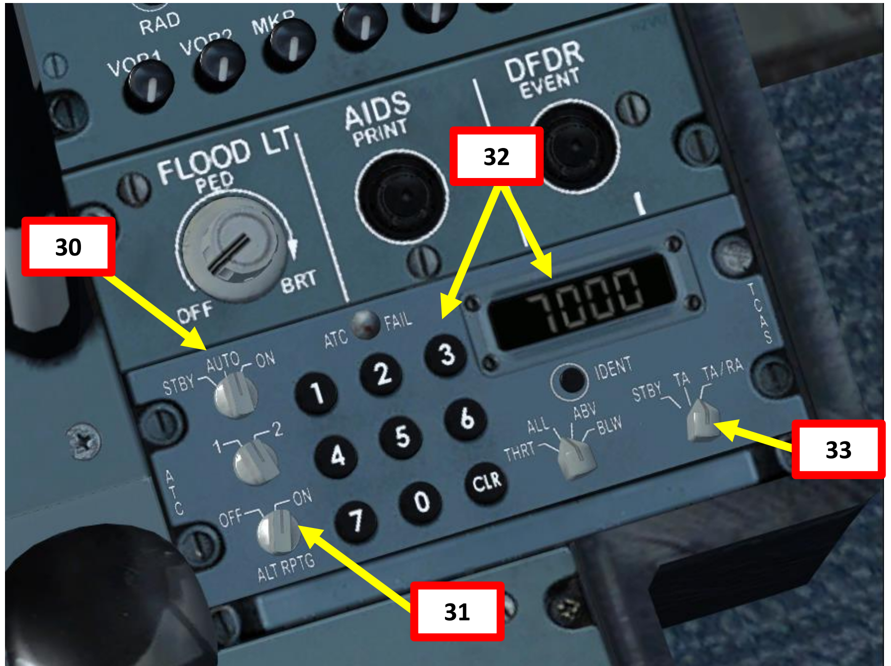


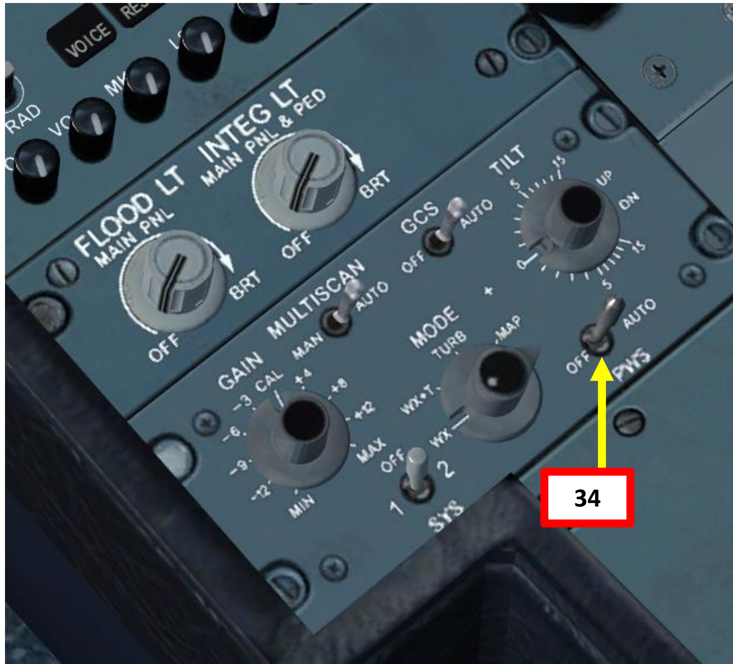


COMPLETE PRE-FLIGHT

23. Set Nose Light switch – TAXI
24. Set Runway Turnoff Lights switch – ON
25. Set Landing Light switches – ON
26. Set Beacon Anti-Collision Light switch – ON
27. Set Strobe Position Lights switch – ON
28. Set Navigation & Logo Lights switch – 1 (lights set 1 ON)
29. Set Signs – Emergency Lights switch - ON
30. Set Transponder switch – AUTO
31. Set Transponder ALT RPTG (Altitude Reporting) switch – ON
32. Set Transponder frequency to 7000 (VFR standard squawk code for most of European airspace, or 1200 if in North America) by pressing CLR on the keypad and then 7000
33. Set TCAS (Traffic Collision and Avoidance System) selector to TA/RA (Traffic Advisory/Resolution Advisory) using right-click.
34. On Weather Radar panel, set PWS (Predictive Windshear System) switch to AUTO

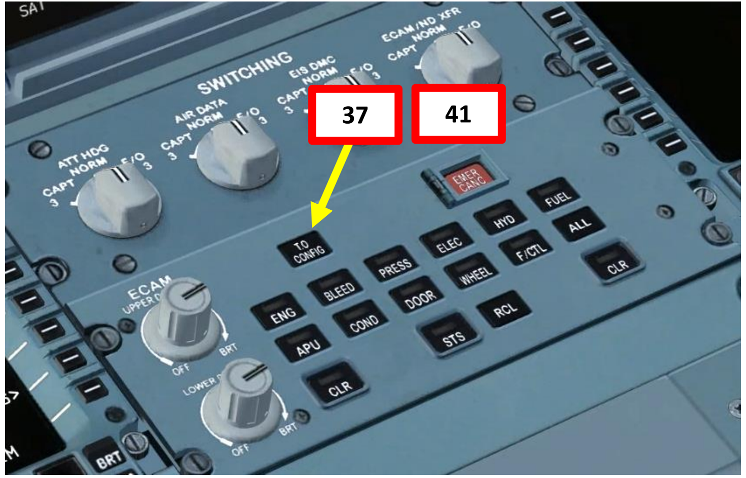


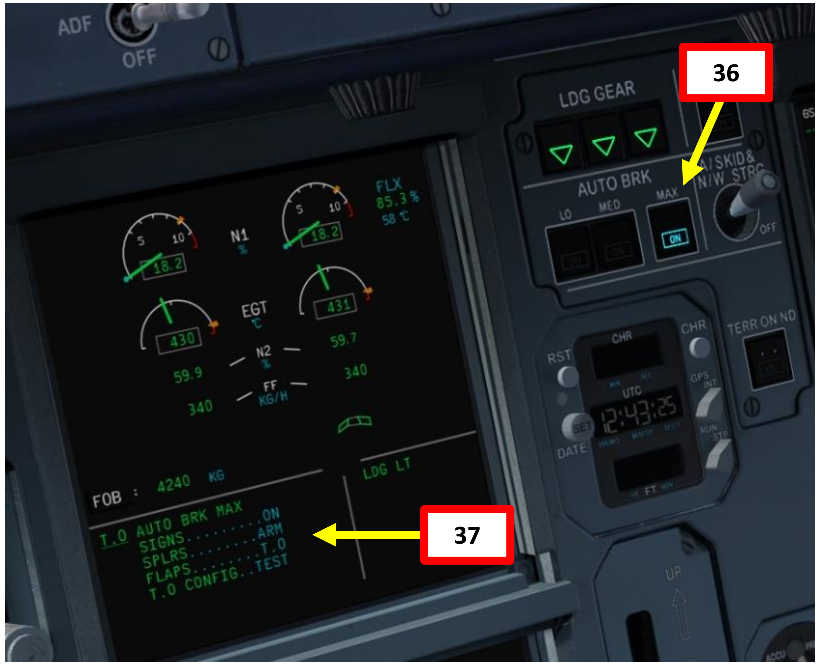


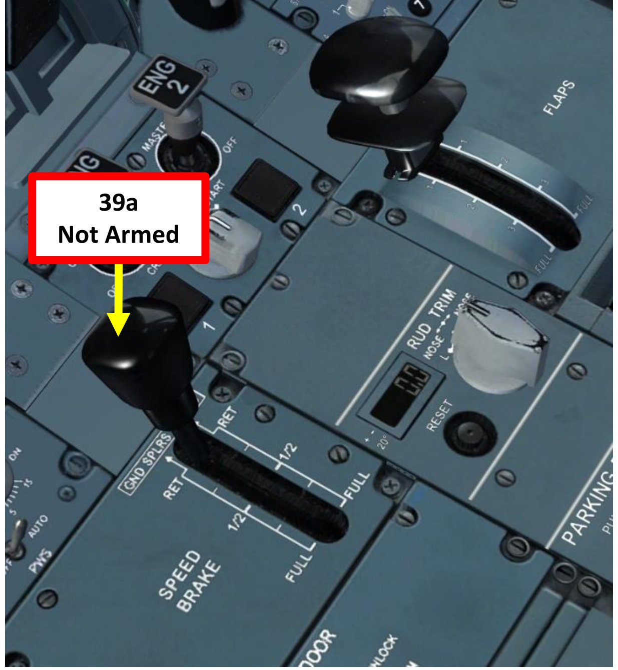


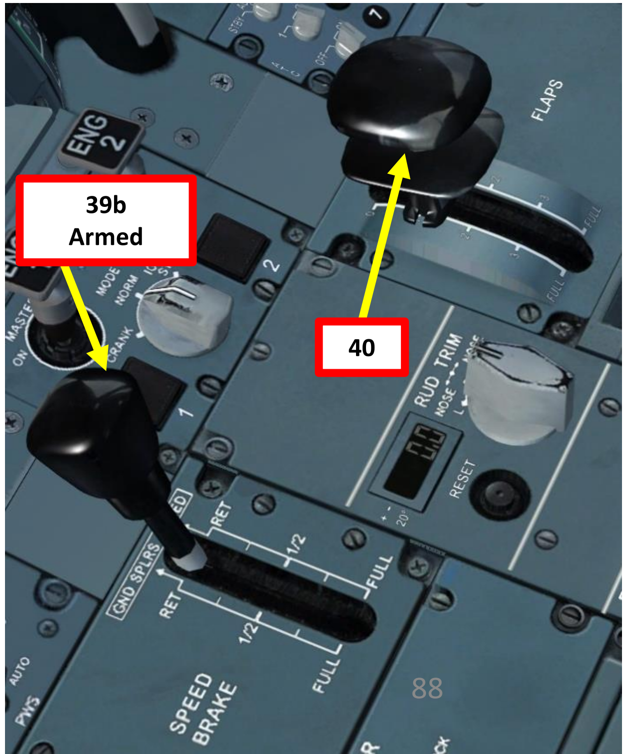
COMPLETE PRE-FLIGHT

35. In real life, you would set PACK 1 and PACK 2 pushbuttons to OFF to ensure maximal engine performance during takeoff and prolong engine life, but we don't need to in this tutorial.
36. Press the AUTO BRK (Autobrake) – MAX pushbutton to arm the autobrake system in the event of a rejected takeoff
37. Press the TO CONFIG button on the central pedestal to check normal takeoff configuration on the upper ECAM display. We see in cyan what corrective actions we need to take. We see that the signs (seat belts and no smoking lights) need to be set to ON, that we need to arm the speed brake, and that the flaps are not set in takeoff position.
38. Set SEAT BELTS sign light to ON and NO SMOKING sign light to AUTO
39. Arm Speed Brake by pulling (right-clicking) on it in the ARMED position.
40. Set Flaps lever to 1 as specified in the FMGC
41. Press the TO CONFIG button again and confirm that everything is set for takeoff.









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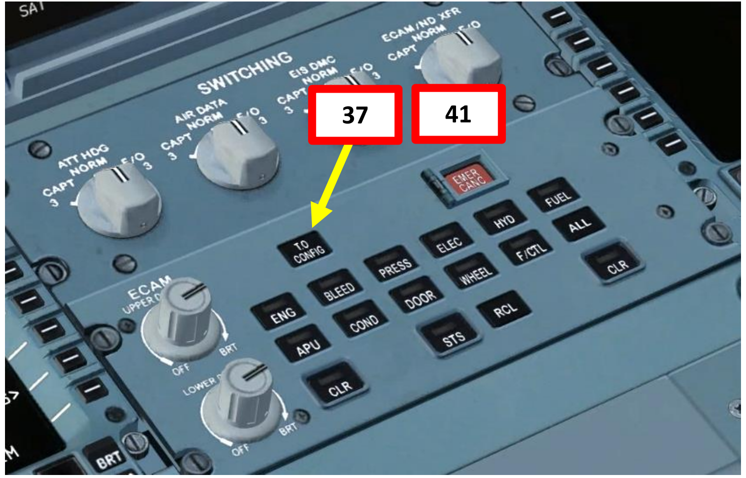
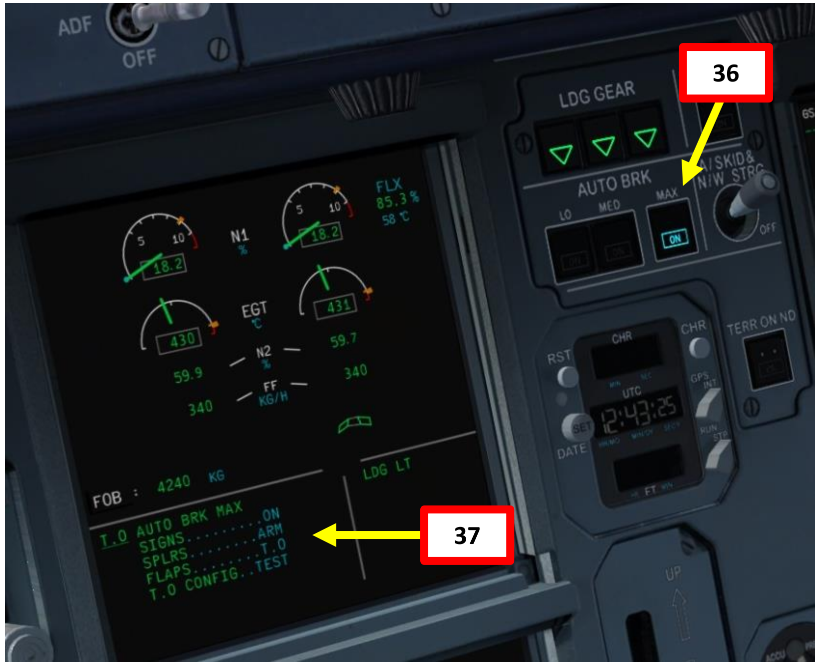
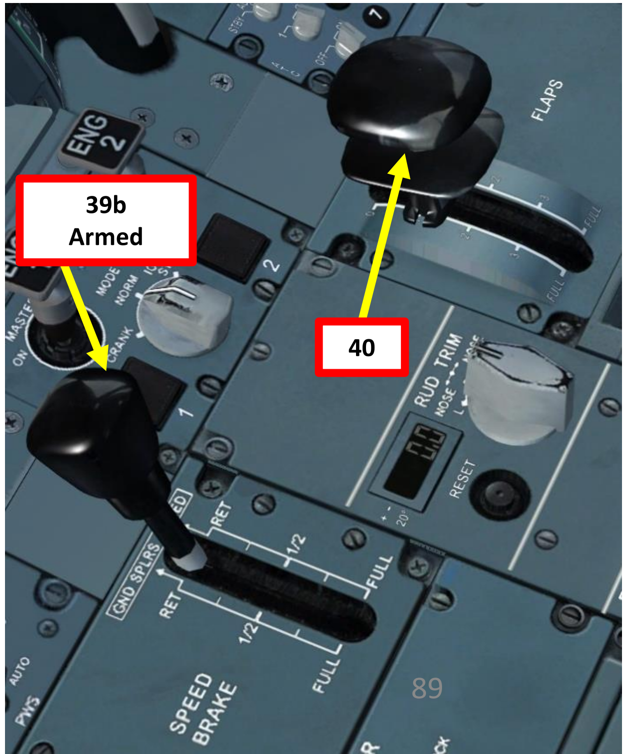
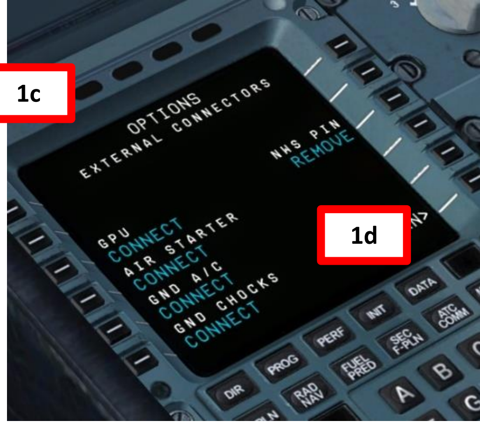


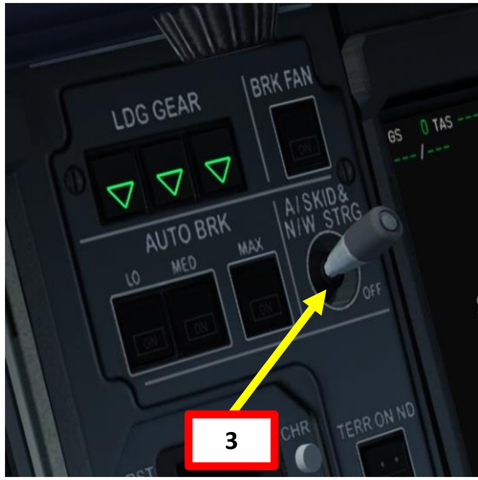




PUSHBACK

1. Set Nosewheel Steering Pin via the MCDU
    a) Select OPTIONS menu -> "EXT CTRLS" (External Controls)
    b) Make sure the NWS PIN displays "SET", which means that it is currently removed.
    c) Click on the "NWS PIN" LSK to set nosewheel steering pin. The MCDU will then display "NWS PIN - REMOVE", and the "NW STRG DISC" amber caution will illuminate on the upper ECAM display.
    d) Return to main MCDU MENU
2. Release parking brake
3. Set Anti-Skid and Nosewheel Steering (A/SKID & N/W STRG) switch to ON (UP)
4. Begin Pushback by holding SHIFT and P to initiate pushback. Once you have enough room to steer the aircraft away from the gate, hold SHIFT and P a second time to stop the push.
5. Remove Nosewheel Steering Pin via the MCDU once pushback is complete as shown in step 1). The MCDU will then display "NWS PIN - SET" and the "NW STRG DISC" amber caution will extinguish on the upper ECAM display





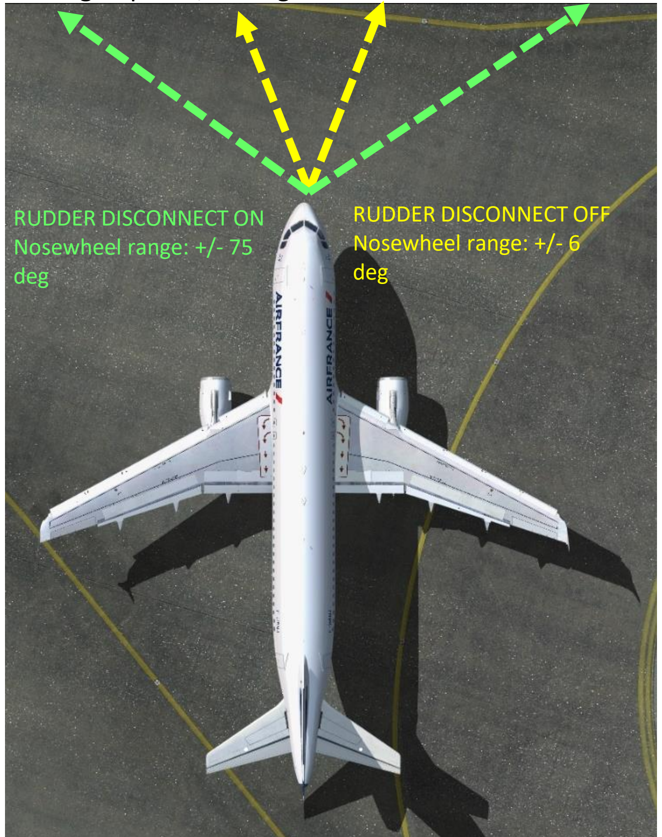
PUSHBACK

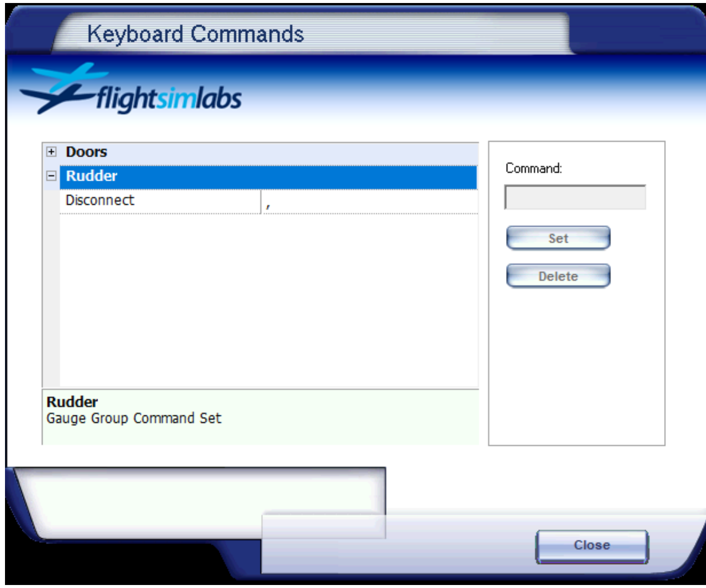
TAXI

Unless you use a program called FSUIPC, we will assume that you cannot map a joystick axis to your nosewheel steering tiller. Therefore, in order to steer the aircraft, Flight Sim Labs programmed a “Rudder Disconnect” keyboard command that allows you to use your rudder pedals like a tiller. By default, this keyboard command is “Comma”. You can modify it by pressing ALT, then going in Add-Ons-> FSLabs->Keyboard Commands.

<u>When you press RUDDER DISCONNECT key (Comma) a first time:</u>
Your rudder pedals will control the nosewheel steering, not the rudder.
Nosewheel range up to +/- 75 degrees turn. Rudder doesn’t physically move, but nosewheel does move.

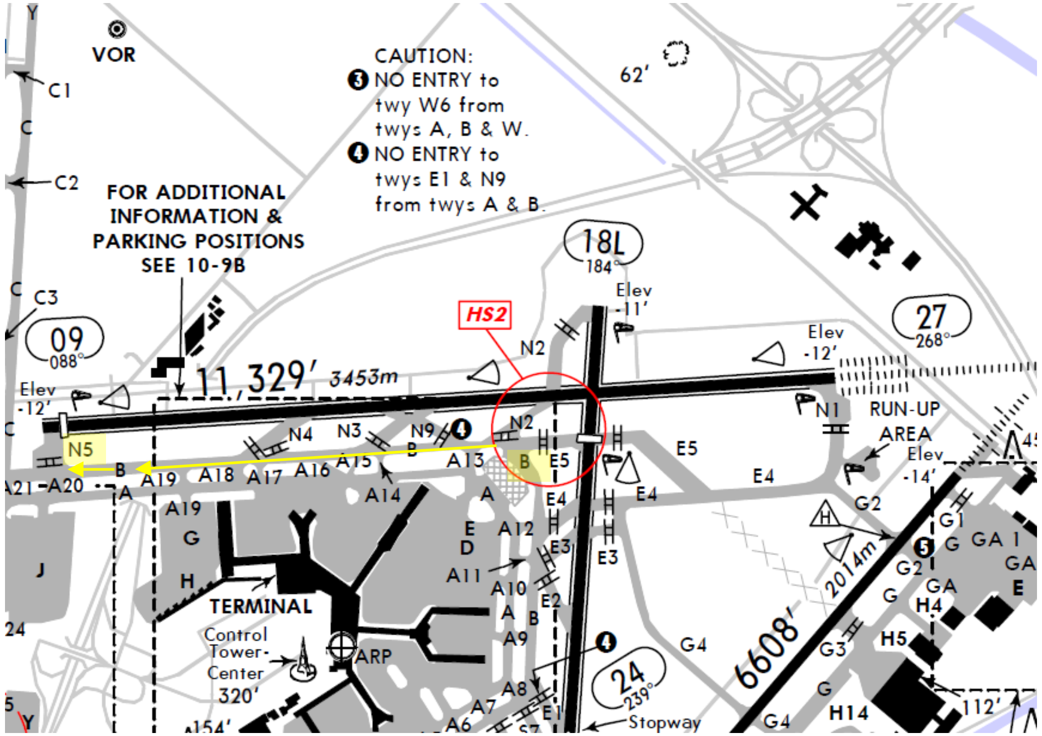
<u>When you press RUDDER DISCONNECT key (Comma) a second time:</u>
Your rudder pedals will control the both the rudder and the nosewheel steering.
Nosewheel range up to +/- 6 degrees turn. Rudder and NWS both move, but with less range.

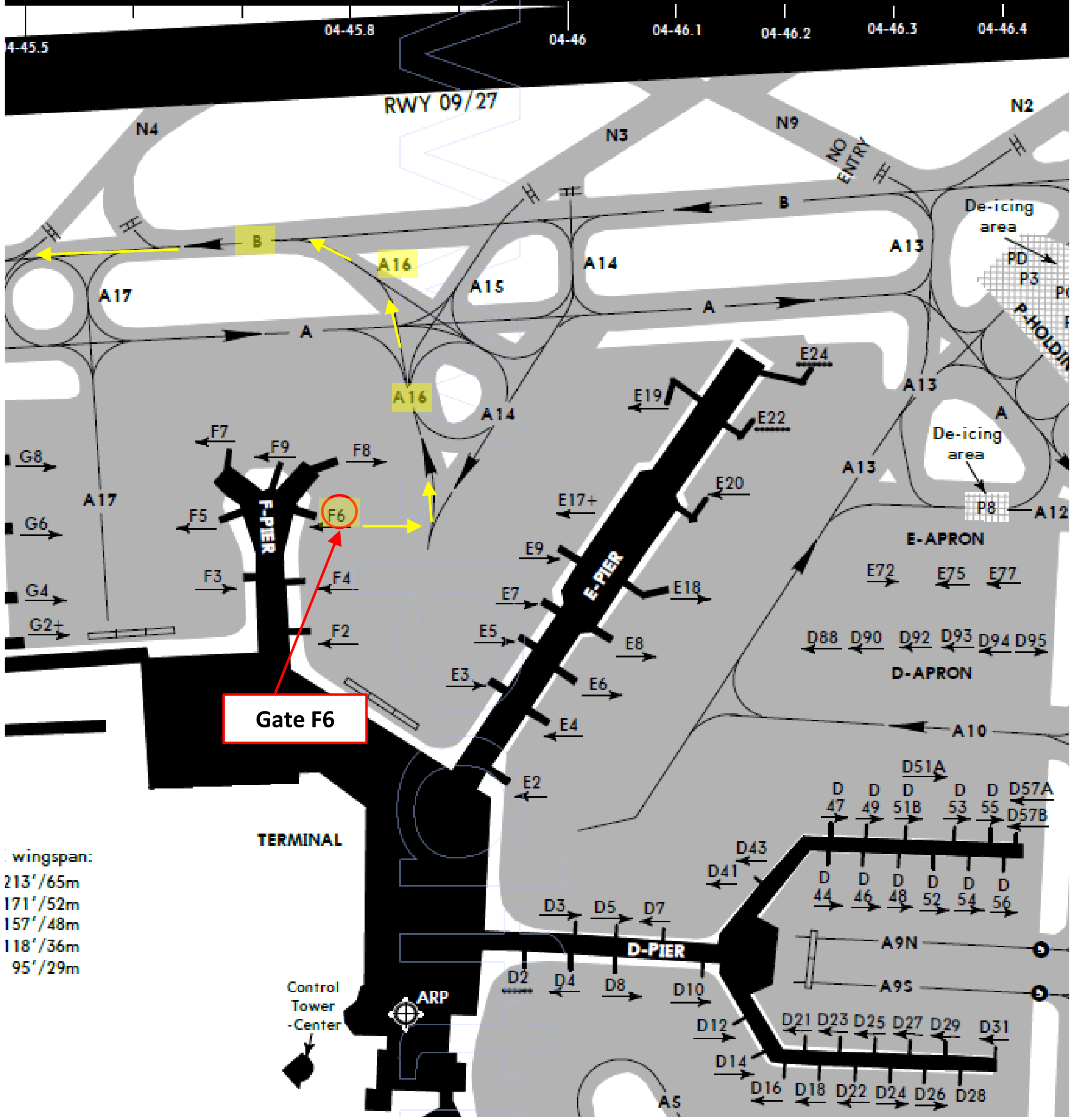


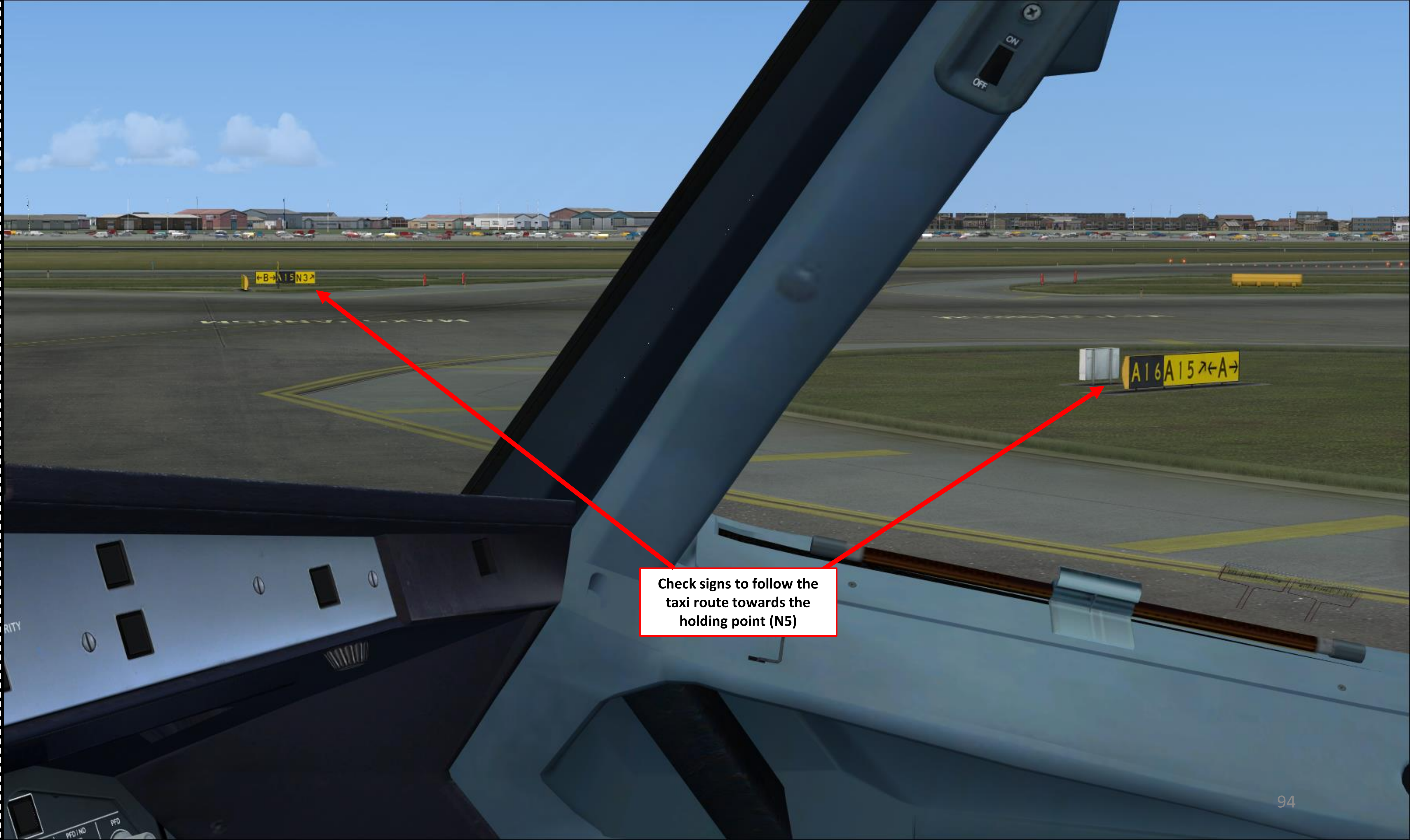


TAXI

- 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 maximum 40 % N1 and maintain a taxi speed of 15 kts maximum. Slow down to a maximum of 10 kts before making a 90 deg turn.



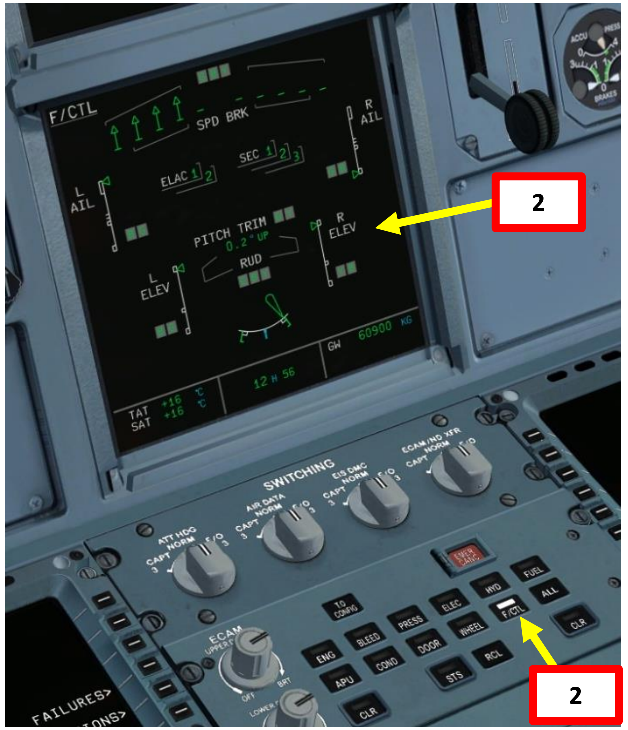


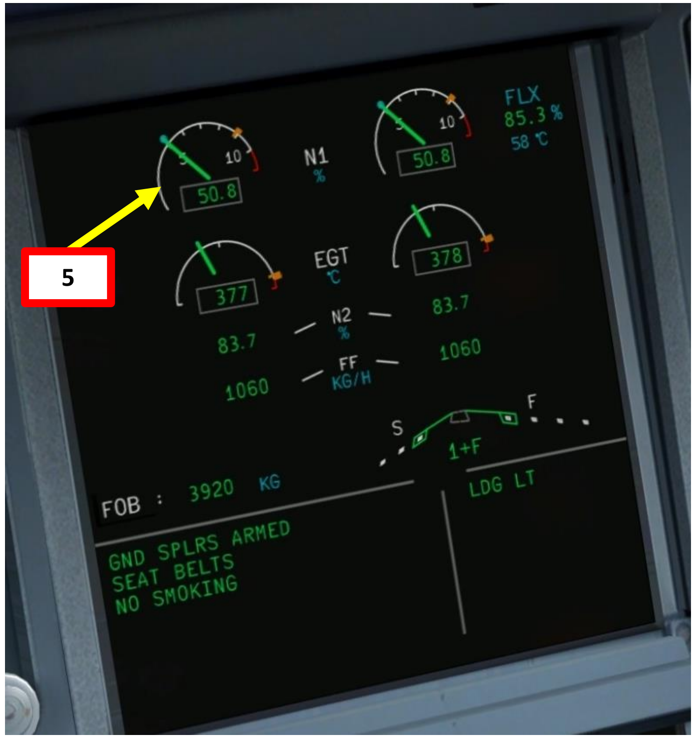

Check signs to follow the taxi route towards the holding point (N5)
A16 A15 ↗←A→
ON
OFF

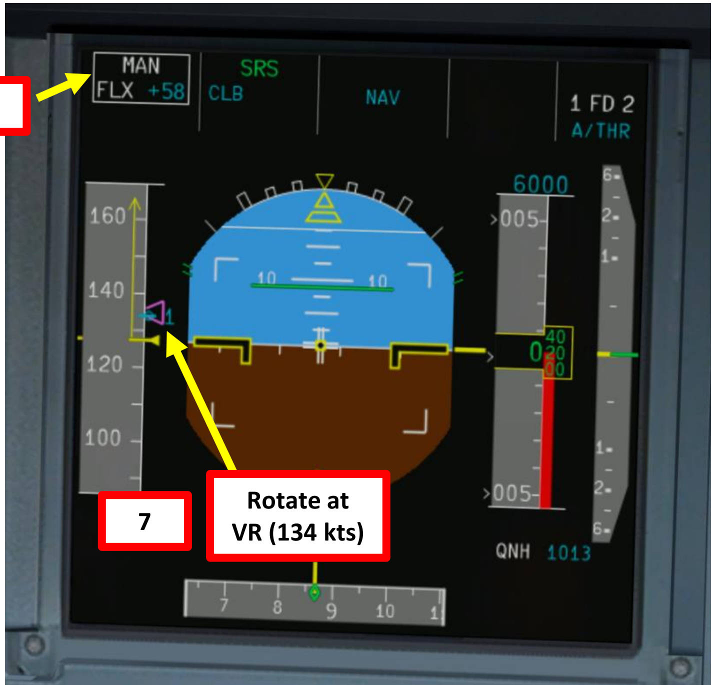

36C
09 N5
CHRONO
SIDE STICK PRIORITY
F-HBNJ
DG-FM

TAKEOFF

1. Line up on the runway and make sure parking brake is disengaged.
2. Click on the F/CTL menu and make sure your control surfaces respond to pitch, roll and rudder input. If your rudder doesn't move, it means that you need to press the "RUDDER DISCONNECT" key (comma).
3. Set Nose Light switch – TAKEOFF (T.O.)
4. Press and hold pedal brakes.
5. Throttle up until engines reach 50 % N1 and stabilize
6. Throttle up to FLEX/MCT power for a normal takeoff or TO/GA for a max power takeoff. You should hear a "click" when you hear the detent. Autothrottle will then engage automatically.
7. Rotate smoothly and continuously when reaching VR (134 kts) until reaching 15 degrees of pitch angle
8. Follow the Flight Director (15 deg pitch)
9. Raise landing gear by left-clicking the landing gear lever and dragging it to the UP position

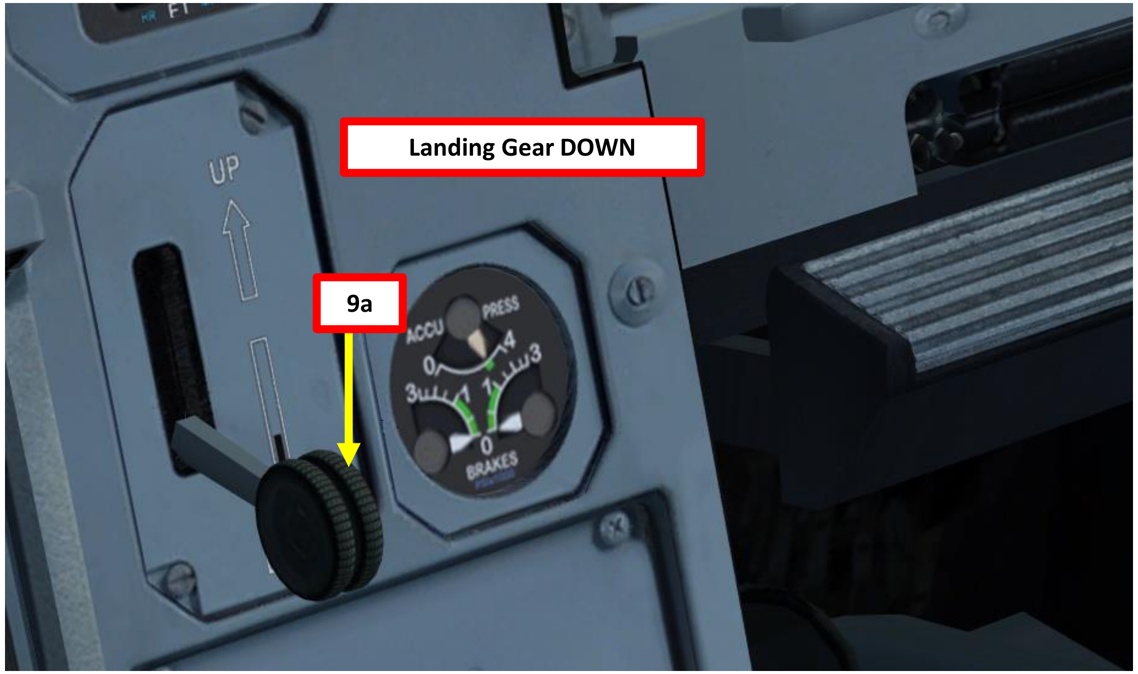






TAKEOFF

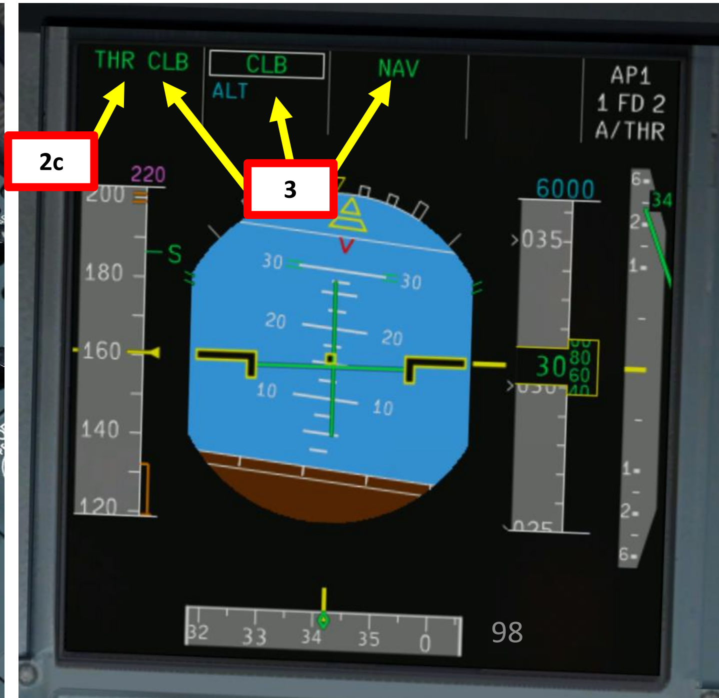

MAN
FLX +58
SRS
CLB
NAV
1 FD 2
A/THR
6000
Your current attitude
8
Green Lines = Flight Path Reference in lateral and vertical planes. You must keep them centered in order to follow the flight plan.


Landing Gear DOWN
9a
UP
ACCU
PRESS
BRAKES


9b
Landing Gear UP
DOWN
ACCU
PRESS
BRAKES

CLIMB

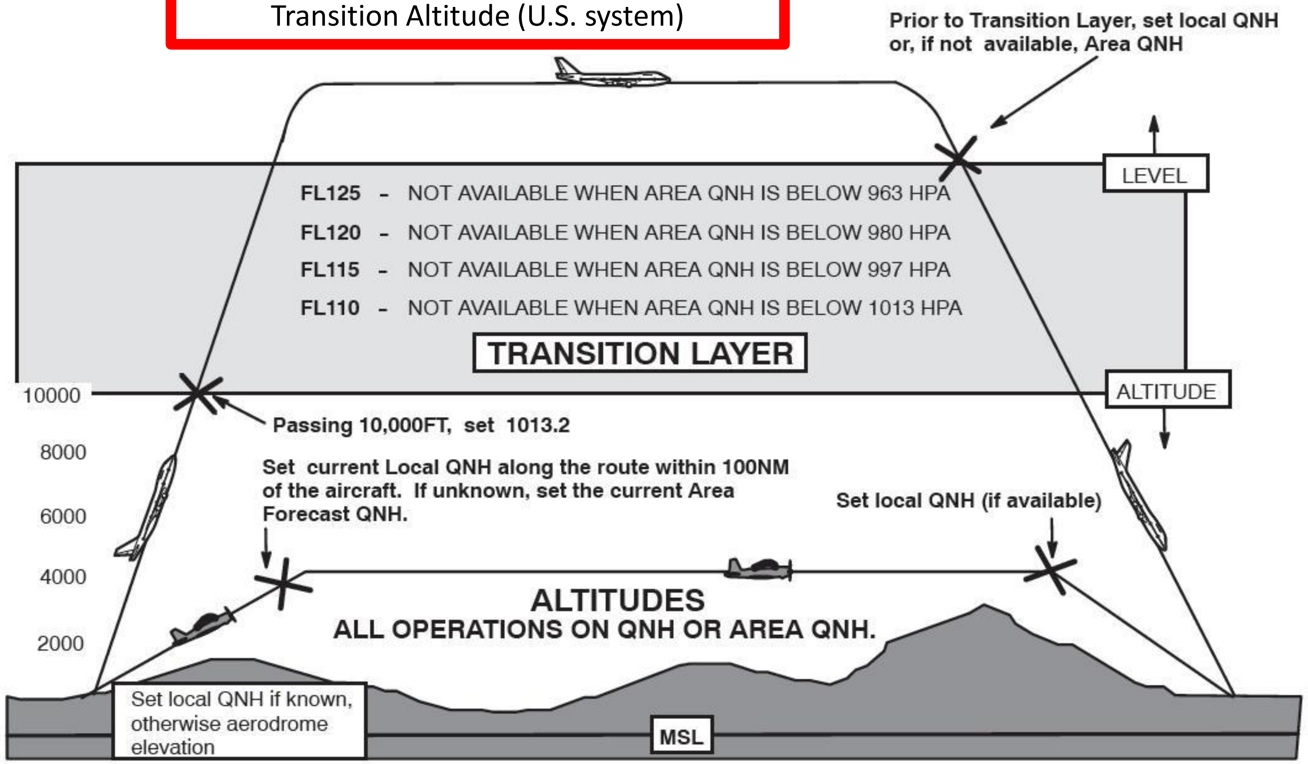
1. When reaching an altitude of 100 ft, you can engage autopilot by pressing the “AP1” button on the FCU. Your aircraft will now follow the “green line” on your navigation display automatically. Since our SID trajectory demands a sharp turn after takeoff, I would advise hand flying the aircraft first by following the flight directory lines on the PFD, and when you are in a straight line segment then engage autopilot.
2. When “LVR CLIMB” indication flashes on your PFD, throttle back to CLIMB. You should hear a “click” when detent is reached. The indication will change to “THR CLB” on your PFD.
3. To confirm that you have a normal climb, make sure you see THR CLB, CLB and NAV all displayed in green on your FMA (Flight Mode Annunciator).

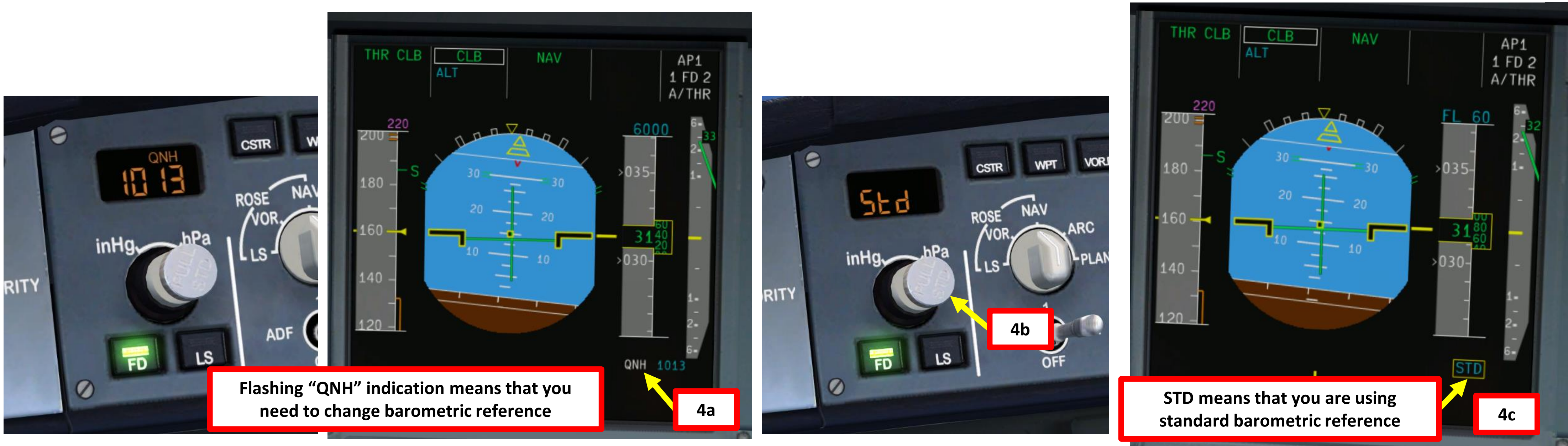


CLIMB

4. Once you pass transition altitude (3000 ft in Europe, 18000 ft in the US), right click on the Barometric Pressure knob to switch barometric pressure to STANDARD pressure in order to use flight levels as a reference. This means you will be using a standard barometric pressure of 1013, 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).

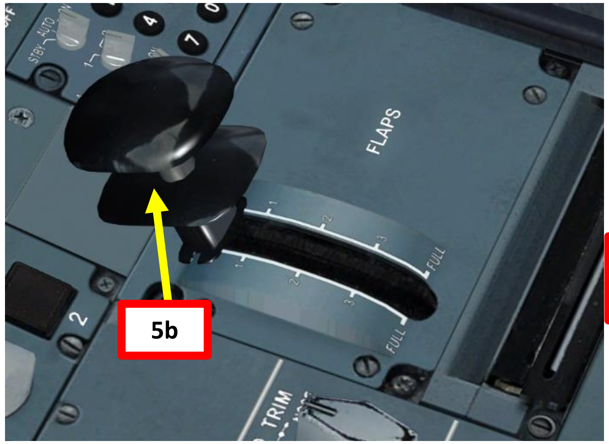
Transition Altitude (U.S. system)





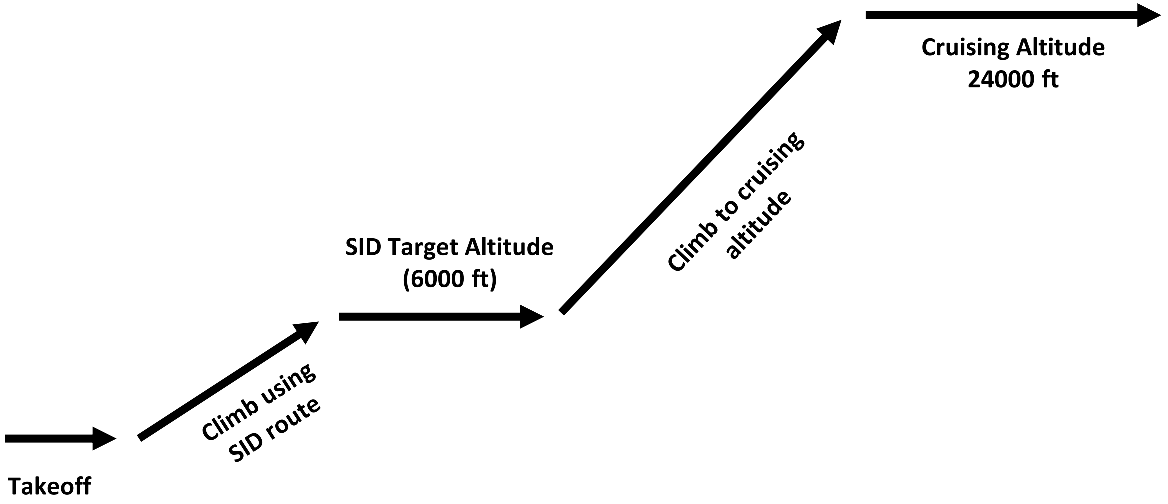
CLIMB

5. Once you have sufficient airspeed (green -S on the speed tape, for « slat & flaps retraction speed », set flaps to UP by right-clicking the flaps lever
6. Set Nose Light switch – OFF
7. Set Runway Turnoff Lights switch – OFF
8. Set Landing Light switches – OFF
9. Set Beacon Anti-Collision Light switch – ON
10. Set Strobe Position Lights switch – AUTO
11. Set Navigation & Logo Lights switch – 1
12. Seat Belt signs light switch – OFF
13. You will reach your “TOP OF CLIMB” point at a blue arrow on your navigation display



CLIMB

14. We will now begin our climb to our cruising altitude of 24000 ft. Set the ALTITUDE knob on the FCU (Flight Control Unit) to 24000.
15. Pull the autopilot ALTITUDE set knob (right click) to select this cruising target altitude for the autopilot. It will override the altitude target of the FMGS.
16. Set the autopilot Vertical Speed knob on the FCU to 2200 feet per minute (typical climb rate). This will ensure a smooth climb and make the passengers not feel like they're about to puke while riding a roller coaster.
17. You will reach your "TOP OF CLIMB" point at a blue arrow on your navigation display for your cruising altitude (24000 ft)



The orange dot means that the FMGS is managing this parameter. Managed mode is achieved by pushing the parameter knob (give control back to the aircraft).

No Orange dot means that the autopilot is trying to maintain your selected parameter. Selected mode is achieved by pulling the parameter knob ("my aircraft", you have control over the aircraft).

Introduction to Autopilot

Many newcomers in the flight simulation world have this idea that on the A320, 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.

Now, why am I saying this? Because *some* people's knowledge of the autopilot system is summed up in "hit AP, 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. This is why you need to constantly to 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 its capabilities and be able to read what the FMA (flight mode annunciator) is telling you.

Autopilot and Auto-Throttle

The autopilot 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 control the engines for you. Take note that when auto-throttle is engaged, the physical throttles will not move but the engines will respond to autopilot thrust commands.

The AP has two channels: A and B. This is why you need to be careful when setting values on the MCP (Main Control Panel) by making sure there are no conflicting AP commands on both the Captain and the First Officer's side.

Managed mode means the autopilot follows the flight management system plan. **Selected** means the pilot chooses the parameter (speed, heading or altitude for example), overriding the FMC. Some axes can be managed while others are selected. Autopilot and autothrottle will be affected depending on what mode is active

Autopilot Parameter Selectors

Tip: When pulling a knob, it's YOUR aircraft (selected input will drive autopilot). When pushing a knob, the FMGS takes over (managed aircraft flight plan will drive autopilot).

- SPD MACH: Change over airspeed unit (IAS (indicated airspeed) vs Mach), usually used above FL260, or 26000 ft
- METRIC ALT: Toggles altitude unit system (metric vs imperial)
- SPEED Selector: When pulled, autopilot and auto-throttle will set the aircraft at the selected speed. When pushed, autopilot and auto-throttle will set the aircraft at the managed speed of the FMGS (flight plan).
- HEADING Selector: When pulled, autopilot and auto-throttle will set the aircraft at the selected heading. When pushed, autopilot and auto-throttle will set the aircraft at the managed heading of the FMGS (flight plan).
- ALTITUDE Selector: When pulled, autopilot and auto-throttle will set the aircraft at the selected altitude. When pushed, autopilot and auto-throttle will set the aircraft at the managed altitude of the FMGS (flight plan). Note that the autopilot will not go below waypoint altitude restrictions (in magenta on PFD altitude tape) in managed mode, while in selected mode it will ignore such restrictions (i.e. if you get clearance from an Air Traffic Controller).
- VERTICAL SPEED Selector: When pulled, aircraft will follow vertical speed selected. When pushed, aircraft will level off.

Note: These speed, heading, altitude and vertical speed autopilot commands can be combined together. It is very important to know whether you set them in "managed" (the FMGS flight plan restrictions drive the autopilot) or "selected" (your selected value drives the autopilot) mode. "Managed" mode will display an orange circle. "Selected" mode will have no circle.

Autopilot, Flight Director & Autothrottle Selectors

- Autothrottle (A/THR) ARM Switch : Arms A/T for engagement. Autothrottle engages automatically.
- Flight Director (FD) Switch: Arms flight director
- AP 1/2: Engages autopilot in selected mode.

Autoflight – Vertical Modes

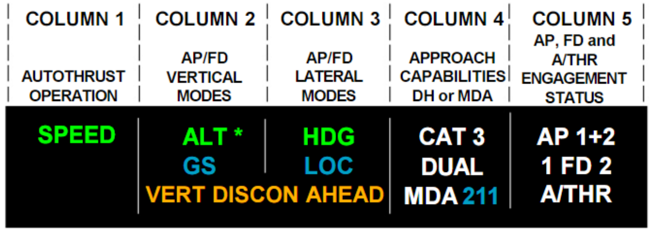
- EXPED: Engages EXPED mode to reach the altitude window with maximum vertical gradient.

Autoflight – Lateral Modes

.
- LOC: Tracks VHF Ominidirectional Range (VOR) localizer. Aircraft will only be controlled laterally. Used in case the ILS system is unserviceable.
- NOTE: LS is not an autopilot mode. Pressing this button displays ILS (Instrumented Landing System) information on the PFD.

Autoflight – Vertical + Lateral Mode

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



Auto Thrust Mode	Vertical Mode	Lateral Mode	Approach Capabilities	Auto flight Status
TOGA	SRS	RWY	CAT 1	AP 1
FLX 42	ALT	RWY TRK	CAT 2	AP 2
MCT	ALT*	GA TRK	CAT 3 SINGLE	AP 1+2
CLB	ALT CRZ	TRACK	CAT 3 DUAL	1FD2
IDLE	ALT CST	HDG	DH XXX	1FD
ASYM	V/S	NAV	MDA XXXX	FD2
A. FLOOR	CLB	LOC		1FD1
TOGA LK	DES	LOC*		2FD2
THR LK	OP CLB	APP NAV		2FD
MAN TOGA	EXP CLB			FD1
MAN FLEX	EXP DES			A/THR
MAN MCT	G/S			
THR MCT	FINAL			
THR CLB	V/S ± XXXX			
THR LVR	FPA ± X.X			
THR SPEED				
THR IDLE				
SPEED				
MACH				
LVR CLB				
LVR MCT				
LVR ASYM				

COMBINED MODES
LAND
FLARE
ROLL OUT
FINAL APP

FMA MESSAGES
USE MAN PITCH TRIM
MAN PITCH TRIM ONLY
DECELERATE
MORE DRAG
VERTICAL DISCON AHEAD
CHECK APP SEL
SET GREEN DOT SPD
SET HOLD SPEED
MACH SEL .XX
SPEED SEL XXX

FMA (Flight Mode Annunciator)

The FMA displays the status of the auto-throttle, vertical mode, lateral mode, and autopilot systems.

First row is for ENGAGED systems, second row if for ARMED systems, third row is for reminders.

Reference: http://www.airbusdriver.net/airbus_studyaids.htm

1: Autothrust	2: Vertical	3: Lateral	5: Autopilot
TOGA: autothrust armed, throttle at TOGA (Takeoff Go-Around) detent	**SRS**: Speed Reference System used for takeoff and go-around	**RWY**: Runway mode	**AP**: Autopilot Command Engaged
FLX 42: Autothrust armed, throttle at FLC/MCT detent	**ALT/ALT***: Altitude Hold/Capture mode	**RWY TRK**: Runway Track mode	**FD**: Flight Director Engaged (no autopilot)
MCT: Single Engine – Autorthust armed, most forward lever at MCT (Max Continuous Thrust) detent	**ALT CRZ/CST**: Altitude hold of the cruise flight level / altitude constraint hold	**GA TRK**: Go Around Track mode	**A/THR**: Autothrottle engaged
CLB: Autothrust armed, throttle at CLB (Climb) detent	**V/S**: Vertical Speed Mode	**TRACK**: Track mode	
IDLE: Auto thrust armed, IDLE power commanded	**CLB**: Climb mode	**HDG**: Heading mode	
ASYM: Asymmetric thrust (autothrust armed but both levers in different positions)	**DES**: Descent mode	**NAV**: Navigation mode	
A. FLOOR: Autothrust engaged while in Alpha Floor conditions	**OP CLB/DES**: Open Climb or Descent mode. FCU selected altitude is higher/lower than actual altitude.	**LOC/LOC***: Localizer track/capture mode	
TOGA LK: TOGA lock is engaged following alpha floor engagement.	**EXP CLB/DES**: Expedite mode in climb or descent	**APP NAV**: Approach Navigation mode	
THR LK: Thrust locked at last known position (A/THR failure or disconnect)	**G/S**: Glide slope mode		
MAN TOGA/FLX/MCT/THR: Autothrust armed, at least one throttle is at TOGA/FLX/MCT/Above CLB detent.	**FINAL**: Final mode (non precision approach)		
THR MCT/CLB/LVR/IDLE: Thrust mode active at MCT/CLIMB/Undetermined Lever Position/Minimum Thrust detent	**FPA**:Flight Path Angle mode		
SPEED: Autothrust armed in SPEED mode	**LAND**: Landing mode engaged below 400 ft AGL		
MACH: Autothrust armed in MACH mode	**FLARE**: Flare mode		
LVR CLB/MCT: Request to set thrust levers in CLB or MCT detents.	**ROLL OUT**: Roll out mode (Autoland)		
LVR ASYM: Request to set both thrust levers in same position/detent.	**FINAL APP**: Final approach mode during a Non-ILS approach		

FLIGHT ENVELOPE PROTECTION

You will often hear people mention “Normal Law” or “Alternate Law”. These flight control laws are basically sets of automated protections applied to your flight control surfaces that will prevent your aircraft from doing unsafe manoeuvers or exceed limitations. Normal Law is always active unless you start pulling circuit breakers. Flight Control Law changes happen automatically. Here is a great link to the Airbus Flight Control Laws: http://www.airbusdriver.net/airbus_fltlaws.htm

FLIGHT CONTROL LAWS

NORMAL LAW	ALTERNATE LAW	ABNORMAL ALTERNATE LAW	DIRECT LAW	MECHANICAL BACKUP
Normal operating configuration of the system. Airplane cannot be stalled in this law. Covers 3-axis control, flight envelope protection and load alleviation with 3 modes according to phase of flight (Ground, Flight or Flare Mode)	Activated by the aircraft if multiple failures of redundant systems occur.. Airplane can be stalled in this law. Reduced protections in comparison to Normal Law with 3 modes according to phase of flight (Ground, Flight or Flare Mode). **ALTN LAW: PROT LOST** caution message on ECAM	Activated by the aircraft if it enters an unusual attitude, allowing recovery from the unusual attitude. Pitch law becomes Alternate without protections, while Roll law becomes Direct law with mechanical yaw control.	Lowest level of computer flight control and occurs with certain multiple failures. Activated when landing gear is down while flying in alternate law. Pilot control inputs are transmitted unmodified to the control surfaces, providing a direct relationship between sidestick and control surface. **USE MAN PITCH TRIM** caution message on PFD	In case of a complete loss of electrical flight control signals, the aircraft can be temporarily controlled by mechanical mode. Pitch control is achieved through the horizontal stabilizer by using the manual trim wheel, lateral control is accomplished using the rudder pedals (requires hydraulic power). **MAN PITCH TRIM ONLY** caution message on PFD
PROTECTIONS • High AoA Protection • Load Factor Limitation • Pitch Attitude Protection • High Speed Protection • Flight Augmentation (Yaw) • Bank Angle Protection • Alpha Floor	**PROTECTIONS** • Low Speed Stability • Load Factor Limitation • High Speed Stability • Yaw Damping Only	**PROTECTIONS** • Load Factor Limitation • Yaw Damping Only	**PROTECTIONS** • None	**PROTECTIONS** • None

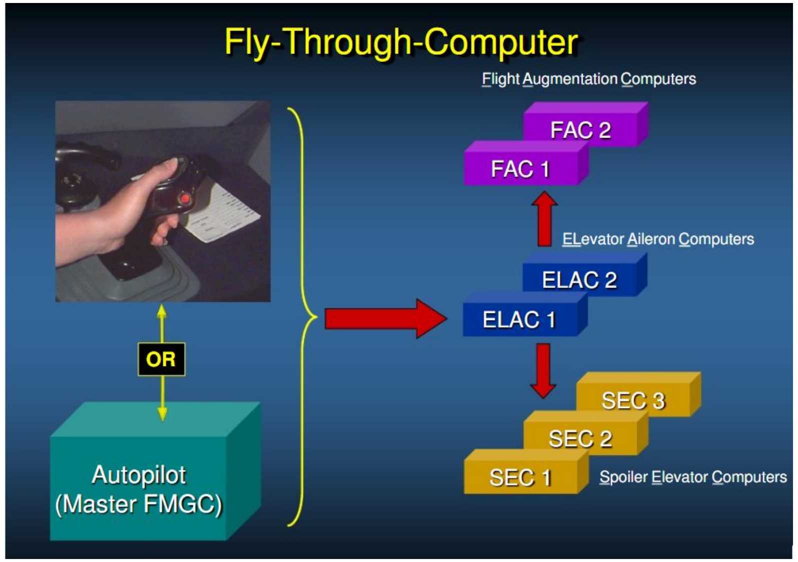
FLIGHT ENVELOPE PROTECTION

There are seven flight control computers: the 3 SEC's (Spoiler Elevator Computers), the 2 ELAC's (Elevator Aileron Computers) and 2 FAC's (Flight Augmentation Computers.

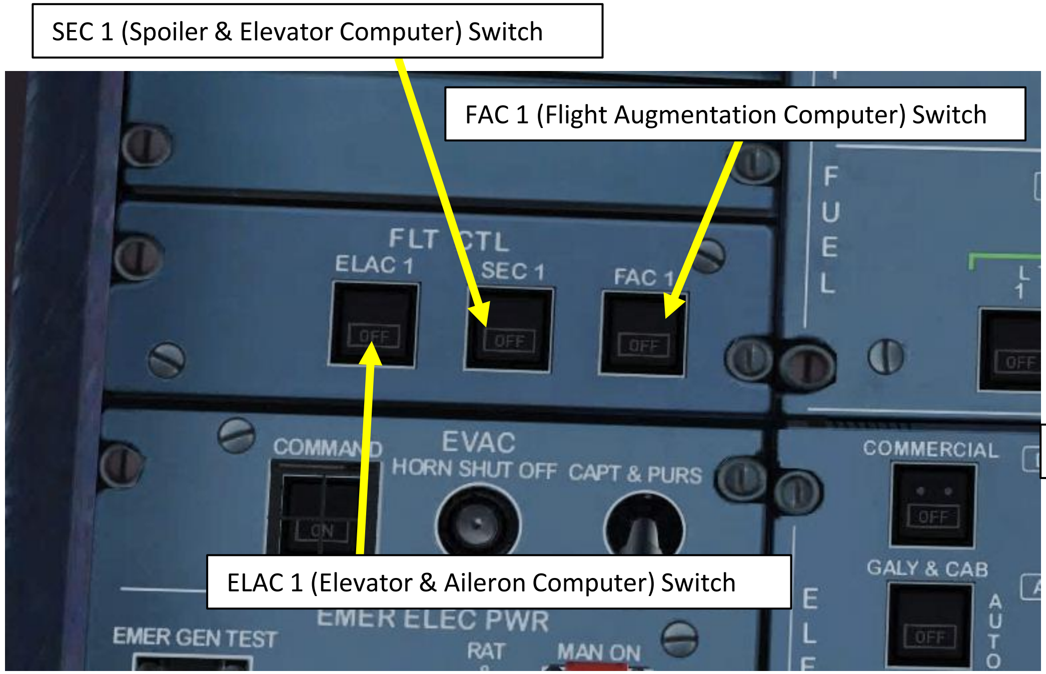
Their uses:

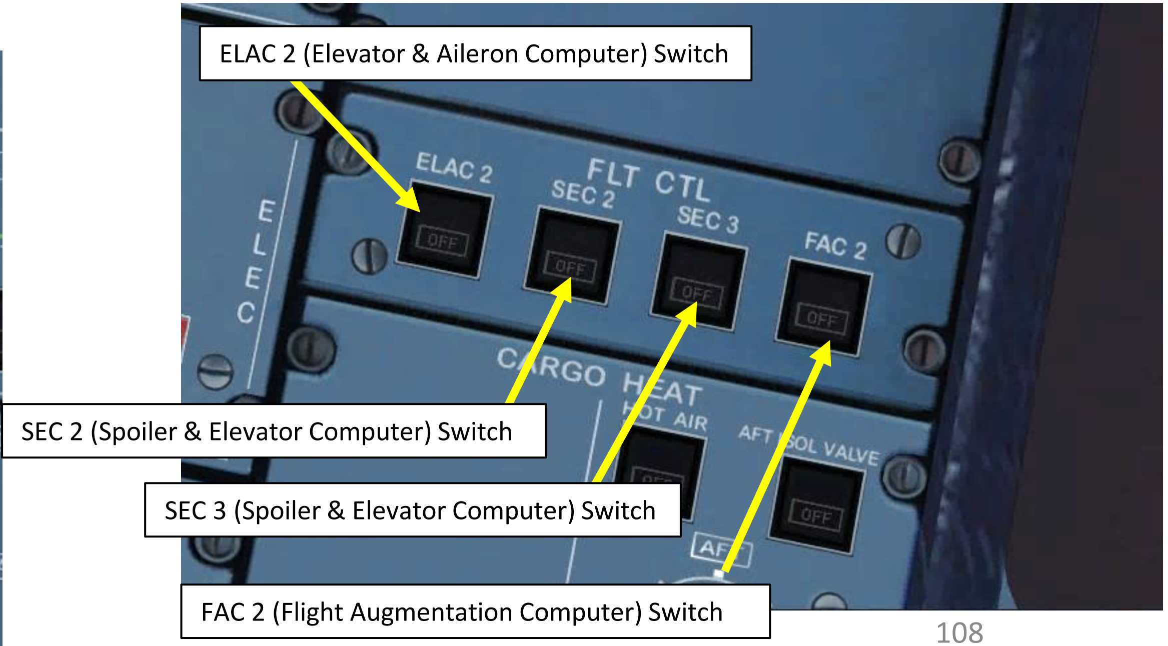
ELAC = Normal elevator and stabilizer control. Aileron control.
SEC = Spoiler control. Standby elevator and stabilizer control
FAC = Electrical Rudder control.

It is through these seven computers and their associated software that programs like Alpha Floor and speed & attitude protection work. If one or more of those computers fail or are switched off, you may lose some of the protections, thereby going into alternate or direct law. But if all seven fail or there is a complete electrical failure or if you switch all seven off, then you are in mechanical reversion. At that point you only have cable operated rudder and cable operated stabilizer trim available for control. The sidestick would be so much useless plastic because you need at least one of those computers running for it to work.



Great link on Flight Control Laws:
https://www.scribd.com/doc/64148571/Airbus-A320-Flight-Controls-Laws

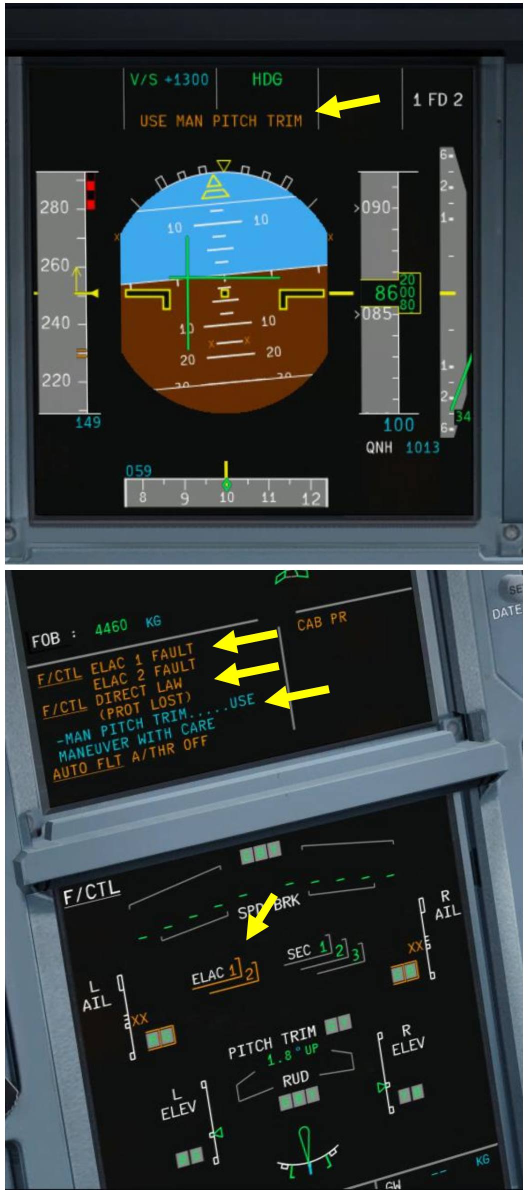




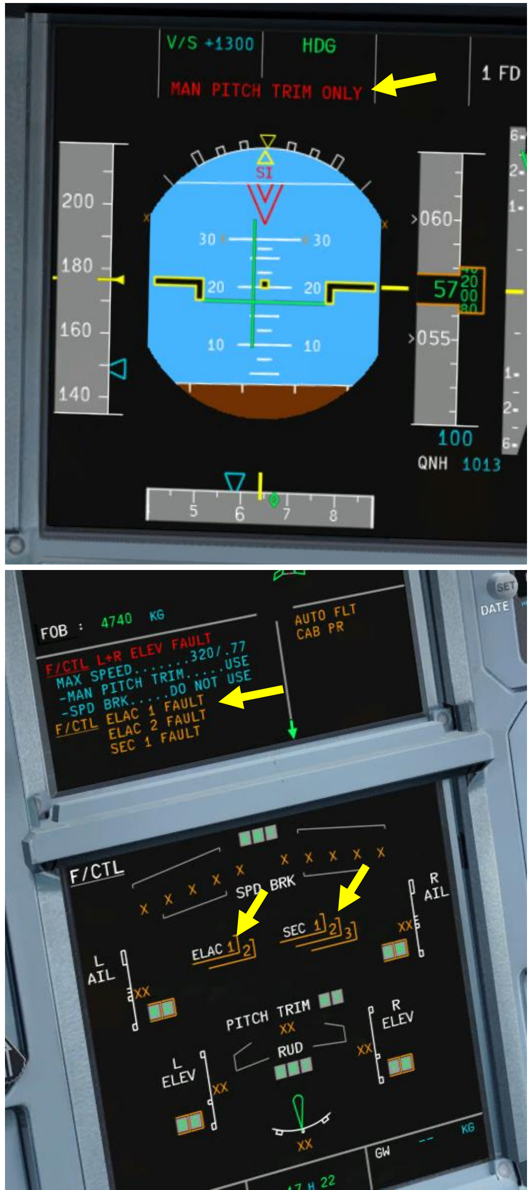
As an example, we can "simulate" a change in flight control laws by forcing the aircraft to power off certain flight computers with the switches shown last page. Here are some tests I did just for fun to illustrate this point:

TEST 1: ELAC 1 and ELAC 2 off = <u>ALTERNATE LAW</u>

TEST 2: ELAC 1 and ELAC 2 off and landing gear deployed = <u>DIRECT LAW</u>

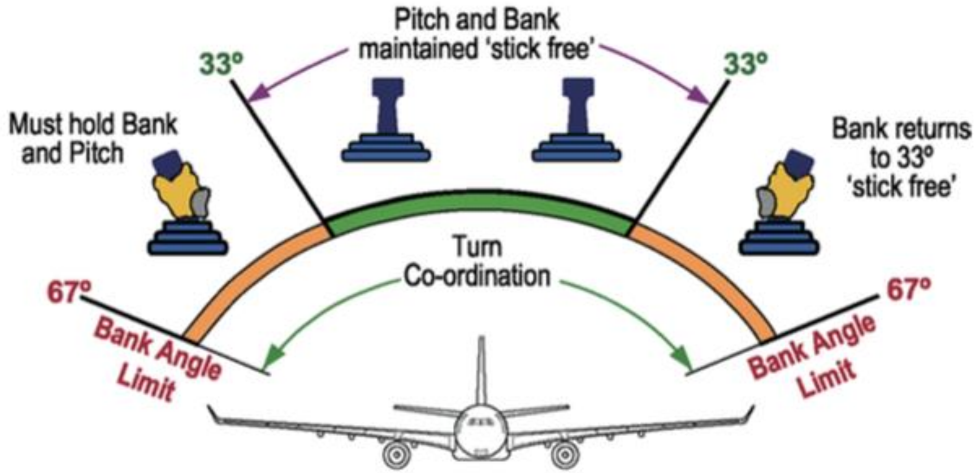


TEST 3: ALL ELAC, FAC & SEC switches OFF = <u>MECHANICAL BACKUP</u>



FLIGHT ENVELOPE PROTECTION - NORMAL LAW

Normal Law is the normal operation of flight control systems. In theory, you should always be operating with normal law unless something breaks in the aircraft due to a malfunction. Normal Law covers the Flight Envelope Protection and Load Alleviation. Load Alleviation is provided by dedicated accumulators to help move the ailerons and spoilers 4 and 5 very rapidly to alleviate the load on the wings during turbulence.



Normal Law has a set of protections that work in conjunction with the flight control computers.

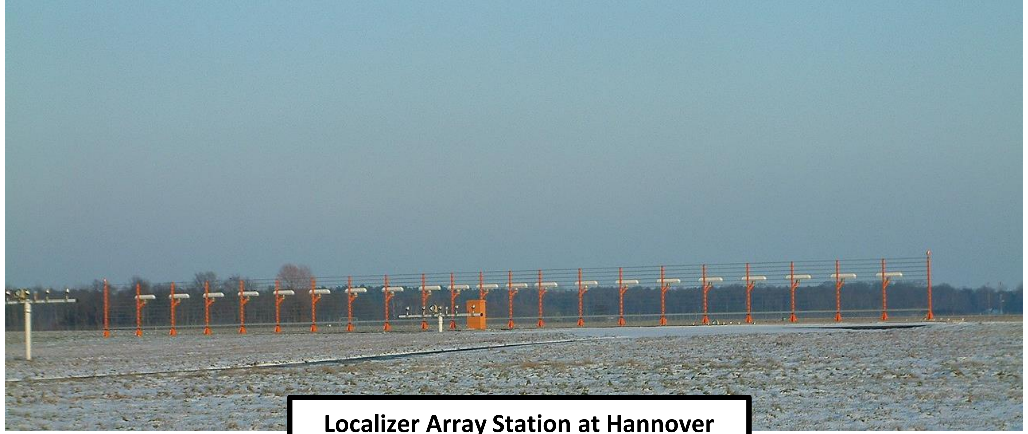
1. **<u>High AoA Protection</u>**
   - When angle of attack (AoA) exceeds a certain angle, the elevator control changes to the "Alpha Protection" mode in which the AoA is proportional to sidestick deflection. Alpha Max cannot be exceeded by the pilot even with full aft sidestick deflection
2. **<u>Load Factor Limitation</u>**
   - Keeps pilot from exceeding g-loads in all configurations
3. **<u>Pitch Attitude Protection</u>**
   - Pitch limited to +30 deg / - 15 deg
4. **<u>High Speed Protection</u>**
   - Prevents exceedance of Vmo/Mmo (Maximum Operating Speed/Mach) by inducing a pitch up load factor demand, which cannot be overridden by the pilot
5. **<u>Flight Augmentation (Yaw)</u>**
   - Controls yaw damper
6. **<u>Bank Angle Protection</u>**
   - Bank angle limited to 67 deg
7. **<u>Low Energy Warning</u>**
   - "Speed, speed!" aural warning warns the pilot in low energy states that require immediate throttle input. Available in Flaps Config 2, 3 or Full between 200 0 ft and 100 ft RA (radar altimeter) when TOGA (Takeoff Go-Around) is not selected.
8. **<u>Alpha Floor</u>**
   - Predictive function of the autothrust system. It activates based on the current trend if it predicts thrust will be required. Is normally available from immediately after takeoff throughout the flight down 100 feet RA in flaps configuration 1 or greater.
     As an example, if the aircraft starts stalling, the auto-thrust system will automatically set the engines to TOGA in order to keep the aircraft flying.

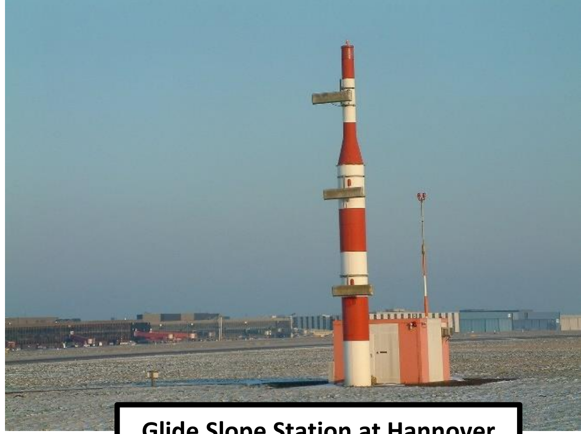
PLANNING DESCENT

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

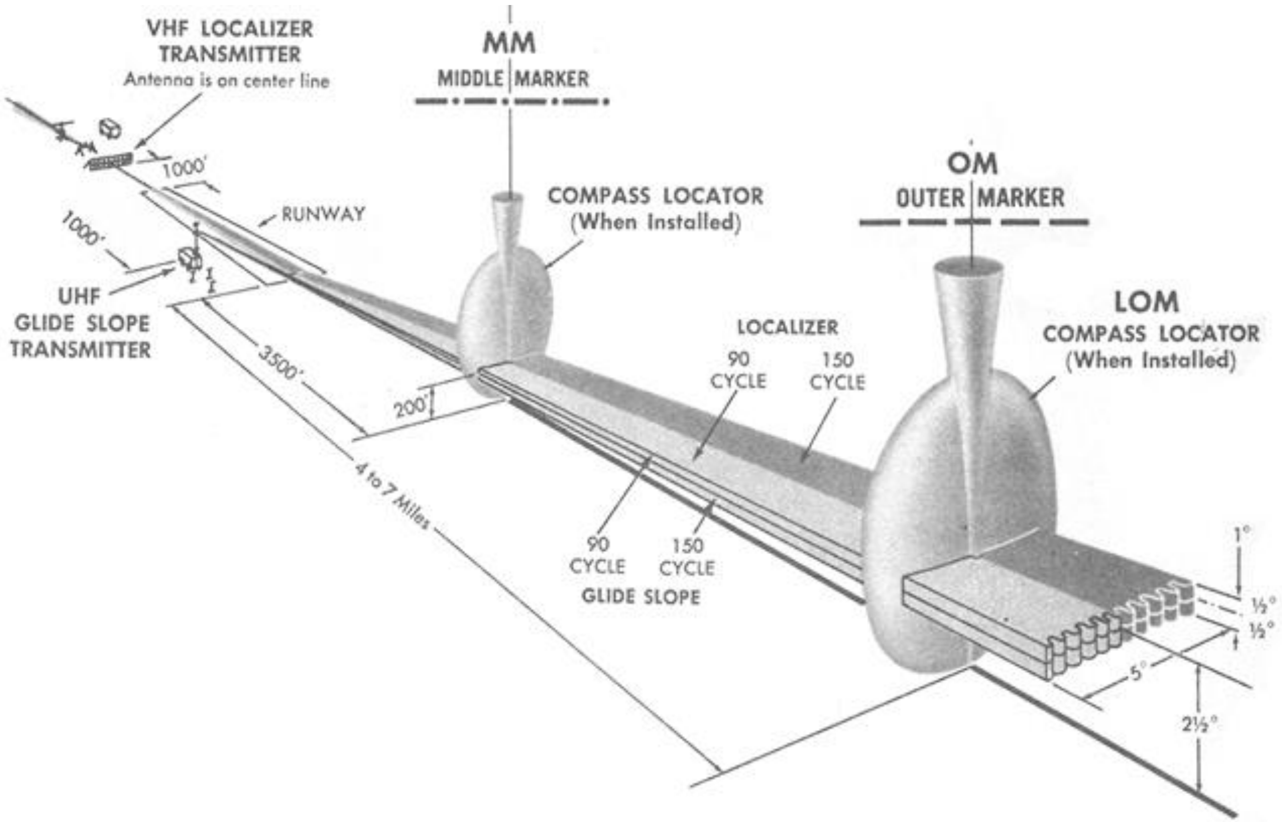
First, let's introduce you to the ILS (Instrument Landing System). This system exists to guide you during your approach.

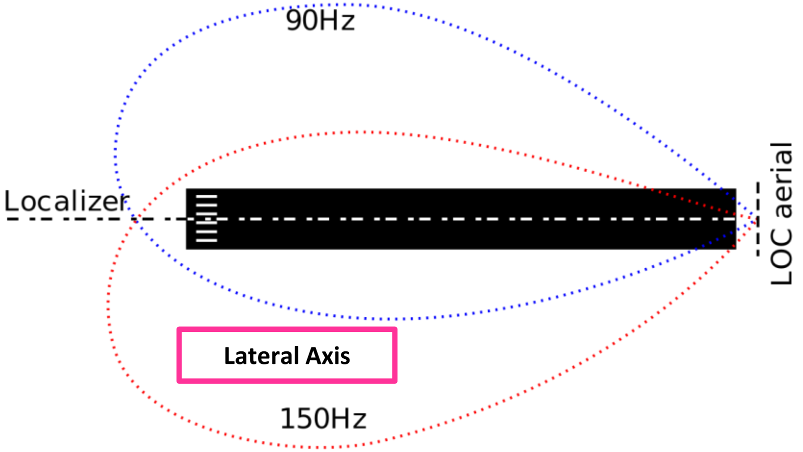
- The Localizer is generally an array of antennas that will give you a lateral reference to the center of the runway.
- The Glide Slope station will help you determine the descent speed you need in order to not smack the runway in a smoldering ball of fire.


Localizer Array Station at Hannover

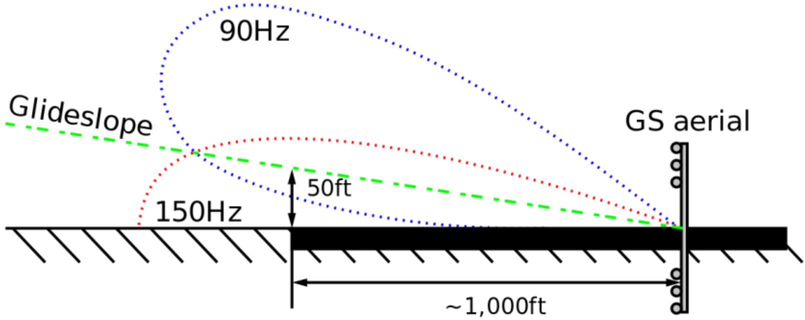

Glide Slope Station at Hannover

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





Lateral Axis

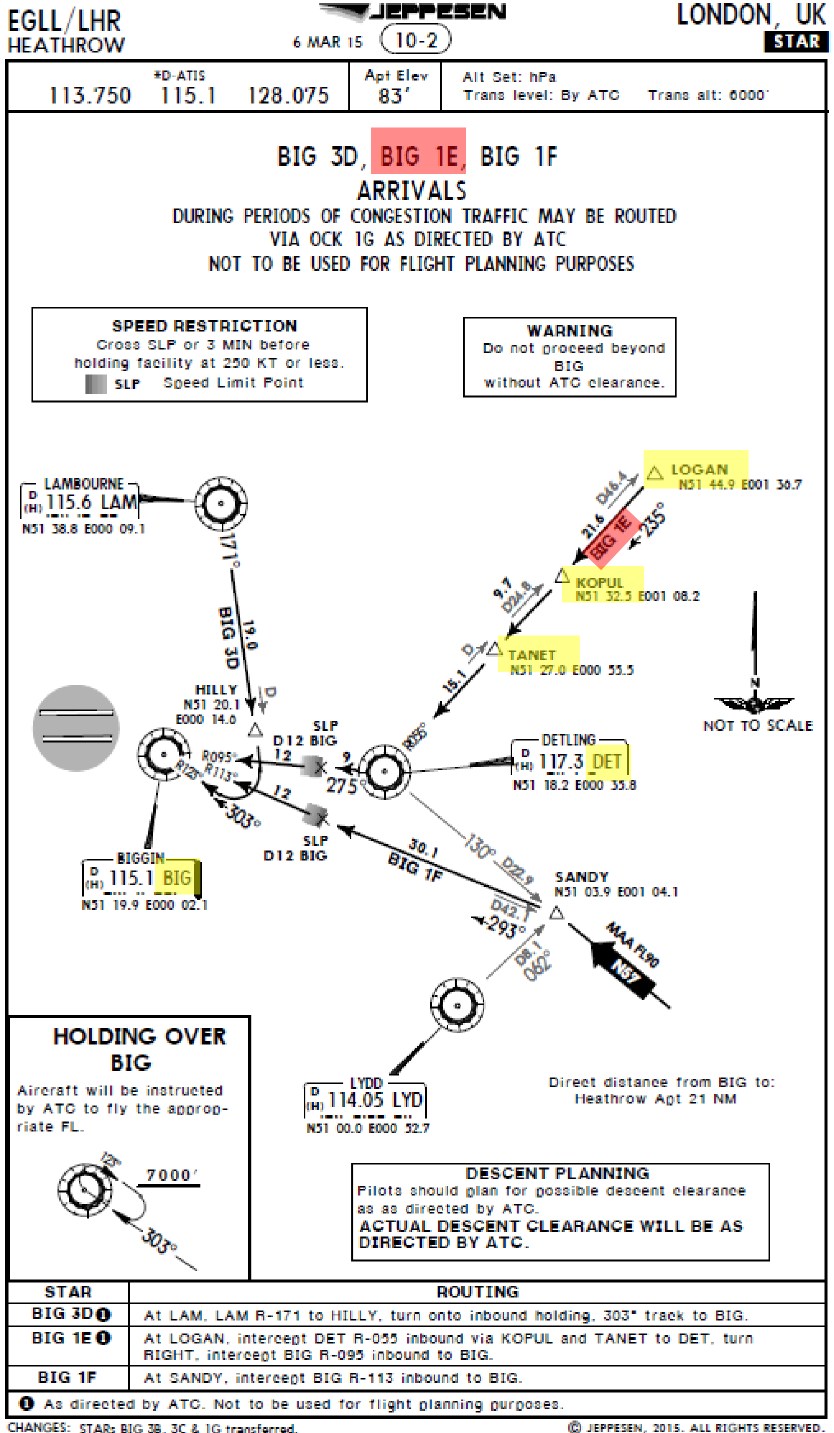


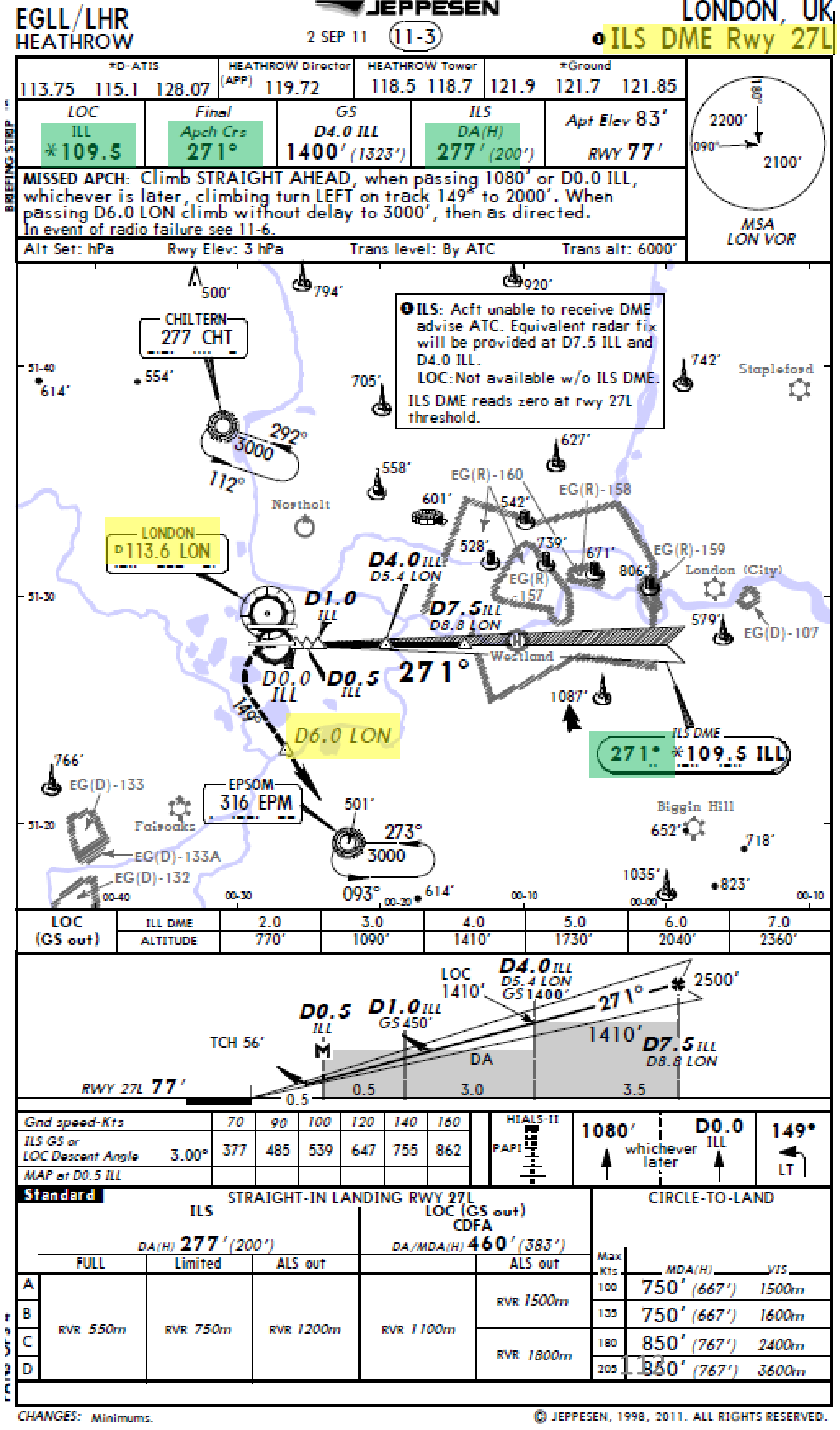
Vertical Axis

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 in BARO: 277

This is the minimum "decision altitude" (DA) during landing. If you go lower than 277 ft, you are committed to land no matter what happens. Above 277 ft, you can still miss your approach and go around.

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

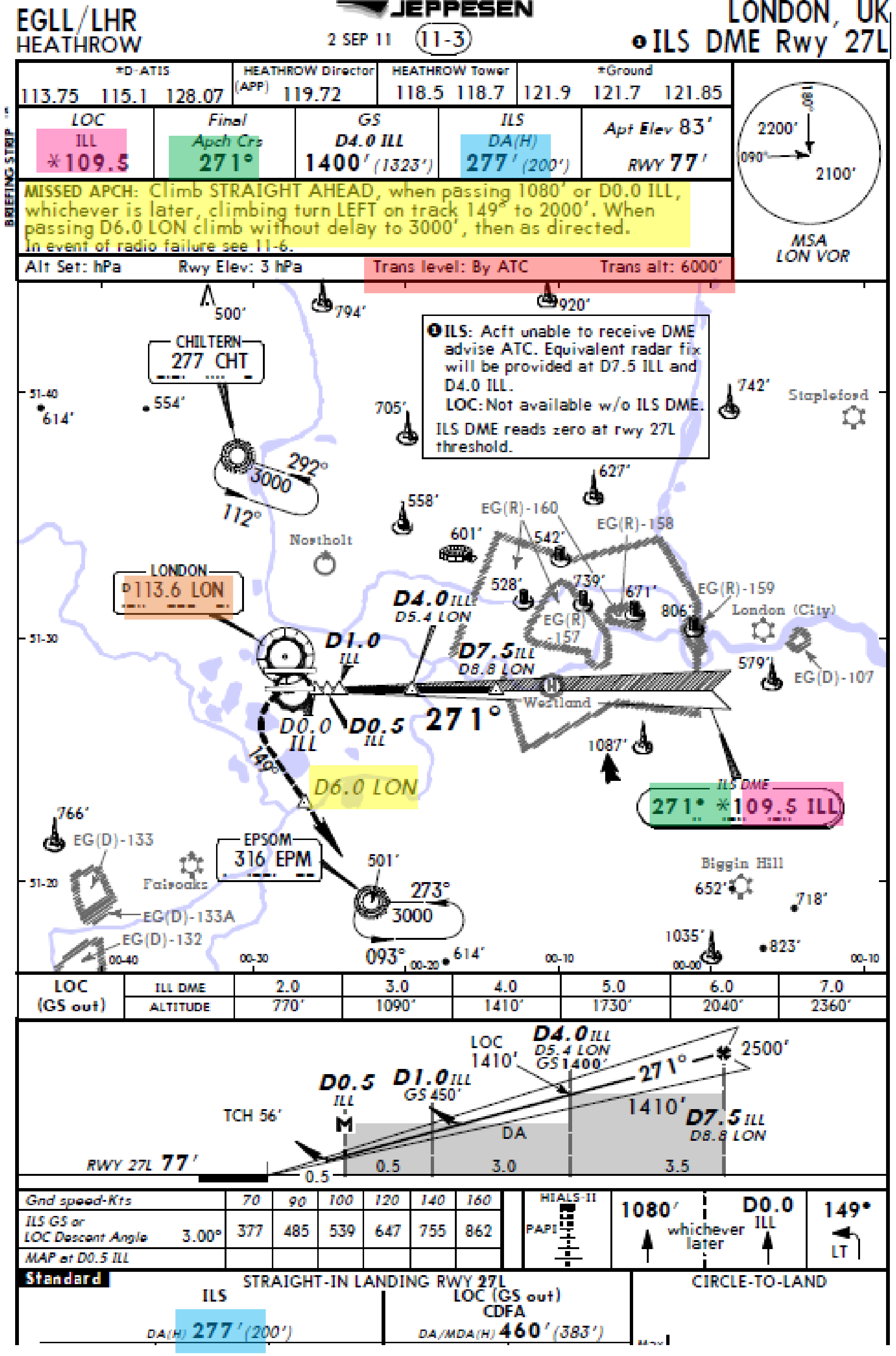
VOR "LONDON" (LON) will be the beacon we will track in case we miss our approach and have to go around.

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.

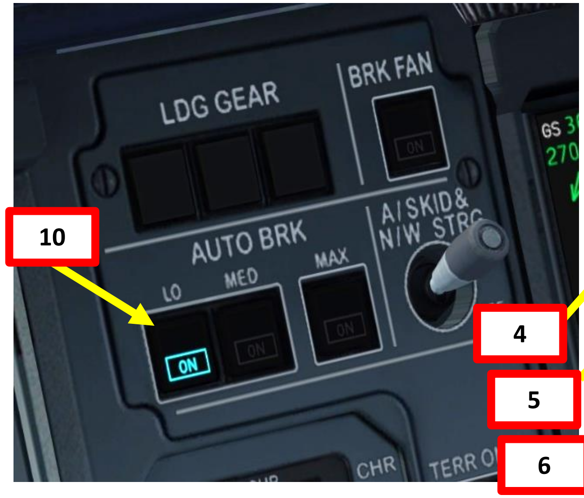


Here is a great link to know how to read these charts properly:

https://community.infinite-flight.com/t/how-to-read-an-approach-chart/8952

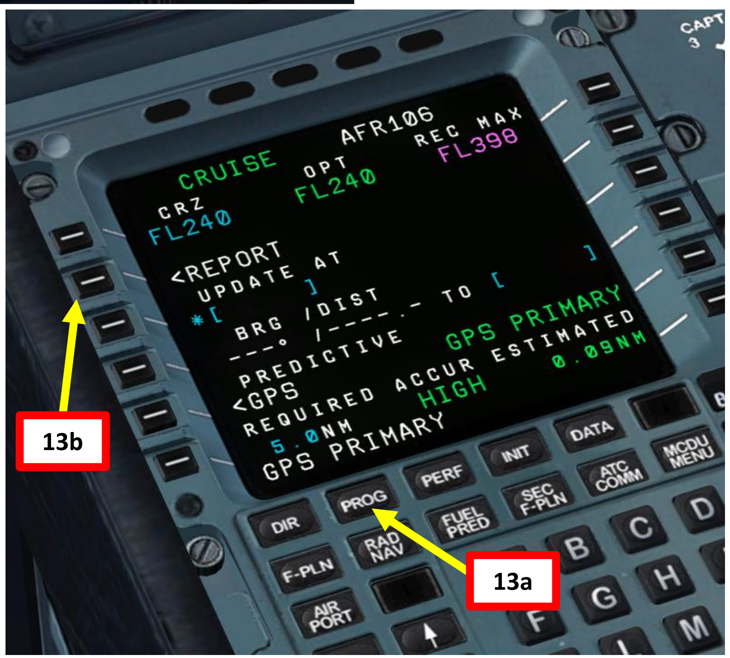
PLANNING DESCENT

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 "FMGC SETUP – FLIGHT PLAN" section.
2. Go on FMGS PERFORMANCE page on the MCDU to set FMGC parameters for your approach and arrival
3. Click on "NEXT PHASE" until you reach the "APPR" (approach) page
4. Set QNH (barometric pressure) setting to 1030 by typing "1030" on MCDU keypad and clicking on LSK next to QNH
5. Set temperature to 15 deg C by typing "15" on MCDU keypad and clicking on LSK next to TEMP
6. Set magnetic heading and wind correction to 271 and 5 kts by typing "271/05" on MCDU keypad and clicking on LSK next to MAG WIND
7. Set Transition Level to FL070 and by typing "70" on MCDU keypad and clicking on LSK next to TRANS FL
8. Set MINIMUMS (Decision Height) to 277 ft by typing "277" on MCDU keypad and clicking on LSK next to "DH"
9. Verify that LDG CONF (Landing Configuration) flaps setting is set to FULL.
10. Set AUTOBRAKE to LO



PLANNING DESCENT

11. On FCU (Flight Control Unit), set Final Descent Altitude to 2000 ft. The aircraft will not start descending yet because it hasn't reached the Top of Descent point, represented with a white arrow.
12. Go in the PERFORMANCE page of the FMGC to monitor your flight progress. You can monitor your distance to the Top of Climb for instance.
13. Go in the PROGRESS page of the FMGC and select the "REPORT" page to 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

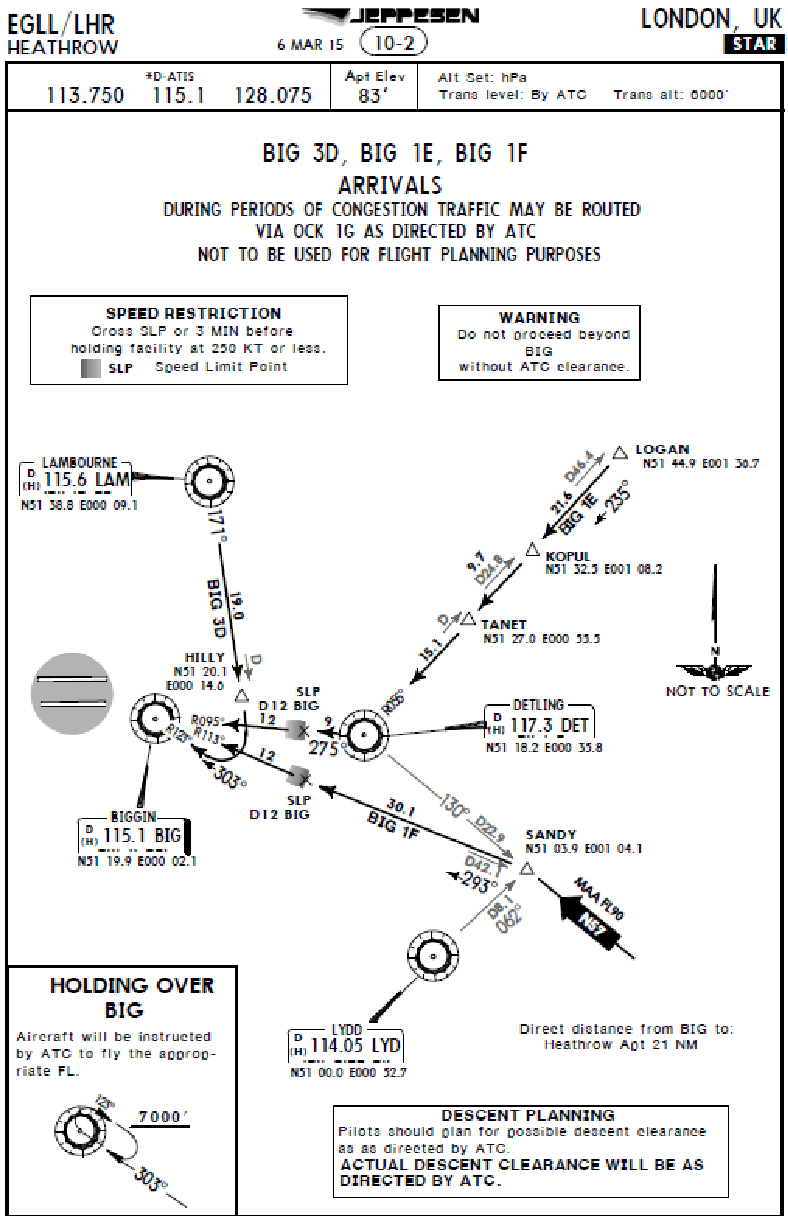


DESCENT & APPROACH

1. Once you reach the Top of Descent point, set ALTITUDE knob to 2000 ft and press it (left click) to engage a “managed mode” descent.
2. Once our descent profile is initiated, click on the “STD” BARO button to set barometric pressure instead of standard pressure. In our case, we will assume the tower told us to leave the barometric pressure at 1030 hPa.
3. When reaching FL100, set LANDING LIGHTS to ON and SEAT BELTS light to ON.

SECURING APPROACH

1. Before you reach the last waypoint of the STAR (BIG), the tower should be able to clear us for open descent to 2000 ft.
2. Once you fly over the Deceleration Point (can be monitored on the Navigation Display or the DECEL menu in the "F-PLN" FMGC page), your aircraft will start losing speed and will begin your approach.
3. Once you crossed the Deceleration Point, open up the PERF page on your FMGC and click two times on the LSK next to "ACTIVATE APPR PHASE".



STAR	ROUTING
BIG 3D ❶	At LAM, LAM R-171 to HILLY, turn onto inbound holding, 303° track to BIG.
BIG 1E ❶	At LOGAN, intercept DET R-055 inbound via KOPUL and TANET to DET, turn RIGHT, intercept BIG R-095 inbound to BIG.
BIG 1F	At SANDY, intercept BIG R-113 inbound to BIG.

❶ As directed by ATC. Not to be used for flight planning purposes.

CHANGES: STARs BIG 3B, 3C & 1G transferred.

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SECURING APPROACH

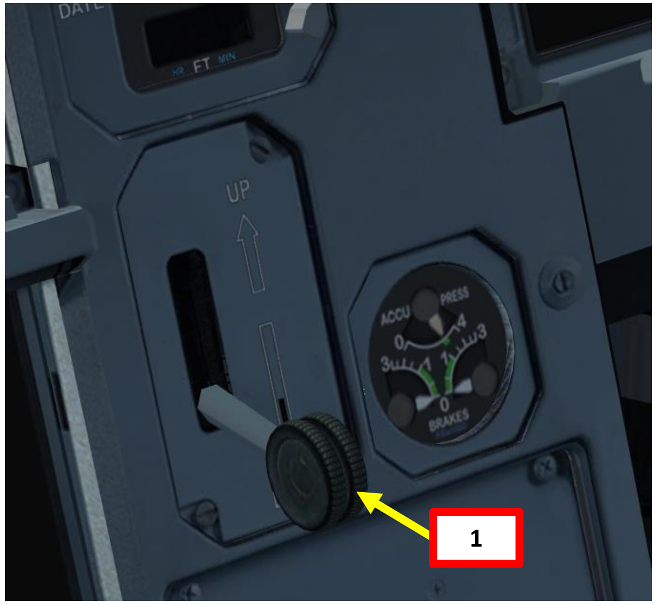
4. Press the “LS” button to show ILS information on the PFD.
5. Once you are at least 25 nm from ILS approach (a bit before Approach Fix CI27L), press the “APPR” autopilot mode to arm both LOC (Localizer) and G/S (Glide Slope) modes.
6. Press the “AP2” button to arm the Autoland autopilot mode (this mode requires a second autopilot channel).
7. Set Navigation Display mode to LS to check for localizer and glide slope.
8. When LOC (localizer) is captured, the PFD will indicate in green that the “LOC” autopilot mode is active.
9. Set Flaps lever to 1
10. Set Navigation Display mode back to NAV
11. When glide slope is captured,/the PFD will indicate in green that the “G/S” autopilot mode is active.
12. Set Flaps lever to 2
13. 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 .

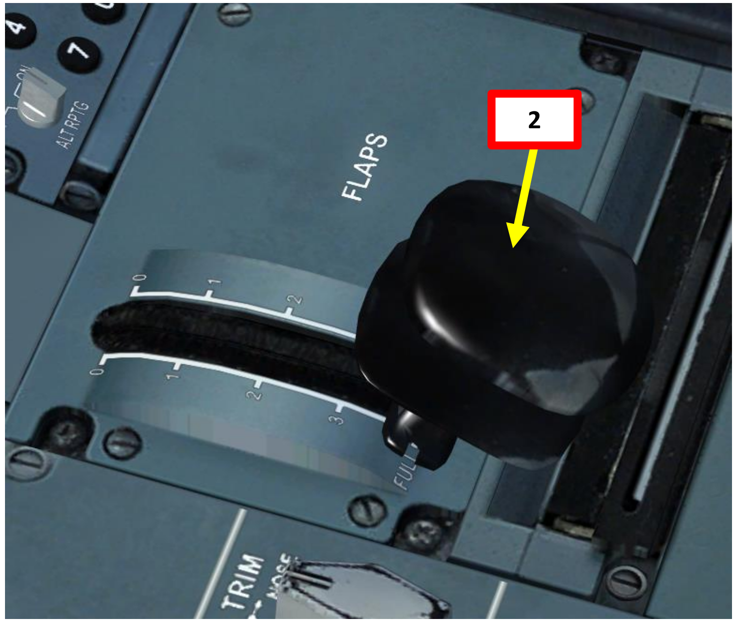
FINAL APPROACH

1. Once you are at 1500 ft on final approach, set landing gear down.
2. Set flaps to FULL.
3. Arm Speed Brake
4. Set all lights ON
5. The Autoland will use three autopilot modes.

- 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.

Another procedure is to disconnect both Autopilot AP1 and AP2 switches and the Autothrottle switch just before landing and follow the flight director to the runway by flying manually.





LANDING

1. When you hear an audio cue “MINIMUM”, 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)

Glide Slope Captured

Localizer Captured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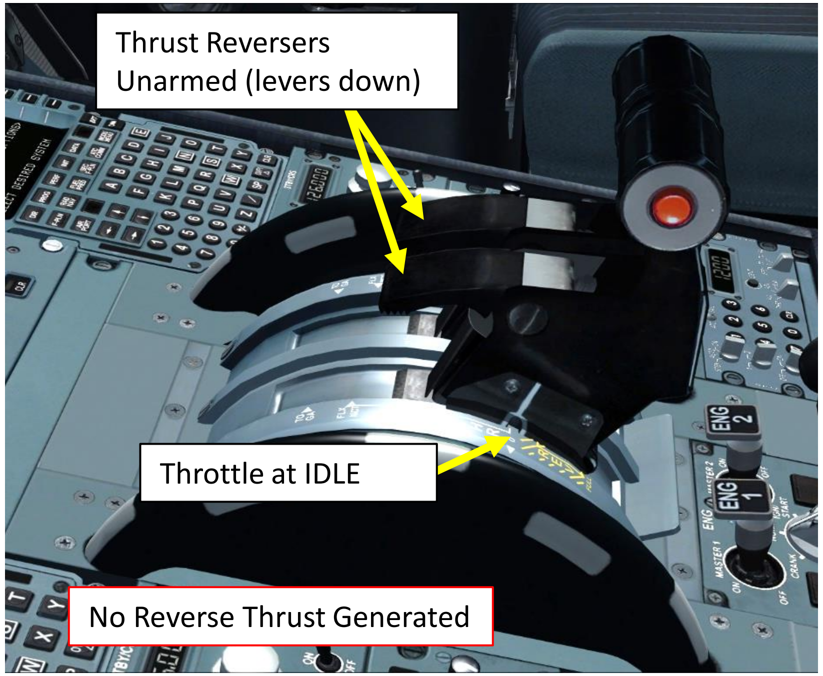
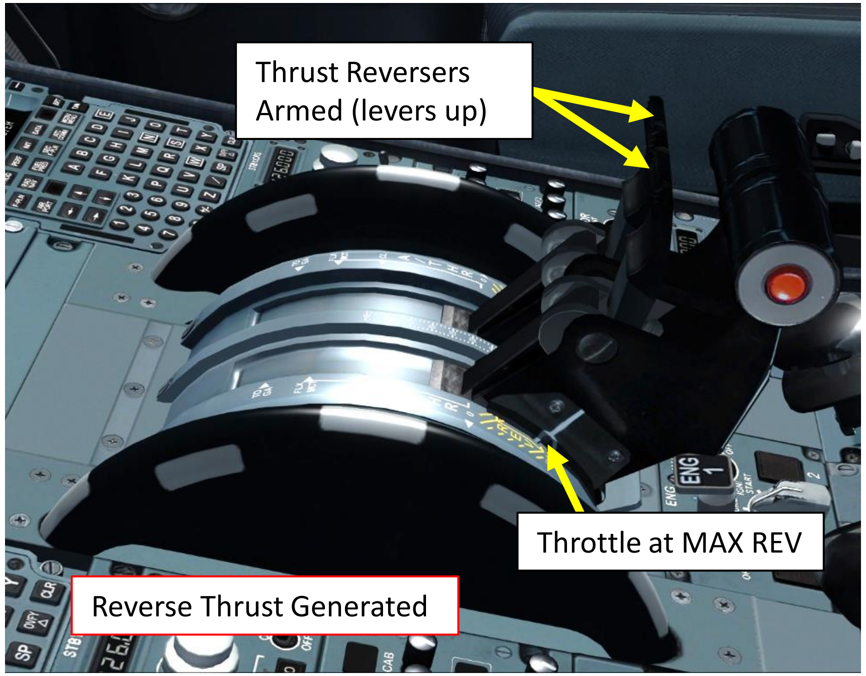
LANDING

5. Press and hold "F2" ("Throttle decrease quickly" binding) to deploy thrust reversers until you slow down enough to vacate the runway safely.

The Thrust Reverser lever can be moved by pressing and holding the "Throttle (decrease quickly)" control mapped to your joystick. Make sure that the "Repeat" slider is set fully to the right. The default key binding is "F2".

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.



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