



*PREPAR3D GUIDE*  
*PMDG 777-200 LR*

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LAST UPDATED: 26/07/2018



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PLATFORM: PREPAR3D V 4.2

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

The **Boeing 777** is a long-range wide-body twin-engine jet airliner developed and manufactured by Boeing Commercial Airplanes. It is the world's largest twinjet and has a typical seating capacity of 314 to 396 passengers, with a range of 5,240 to 8,555 nautical miles (9,704 to 15,844 km). Commonly referred to as the "Triple Seven", its distinguishing features include the largest-diameter turbofan engines of any aircraft, long raked wings, six wheels on each main landing gear, fully circular fuselage cross-section, and a blade-shaped tail cone. Developed in consultation with eight major airlines, the 777 was designed to replace older wide-body airliners and bridge the capacity difference between Boeing's 767 and 747. Boeing's first fly-by-wire airliner, it has computer-mediated controls. It was also the first commercial aircraft to be designed entirely with computer-aided design.

The 777 is produced in two fuselage lengths as of 2018. The original 777-200 variant entered commercial service in 1995, followed by the extended-range 777-200ER in 1997. The stretched 777-300, which is 33.25 ft (10.1 m) longer, followed in 1998. The initial 777-200, extended-range -200ER, and -300 versions are equipped with General Electric GE90, Pratt & Whitney PW4000, or Rolls-Royce Trent 800 engines. They have since been collectively referred to as 777 Classics. The extended-range 777-300ER and ultra long-range 777-200LR variants entered service in 2004 and 2006 respectively, while the 777F, a freighter version, debuted in February 2009; these second-generation variants all feature high-output GE90 engines and extended raked wingtips. The 777-200LR is one of the world's longest-range airliners, able to fly more than halfway around the globe and holds the record for the longest distance flown non-stop by a commercial aircraft.

The 777 ranks as one of Boeing's best-selling models, making it the most-produced Boeing wide-body jet, surpassing the Boeing 747. Airlines have acquired the type as a comparatively fuel-efficient alternative to other wide-body jets and have increasingly deployed the aircraft on long-haul transoceanic routes. Direct market competitors include the Airbus A330-300, the Airbus A350 XWB, and the out-of-production A340 and McDonnell Douglas MD-11. The 787 Dreamliner, which entered service in 2011, shares design features and a common type rating for pilots with the 777.

The 777 is one of the most modern aircraft available in Prepar3d and FSX. It comes with built-in checklists that are accessible directly on the multifunction displays, which makes the pilots' life much easier.

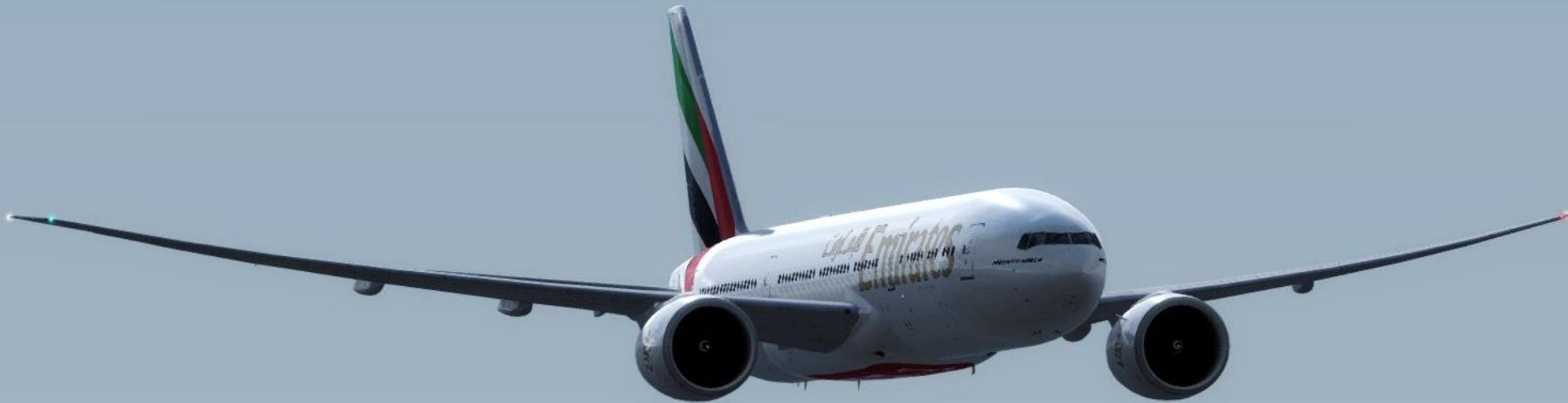


**777 Built-In Checklists**

In the early 1970s, the Boeing 747, McDonnell Douglas DC-10, and the Lockheed L-1011 TriStar became the first generation of wide-body passenger airliners to enter service. In 1978, Boeing unveiled three new models: the twin-engine Boeing 757 to replace its 727, the twin-engine 767 to challenge the Airbus A300, and a trijet 777 concept to compete with the DC-10 and L-1011. The mid-size 757 and 767 launched to market success, due in part to 1980s' extended-range twin-engine operational performance standards (ETOPS) regulations governing transoceanic twinjet operations. These regulations allowed twin-engine airliners to make ocean crossings at up to three hours' distance from emergency diversionary airports. Under ETOPS rules, airlines began operating the 767 on long-distance overseas routes that did not require the capacity of larger airliners. The trijet 777 was later dropped, following marketing studies that favored the 757 and 767 variants. Boeing was left with a size and range gap in its product line between the 767-300ER and the 747-400.

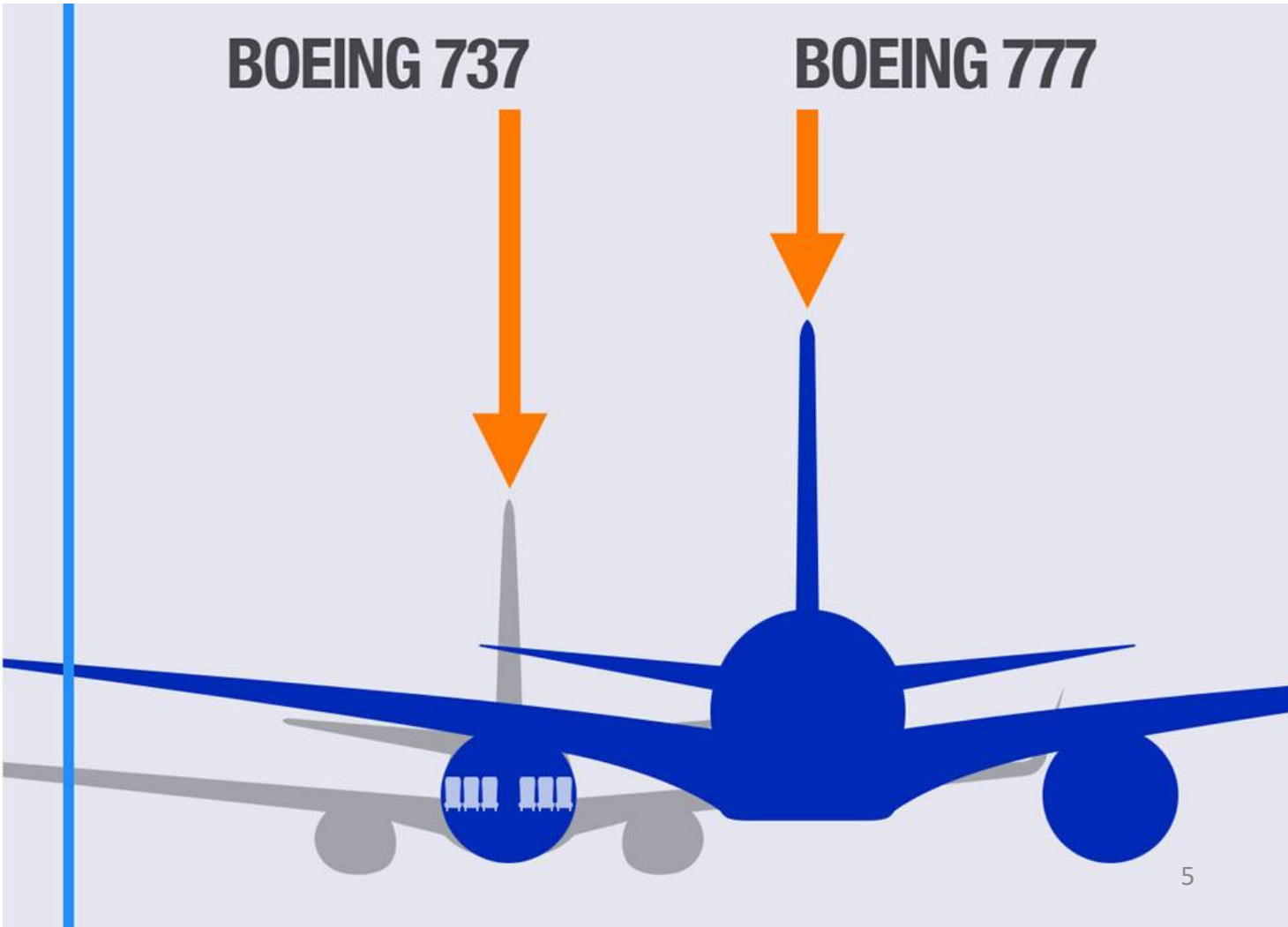
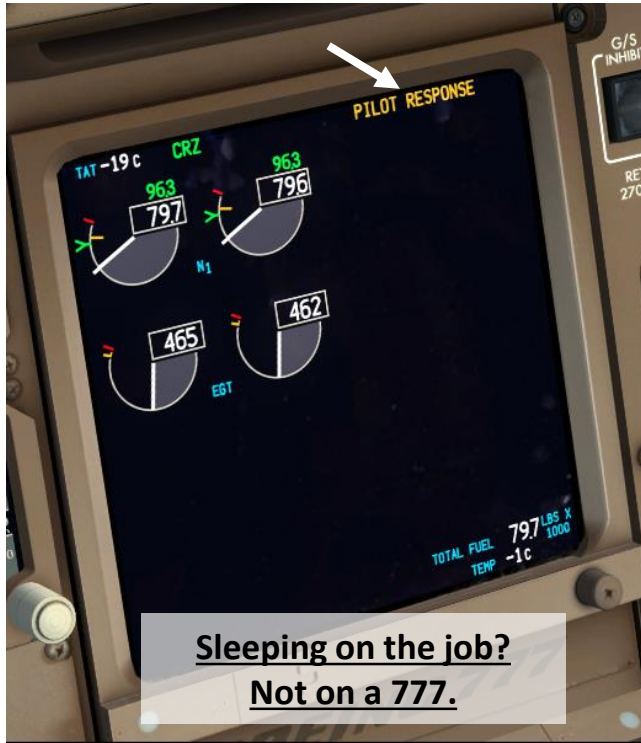
By the late 1980s, DC-10 and L-1011 models were approaching retirement age, prompting manufacturers to develop replacement designs. McDonnell Douglas was working on the MD-11, a stretched and upgraded successor of the DC-10, [while Airbus was developing its A330 and A340. In 1986, Boeing unveiled proposals for an enlarged 767, tentatively named 767-X, to target the replacement market for first-generation wide-bodies such as the DC-10, and to complement existing 767 and 747 models in the company lineup. The initial proposal featured a longer fuselage and larger wings than the existing 767, along with winglets. Later plans expanded the fuselage cross-section but retained the existing 767 flight deck, nose, and other elements.

Airline customers were uninterested in the 767-X proposals, and instead wanted an even wider fuselage cross-section, fully flexible interior configurations, short- to intercontinental-range capability, and an operating cost lower than any 767 stretch. Airline planners' requirements for larger aircraft had become increasingly specific, adding to the heightened competition among aircraft manufacturers. By 1988, Boeing realized that the only answer was a new clean-sheet design, which became the 777 twinjet. The company opted for the twin-engine configuration given past design successes, projected engine developments, and reduced-cost benefits. On December 8, 1989, Boeing began issuing offers to airlines for the 777.



Some people think that the 777 is just a bigger 737 with a longer range. This couldn't be further from the truth. The 777 simulated by PMDG represents an aircraft that has a high degree of automation. The systems of the 777 significantly reduce the pilot's workload and people used to fly older aircraft will find themselves often wondering if they missed something or not. If you plan to fly the 777 on real routes, a 12-hour flight on a highly automated aircraft may feel a little boring. That's how I discovered that the aircraft will trigger an advisory requiring a pilot response if you let the aircraft fly on autopilot for too long. Pretty neat, eh? The 777 may feel like a simple aircraft to operate at first, but there is evidently a lot of work going on "under the hood".

The Triple-Seven is huge. I never realized how big it was until I stood right next to one and saw that a whole fuselage could fit through its GE90 engines of epic proportions. This aircraft is also seriously long, so that tight cornering during taxi becomes a challenge. Taking off and landing the aircraft requires careful input since it is easy to smack the aircraft's tail on the ground. This is an aircraft begging to be discovered and studied, and it is obvious that PMDG did put a lot of care and thought into making sure we are flying the highest-fidelity version of the aircraft to date.







777-200LR

## TUTORIAL STRUCTURE

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

The flight tutorial is structured as follows:

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

## BEST RESOURCES

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

PMDG 777 FCOM (Flight Crew Operations Manual)

PMDG 777 FCTM (Flight Crew Training Manual)

PMDG Documentation Downloads Section

<https://www.precisionmanuals.com/pages/downloads/docs.html>

777 Continental Flight Manual

<http://www.ameacademy.com/pdf/boeing/Boeing-777-FCOM.pdf>

Boeing 777 CBT (Computer Based Training)

[https://www.youtube.com/watch?v=h2kMw655TDM&list=PL\\_4ljWrVvM91FL\\_Q7wv2HGHU\\_M8MUR6Tu](https://www.youtube.com/watch?v=h2kMw655TDM&list=PL_4ljWrVvM91FL_Q7wv2HGHU_M8MUR6Tu)

Matt Davies' PMDG 777 Tutorial (Three Parts) (Youtube)

Part 1: <https://www.youtube.com/watch?v=z6cFl5uT-u0>

Part 2: <https://www.youtube.com/watch?v=PPpN4gA1JTo>

Part 3: <https://www.youtube.com/watch?v=7UdU0plEfs8>

777 Flight Deck (Jerome Meriweather)

<http://meriweather.com/flightdeck/777/fyi/fyi-777.html>





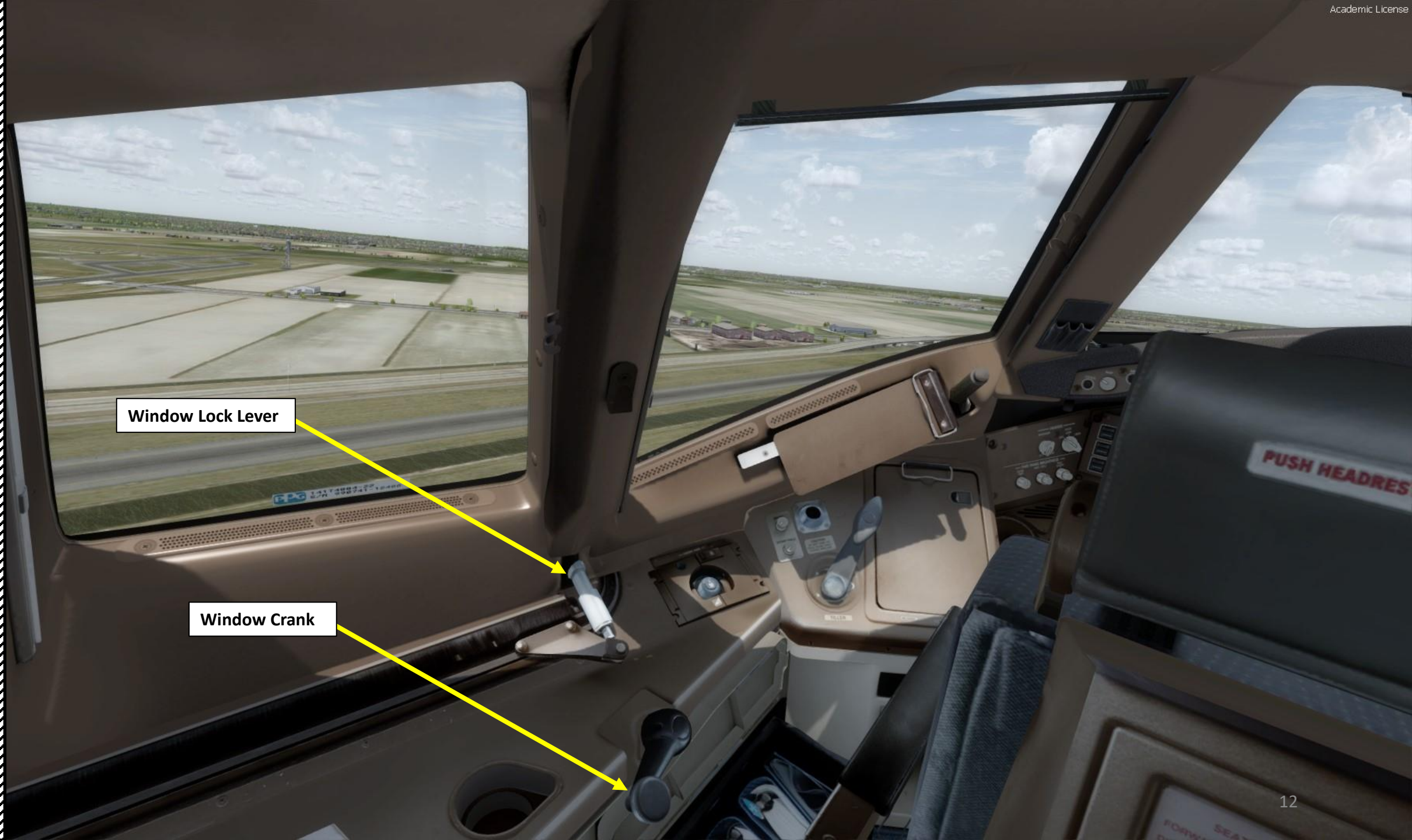
777-200LR 

**PART 2 - COCKPIT**



Front Flight Deck





Window Lock Lever

Window Crank

**Window Lock Lever**

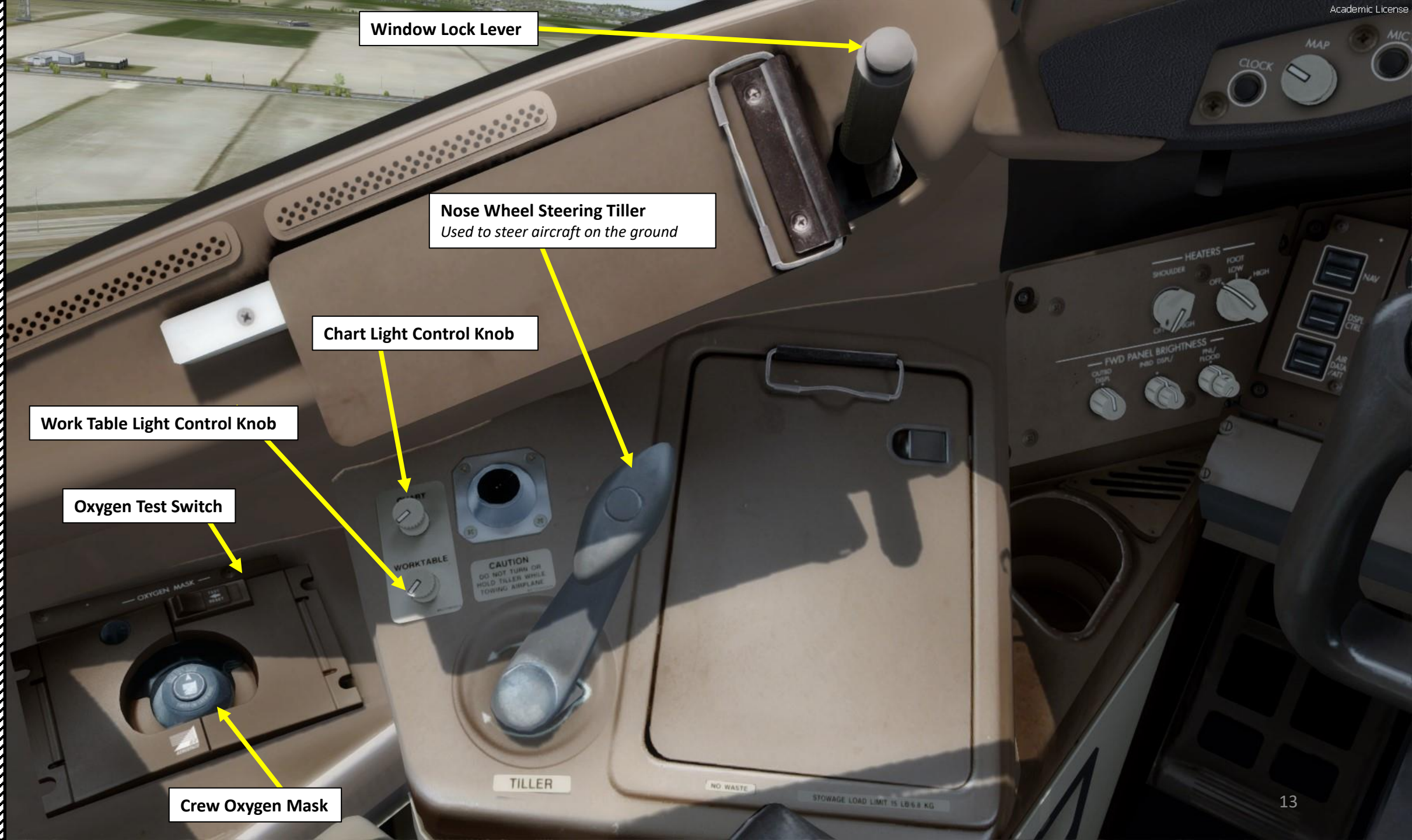
**Nose Wheel Steering Tiller**  
*Used to steer aircraft on the ground*

**Chart Light Control Knob**

**Work Table Light Control Knob**

**Oxygen Test Switch**

**Crew Oxygen Mask**



Microphone Switch

Navigation Data Source Switch

Clock

Map Light Control Knob

Clock Chronograph Switch

Foot Heater Switch

Shoulder Heater Switch

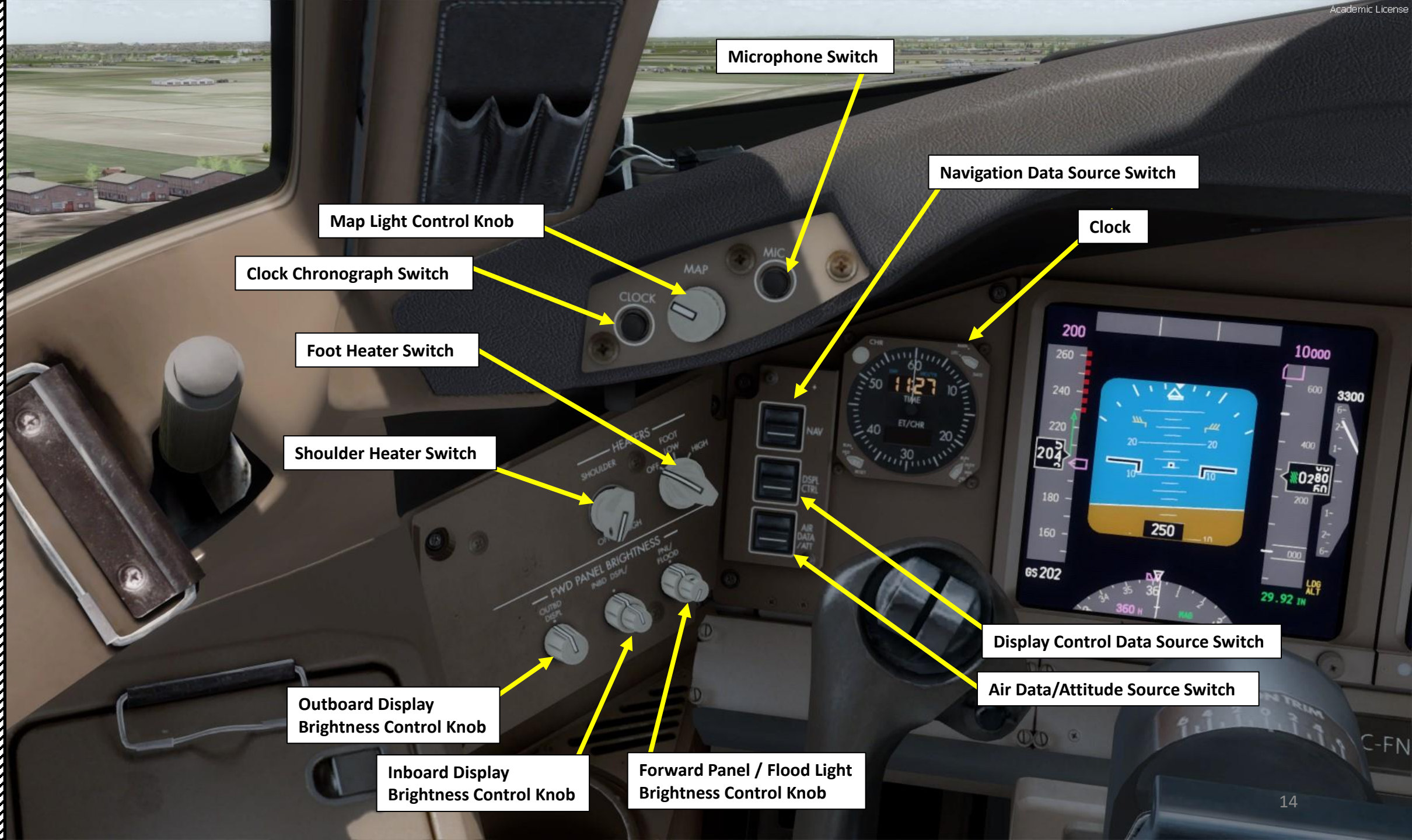
Display Control Data Source Switch

Air Data/Attitude Source Switch

Outboard Display  
Brightness Control Knob

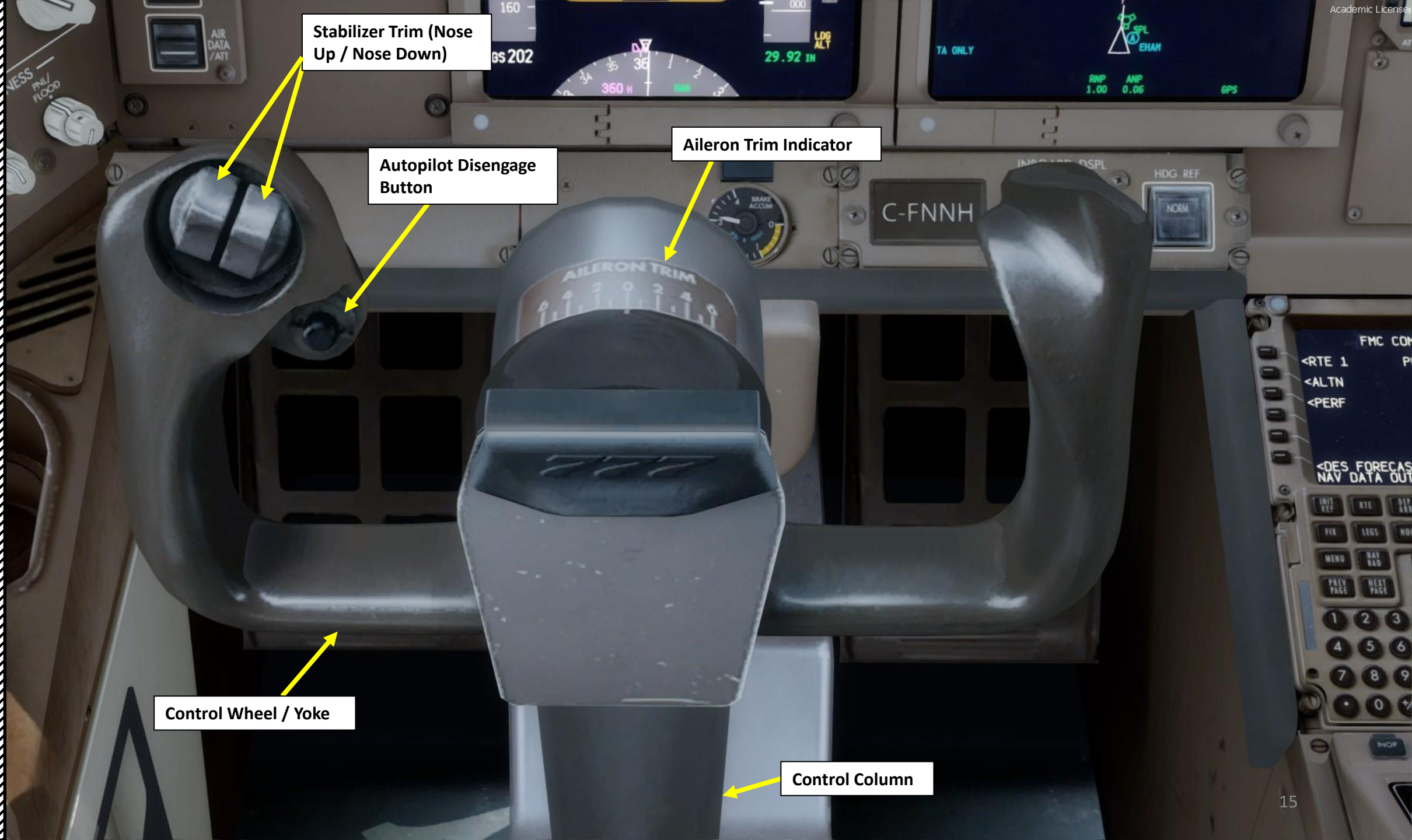
Inboard Display  
Brightness Control Knob

Forward Panel / Flood Light  
Brightness Control Knob



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**PART 2 – COCKPIT**



Stabilizer Trim (Nose Up / Nose Down)

Autopilot Disengage Button

Aileron Trim Indicator

Control Wheel / Yoke

Control Column

777-200LR

PART 2 - COCKPIT

Captain's PFD (Primary Flight Display)

Flight Mode Annunciator

Autopilot Pitch Mode

Autopilot Roll Mode

Bank Angle Scale

Autothrottle Thrust/Speed Mode

Vertical Speed Indicator (ft/min)

Autopilot Status

Calibrated Airspeed Indicator (kts)

Altitude Indicator (ft)

Pitch Angle Scale (deg)

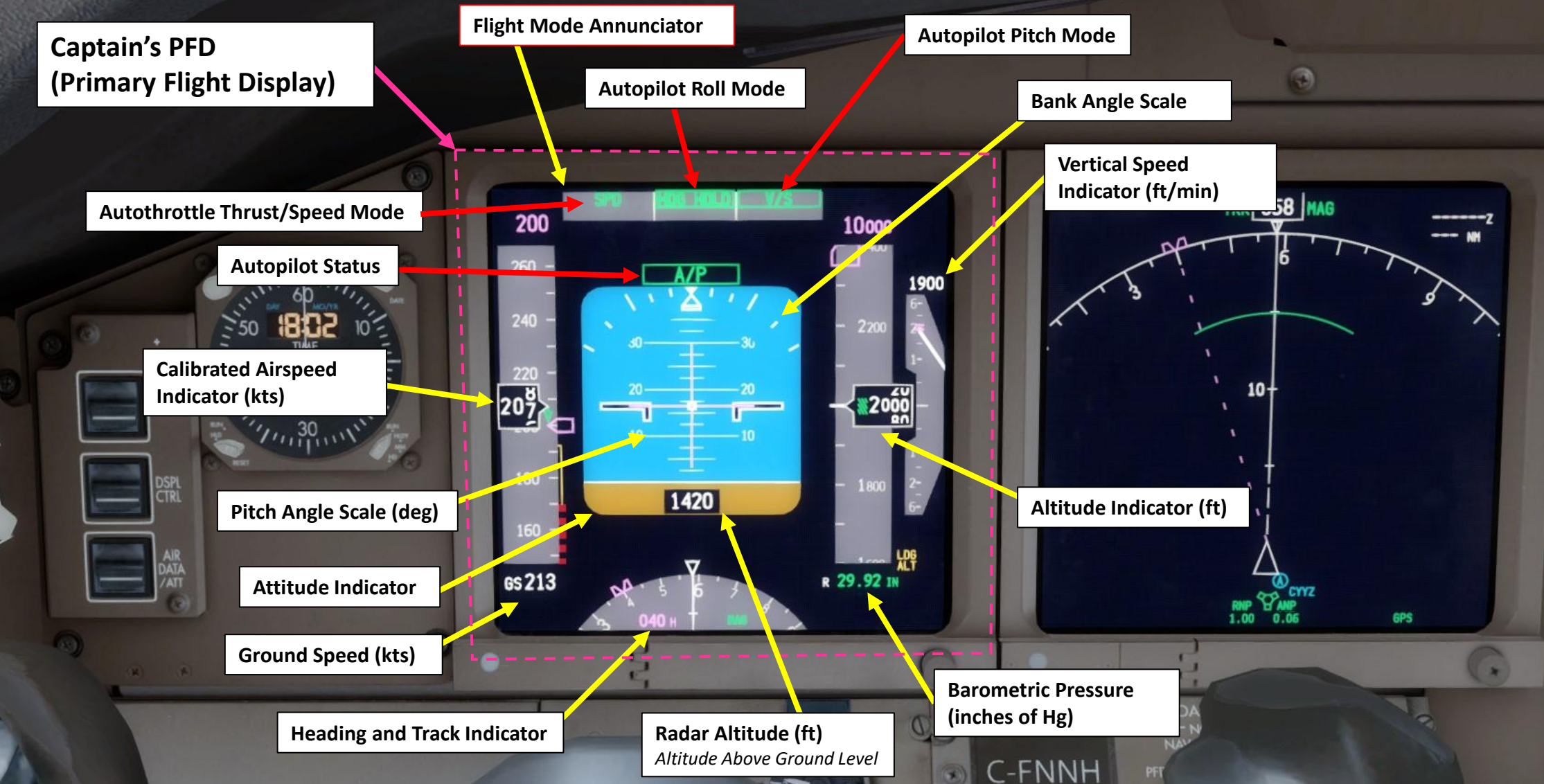
Attitude Indicator

Ground Speed (kts)

Barometric Pressure (inches of Hg)

Heading and Track Indicator

Radar Altitude (ft)  
*Altitude Above Ground Level*





777-200LR

PART 2 - COCKPIT

ND True Airspeed Indication (kts)

ND Ground Speed Indication (kts)

Captain's ND (Navigation Display)

Heading Indicator (Triangle)

Range (nautical miles)

Standby Attitude Indicator





**Brake Source Light**  
*Indicates low pressure in both active brake hydraulic sources*



**Brake Accumulator Pressure Indicator (psi)**



**Aircraft Identification Number**

C-FNNH

**Inboard Captain Display Selector**  
*PFD: Displays Primary Flight Display*  
*NAV: Displays Navigation Display*  
*MFD: Displays MFD (Multifunction Display)*  
*EICAS: Displays EICAS (Engine Indicating and Crew Alerting System)*



**Heading Reference Switch**



Total Air Temperature (TAT) (deg C)

Thrust Mode Display (TO = Takeoff)

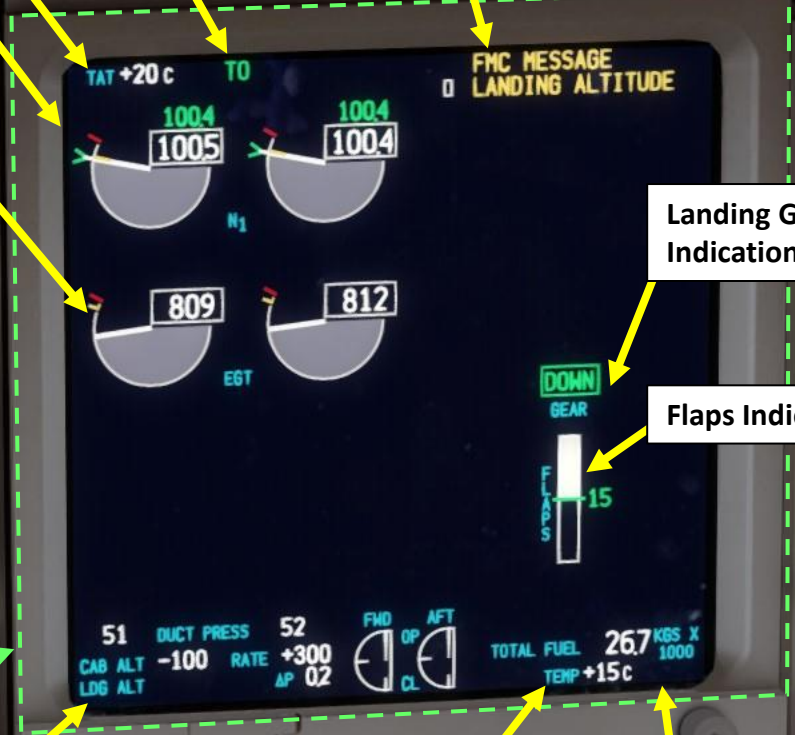
Engine Crew Alerts i.e. START VALVE OPEN, OIL FILTER BYPASS, LOW OIL PRESSURE, etc.

N1 (Fan Speed/Low Pressure Compressor Speed) Indication (%RPM)

EGT (Exhaust Gas Temperature) Indication (deg C)



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



Cabin Pressurization Data

Fuel Temperature (deg C)

Fuel Quantity (x 1000 lbs/kg)

Landing Gear Indication

Flaps Indication

INBOARD DSPL NORM MFD

NAV MFD

PFD EICAS

HDG REF NORM

C-FNNH

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PART 2 - COCKPIT

**Ground Proximity Warning System (GPWS) BELOW G/S PUSH-INHIBIT light**  
*Illuminates when flying below a safe glide slope except when flying under 1000 ft*

**Ground Proximity Warning System (GPWS) Flap Override Switch**

**Ground Proximity Warning System (GPWS) Landing Gear Override Switch**

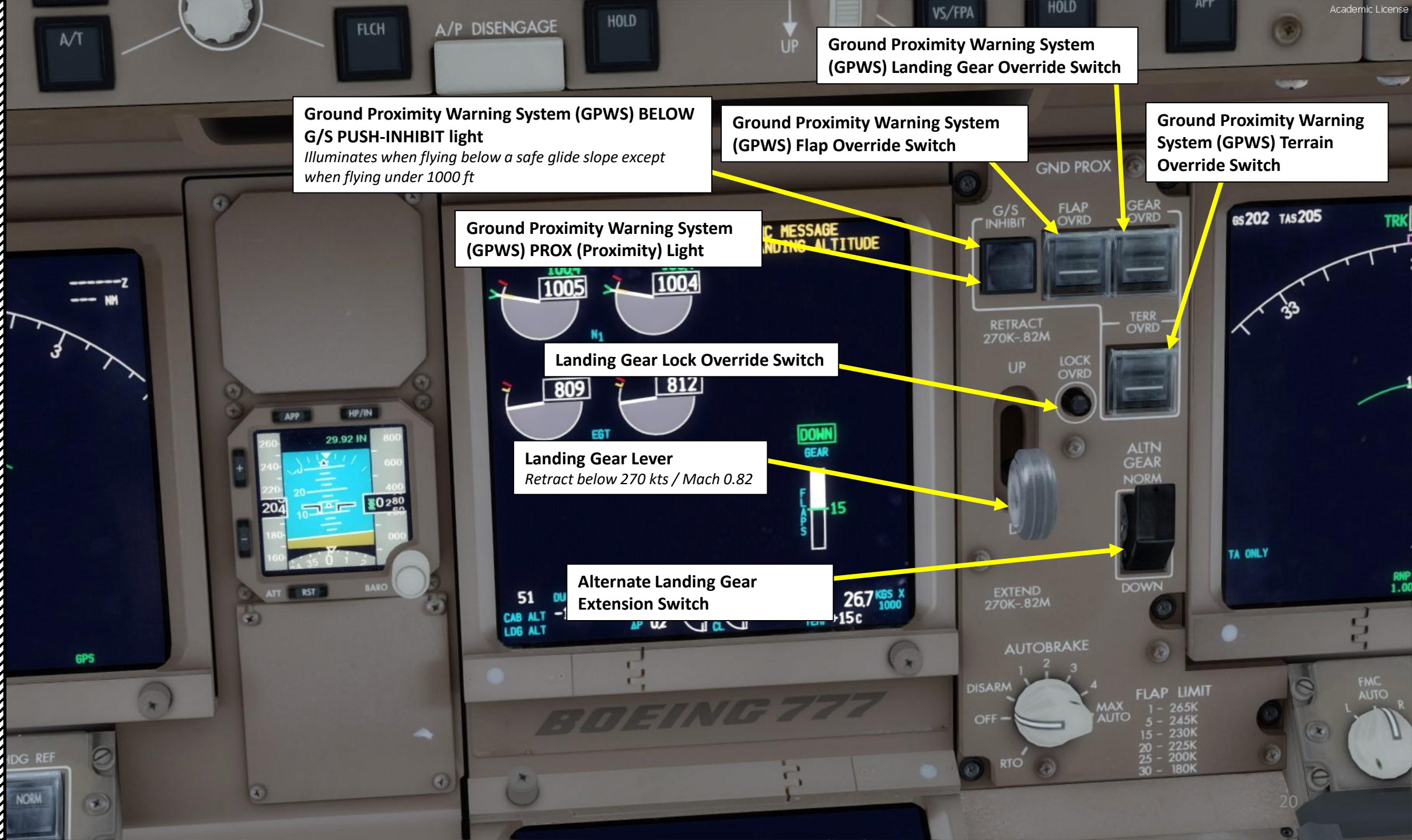
**Ground Proximity Warning System (GPWS) Terrain Override Switch**

**Ground Proximity Warning System (GPWS) PROX (Proximity) Light**

**Landing Gear Lock Override Switch**

**Landing Gear Lever**  
*Retract below 270 kts / Mach 0.82*

**Alternate Landing Gear Extension Switch**



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PART 2 - COCKPIT

TAT +20c TO FMC MESSAGE LANDING ALTITUDE

1004 1004  
1005 1004

809 81

EGT N1

51 DUCT PRESS 52 FWD OP AFT CL  
CAB ALT -100 RATE +300 AP 02  
LDG ALT

TOTAL FUEL 267 KGS X 1000  
TEMP +15c

FLAP LIMIT	
1 deg	265 kts
5 deg	245 kts
15 deg	230 kts
20 deg	225 kts
25 deg	200 kts
30 deg	180 kts

GND PROX

G/S INHIBIT FLAP OVRD GEAR OVRD

RETRACT 270K-82M TERR OVRD

UP LOCK OVRD

EXTEND 270K-82M ALTN GEAR NORM

DOWN

6s202 TAS205 TRK 003 MAG

36 33 3

10

TA ONLY

RNP 1.00 ANP 0.06 GPS

**Inboard First Officer Display Selector**  
 PFD: Displays Primary Flight Display  
 NAV: Displays Navigation Display  
 MFD: Displays MFD (Multifunction Display)  
 EICAS: Displays EICAS (Engine Indicating and Crew Alerting System)

AUTOBRAKE

DISARM 1 2 3 4 MAX AUTO

OFF RTO

FLAP LIMIT

1 - 265K  
 5 - 245K  
 15 - 230K  
 20 - 225K  
 25 - 200K  
 30 - 180K

INBOARD DSPL

FMC AUTO L R

EICAS NORM NAV PFD

C-FNNH

**Autobrake Switch**  
 OFF / DISARM / 1 / 2 / 3 / 4 / MAX AUTO / RTO (Rejected Takeoff)

**First Officer FMC (Flight Management Computer) Selector Switch**  
 Left/Auto/Right

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PART 2 - COCKPIT

First Officer's ND  
(Navigation Display)

First Officer's PFD  
(Primary Flight Display)

Navigation Data Source Switch

Clock

Display Control Data Source Switch

Air Data/Attitude Source Switch



Window Lock Lever

Map Light Control Knob

Microphone Switch

Clock Chronograph Switch

Foot Heater Switch

Shoulder Heater Switch

Chart Light Control Knob

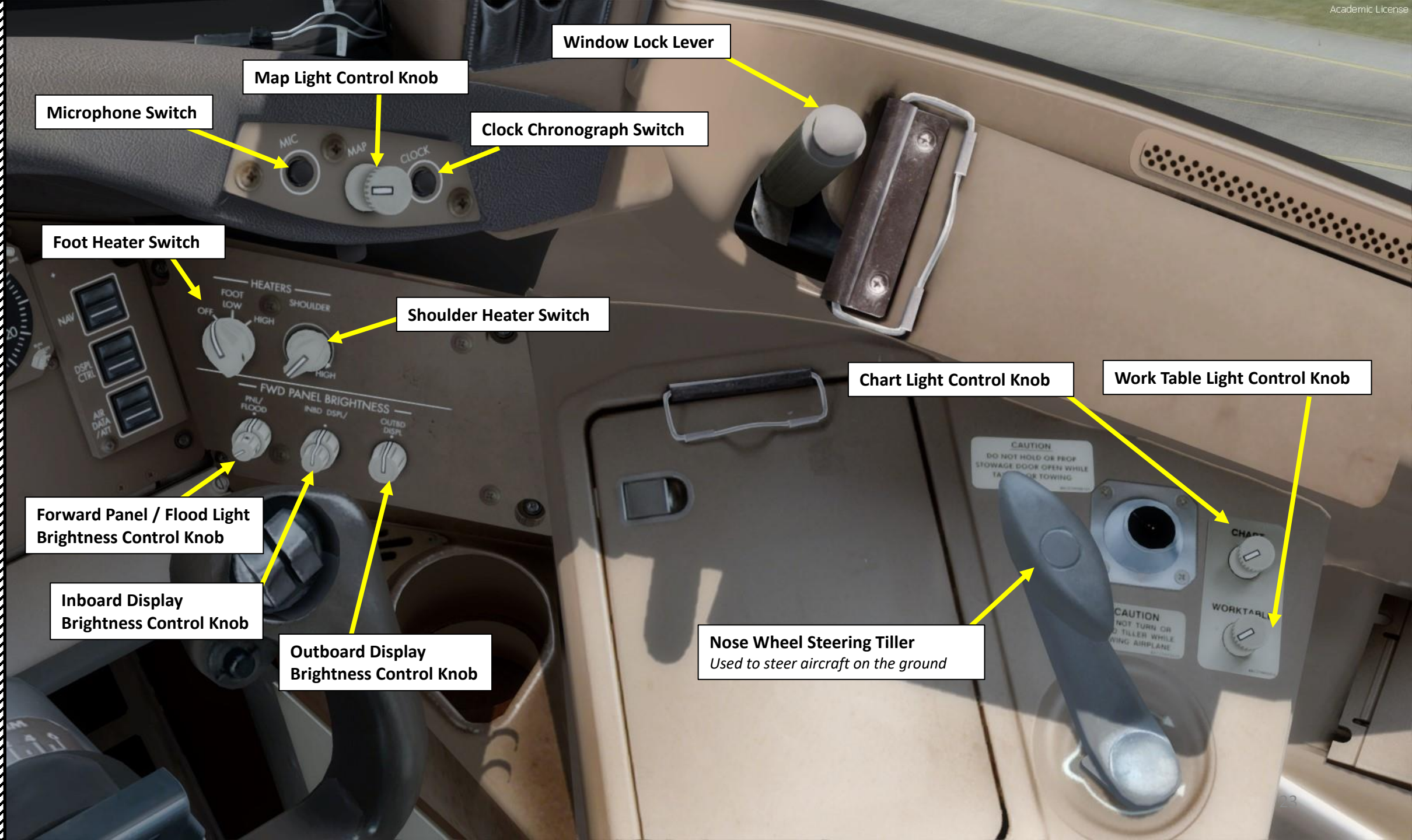
Work Table Light Control Knob

Forward Panel / Flood Light Brightness Control Knob

Inboard Display Brightness Control Knob

Outboard Display Brightness Control Knob

Nose Wheel Steering Tiller  
*Used to steer aircraft on the ground*



**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 engine indicating and crew alerting system (EICAS) display.  
*Note 2:* The complex electromechanical attitude director indicator (ADI) and horizontal situation indicator (HSI) were the first candidates for replacement by EFIS.

**MINS (Minimums) Reference Selector**  
 Outer knob selects RADIO or BAROMETRIC altitude reference for minimums  
 Middle knob adjusts radio or barometric altitude value  
 Inner reset pusher resets minimum

**VOR / ADF 1 (VHF Omnidirectional Range or Automatic Direction Finder) selector switch**

**FPV (Flight Path Vector) switch**  
 Displays the flight path vector on the attitude indicator.

**MTRS (Meters) switch**  
 Displays the altitude in meters instead of feet.

**BARO (Barometric) Reference Selector**  
 Outer knob selects units in Hg or HPA  
 Middle knob adjusts barometric altitude value  
 Inner STD pushbutton sets standard 29.92 in Hg

**VOR / ADF 2 (VHF Omnidirectional Range or Automatic Direction Finder) selector switch**

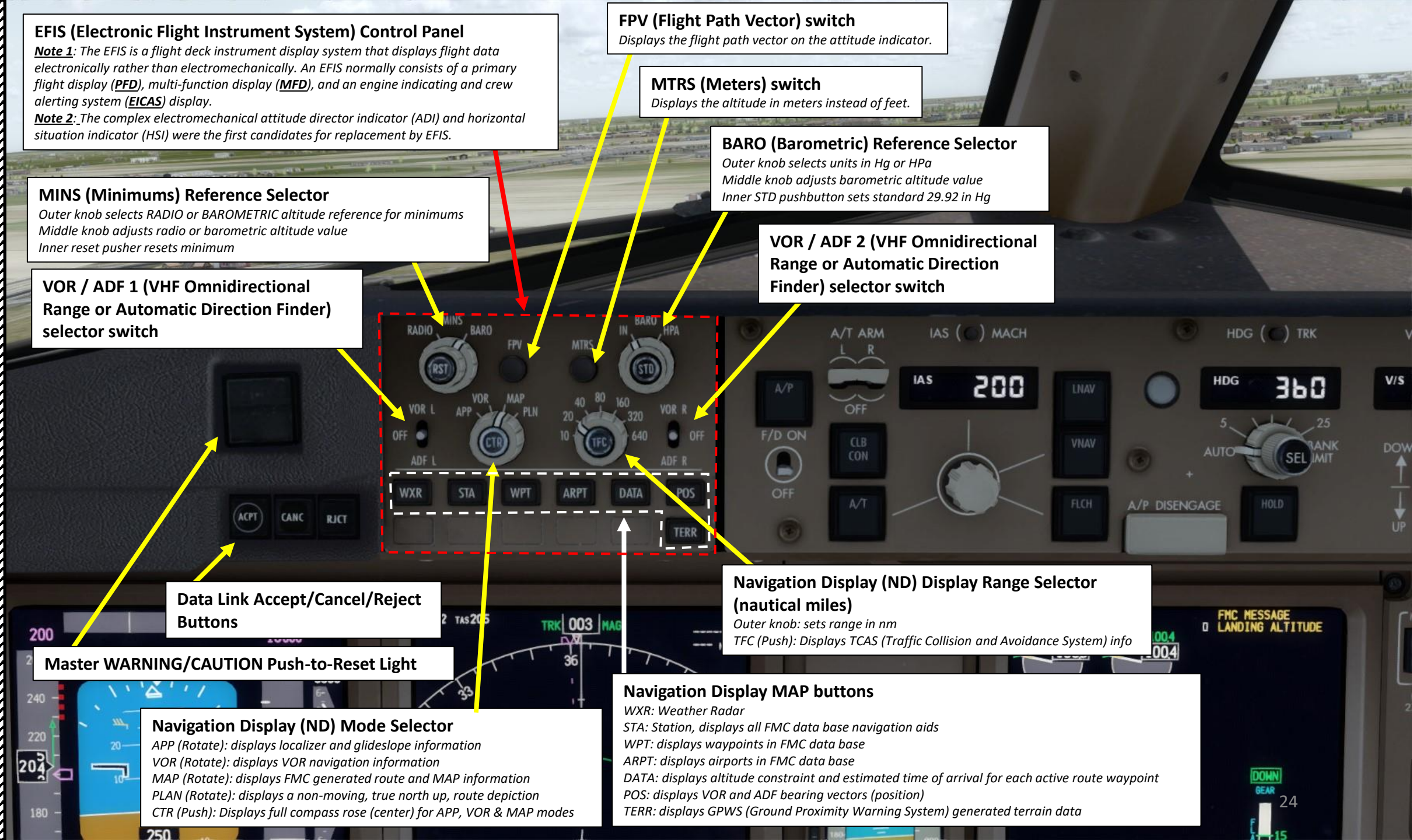
**Data Link Accept/Cancel/Reject Buttons**

**Master WARNING/CAUTION Push-to-Reset Light**

**Navigation Display (ND) Mode Selector**  
 APP (Rotate): displays localizer and glideslope information  
 VOR (Rotate): displays VOR navigation information  
 MAP (Rotate): displays FMC generated route and MAP information  
 PLAN (Rotate): displays a non-moving, true north up, route depiction  
 CTR (Push): Displays full compass rose (center) for APP, VOR & MAP modes

**Navigation Display MAP buttons**  
 WXR: Weather Radar  
 STA: Station, displays all FMC data base navigation aids  
 WPT: displays waypoints in FMC data base  
 ARPT: displays airports in FMC data base  
 DATA: displays altitude constraint and estimated time of arrival for each active route waypoint  
 POS: displays VOR and ADF bearing vectors (position)  
 TERR: displays GPWS (Ground Proximity Warning System) generated terrain data

**Navigation Display (ND) Display Range Selector (nautical miles)**  
 Outer knob: sets range in nm  
 TFC (Push): Displays TCAS (Traffic Collision and Avoidance System) info





**MCP (Mode Control Panel)**  
*Autopilot Controls*

**Autopilot Speed (IAS or Mach) Selected Indicator**

**Autothrottle (A/T) Arming Switches**

**Autopilot Speed (IAS or Mach) Selector**

**Autopilot Reference Speed (IAS or Mach) Selector**

**Autopilot LNAV (Lateral Navigation) Mode Button**

**Autopilot VNAV (Vertical Navigation) Mode Button**

**Cabin Light Sensor Switch**  
*Sensor checks ambient light in the cockpit then adjusts all of the cabin display lights accordingly.*



**Autothrottle (A/T) Switch**  
*Engages autothrottle mode selected.*

**Autothrust CLB/CON (Climb/Continuous) Thrust Mode Button**  
*With two engines operating, changes the engine thrust limit to the FMC selected climb thrust. With one engine operating, changes the thrust limit to maximum continuous thrust (CON).*

**Flight Director (F/D) Switch**

**Autopilot FLCH (Flight Level Change) Mode Button**

**Autopilot Disengage Switch**

**Autopilot (A/P) Button**



Autopilot VS/FPA (Vertical Speed/Flight Path Angle) Mode Toggle Switch

Autopilot Vertical Speed / Flight Path Angle Indicator (ft/min)

Autopilot Heading/Track Mode Toggle Switch

Autopilot Selected Heading/Track Indicator

Autopilot Selected Altitude Indicator (ft)

Autopilot (A/P) Button

Autopilot Localizer Mode Button

Autopilot Bank Angle Limit Selector

Autopilot Selected Heading/Track Selector

Autopilot Heading/Track Hold Mode Button

Autopilot Vertical Speed Thumbwheel selector

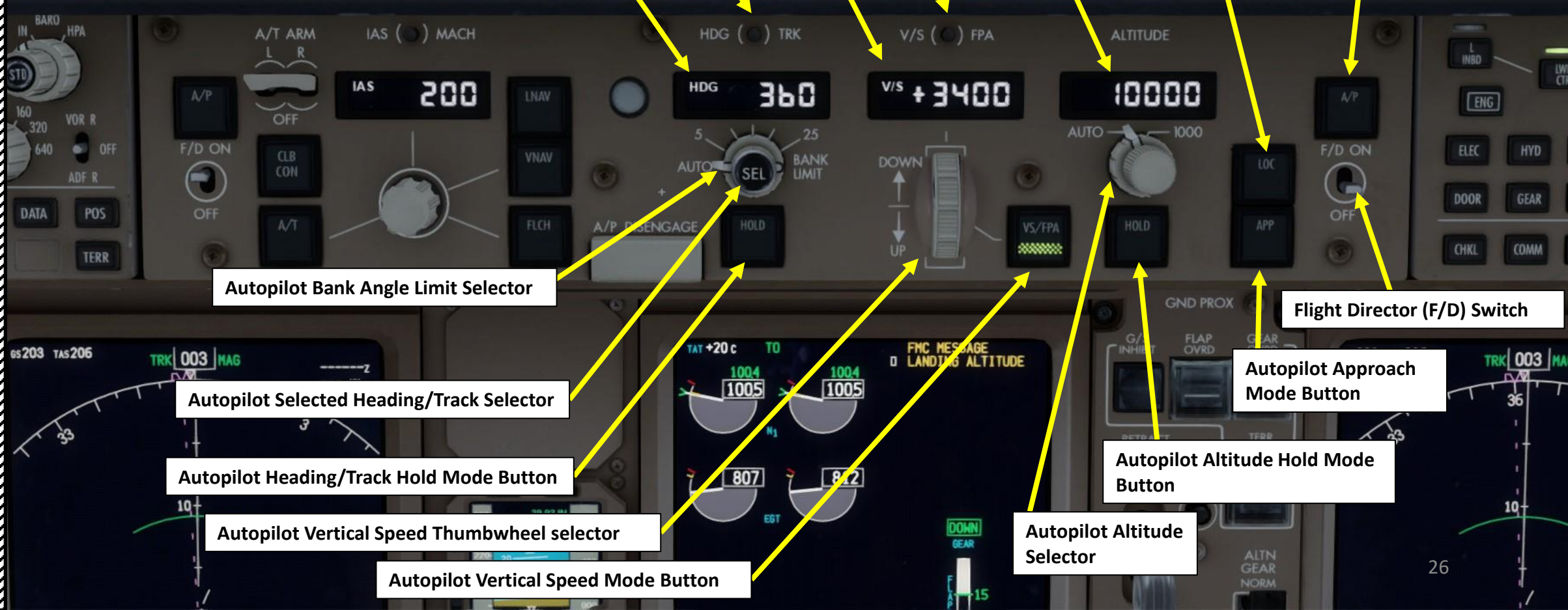
Autopilot Vertical Speed Mode Button

Autopilot Altitude Selector

Flight Director (F/D) Switch

Autopilot Approach Mode Button

Autopilot Altitude Hold Mode Button



**LWR CTR (Lower Center) MFD (Multifunction Display) Display Select Button**

**R INBD (Right Inboard) MFD (Multifunction Display) Display Select Button**

**L INBD (Left Inboard) MFD (Multifunction Display) Display Select Button**

**STAT Display Select Button**  
*Displays Stat (System Status) Page on respective MFD*

**ENG Display Select Button**  
*Selects secondary engine EICAS*

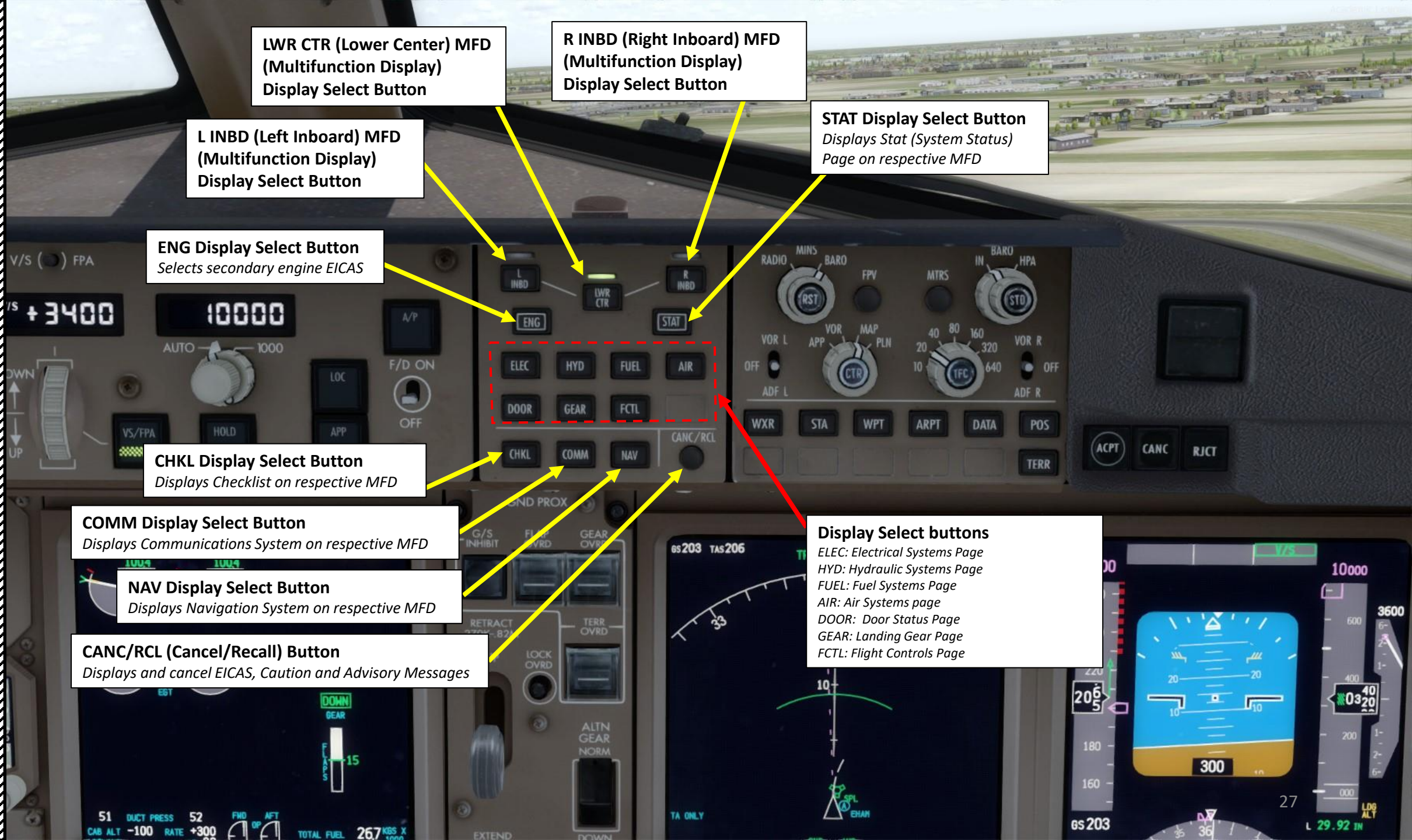
**CHKL Display Select Button**  
*Displays Checklist on respective MFD*

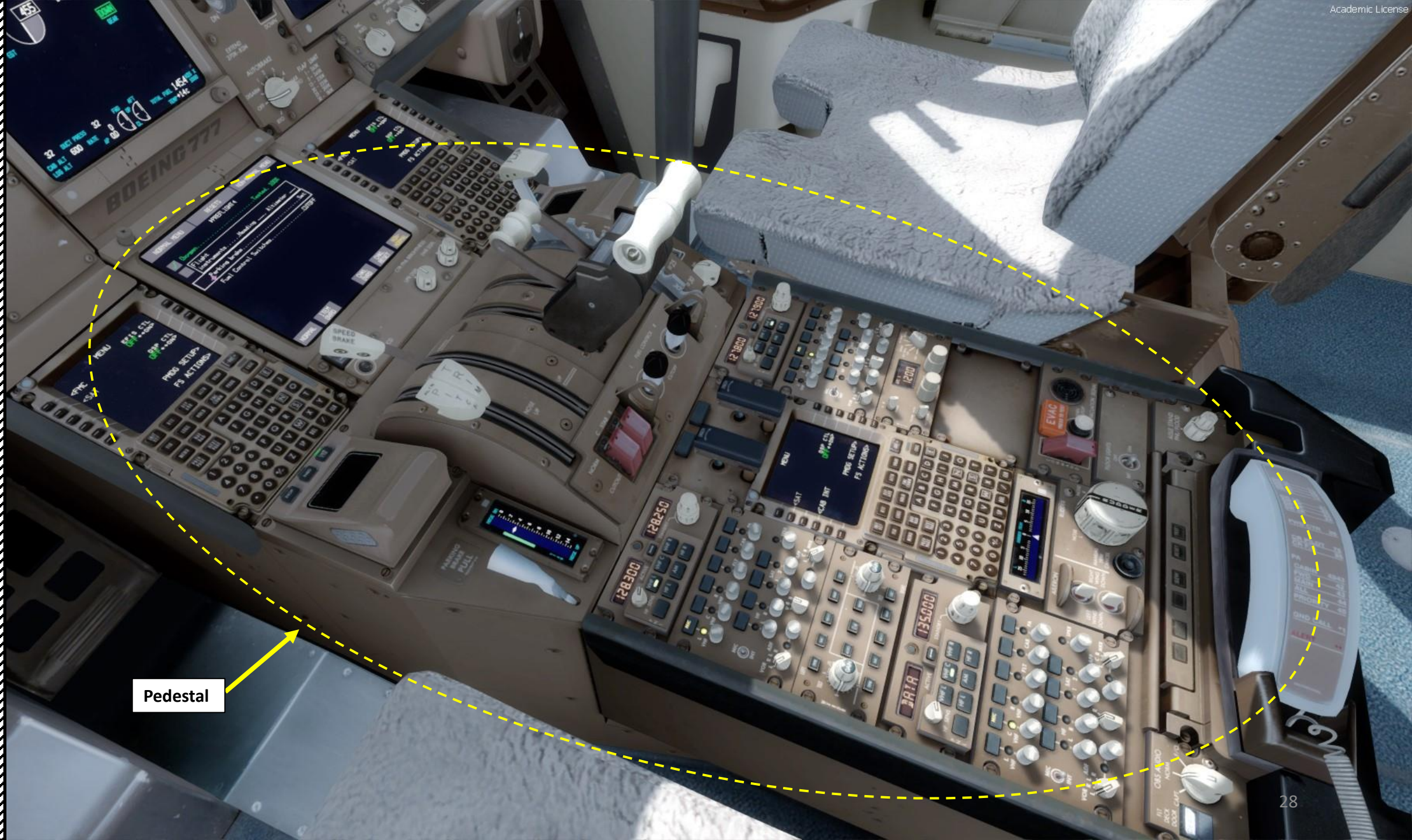
**COMM Display Select Button**  
*Displays Communications System on respective MFD*

**NAV Display Select Button**  
*Displays Navigation System on respective MFD*

**CANC/RCL (Cancel/Recall) Button**  
*Displays and cancel EICAS, Caution and Advisory Messages*

**Display Select buttons**  
ELEC: Electrical Systems Page  
HYD: Hydraulic Systems Page  
FUEL: Fuel Systems Page  
AIR: Air Systems page  
DOOR: Door Status Page  
GEAR: Landing Gear Page  
FCTL: Flight Controls Page

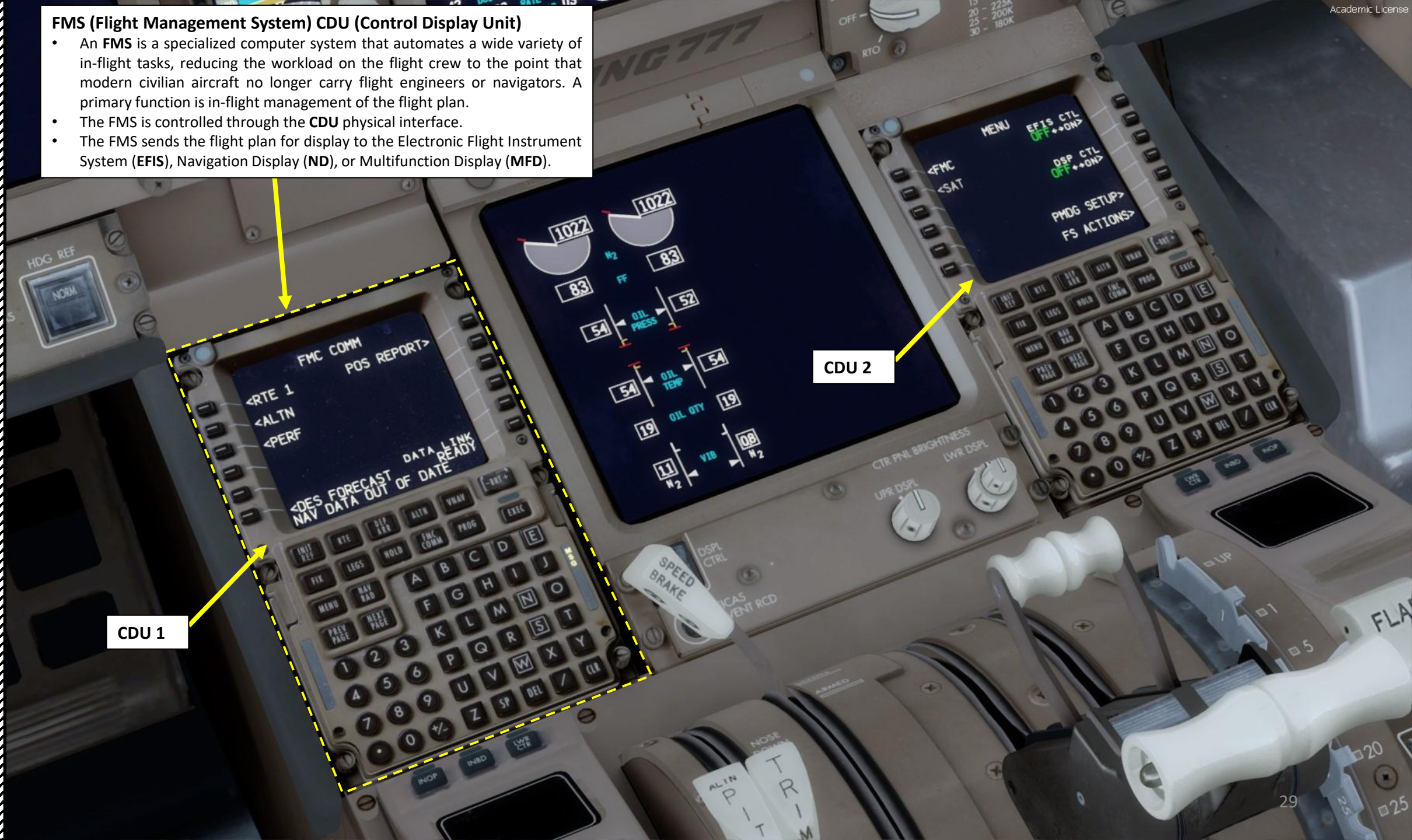




Pedestal

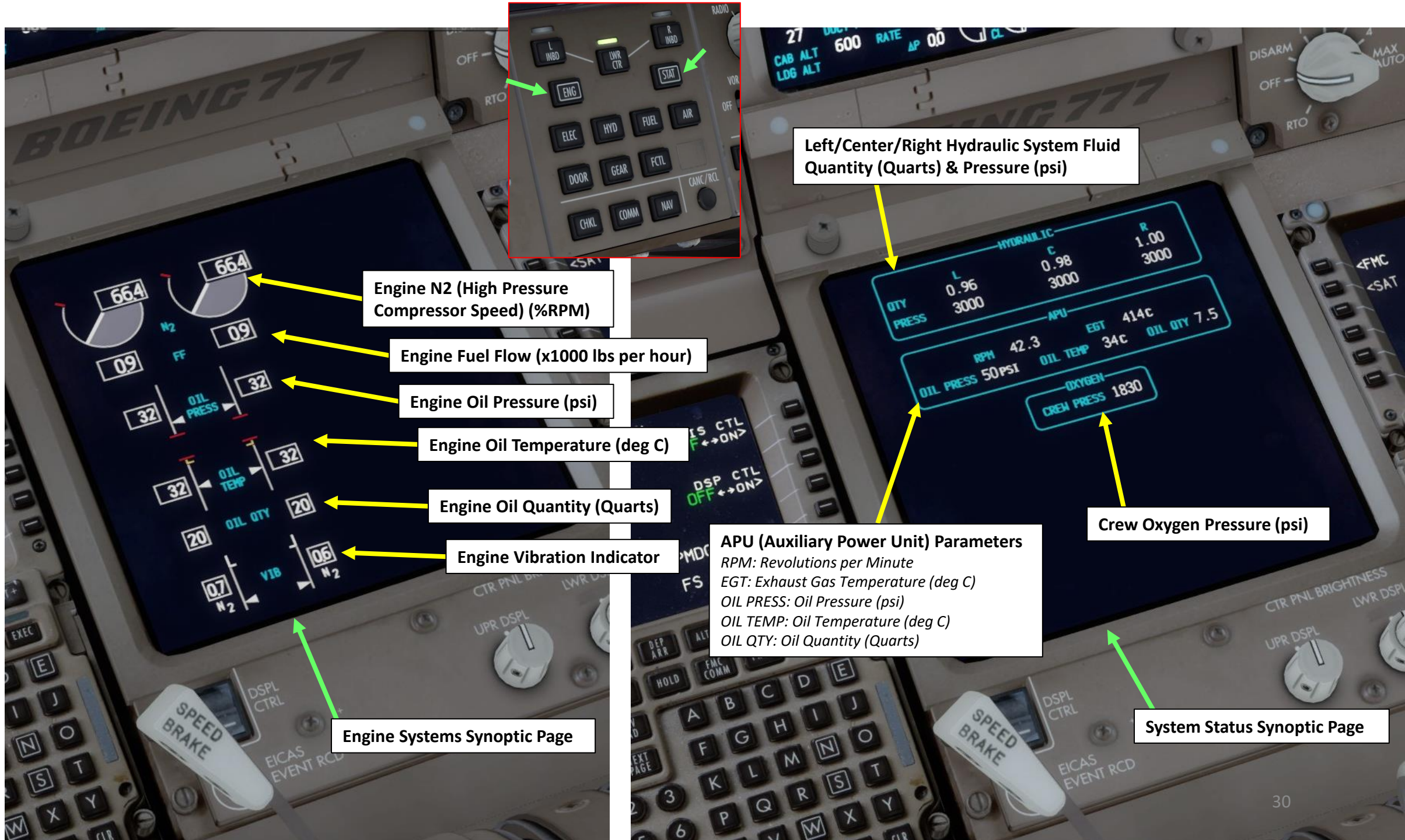
### FMS (Flight Management System) CDU (Control Display Unit)

- 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 **CDU** physical interface.
- The FMS sends the flight plan for display to the Electronic Flight Instrument System (EFIS), Navigation Display (ND), or Multifunction Display (MFD).



CDU 1

CDU 2



Left/Center/Right Hydraulic System Fluid Quantity (Quarts) & Pressure (psi)

Engine N2 (High Pressure Compressor Speed) (%RPM)

Engine Fuel Flow (x1000 lbs per hour)

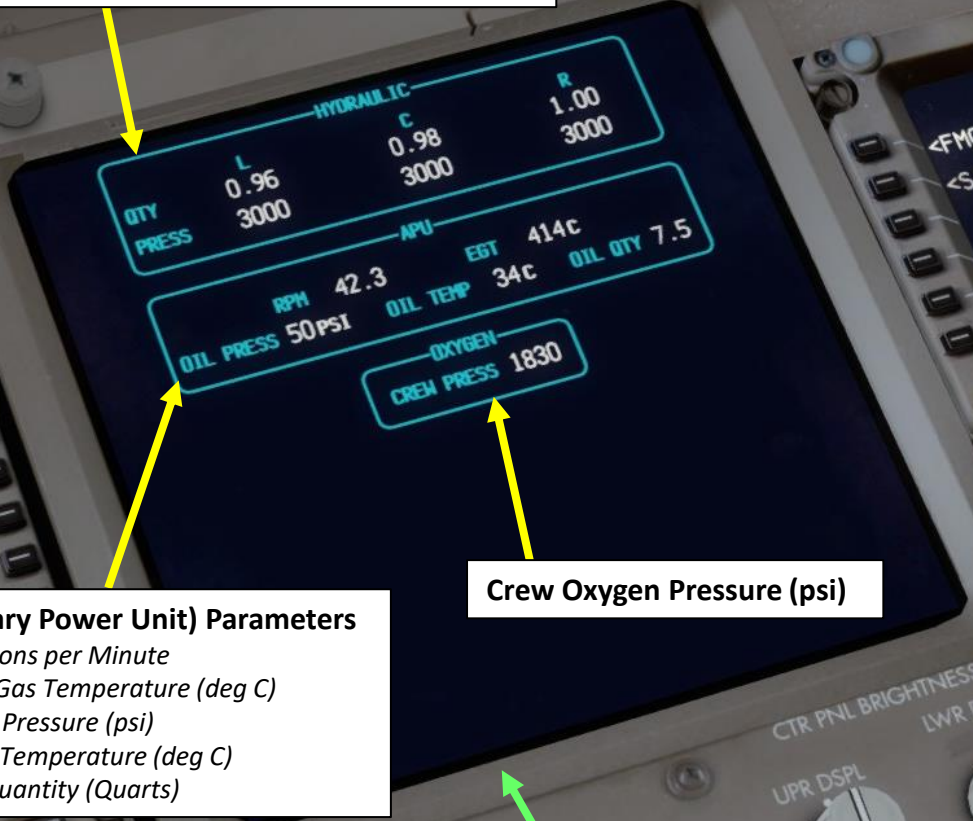
Engine Oil Pressure (psi)

Engine Oil Temperature (deg C)

Engine Oil Quantity (Quarts)

Engine Vibration Indicator

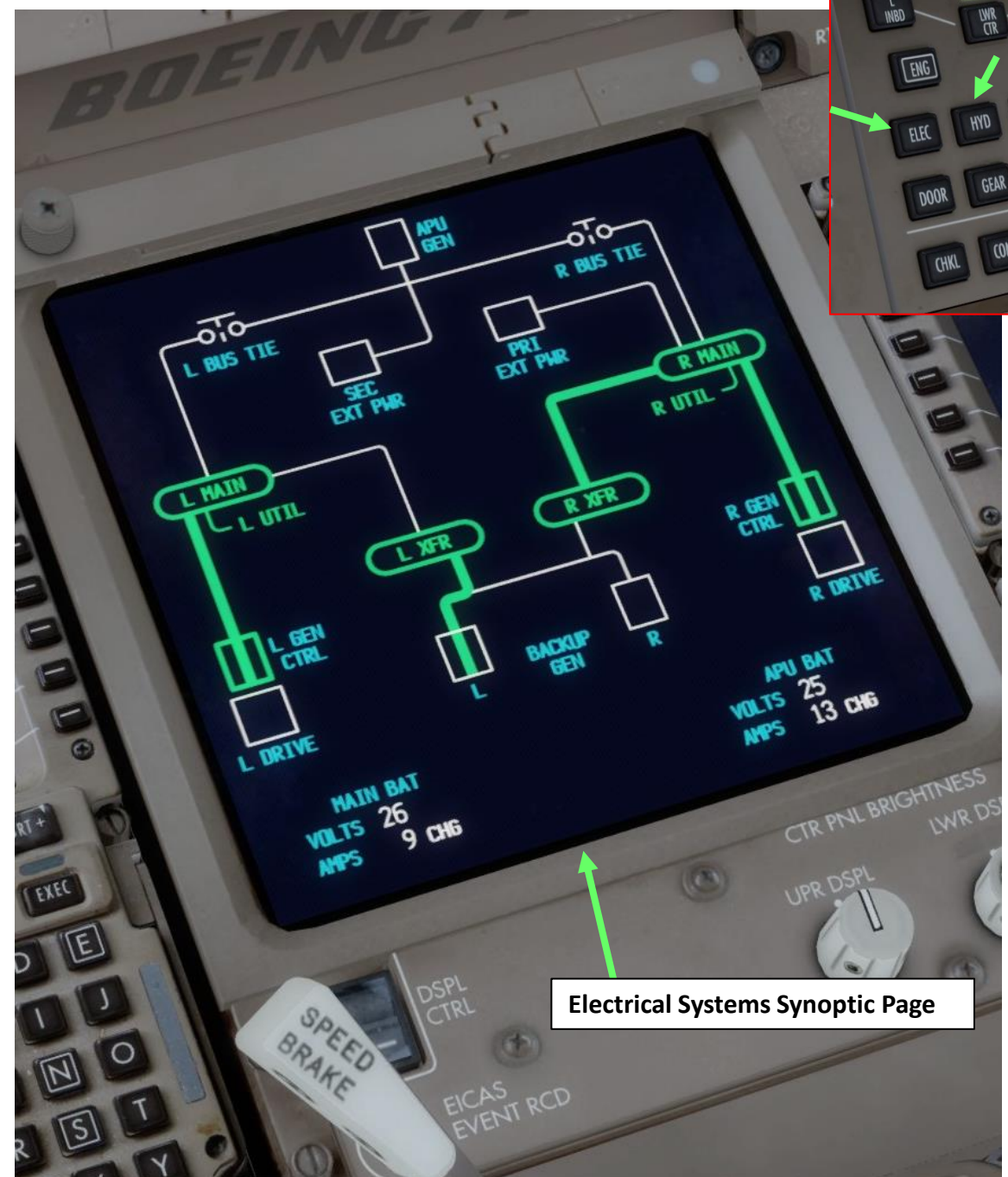
Engine Systems Synoptic Page



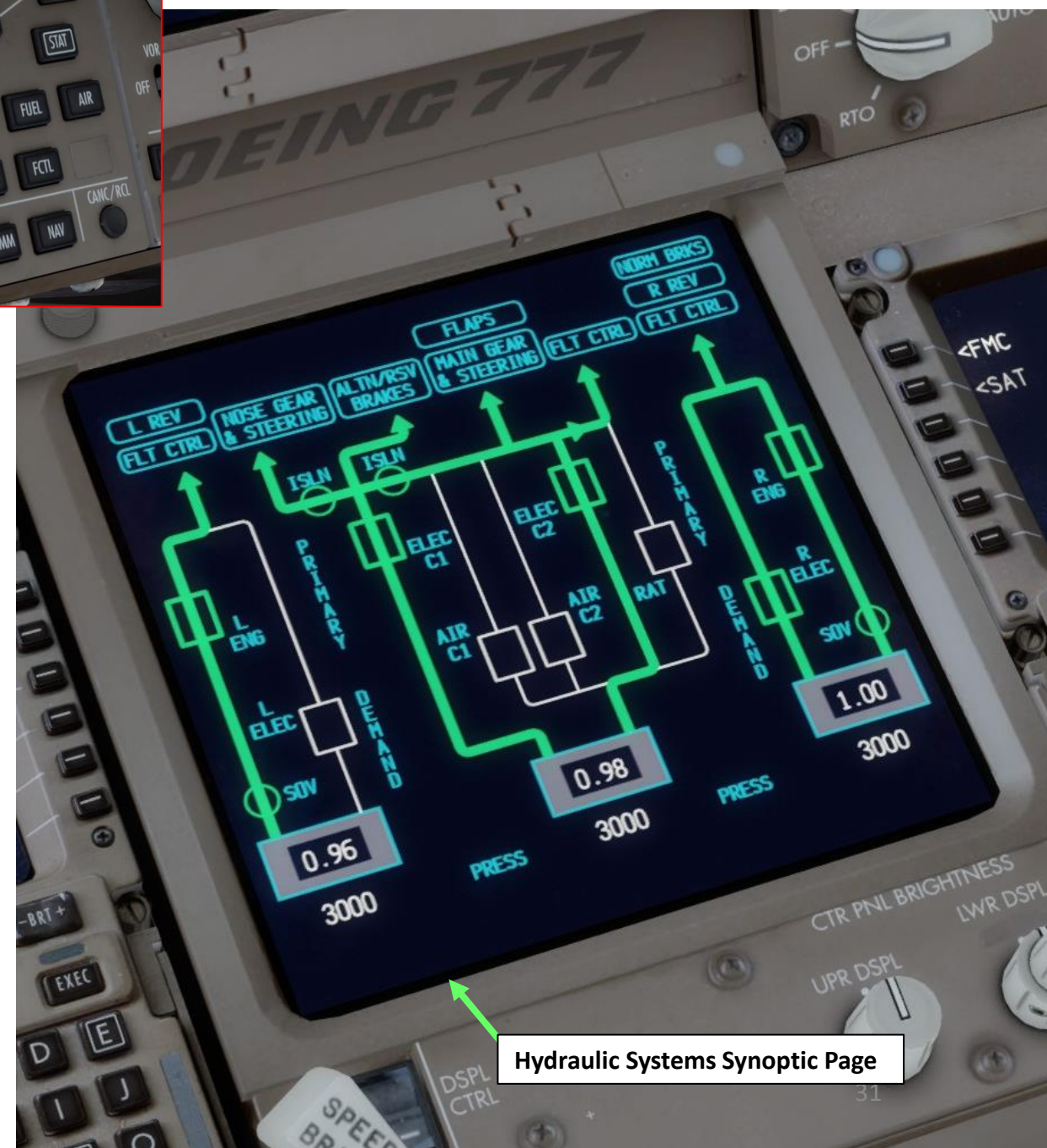
APU (Auxiliary Power Unit) Parameters  
RPM: Revolutions per Minute  
EGT: Exhaust Gas Temperature (deg C)  
OIL PRESS: Oil Pressure (psi)  
OIL TEMP: Oil Temperature (deg C)  
OIL QTY: Oil Quantity (Quarts)

Crew Oxygen Pressure (psi)

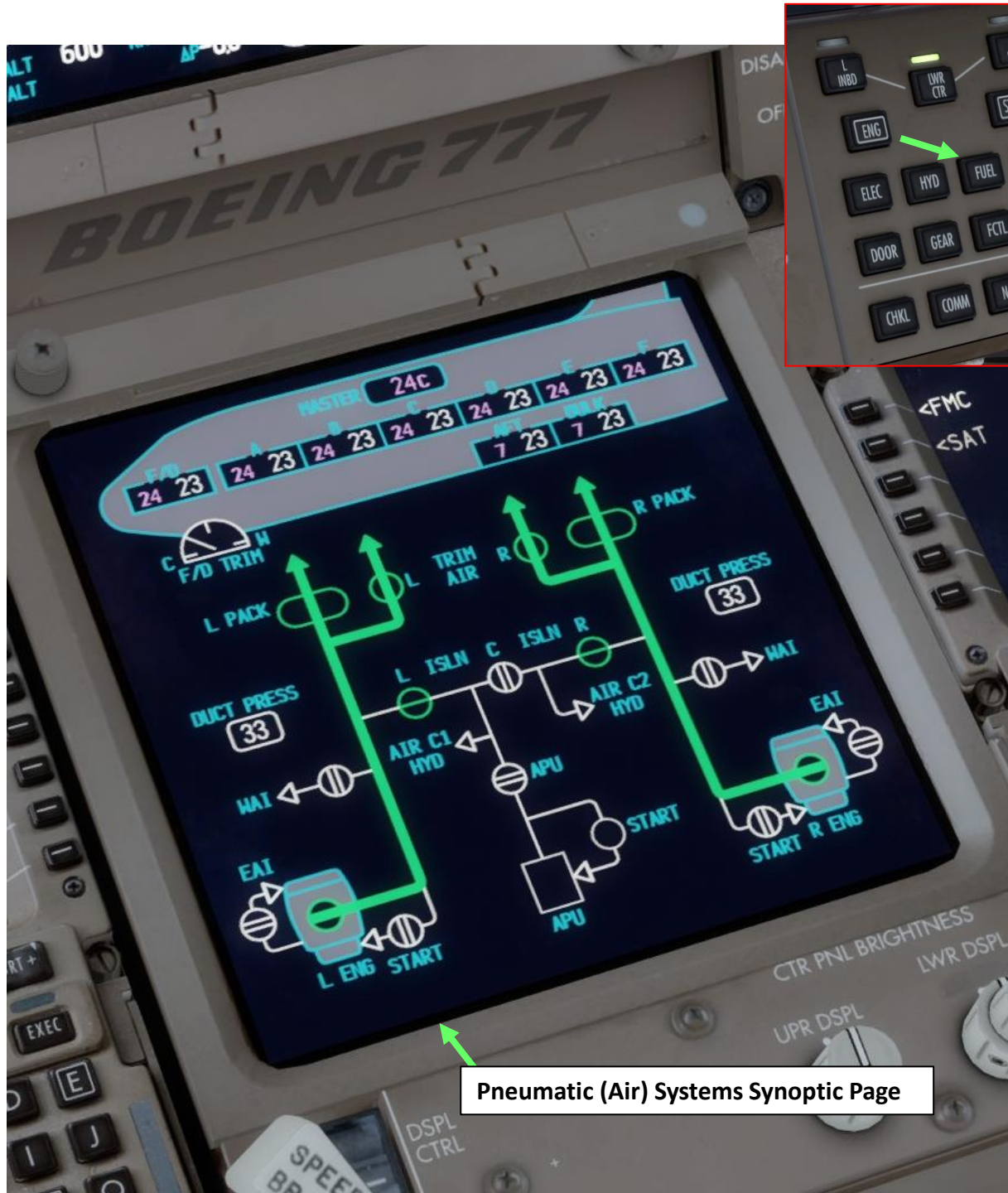
System Status Synoptic Page



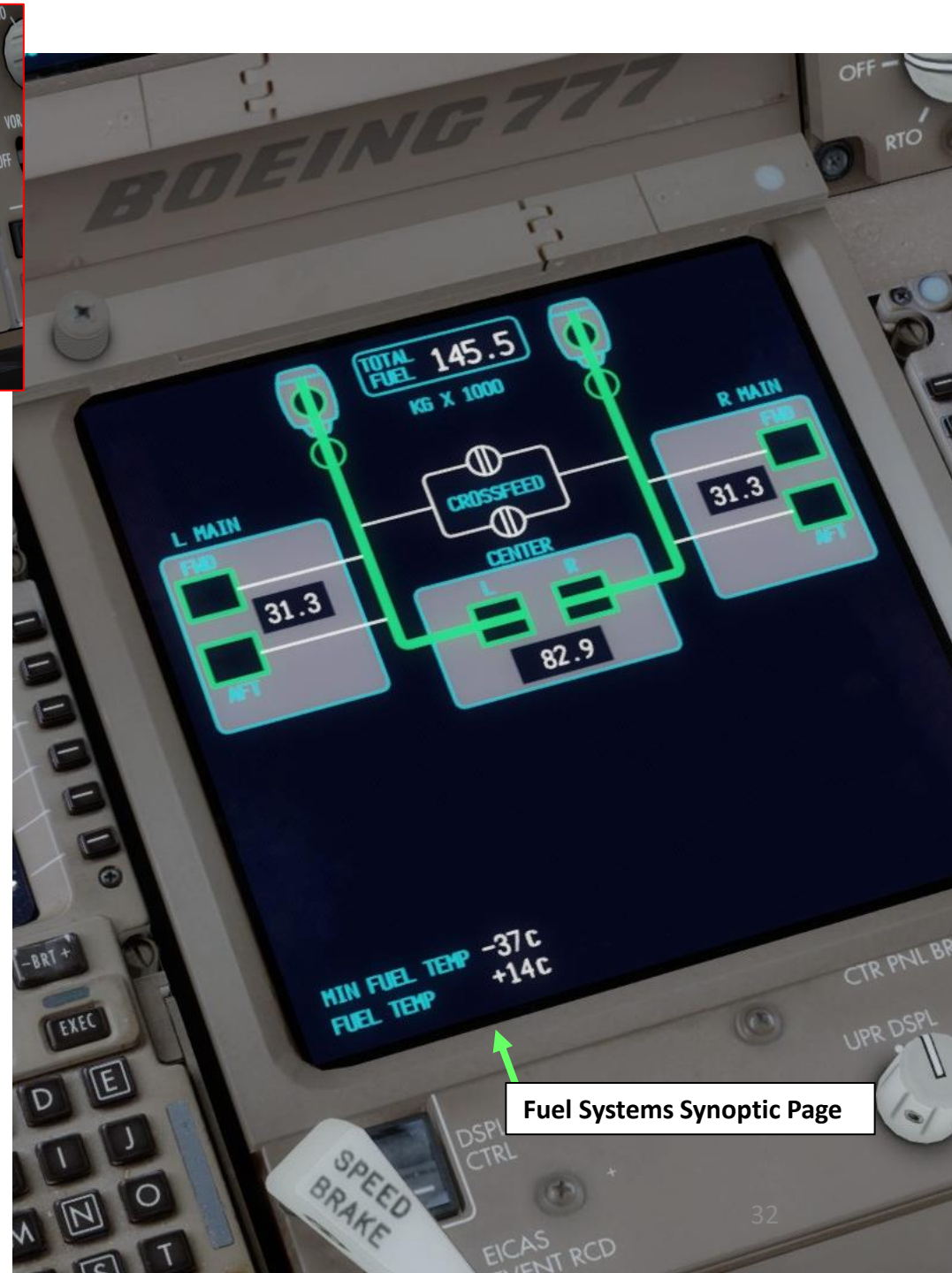
Electrical Systems Synoptic Page



Hydraulic Systems Synoptic Page

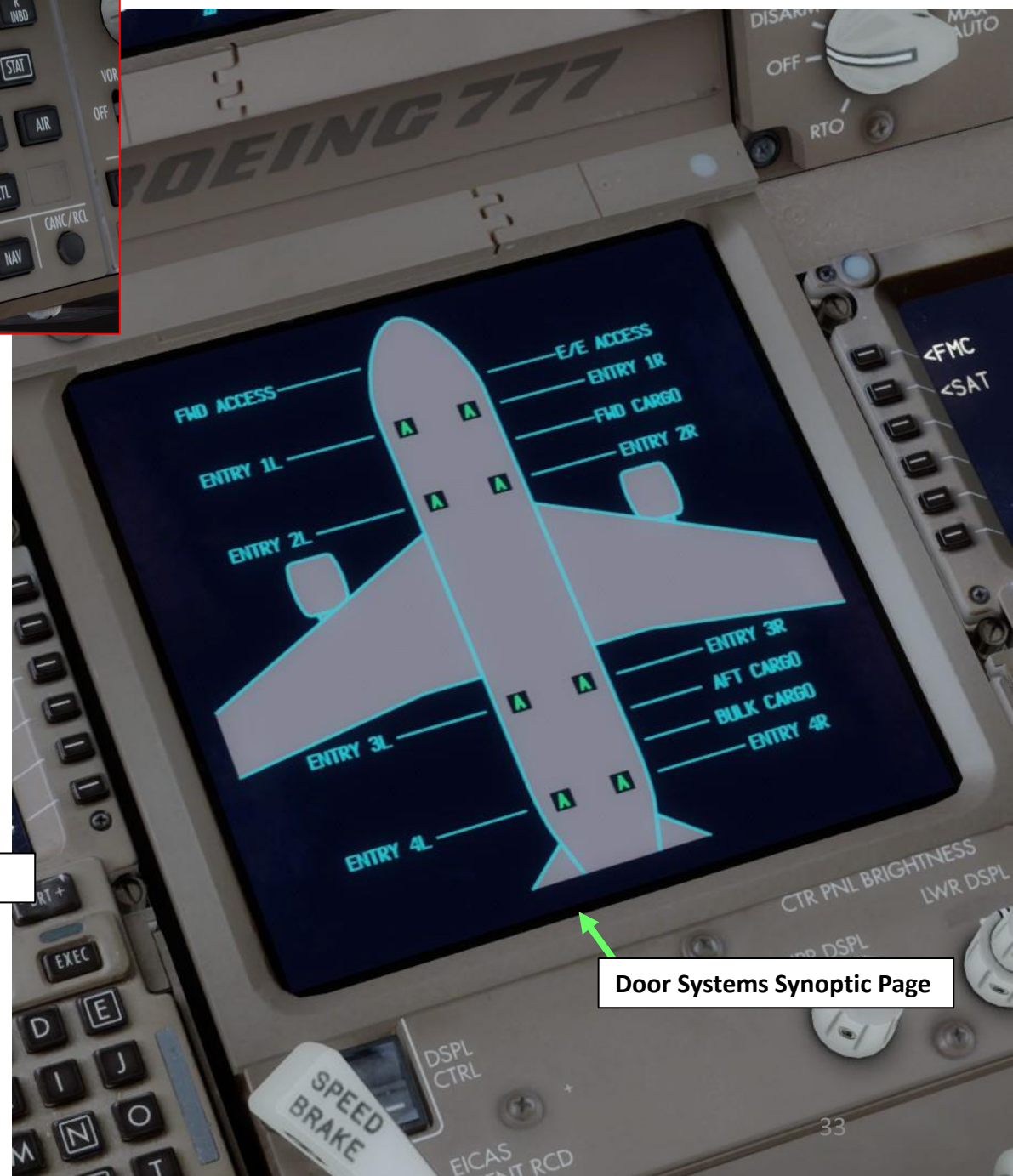
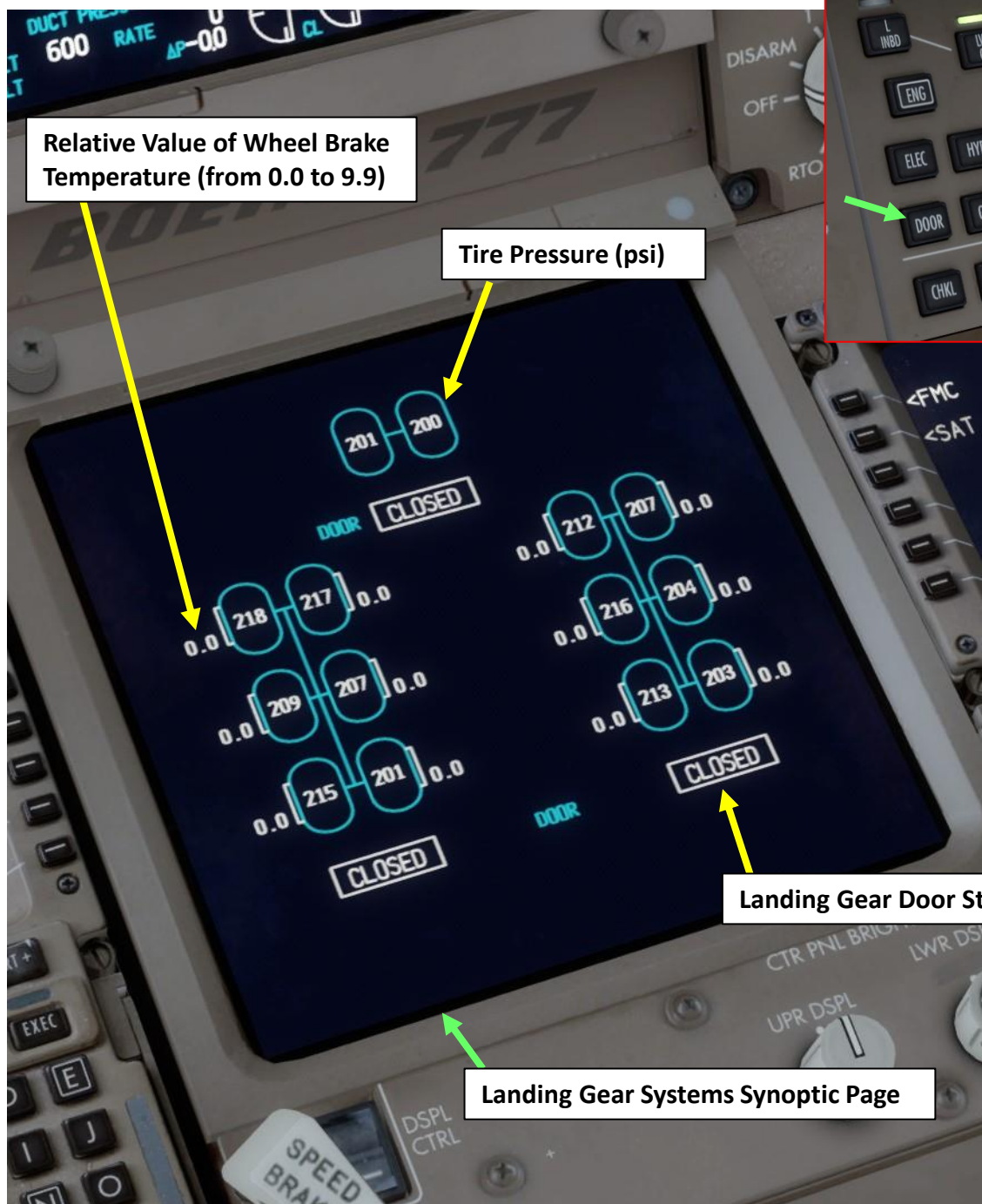


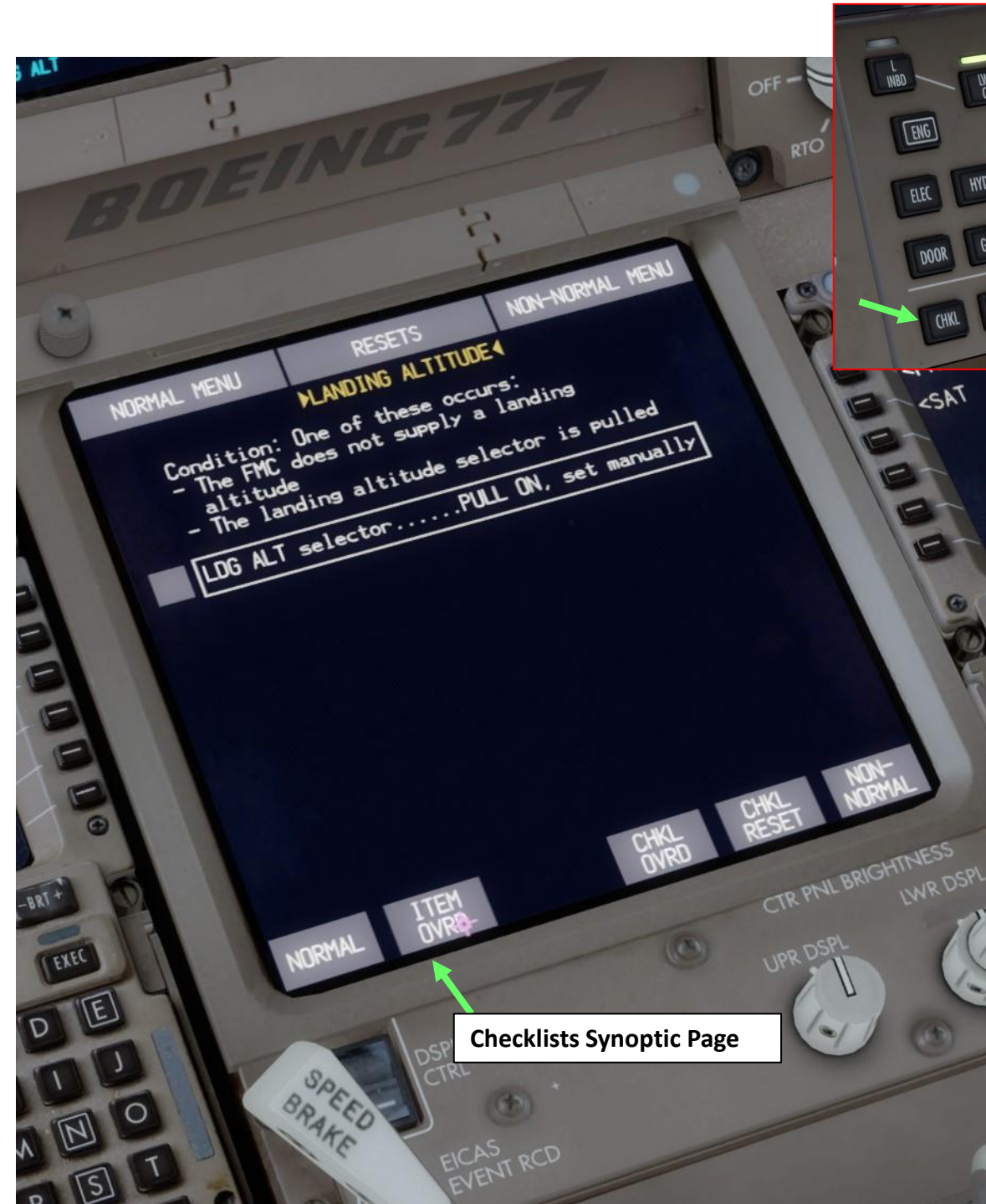
Pneumatic (Air) Systems Synoptic Page



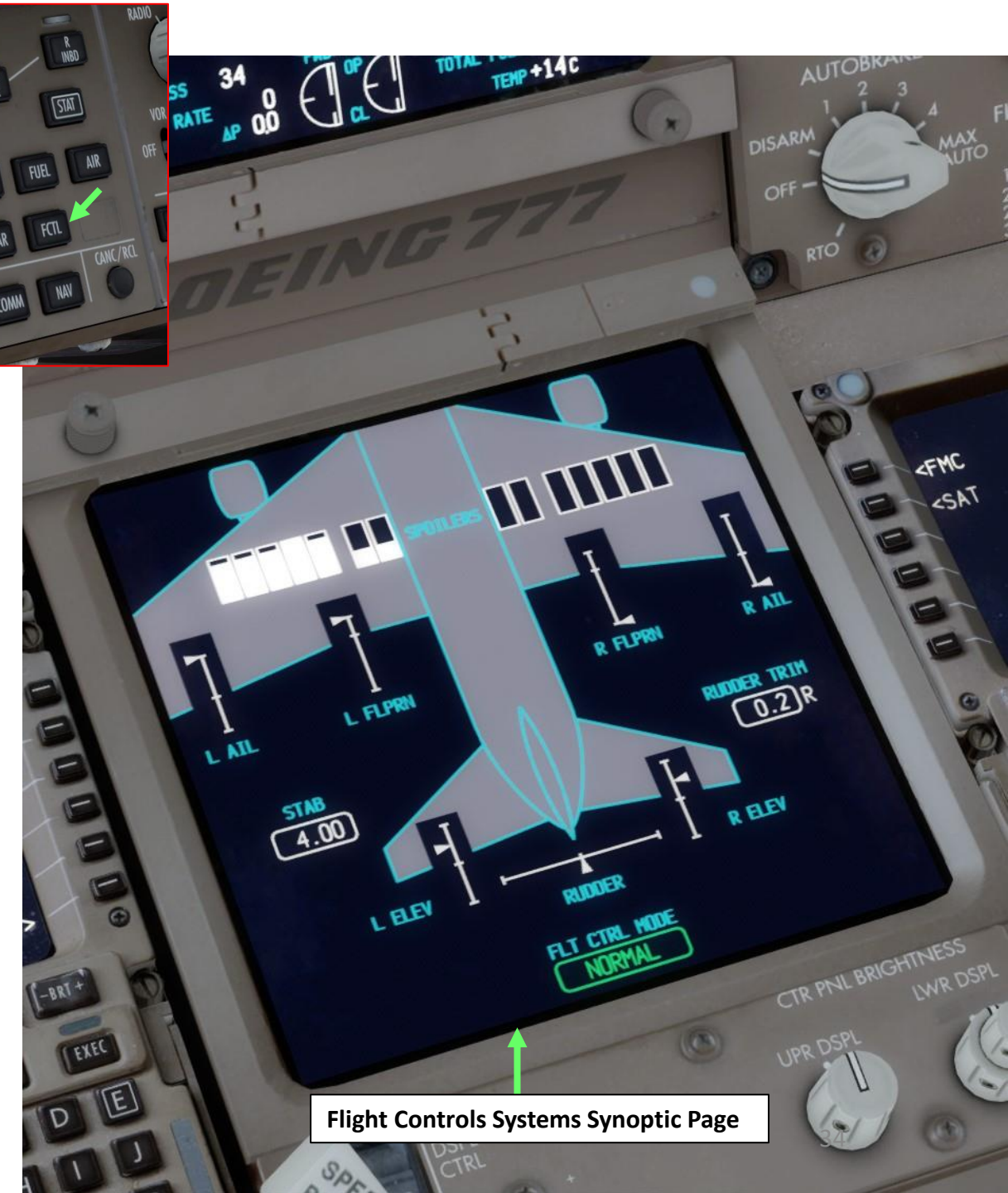
Fuel Systems Synoptic Page







Checklists Synoptic Page



Flight Controls Systems Synoptic Page



Communications Synoptic Page



Navigation Systems Synoptic Page

BOEING 777

AUTOBRAKE

DISARM 1 2 3 4

OFF MAX AUTO

RTO

FLAP LIMIT

1 - 265K

5 - 245K

15 - 230K

20 - 225K

25 - 200K

30 - 180K

FMC AUTO L R

INBOARD NORM MFD

EICAS

FMC COMM

<RTE 1 POS REPORT>

<ALTN

<PERF

MENU

<FMC EFIS CTL OFF ↔ ON>

<SAT DSP CTL OFF ↔ ON>

PMDG SETUP>

FS ACTIONS>

INIT REF RTE DEP ARR ALTN VNAV

FIX LEGS HOLD FMC COMM PROG EXEC

MENU NAV RAD

PREV PAGE NEXT PAGE

1 2 3 K L M N O

4 5 6 P Q R S T

7 8 9 U V W X Y

0 1/2 Z SP DEL / CLR

**Alternate Display Control (DSPL CTRL) Button**

*Provides capability to manually select PFD and ND sources.*

**EICAS Event Record Switch**

**Center Panel Upper Display Brightness Control Knob**

**Center Panel Lower Display Brightness Control Knob**

SPEED BRAKE

DSPL CTRL

EICAS EVENT RCD

CTR PNL BRIGHTNESS

UPR DSPL LWR DSPL

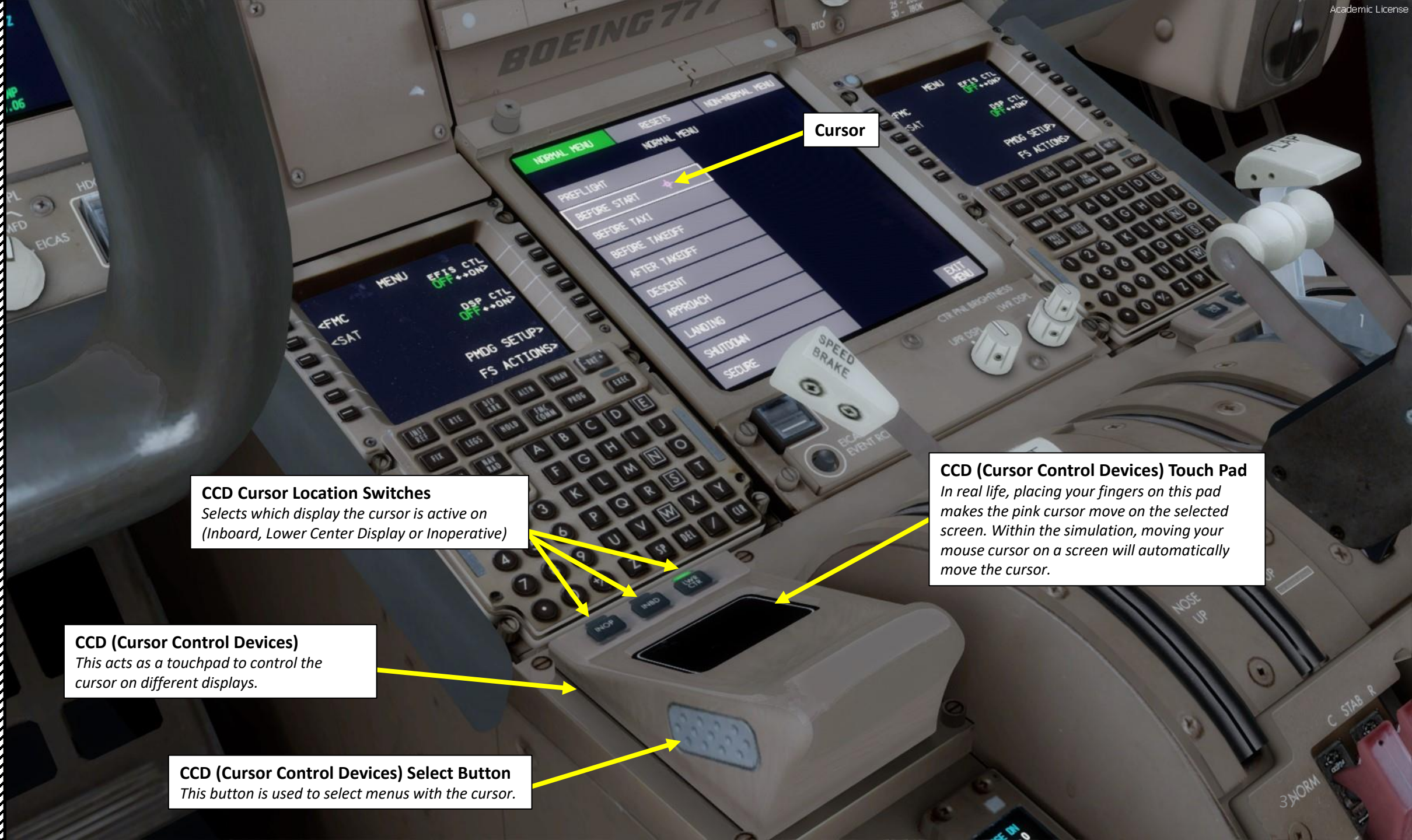
Cursor

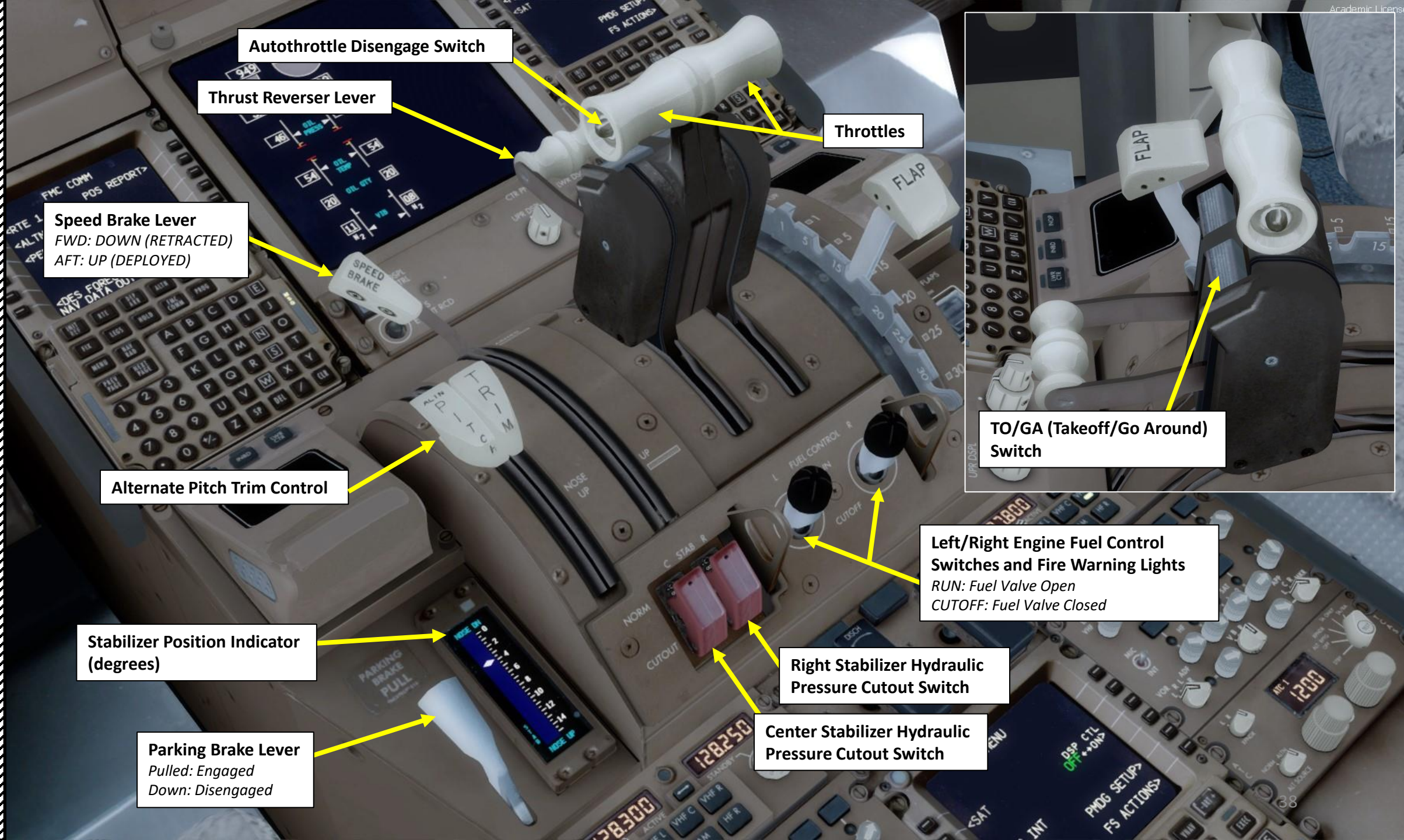
**CCD Cursor Location Switches**  
*Selects which display the cursor is active on (Inboard, Lower Center Display or Inoperative)*

**CCD (Cursor Control Devices) Touch Pad**  
*In real life, placing your fingers on this pad makes the pink cursor move on the selected screen. Within the simulation, moving your mouse cursor on a screen will automatically move the cursor.*

**CCD (Cursor Control Devices)**  
*This acts as a touchpad to control the cursor on different displays.*

**CCD (Cursor Control Devices) Select Button**  
*This button is used to select menus with the cursor.*





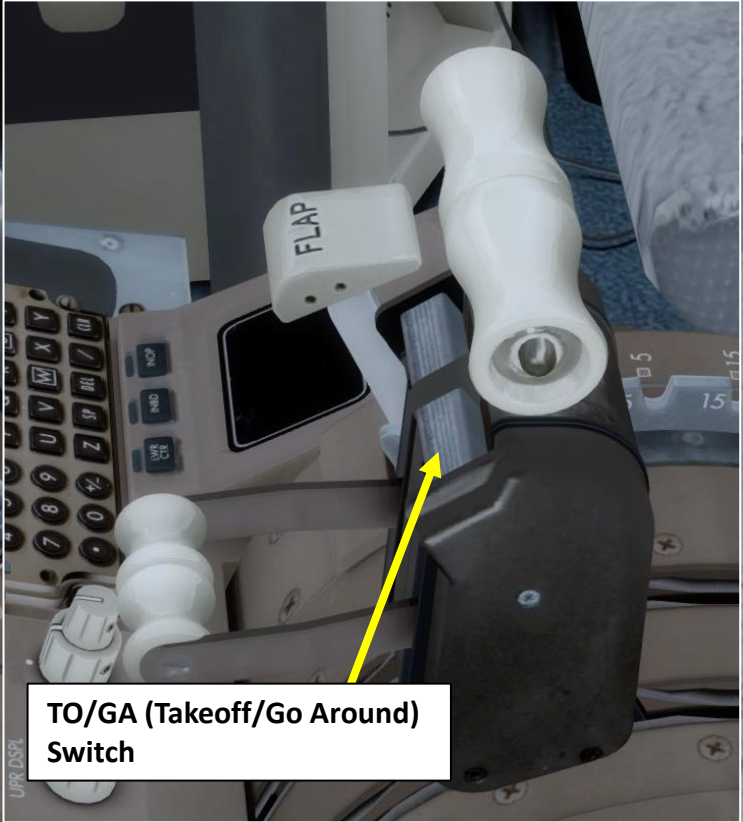
Autothrottle Disengage Switch

Thrust Reverser Lever

Throttles

Speed Brake Lever  
FWD: DOWN (RETRACTED)  
AFT: UP (DEPLOYED)

SPEED BRAKE



TO/GA (Takeoff/Go Around) Switch

Alternate Pitch Trim Control

TRIM  
T-O  
G-A

Left/Right Engine Fuel Control Switches and Fire Warning Lights  
RUN: Fuel Valve Open  
CUTOFF: Fuel Valve Closed

Right Stabilizer Hydraulic Pressure Cutout Switch

Stabilizer Position Indicator (degrees)

Stabilizer Position Indicator

Center Stabilizer Hydraulic Pressure Cutout Switch

Parking Brake Lever  
Pulled: Engaged  
Down: Disengaged

PARKING BRAKE  
PULL



Flaps Lever

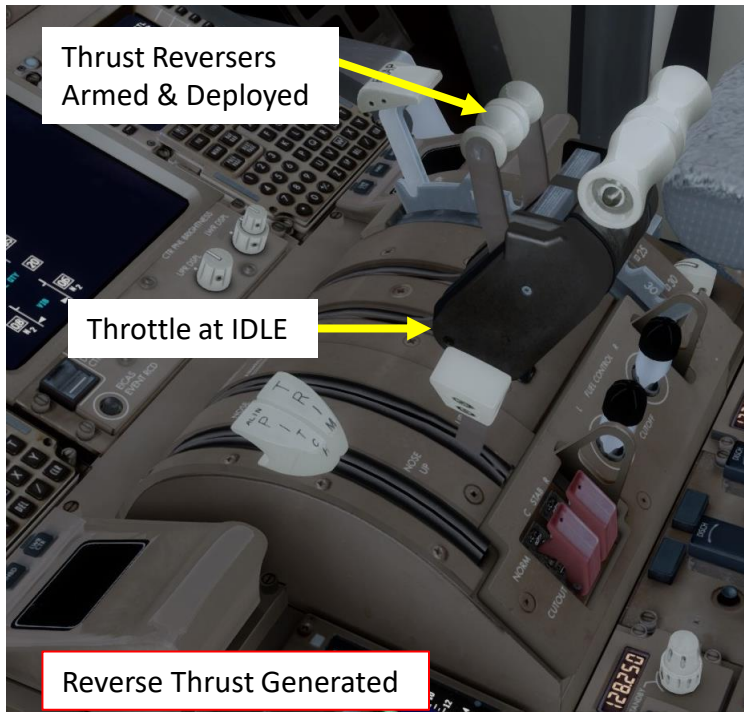
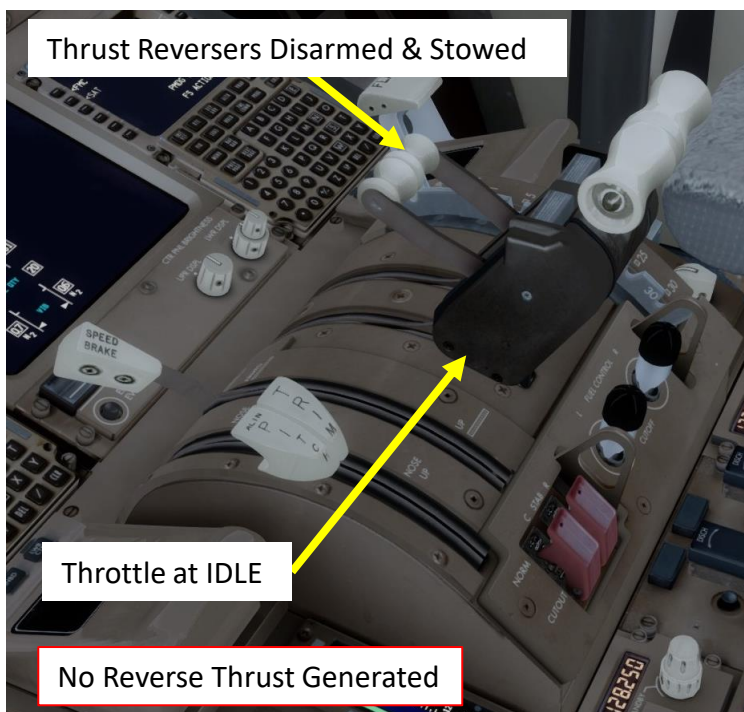
FLAP

Alternate Flaps Arming Switch

ALTN FLAPS ARM

RET OFF EXT

Alternate Flaps Selector  
Retracted/OFF/Extended



### Options - Key Assignments

Controller: Joystick - HOTAS Warthog | Show: Name

Flight Mode: Normal | Event Category: All Events | Search...

EVENT	ASSIGNMENT	REPEAT	ON RELEASE
Tail wheel (lock/unlock)	Shift + G		<input type="checkbox"/>
Takeoff assist (arm/disarm)	Shift + I		<input type="checkbox"/>
Takeoff assist (trigger)	Shift + Space		<input type="checkbox"/>
Throttle (cut)	F1		<input type="checkbox"/>
Throttle (decrease quickly)	F2		<input type="checkbox"/>
Throttle (decrease quickly)	Button 3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Throttle (decrease)	Mouse 3		<input type="checkbox"/>
Throttle (decrease)	F4		<input type="checkbox"/>
Throttle (full)	F5		<input type="checkbox"/>
Throttle (increase quickly)	F6		<input type="checkbox"/>
Throttle (increase)	F7		<input type="checkbox"/>
Throttle (increase)	F8		<input type="checkbox"/>

**General**  
Application  
Information  
Sound  
Traffic  
Realism

**Graphics**  
Display  
World  
Lighting  
Weather

**Controls**  
Key Assignments  
Axis Assignments  
Calibration  
Other

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".

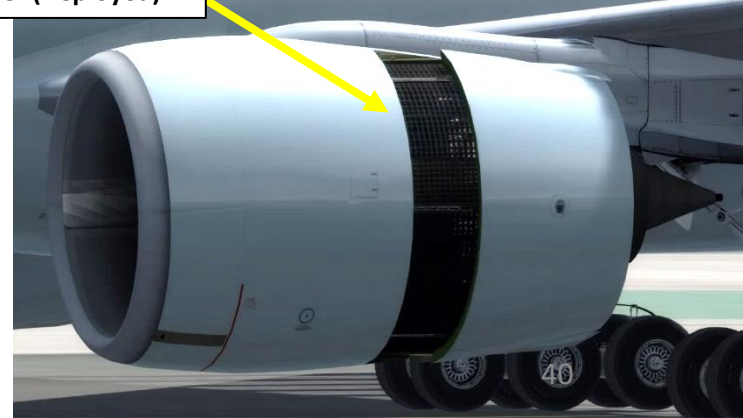
Take note that the Reverse Thrust lever can only be engaged if your throttle is at IDLE. The reason for that is a mechanical stopper that prevents you from engaging thrust reversers at high throttle settings.

Cancel OK

Cascade-Type Thrust Reverser (Stowed)



Cascade-Type Thrust Reverser (Deployed)







Radio Panel

Audio Control Panel

**Engine Bottle 1 & 2 Discharge Lights**  
*Indicates low pressure in respective extinguisher*

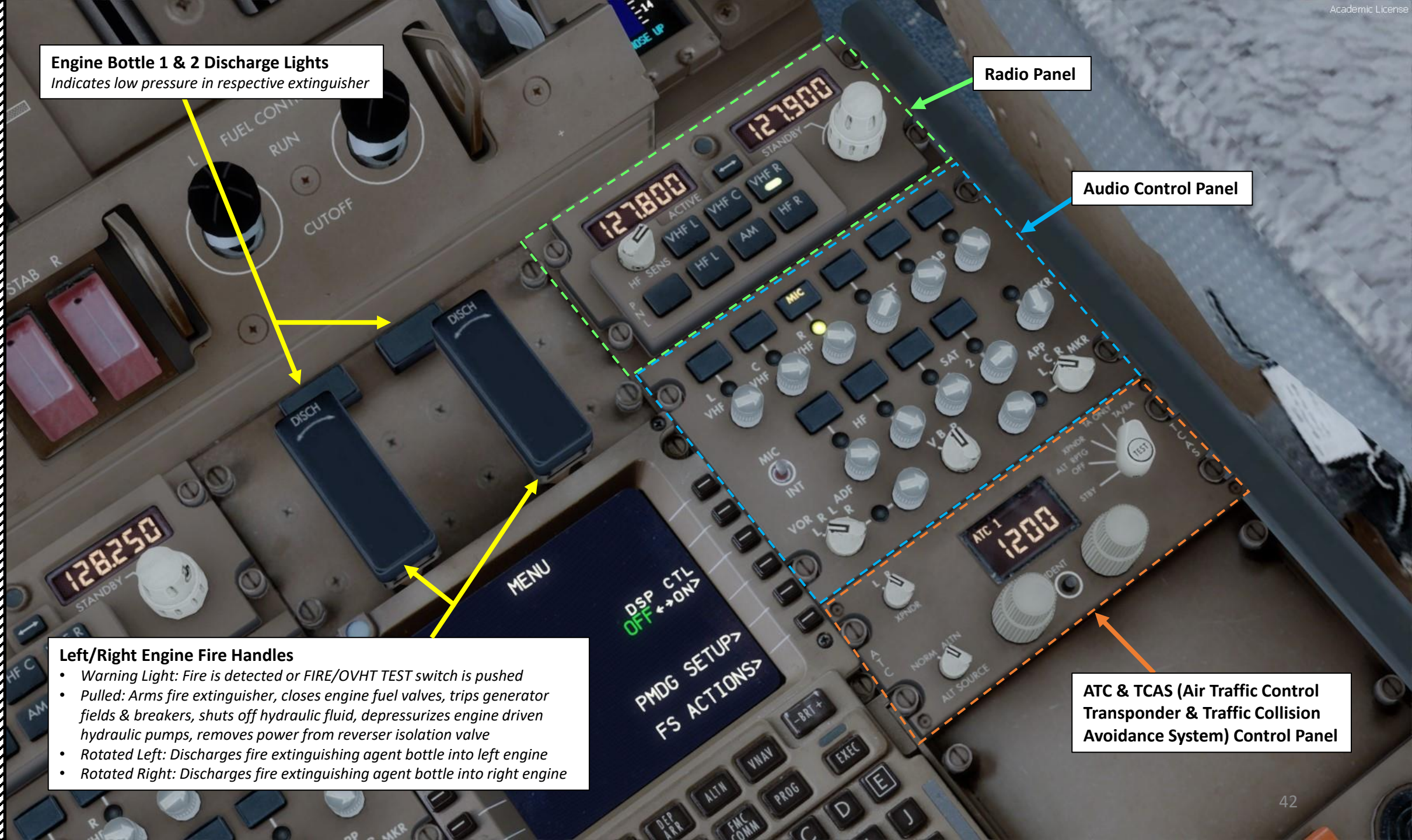
**Radio Panel**

**Audio Control Panel**

**ATC & TCAS (Air Traffic Control Transponder & Traffic Collision Avoidance System) Control Panel**

**Left/Right Engine Fire Handles**

- *Warning Light: Fire is detected or FIRE/OVHT TEST switch is pushed*
- *Pulled: Arms fire extinguisher, closes engine fuel valves, trips generator fields & breakers, shuts off hydraulic fluid, depressurizes engine driven hydraulic pumps, removes power from reverser isolation valve*
- *Rotated Left: Discharges fire extinguishing agent bottle into left engine*
- *Rotated Right: Discharges fire extinguishing agent bottle into right engine*



Weather Radar Control Panel

ACTIVE 128.300 STANDBY 128.250

VHF L VHF C VHF R  
HF L AM HF R

MIC

VHF L VHF C VHF R

INT

VOR R L ADF R

V B R

APP L C R MKR

LEFT

TFR WX WX+T MAP GC

TILT 5 15 UP

WXR DR

GAIN

AUTO

TEST

RIGHT

TILT 5 15 UP

TFR WX WX+T MAP GC

DISCH

DISCH

MENU

<SAT

DSP CTL OFF ↔ ON

<CAB INT

PMDG SETUP>

FS ACTIONS>

INIT REF RTE DEP ARR ALTN VNAV -BRT +

FIX LEGS HOLD FMC COMM PROG EXEC

MENU NAV RAD

A B C D E

PREV PAGE NEXT PAGE

F G H I

ACTIVE 127.800 STANDBY 127.900

VHF L VHF C VHF R  
HF L AM HF R

MIC

VHF L VHF C VHF R

INT

VOR R L ADF R

V B R

APP L C R MKR

XPNDR

ATC

NORM ALTN

ALT SOURCE

ATC 1

1200

XPNDR TA ONLY TA/RA

ALT RPTG OFF

STBY

TEST

T C A S

CDU 3



VHF & HF Radio Control Panel



DATA 135.000

ACTIVE STANDBY

VHF L VHF C VHF R

HF L AM HF R

MENU

<SAT DSP CTL OFF ↔ ON>

<CAB INT>

PMDG SETUP>

FS ACTIONS>

INIT REF RTE DEP ARR ALTN VNAV -BRT+ EXEC

FIX LEGS HOLD FMC COMM PROG EXEC

MENU NAV RAD A B C D E

PREV PAGE NEXT PAGE F G H I J

1 2 3 K L M N O

4 5 6 P Q R S T

7 8 9 U V W X Y

0 +/- Z SP DEL / CLR

AILFRON RUDDER

NOSE L NOSE R

RUDDER TRIM

L 15 10 5 0 5 10 15 R

VHF VHF R/HF T AB

MIC INT HF SAT 2 KR

VOR L ADF R V APP L C R MKR

XPDR TA ONLY TA/RA

ATC 1 1200

IDENT

XPDR ALT RPTG OFF TEST

NORM ATN ALT SOURCE

EVAC PRESS TO TEST

COMMAND PULL

HORN SHUTOFF 44

EVACUATION SIGNAL

LEFT TFR WK WK+T MAP GC

GAIN 15 UP 0 5 15 DOWN

AUTO CR TEST

TILT 5 15 DOWN

RIGHT TFR WK WK+T MAP GC

Rudder Trim Indicator

7070 135.000

STANDBY

VHF L VHF C VHF R

HF SENS HF L AM HF R

Audio Control Panel

MIC

VHF L VHF C VHF R

FLT CAB PA

MIC INT

HF L HF R

SAT 1 2

SPKR

VOR R L ADF V B R

APP L C R MKR

Aileron Trim Switches

< CAB INT

PMDG SETUP> FS ACTIONS>

INIT REF RTE DEP ARR ALTH VNAV -BRT+ EXEC

FIX LEGS HOLD FMC COMM PROG

MENU NAV RAD A B C D E

PREV PAGE NEXT PAGE F G

1 2 3 P Q R S T

4 5 6 7 8 9 U V W X Y

0 +/- Z SP DEL / CLR

Evacuation Command Switch

Evacuation Light & Test Switch

RUDDER TRIM

L 15 10 5 0 5 10 15 R

Manual Rudder Trim Cancel Button

Rudder Trim Control

ATC 1 1200

XPNDR TA ONLY TA/RA

ALT SPTG OFF TEST

NORM ATN IDENT

ALT SOURCE

Evacuation Signal Horn

COMMAND

EVAC PRESS TO TEST

HORN SHUTOFF

EVACUATION SIGNAL

Evacuation Signal Horn Shutoff Button

FLOOR LIGHTS OFF

BRT DIM

Floor Lights Dimming Control Switch

777-200LR

PART 2 - COCKPIT

Flight Deck Door Lock Switch

Observer Audio Selector

Printer Fail Light

Printer Low Paper Light

Printer Paper Cut Button

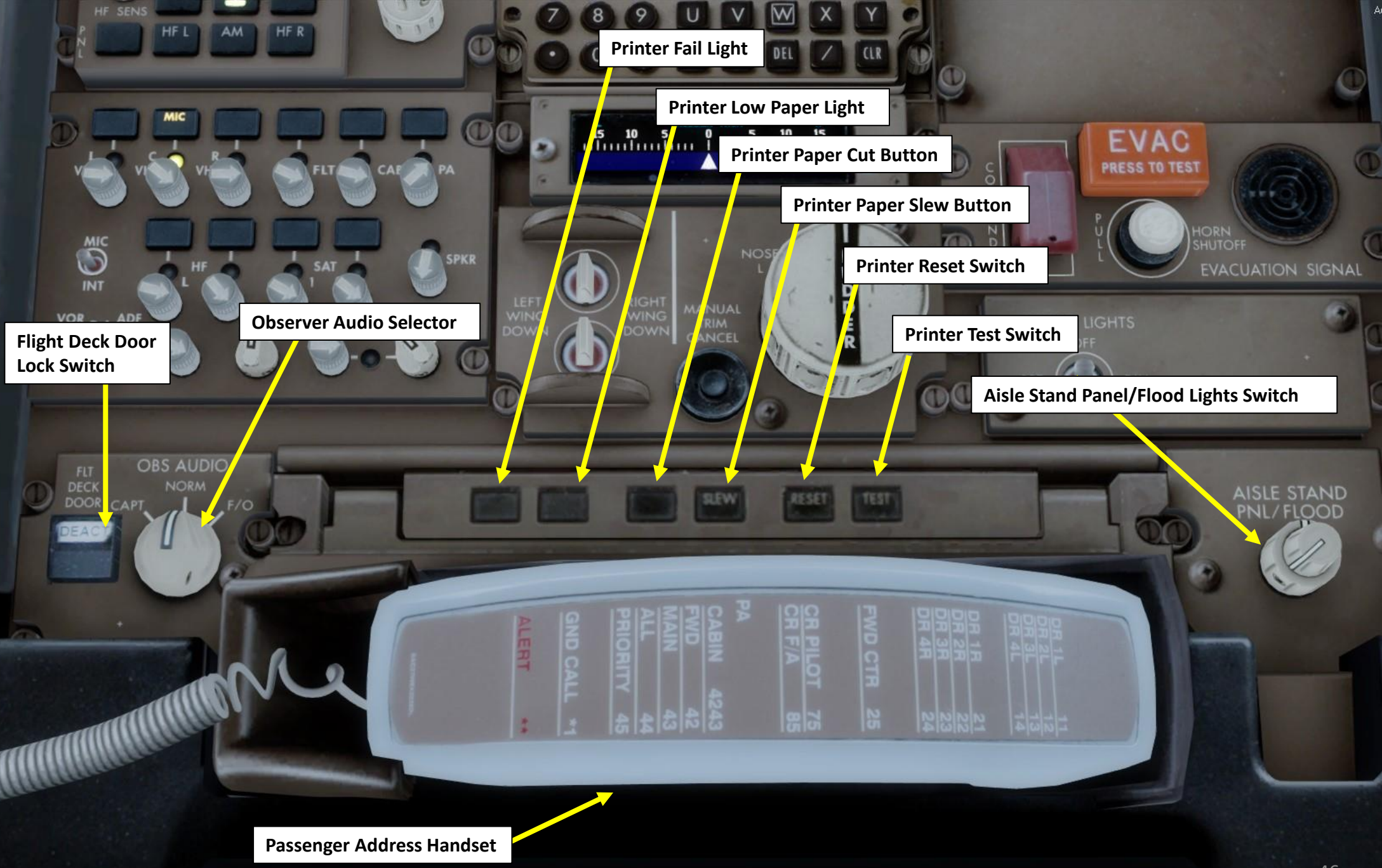
Printer Paper Slew Button

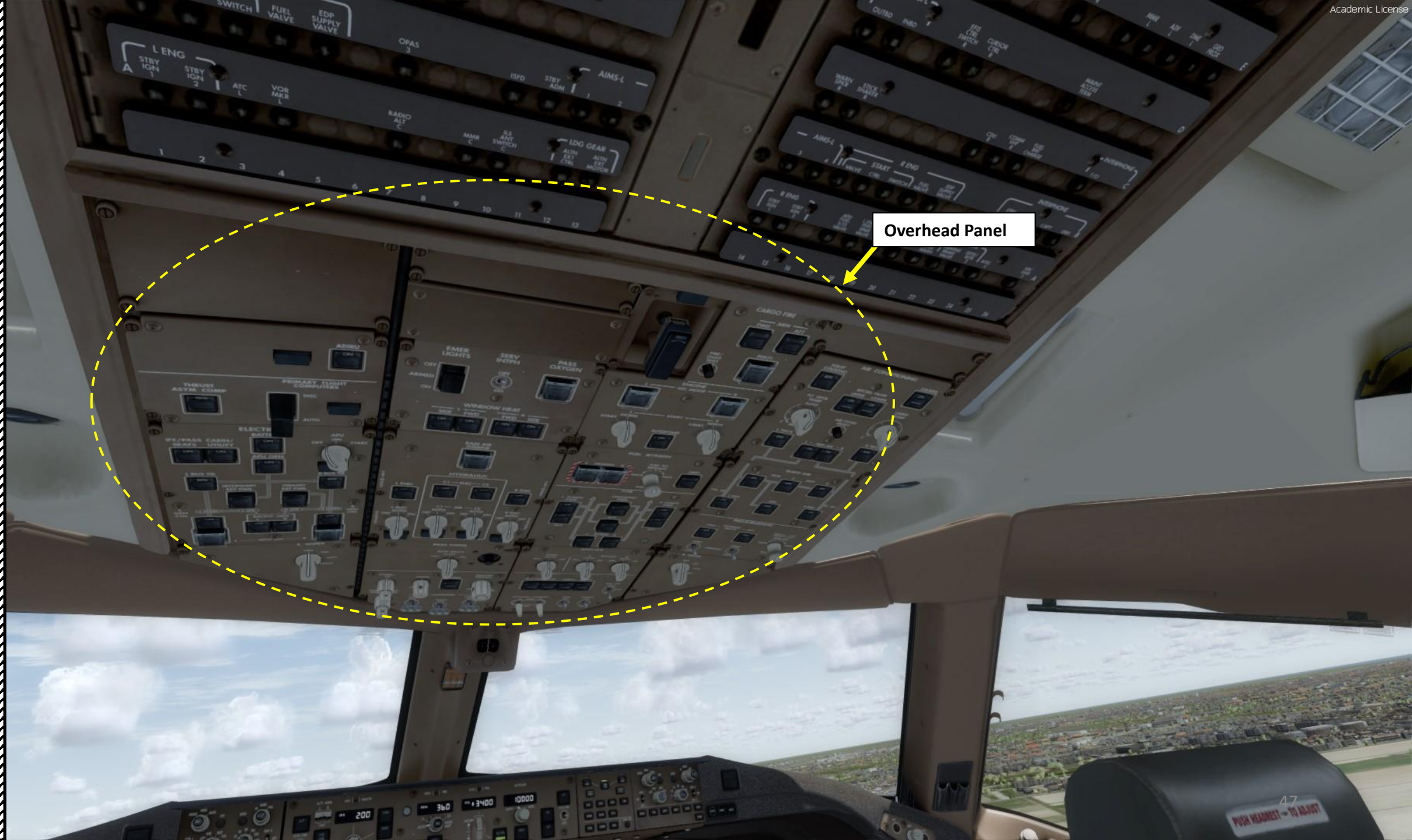
Printer Reset Switch

Printer Test Switch

Aisle Stand Panel/Flood Lights Switch

Passenger Address Handset





Overhead Panel

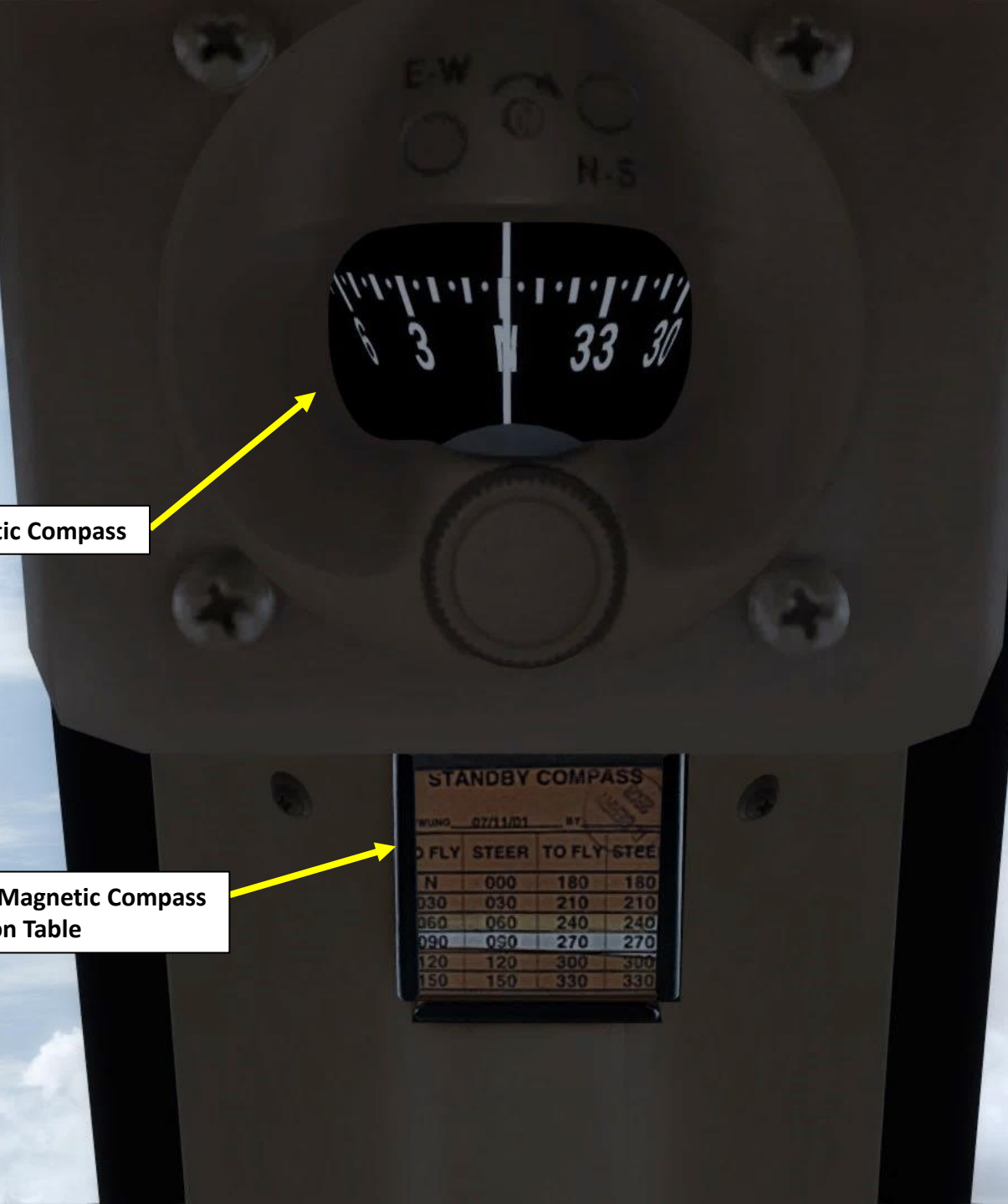






Circuit Breakers





Standby Magnetic Compass

Standby Magnetic Compass Correction Table

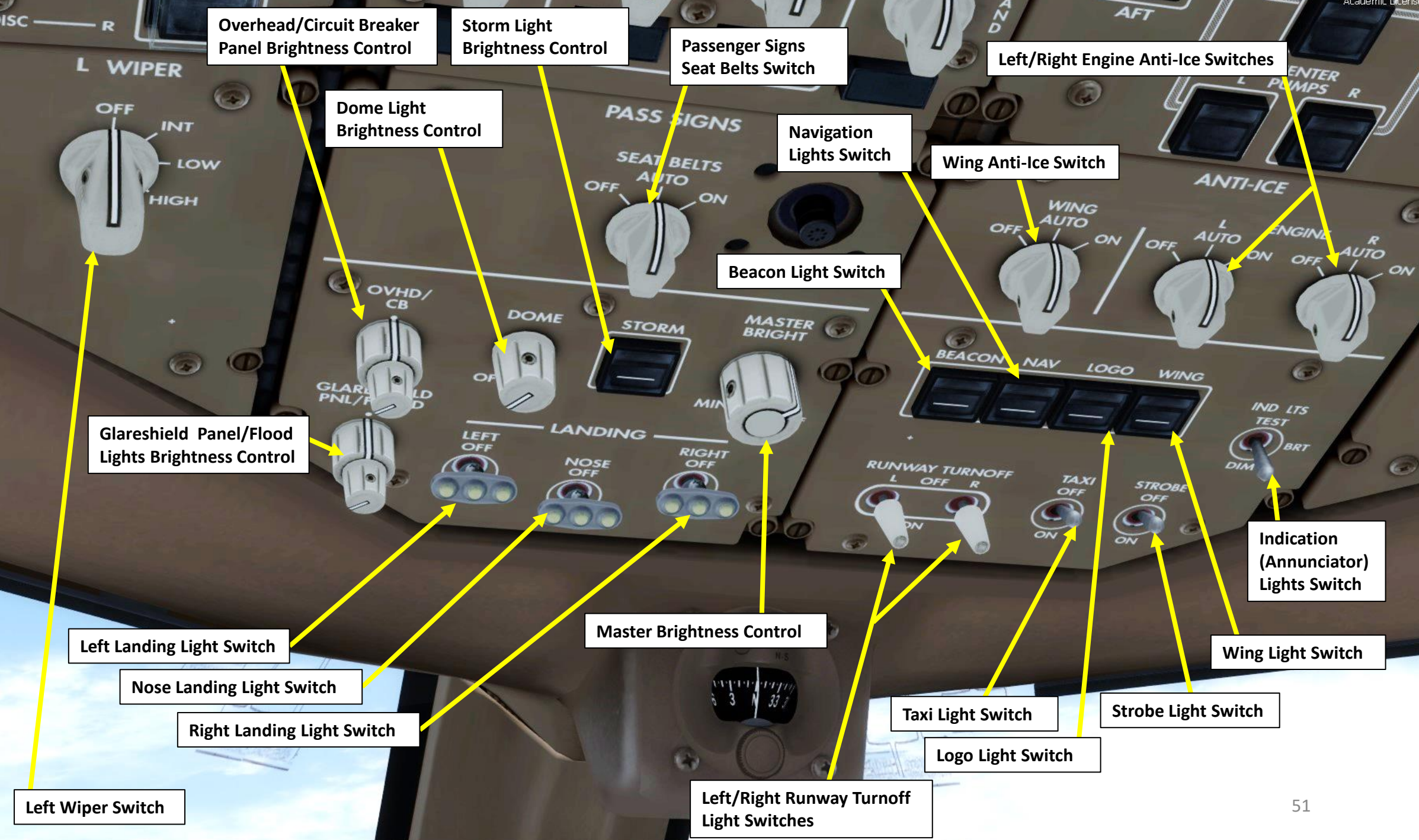
STANDBY COMPASS

W/NO 07/11/01 BY: [Signature]

TO FLY	STEER	TO FLY	STEER
N	000	180	180
030	030	210	210
060	060	240	240
090	090	270	270
120	120	300	300
150	150	330	330

777-200LR

PART 2 - COCKPIT



Overhead/Circuit Breaker Panel Brightness Control

Storm Light Brightness Control

Passenger Signs Seat Belts Switch

Left/Right Engine Anti-Ice Switches

Dome Light Brightness Control

Navigation Lights Switch

Wing Anti-Ice Switch

Beacon Light Switch

Glareshield Panel/Flood Lights Brightness Control

Indication (Annunciator) Lights Switch

Wing Light Switch

Left Landing Light Switch

Nose Landing Light Switch

Right Landing Light Switch

Master Brightness Control

Taxi Light Switch

Strobe Light Switch

Logo Light Switch

Left/Right Runway Turnoff Light Switches

Left Wiper Switch

777-200LR

PART 2 - COCKPIT

IFE/PASS (In-Flight Entertainment System/Passenger Seats) Power Switch

Cabin/Utility Power Switch

Battery Switch

APU (Auxiliary Power Unit) Switch OFF / ON / START

APU FAULT Light

APU Generator Switch

Right Bus Tie Switch

Left Bus Tie Switch

Primary External Power Switch

Secondary External Power Switch

Right Main Generator Switch

Left Main Generator Switch

Left/Right Backup Generator Switches

Left/Right Generator IDG (Integrated Drive Generator) Disconnect Switches

ELECTRICAL

BATTERY

APU GEN

L BUS TIE

APU ON OFF START

R BUS TIE

SECONDARY EXT PWR

PRIMARY EXT PWR

HYDRAULIC

C1 - ELEC - C2

C1 - AIR - C2

L GEN CTRL

L MAIN

L XFR

R XFR

R MAIN

R GEN CTRL

BACKUP GEN L R

ON ON

L DRIVE DISC R

L WIPER

52  
PASS SIGNS

**RAT (Ram Air Turbine) Switch**  
PRESS Light: RAT is deployed  
UNLKD Light: RAT is not in stowed position

**Primary C1 (Center Hydraulic System) Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Switch**

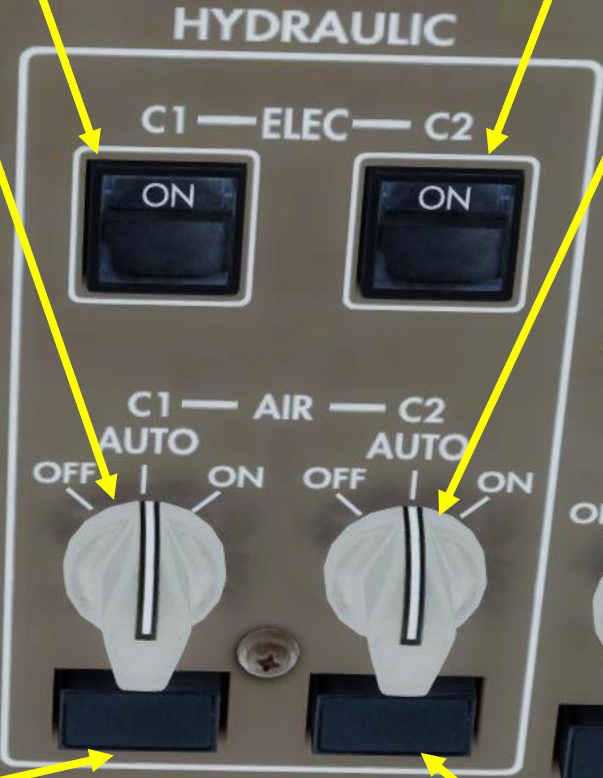
**Primary C2 (Center Hydraulic System) Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Switch**

**Primary C1 (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) Selector Switch**

**Primary C2 (Center Hydraulic System) Air-Driven Hydraulic Pump (ADP) Selector Switch**

**Primary Right Engine-Driven Hydraulic Pump (EDP) Switch**

**Primary Left Engine-Driven Hydraulic Pump (EDP) Switch**



**Left Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Selector Switch**

**Right Electrically-Driven Hydraulic Pump (ACMP, or AC Motor Pump) Selector Switch**

**Left Hydraulic Demand Pump Fault Light**

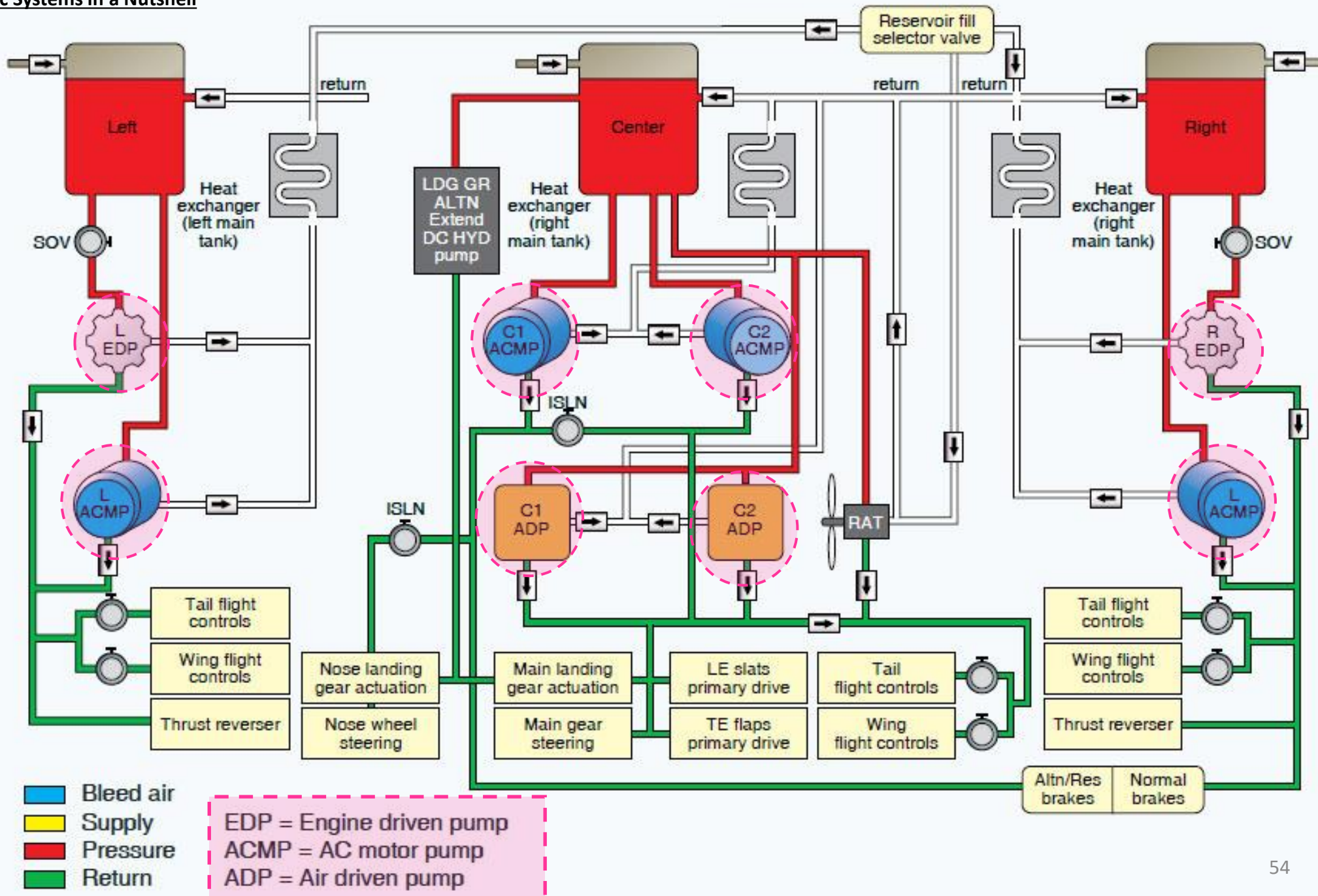
**Right Hydraulic Demand Pump Fault Light**

**C1 Hydraulic Demand Pump Fault Light**

**C2 Hydraulic Demand Pump Fault Light**

PASS SIGNS

# Hydraulic Systems in a Nutshell



Right Fuel Jettison Nozzle Switch

Left Fuel Jettison Nozzle Switch

Fuel To Remain Selector

Fuel Jettison ARM Switch and Fault Light

Forward Crossfeed Valve Switch and Low Pressure Light

Left Forward Fuel Pump Switch and Low Pressure Light

Left Aft Fuel Pump Switch and Low Pressure Light

Aft Crossfeed Valve Switch and Low Pressure Light

Left Center Fuel Pump Switch and Low Pressure Light

CROSSFEED FWD

AFT

CENTER PUMPS

R PUMPS FWD

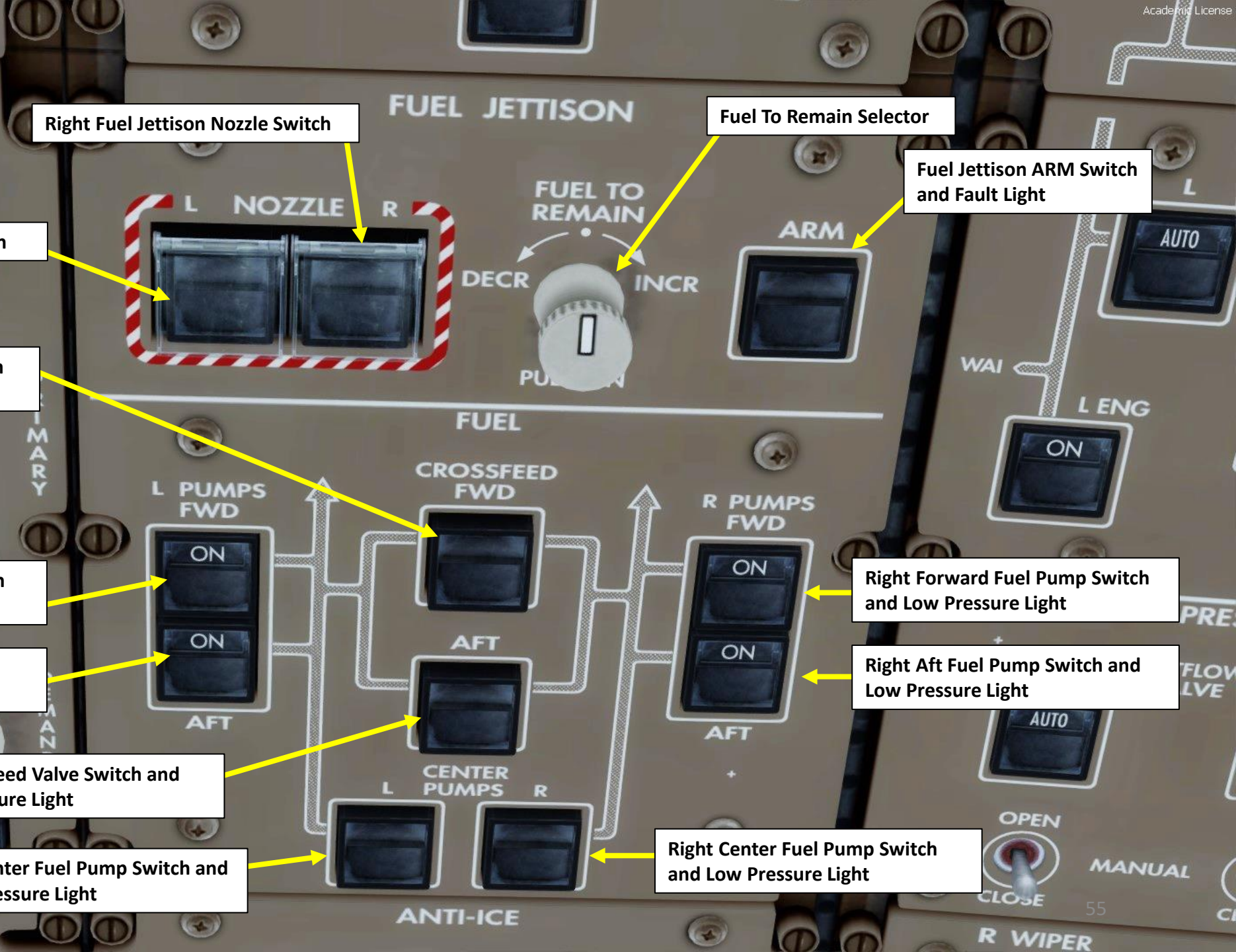
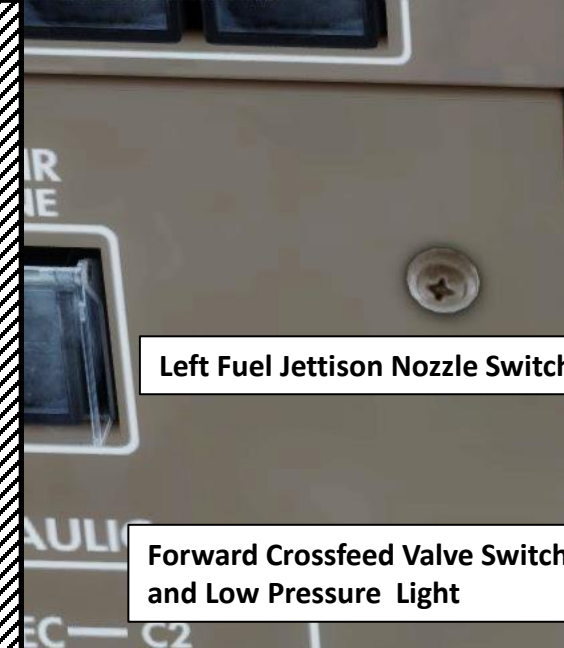
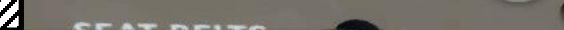
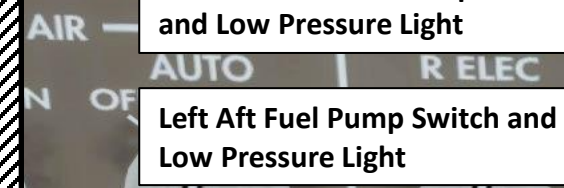
AFT

Right Forward Fuel Pump Switch and Low Pressure Light

Right Aft Fuel Pump Switch and Low Pressure Light

Right Center Fuel Pump Switch and Low Pressure Light

FUEL JETTISON



777-200LR

PART 2 - COCKPIT

Center Isolation Valve Switch

Left Isolation Valve Switch

Right Isolation Valve Switch

Left Engine Bleed Air Switch

APU (Auxiliary Power Unit) Bleed Air Switch

Right Engine Bleed Air Switch

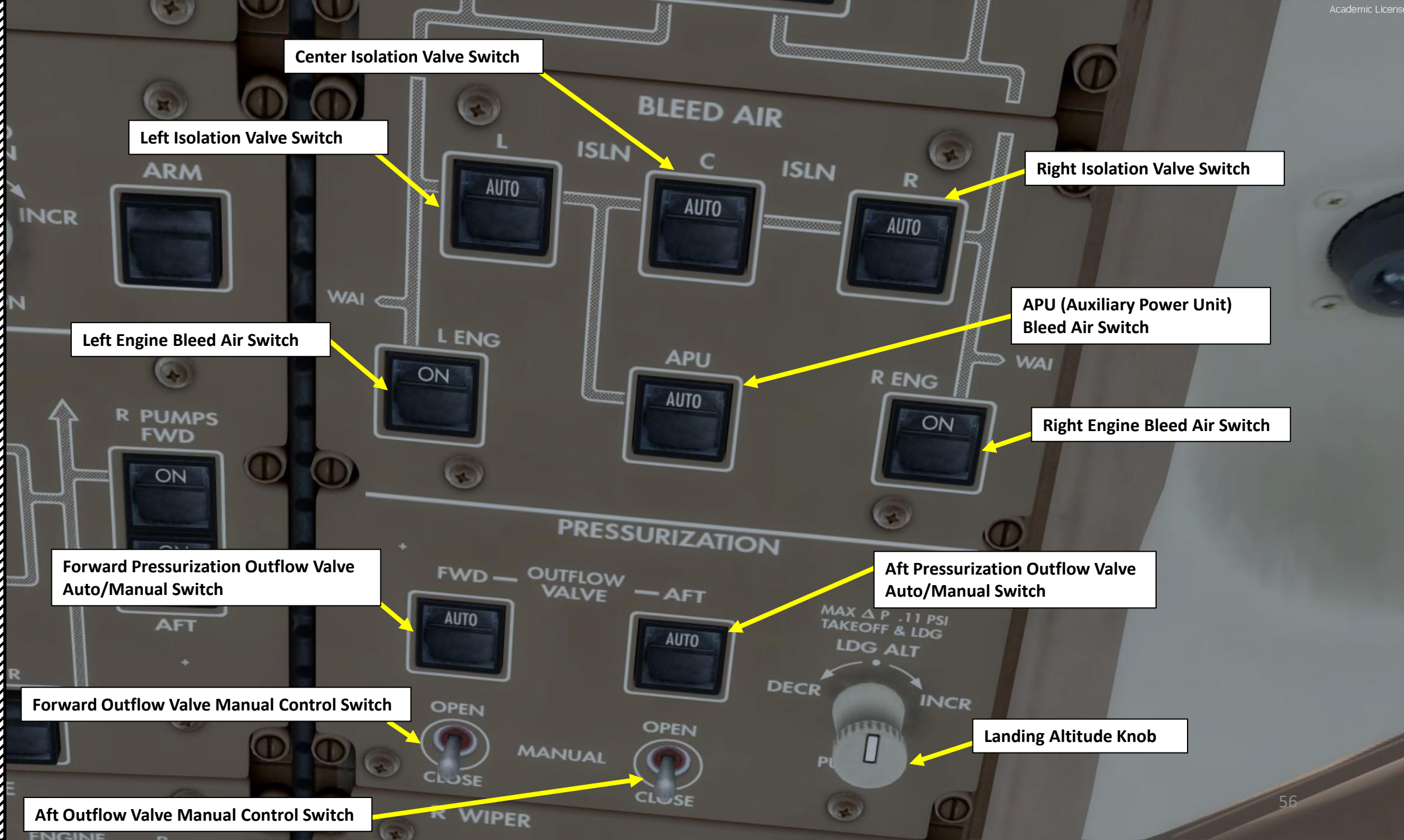
Forward Pressurization Outflow Valve Auto/Manual Switch

Aft Pressurization Outflow Valve Auto/Manual Switch

Forward Outflow Valve Manual Control Switch

Landing Altitude Knob

Aft Outflow Valve Manual Control Switch





**Left/Right EEC (Electronic Engine Control) Mode Switch**

- *NORM*: EEC sets thrust using EPR (Engine Pressure Ratio) as the controlling parameter
- *ALTN* (Alternate): EEC sets thrust using N1 as the controlling parameter.

Equipment Bay Cooling Switch

Gasper Fan Switch

Upper/Lower Recirculation Fan Switches

Cabin Temperature Control (Cold/Warm)

Air Conditioning Reset Switch

Right PACK (Pneumatic Air Conditioning Kit) Switch

Left/Right Trim Air Switches

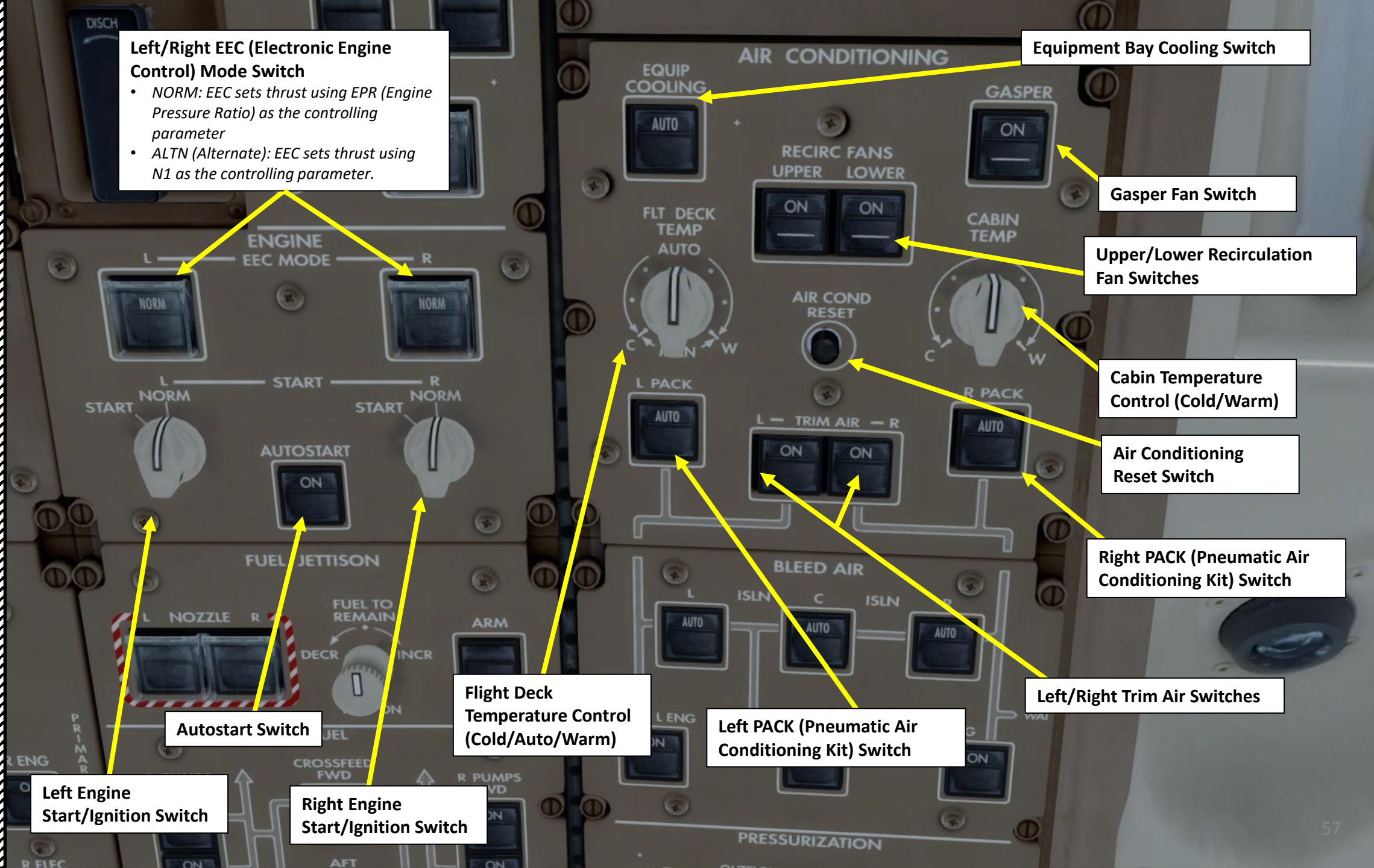
Left PACK (Pneumatic Air Conditioning Kit) Switch

Flight Deck Temperature Control (Cold/Auto/Warm)

Autostart Switch

Left Engine Start/Ignition Switch

Right Engine Start/Ignition Switch



**APU (Auxiliary Power Unit) Fire Handle**

- *Warning Light:* Fire is detected or FIRE/OVHT TEST switch is pushed
- *Pulled:* Arms APU fire extinguisher, closes APU fuel valve, APU bleed air valve, APU air inlet door, Trips APU generator field and breaker, and shuts down APU
- *Rotated:* Discharges fire extinguishing agent bottle into APU

**APU Bottle Discharge Light**  
Indicates low pressure in extinguisher

**Service Interphone Switch**

**Passenger Oxygen Switch & Light**

**Emergency Lights Switch**

**CARGO FIRE**

**Aft Cargo Bay Fire Arming Switch and Warning Light**

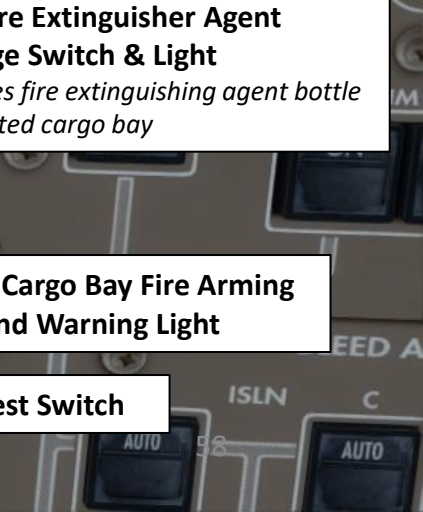
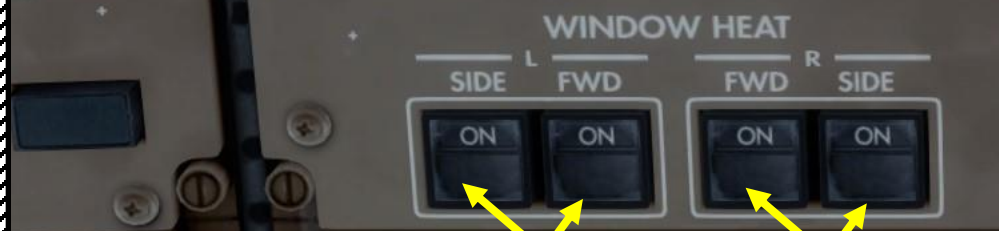
**Cargo Fire Extinguisher Agent Discharge Switch & Light**  
*Discharges fire extinguishing agent bottle into selected cargo bay*

**Forward Cargo Bay Fire Arming Switch and Warning Light**

**Fire/Overheat Test Switch**

**Left Side/Forward Window Heat Switches**

**Right Forward/Side Window Heat Switches**



**ADIRU (Air Data Inertial Reference Unit) ON BAT Light**  
 Indicates that ADIRU is powered by the airplane battery.  
 Illuminates only when the ADIRU has been aligned on airplane or ground power and power is subsequently removed or failed.

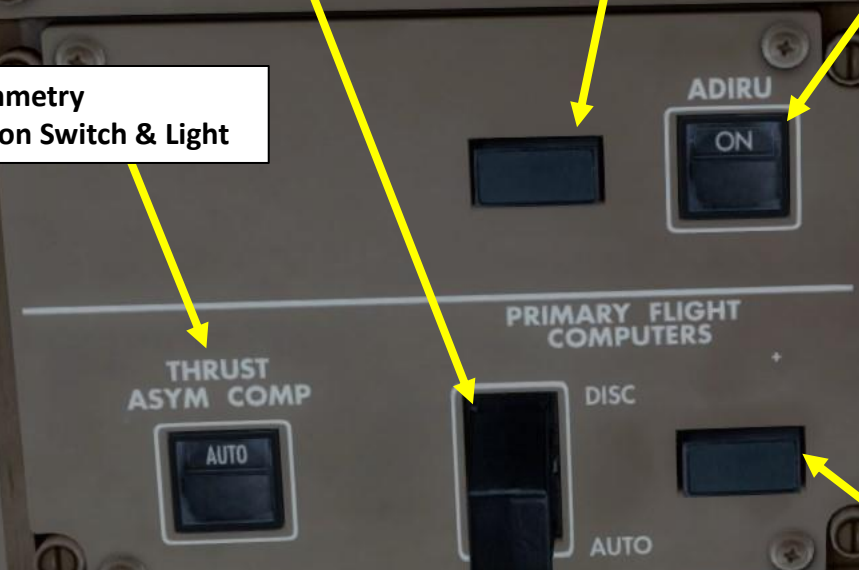
**Primary Flight Computers Switch**

- **AUTO:** Flight Control System operates in normal mode and automatically switches to the secondary or direct mode if a system fault is detected.
- **DISC:** Disconnects Primary Flight Computers and replaces flight control system in the direct mode.

**ADIRU (Air Data Inertial Reference Unit) Power Switch**

- **ON/OFF**
- The ADIRU is a key component of the integrated air data inertial reference system (ADIRS), which supplies air data (airspeed, angle of attack and altitude) and inertial reference (position and attitude) information to the pilots' electronic flight instrument system displays as well as other systems on the aircraft such as the engines, autopilot, aircraft flight control system and landing gear systems.

**Thrust Asymmetry Compensation Switch & Light**



**Primary Flight Computers Light**  
 DISC: Indicates Primary Flight Computers are disconnected automatically or manually and the system is in the direct mode.



777-200LR

PART 2 - COCKPIT

Circuit Breakers Overhead Panel

EMER LIGHTS (E, 2R, WA2L, FIT DECK 18 PWB. 1)

COMM HF L (G), CAPT CLOCK, COMM VHF C, LDG GEAR (RETR AUTO OFF, EXTD/RETR 1), AIR/GND 1

SELCAL (F), C DSPL LWR, MCP L, A/T SERVO L, CAPT, CDU C, ILS ANT SWITCH L, RETR OFF, AFDC L, AFDC BACK DRIVE L (1, 2), AIMS-R

L ENG IGN 1 (E), R ENG IGN 2, TCAS, WXR L, RADIO ALT L, AMR L, ADF L, DME L, GRID PROX

CAPT DSPL (D), OUTBD, INBD, C DSPL UPR, EFIS CTRL SWITCH L, CURSOR CTRL L, OPAS 1, TERR DSPL, RAT AUTO CTRL

WARN SPKR L (C), STICK SHAKER L, ATC ANT SWITCH, CDU L, COMM VHF L

L ENG (B), START VALVE CTRL, SWITCH, FUEL VALVE, EDP SUPPLY VALVE, OPAS 3, ISFD, STBY ADM (1, 2), AIMS-L

L ENG (L), STBY IGN 1, STBY IGN 2, ATC L, VOR MKR L, RADIO ALT C, MMR C, ILS ANT SWITCH C, LDG GEAR (ALTN EXT CTRL, ALTN EXT MOTOR)

2 3 4 5 6 7 8 9 10 11 12 13

EMER LIGHTS (H), FIT DECK 18 PWB. 1, 3L, 3R, 4L&4R

COMM HF R (G), F/O CLOCK, OPAS 2, AIR/GND 2

AIMS-R (F), 3, 4, 1, MCP R, A/T SERVO R, ILS ANT SWITCH R, AFDC R, AFDC BACK DRIVE R

L ENG IGN 2 (E), R ENG IGN 1, WXR R, TCAS, RADIO ALT R, MMR L, ADF L, DME L, GRID PROX

CAPT DSPL (D), OUTBD, INBD, EFIS CTRL SWITCH R, CURSOR CTRL R, MAINT ACCESS TERM

WARN SPKR R (C), STICK SHAKER R, CDU R, COMM VHF R, FUEL BAT CHARGE, INTERPHONE (F/O)

AIMS-L (B), 3, 4, VALVE, START CTRL, SWITCH, R ENG (R ENG, FUEL VALVE, EDP SUPPLY VALVE), INTERPHONE (STBY F/O, SERV, CAPT, OBS)

R ENG (L), STBY IGN 1, STBY IGN 2, APU FUEL S/O VALVE, L ENG FUEL SPAR VALVE, R ENG FUEL SPAR VALVE, FUEL S/O VALVE BUS, AFDC WARN, LDG GEAR (PARKING BRAKE VALVE, EXTD/RETR 2), AFDC C, AIR/GND 3

14 15 16 17 18 19 20 21 22 23 24 25

Maintenance Overhead Panel

Right Backup Window Heat Switch

Left Backup Window Heat Switch

Flight Control Hydraulic Power Switches for Tail Actuators (Left/Center/Right Systems)  
NORM / SHUTOFF

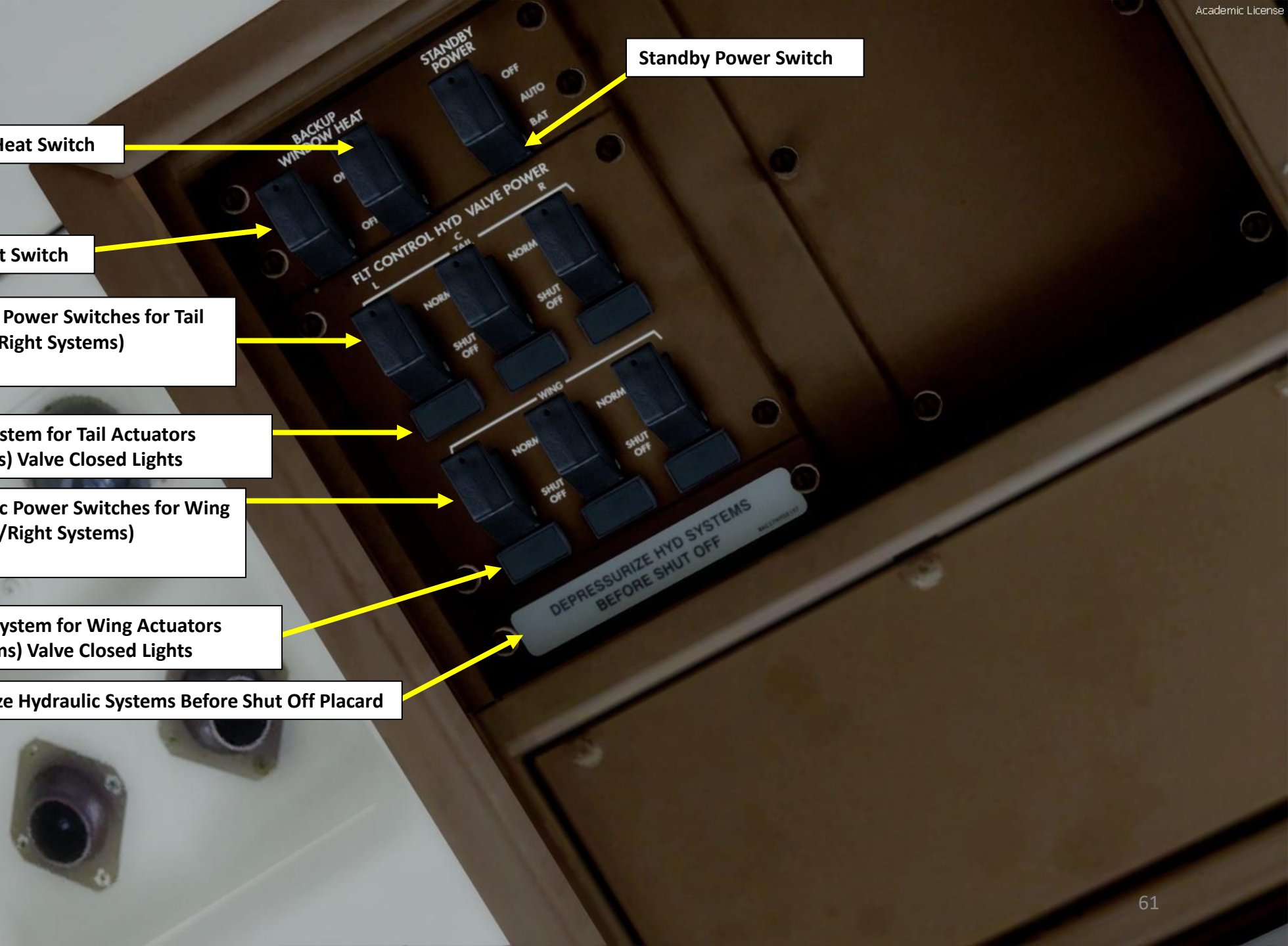
Flight Control Hydraulic System for Tail Actuators (Left/Center/Right Systems) Valve Closed Lights

Flight Control Hydraulic Power Switches for Wing Actuators (Left/Center/Right Systems)  
NORM / SHUTOFF

Flight Control Hydraulic System for Wing Actuators (Left/Center/Right Systems) Valve Closed Lights

Depressurize Hydraulic Systems Before Shut Off Placard

Standby Power Switch



777-200LR

PART 2 - COCKPIT

Maintenance Overhead Panel

APU (Auxiliary Power Unit) Power Maintenance Switch

Left EEC (Electronic Engine Control) Maintenance Switch

Right EEC (Electronic Engine Control) Maintenance Switch

Aft Cargo Bay Temperature Selector Switch
• OFF: Shuts off bleed air to selected compartment
• LOW: Compartment is automatically kept at a low temperature (approx. 45 deg F)
• HIGH: Compartment is automatically kept at a high temperature (approx. 70 deg F)

Towing Power Switch

Bulk Cargo Compartment Temperature Selector Switch
• OFF: Shuts off bleed air to selected compartment
• LOW: Compartment is automatically kept at a low temperature (approx. 45 deg F)
• HIGH: Compartment is automatically kept at a high temperature (approx. 70 deg F)

Ground Test Switch

Cockpit Voice Recorder Speaker

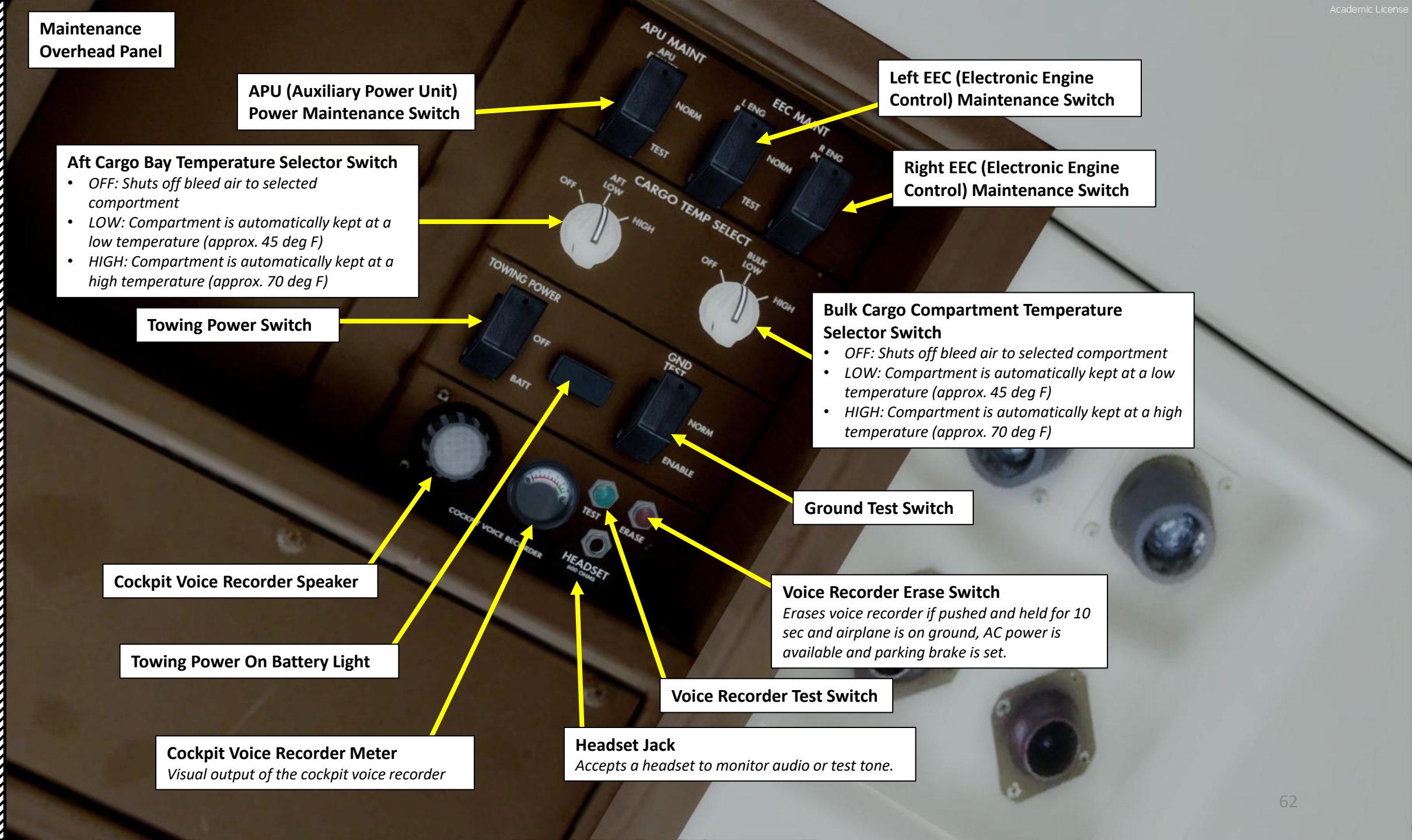
Voice Recorder Erase Switch
Erases voice recorder if pushed and held for 10 sec and airplane is on ground, AC power is available and parking brake is set.

Towing Power On Battery Light

Voice Recorder Test Switch

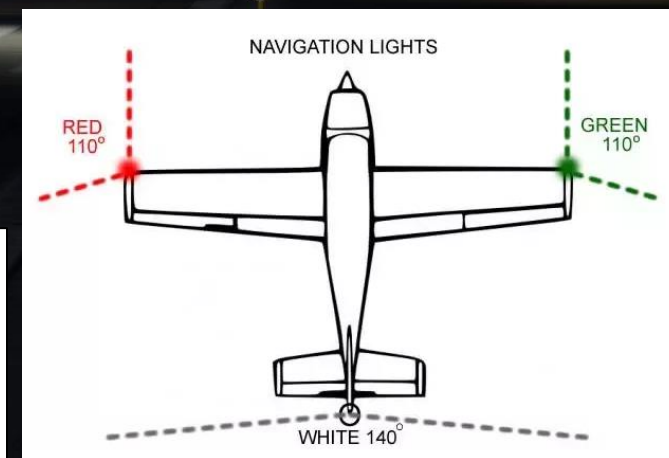
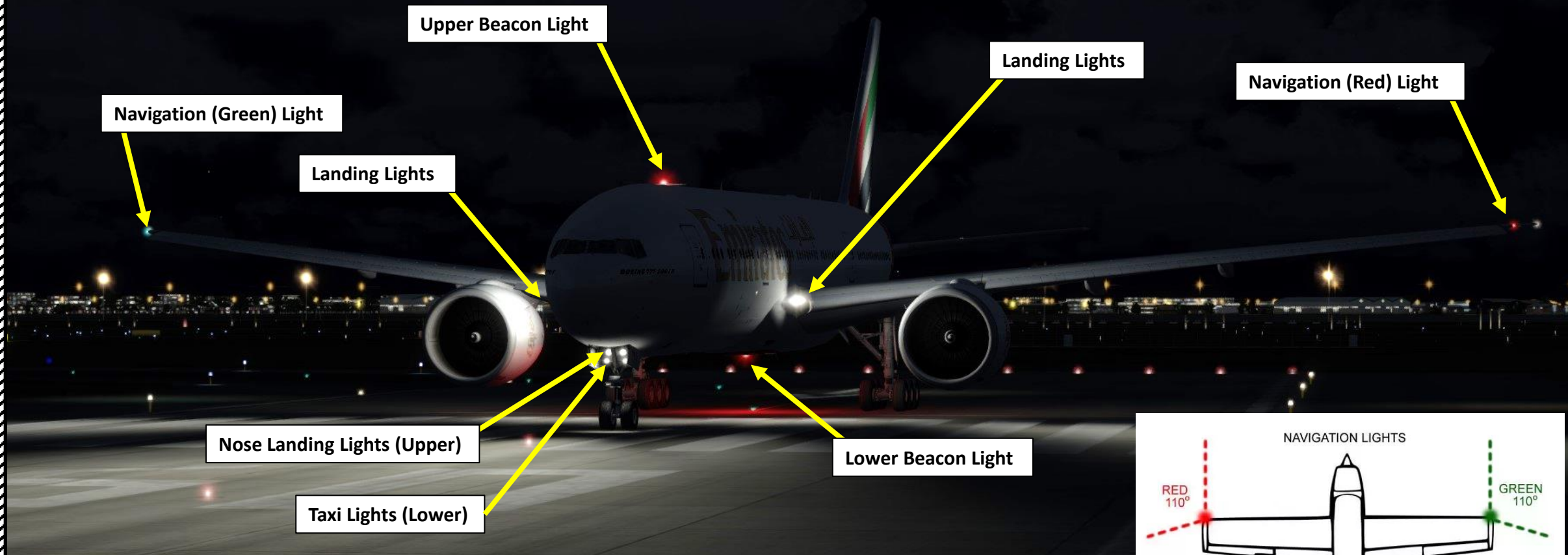
Cockpit Voice Recorder Meter
Visual output of the cockpit voice recorder

Headset Jack
Accepts a headset to monitor audio or test tone.

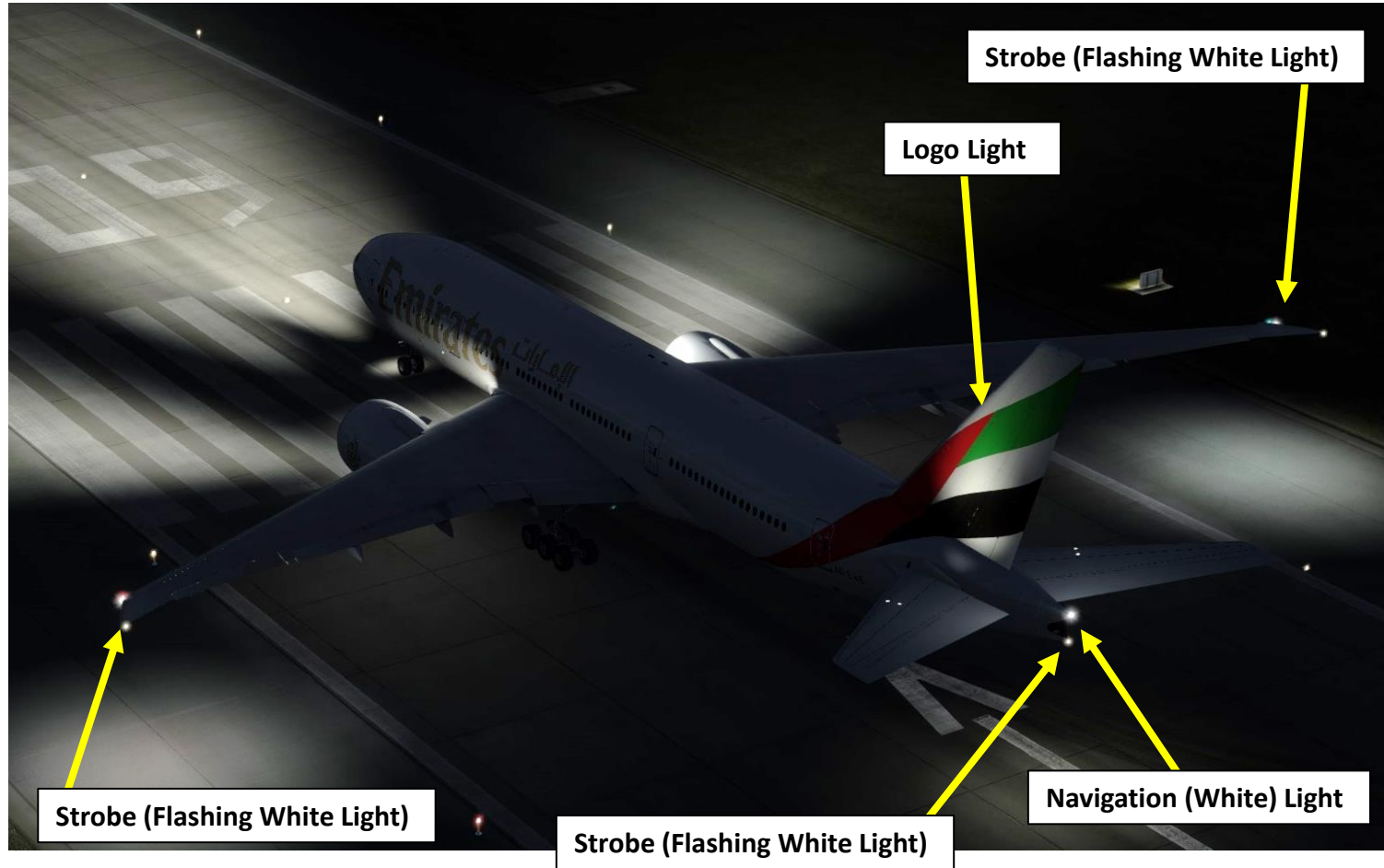


777-200LR

## PART 2 – COCKPIT



- **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





# PLANNING THE FLIGHT

In real life, you cannot just fly a 777 wherever and whenever you please. Just like on land, the sky is littered with an intricate network of waypoints and aerial highways. Therefore, it is necessary to plan your flight route and to determine how much fuel you will need to carry in order to reach your destination.

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

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



Airways:  
EHAM SID GORLO UL980 LOGAN STAR EGLL

Provided by RouteFinder

METAR:

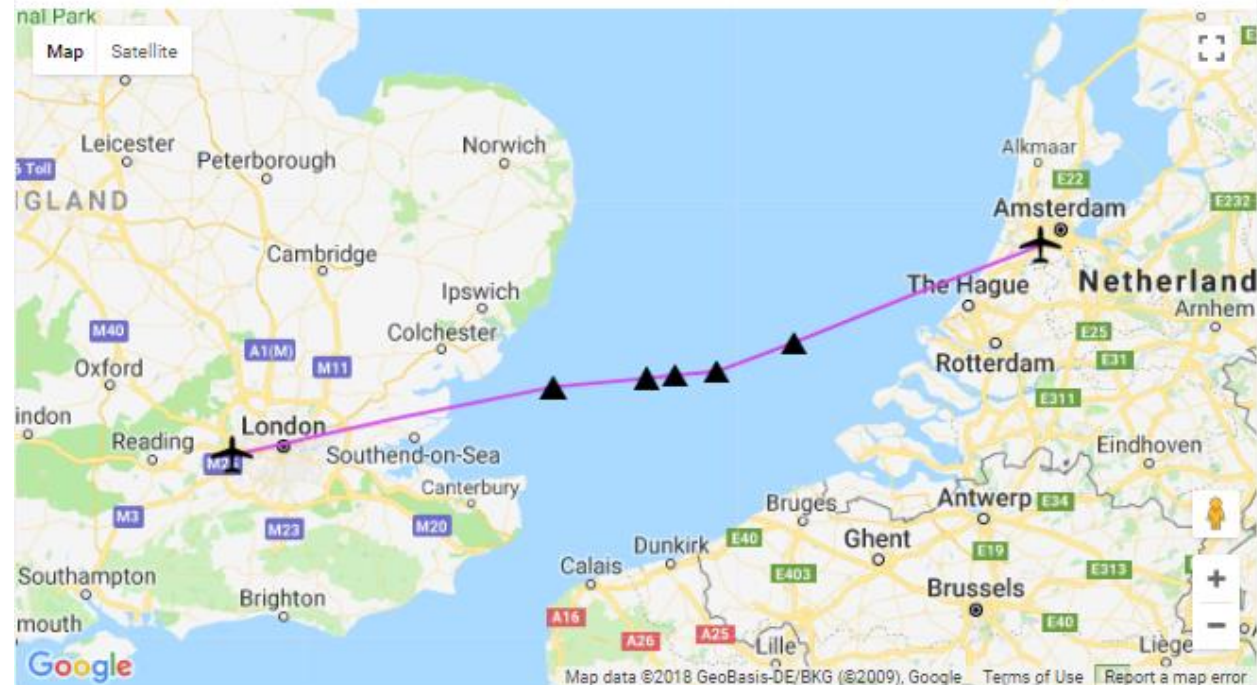
Departure: EHAM 110225Z 33004KT 8000 NSC 12/11 Q1018 BECMG 7000  
Destination: EGLL 110220Z AUTO 03005KT 360V070 9999 OVC009 14/12 Q1023 TEMPO BKN012

Provided by CheckWX API

## Fuel quantity for Boeing 777-200

	Fuel	Time
Fuel Usage	14516 lbs	00:52
Reserve Fuel	20911 lbs	01:15
Fuel on Board	35427 lbs	02:07

Provided by Fuelplanner.com

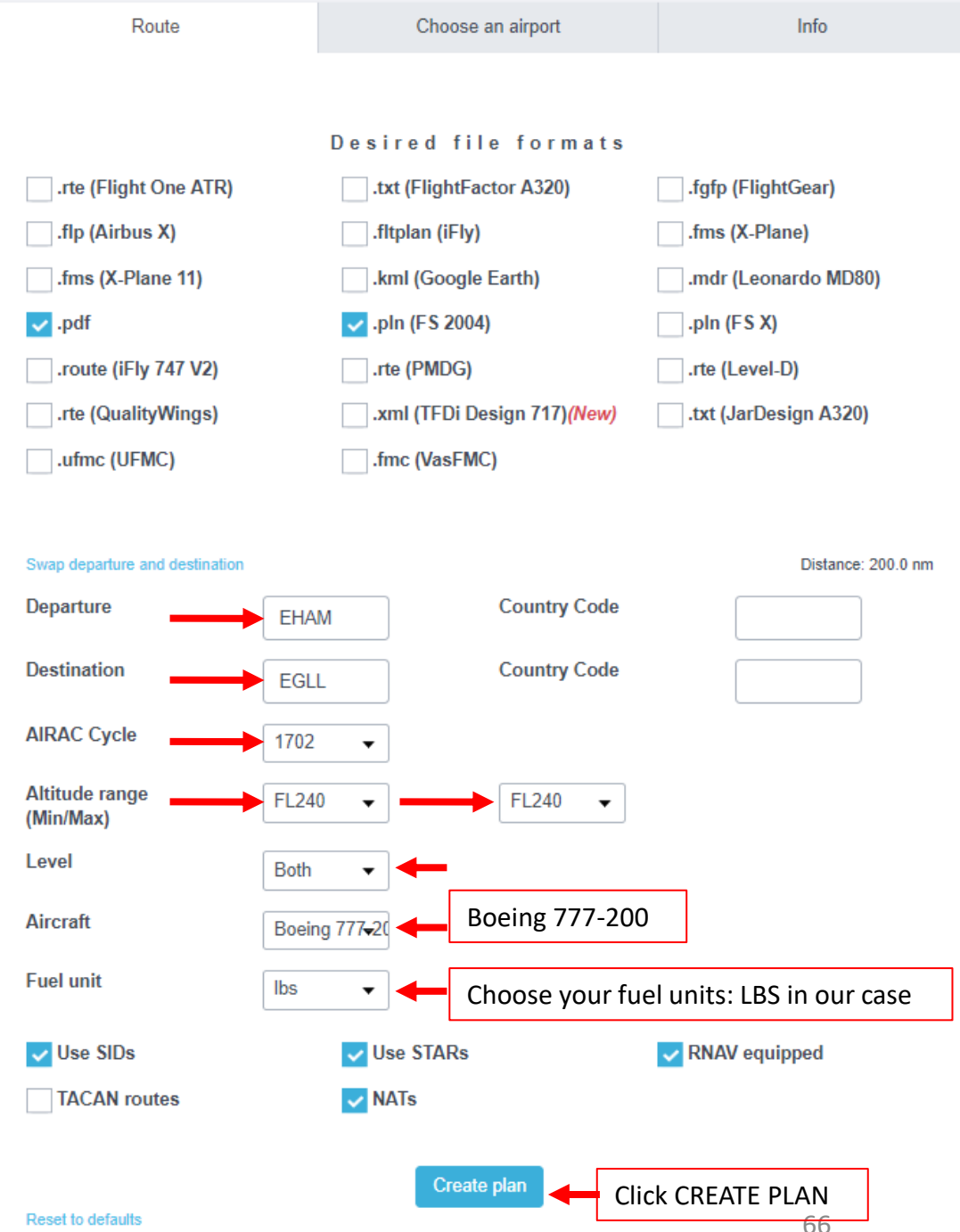
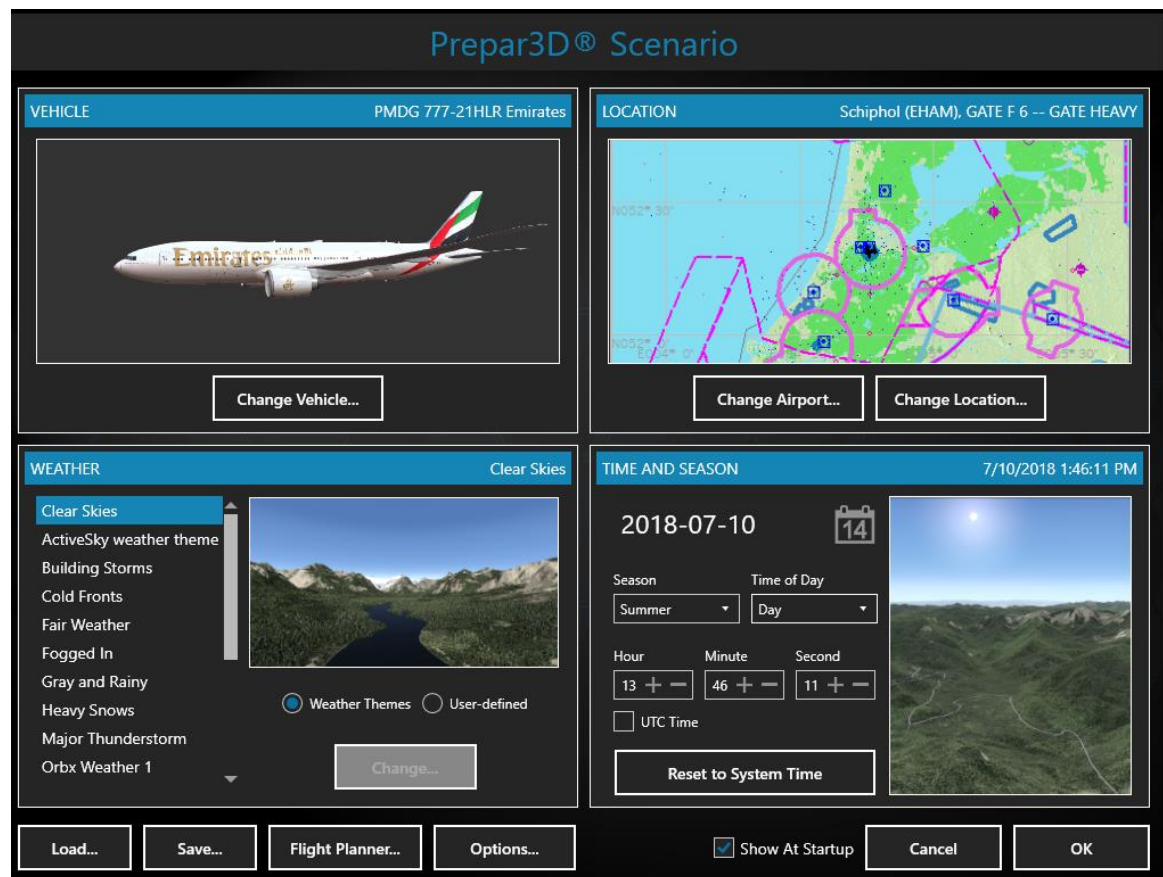


# PLANNING THE FLIGHT

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

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

Click on **CREATE PLAN** to generate a flight plan.



## PLANNING THE FLIGHT

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

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

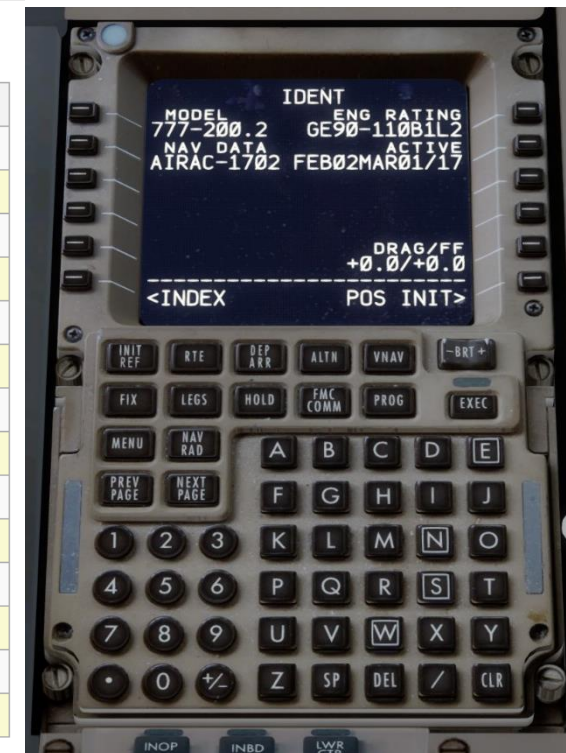
1. Plan your flight using the default AIRAC cycle programmed in the FMC when it was first coded by PMDG during early February, 2017 (period **02**) **2017** (AIRAC cycle **1702**), which is what we will do for this tutorial. This option is free and simple if you fly alone. However, if you fly with online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

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

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

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

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





# PLANNING THE FLIGHT

## FUEL

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

### Imperial Units

Fuel for flight = (Number of 100 nm legs) x (7000 lbs)  
= 2 x 7000 lbs = **14000 lbs**

Reserve Fuel = **17500 lbs**

Total Fuel = Fuel for Flight + Reserve Fuel = **31500 lbs**

### Metric Units

Fuel for flight = (Number of 100 nm legs) x (3200 kg)  
= 2 x 3200 kg = 6400 kg

Reserve Fuel = 8000 kg

Total Fuel = Fuel for Flight + Reserve Fuel = 14400 kg

## FLIGHT ROUTE

The flight route we will take is:

**EHAM SID GORLO UL980 LOGAN STAR EGLL**

Write this route down.

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

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

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

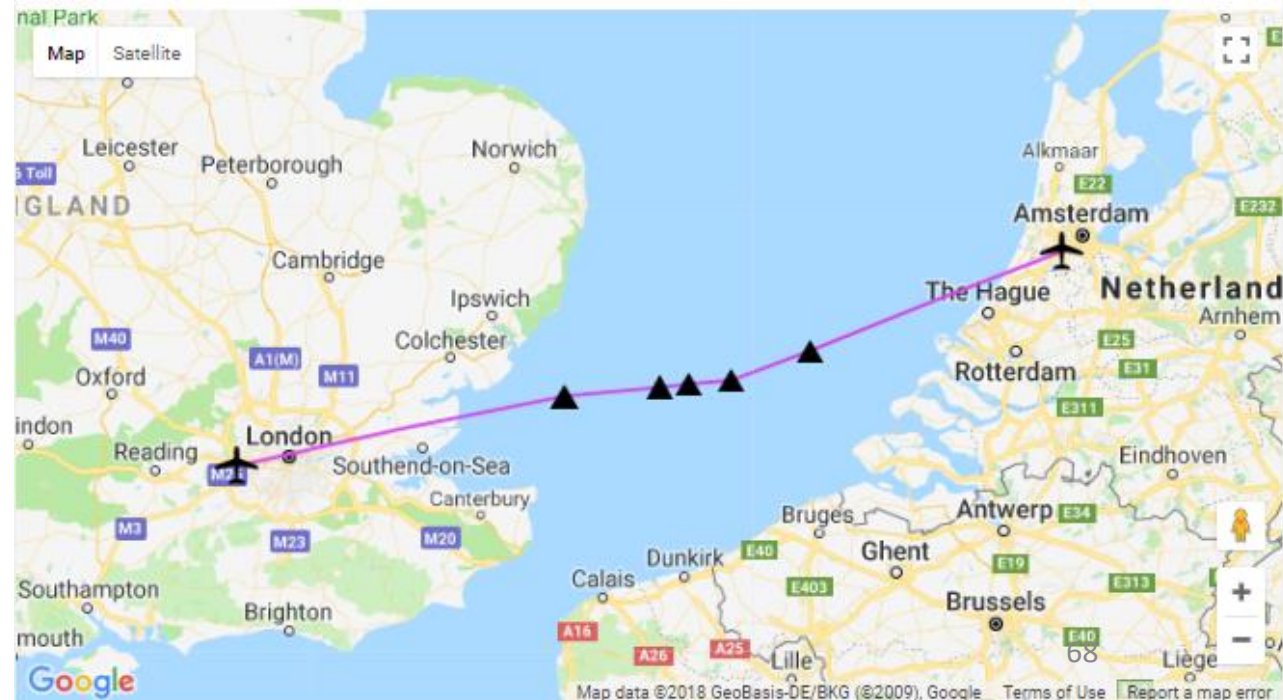
ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
EHAM	-	0	0	N52°18'29.00"	E004°45'51.00"	AMSTERDAM/SCHIPHOL
GORLO	-	249	63	N51°55'26.64"	E003°10'18.61"	GORLO
REFSO	-	250	20	N51°48'34.44"	E002°40'00.87"	REFSO
ULKOK	-	264	10	N51°47'43.62"	E002°24'40.76"	ULKOK
XAMAN	-	264	7	N51°47'05.13"	E002°13'27.22"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

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

*7 fixes, 202 nm.*

*Airways:*

**EHAM SID GORLO UL980 LOGAN STAR EGLL**





# WHAT IS A SID AND A STAR?

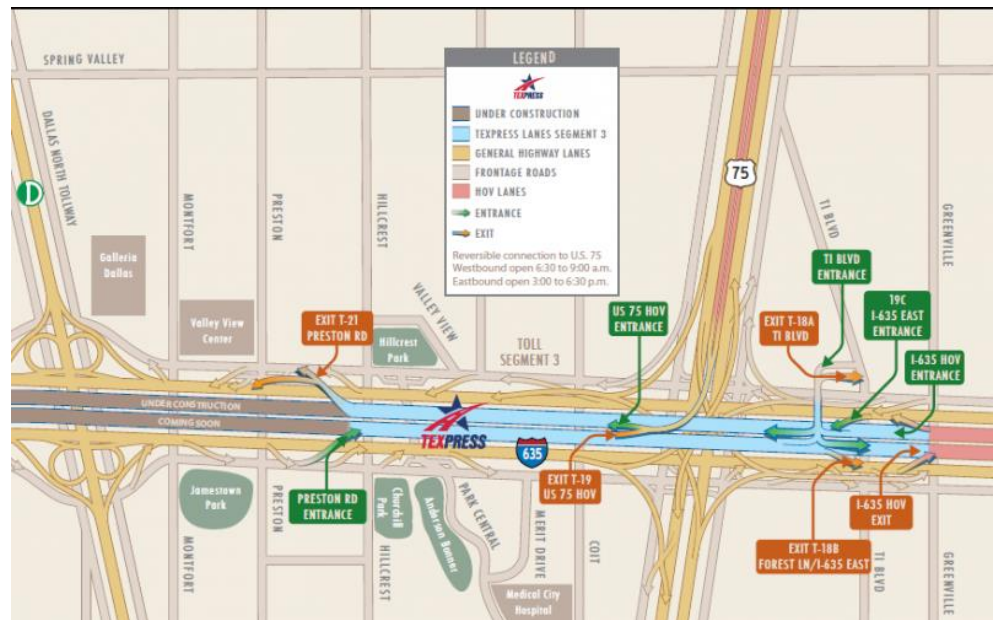
A **SID** (Standard Instrument Departure) is a small initial route which leads an aircraft from the runway they've just taken off from to the first point in his/her intended route. An airport usually has a lot of aircraft departing from it's runways. To save confusion (and for safety), a busy airport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

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

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

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

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

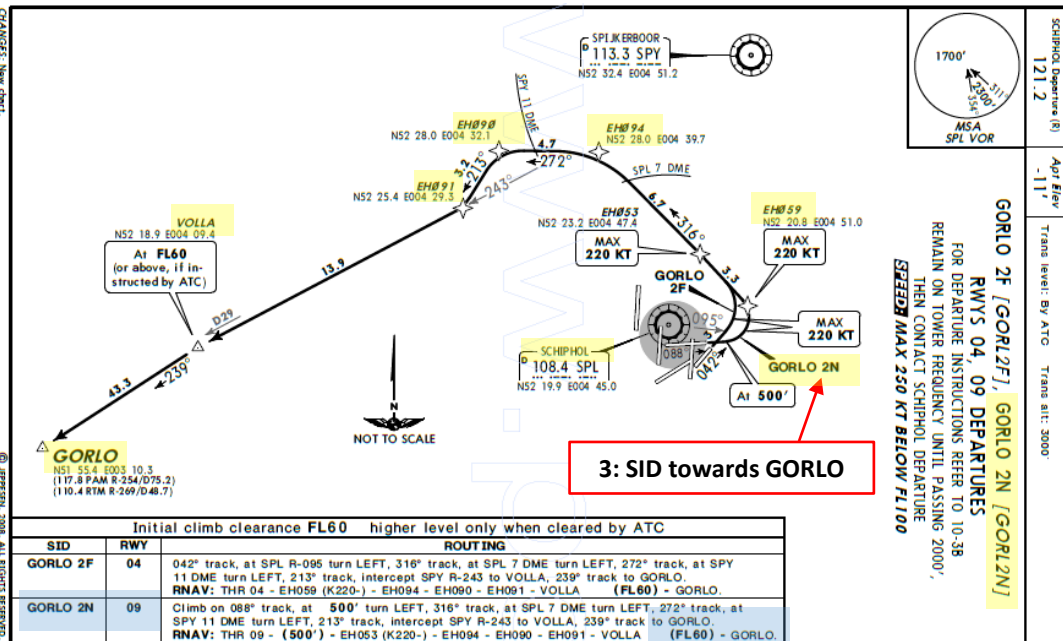
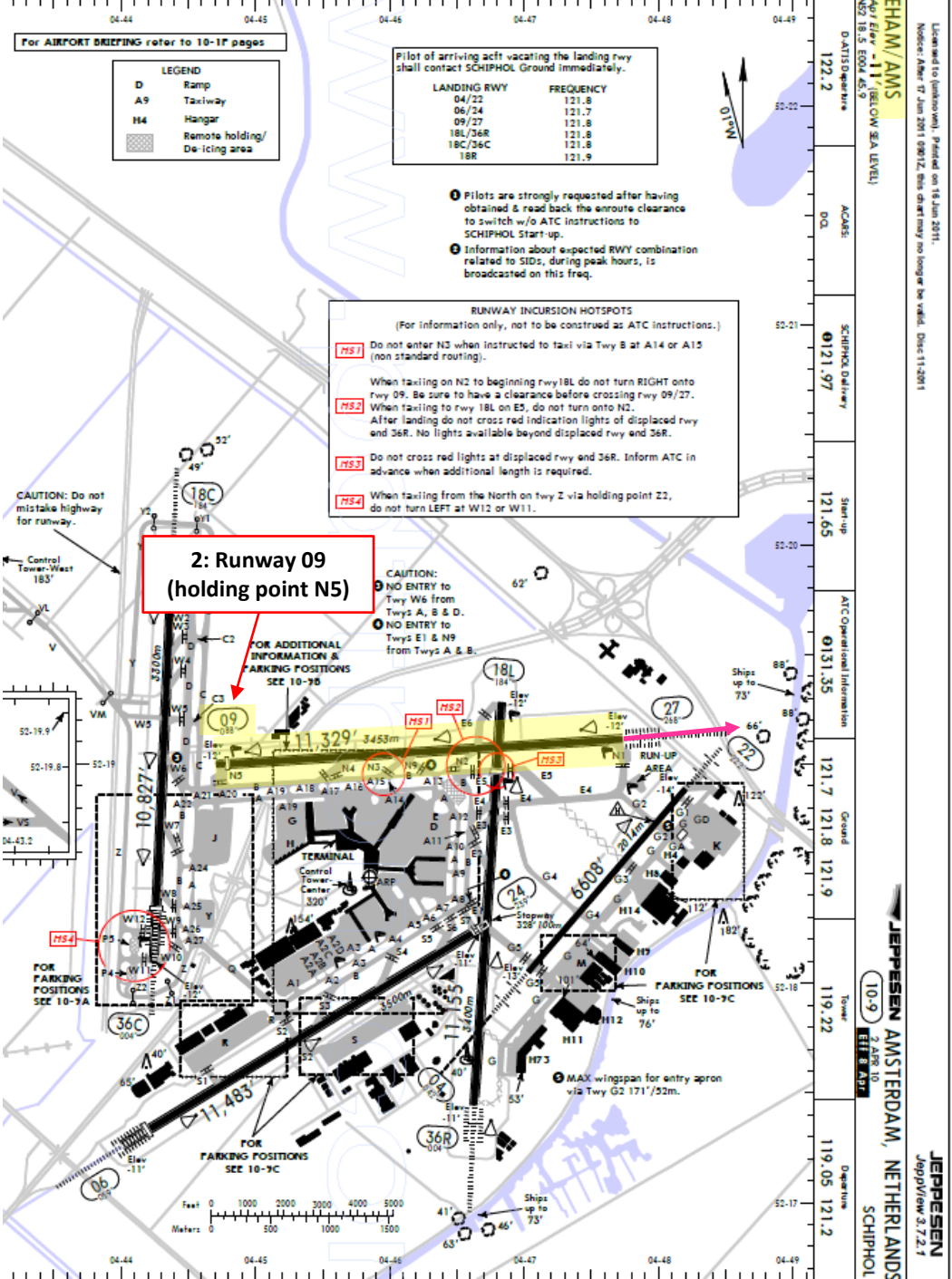
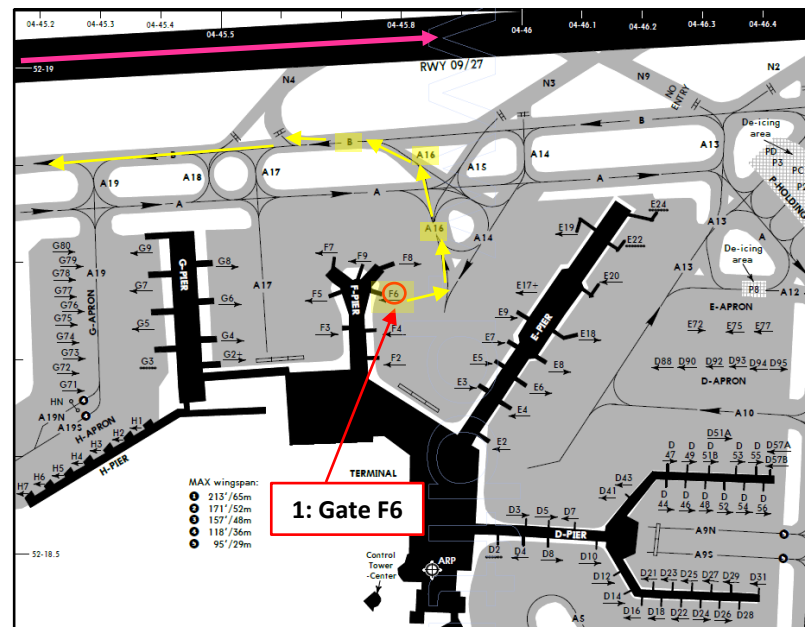




# PLANNING THE DEPARTURE - SID

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

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



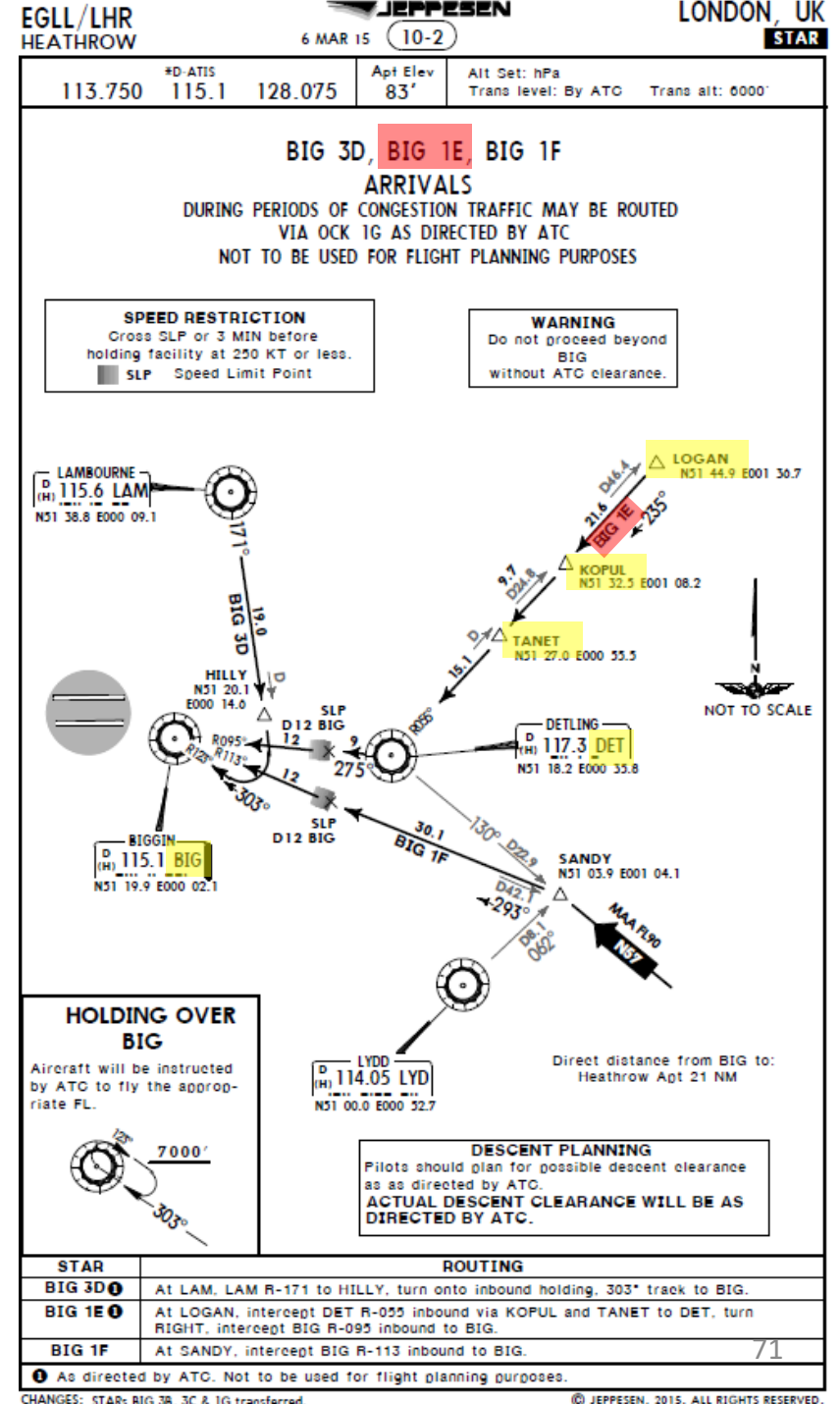
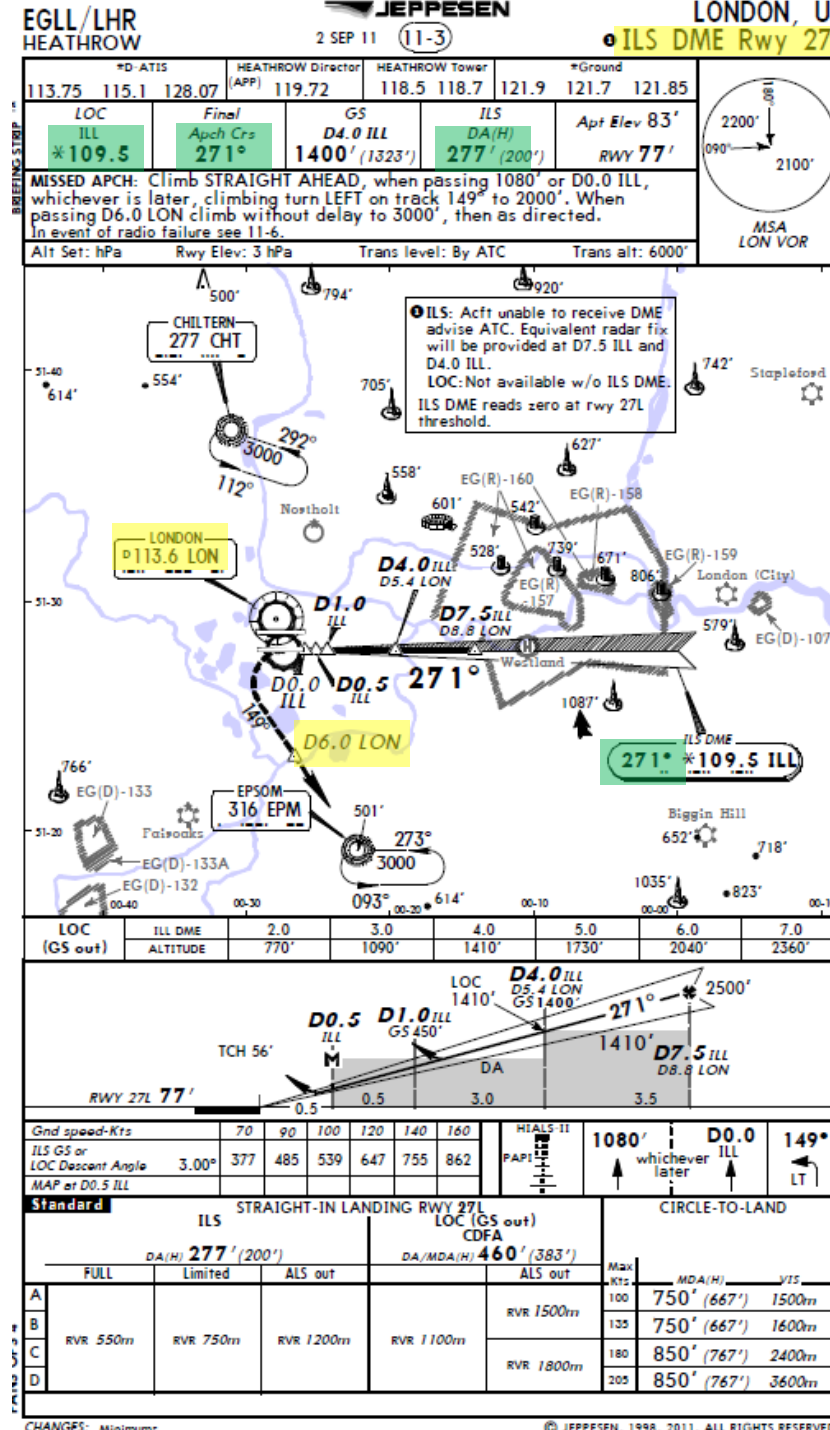
SID	RWY	Initial climb clearance FL60 higher level only when cleared by ATC	
		ROUTING	REMARKS
GORLO 2F	04	042° track, at SPL R-095 turn LEFT, 316° track, at SPL 7 DME turn LEFT, 272° track, at SPY 11 DME turn LEFT, 213° track, intercept SPY R-243 to VOLLA, 239° track to GORLO. RNAV: THR 04 - EH059 (K220-) - EH094 - EH090 - EH091 - VOLLA (FL60) - GORLO.	
GORLO 2N	09	Climb on 088° track, at 500' turn LEFT, 316° track, at SPL 7 DME turn LEFT, 272° track, at SPY 11 DME turn LEFT, 213° track, intercept SPY R-243 to VOLLA, 239° track to GORLO. RNAV: THR 09 - (500') - EH053 (K220-) - EH094 - EH090 - EH091 - VOLLA (FL60) - GORLO.	

CHANGES: New chart. © JEPPESEN, 2008. ALL RIGHTS RESERVED.

# PLANNING THE APPROACH - STAR

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

1. Come from LOGAN waypoint
2. Fly from LOGAN towards the BIG1E arrival route.
3. Follow the STAR (BIG1E -> KOPUL -> TANET -> DET -> BIG)
4. Select an AIF (Approach Initial Fix) from the FMC database (in our case C127L) and follow the approach towards the runway, guided by the EGLL airport's ILS (Instrumented Landing System).
5. Land at Heathrow (EGLL) on runway 27L (orientation: 270 Left)



# PLANNING THE FLIGHT - SUMMARY

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

Flight Plan Input to FMC

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

Provided by  RouteFinder

*METAR:*

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

Provided by [CheckWX API](#)

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

## Fuel quantity for Boeing 777-200

	Fuel	Time
Fuel Usage	14516 lbs	00:52
Reserve Fuel	20911 lbs	01:15
Fuel on Board	35427 lbs	02:07



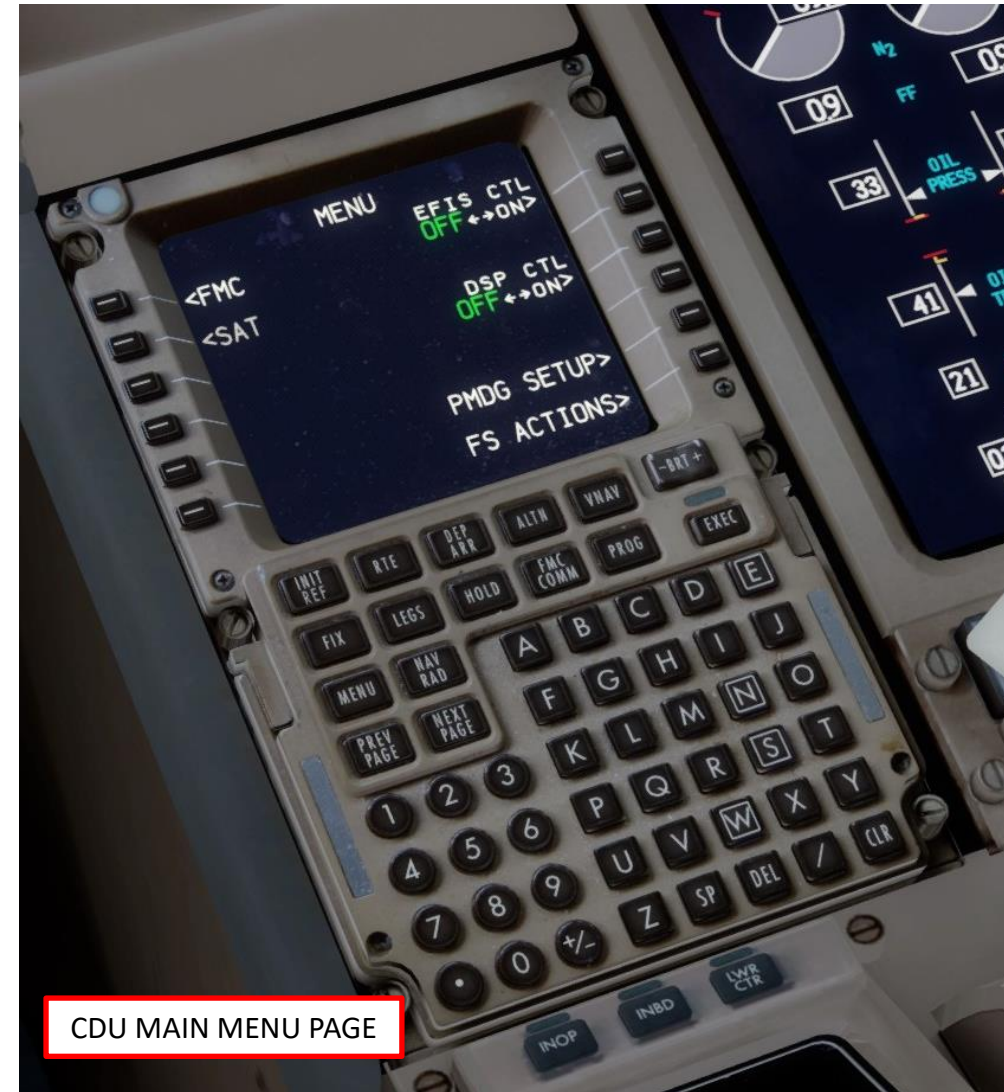
## CDU/FMC IN A NUTSHELL

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

**CDU:** Control Display Unit

**MAIN MENU** page:

- **FMC** -> Flight Management Computer
  - Fundamental component of a modern airliner's avionics. The FMC is a component of the FMS (Flight Management System), which is a specialized computer system that automates a wide variety of in-flight tasks, reducing the workload on the flight crew to the point that modern civilian aircraft no longer carry flight engineers or navigators. A primary function is in-flight management of the flight plan. All FMS contain a navigation database. The navigation database contains the elements from which the flight plan is constructed. The FMS sends the flight plan for display to the Electronic Flight Instrument System (EFIS), Navigation Display (ND), or Multifunction Display (MFD).
- **SAT** -> SATCOM (Satellite Communications)
  - Provides aircraft onboard equipment for SATCOM and includes a satellite data unit, a high power amplifier and an antenna with a steerable beam. A typical aircraft SATCOM installation can support data link channels for 'packet data services' as well as voice channels.
- **PMDG SETUP** -> Setup various aircraft options
  - Allows you to configure aircraft equipment installed on your current airframe, customize various parameters like display parameters, unit system, IRS alignment time, setup cold & dark and other panel states, and configuration of aircraft malfunctions/failures.
- **FS ACTIONS** -> Flight Simulation Actions
  - 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 PMDG as a tool for you to work with.



CDU MAIN MENU PAGE



## CDU/FMC IN A NUTSHELL

- **FMC** -> Flight Management Computer
  - **INIT REF**: data initialization or for reference data
  - **RTE**: input or change origins, destination or route
  - **DEP ARR**: input or change departure and arrival procedures
  - **ALTN**: displays alternate airports data
  - **VNAV**: input or change vertical navigation path data
  - **FIX**: create reference points (fix) on map display
  - **LEGS**: view or change lateral and vertical data
  - **HOLD**: create and show holding pattern data
  - **FMC COMM**: displays datalink, which is used to send information between aircraft and air traffic controllers when an aircraft is too far from the ATC to make voice radio communication and radar observations possible.
  - **PROG**: shows progression of dynamic flight and navigation data, including waypoint estimated time of arrival, fuel remaining, etc.
  - **RAD NAV**: view or change radio navigation data
- **MENU**: view the main menu page (see previous page)
- **PREV PAGE / NEXT PAGE** : Cycles through previous and next page of selected FMC page
- **BRT**: controls CDU brightness
- **EXEC**: Makes data modifications active

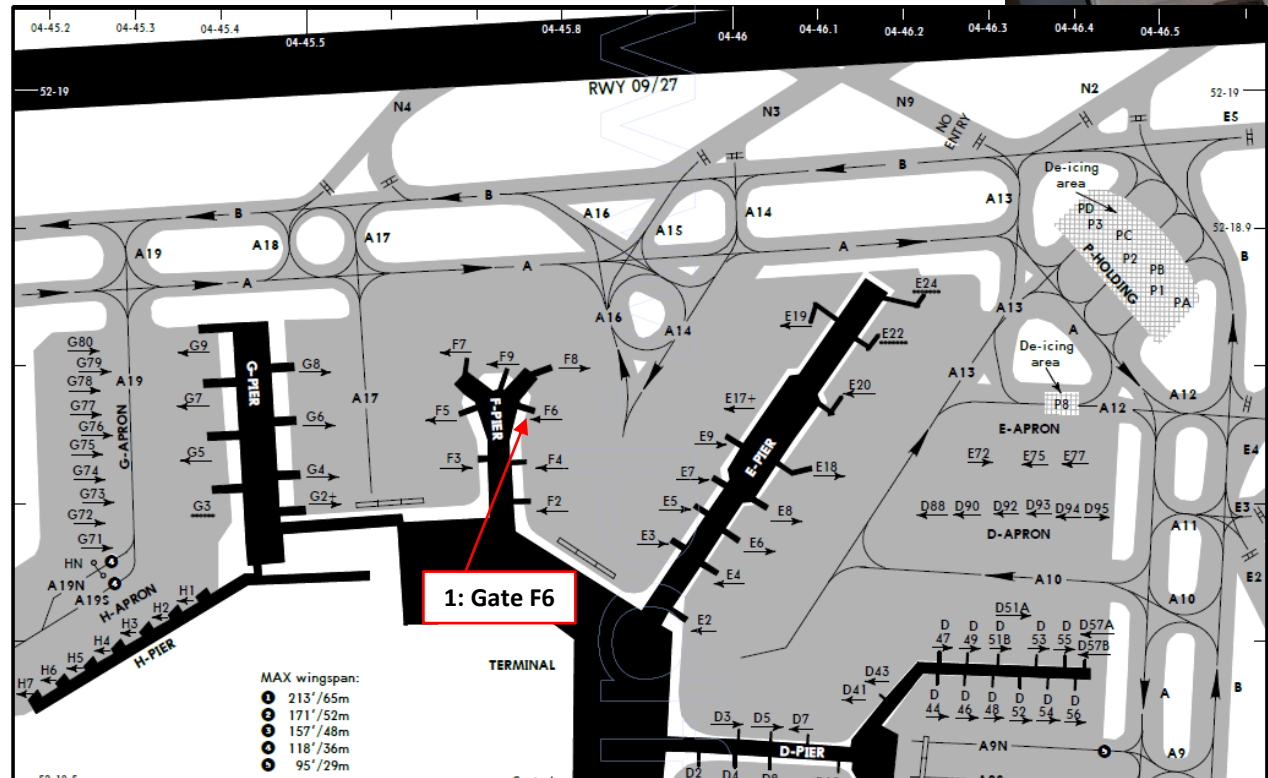
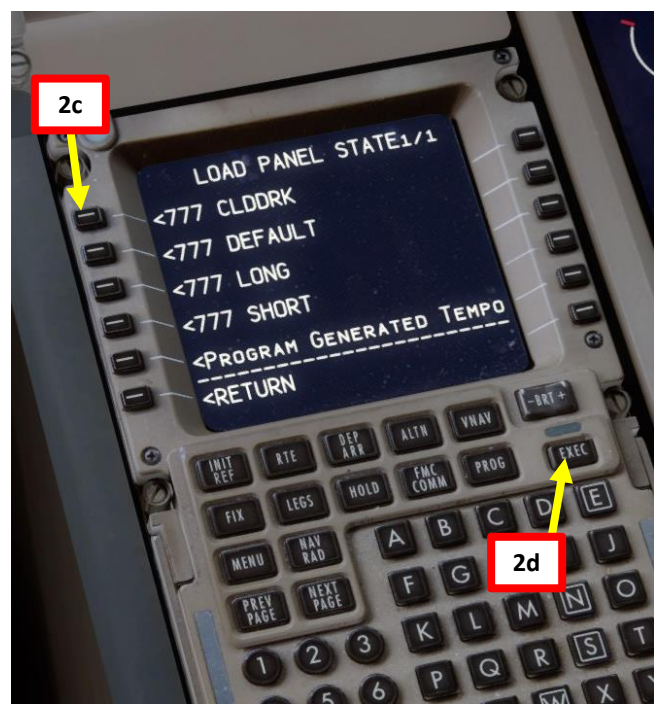
Sounds complicated? Don't worry, it's much simpler than it looks. We'll see how it works in the tutorial section.



# SET COLD & DARK STATE

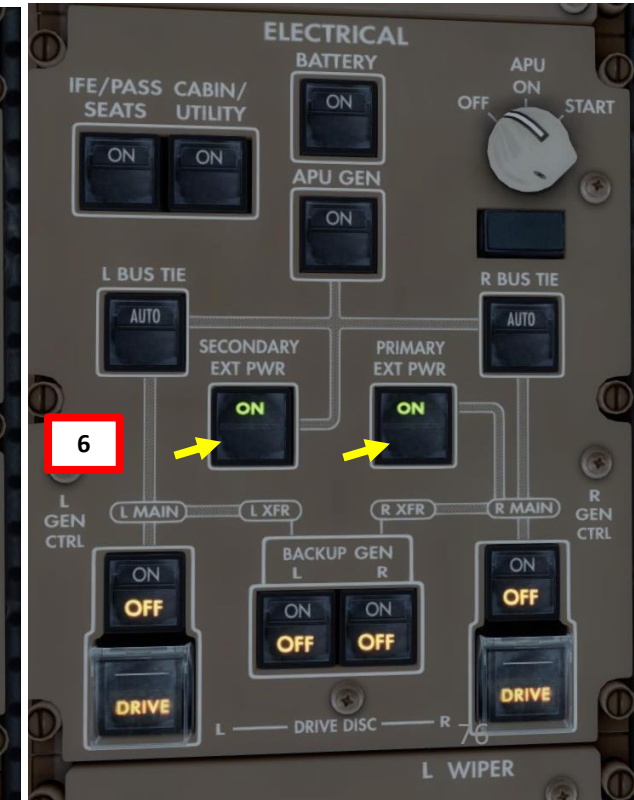
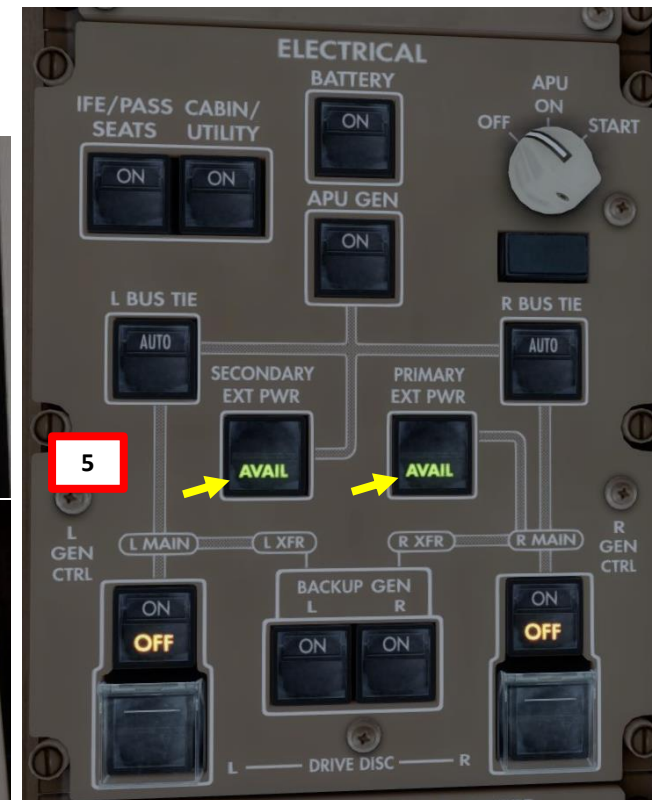
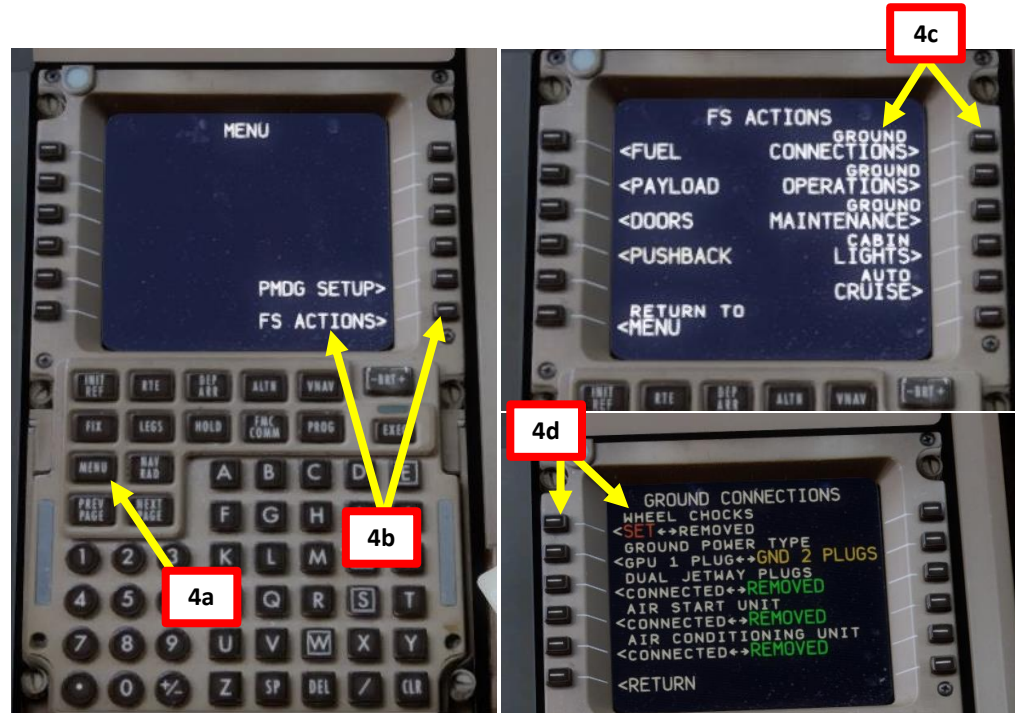
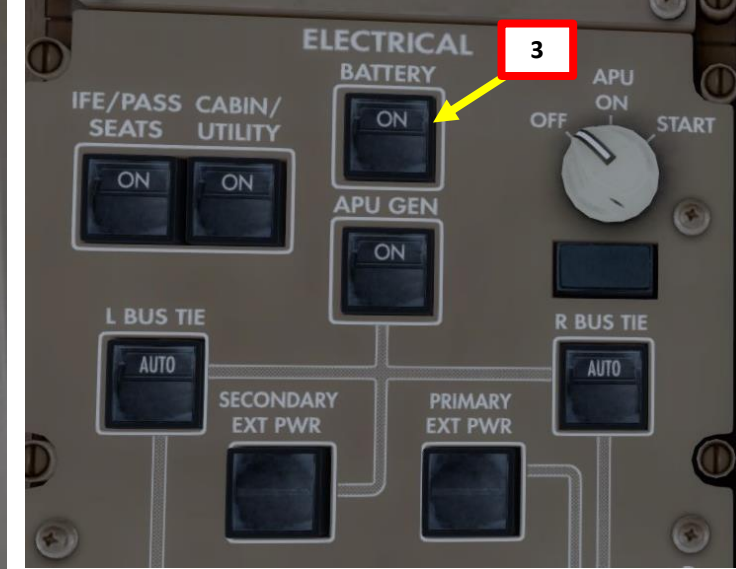
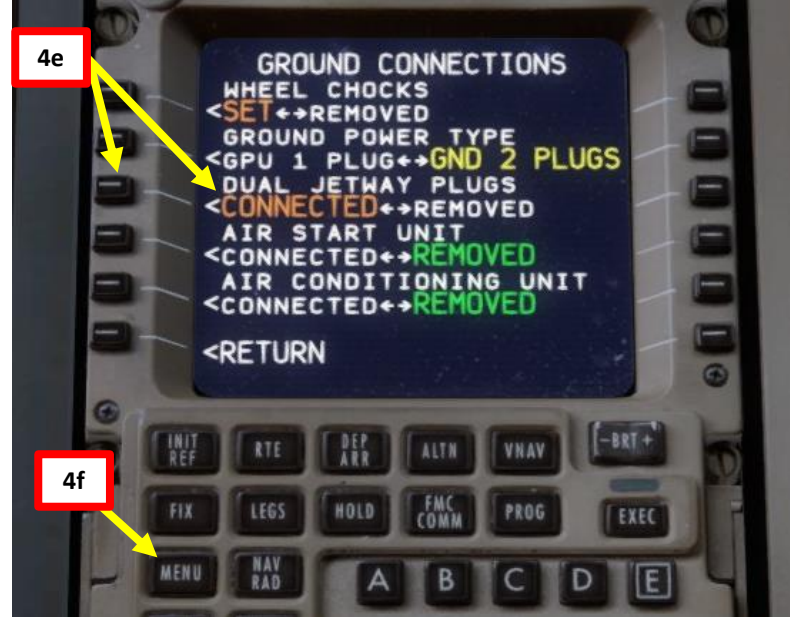
In Prepar3d or FSX, you will generally spawn with your engines running. A "cold & dark" start-up means that your aircraft is in an unpowered state with engines and every other system off. Here is the procedure to spawn in such a state:

1. Spawn like you normally would at Gate F6 in EHAM (departure airport).
2. Go on CDU main menu and reset aircraft to COLD and DARK configuration.
  - a) Select PMDG SETUP
  - b) Select PANEL STATE LOAD
  - c) Select 777 CLDDRK setup
  - d) Click "EXEC" on CDU keypad
  - e) Aircraft should be set to Cold and Dark configuration as shown



## POWER UP AIRCRAFT

3. On Overhead panel, set the battery switch to ON
4. Turn on FMC, and go on the CDU main menu to install wheel chocks, connect ground power cart to the aircraft
  - a) Press and hold the MENU button to turn on the FMC (Flight Management Computer)
  - b) Select FS ACTIONS
  - c) Select GROUND CONNECTIONS
  - d) Click on the “WHEEL CHOCKS” LSK to set wheel chocks to “SET”
  - e) Click on the “DUEL JETWAY PLUGS” LSK to set ground power to “CONNECTED”
  - f) Return to main MENU
5. On Overhead panel, confirm that the “PRIMARY EXT PWR” and “SECONDARY EXT PWR” indications are set to AVAIL
6. Click on the “PRIMARY EXT PWR” and “SECONDARY EXT PWR” switches to power the aircraft. Confirm that both indications turn to ON.



POWER UP AIRCRAFT

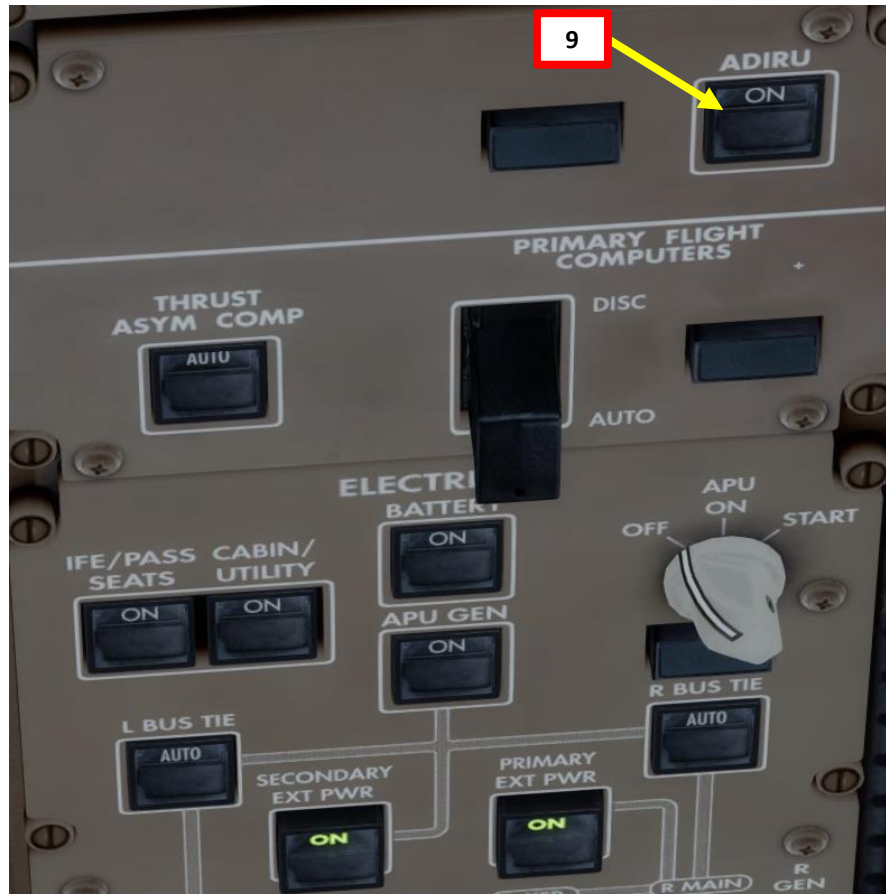
777-200LR

PART 3 - FLIGHT PLANNING



**START IRS ALIGNMENT**

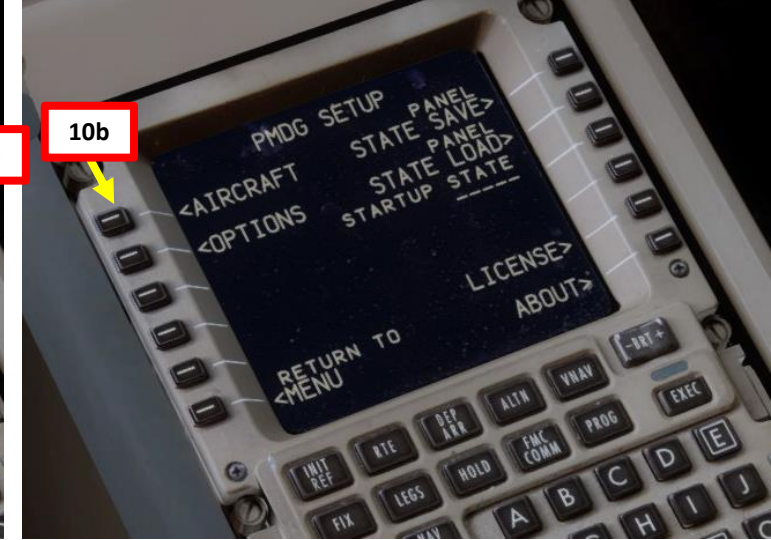
7. Engage Parking Brake (aircraft movement can screw up your navigation system alignment)
8. On Overhead panel, set ADIRU (Air Data Inertial Reference Unit) switch to ON to start IRS (Inertial Reference System) alignment.
9. This alignment phase usually takes between 6 and 7 minutes. IRS alignment is complete once a full PFD (Primary Flight Display) and ND (Navigation Display) are displayed on your display units.



## FMC SETUP - UNITS

10. Go on CDU main menu and set aircraft fuel weight units to your desired system (lbs or kg). We will choose Lbs, even though in Europe you would typically use kgs.

- Select PMDG SETUP
- Select AIRCRAFT
- Select DISPLAYS
- Set Weight to LBS
- Return to main MENU

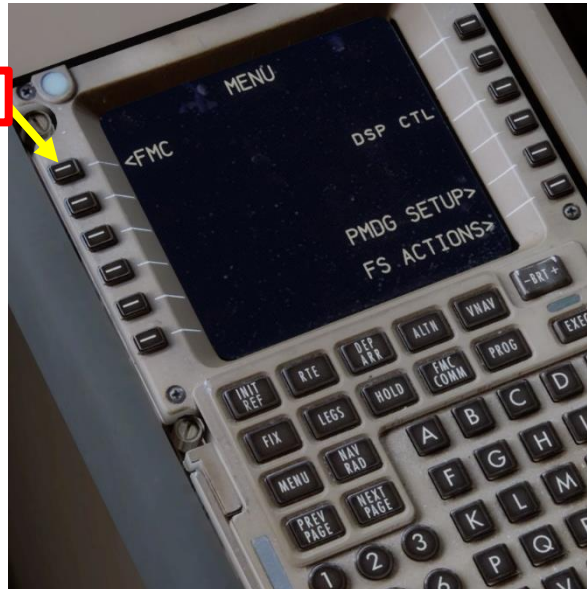


## FMC SETUP - POSITION

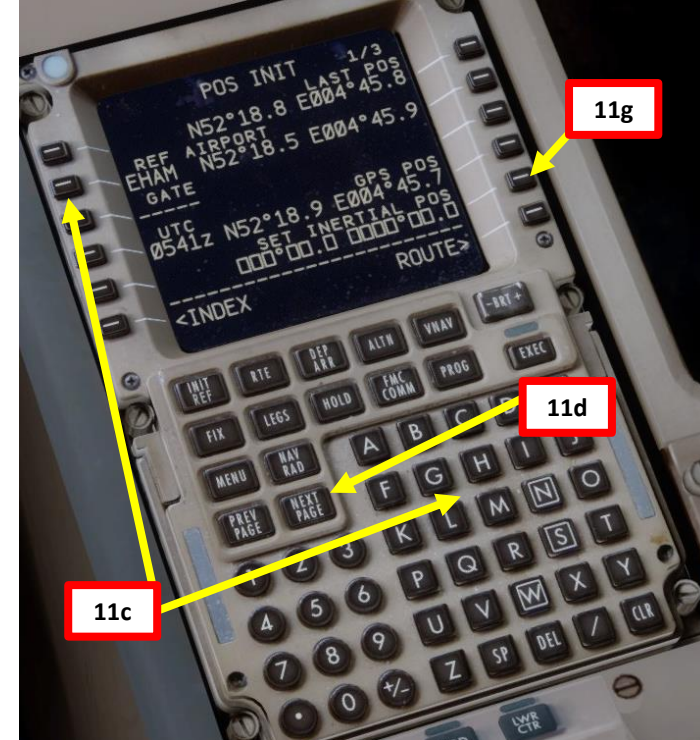
11. Go on FMC (Flight Management Computer) and set initial position for the IRS

- Select FMC
- Select POS INIT
- Type "EHAM" on the CDU keypad and select LSK next to REF AIRPORT since we spawned at Schiphol Airport (EHAM)
- Click on "NEXT PAGE" to access the POS REF page (2/4)
- Select GPS line to copy the coordinates to your keypad
- Click on "PREV PAGE" to access the POS INIT page (1/4)
- Click on the SET IRS POS to paste the coordinates, setting your IRS (Inertial Reference System) your initial reference position.
- Congratulations! Your aircraft's navigation system now knows where you are.

11a

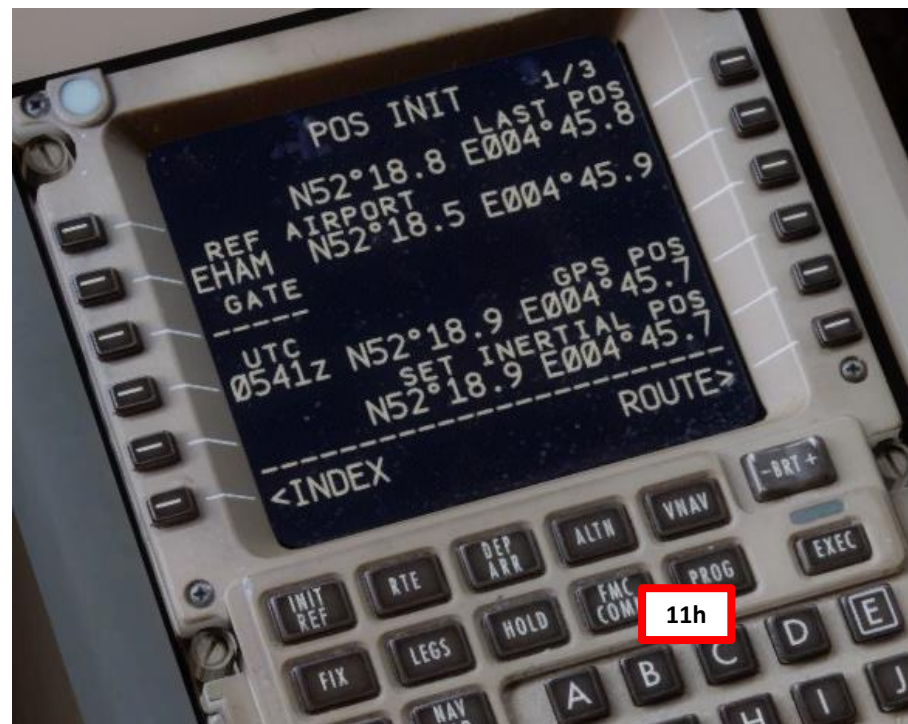


11g

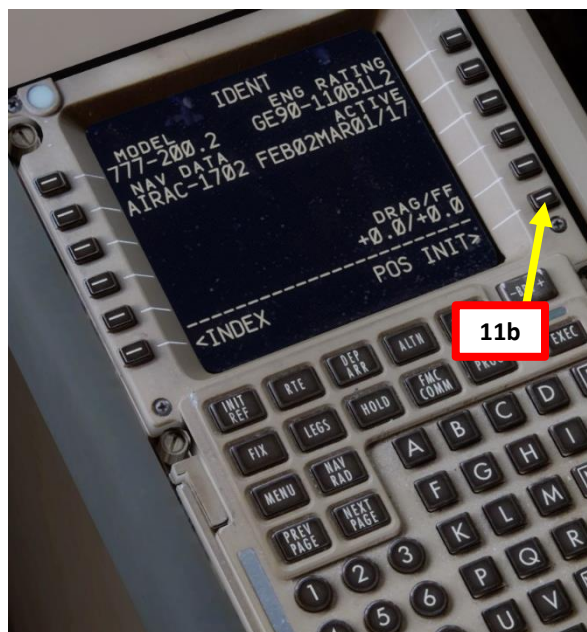


11d

11c

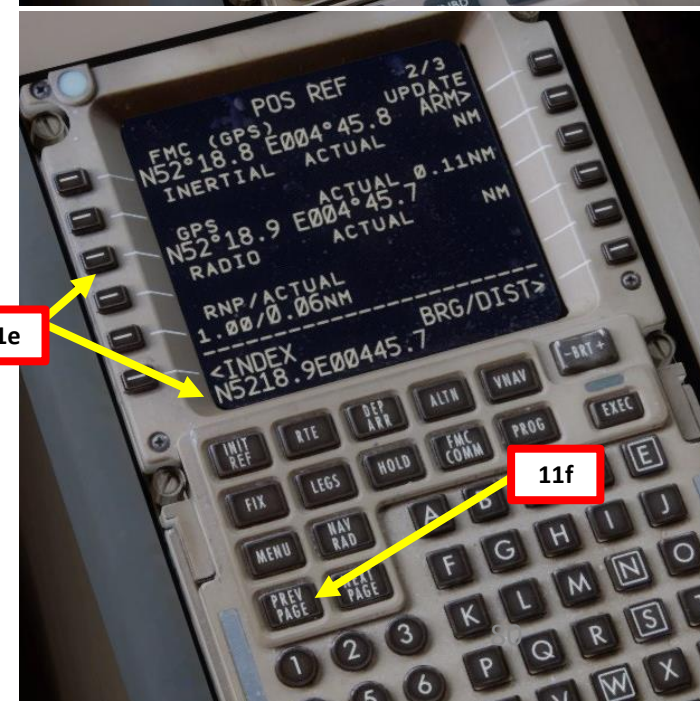


11h



11b

11e



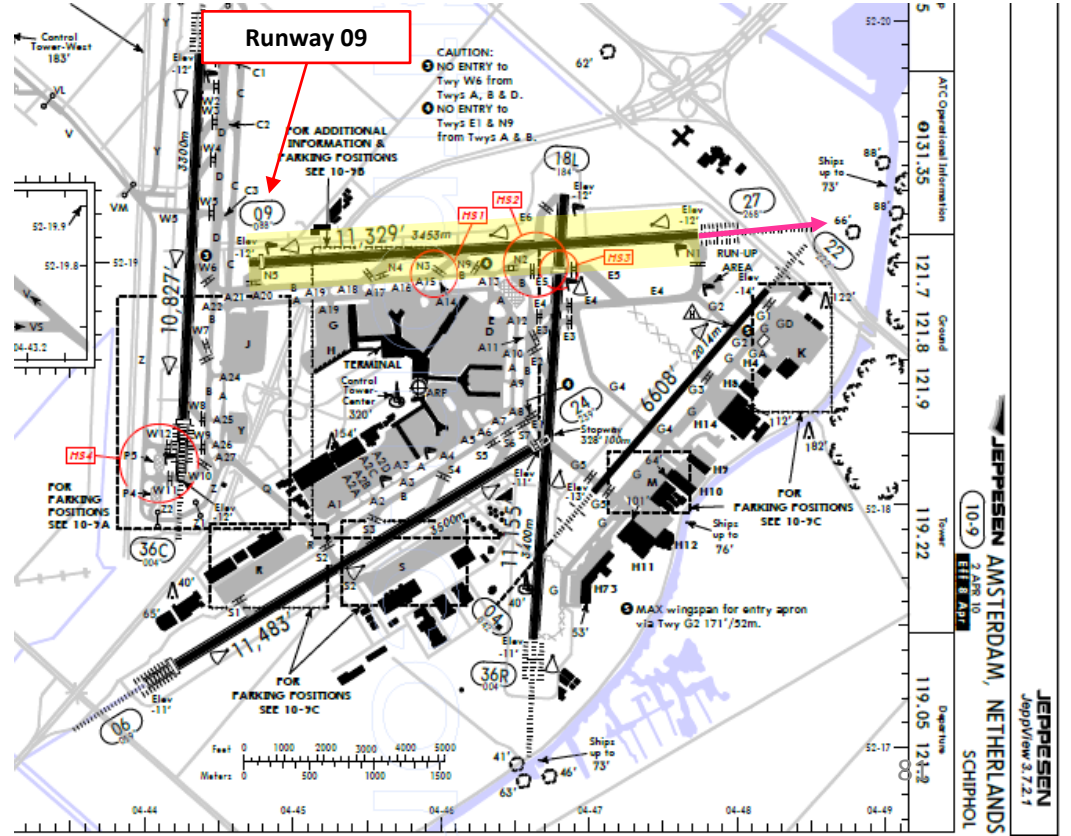
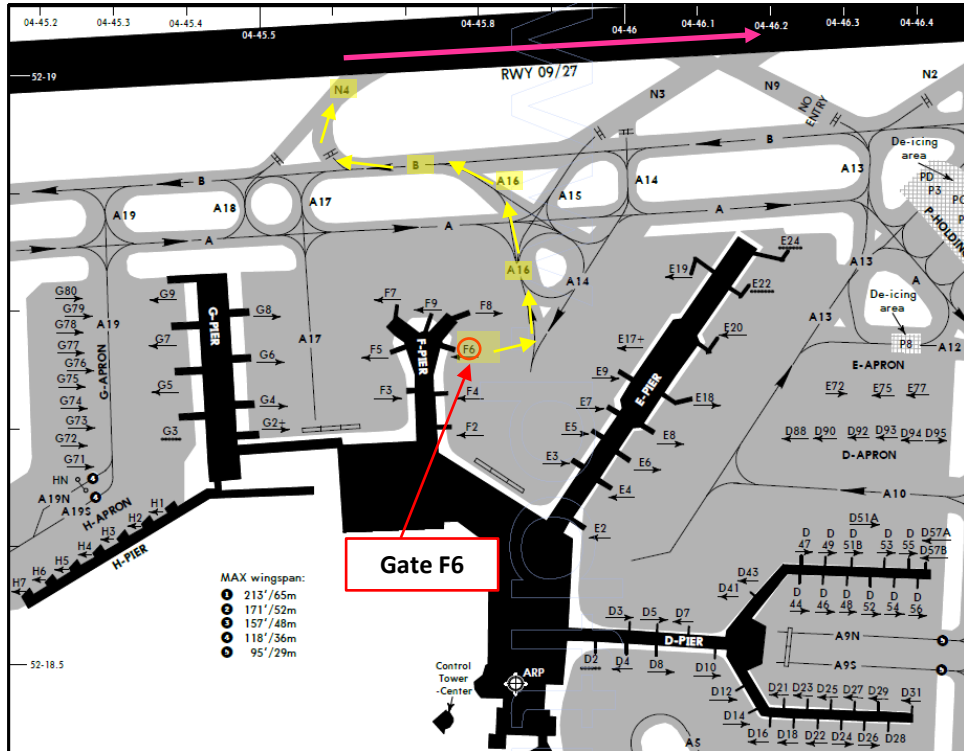
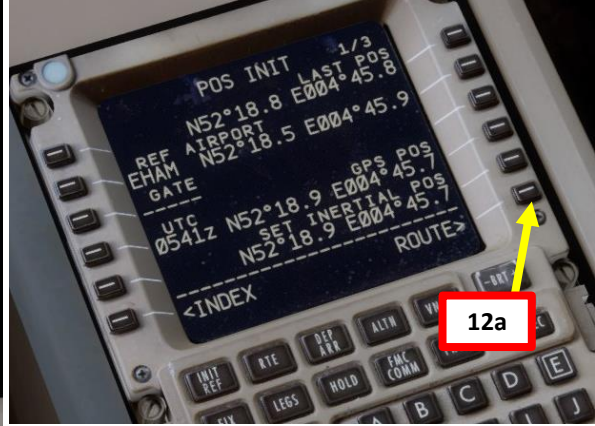
11f



# FMC SETUP - ROUTE

12. Go on FMC (Flight Management Computer) and set aircraft route

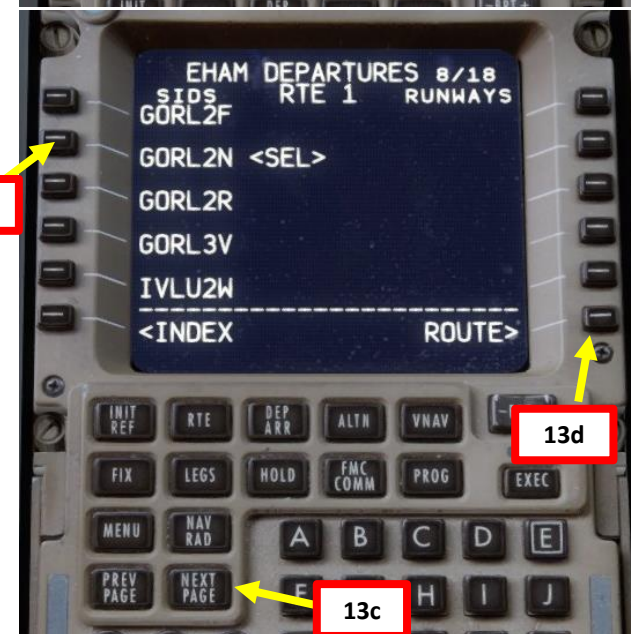
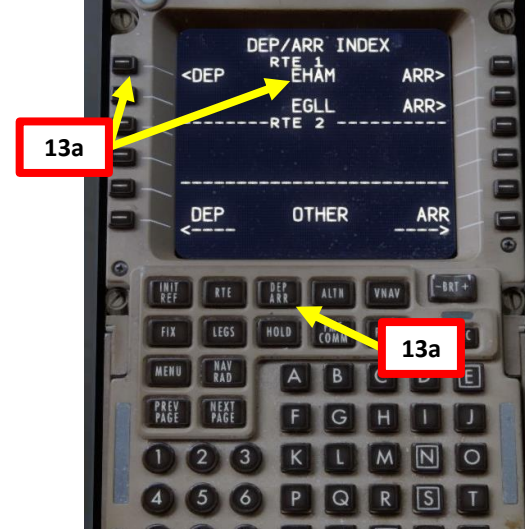
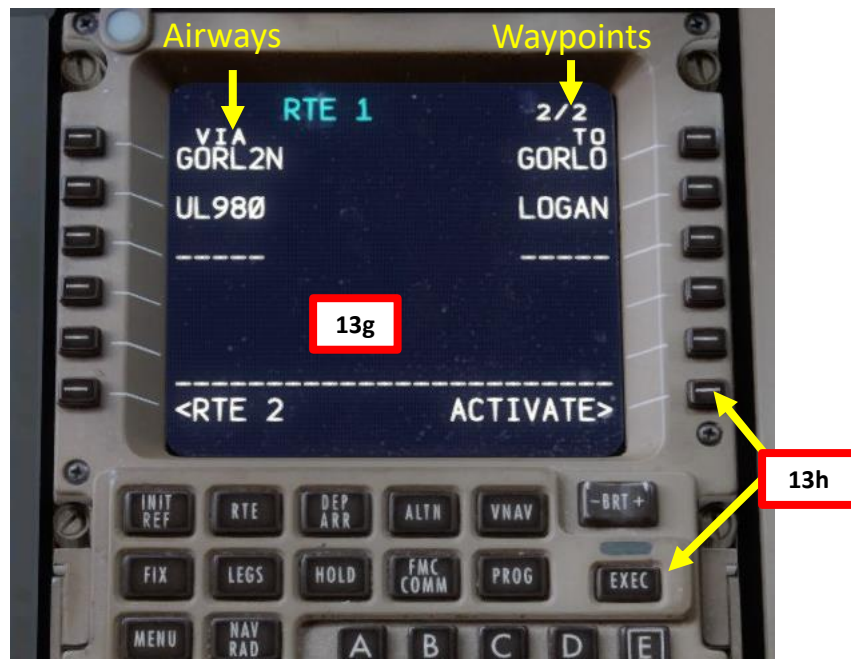
- In POS INIT menu, select ROUTE menu
- Type "EHAM" on the CDU keypad and click 'ORIGIN' to set EHAM (Schiphol) as your takeoff airport.
- Consult navigation chart of EHAM (Schiphol) Airport and find runway from which you will takeoff from (Runway 09).
- Type "09" (for Runway 090) on CDU keypad and click on RUNWAY.
- Type "EGLL" on the CDU keypad and click on "DEST" to set HEATHROW as your destination
- Type your flight number (i.e. Flight No. UAE106) on the CDU keypad and click on FLT NO.



# FMC SETUP - WAYPOINTS

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

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



## FMC SETUP - WAYPOINTS

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

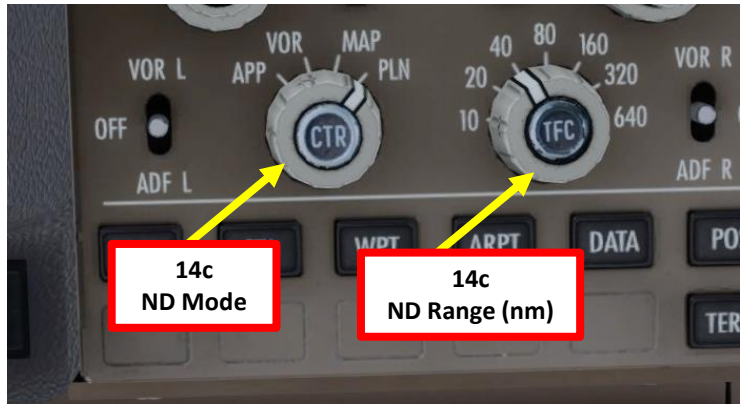
13. Go on FMC (Flight Management Computer) and set flight waypoints and airways
- Click on "DEP ARR" (Departure Arrival) twice and click on "EGLL - ARR" to set Heathrow as our Arrival Point
  - Select ILS 27L as our landing runway
  - Select STAR (Standard Terminal Arrival Route) for BIG1E as determined when we generated our flight plan.
  - Click on EXECUTE on the CDU keypad to activate your flight plan update



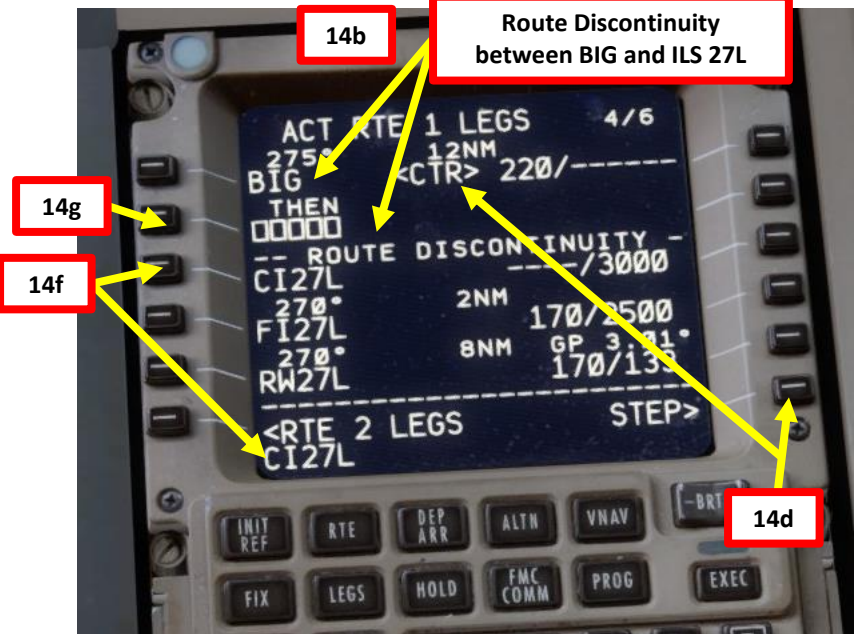
# FMC SETUP – WAYPOINT DISCONTINUITIES

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

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



Route Discontinuity between BIG and ILS 27L



# FMC SETUP – WAYPOINT DISCONTINUITIES

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

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



14i



14j



Route Discontinuity between BIG and ILS 27L



Direct Route between BIG and ILS 27L



Navigation Display MAP Mode

## FMC SETUP - FUEL

NOTE: Remember our fuel calculations of earlier:

Reserve Fuel = **17500 lbs**

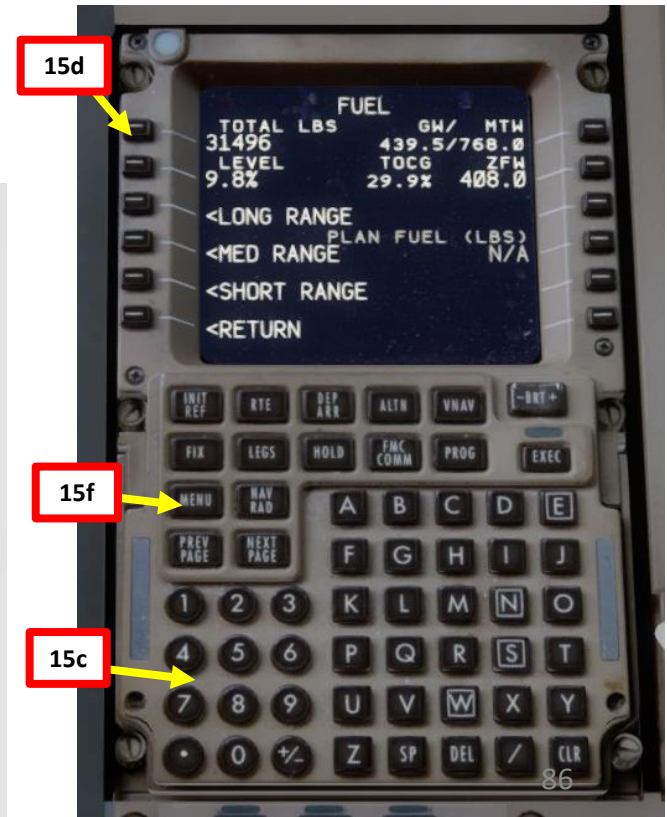
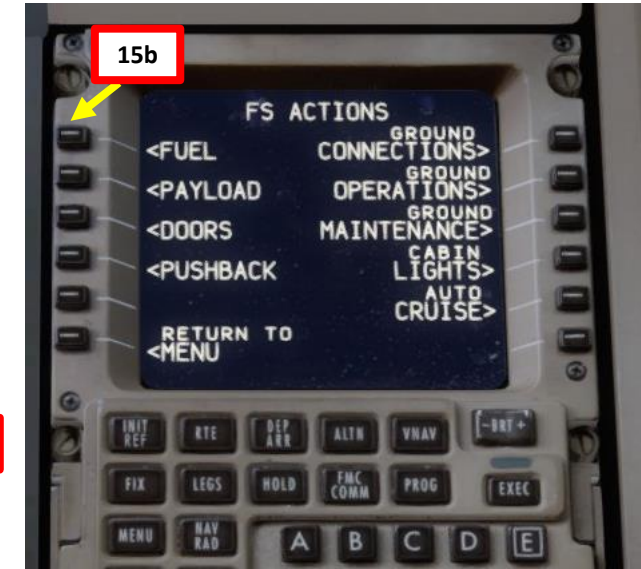
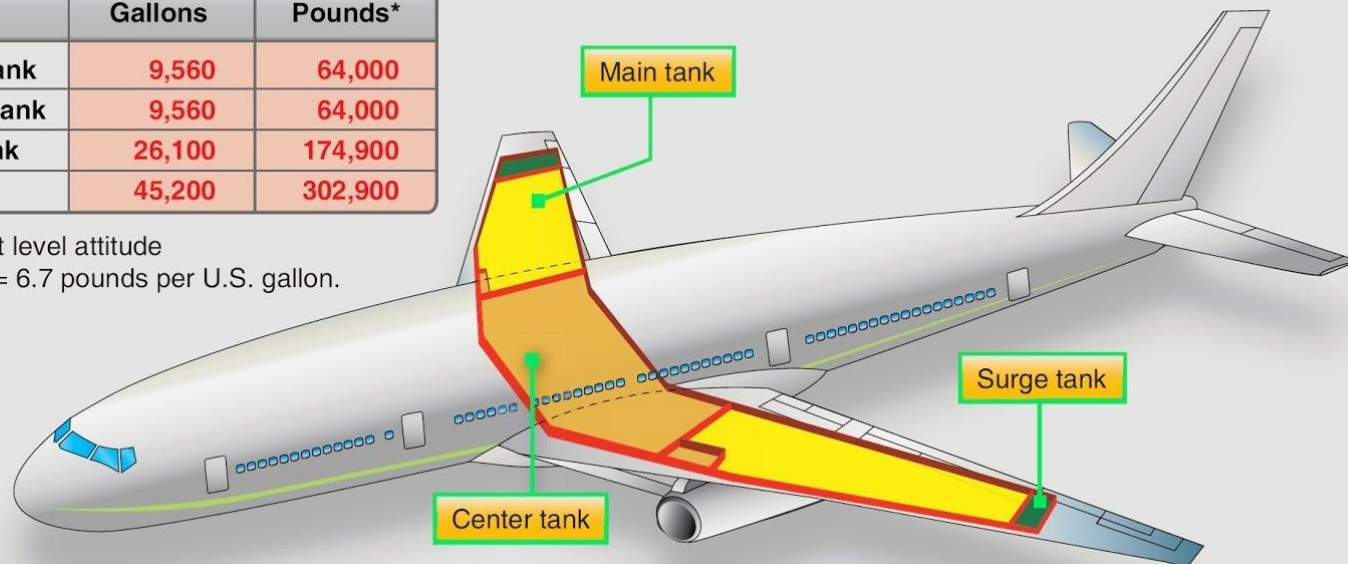
Total Fuel = Fuel for Flight + Reserve Fuel = **31500 lbs**

15. Go to CDU Main Menu and set fuel payload
  - a) Select FS ACTIONS
  - b) Select FUEL
  - c) Type "31500" on the CDU keypad (since we need 31500 lbs)
  - d) Click on "TOTAL LBS" menu to set fuel payload
  - e) Ta-dah! The aircraft fuel load is now properly set in the sim instead of having to go through the Prepar3d main menu
  - f) Click on MENU to return to main menu

NOTE: Normally, there is a whole procedure to set up your payload (passengers + cargo) but since we are short on time, we will simply skip it and assume that we are not overweight and that we are within safe CG (center of gravity) boundaries.

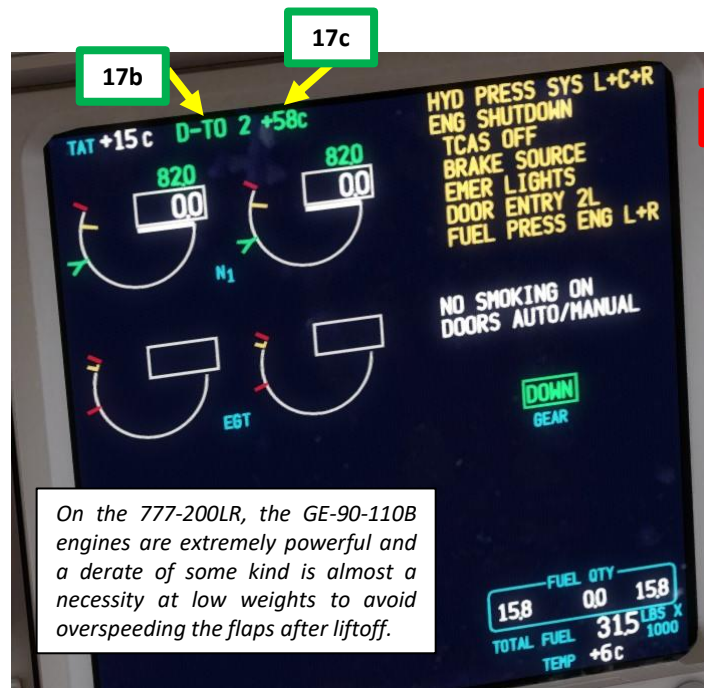
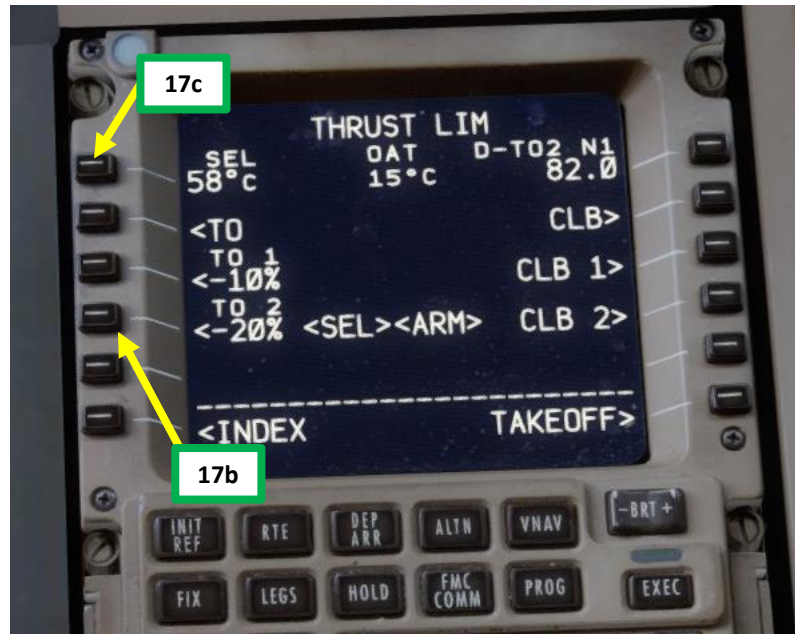
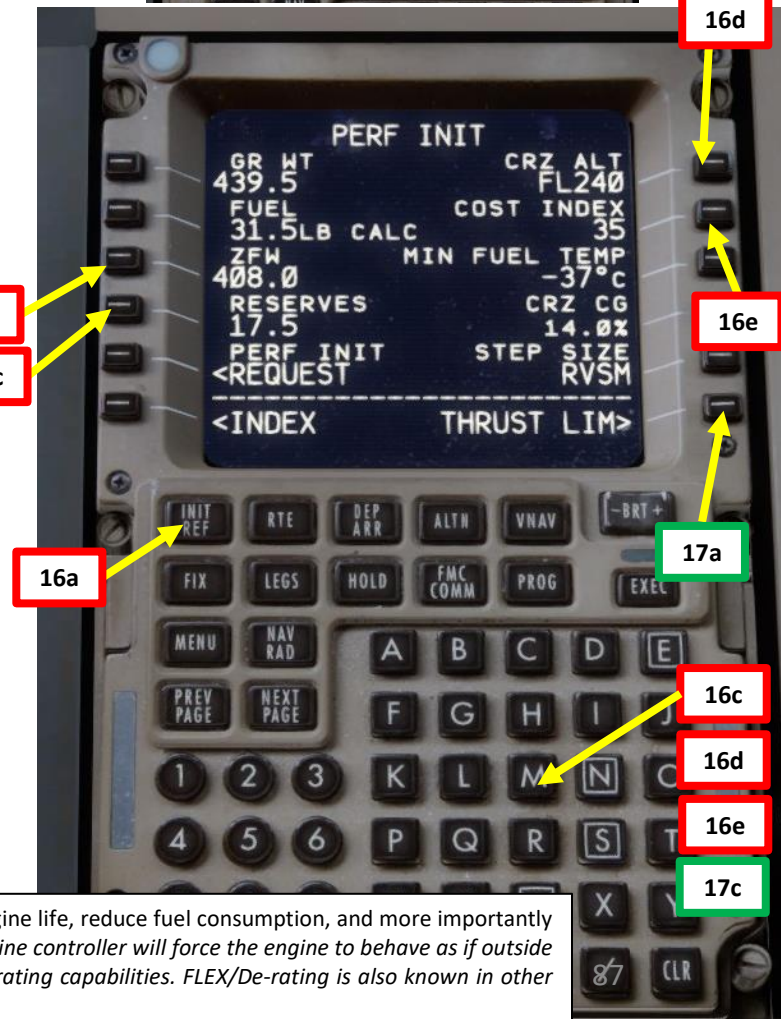
Tank	Gallons	Pounds*
Left main tank	9,560	64,000
Right main tank	9,560	64,000
Center tank	26,100	174,900
<b>Total</b>	<b>45,200</b>	<b>302,900</b>

\* Usable fuel at level attitude  
Fuel density = 6.7 pounds per U.S. gallon.



# FMC SETUP – PERF INIT

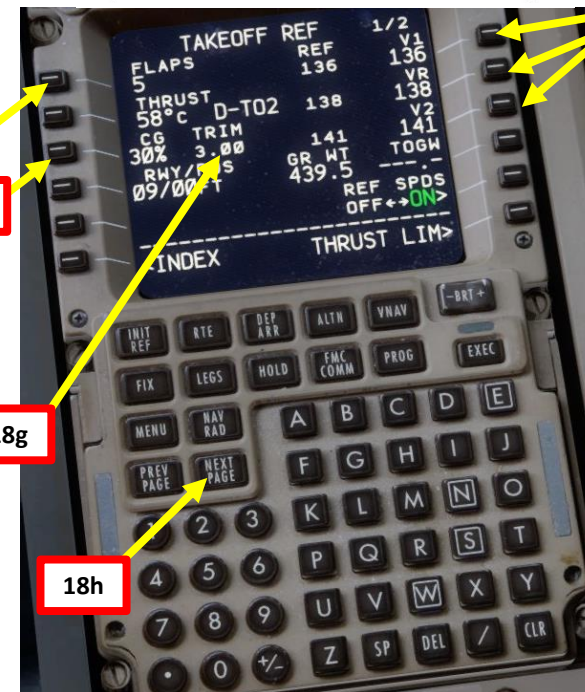
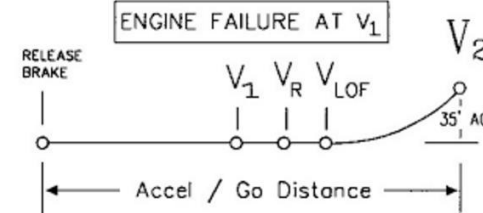
16. Go on FMC (Flight Management Computer) and set aircraft performance parameters
  - a) Select “FMC” menu on the CDU and press the “INIT REF” button to open the PERF INIT page
  - b) Double-Click on ZFW (Zero Fuel Weight) button to enter the automatically calculated ZFW
  - c) Type “17.5” on CDU keypad and select RESERVES to set reserve fuel weight determined by Fuel Planner tool (17.5 x 1000 for 17500 lbs)
  - d) Set cruising altitude to FL240 (24000 ft) by typing “240” on the CDU keypad and selecting CRZ ALT.
  - e) Type “35” on CDU keypad and select COST INDEX (cost index is generally given to you by the airline company, so you shouldn’t really care about it within the scope of this simulation)
  - f) For simplification purposes, we will leave the minimum fuel temperature value as is
17. Select required Engine De-Rating limit in order to limit your engines’ thrust.
  - a) Select the THRUST LIMIT menu by pressing the LSK next to THRUST LIM
  - b) Click on the “TO-2” (-20%) N1 Limit to set engine N1 limit
  - c) Set an Assumed Temperature of 58 deg C by typing “58” on the CDU keypad and clicking on the LSK next to SEL.



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

# FMC SETUP – PERF INIT

18. Go on FMC (Flight Management Computer) and set TAKEOFF parameters
  - a) Select TAKEOFF menu
  - b) Type "5" on CDU keypad and select LSK next to "FLAPS" to set takeoff flaps to 5 degrees
  - c) Click on the LSKs next to V1, VR and V2 to automatically calculate your V speeds.
  - d) Observe the resulting V1, VR and V2 speeds resulting of this flap setting and current aircraft weight: **V1** is the Decision Speed (minimum airspeed in the takeoff, following a failure of the critical engine at VEF, at which the pilot can continue the takeoff with only the remaining engines), **VR** is the rotation speed (airspeed at which the pilot initiates rotation to obtain the scheduled takeoff performance), and **V2** is Takeoff Safety Speed (minimum safe airspeed in the second segment of a climb following an engine failure at 35 ft AGL).
  - e) V1 Speed is 136 kts  
VR Speed is 138 kts  
V2 Speed is 141 kts
  - f) Click on the LSK next to CG twice to automatically calculate the CG position.
  - g) Observe the resulting TAKEOFF TRIM setting: 3.00
  - h) Click on NEXT PAGE button
  - i) Type 800 on the CDU keypad and click on the LSK next to EO ACCEL HT to set your Engine Out Acceleration Height to 800 ft AGL.
  - j) Type 3000 on the CDU keypad and click on the LSK next to ACCEL HT to set your Acceleration Height to 3000 ft AGL.
  - k) Type 1500 on the CDU keypad and click on the LSK next to REDUCTION to set your Thrust Reduction Height to 1500 ft AGL.





# FMC SETUP – PERF INIT

## NOTE:

The Acceleration, Thrust Reduction and Engine Out Acceleration 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](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** (800 ft in our case) 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 800 ft. Some UK pilots add the airport elevation to this value.

## 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.

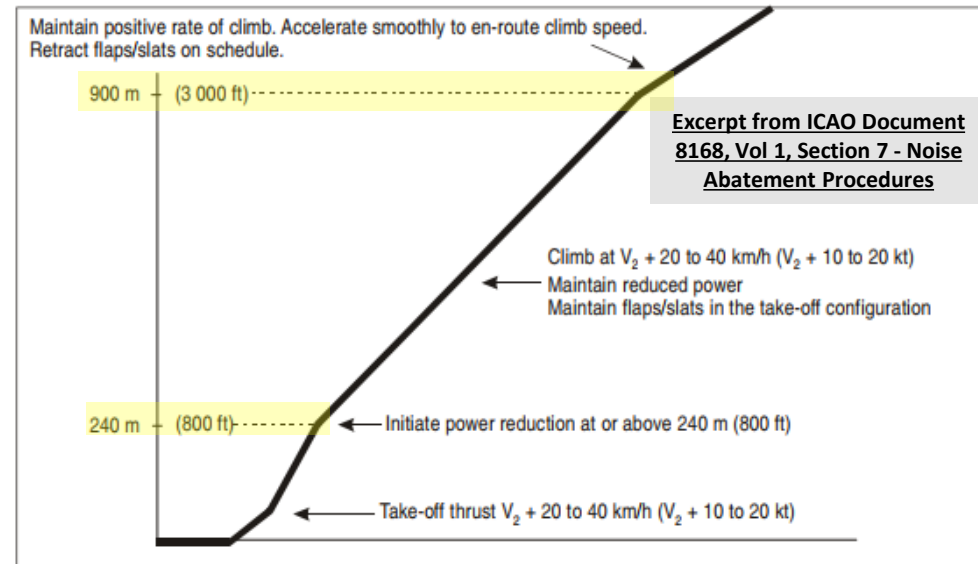
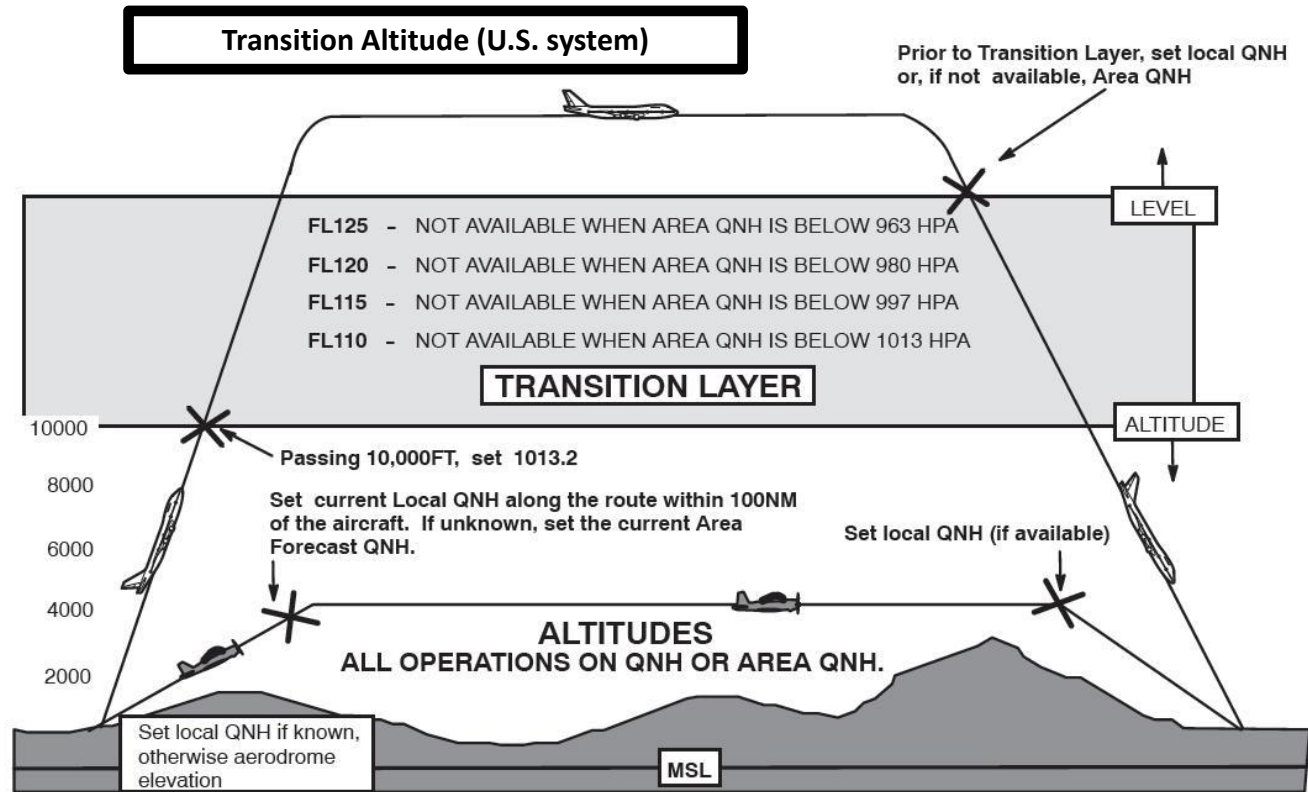


Figure I-7-3-App-1. Noise abatement take-off climb — Example of a procedure alleviating noise close to the aerodrome (NADP)

## FMC SETUP – VNAV

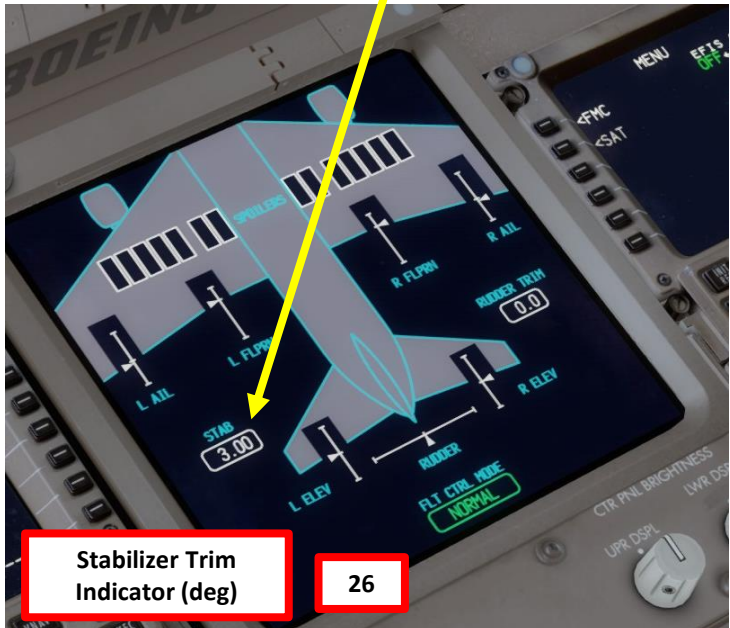
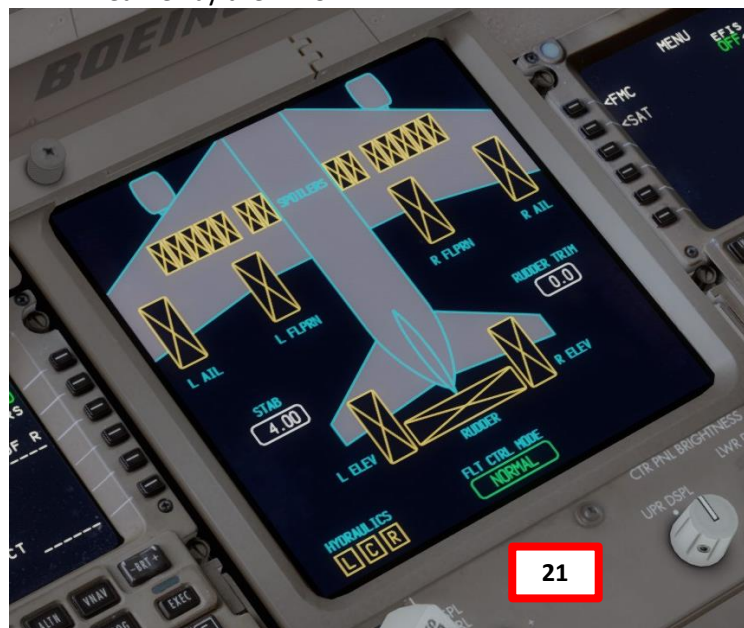
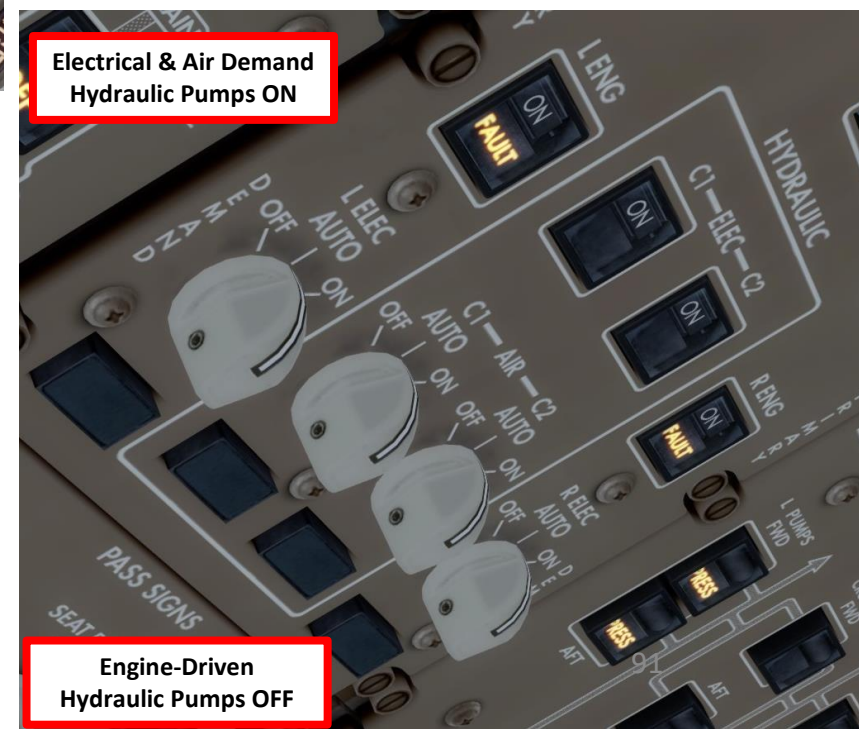
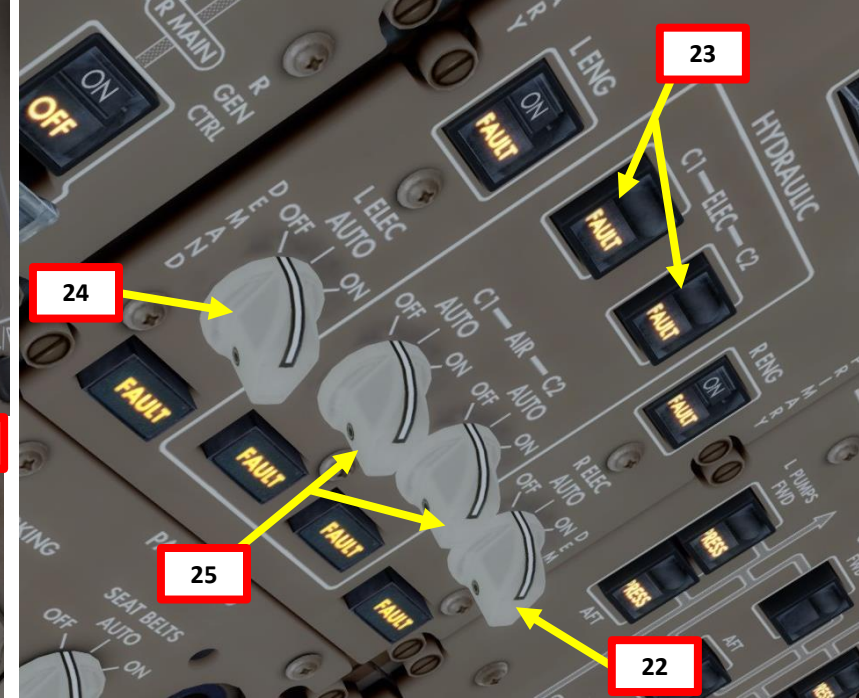
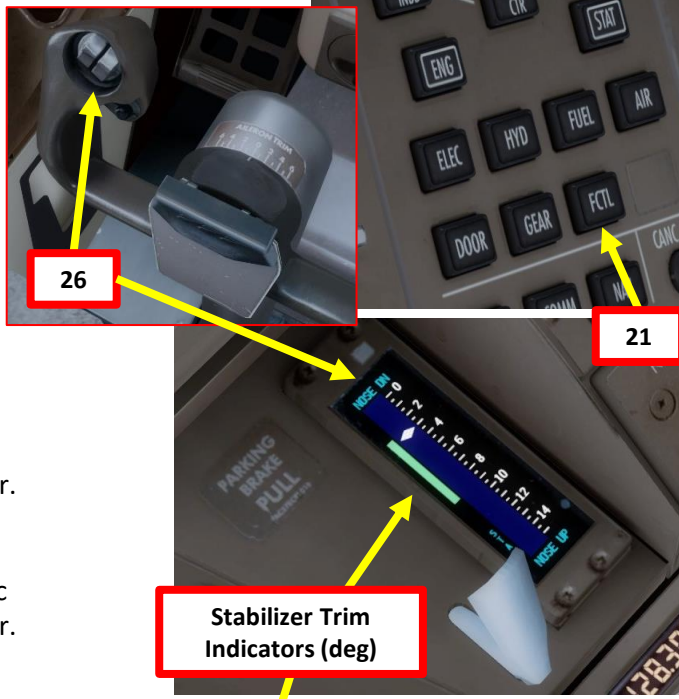
19. Go on FMC (Flight Management Computer) and set Transition Altitude
  - a) Select “FMC” menu on the CDU and press the “VNAV” button to open the Vertical Navigation page
  - b) Set transition altitude to 3000 ft by typing “3000” on the CDU keypad and selecting TRANS ALT (as per Europe norms, but you would use 18000 ft in North America).



# TAKEOFF TRIM & HYDRAULIC POWER SETUP

V1 Speed is 136 kts  
 VR Speed is 138 kts  
 V2 Speed is 141 kts  
 Takeoff Trim is 3.00

20. In order to set up our stabilizer takeoff trim, we need hydraulic power. We will use the hydraulic electrically-driven pumps and hydraulic demand pumps for that.
21. Press the "FCTL" button on the glareshield to display the Flight Controls Page
22. Set R ELEC DEMAND (right electrical) hydraulic pump switch to AUTO. Wait for the FAULT message to disappear.
23. Set C1 and C2 ELEC PRIMARY (center 1 & 2 electrical) hydraulic pump switches to ON. Wait for the FAULT message to disappear.
24. Set L ELEC DEMAND (left electrical) hydraulic pump switch to AUTO. Wait for the FAULT message to disappear.
25. Set C1 and C2 AIR DEMAND (center 1 & 2 air demand) hydraulic pump switches to ON. Wait for the FAULT message to disappear.
26. Set Stabilizer Trim to the Takeoff Trim value of 3.00 calculated earlier by the FMC.



21

Stabilizer Trim Indicator (deg)

26

Electrical & Air Demand Hydraulic Pumps ON

Engine-Driven Hydraulic Pumps OFF

# AUTOPILOT & CABIN PRESSURE SETUP

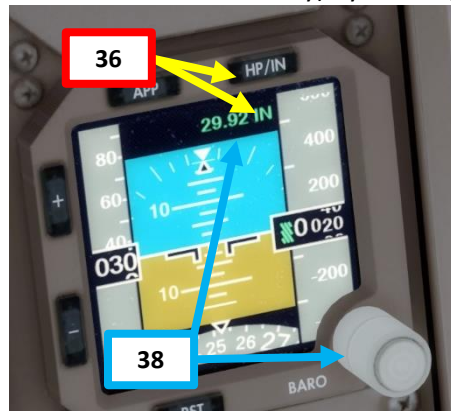
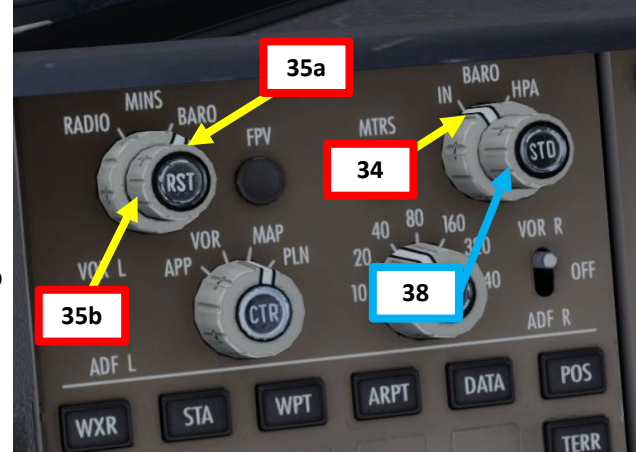
V1 Speed is 136 kts  
 VR Speed is 138 kts  
 V2 Speed is 141 kts  
 Takeoff Trim is 3.00

27. Set HEADING knob to runway QDM (Magnetic) heading 087 as per Jeppesen chart.
28. Turn on both FD (Flight Director) switches – UP POSITION
29. Turn on both A/T ARM (Autothrottle Arm) switches ON (UP)
30. Turn on all VOR switches – UP POSITION
31. Set V2 Speed on MCP (Mode Control Panel) by rotating MCP IAS knob on the glareshield until IAS is set to 141 kts (V2 speed)
32. As per EHAM SID Chart, set Initial Altitude (FL060, or 6,000 ft) on MCP (Mode Control Panel) by rotating ALTITUDE knob on glareshield until Altitude is set to 6,000 ft
33. Verify that Cabin Pressurization Forward & Aft Outflow Valve Switches are set to AUTO.



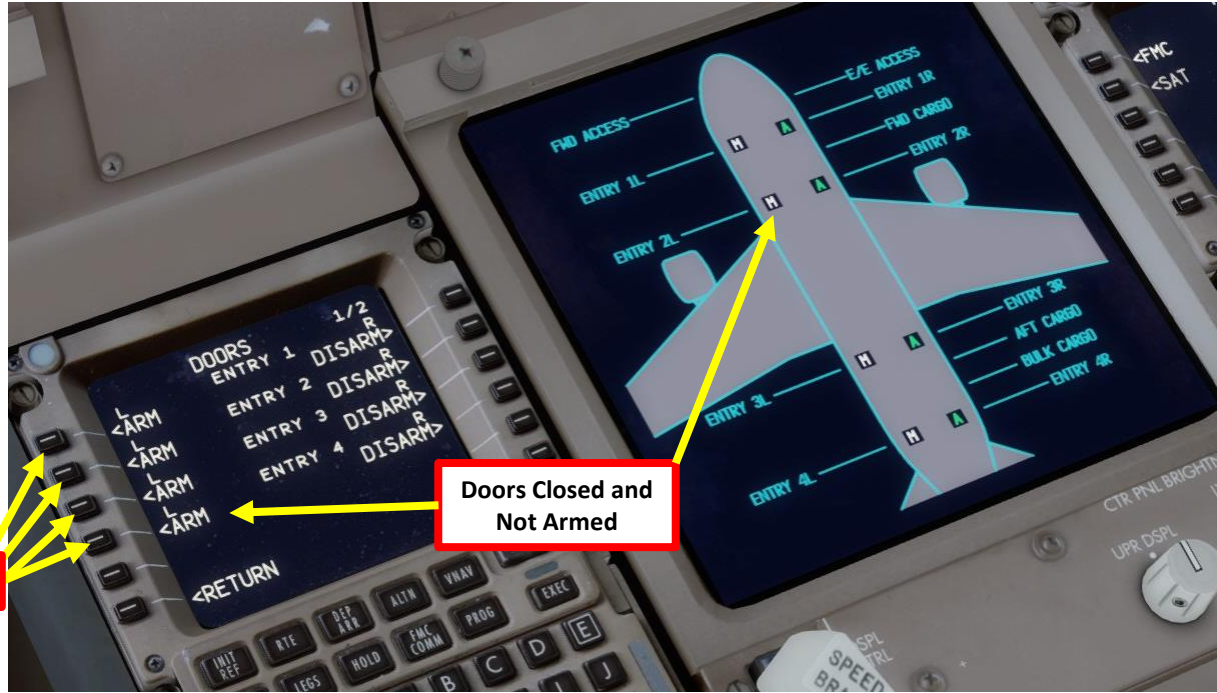
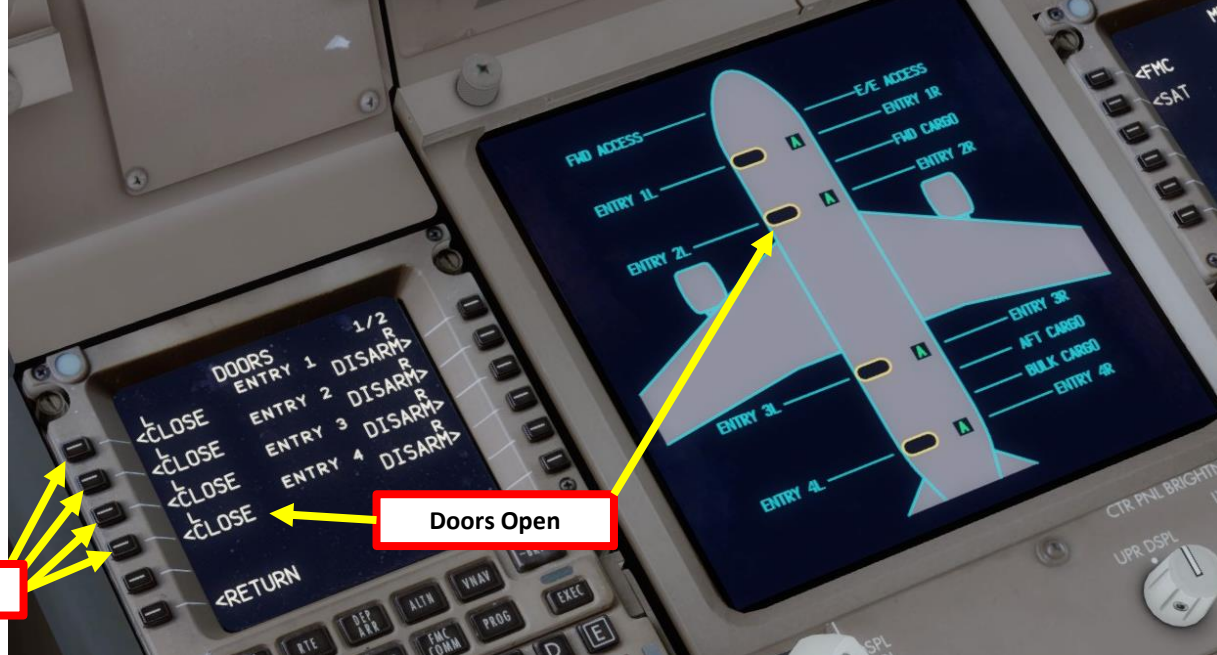
# ALTIMETER SETUP

34. Set Altimeter Setting knob to desired unit system by left clicking on outer BARO knob. We will use Hg (inches of Mercury) instead of Hpa (Hectopascals).
35. Set Engine Out Acceleration Height in Baro as a reference by setting BARO (left click outer knob) and tuning the BARO value to 800 ft using the inner BARO knob.
36. Click on the Hp/In button on the standby ADI to set the desired unit system (Inches of Hg in our case).
37. You can consult the EHAM ATIS (Automatic Terminal Information Service) system with the radio to get the altimeter setting.
  - a) Consult the EHAM chart and find the Schiphol ATIS Frequency (122.200).
  - b) Set VHF-1 STANDBY radio frequency ATIS frequency (122.200)
  - c) Click on the Transfer button to set the ATIS frequency to the ACTIVE frequency.
  - d) Press the L VHF button on the Audio Select Panel to listen on the VHF-1 active frequency.
  - e) You should receive the ATIS automated report on the radio for Schiphol Airport. The reported altimeter setting is 29.92 inches of Hg.
  - f) Press the L VHF button on the Audio Select Panel to mute the VHF-1 active frequency once you have the information you need.
38. Set altimeter setting and standby altimeter setting to 2992 (29.92 inches of mercury) by rotating the altimeter inner BARO knob.



# DOORS

- 39. Go to CDU Main Menu and close doors
  - a) Press the DOOR button on the glareshield to display the DOORS synoptic page
  - b) Select FS ACTIONS
  - c) Select DOORS page
  - d) Click on "CLOSE" on any door that is open to request the flight crew to shut down the doors
  - e) Once all doors are closed, click on "ARM" to ask the flight crew to arm the doors.

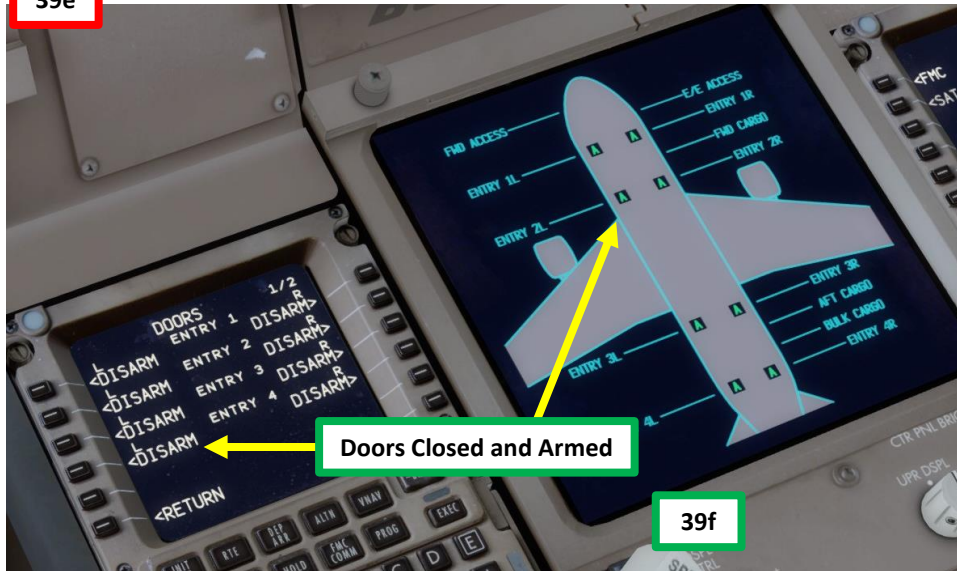
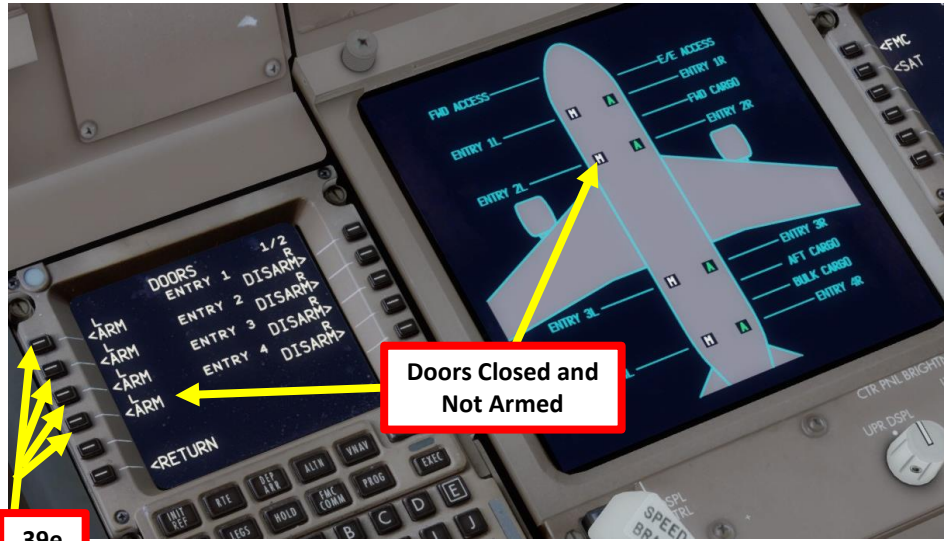


Doors Open

Doors Closed and Not Armed

# DOORS

- 39. Go to CDU Main Menu and close doors
  - d) Click on "CLOSE" on any door that is open to request the flight crew to shut down the doors
  - e) Once all doors are closed, click on "ARM" to ask the flight crew to arm the doors.
  - f) Click on MENU to return to main menu



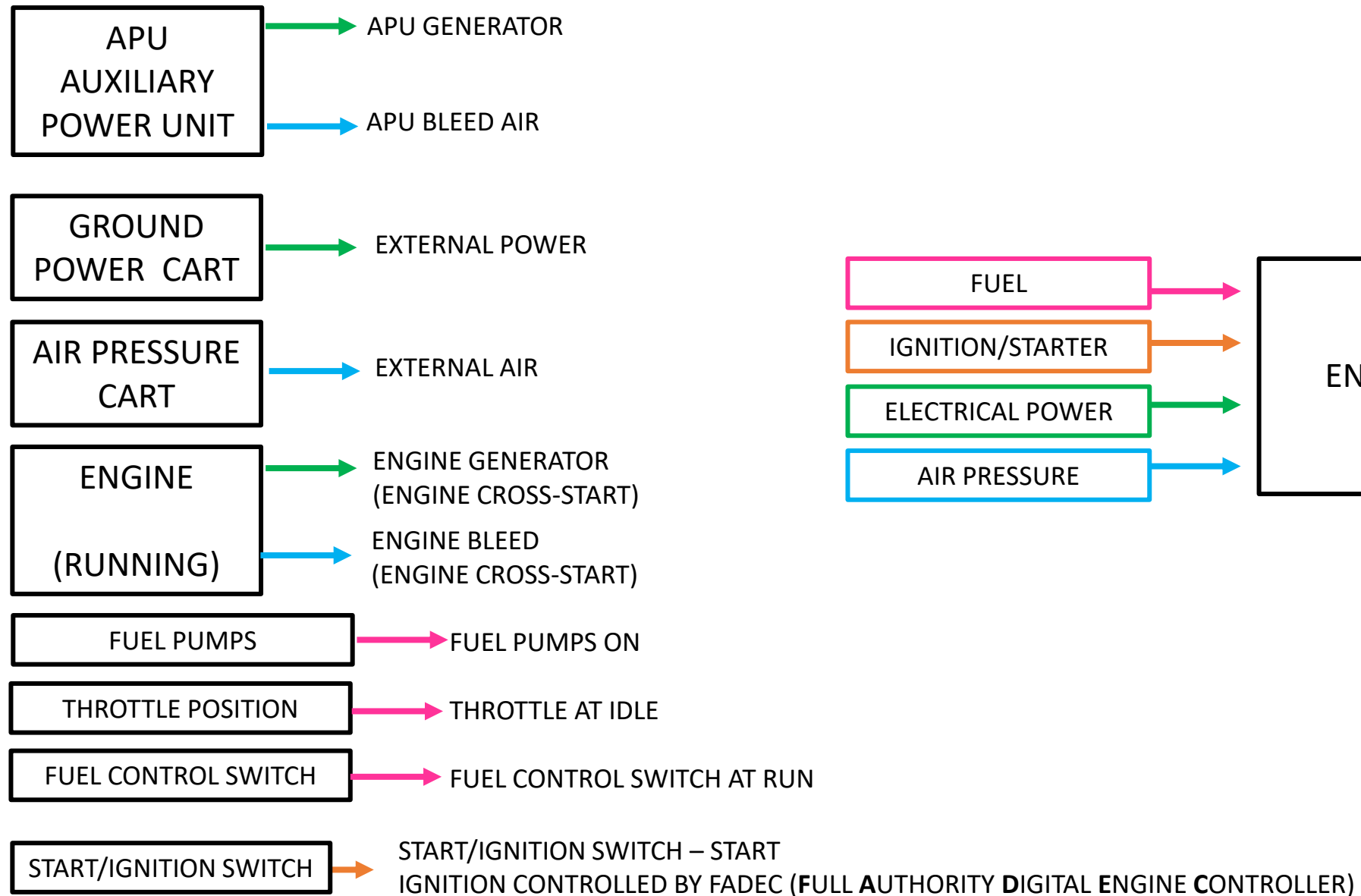
## DOORS

Note: Don't forget that there are also the forward, aft and bulk cargo doors on the second DOORS page, which is accessible by pressing the NEXT PAGE button on the CDU.



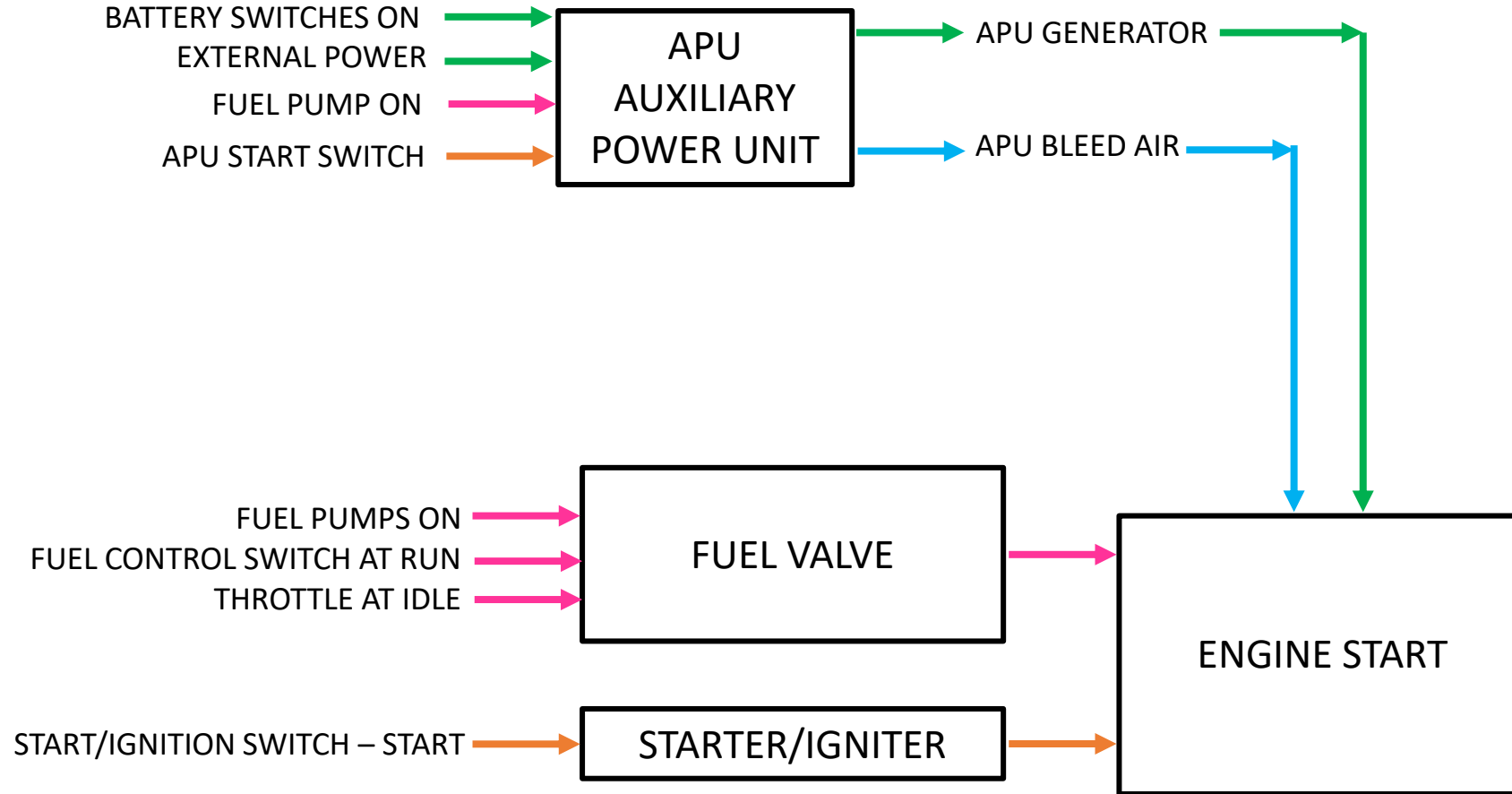


**ENGINE START-UP**



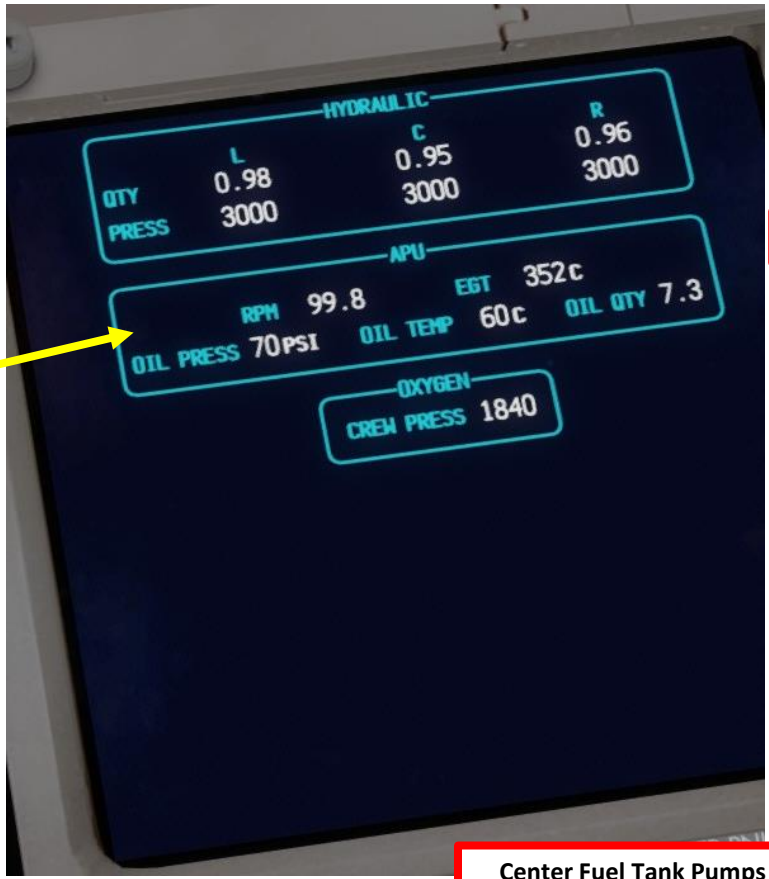
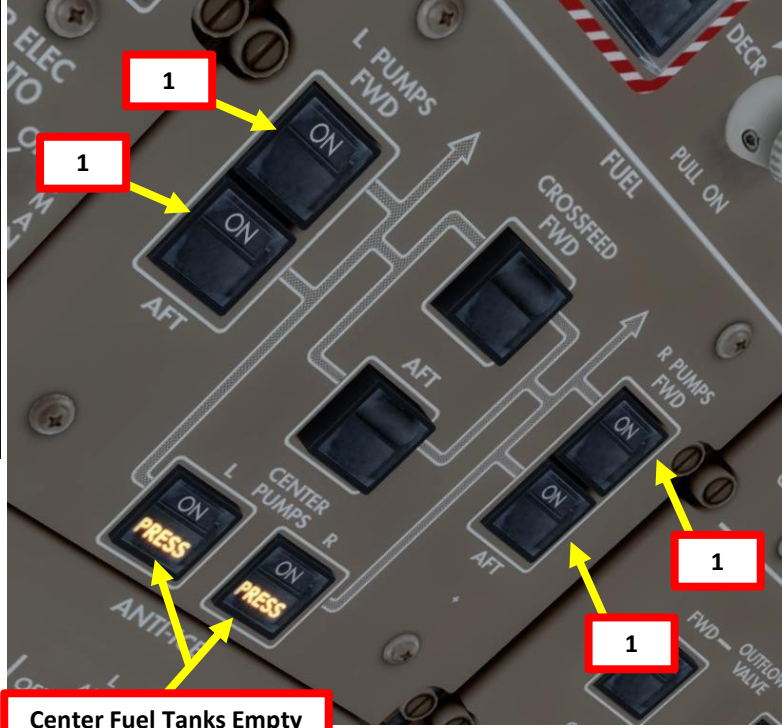
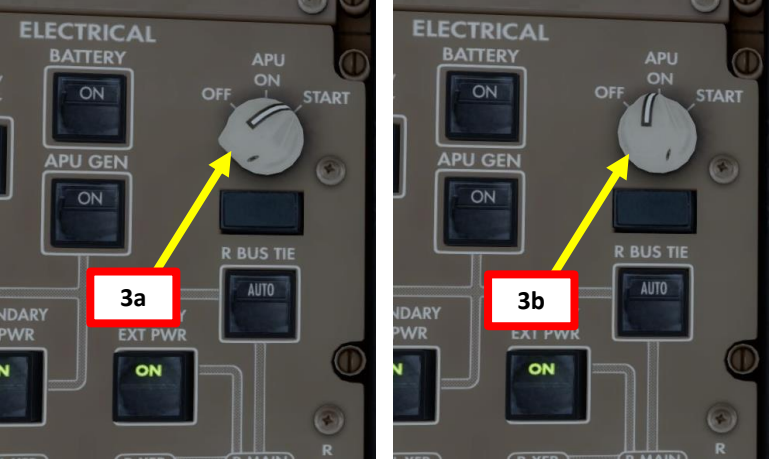
# ENGINE START-UP

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



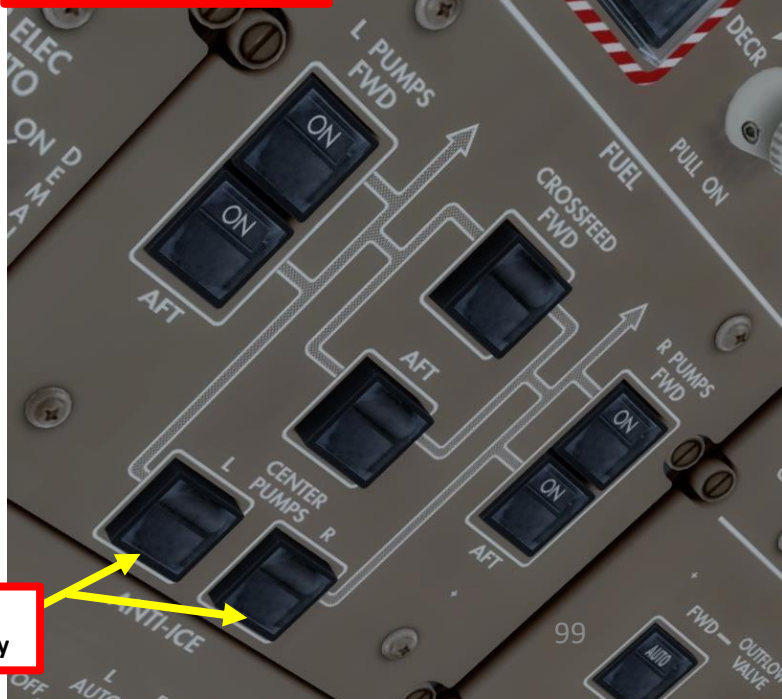
# APU (AUXILIARY POWER UNIT) START

1. On Overhead Panel, turn ON the Left Forward & Aft Fuel Pumps and the Right Forward & Aft Fuel Pumps. If you press the Center Pumps switches, the PRESS caution means that there is no fuel in those tanks and that the switches can remain to OFF.
2. Press the STAT synoptic page button to monitor APU parameters
3. Set APU switch to START to initiate start, then set switch to ON after by right clicking twice on the APU switch, holding the mouse button on the second click until you see the switch spring back to the ON position.



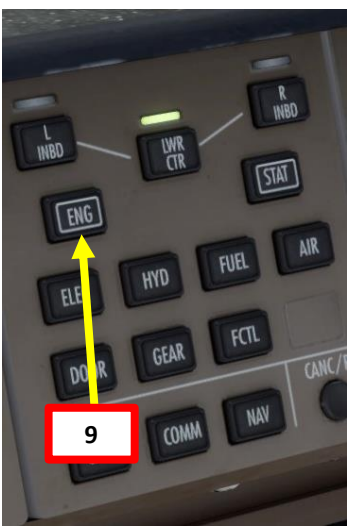
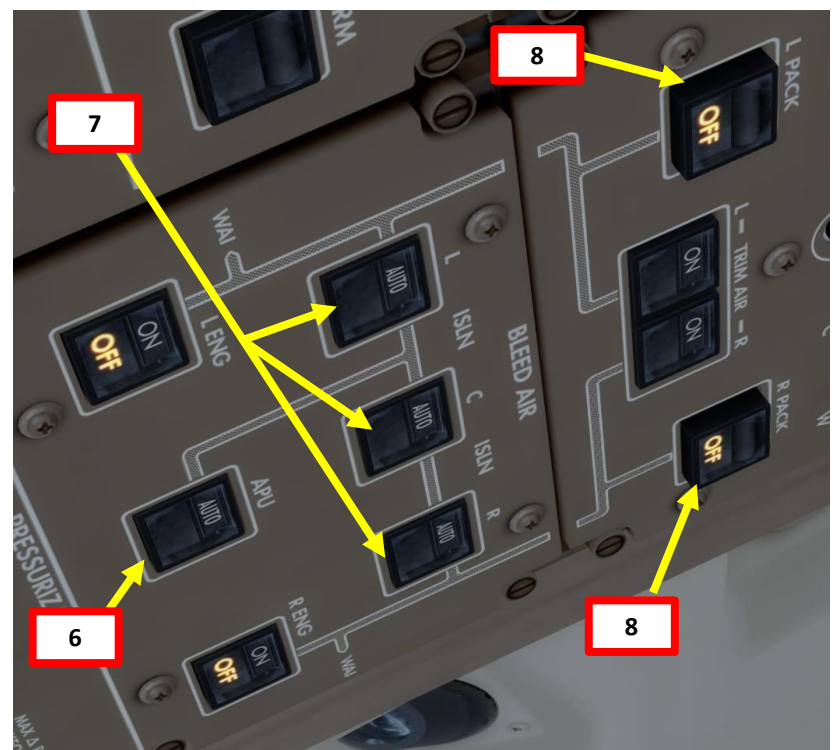
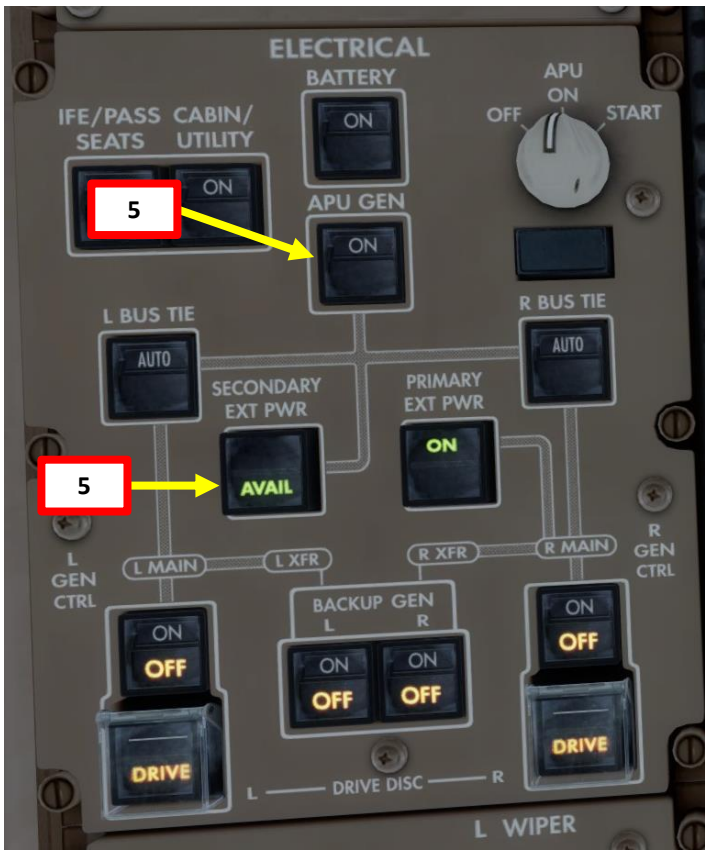
Center Fuel Tanks Empty

Center Fuel Tank Pumps OFF since tanks are empty

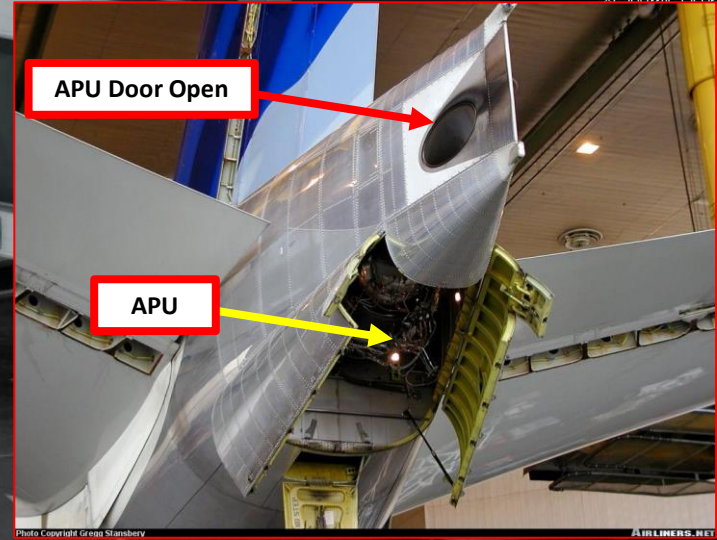
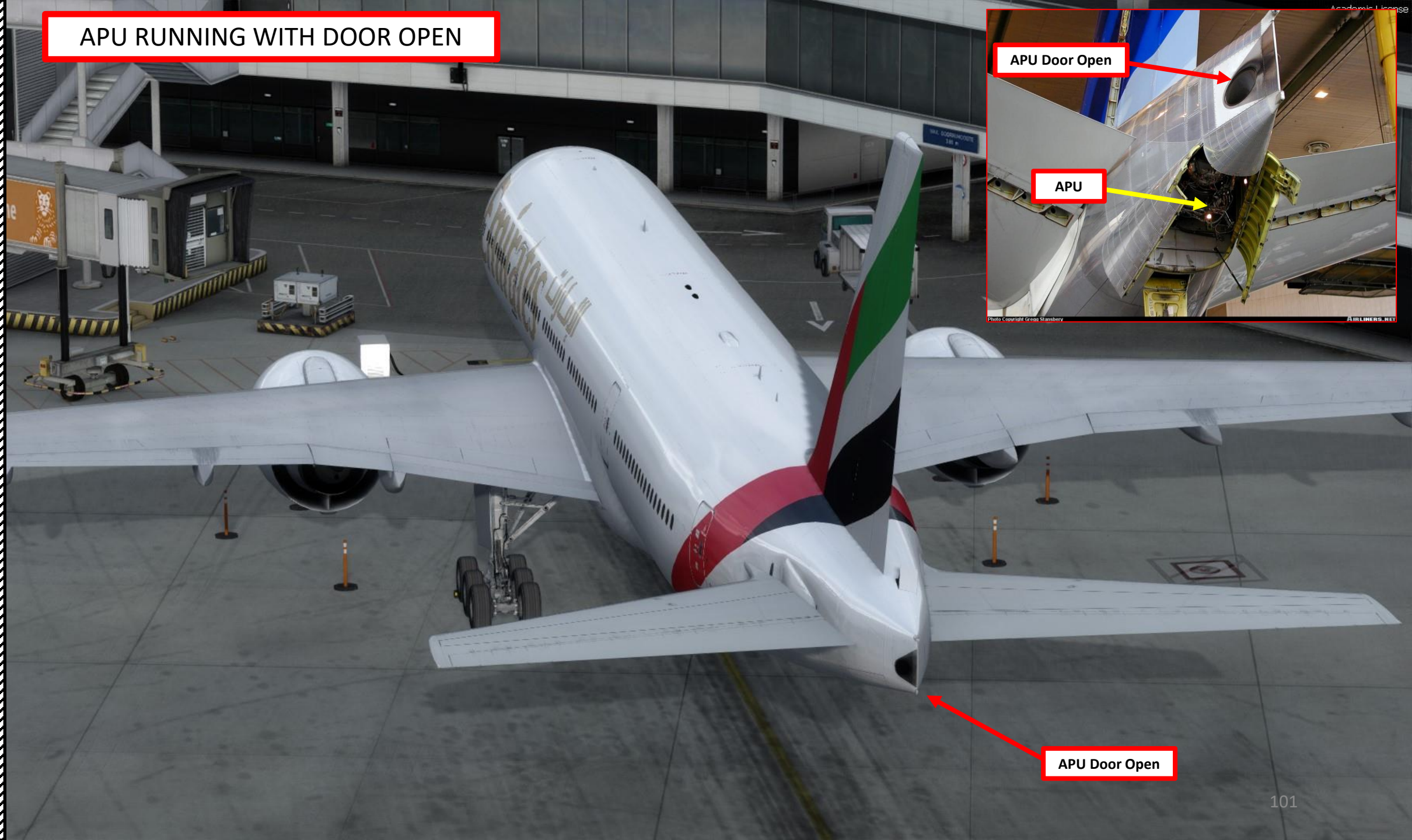


# APU (AUXILIARY POWER UNIT) START

4. Wait until the APU RPM reaches approx. 100 %. The messages “APU RUNNING” should appear.
5. Make sure the APU GEN switch is ON and the SECONDARY EXT PWR becomes AVAIL.
6. Make sure the APU BLEED AIR switch is set to AUTO
7. Make sure the LEFT, CENTER & RIGHT ISOLATION VALVE switches are all set to AUTO
8. Set LEFT PACK and RIGHT PACK (Pneumatic Air Conditioning Kit) switches OFF to ensure enough APU bleed air pressure is available for engine start
9. Push “ENG” button to display the Engine synoptic page
10. Set throttle to IDLE (fully aft).



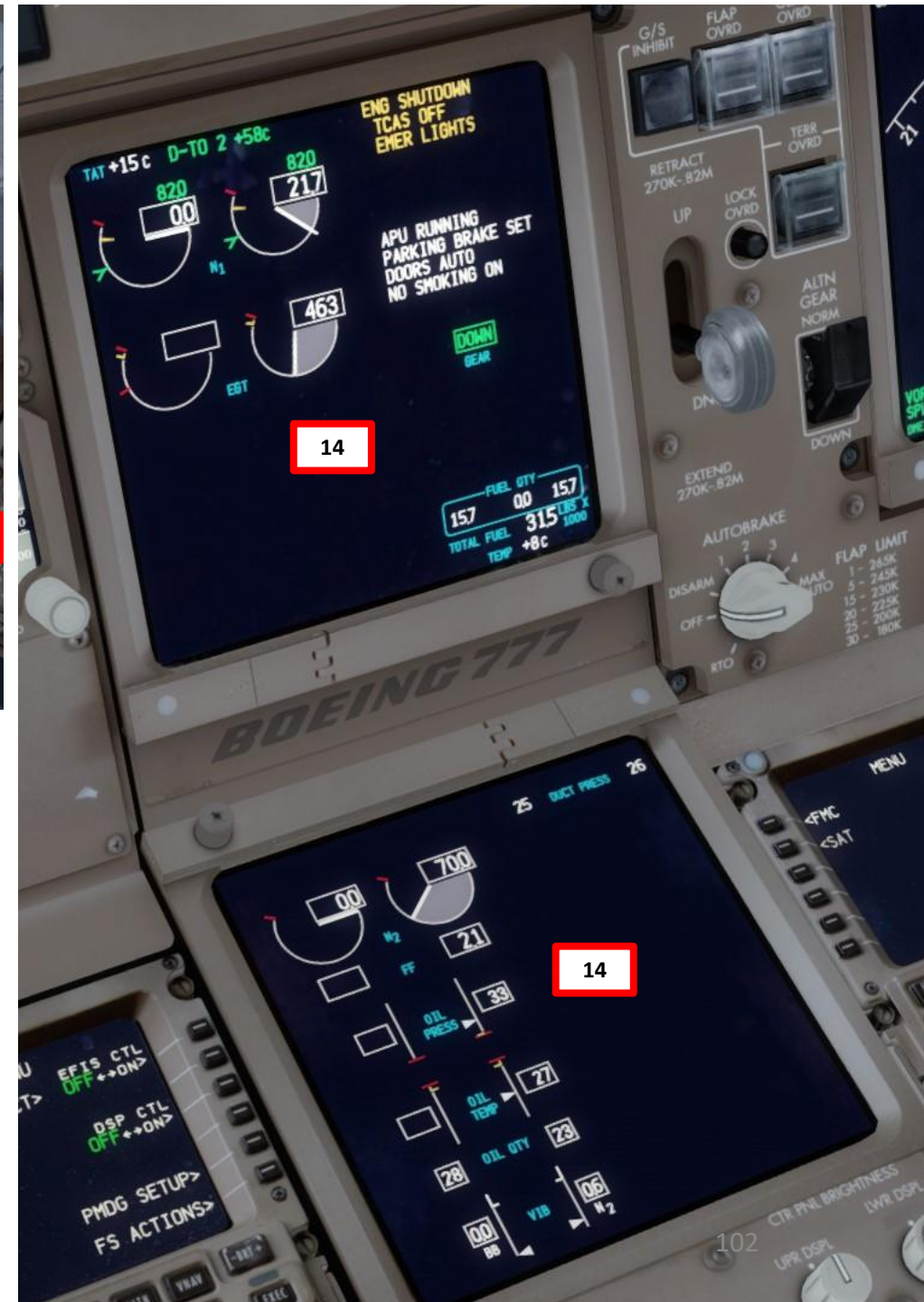
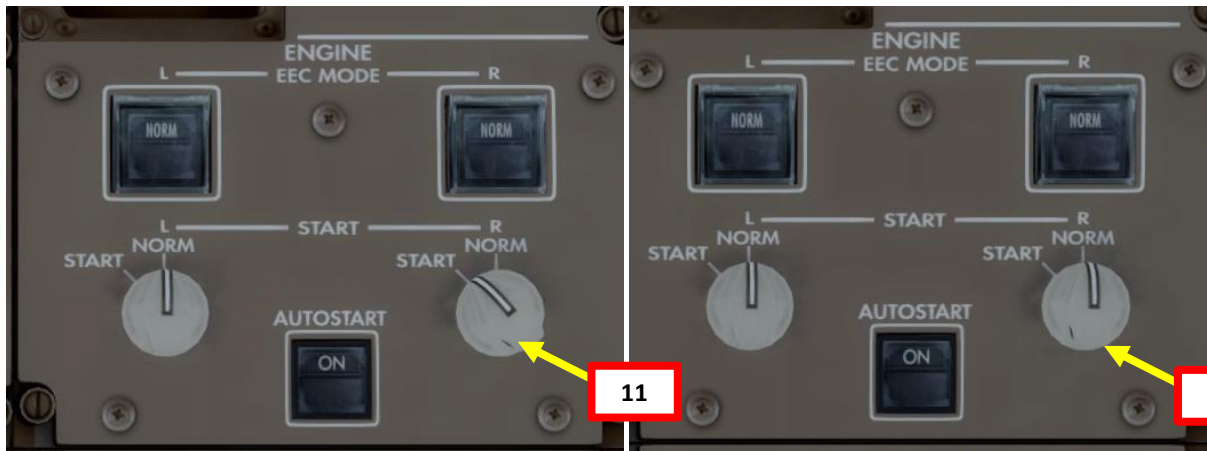
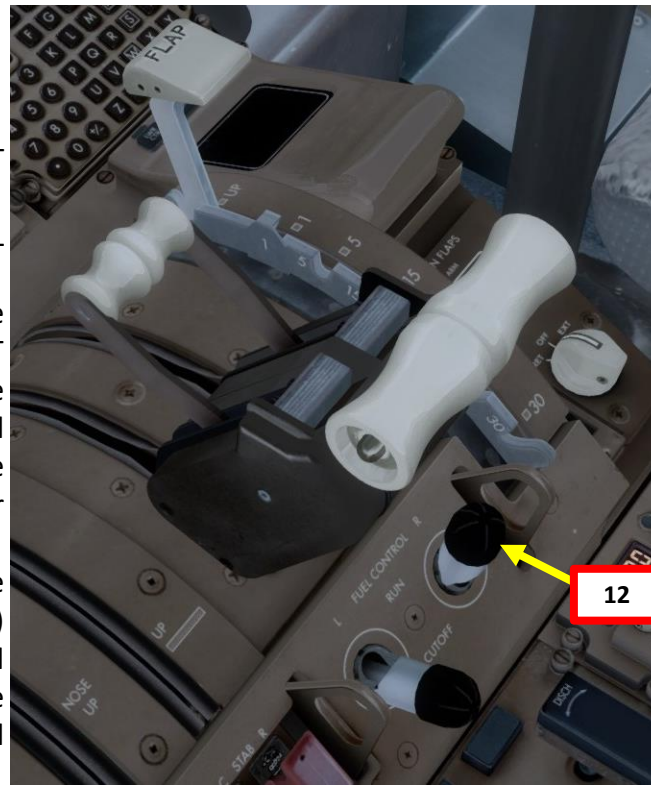
APU RUNNING WITH DOOR OPEN



APU Door Open

## ENGINE START-UP

11. Set RIGHT START/IGNITION switch to START (Left Click)
12. Immediately set the RIGHT FUEL CONTROL switch to RUN (UP)
13. There is no need to manually time the application of fuel since the AUTOSTART system and the EEC (Electronic Engine Controller) take care of fuel scheduling and applies fuel to the engine at precisely the right N2 value (High Pressure Compressor Rotation Speed) for the conditions.
14. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), FF (Fuel Flow) and EGT (Exhaust Gas Temperature), Oil Pressure & Oil Temperature for No. 2 Engine should increase, and RPM will accelerate and stabilize.
15. When No. 2 Engine parameters stabilize at about 20% N1 and 70% N2, RIGHT START/IGNITION switch will automatically be reset to NORM



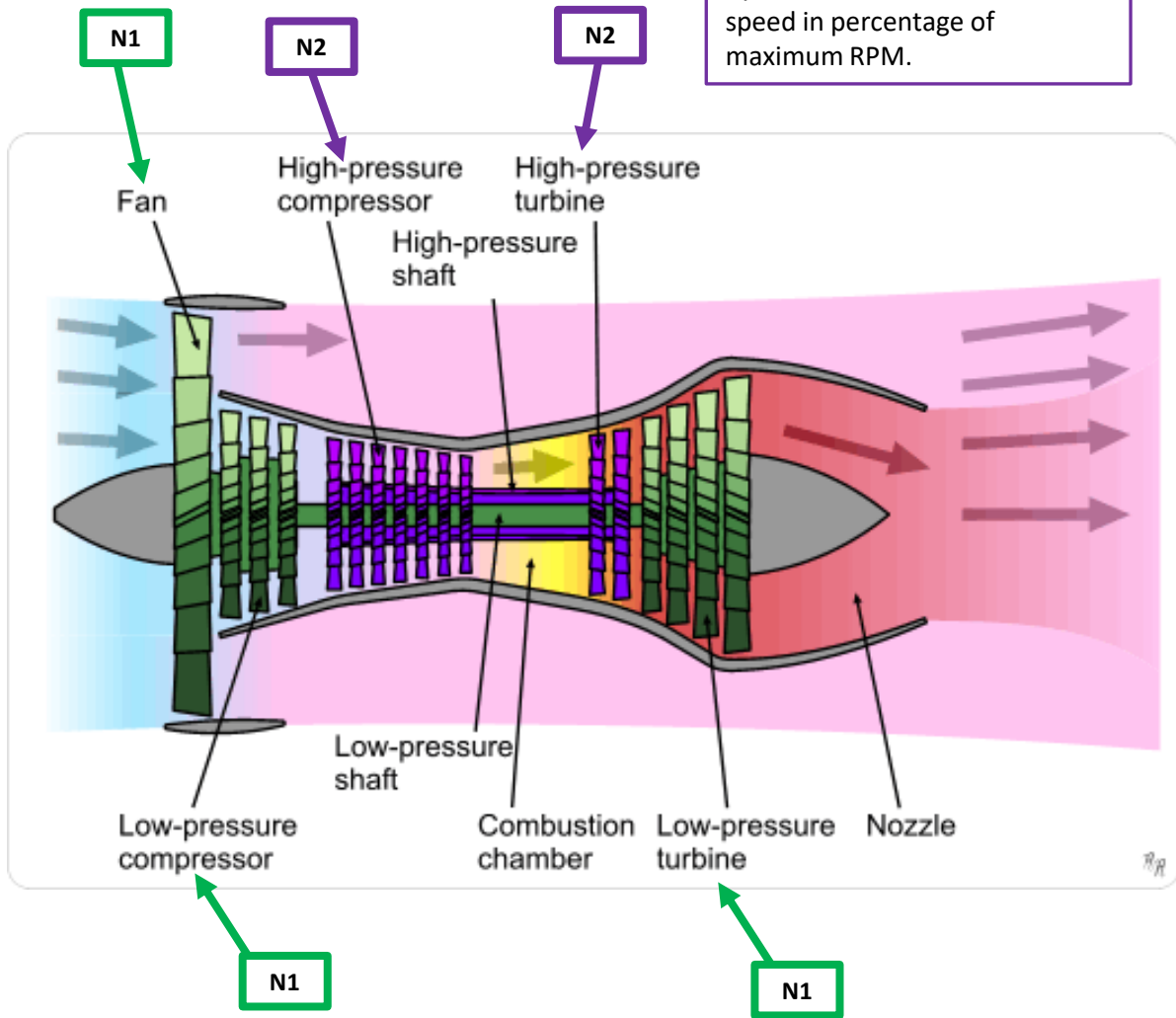


## ENGINE START-UP

16. Set LEFT START/IGNITION switch to START (Left Click)
17. Immediately set the LEFT FUEL CONTROL switch to RUN (UP)
18. There is no need to manually time the application of fuel since the AUTOSTART system and the EEC (Electronic Engine Controller) take care of fuel scheduling and applies fuel to the engine at precisely the right N2 value (High Pressure Compressor Rotation Speed) for the conditions.
19. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), FF (Fuel Flow) and EGT (Exhaust Gas Temperature), Oil Pressure & Oil Temperature for No. 1 Engine should increase, and RPM will accelerate and stabilize.
20. When No. 2 Engine parameters stabilize at about 20% N1 and 70% N2, LEFT START/IGNITION switch will automatically be reset to NORM

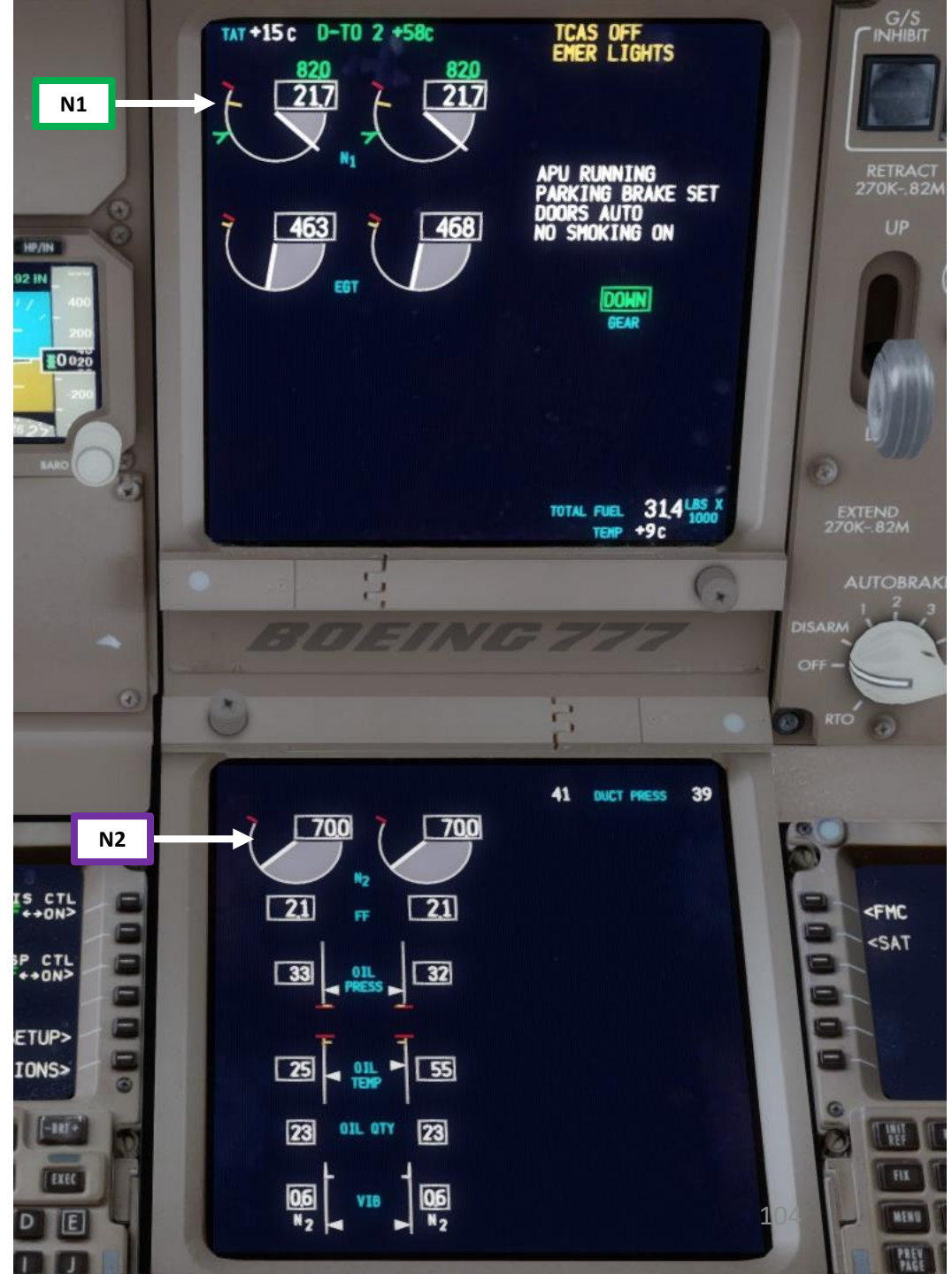


**ENGINE START-UP**



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

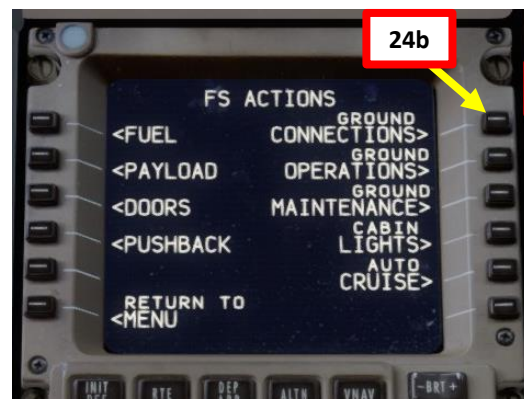
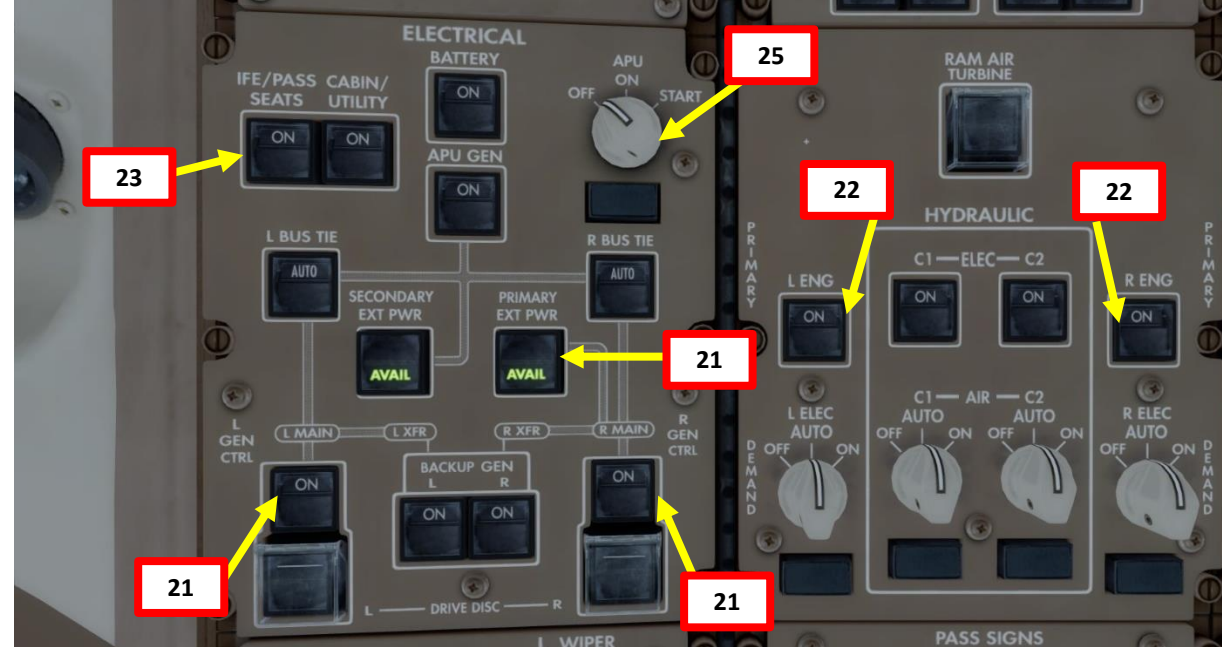
Fan, low-pressure compressor and low-pressure turbine are driven by the same shaft. This is N1 speed in percentage of maximum RPM.





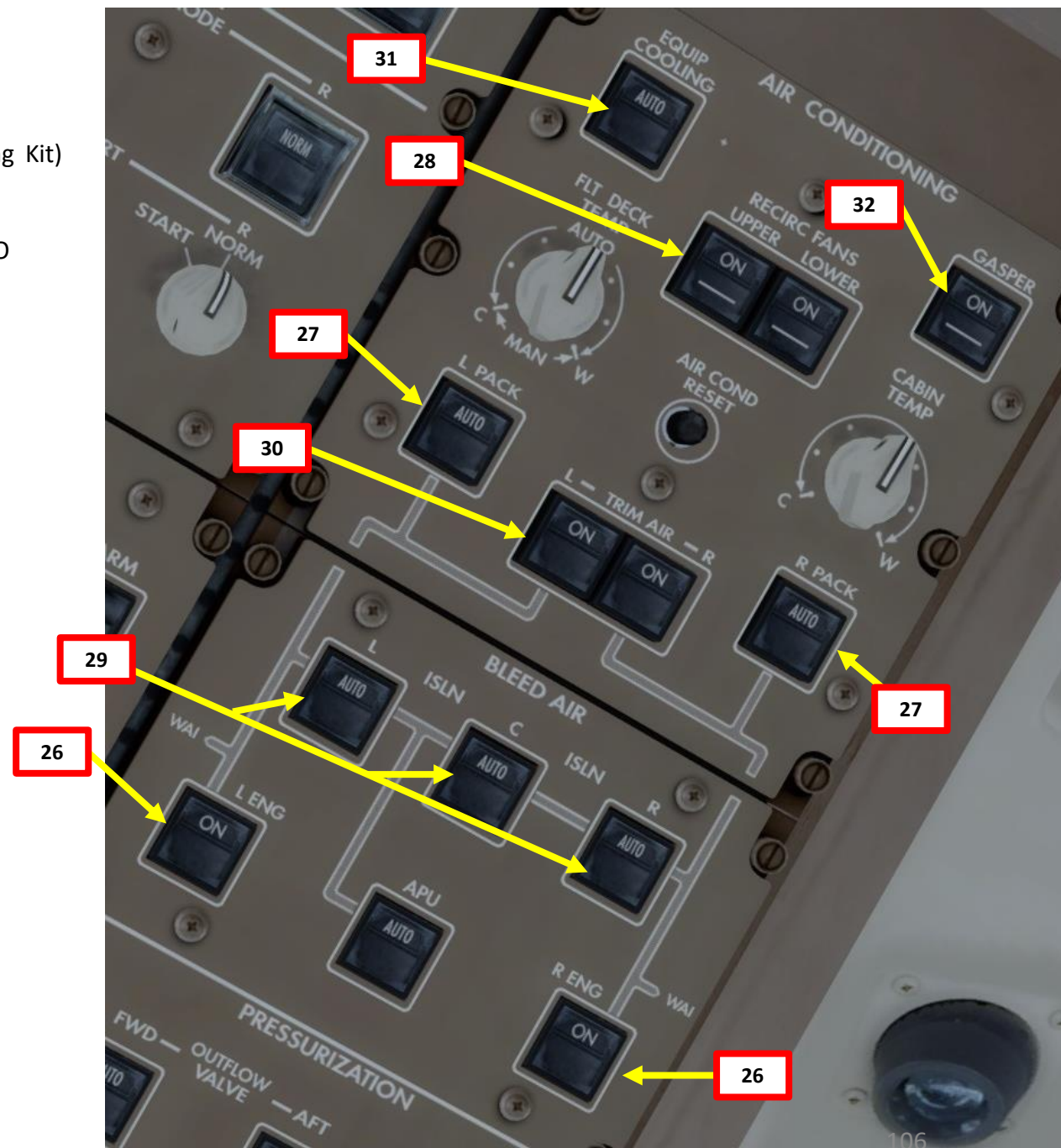
## ENGINE START-UP

21. Verify that LEFT & RIGHT MAIN GENERATOR switches and LEFT & RIGHT BACKUP GENERATOR switches are ON and that the PRIMARY EXT PWR indication is AVAIL
22. Verify that the LEFT & RIGHT ENGINE-DRIVEN HYDRAULIC PUMP switches are ON
23. Verify that the IFE/PASS SEATS (In-Flight Entertainment Systems/Passengers) and the CABIN/UTILITY electrical switches are ON
24. Turn OFF ground Power and remove chocks via the CDU
  - FS ACTIONS -> GROUND CONNECTIONS -> DUAL JETWAY PLUGS REMOVED
  - Confirm that both PRIMARY EXT PWR and SECONDARY EXT PWR indications are extinguished
  - FS ACTIONS -> GROUND CONNECTIONS -> WHEEL CHOCKS REMOVED
25. Set APU switch – OFF  
 APU cooldown sequence will begin and shutdown will occur automatically once cooldown sequence is complete.



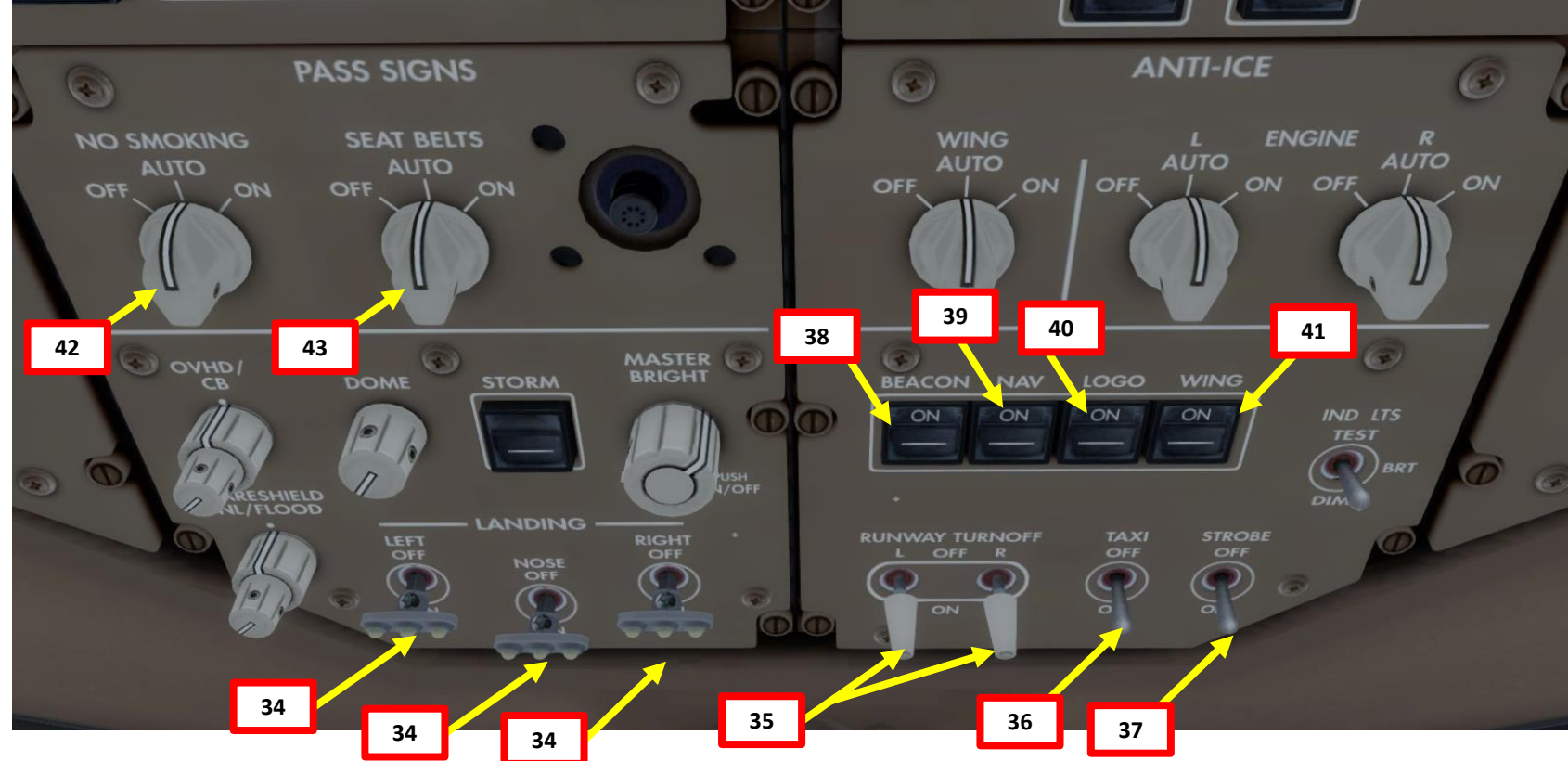
## ENGINE START-UP

26. Verify that LEFT & RIGHT ENGINE BLEED switches are ON
27. Set LEFT and RIGHT AIR CONDITIONING PACK (Pneumatic Air Conditioning Kit) switches – AUTO.
28. Verify that UPPER and LOWER RECIRCULATION FAN switches are ON
29. Verify that LEFT, CENTER & RIGHT ISOLATION VALVE switches are set to AUTO
30. Verify that LEFT & RIGHT TRIM AIR switches are set to AUTO
31. Verify that EQUIPMENT COOLING switch is set to AUTO
32. Verify that GASPER FAN switch is ON
33. Set Engine Anti-Ice / Wing Anti-Ice / Window Heat switches – As Required



## COMPLETE PRE-FLIGHT

34. Landing Lights switch – ON
35. Runway Turnoff Lights switches – ON
36. Taxi Light switch – ON
37. Strobe Light switch – ON
38. Beacon Light switch – ON
39. Navigation Position Lights switch – ON
40. Logo Light switch – ON
41. Wing Lights switch – ON
42. Set No Smoking Switch – AUTO
43. Set Seat Belts switch – AUTO
44. Emergency Lights – set switch to ARMED and close cover
45. Set Service Interphone Switch – ON



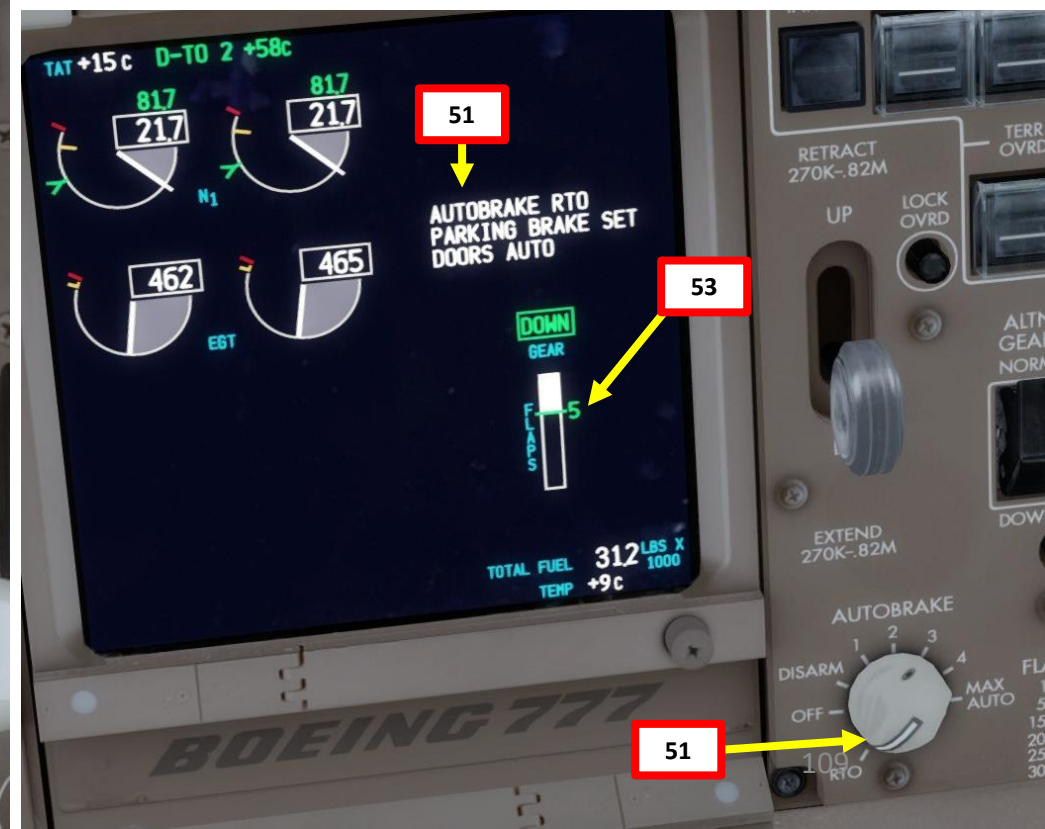
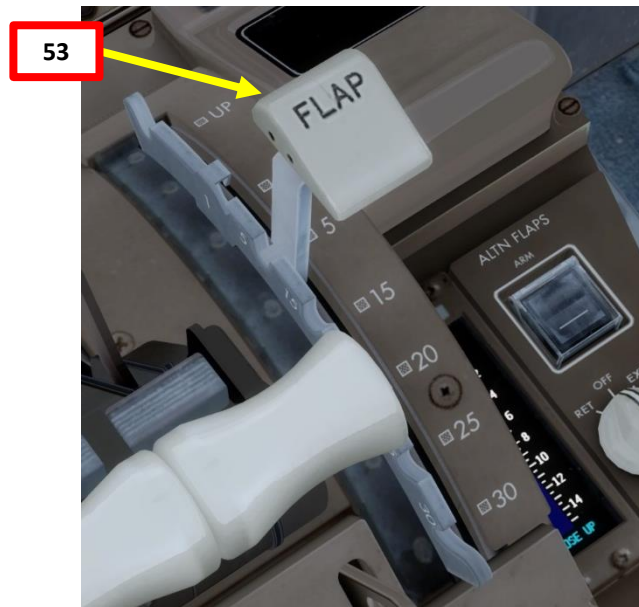
## COMPLETE PRE-FLIGHT

46. Set Transponder frequency to 2200 (IFR standard squawk code). 7000 is used for VFR in most of European airspace and 1200 for VFR in North America.
47. Set TCAS (Traffic Collision and Avoidance System) selector to TA/RA (Traffic Advisory/Resolution Advisory)
48. Push TCAS switch to initiate TCAS test by left-clicking and holding (pushing) the selector switch.
49. Confirm that TCAS test is performed correctly (aural warning « TCAS TEST PASSED » and caution on Navigation Display page)



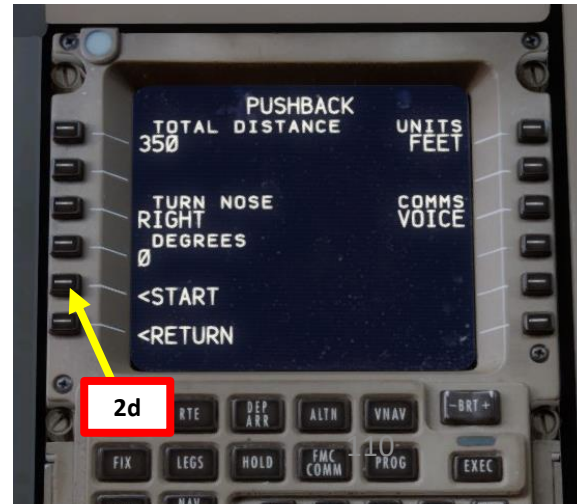
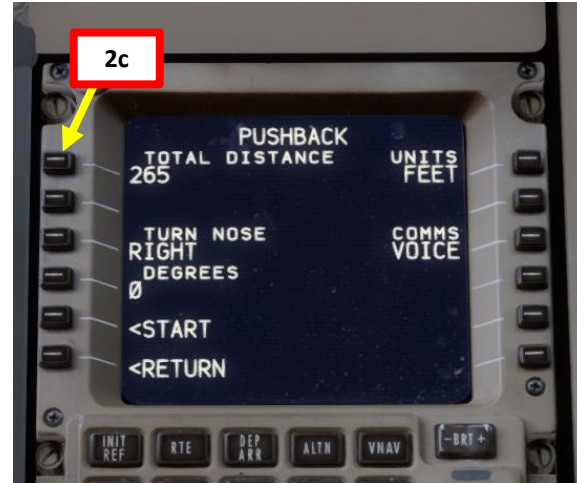
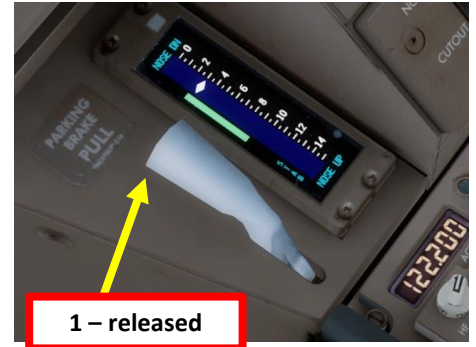
# COMPLETE PRE-FLIGHT

50. In real life, you would set PACK 1 and PACK 2 switches to OFF to ensure maximal engine performance during takeoff and prolong engine life, but we don't need to in this tutorial.
51. Set Autobrake selector to RTO (Rejected Takeoff)
52. Make sure Speed Brake is OFF (NOT ARMED)
53. Set Flaps lever to 5 as specified in the FMC
54. Set Weather Radar to AUTO and press the WXR button if you want to display the weather radar on the Navigation Display.



# PUSHBACK

1. Release parking brake
2. Begin Pushback via the CDU
  - FS ACTIONS -> PUSHBACK
  - Set STRAIGHT LENGTH to 350 ft by typing 350 on the keypad and clicking on the LSK next to STRAIGHT LENGTH
  - Set TURN NOSE to RIGHT (does not matter in our case since we will pushback in a straight line at 0 degree)
  - Set DEGREES to 0 degrees
  - Click on START
3. Alternatively, you can simply use "LSHIFT+P" to start and stop pushback procedure since we are in a very tight spot.



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PART 5 - TAXI

PUSHBACK



## TAXI

The 777 is steered on the ground by using a Nose Gear Steering Tiller.

However, in FSX or Prepar3d you cannot map a joystick axis to your tiller: it's a limitation of the sim itself. In order to steer the aircraft, PMDG mapped the tiller axis directly on the rudder axis. If you move your rudder pedals while on the ground, the aircraft will have its full steering range as if you were using the tiller.



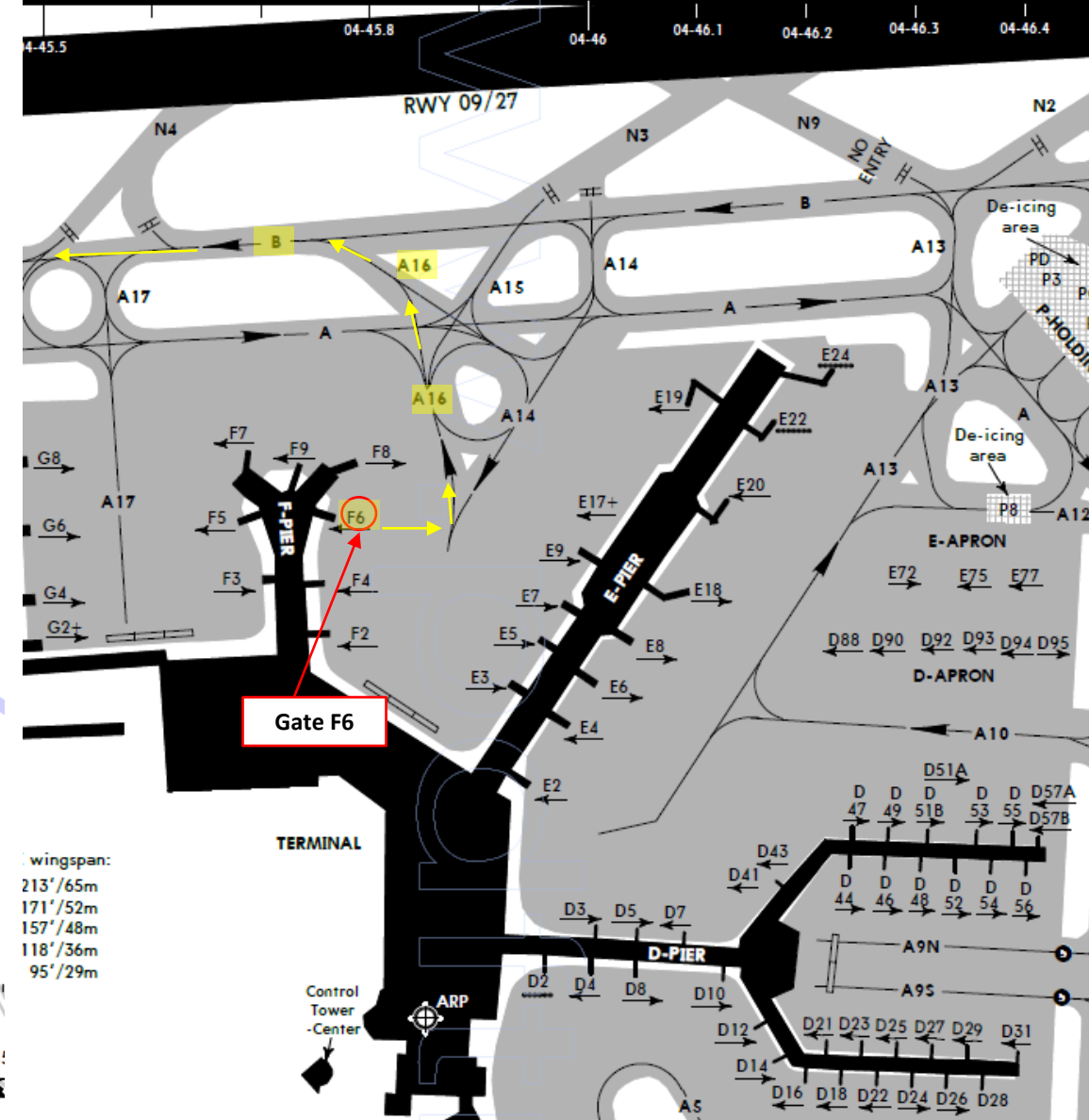
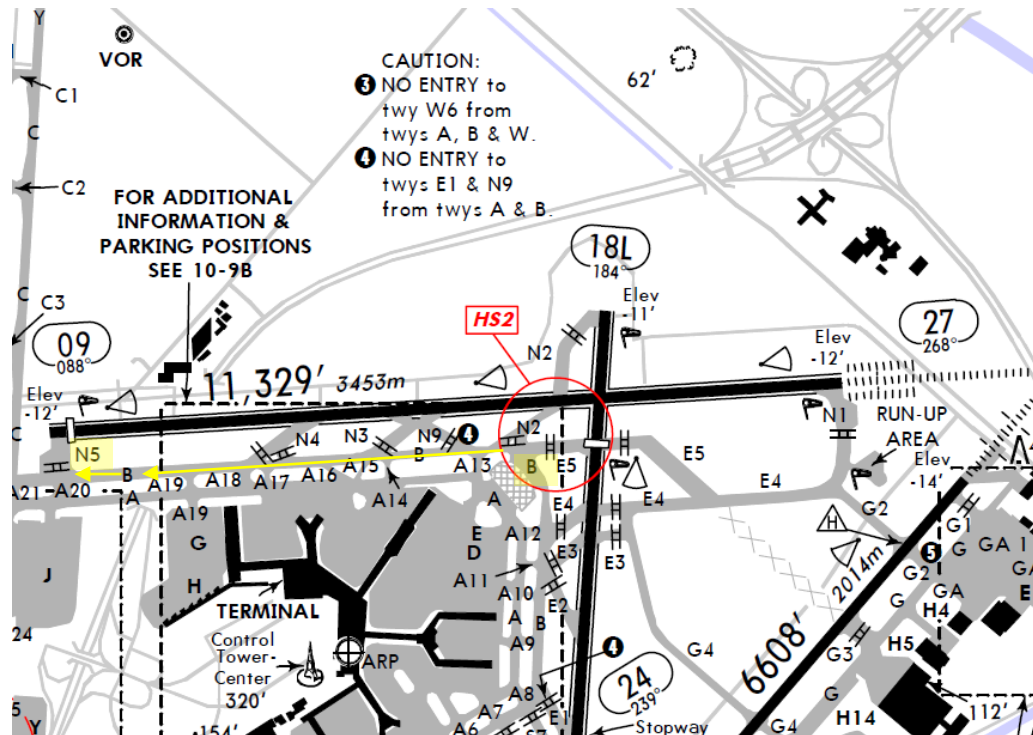
**Nose Gear Steering Tiller**  
Used to steer aircraft on the ground





## TAXI

- Our Flight Number is UAE106 and we spawned at gate F6.
- After we performed pushback from Gate F6, we would typically contact the tower for guidance by saying "UAE106, requesting taxi."
- The tower would then grant you taxi clearance by saying "UAE106, taxi to holding position N5 Runway 09 via taxiways Alpha 16 (A16), Bravo (B).
- This means that we will follow the A16 line, then go to B, then turn right to N5 and hold there until we get our clearance for takeoff.
- Throttle up to maintain a taxi speed of 15 kts maximum. Slow down to a maximum of 10 kts before making a 90 deg turn.



wingspan:  
 213'/65m  
 171'/52m  
 157'/48m  
 118'/36m  
 95'/29m



Check signs to follow the taxi route towards the holding point (N5)





TAKEOFF

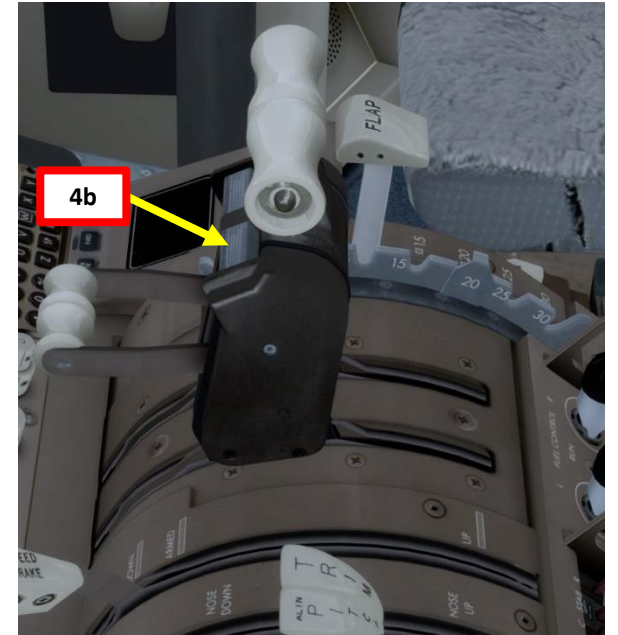
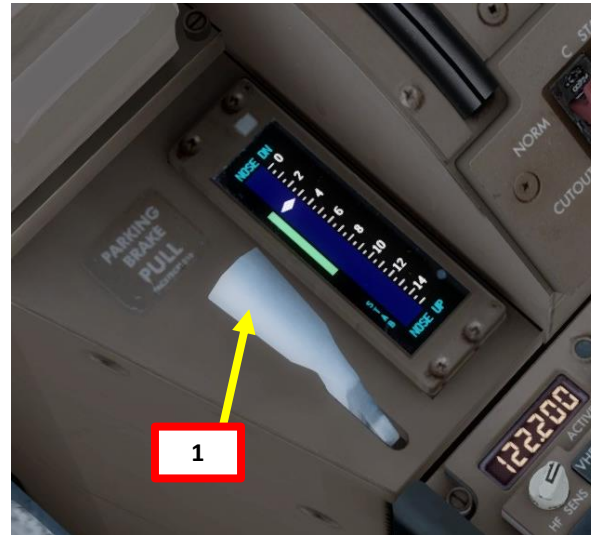
777-200LR

PART 6 – TAKEOFF, CLIMB & CRUISE



# TAKEOFF

1. Line up on the runway and make sure parking brake is disengaged
2. Press and hold pedal brakes
3. Throttle up until engines reach 55 % N1 and stabilize
4. Press the TO/GA (Takeoff/Go Around) paddles on the throttle to engage autothrottle and release brakes (alternatively, you can just throttle to max power)



# TAKEOFF

5. Rotate smoothly and continuously when reaching VR (138 kts) until reaching 15 degrees of pitch angle
6. Follow the Flight Director (15 deg pitch)
7. Raise landing gear by setting landing gear lever to UP
8. Autobrake switch – OFF



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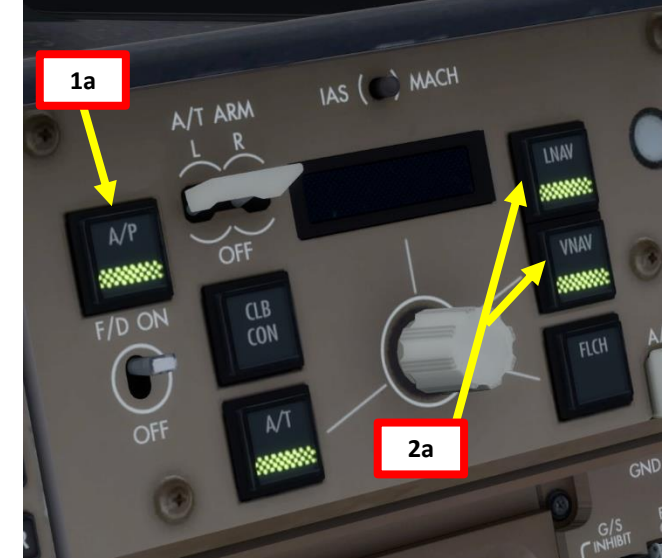
**PART 6 – TAKEOFF, CLIMB & CRUISE**

**TAKEOFF**



## CLIMB

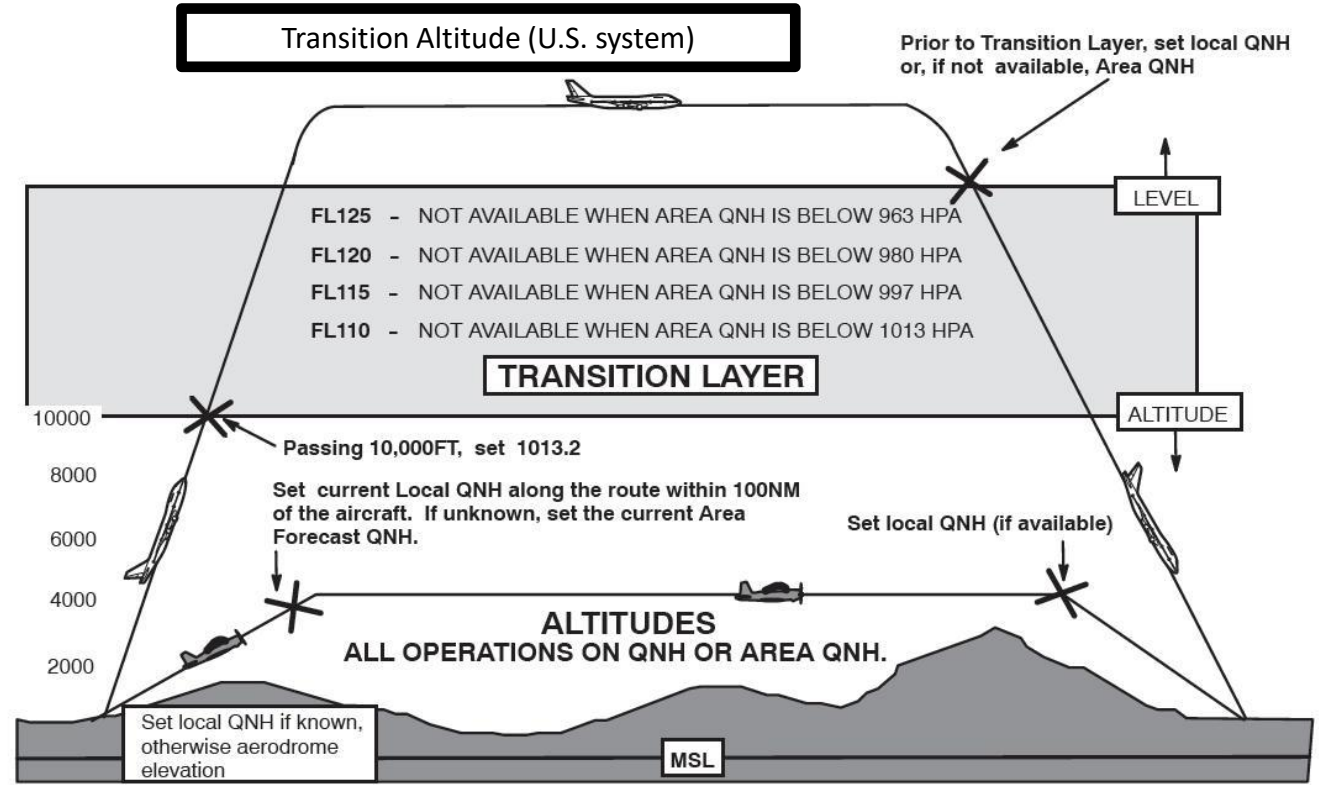
1. When reaching an altitude of 400 ft, engage autopilot by pressing the “A/P” button on the MCP. Your aircraft will now follow the “magenta line” on your navigation display automatically once you engage the VNAV and LNAV modes.
2. Press on the VNAV (Vertical Navigation) and LNAV (Lateral Navigation) autopilot mode buttons on the MCP (Mode Control Panel) to engage VNAV and LNAV autopilot modes
3. Always synchronize your heading using the HEADING knob on the MCP. This will not steer the aircraft, but it is good practice in case you need to engage other autopilot modes quickly.





**CLIMB**

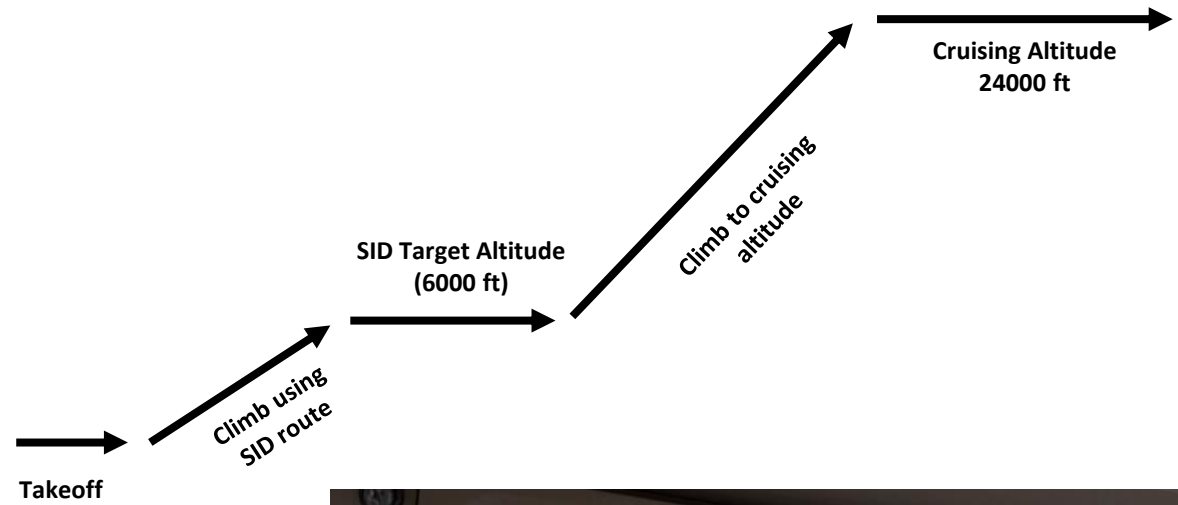
- Once you pass transition altitude (3000 ft in Europe, 18000 ft in the US), click on the SET SPD knob to switch barometric pressure to STANDARD pressure in order to use flight levels as a reference. This means you will be using a standard barometric pressure of 29.92 in Hg, which is also used by other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





# CLIMB

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





CLIMB

16. You will reach your “TOP OF CLIMB” point at “T/C” on your navigation display for your cruising altitude (24000 ft)



CLIMB

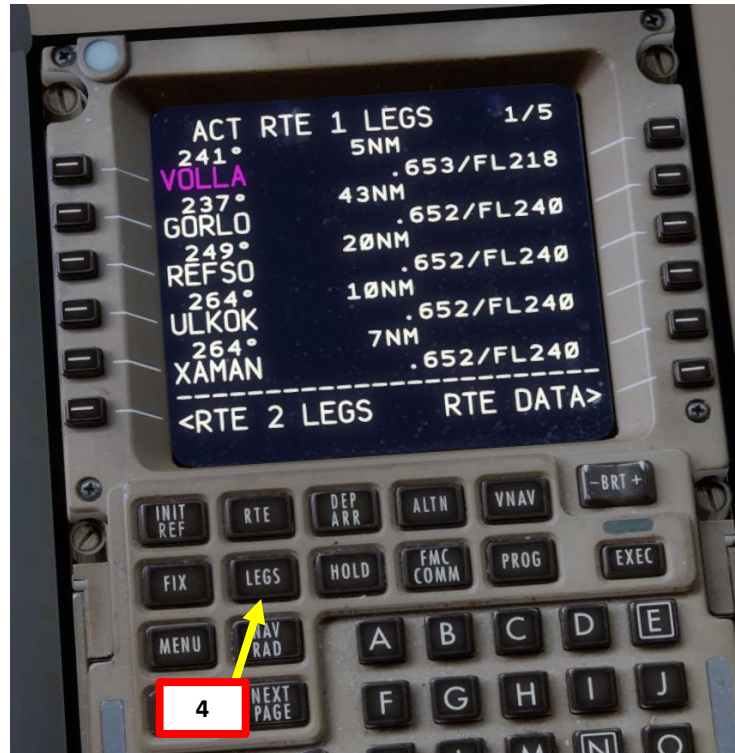
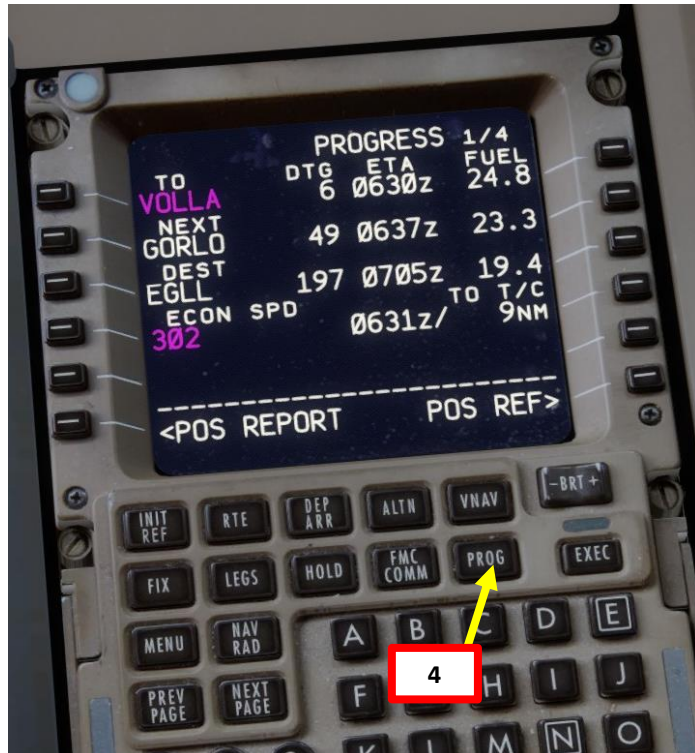
777-200LR

PART 6 – TAKEOFF, CLIMB & CRUISE



# CRUISE

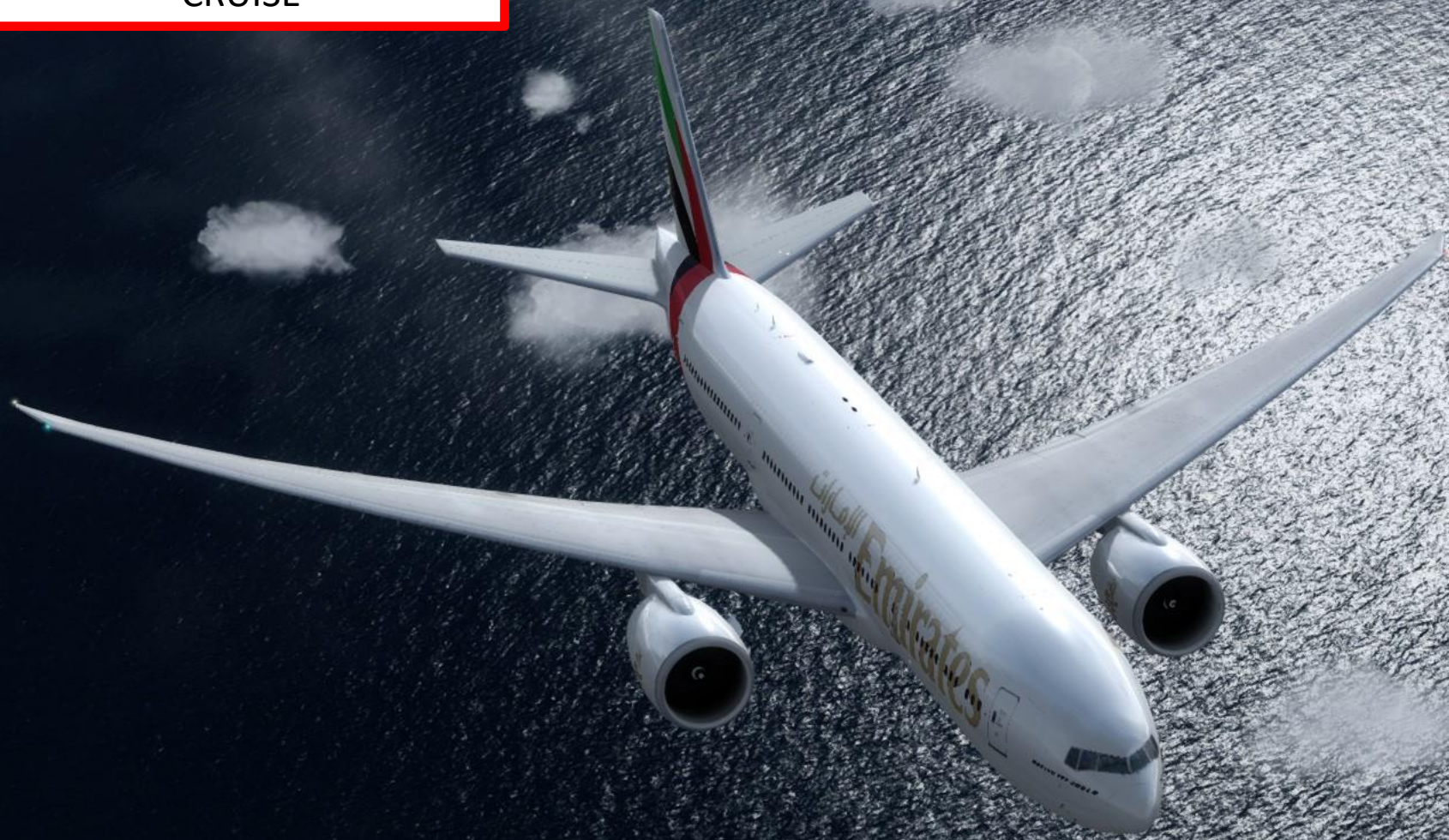
1. When reaching the top of climb, the autopilot will start levelling off.
2. Once levelled off to 24000 ft, the vertical autopilot mode will switch to VNAV PTH (Vertical Navigation Path).
3. The autothrottle system will automatically set the most efficient throttle setting during cruise.
4. You can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



CRUISE

777-200LR

PART 6 - TAKEOFF, CLIMB & CRUISE



## Introduction to Autopilot

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

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

## Autopilot and Auto-Throttle

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

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







### Autopilot Parameter Selectors

- IAS MACH Selector: Sets speed input to aircraft autopilot.
- IAS/MACH SEL Button: Toggles airspeed unit (IAS (indicated airspeed) vs Mach), usually used above FL260, or 26000 ft
- Heading/Track Selector: Sets heading (where the aircraft nose is pointed) or track (direction of movement of the aircraft) input to aircraft autopilot.
- HDG/TRK SEL Button: Toggles heading or track autopilot reference
- Bank Angle Limit Selector: Sets autopilot bank angle limit
- Vertical Speed (V/S)/Flight Path Angle (FPA) Selector: Sets vertical speed or flight path angle input to aircraft autopilot.
- V/S/FPA SEL Button: Toggles vertical speed or flight path angle autopilot reference
- Altitude Selector: Sets altitude input to aircraft autopilot.

### Autopilot, Flight Director & Autothrottle Selectors

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



### Autoflight – Thrust/Speed Modes

- CLB CON: Engages autothrottle and selects climb or Maximum Continuous thrust after takeoff or go-around. Mode inhibited under 400 ft altitude.
- A/T: Engages auto-throttle in appropriate mode selected, or in SPEED mode (maintains IAS/MACH value in display) if no pitch mode is selected. In SPEED mode, Speed Selector knob must be pushed to override the speed target of the FMC.

### Autoflight – Vertical Modes

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

### Autoflight – Lateral Modes

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

### Autoflight – Vertical + Lateral Mode

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

Autopilot Modes

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

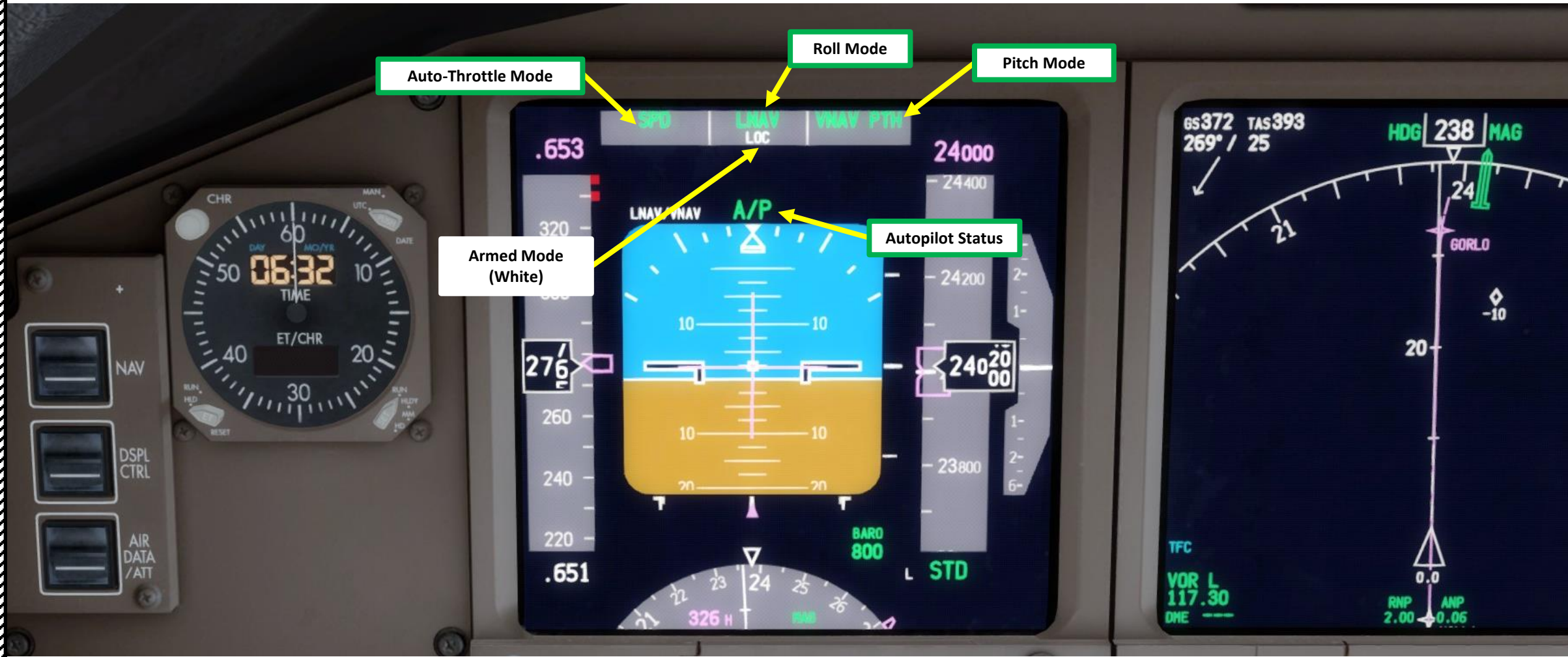
Button	Description
A/T	Autothrottle system will adjust thrust to maintain desired indicated airspeed (kts) or selected autothrottle mode.
CLB CON	Autothrottle system will adjust thrust to select climb or maximum continuous thrust after takeoff or go-around

<b>VERTICAL MODE</b>
<b>LATERAL MODE</b>
<b>VERTICAL &amp; LATERAL MODE</b>
<b>AUTO-THROTTLE MODE</b>

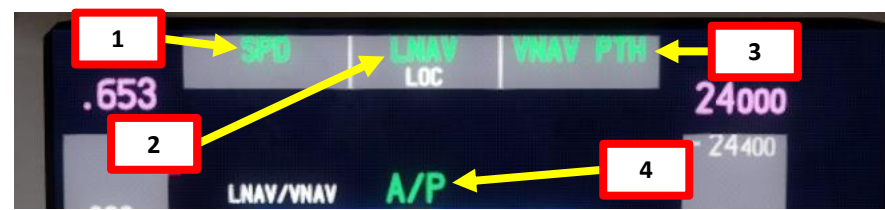
### FMA (Flight Mode Annunciator)

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

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



**FMA (Flight Mode Annunciator)**



1: Autothrottle Mode	2: Roll Mode	3: Pitch Mode	4: Autopilot
<b>THR:</b> Autothrottle applies thrust to maintain the climb/descent rate required by the pitch mode	<b>HDG HOLD:</b> autopilot maintains current heading	<b>TO/GA:</b> annunciates by positioning either flight director switch ON when both flight directors are OFF or in flight when flaps are out of up or glideslope is captured.	<b>FLT DIR:</b> flight directors are ON and autopilots are not engaged
<b>THR REF:</b> thrust set to the reference thrust limit displayed on EICAS	<b>HDG SEL:</b> autopilot maintains heading set on the MCP with the HEADING/TRACK SELECT knob	<b>ALT:</b> altitude hold mode activated or target altitude is captured	<b>A/P:</b> autopilot command is engaged
<b>HOLD:</b> thrust lever autothrottle servos are inhibited. Pilot can set the thrust levers manually	<b>LNAV:</b> activates Lateral Navigation autopilot roll mode, following FMC flight plan	<b>V/S:</b> autopilot maintains selected vertical speed	<b>LAND 3:</b> three autopilot channels engaged and operating normally for an automatic landing
<b>IDLE:</b> displays while autothrottle moves thrust lever to IDLE. IDLE mode is followed by HOLD mode.	<b>LOC:</b> Autopilot captures the localizer course	<b>VNAV PTH:</b> Vertical Navigation, AP maintains FMC altitude or descent path with pitch commands	<b>LAND 2 (Green with white triangles):</b> autopilot redundancy reduced, only two autopilots available
<b>SPD:</b> both autothrottle servos are functional and system maintains commanded speed, which can be set using the IAS/MACH selected or by the FMC flight plan	<b>ROLLOUT:</b> After touchdown, AFDS uses rudder and nosewheel steering to steer the airplane on the localizer centerline	<b>VNAV SPD:</b> Vertical Navigation, AP maintains FMC speed with pitch commands	<b>NO AUTOLAND (amber):</b> fault occurs after LAND 3 or LAND 2 annunciates, making AFDS unable to make an automatic landing
<b>L-SPD:</b> right autothrottle servos have failed and left autothrottle maintains commanded speed, which can be set using the IAS/MACH selected or by the FMC flight plan	<b>TO/GA:</b> annunciates by positioning either flight director switch ON when both flight directors are OFF or in flight when flaps are out of up or glideslope is captured.	<b>VNAV ALT:</b> Vertical Navigation, AP maintains MCP (Mode Control Panel) selected altitude in case of a conflict between the VNAV profile and the MCP altitude.	
<b>R-SPD:</b> left autothrottle servos have failed and right autothrottle maintains commanded speed, which can be set using the IAS/MACH selected or by the FMC flight plan	<b>ATT:</b> when autopilot is first engaged or the flight director is first turned on in flight, AFDS (Autopilot Flight Director System) holds a bank angle between 5 and 30 deg and will not roll to wings level.	<b>G/S:</b> AFDS (Autopilot Flight Director System) follows the ILS (Instrumented Landing System) glideslope.	
	<b>TRK SEL:</b> autopilot maintains track set on the MCP with the HEADING/TRACK SELECT knob	<b>FLARE:</b> during Autoland, aircraft flare activates between 60 and 40 ft RA (radar altimeter)	
	<b>TRK HOLD:</b> autopilot maintains current track	<b>FLCH SPD:</b> Autopilot maintains airspeed by using aircraft pitch input	
		<b>FPA:</b> autopilot maintains selected flight path angle	

# 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.

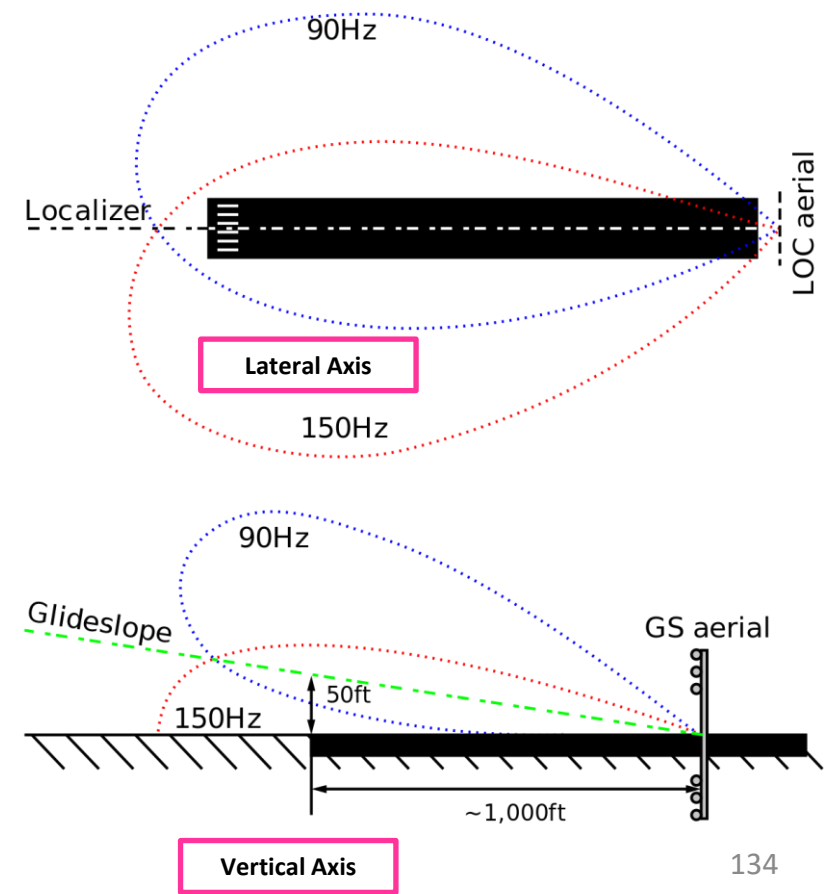
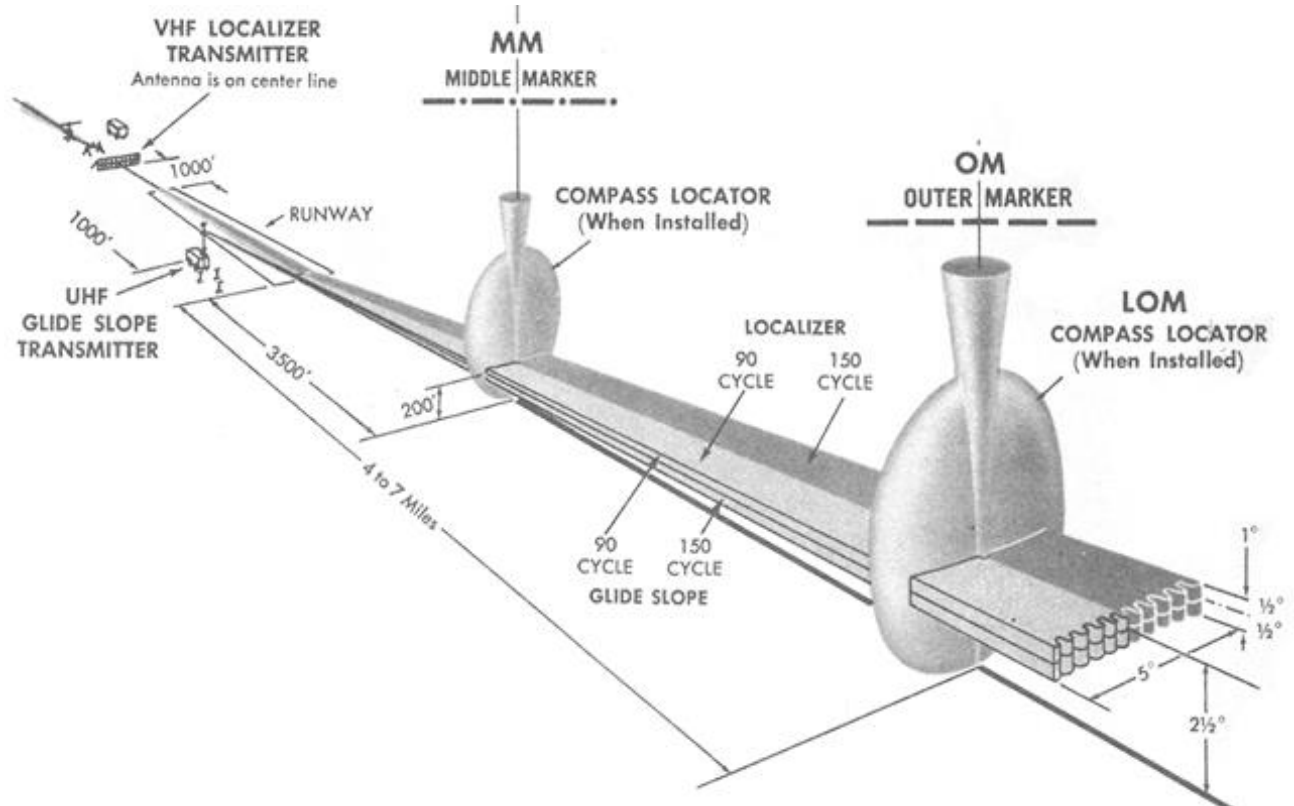


Localizer Array Station at Hannover



Glide Slope Station at Hannover

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



**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)

**BIG 3D, BIG 1E, BIG 1F ARRIVALS**  
 DURING PERIODS OF CONGESTION TRAFFIC MAY BE ROUTED VIA OCK 1G AS DIRECTED BY ATC  
 NOT TO BE USED FOR FLIGHT PLANNING PURPOSES

**SPEED RESTRICTION**  
 Cross SLP or 3 MIN before holding facility at 250 KT or less.  
 SLP Speed Limit Point

**WARNING**  
 Do not proceed beyond BIG without ATC clearance.

**HOLDING OVER BIG**  
 Aircraft will be instructed by ATC to fly the appropriate FL.

**DESCENT PLANNING**  
 Pilots should plan for possible descent clearance as as directed by ATC. ACTUAL DESCENT CLEARANCE WILL BE AS DIRECTED BY ATC.

Direct distance from BIG to: Heathrow Apt 21 NM

STAR	ROUTING
BIG 3D	At LAM, LAM R-171 to HILLY, turn onto inbound holding, 303° track to BIG.
BIG 1E	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.

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

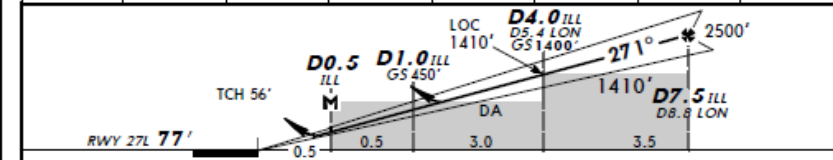
**LOC**  
 ILL \*109.5 Final Appch Crs 271° GS D4.0 ILL 1400' (1323') ILS DA(H) 277' (200') Apt Elev 83' RWY 77'

**MISSED APCH:** Climb STRAIGHT AHEAD, when passing 1080' or D0.0 ILL, whichever is later, climbing turn LEFT on track 149° to 2000'. When passing D6.0 LON climb without delay to 3000', then as directed. In event of radio failure see 11-6.

Alt Set: hPa Rwy Elev: 3 hPa Trans level: By ATC Trans alt: 6000'

**ILS:** Act unable to receive DME advise ATC. Equivalent radar fix will be provided at D7.5 ILL and D4.0 ILL. LOC: Not available w/o ILS DME. ILS DME reads zero at rwy 27L threshold.

LOC (GS out)	ILL DME ALTITUDE	2.0	3.0	4.0	5.0	6.0	7.0
		770'	1090'	1410'	1730'	2040'	2360'



Gnd speed-Kts	70	90	100	120	140	160	1080'	D0.0 ILL	149°
ILS GS or LOC Descent Angle	3.00°	377	485	539	647	755	862	whichever later	↑

	STRAIGHT-IN LANDING RWY 27L				CIRCLE-TO-LAND	
	ILS LOC (GS out) CDFA		LOC (GS out) CDFA		Max Kts	MDA(H) / VIS
A	FULL	Limited	ALS out	ALS out	100	750' (667') 1500m
B					125	750' (667') 1600m
C					180	850' (767') 2400m
D					205	850' (767') 3600m

# PLANNING DESCENT

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

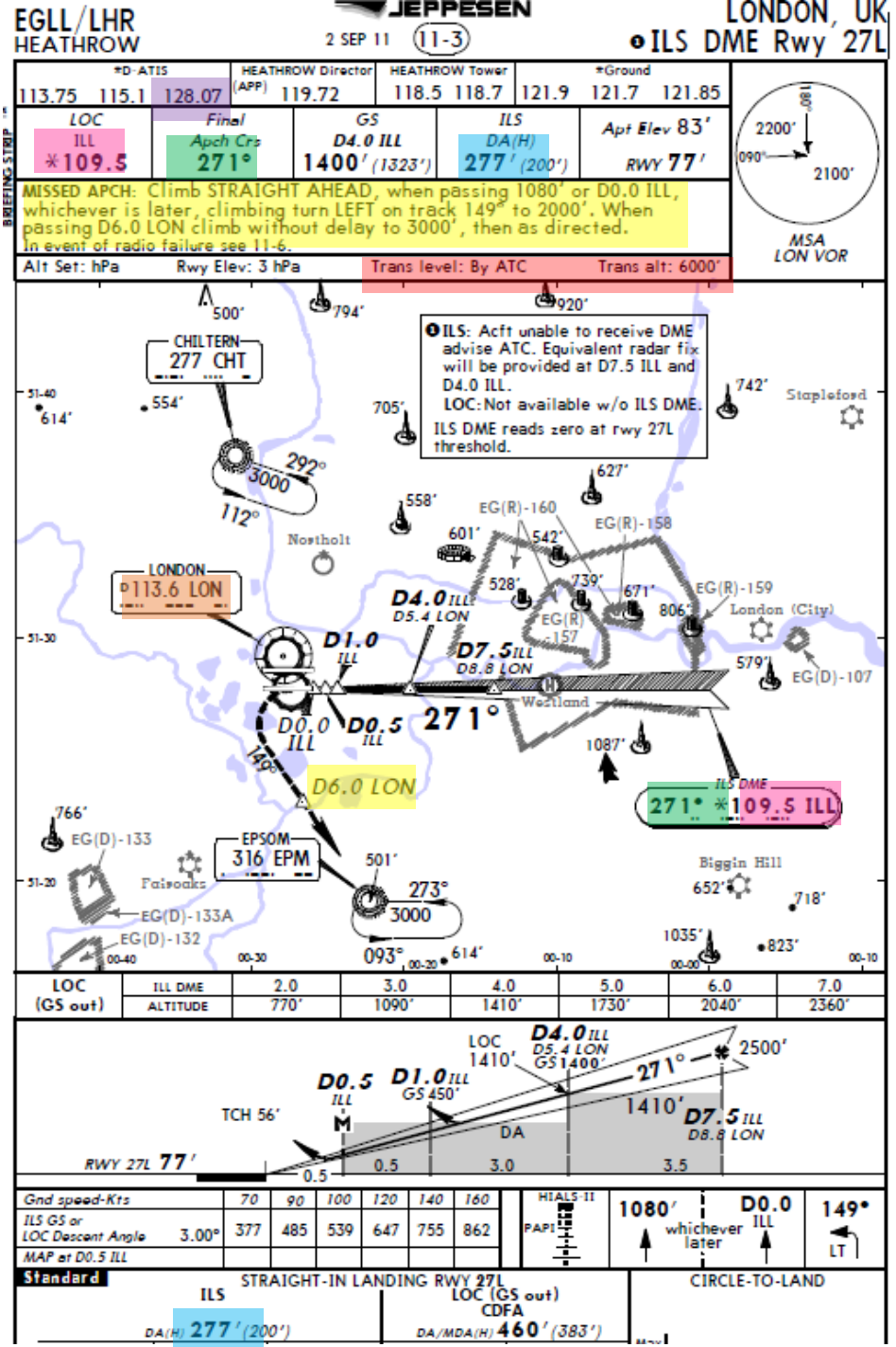
**Minimums in BARO: 277**  
 This is the minimum "decision altitude" (DA) during landing. If you go lower than 277 ft, you are committed to land no matter what happens. Above 277 ft, you can still miss your approach and go around.

**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 FLO70, or 7000 ft.



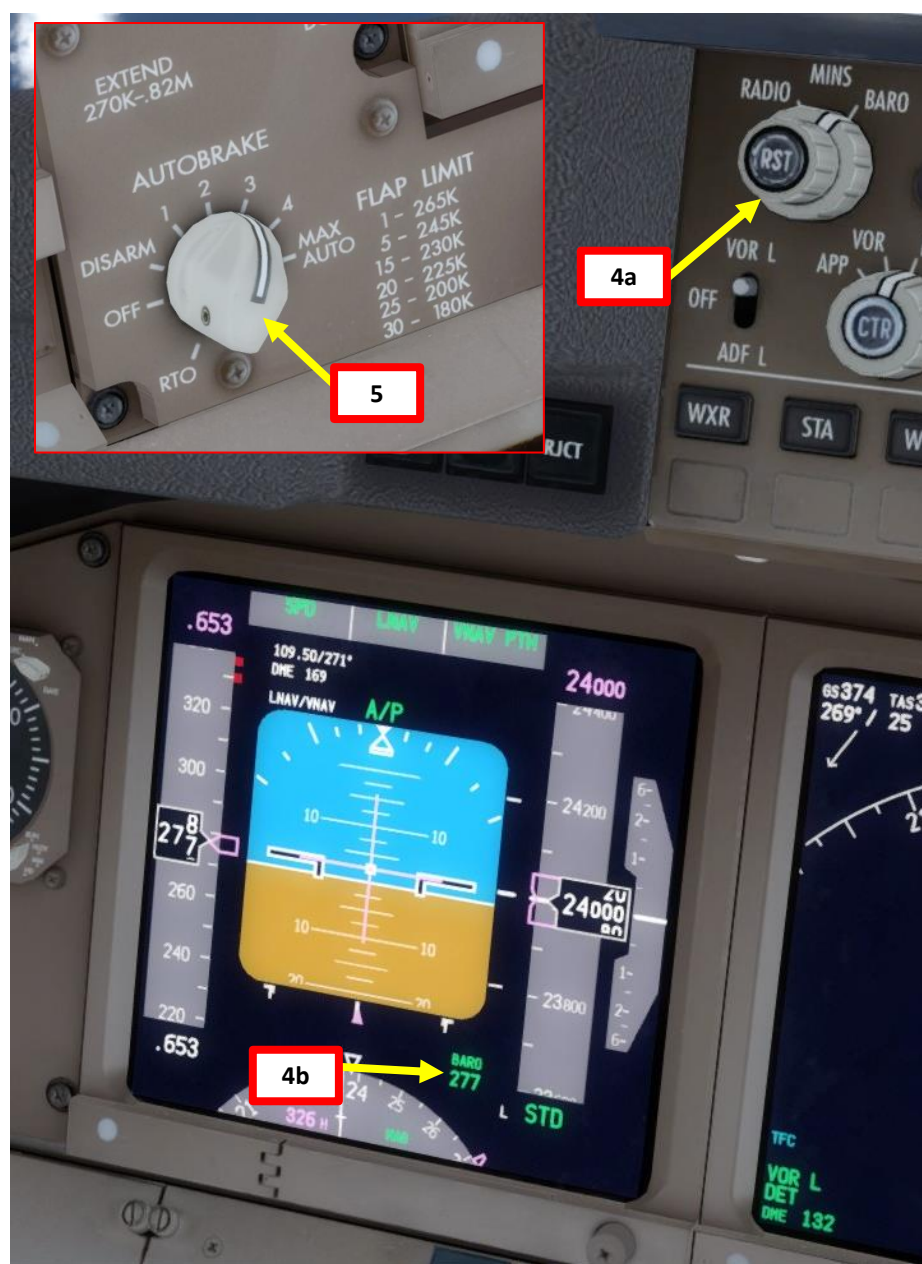
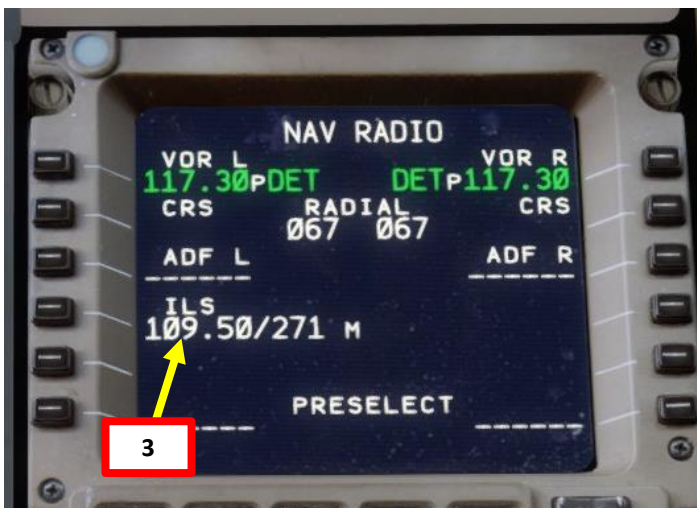
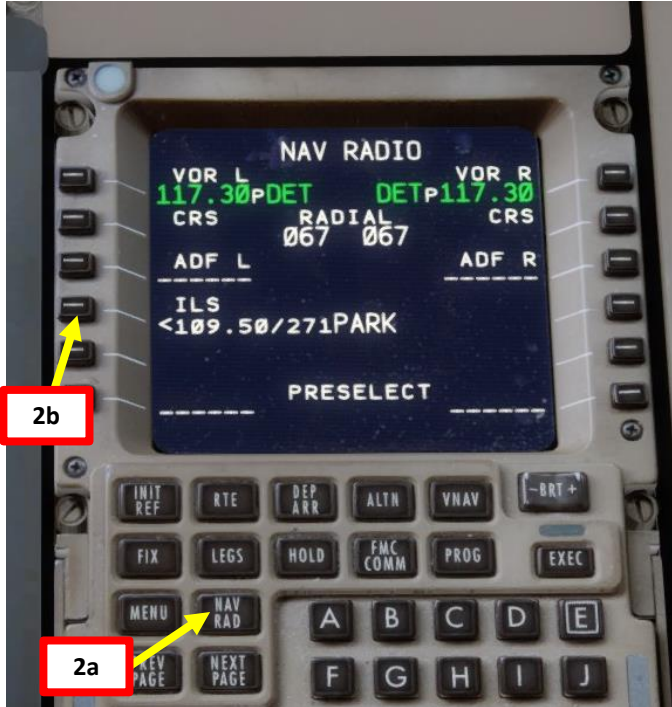
Here is a great link to know how to read these charts properly:  
<https://community.infinite-flight.com/t/how-to-read-an-approach-chart/8952>

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



## PLANNING DESCENT

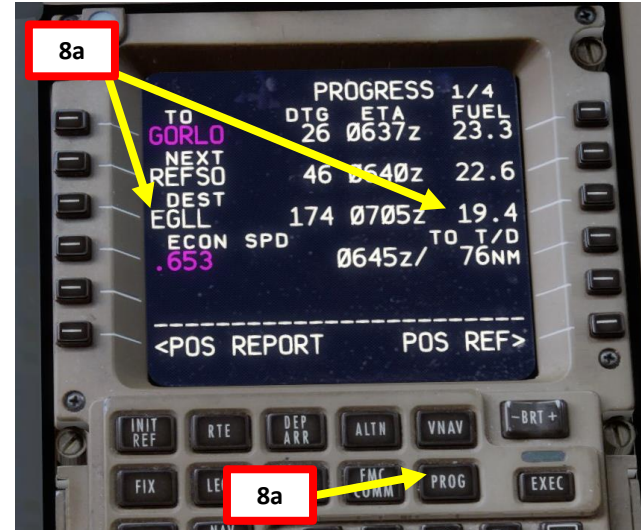
1. We have already selected in our FMC our Arrival runway as ILS27L and our arrival STAR “BIG1E” and our Initial Approach Fix “CI27L” at the beginning. Normally, we do this before we begin our approach. See the “FMC SETUP – WAYPOINTS” section.
2. In the FMC, go in the RAD NAV (Radio Navigation) page. The final approach course for runway 27L (271) will already be automatically displayed since we entered the destination airport. Press on the LSK next to ILS 109.50/271PARK to select this ILS frequency.
3. The ILS field will now display the VOR frequency, followed by the course (109.50/271).
4. Set MINIMUMS on BARO to 277
5. Set AUTOBRAKE to 3
6. Set Standby Attitude Indicator to APP (approach) mode



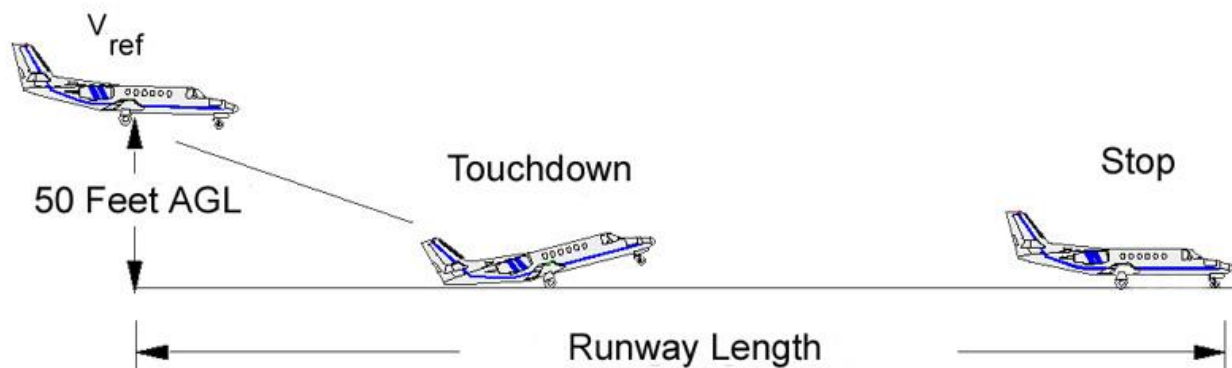
## PLANNING DESCENT

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

**GW @ Landing = (Current GW) – (Current Fuel – Arrival Fuel) = 427,400 lbs**  
 Arrival Fuel @ EGLL = 19,400 lbs (see FMC "PROGRESS" page at "EGLL - FUEL")  
 Current Fuel = 24,100 lbs (see TOTAL FUEL indication on EICAS ENG page)  
 Current Gross Weight = 432,100 lbs (see FMC "INIT/APPROACH REF" page at "GROSS WT")



### FAR Part 25 Landing Distance & Weight Limitation



Landing weight limitations are based on Vref at 50 feet AGL over the landing threshold. Thrust reverse is not considered when determining maximum landing weight based on runway limitations.



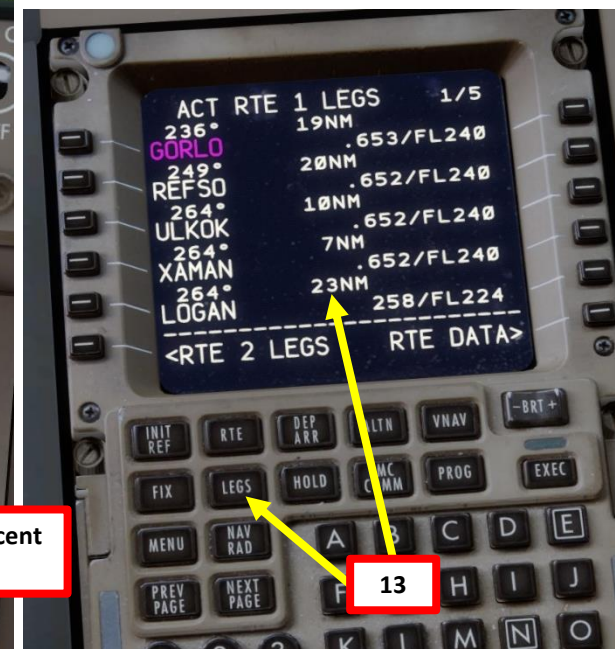
# PLANNING DESCENT

9. On the CDU keypad, enter the predicted gross weight at landing "427.4" (for 427,400 lbs) and select the LSK next to "GROSS WT" to update the VREF values. You should see them change to lower reference airspeed values.
10. Click on the LSK next to "30° – 137KT" to copy the VREF speed for a Flaps 30 degrees landing configuration.
11. Click on the LSK next to FLAP/SPEED to paste the calculated VREF value.



# PLANNING DESCENT

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



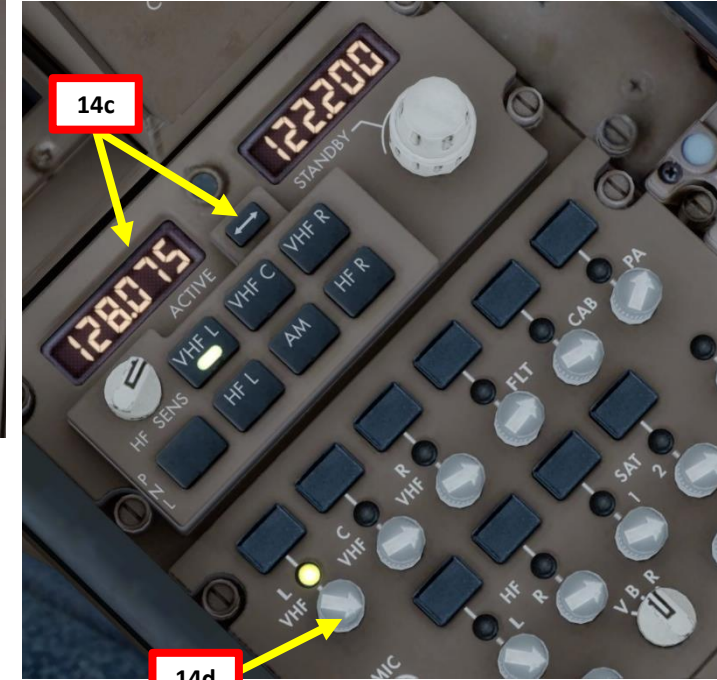
# PLANNING DESCENT

14. You can consult the EGLL ATIS (Automatic Terminal Information Service) system with the radio to get the altimeter setting.
  - a) Consult the EGLL chart and find the Heathrow ATIS Frequency (128.075).
  - b) Set VHF-1 STANDBY radio frequency ATIS frequency (128.075)
  - c) Click on the Transfer button to set the ATIS frequency to the ACTIVE frequency.
  - d) Press the L VHF button on the Audio Select Panel to listen on the VHF-1 active frequency.
  - e) You should receive the ATIS automated report on the radio for Schiphol Airport. The reported altimeter setting is 30.00 inches of Hg.
  - f) Press the L VHF button on the Audio Select Panel to mute the VHF-1 active frequency once you have the information you need.
15. When reaching the transition level of 7000 ft, click on the “STD” BARO button to set barometric pressure instead of standard pressure. In our case, we will use the barometric pressure the tower told us (30.00 in Hg).

EGLL/LHR  
HEATHROW

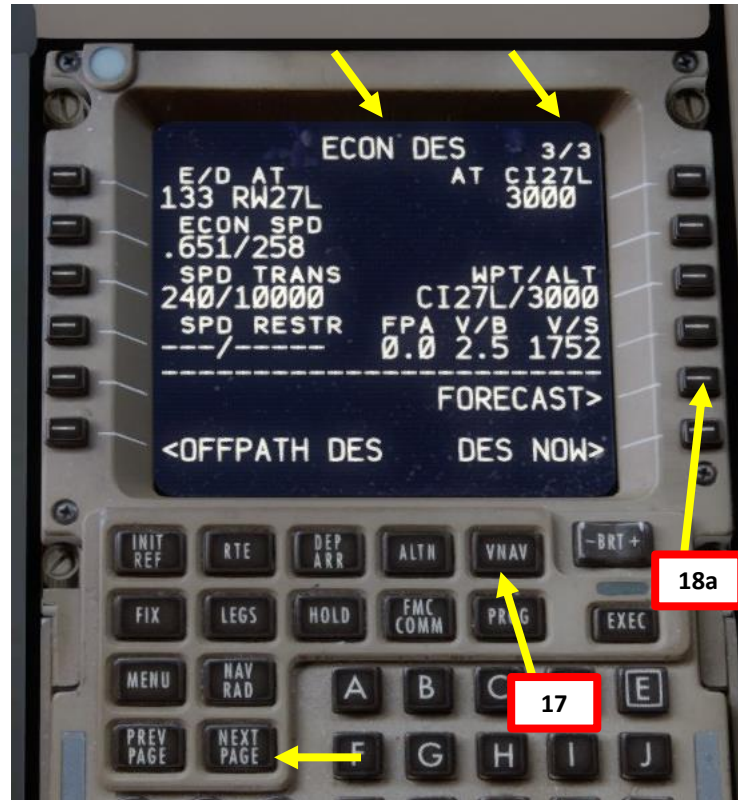
JEPPESEN  
2 SEP 11 (11-3)

#D	ATIS	HEATHROW Director (APP)	HEATHROW Tower
113.75	115.1	128.07	119.72
LOC ILL	Final Apch Crs	GS DA.0 ILL	ILS DA(H)
*109.5	271°	1400' (1323')	277' (200')



# PLANNING DESCENT

- 16. We must now set our transition level in the FMC
- 17. Click on the "VNAV" FMC page on the CDU and use the NEXT button to reach Page 3/3: ECON DES.
- 18. Select LSK next to the "FORECAST" menu.
- 19. Type "070" for FL070 (7000 ft) on the CDU keypad and click on the LSK next to "TRANS LVL".



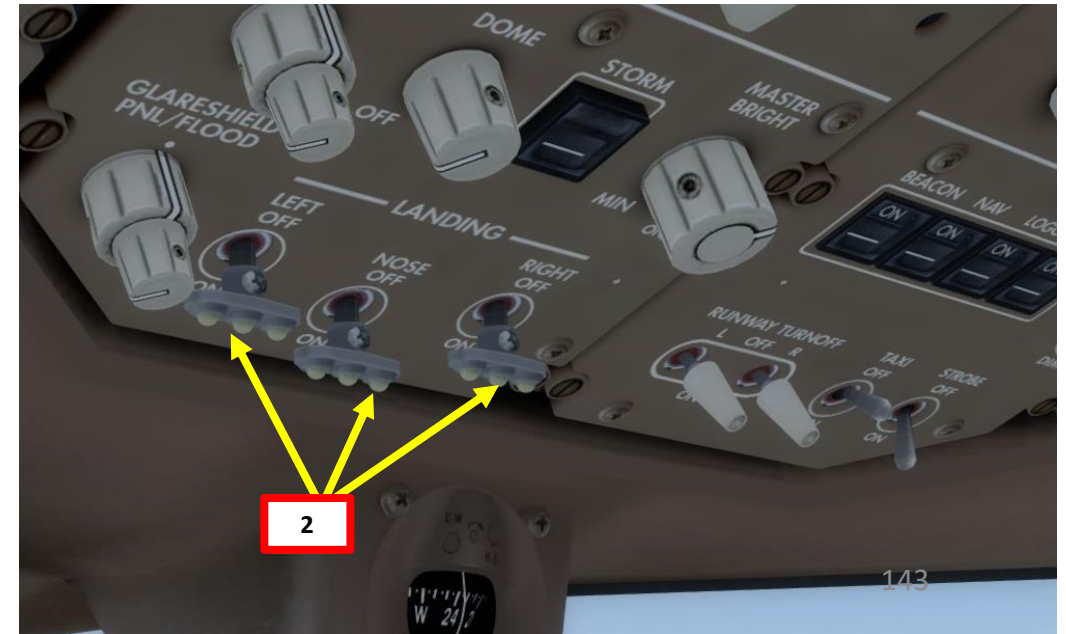
## DESCENT

1. You will automatically start descending when reaching the T/D point.

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

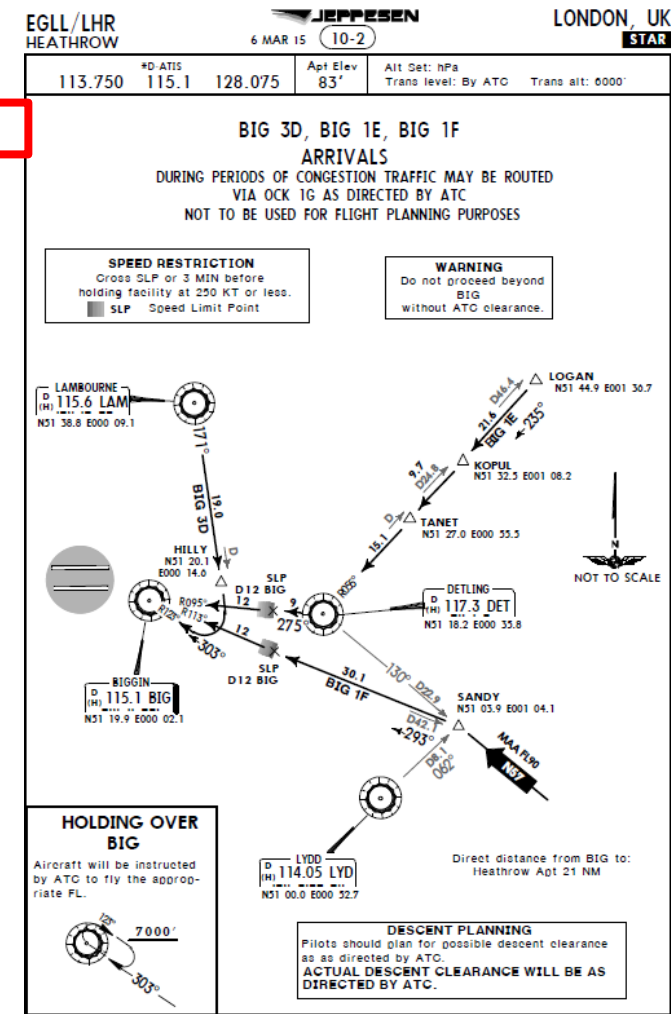
*ALTERNATIVE PROCEDURE: When you are about 5-10 nm from the Top of Descent point (T/D), click on the “VNAV” FMC page on the CDU, select Page 3/3 ECON DES, then select LSK next to “DES NOW” and click on the EXEC button on the CDU.*

2. When reaching FL100, set Landing Lights to ON.



## DESCENT

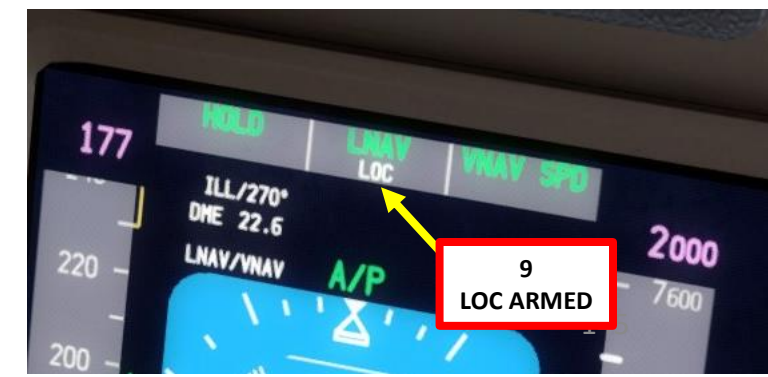
- Before you reach the last waypoint of the STAR (BIG), the tower should be able to clear us for open descent to 2000 ft. Once you fly over the Deceleration Point (can be monitored on the Navigation Display), your aircraft will start losing speed and will begin your approach.
- Open up the LEGS page on your FMC and look for the speed restriction at BIG. It says that we cannot fly faster than 220 kts.
- Set autopilot speed to 220 and the altitude to 2000, then press the MCP Speed button (Speed Intervention) and the MCP Altitude button (Altitude Intervention).





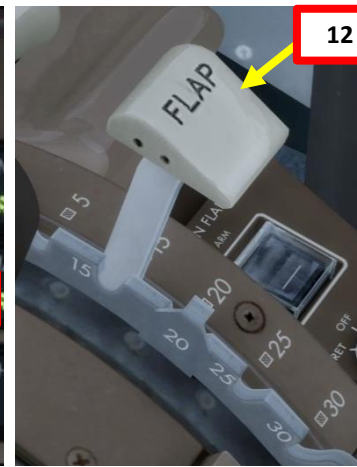
## DESCENT

6. Once you are approaching the Approach Fix CI27L, slow down to FLAPS UP speed of 217 kts (indicated on speed tape) by setting the autopilot MCP SPEED knob to 217. If IAS window is blank, click on the MCP SPEED knob to activate the Speed Intervention functionality.
7. Set Flaps lever to 5 deg
8. Set MCP SPEED to the Flaps 5 Speed (177 kts), as shown on Speed Tape
9. Arm LOC (Localizer) switch



## DESCENT

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



## DESCENT

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



## DESCENT

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



**DESCENT**

- When lined up on approach, set flaps to 20 deg.
- Set MCP SPEED to the FLAPS 20 speed of 157 kts (indicated on speed tape).





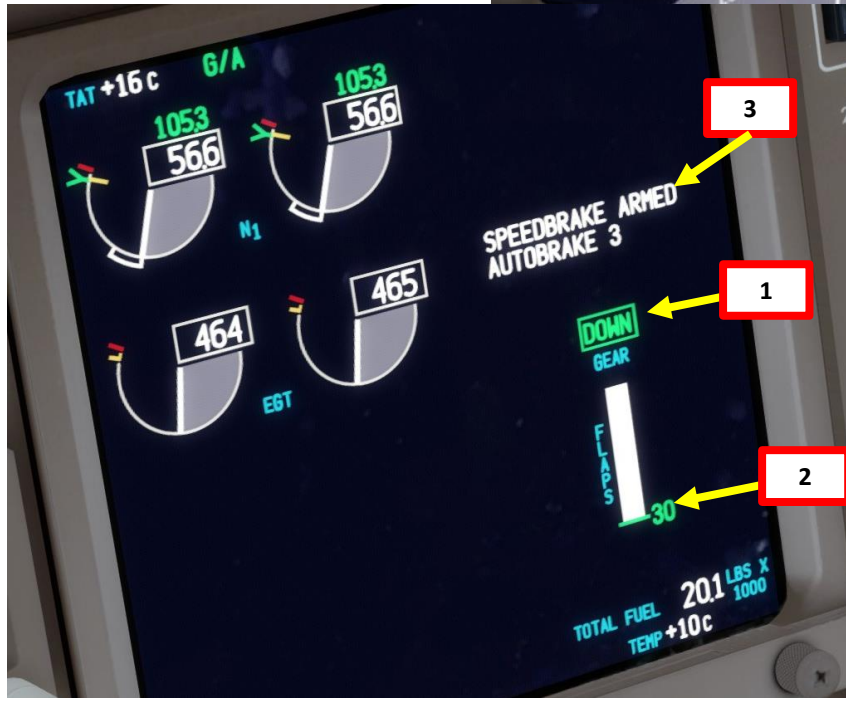
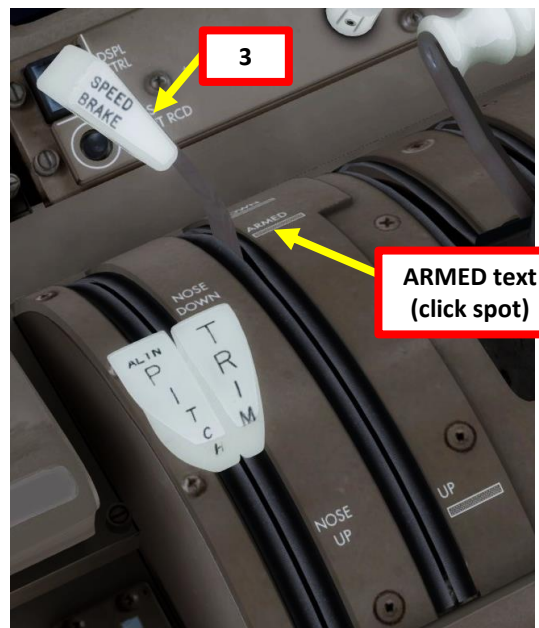
DESCENT



# FINAL APPROACH

1. Once you are at 1500 ft on final approach, set landing gear down.
2. Set Flaps Lever to 30 degrees
3. Arm Speed Brake (you can click on the ARMED text next to the lever)
4. Set MCP SPEED to the VREF+5 speed of (137 + 5) kts (indicated on speed tape). In other words, set the autopilot MCP SPEED to 142.
5. This landing will be done with the Autoland (LAND3).
  - When flying at 400 ft, the autopilot will switch to LAND mode in order to set the aircraft in a proper altitude and attitude to flare properly.
  - When flying at 50 ft, the autopilot will switch to FLARE mode in order to flare the aircraft to have a smooth touchdown.
  - On touchdown, the autopilot will switch to ROLLOUT mode. This mode will keep the aircraft on the runway centerline.

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



777-200LR

**PART 8 – APPROACH & LANDING**

**FINAL APPROACH**







# LANDING

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



777-200LR

**PART 8 – APPROACH & LANDING**

LANDING



777-200LR

PART 8 - APPROACH & LANDING

LANDING





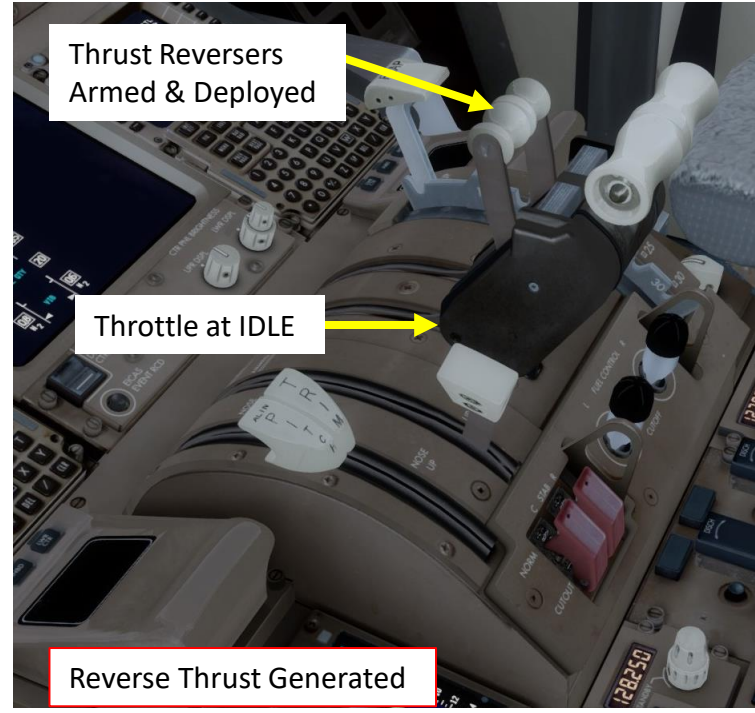
**LANDING**

- 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.



777-200LR

**PART 8 – APPROACH & LANDING**

LANDING





BOEING 777-300ER

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Emirates الإمارات



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