BY CHUCK
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PREPAR3D GUIDE
MAJESTIC SOFTWARE'S
BOMBARDIER Q400 "DASH 8"

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

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MAJESTIC Q400 EDITION: PRO
PLATFORM: PREPAR3D V 4.1

The **Dash 8 "Q400"** is a series of twin-engine, medium-range, turboprop regional airliners. The aircraft was introduced by de Havilland Canada (DHC) in 1984. Originally named the DHC-8 (nicknamed "Dash 8"), the aircraft started as the -100 series, then the -200 series, the -300 series and finally the -400 series. They are now produced by Bombardier Aerospace. De Havilland Canada was sold to Boeing in 1986, but then re-sold to Montreal-based Bombardier Aerospace in 1992. This acquisition was done in the midst of Bombardier's expansion of the late 80's; it had acquired Canadair in 1986, Short Brothers in 1989 and then Learjet as well in 1990.

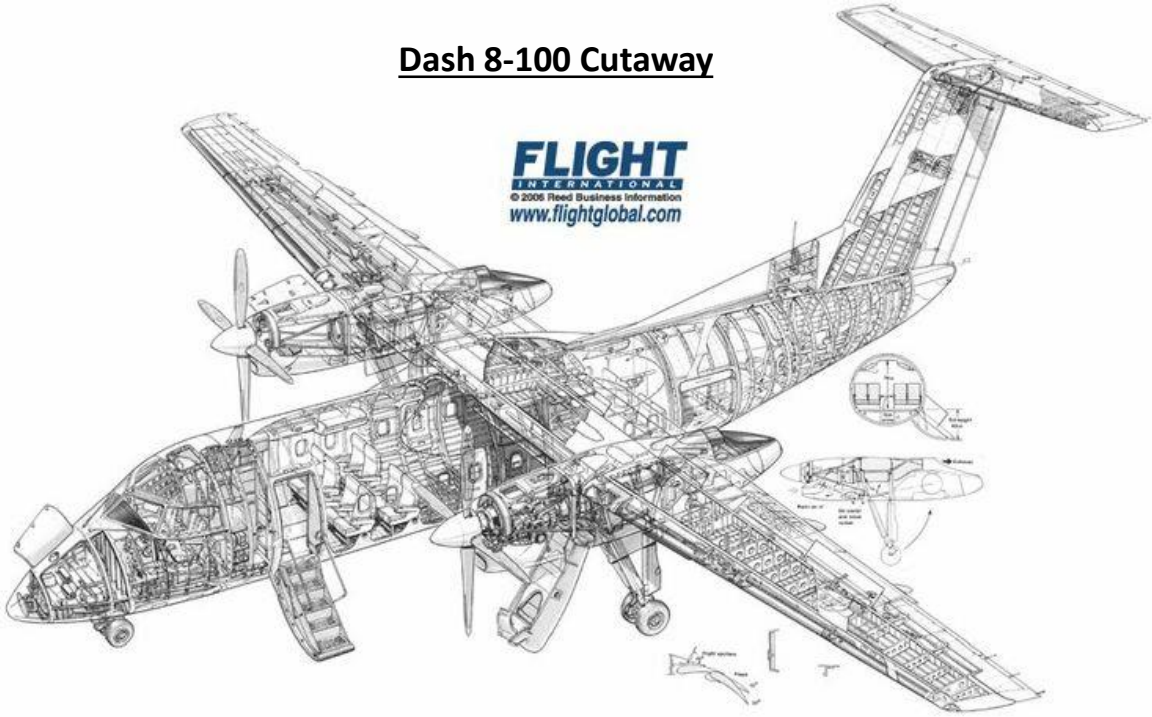
The Dash 8 was developed from the de Havilland Canada Dash 7, which featured extreme short take-off and landing (STOL) performance. With the Dash 8, DHC focused on improving cruise performance and lowering operational costs. The engine chosen was the Pratt & Whitney Canada PW100. The aircraft has been delivered in four series. The Series 100 has a maximum capacity of 39, the Series 200 has the same capacity but offers more powerful engines, the Series 300 is a stretched, 50-seat version, and the Series 400 is further stretched to 78 passengers. Over 1,000 Dash 8s of all models have been built.

The DHC-8-400 "Q400" is a stretched and improved version of the Dash 8 that entered service in 2000. It is equipped with an ANVS system (Active Noise and Vibration Suppression). Models delivered after 1997 have cabin noise suppression and are designated with the prefix "Q", as in "Q400". Its 360 knot (667 km/h) cruise speed is 60–90 knots (111–166 km/h) higher than its competitors and predecessors. Powered by PW150A engines rated at 5,071 shp (3,781 kW) at maximum power (4,850 shp or 3,620 kW maximum continuous rated). The maximum operating altitude is 25,000 ft (7,600 m) for the standard version. Production of the Series 100 ceased in 2005, and the Q200 and Q300 in 2009.

The Q400 has been through two company acquisitions, one of which was near fatal. The engineers who worked on this airframe are very proud of its rich history and know all too well the challenges of stretching the airframe and stretching a shrinking budget. We have to remember that this started as a bush flying aircraft that has been marketed to compete with jets. The aircraft is incredibly diverse being able to serve in high end commuter markets, to military platforms and even as a water bomber. This is an aircraft that has adapted to changing economic times and kept a great safety rating.

This is an aircraft designed to operate in the harsh canadian winter and difficult weather conditions that you will have to fly into without expensive automation systems: there is no auto-throttle nor auto-land system. The approaches need to be planned very carefully and most of your landings will be quite "firm" because of the landing gear's configuration. Give it a chance and I am sure that you will enjoy its superbly simulated systems. Great job, Majestic Software!

Dash 8-100 Cutaway



DHC-1 Chipmunk (1946)

DHC-2 Beaver (1947)

DHC-3 Otter (1951)

DHC-5 Buffalo (1964)

DHC-4 Caribou (1958)

DHC-7 Dash 7 (1975)

DHC-8 Dash 8 “Q-Series” (1983)

DHC-6 Twin Otter (1965)

De Havilland Canada Aircraft

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
- Explain engine and hydraulic system functionalities
- Explain the ice protection systems
- Descend, approach and land

BEST RESOURCES

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

Majestic Software Downloads Section
http://majesticsoftware.com/mjc8q400/downloads.html

Smart Cockpit Dash-8-400
http://www.smartcockpit.com/plane/BOMBARDIER/DASH-8-400.html

Froogle Sims Q400 Fully Loaded Playlist (Youtube)
https://www.youtube.com/watch?v=PkOc2gIS_s8&list=PL_xDmvmUFDEjAyzamHQaoM7hXrJudErUX

Airline2Sim (Payware Course)
https://www.airline2sim.com/course/q400-cadet/

Airline2Sim SIDs and STAR (Youtube)
https://www.youtube.com/watch?v=CKhxjVHTJYc

Aircraft Icing:
https://aircrafticing.grc.nasa.gov/1_1_3_3.html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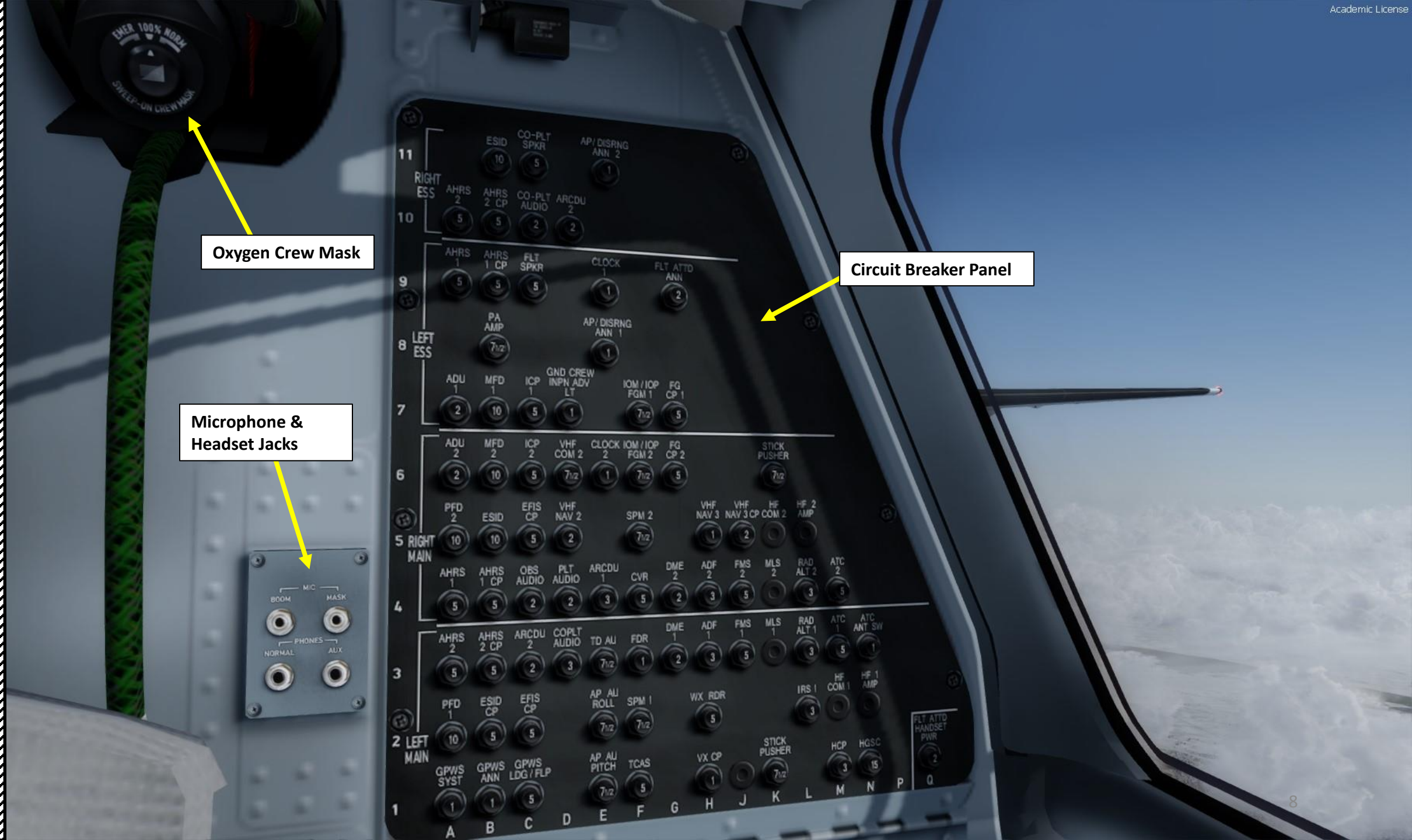
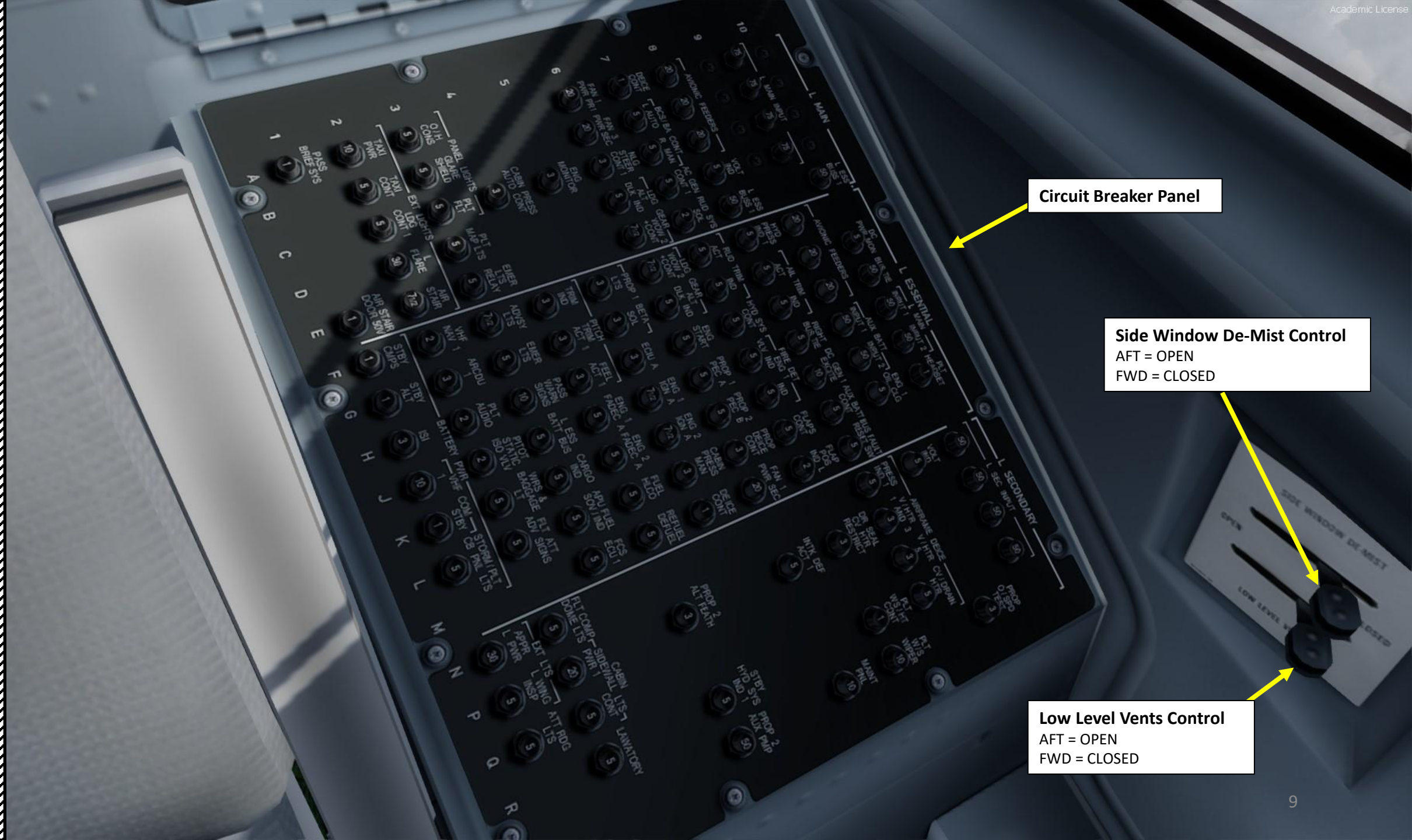
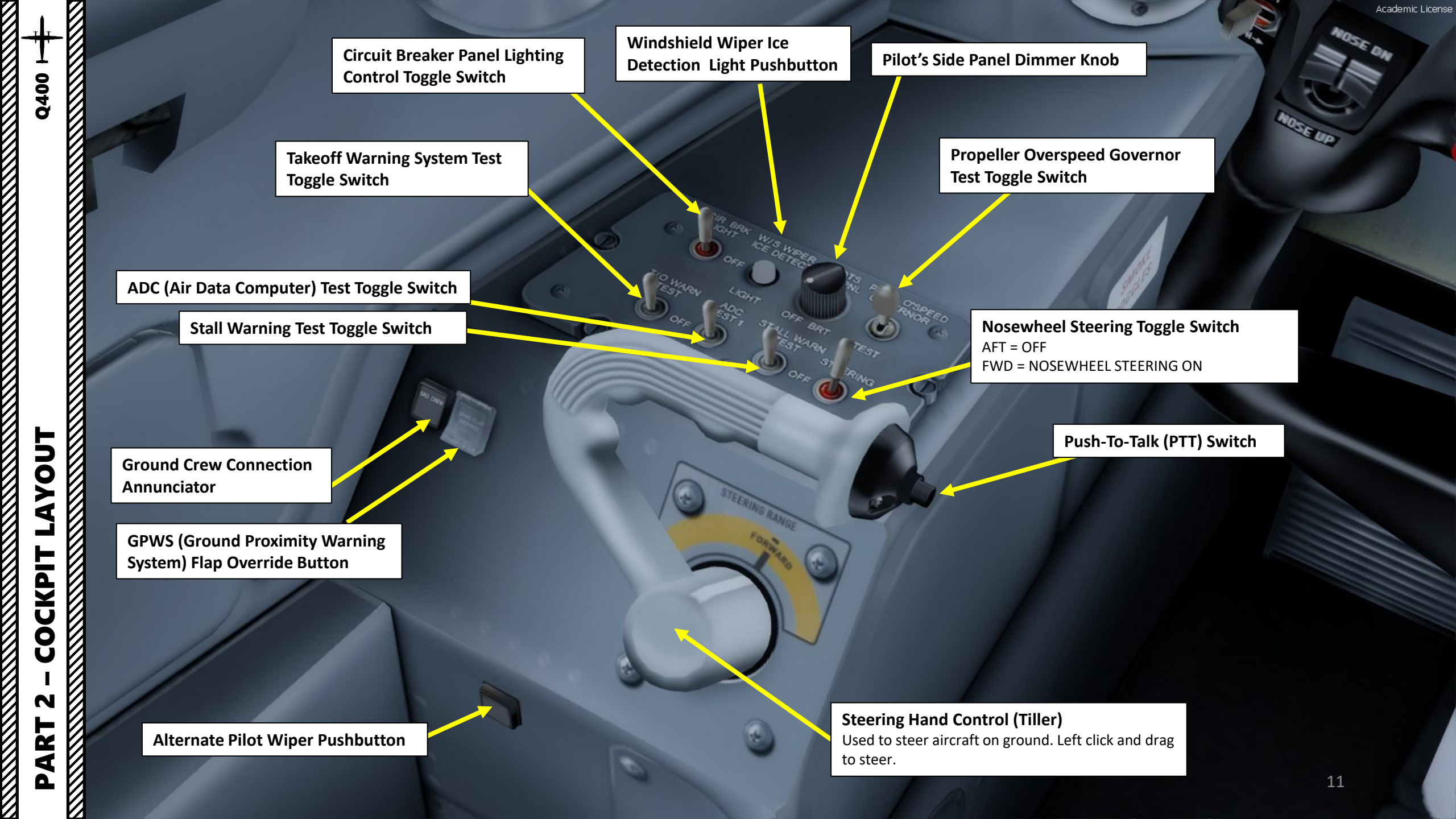



Circuit Breaker Panel
Side Window De-Mist Control
AFT = OPEN
FWD = CLOSED
Low Level Vents Control
AFT = OPEN
FWD = CLOSED



Circuit Breaker Panel Lighting Control Toggle Switch

Windshield Wiper Ice Detection Light Pushbutton

Pilot's Side Panel Dimmer Knob

Takeoff Warning System Test Toggle Switch

Propeller Overspeed Governor Test Toggle Switch

ADC (Air Data Computer) Test Toggle Switch

Stall Warning Test Toggle Switch

Nosewheel Steering Toggle Switch
AFT = OFF
FWD = NOSEWHEEL STEERING ON

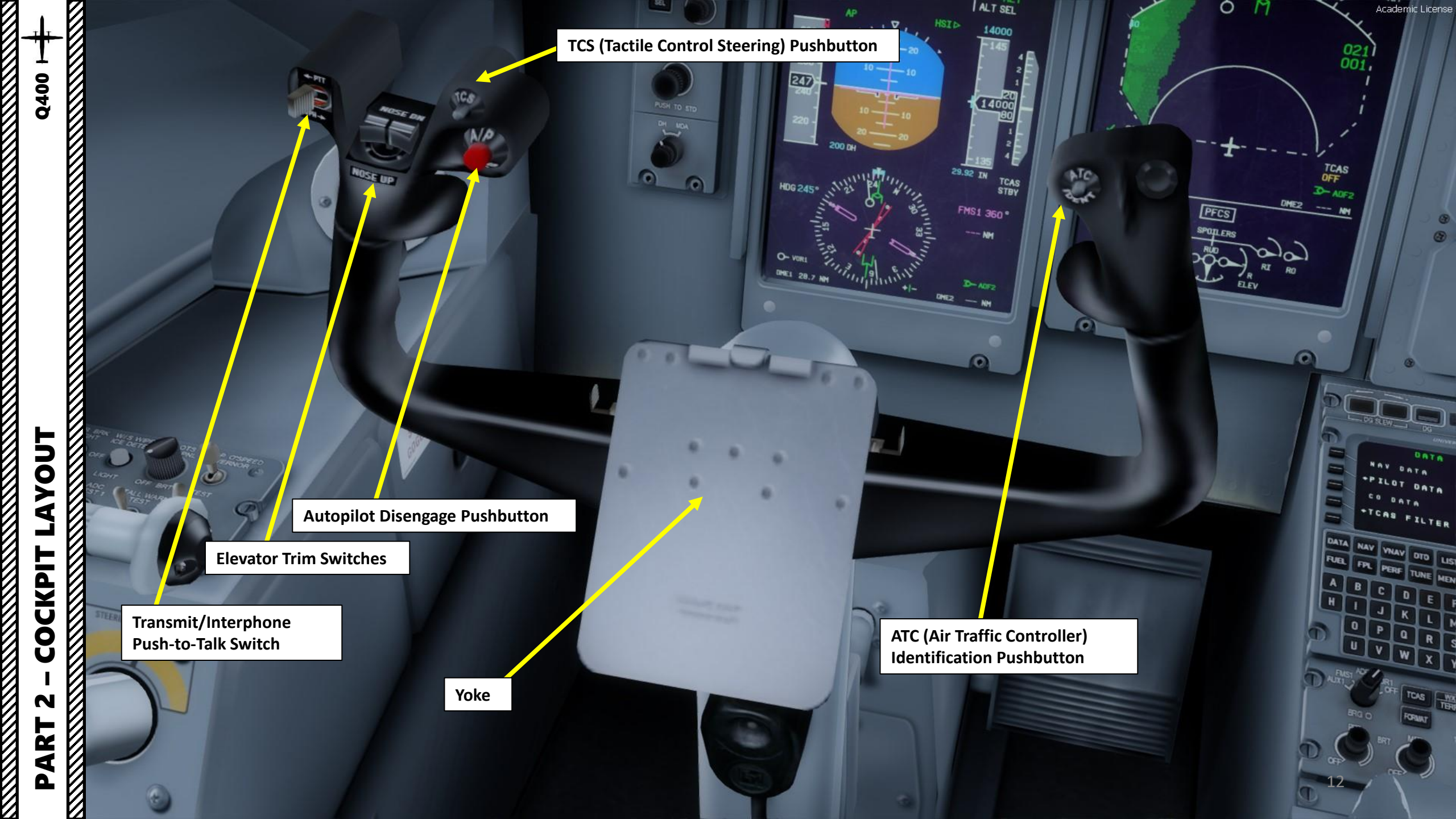
Push-To-Talk (PTT) Switch

Ground Crew Connection Annunciator

GPWS (Ground Proximity Warning System) Flap Override Button

Alternate Pilot Wiper Pushbutton

Steering Hand Control (Tiller)
Used to steer aircraft on ground. Left click and drag to steer.


TCS (Tactile Control Steering) Pushbutton
Autopilot Disengage Pushbutton
Elevator Trim Switches
Transmit/Interphone
Push-to-Talk Switch
Yoke
ATC (Air Traffic Controller)
Identification Pushbutton
NOSE DN
NOSE UP
TCS
A/P
PTT
ALT SEL
HSI
TCAS
OFF
ADF2
PFCS
SPOILERS
ELEV
DATA
NAV DATA
PILOT DATA
CO DATA
TCAS FILTER
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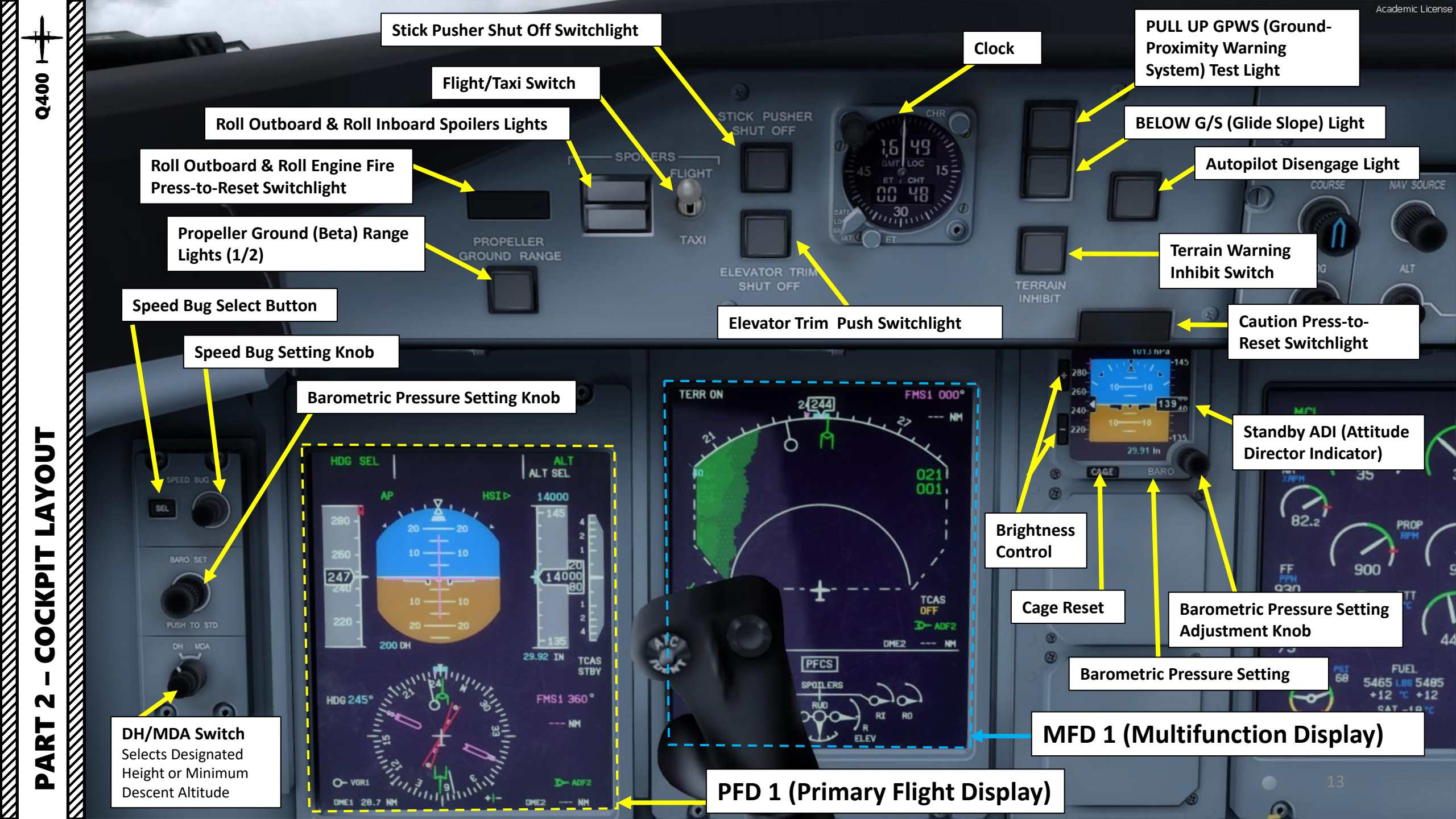
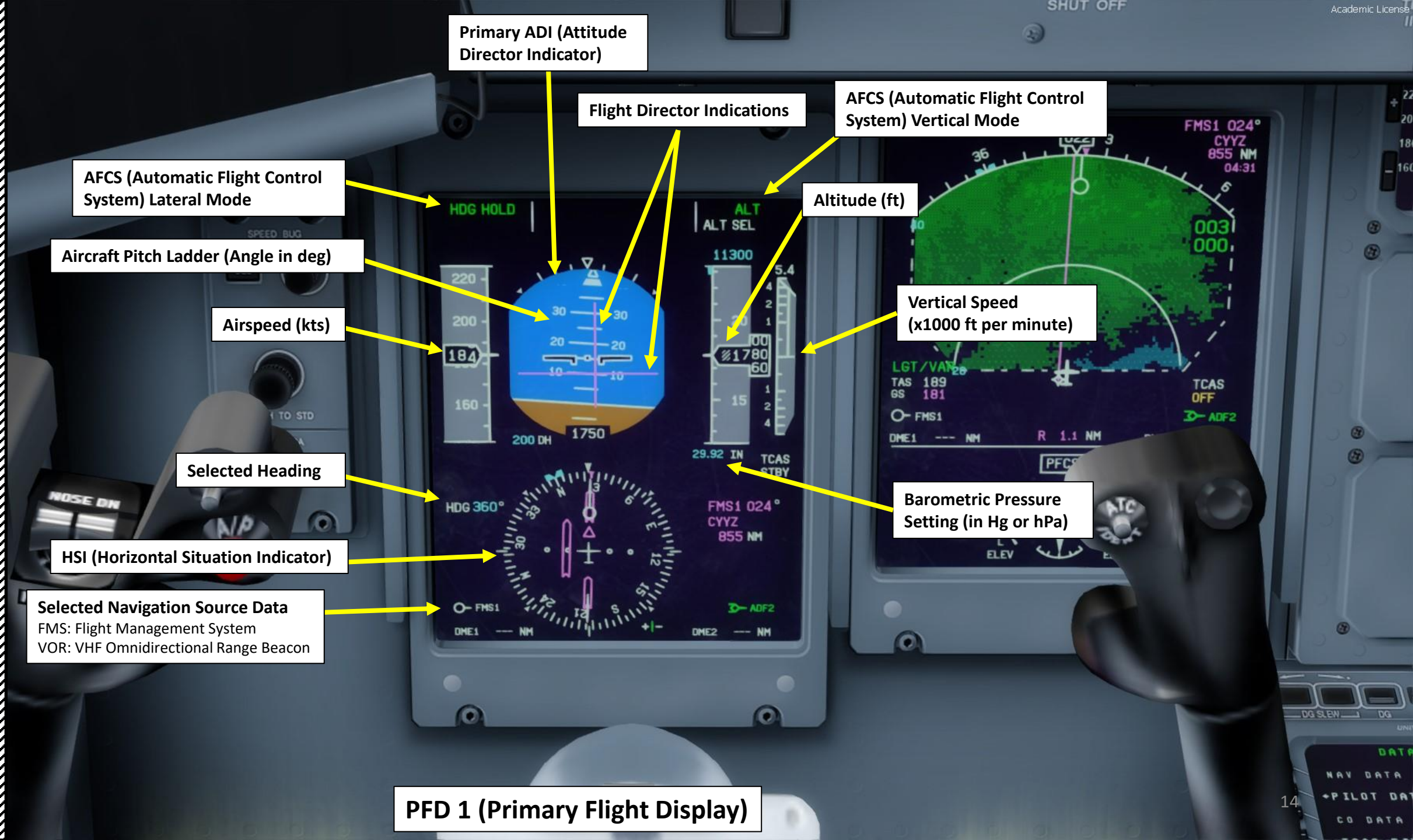
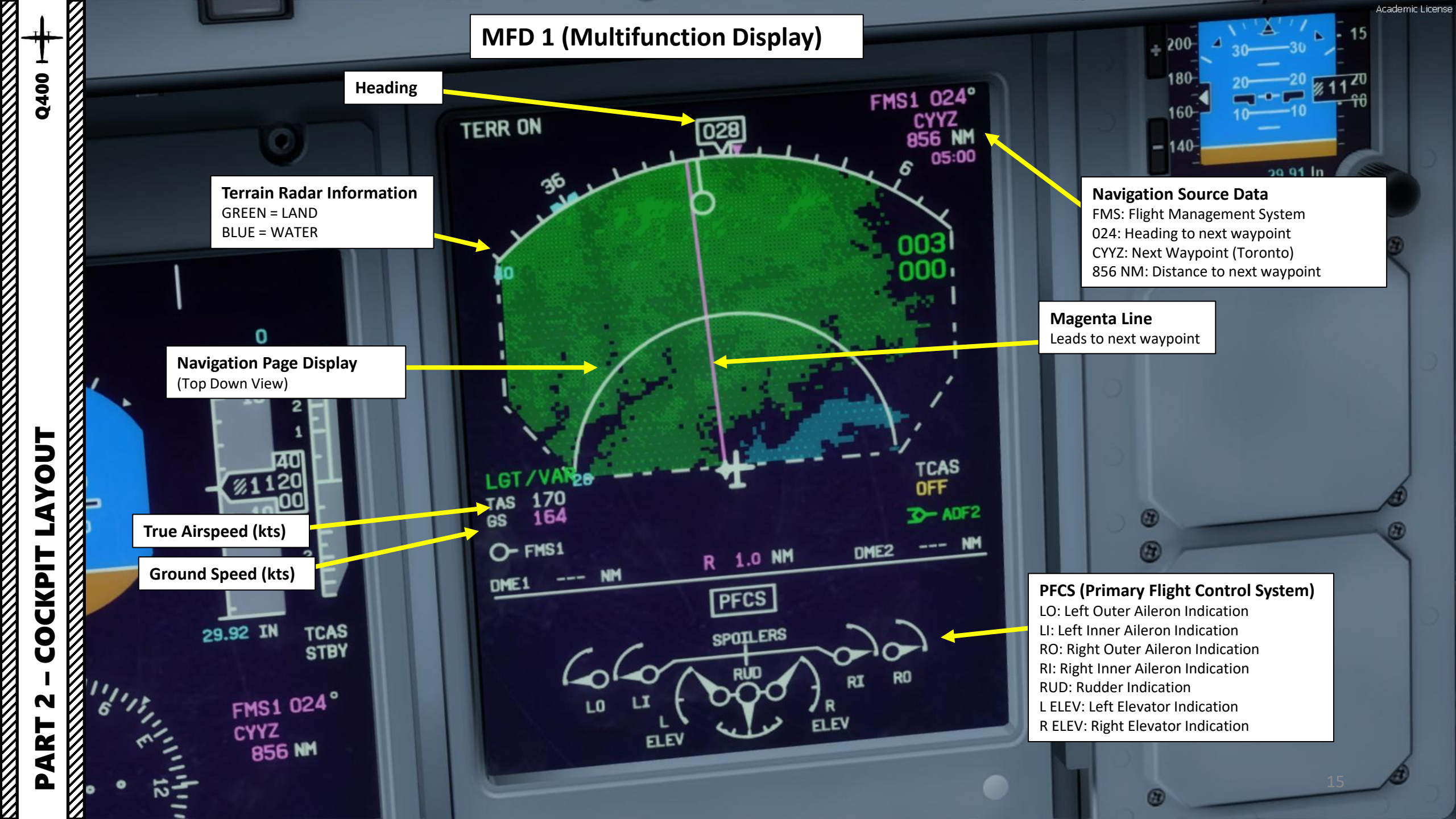
PART 2 – COCKPIT LAYOUT





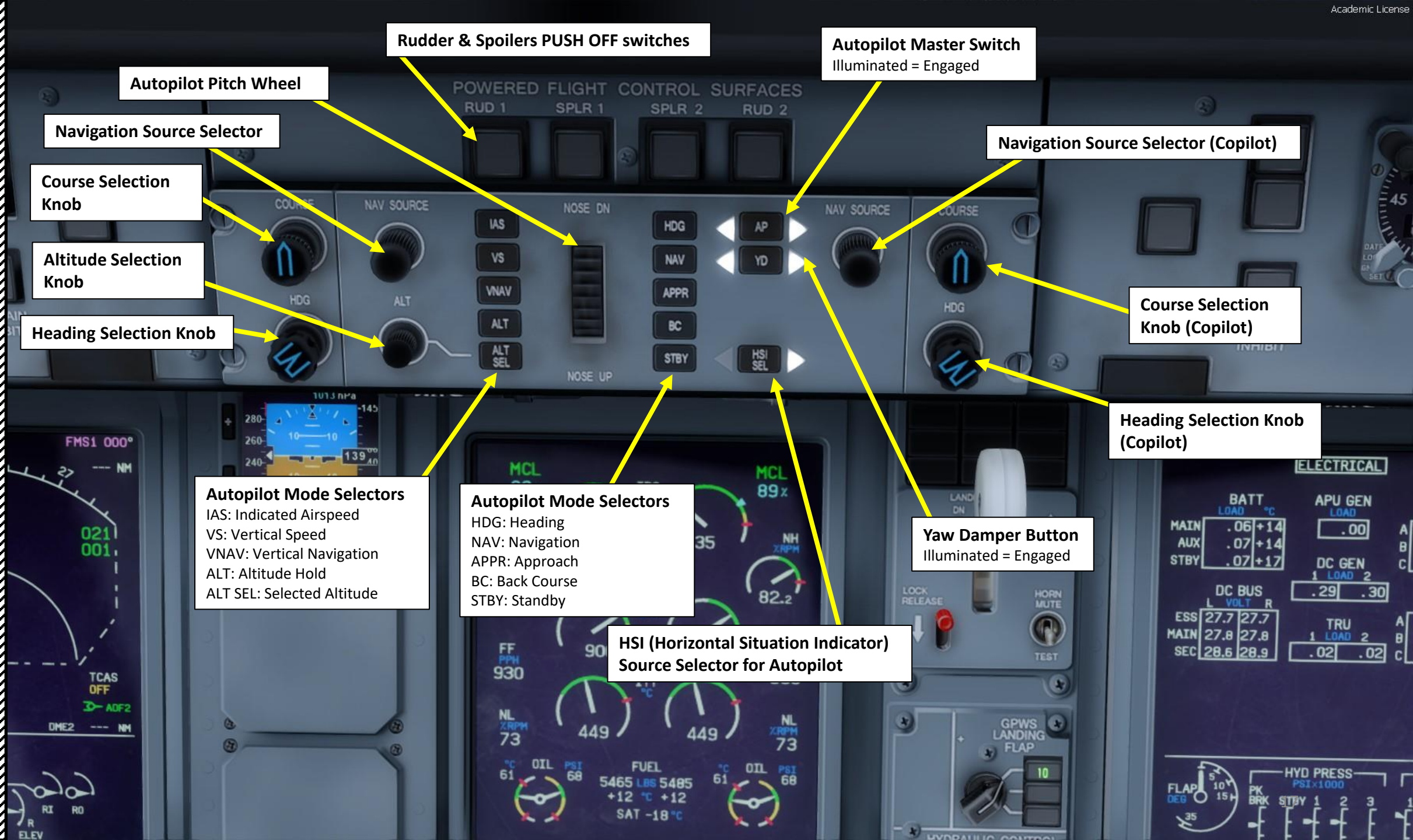
PFD 1 (Primary Flight Display)

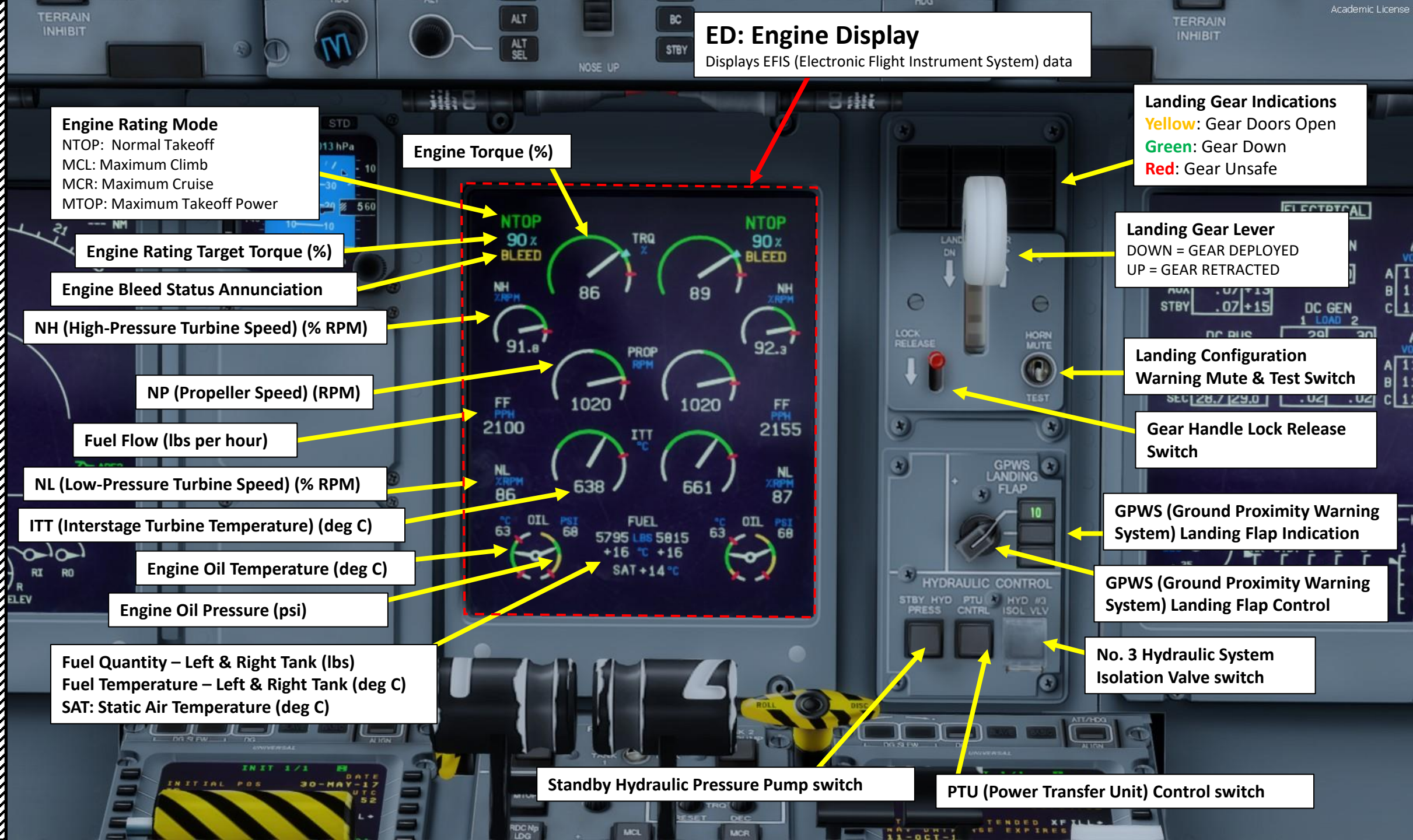
MFD 1 (Multifunction Display)



Pitot Static Isolation Valve Switch

PART 2 – COCKPIT LAYOUT




ED: Engine Display
Displays EFIS (Electronic Flight Instrument System) data
Engine Rating Mode
NTOP: Normal Takeoff
MCL: Maximum Climb
MCR: Maximum Cruise
MTOP: Maximum Takeoff Power
Engine Torque (%)
Engine Rating Target Torque (%)
Engine Bleed Status Annunciation
NH (High-Pressure Turbine Speed) (% RPM)
NP (Propeller Speed) (RPM)
Fuel Flow (lbs per hour)
NL (Low-Pressure Turbine Speed) (% RPM)
ITT (Interstage Turbine Temperature) (deg C)
Engine Oil Temperature (deg C)
Engine Oil Pressure (psi)
Fuel Quantity – Left & Right Tank (lbs)
Fuel Temperature – Left & Right Tank (deg C)
SAT: Static Air Temperature (deg C)
NTOP
90%
BLEED
TRQ %
86
89
NH %RPM
91.8
92.3
PROP RPM
1020
1020
FF PPH
2100
2155
ITT °C
638
661
NL %RPM
86
87
OIL °C
63
OIL PSI
68
FUEL
5795 LBS 5815
+16 °C +16
SAT +14 °C
Landing Gear Indications
Yellow: Gear Doors Open
Green: Gear Down
Red: Gear Unsafe
Landing Gear Lever
DOWN = GEAR DEPLOYED
UP = GEAR RETRACTED
Landing Configuration Warning Mute & Test Switch
Gear Handle Lock Release Switch
GPWS (Ground Proximity Warning System) Landing Flap Indication
GPWS (Ground Proximity Warning System) Landing Flap Control
No. 3 Hydraulic System Isolation Valve switch
Standby Hydraulic Pressure Pump switch
PTU (Power Transfer Unit) Control switch
LOCK RELEASE
HORN MUTE
TEST
GPWS LANDING FLAP
HYDRAULIC CONTROL
STBY HYD PRESS
PTU CNTRL
HYD #3 ISOL VLV


HGS (Head-Up Guidance System) Advisory Panel
Anti-Skid Switch
DOWN = OFF
MIDDLE = ON
UP = TEST
STICK PUSHER SHUT OFF
ELEVATOR TRIM SHUT OFF
TERRAIN INHIBIT
ANTI SKID TEST
ON
OFF
HGS
ELECTRICAL
BATT
APU GEN
AC GEN 1
AC GEN 2
DC GEN
DC BUS
TRU
HDG SEL
ALT SEL
AP
HDG
SPEED BUG
BARO SET
PUSH TO STD
HORN MUTE
LOCK RELEASE


MFD 2 (Multifunction Display)
ELECTRICAL
BATT
LOAD °C
MAIN .06 +14
AUX .07 +14
STBY .07 +17
APU GEN
LOAD
.00
AC GEN 1
VOLT LOAD
A 116 .15
B 116 .15
C 116 .15
DC GEN
1 LOAD 2
.29 .30
AC GEN 2
VOLT LOAD
A 117 .15
B 117 .15
C 117 .15
DC BUS
L VOLT R
ESS 27.7 27.7
MAIN 27.8 27.8
SEC 28.6 28.9
TRU
1 LOAD 2
.02 .02
HYD PRESS
PSIx1000
PK BRK
STBY
HYD QTY
%x100
FLAP
DEG
HDG SEL
AP
ALT
ALT SEL
14000
200 DH
29.92
HDG 245°
ADF1
DME1 28.7 NM
SPEED BUG
SEL
BARO SET
PUSH TO STD
DH MDA
TERRAIN
INHIBIT
ATT/HDG
ALIGN

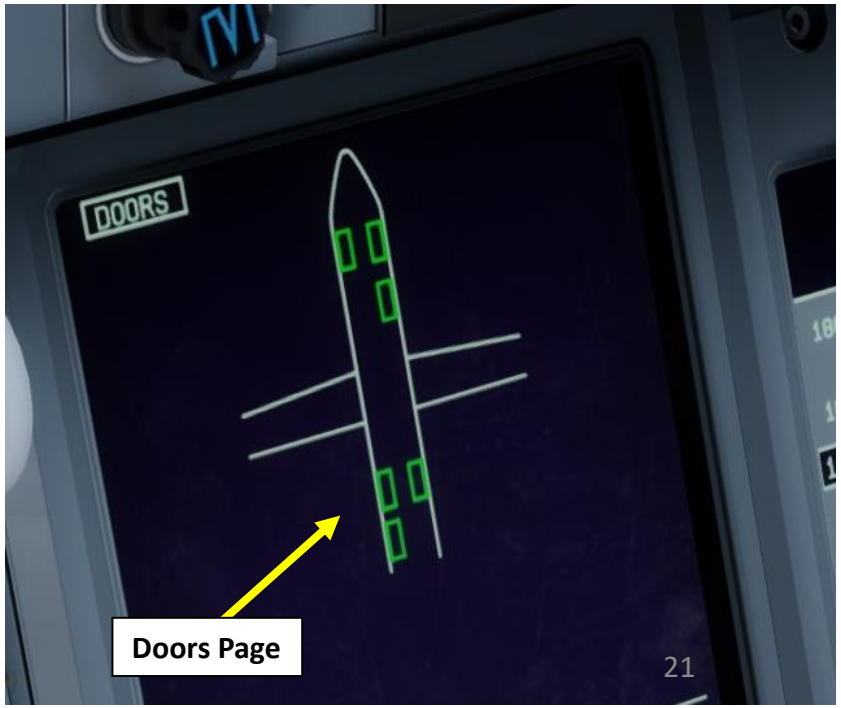
MFD 2 (Multifunction Display) Pages

Electrical Systems Page

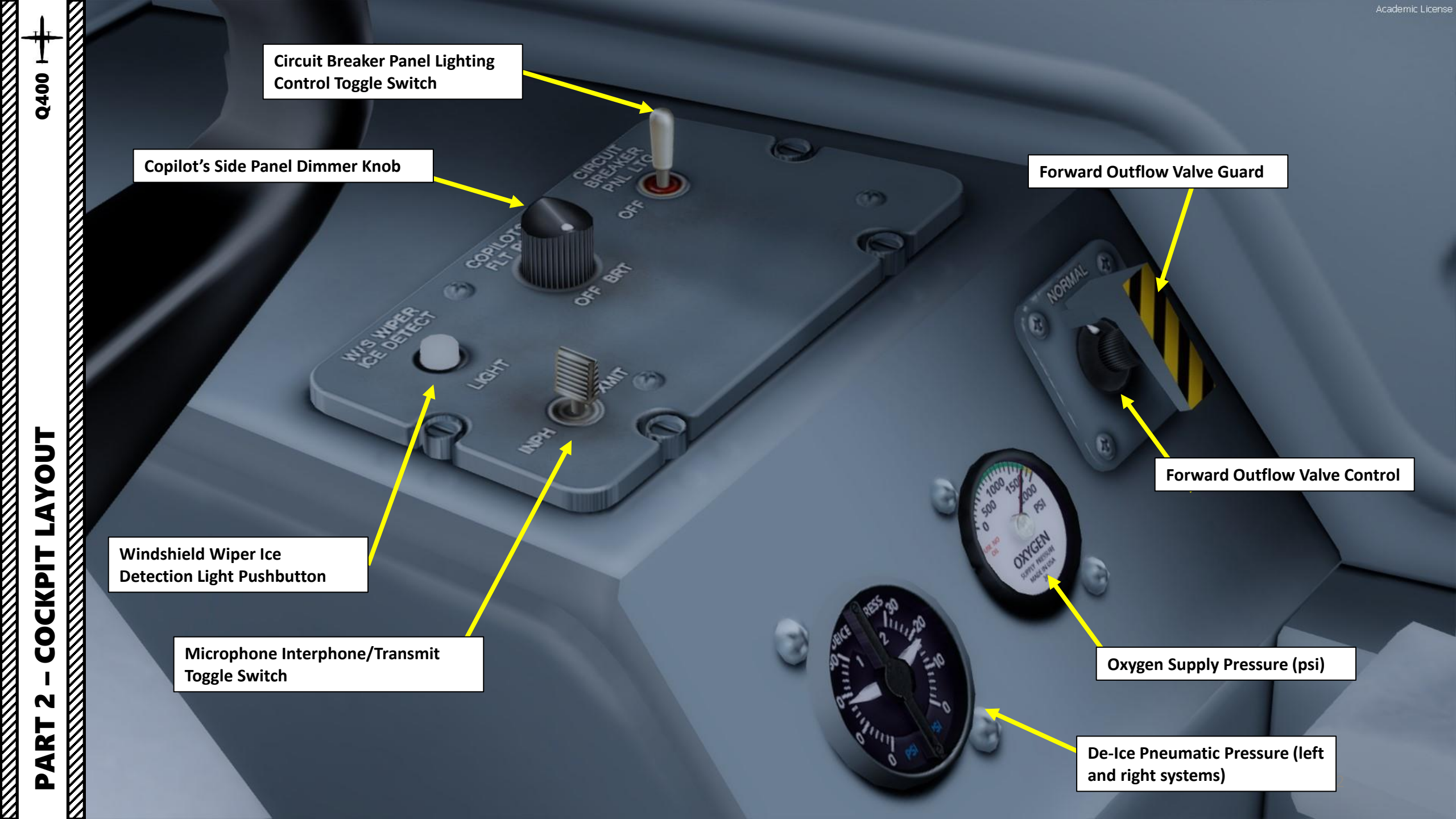
Hydraulic Systems Page

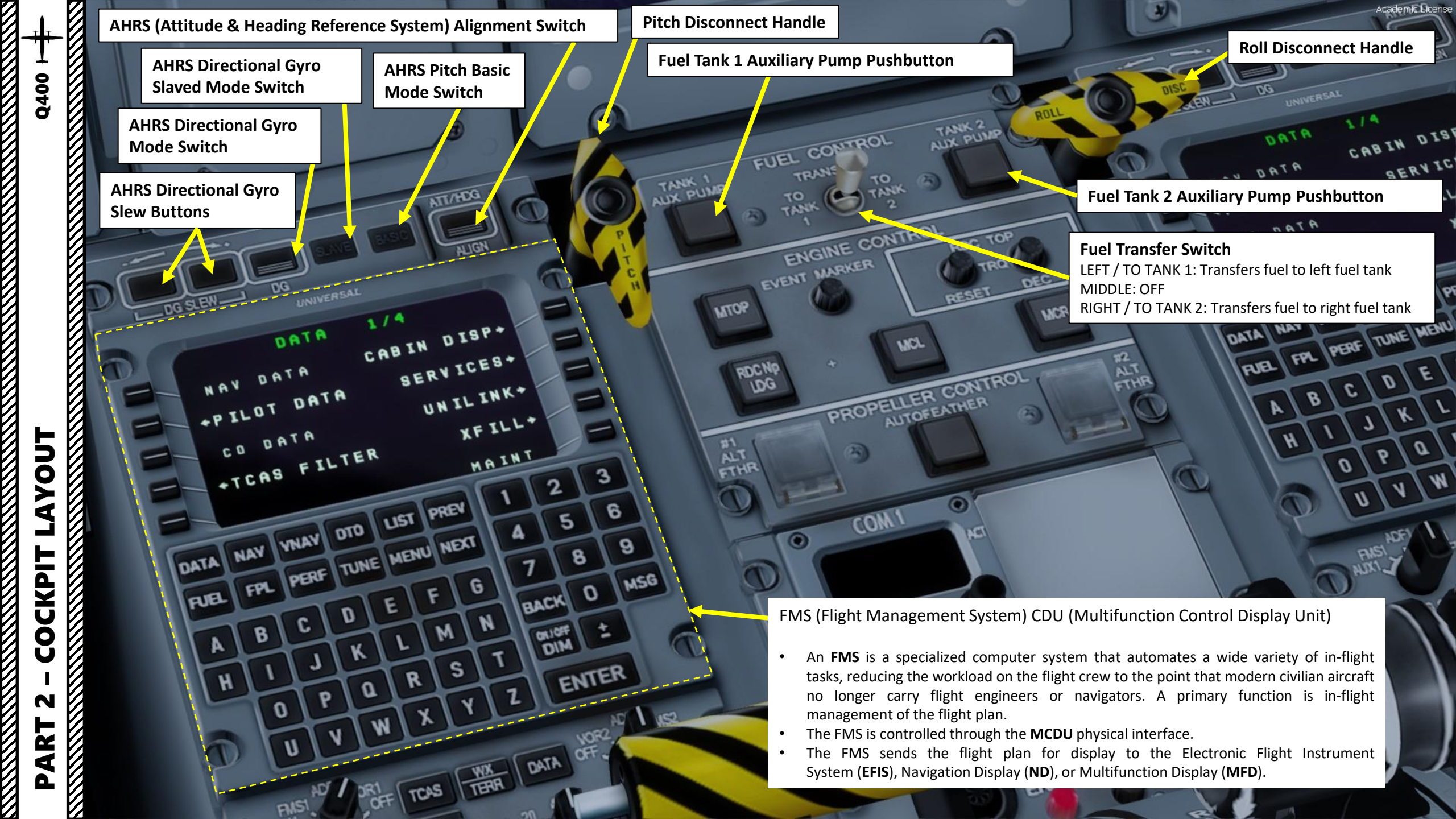
Engine Page

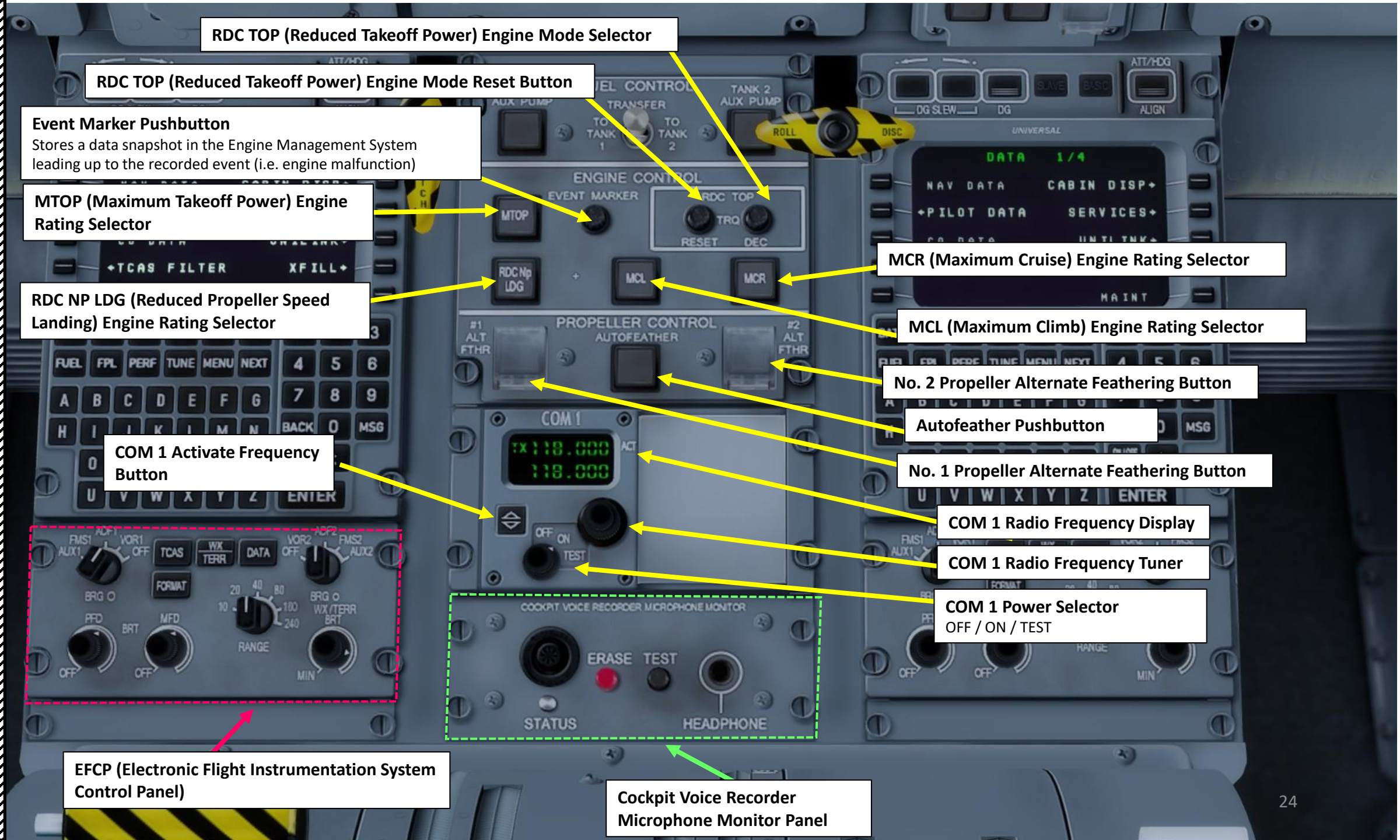
Fuel Systems Page

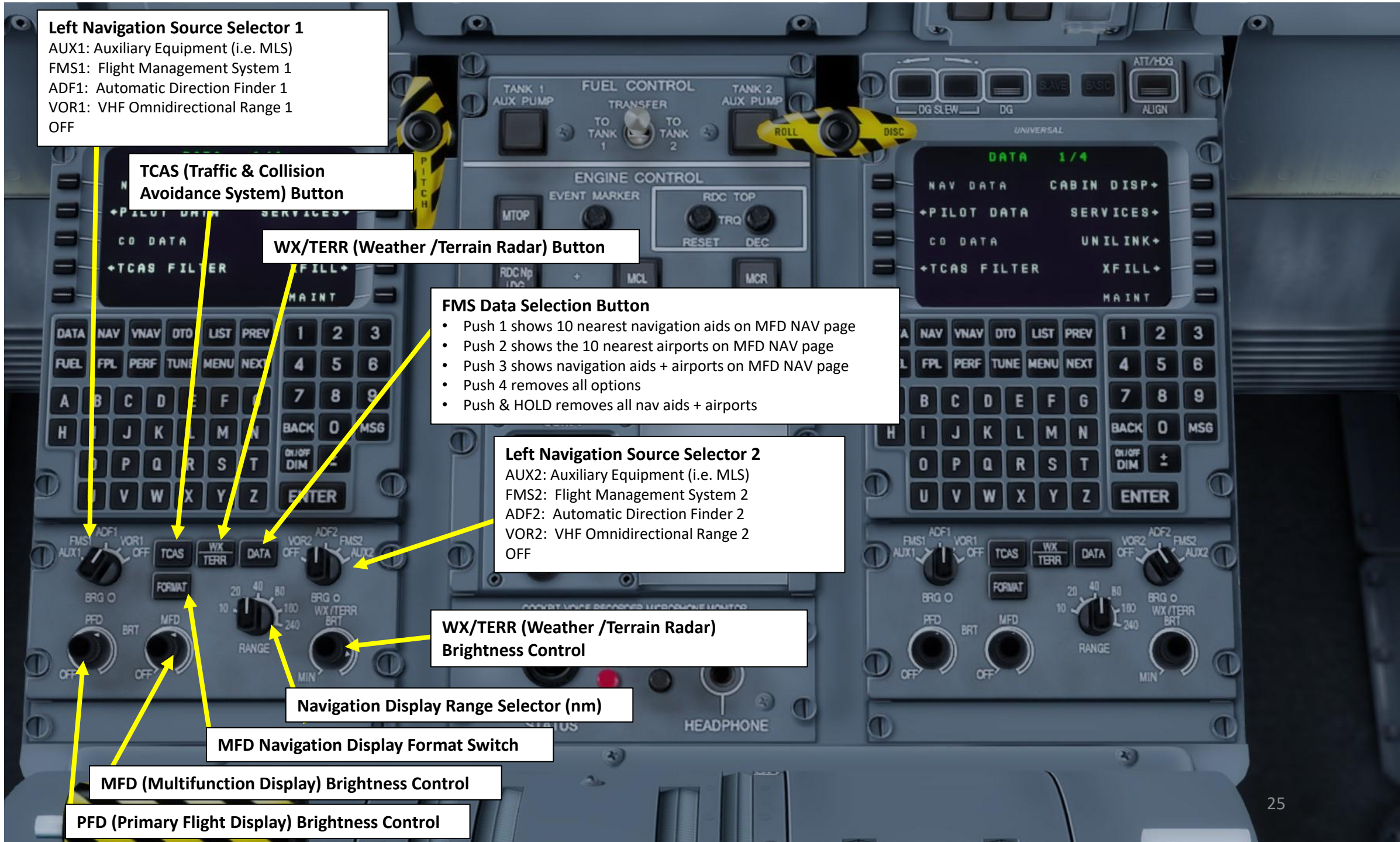


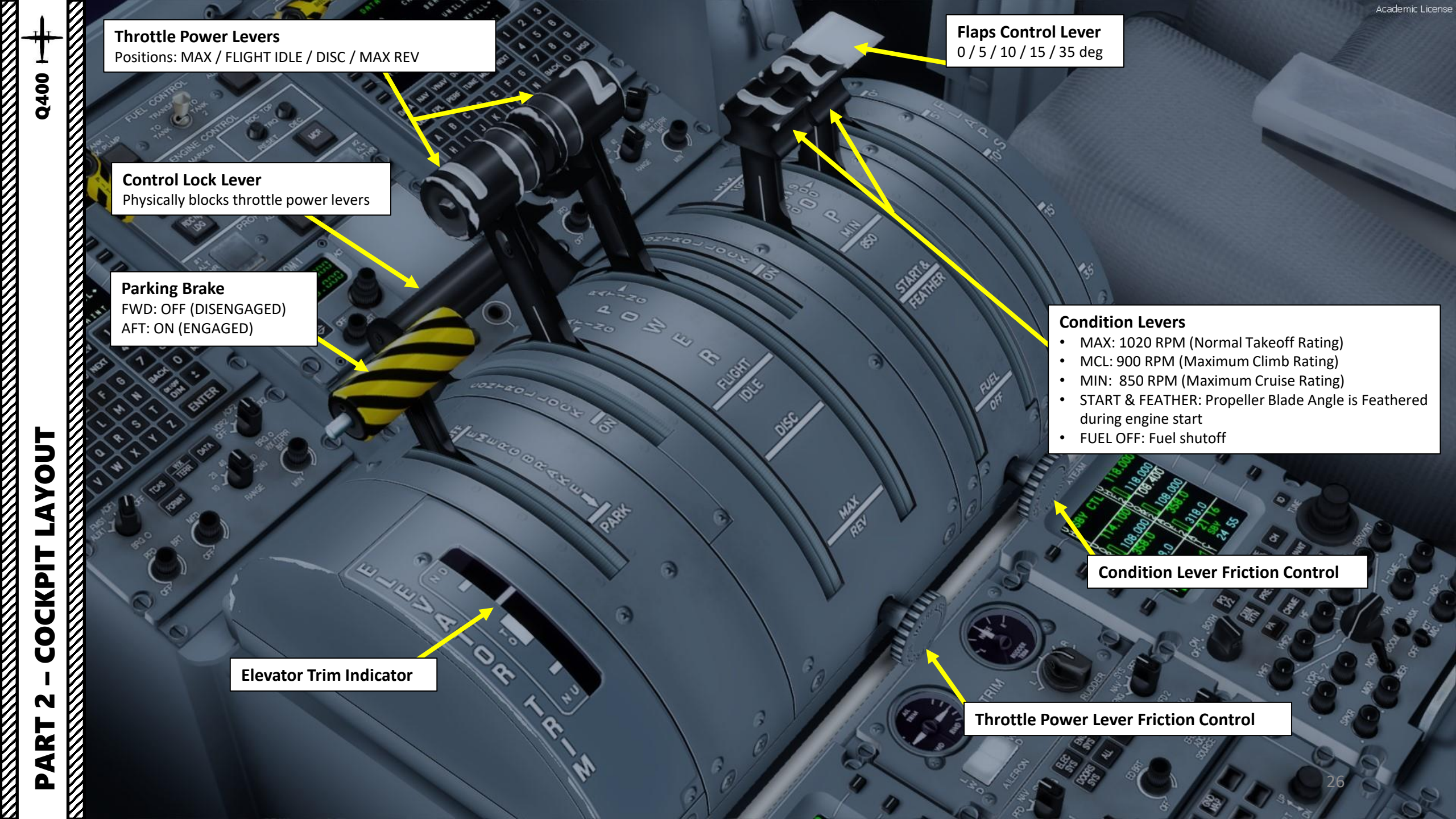
Doors Page




AHRS (Attitude & Heading Reference System) Alignment Switch
AHRS Directional Gyro Slaved Mode Switch
AHRS Pitch Basic Mode Switch
AHRS Directional Gyro Mode Switch
AHRS Directional Gyro Slew Buttons
Pitch Disconnect Handle
Fuel Tank 1 Auxiliary Pump Pushbutton
Roll Disconnect Handle
Fuel Tank 2 Auxiliary Pump Pushbutton
Fuel Transfer Switch
LEFT / TO TANK 1: Transfers fuel to left fuel tank
MIDDLE: OFF
RIGHT / TO TANK 2: Transfers fuel to right fuel tank
FMS (Flight Management System) CDU (Multifunction Control Display Unit)
• An FMS is a specialized computer system that automates a wide variety of in-flight tasks, reducing the workload on the flight crew to the point that modern civilian aircraft no longer carry flight engineers or navigators. A primary function is in-flight management of the flight plan.
• The FMS is controlled through the MCDU physical interface.
• The FMS sends the flight plan for display to the Electronic Flight Instrument System (EFIS), Navigation Display (ND), or Multifunction Display (MFD).


RDC TOP (Reduced Takeoff Power) Engine Mode Selector
RDC TOP (Reduced Takeoff Power) Engine Mode Reset Button
Event Marker Pushbutton
Stores a data snapshot in the Engine Management System leading up to the recorded event (i.e. engine malfunction)
MTOP (Maximum Takeoff Power) Engine Rating Selector
RDC NP LDG (Reduced Propeller Speed Landing) Engine Rating Selector
COM 1 Activate Frequency Button
MCR (Maximum Cruise) Engine Rating Selector
MCL (Maximum Climb) Engine Rating Selector
No. 2 Propeller Alternate Feathering Button
Autofeather Pushbutton
No. 1 Propeller Alternate Feathering Button
COM 1 Radio Frequency Display
COM 1 Radio Frequency Tuner
COM 1 Power Selector
OFF / ON / TEST
EFCP (Electronic Flight Instrumentation System Control Panel)
Cockpit Voice Recorder Microphone Monitor Panel
ENGINE CONTROL
EVENT MARKER
RDC TOP
TRQ
RESET
DEC
MTOP
RDC Np LDG
MCL
MCR
PROPELLER CONTROL
AUTOFEATHER
#1 ALT FTHR
#2 ALT FTHR
COM 1
118.000
ACT
OFF ON TEST
COCKPIT VOICE RECORDER MICROPHONE MONITOR
ERASE
TEST
STATUS
HEADPHONE
TCAS
WX TERR
DATA
FORMAT
RANGE
PFD
MFD
BRT
ATT/HDG
DG SLEW
DG
ALIGN
ROLL
DISC
UNIVERSAL
DATA 1/4
NAV DATA
CABIN DISP
PILOT DATA
SERVICES
MAINT
TCAS FILTER
XFILL
FUEL
FPL
PERF
TUNE
MENU
NEXT
ENTER
BACK
MSG


Left Navigation Source Selector 1
AUX1: Auxiliary Equipment (i.e. MLS)
FMS1: Flight Management System 1
ADF1: Automatic Direction Finder 1
VOR1: VHF Omnidirectional Range 1
OFF
TCAS (Traffic & Collision Avoidance System) Button
WX/TERR (Weather /Terrain Radar) Button
FMS Data Selection Button
• Push 1 shows 10 nearest navigation aids on MFD NAV page
• Push 2 shows the 10 nearest airports on MFD NAV page
• Push 3 shows navigation aids + airports on MFD NAV page
• Push 4 removes all options
• Push & HOLD removes all nav aids + airports
Left Navigation Source Selector 2
AUX2: Auxiliary Equipment (i.e. MLS)
FMS2: Flight Management System 2
ADF2: Automatic Direction Finder 2
VOR2: VHF Omnidirectional Range 2
OFF
WX/TERR (Weather /Terrain Radar) Brightness Control
Navigation Display Range Selector (nm)
MFD Navigation Display Format Switch
MFD (Multifunction Display) Brightness Control
PFD (Primary Flight Display) Brightness Control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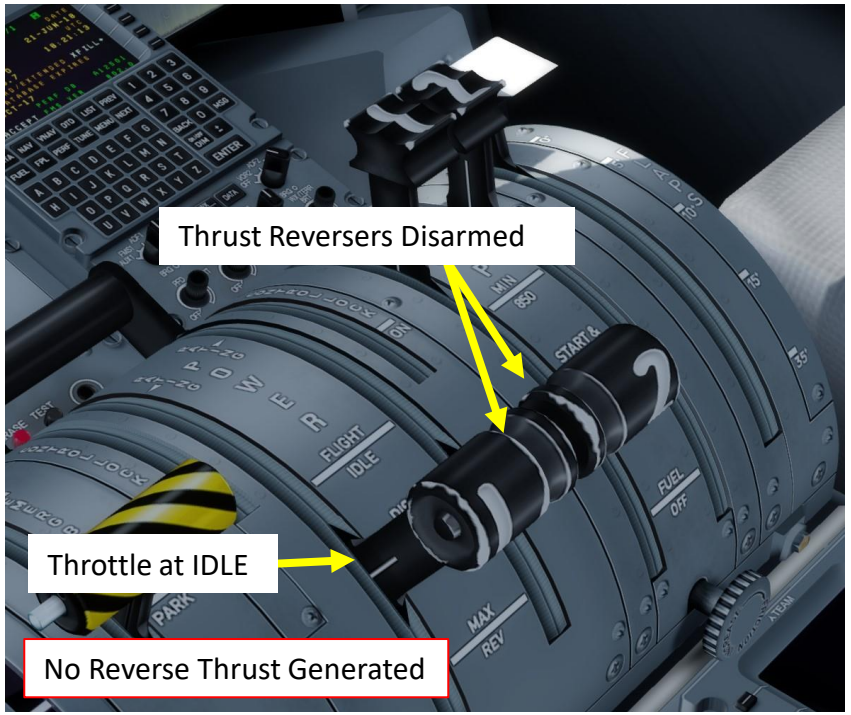
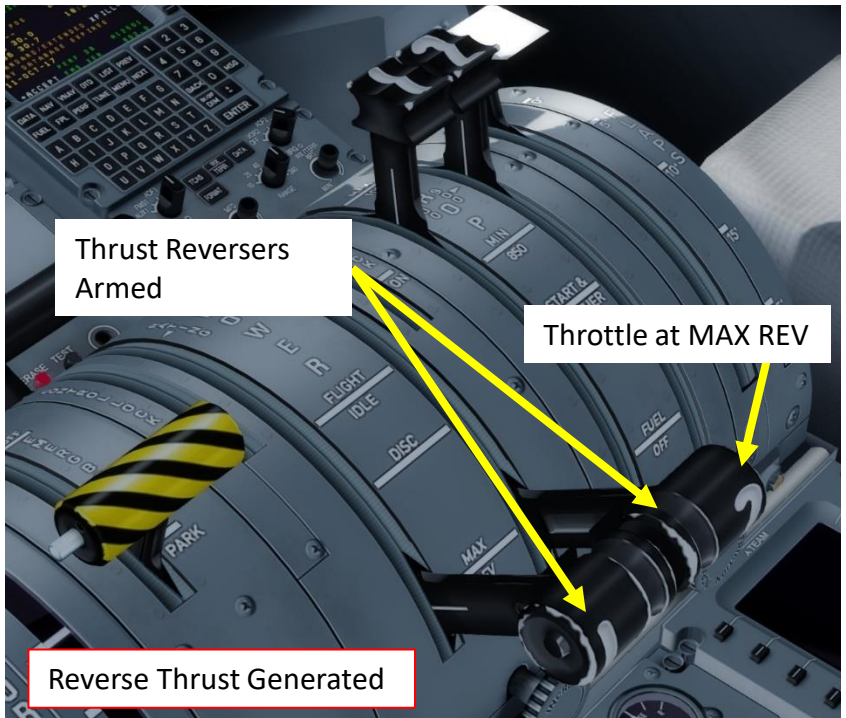
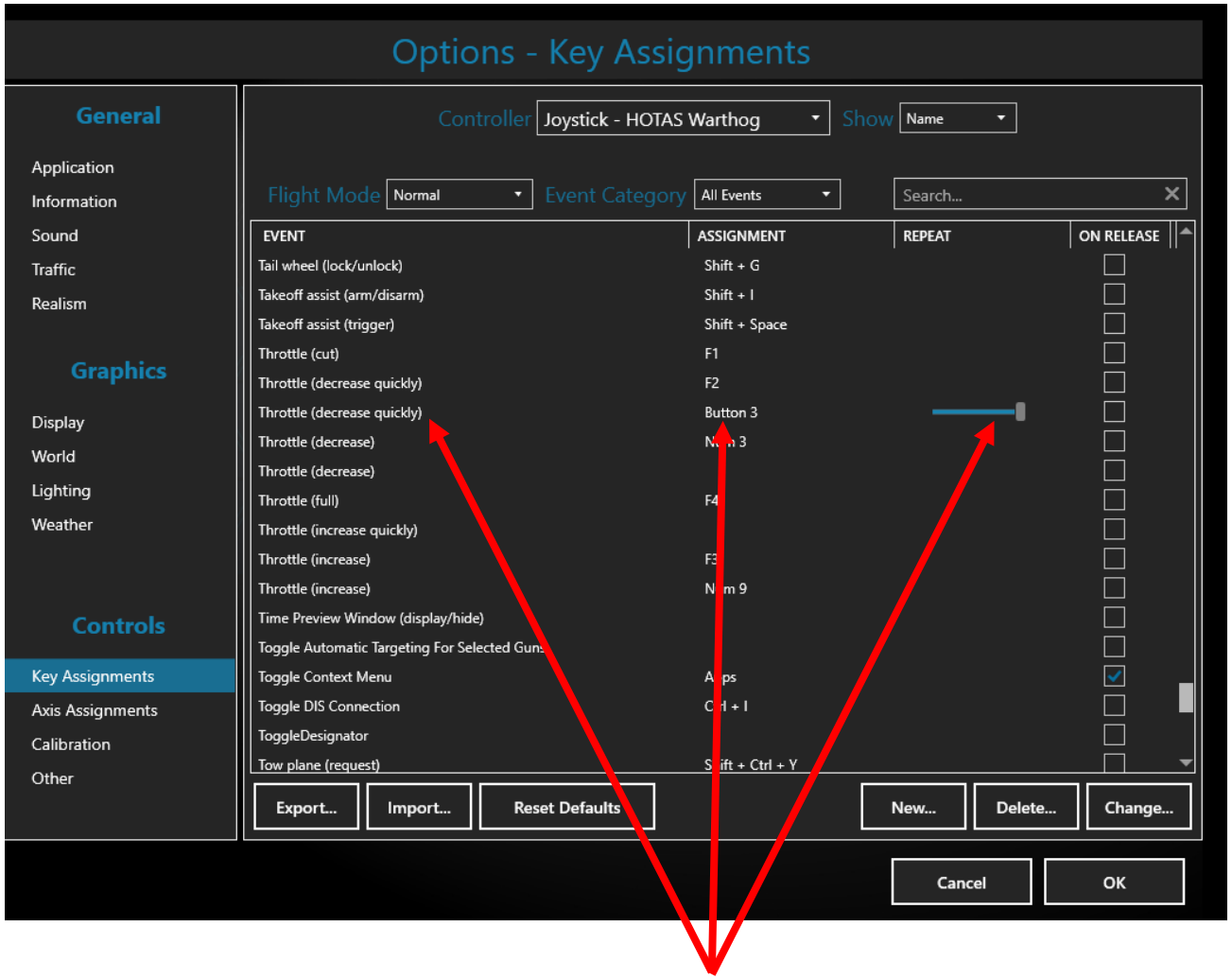
Throttle Power Levers
Positions: MAX / FLIGHT IDLE / DISC / MAX REV
Flaps Control Lever
0 / 5 / 10 / 15 / 35 deg
Control Lock Lever
Physically blocks throttle power levers
Parking Brake
FWD: OFF (DISENGAGED)
AFT: ON (ENGAGED)
Condition Levers
• MAX: 1020 RPM (Normal Takeoff Rating)
• MCL: 900 RPM (Maximum Climb Rating)
• MIN: 850 RPM (Maximum Cruise Rating)
• START & FEATHER: Propeller Blade Angle is Feathered during engine start
• FUEL OFF: Fuel shutoff
Condition Lever Friction Control
Throttle Power Lever Friction Control
Elevator Trim Indicator

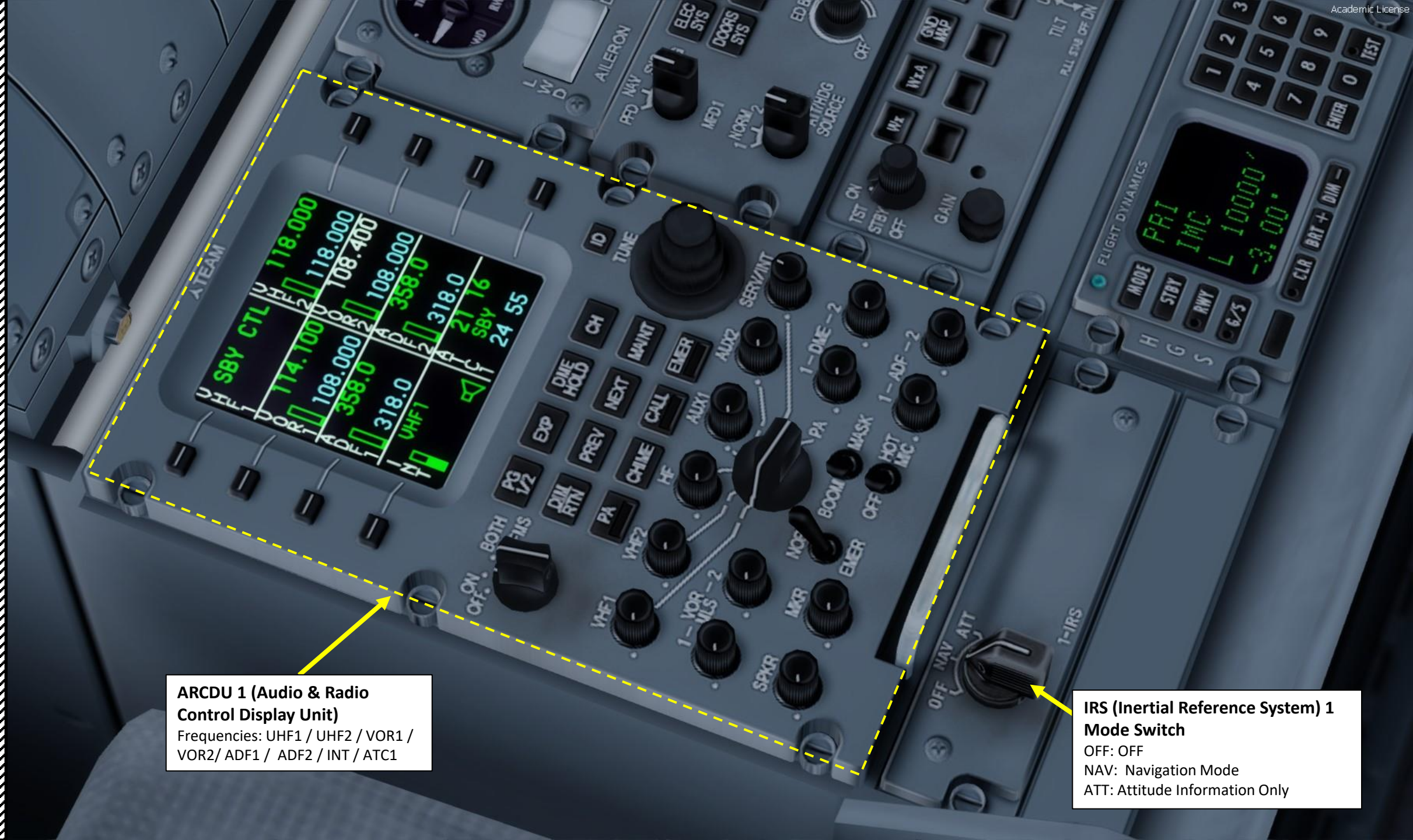


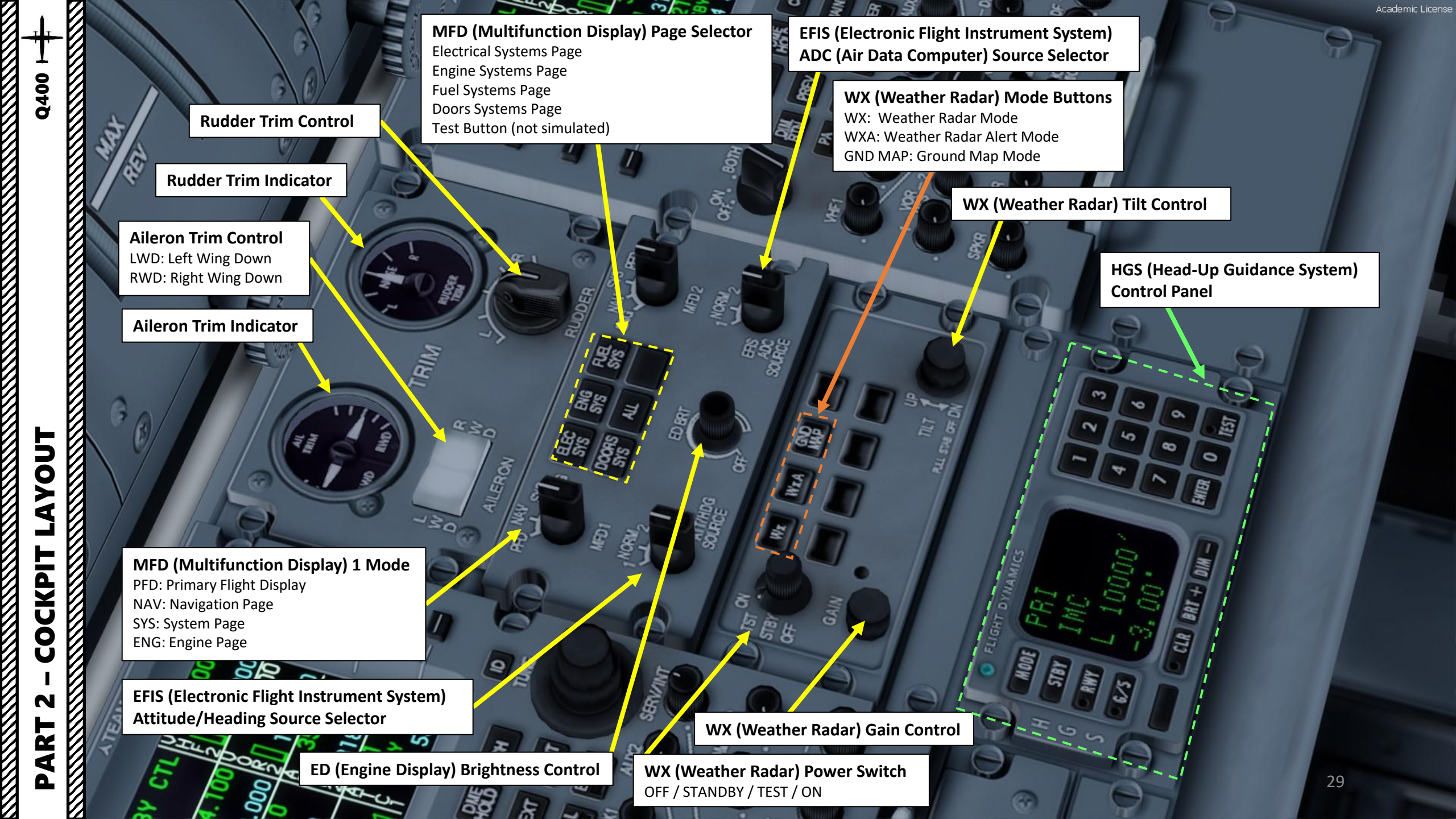


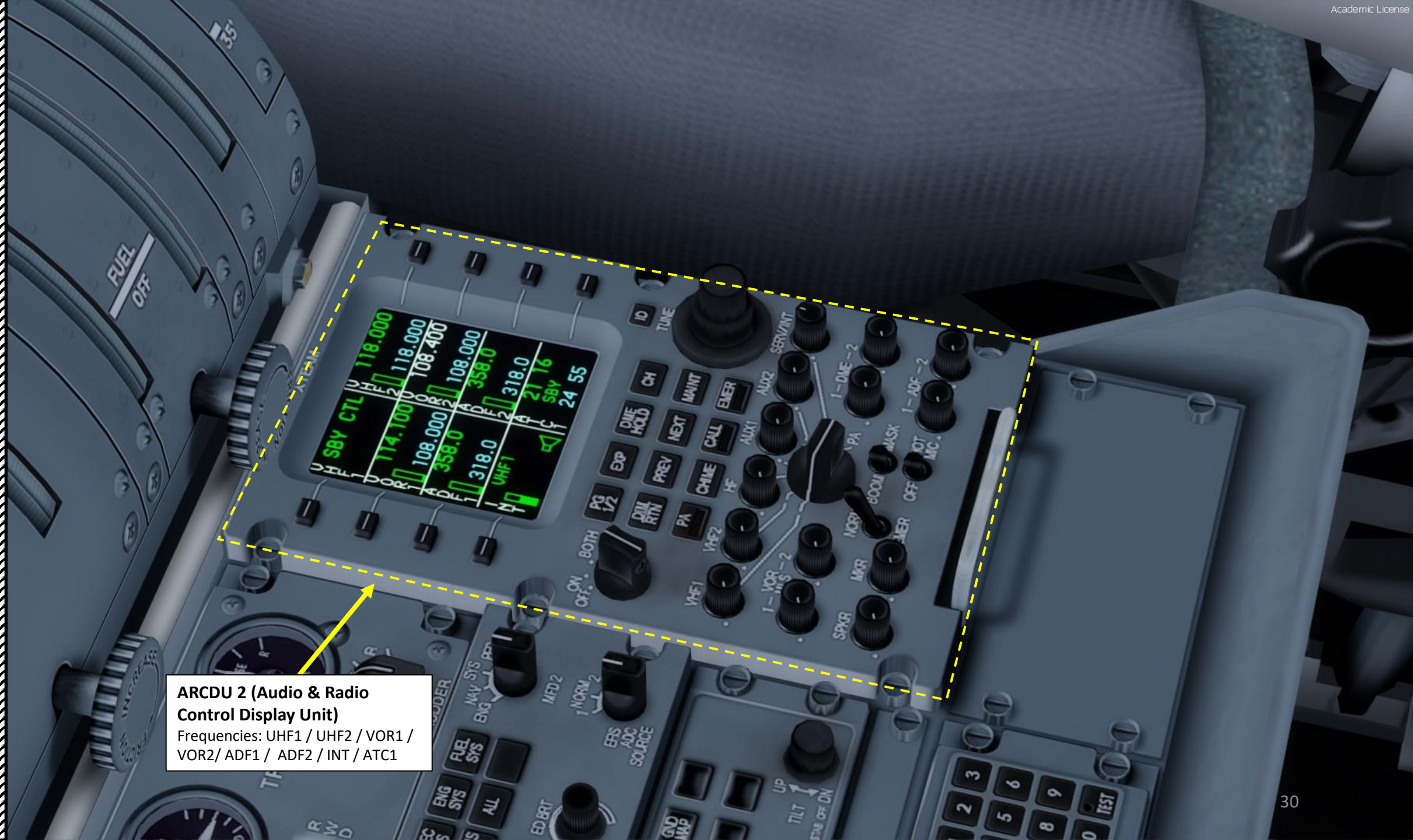


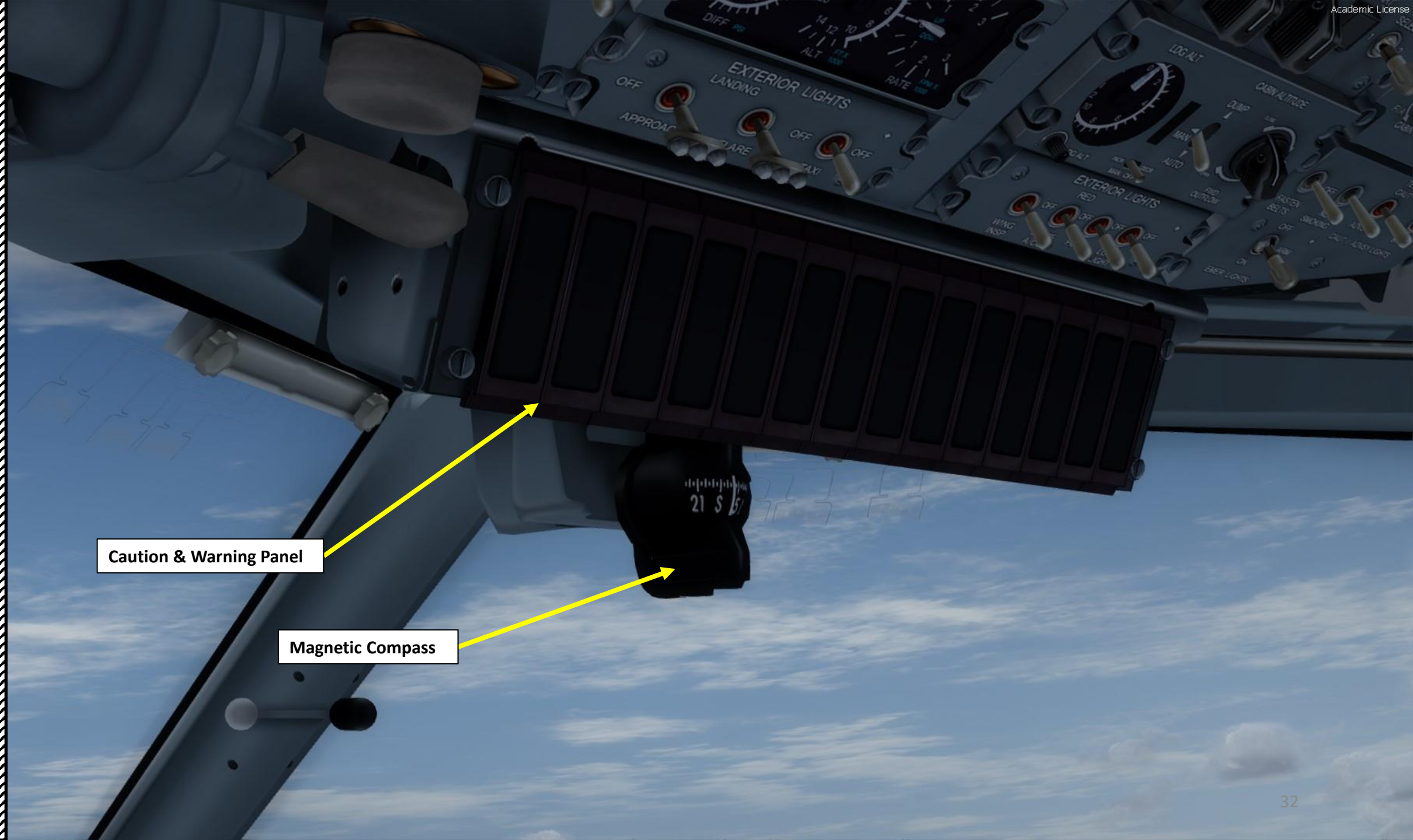
The Thrust Reverser lever can be moved by pressing and holding the “Throttle (decrease quickly)” control mapped to your joystick. Make sure that the “Repeat” slider is set fully to the right. The default key binding is “F2”.

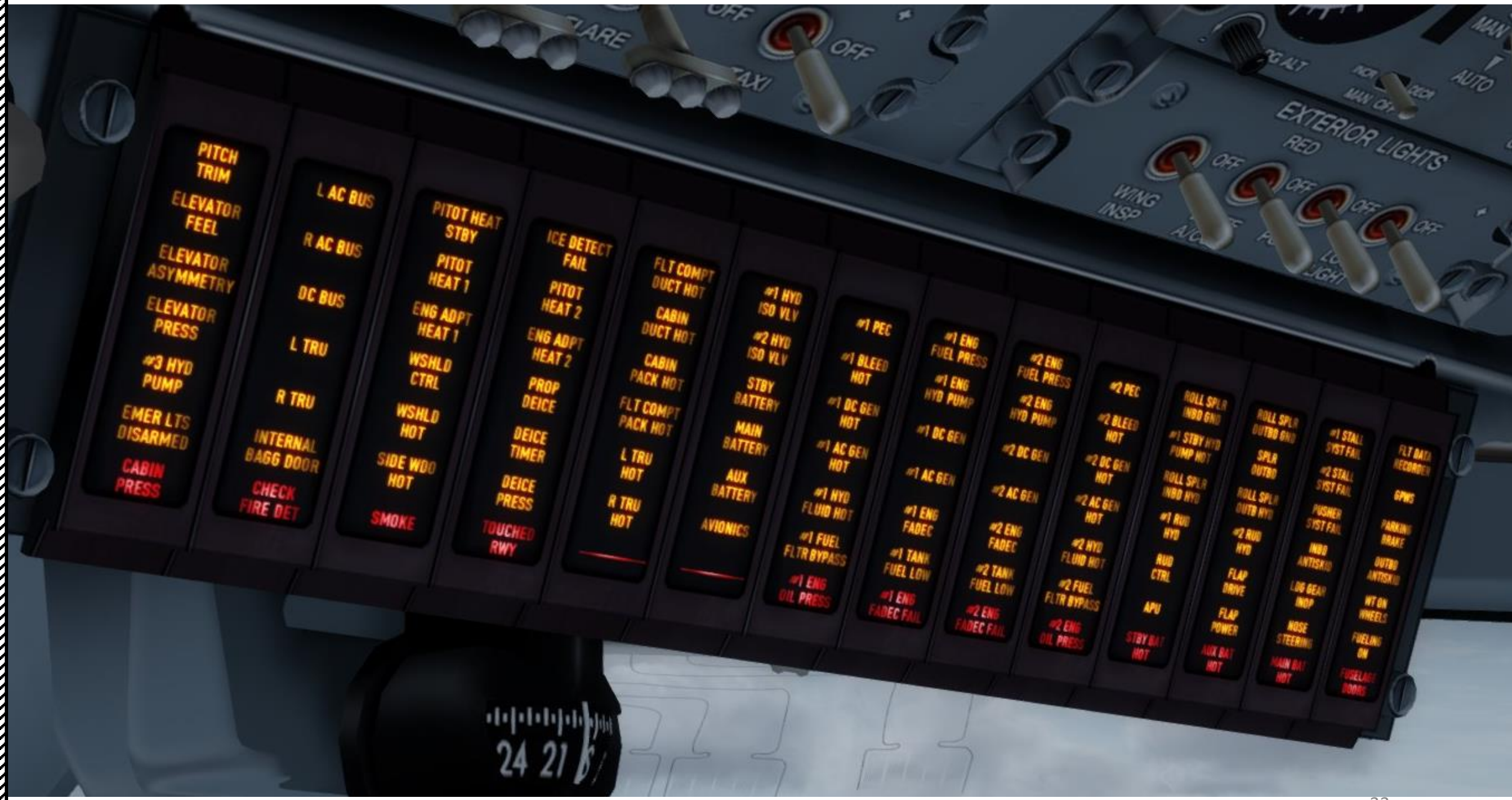
Take note that the Reverse Thrust lever can only be engaged if your throttle is at IDLE. The reason for that is a mechanical stopper that prevents you from engaging thrust reversers at high throttle settings.

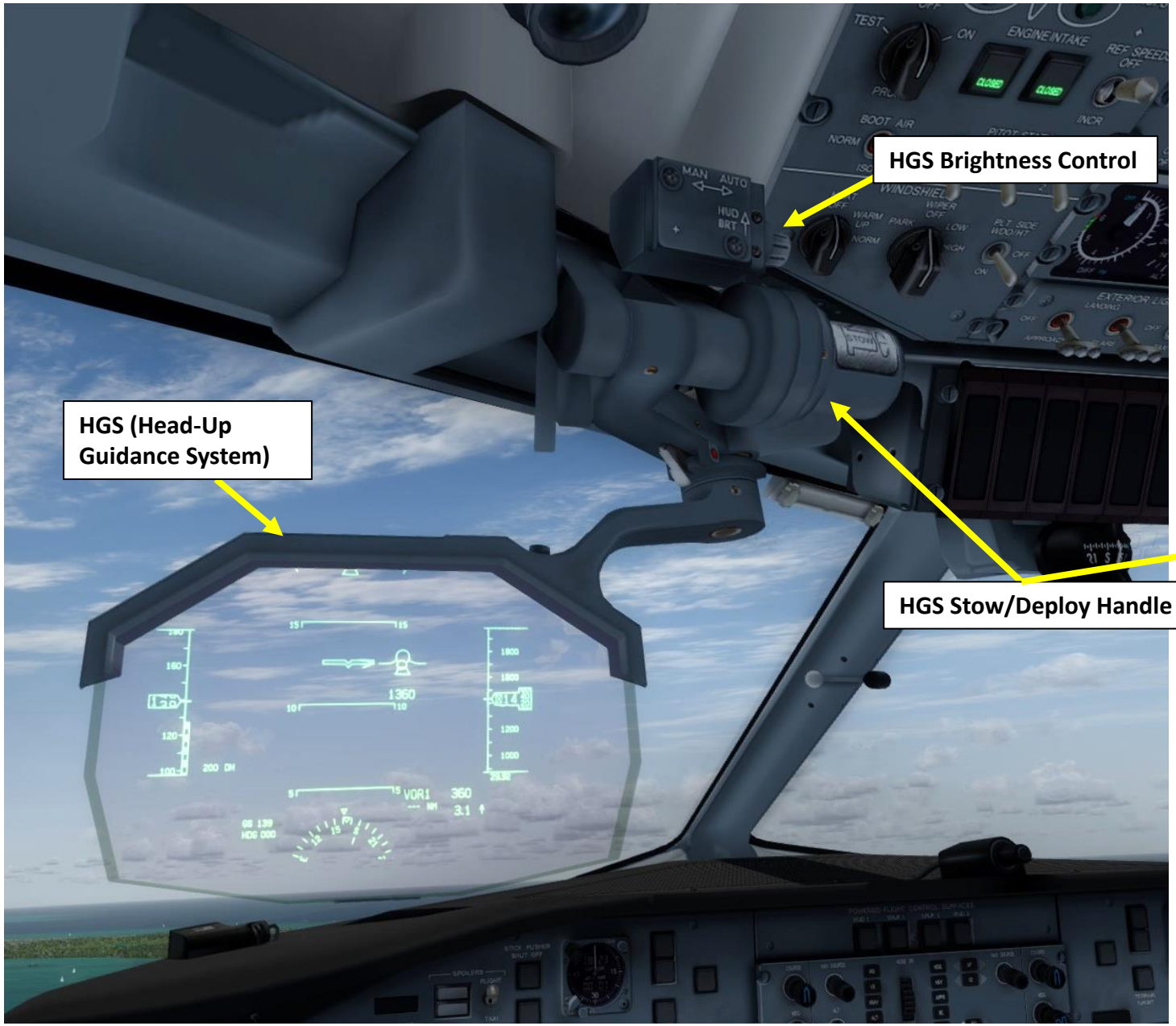

ARCDU 1 (Audio & Radio Control Display Unit)
Frequencies: UHF1 / UHF2 / VOR1 / VOR2/ ADF1 / ADF2 / INT / ATC1
IRS (Inertial Reference System) 1 Mode Switch
OFF: OFF
NAV: Navigation Mode
ATT: Attitude Information Only

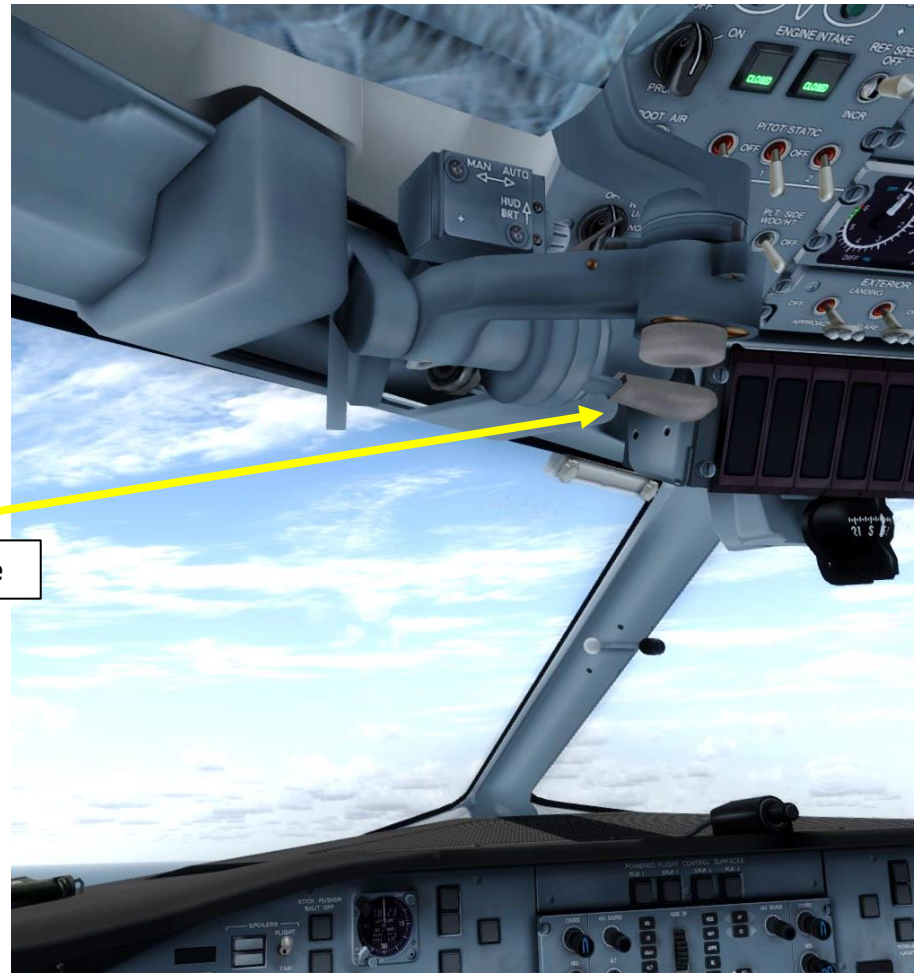


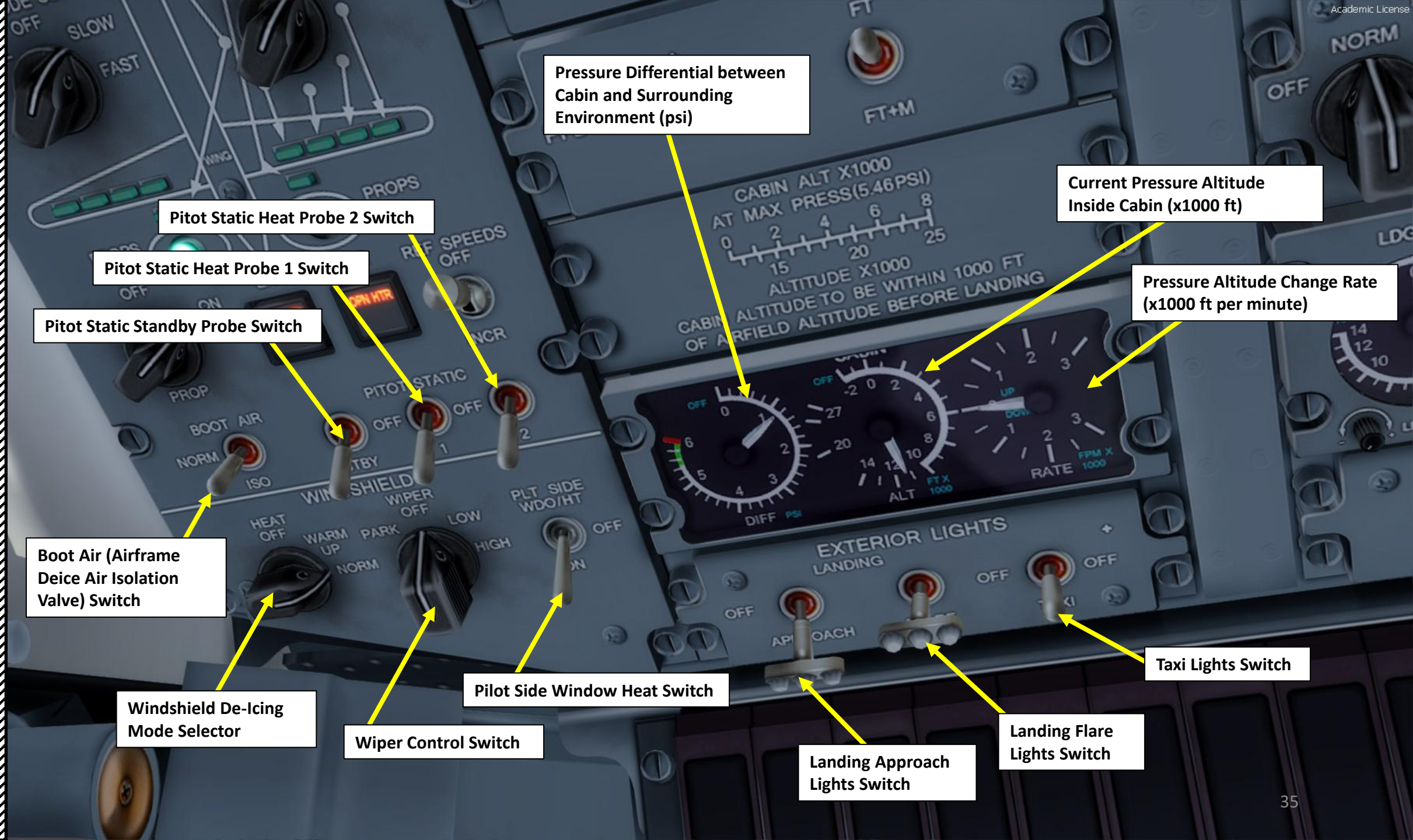


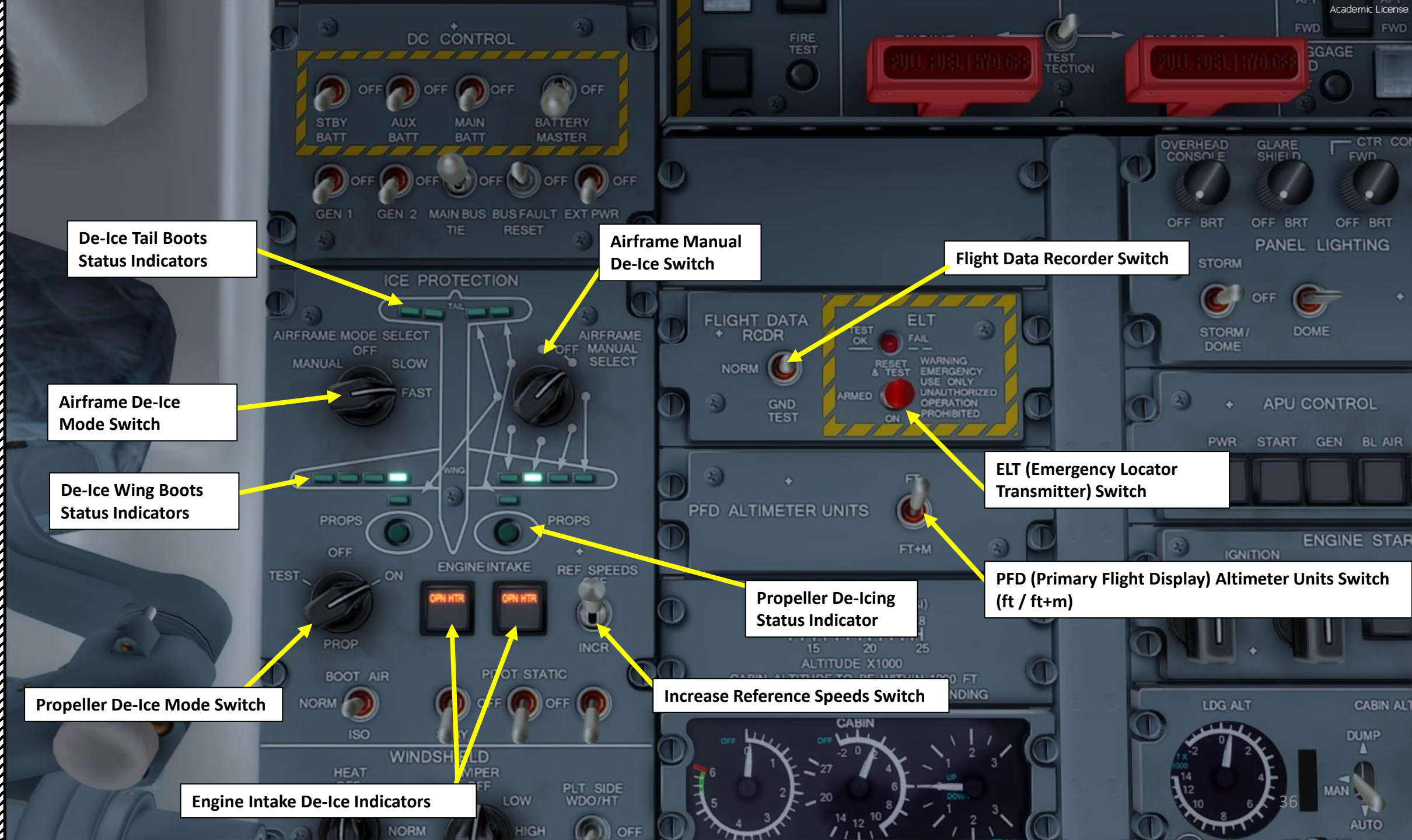



PITCH TRIM
ELEVATOR FEEL
ELEVATOR ASYMMETRY
ELEVATOR PRESS
#3 HYD PUMP
EMER LTS DISARMED
CABIN PRESS
L AC BUS
R AC BUS
DC BUS
L TRU
R TRU
INTERNAL BAGG DOOR
CHECK FIRE DET
PITOT HEAT STBY
PITOT HEAT 1
ENG ADPT HEAT 1
WSHLD CTRL
WSHLD HOT
SIDE WDO HOT
SMOKE
ICE DETECT FAIL
PITOT HEAT 2
ENG ADPT HEAT 2
PROP DEICE
DEICE TIMER
DEICE PRESS
TOUCHED RWY
FLT COMPT DUCT HOT
CABIN DUCT HOT
CABIN PACK HOT
FLT COMPT PACK HOT
L TRU HOT
R TRU HOT
#1 HYD ISO VLV
#2 HYD ISO VLV
STBY BATTERY
MAIN BATTERY
AUX BATTERY
AVIONICS
#1 PEC
#1 BLEED HOT
#1 DC GEN HOT
#1 AC GEN HOT
#1 HYD FLUID HOT
#1 FUEL FLTR BYPASS
#1 ENG OIL PRESS
#1 ENG FUEL PRESS
#1 ENG HYD PUMP
#1 DC GEN
#1 AC GEN
#1 ENG FADEC
#1 TANK FUEL LOW
#1 ENG FADEC FAIL
#2 ENG FUEL PRESS
#2 ENG HYD PUMP
#2 DC GEN
#2 AC GEN
#2 ENG FADEC
#2 TANK FUEL LOW
#2 ENG FADEC FAIL
#2 PEC
#2 BLEED HOT
#2 DC GEN HOT
#2 AC GEN HOT
#2 HYD FLUID HOT
#2 FUEL FLTR BYPASS
#2 ENG OIL PRESS
ROLL SPLR INBD GND
#1 STBY HYD PUMP HOT
ROLL SPLR INBD HYD
#1 RUD HYD
RUD CTRL
APU
STBY BAT HOT
ROLL SPLR OUTBD GND
SPLR OUTBD
ROLL SPLR OUTB HYD
#2 RUD HYD
FLAP DRIVE
FLAP POWER
AUX BAT HOT
#1 STALL SYST FAIL
#2 STALL SYST FAIL
PUSHER SYST FAIL
INBD ANTISKID
LDG GEAR INOP
NOSE STEERING
MAIN BAT HOT
FLT DATA RECORDER
GPWS
PARKING BRAKE
OUTBD ANTISKID
WT ON WHEELS
FUELING ON
FUSELAGE DOORS
EXTERIOR LIGHTS
RED
WING INSP
OFF
TAXI
LANDING
AUTO

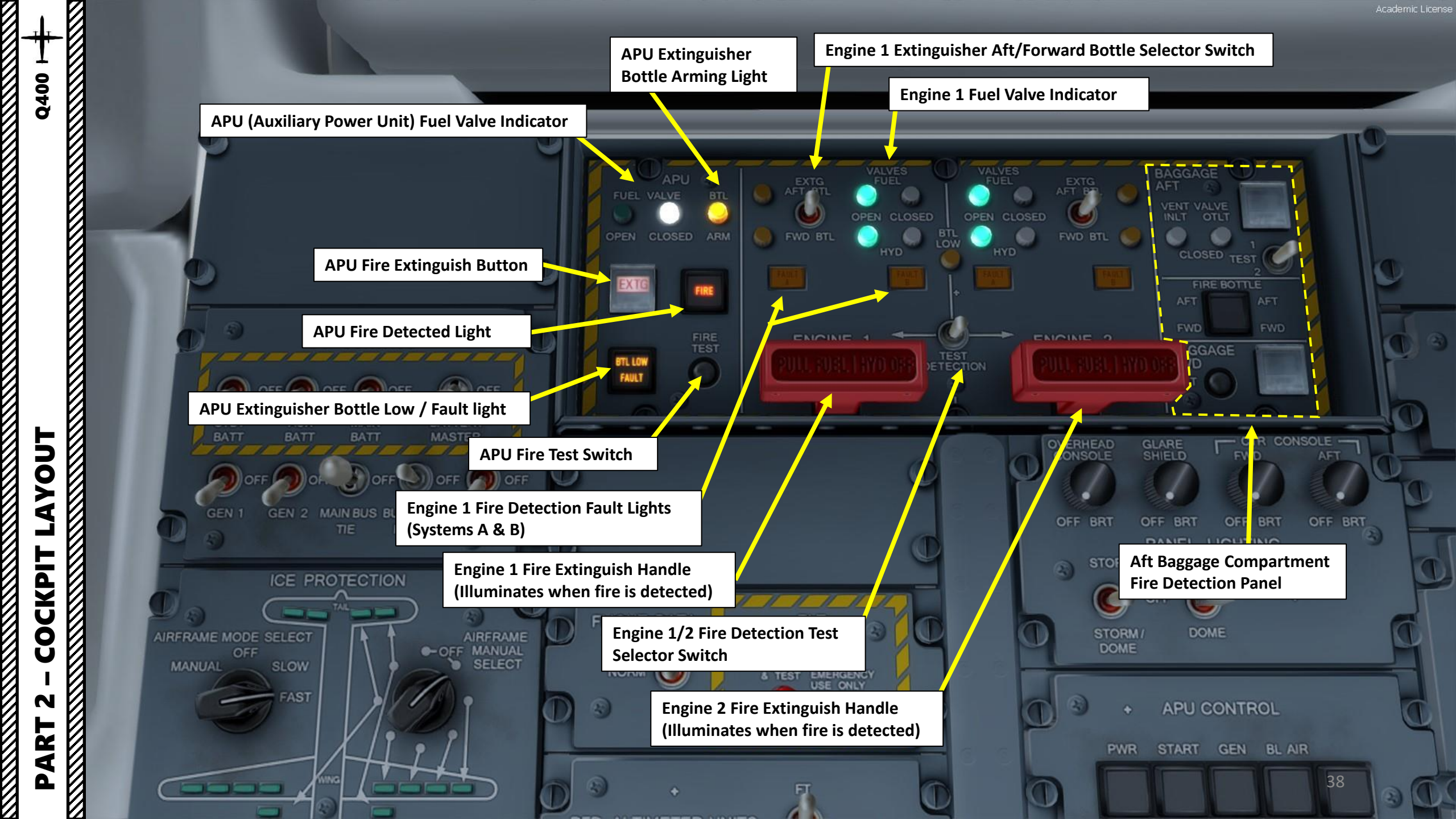

HGS Brightness Control
HGS (Head-Up Guidance System)
HGS Stow/Deploy Handle

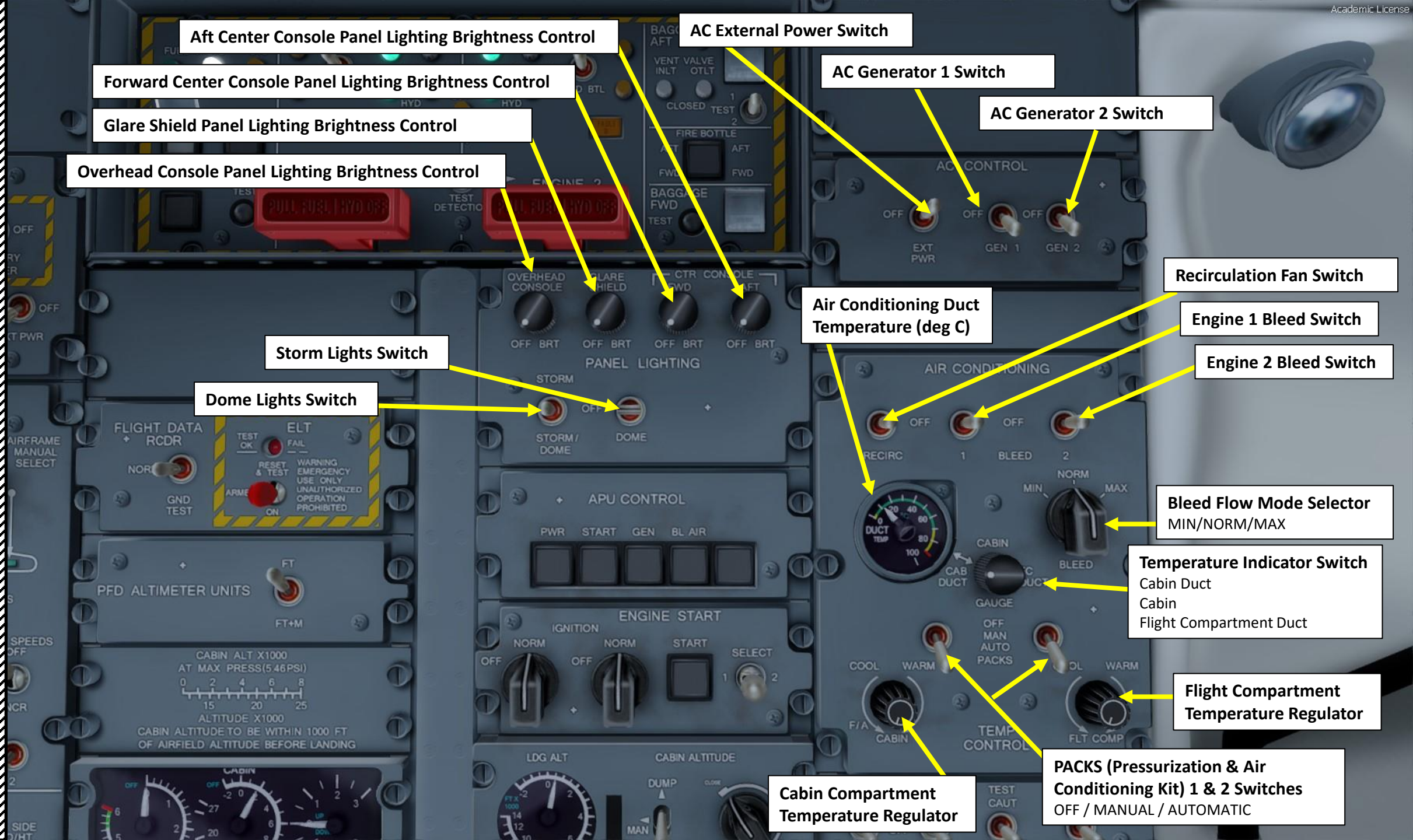


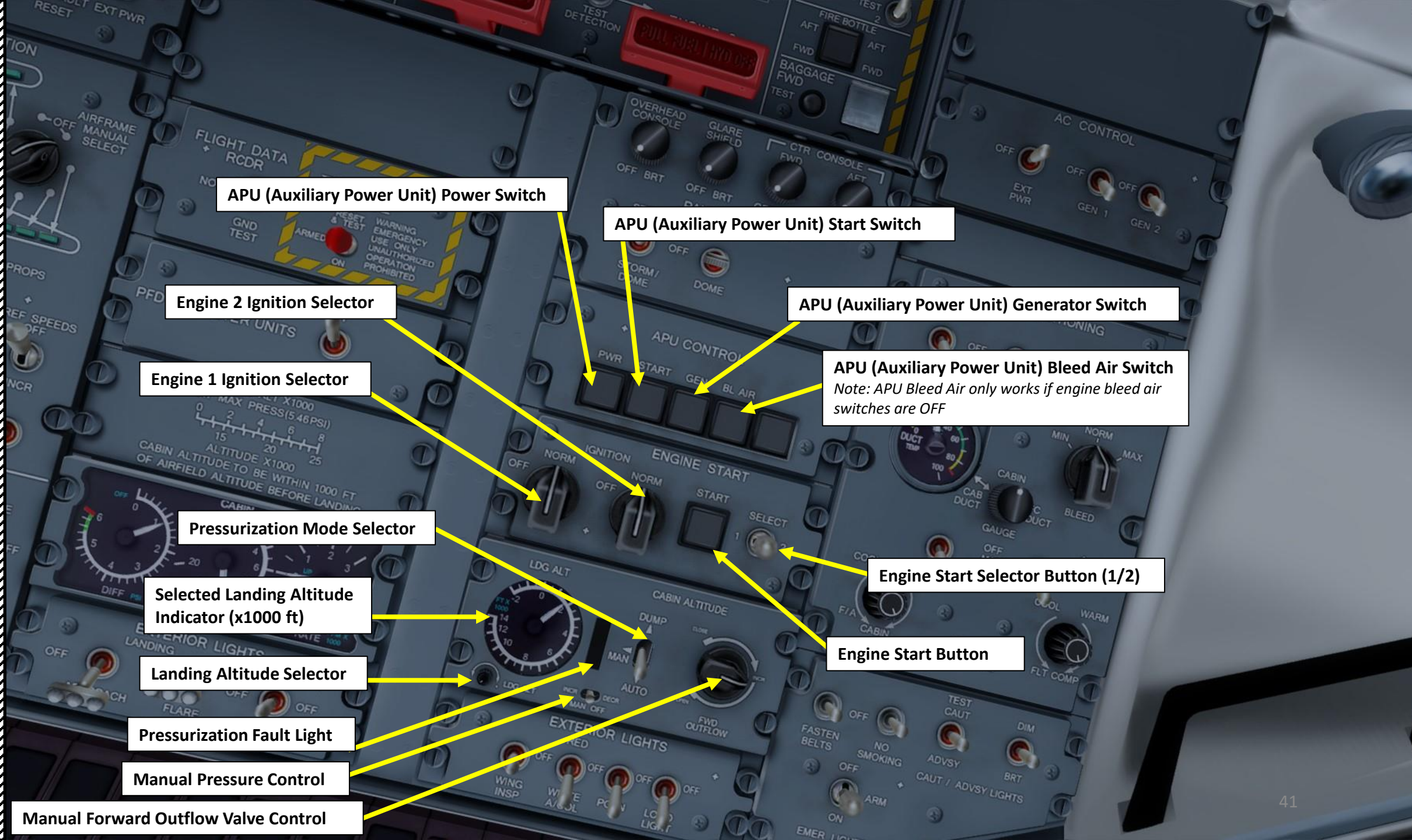

Pressure Differential between Cabin and Surrounding Environment (psi)
Current Pressure Altitude Inside Cabin (x1000 ft)
Pressure Altitude Change Rate (x1000 ft per minute)
Pitot Static Heat Probe 2 Switch
Pitot Static Heat Probe 1 Switch
Pitot Static Standby Probe Switch
Boot Air (Airframe Deice Air Isolation Valve) Switch
Windshield De-Icing Mode Selector
Wiper Control Switch
Pilot Side Window Heat Switch
Taxi Lights Switch
Landing Flare Lights Switch
Landing Approach Lights Switch
CABIN ALT X1000
AT MAX PRESS(5.46PSI)
ALTITUDE X1000
CABIN ALTITUDE TO BE WITHIN 1000 FT
OF AIRFIELD ALTITUDE BEFORE LANDING
DIFF PSI
ALT FT X 1000
RATE FPM X 1000
EXTERIOR LIGHTS
LANDING
PITOT STATIC
BOOT AIR
WINDSHIELD
WIPER
PLT SIDE WDO/HT
PROPS
PROP
REF SPEEDS
FT
FT+M
NORM
OFF
SLOW
FAST

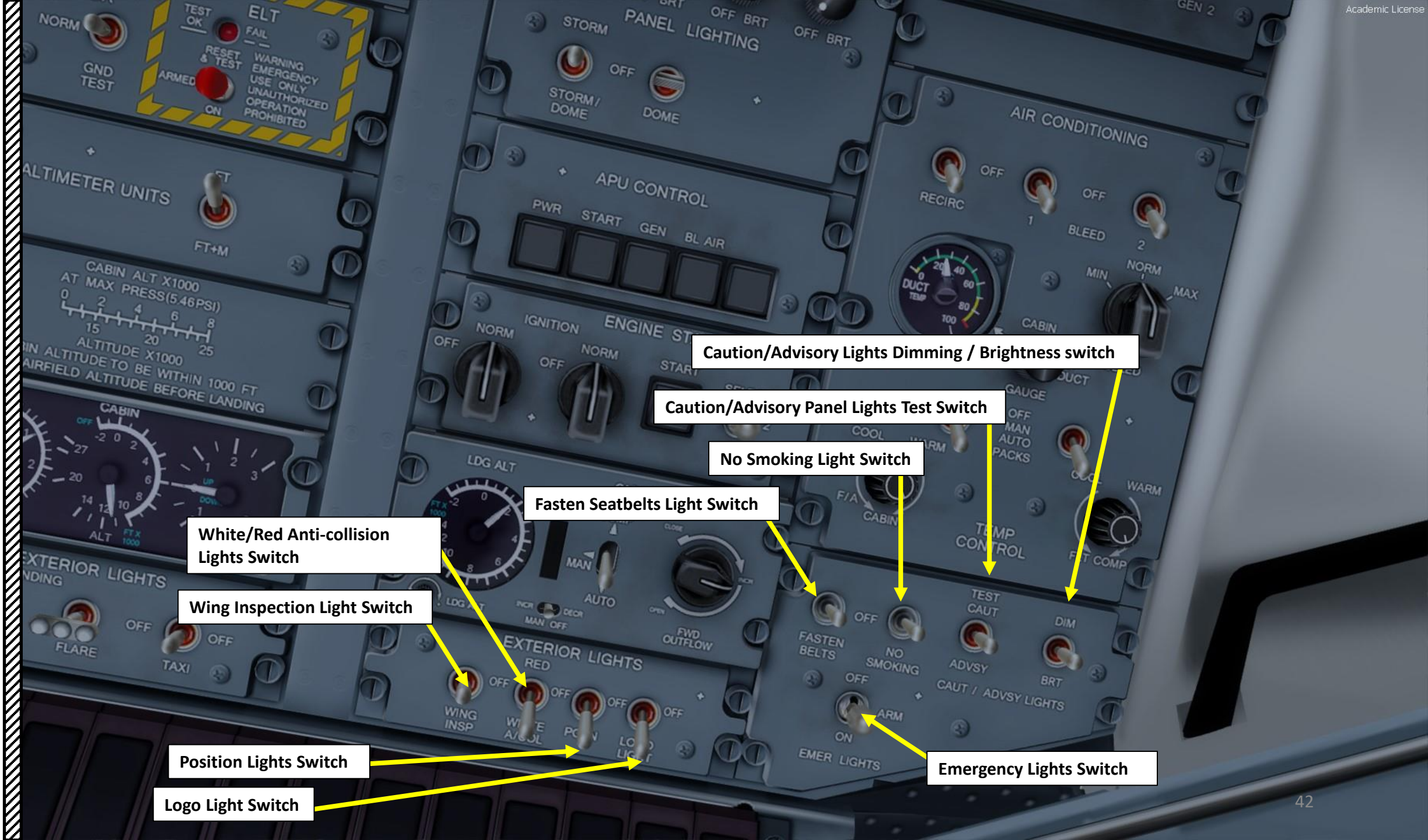

De-Ice Tail Boots Status Indicators
Airframe Manual De-Ice Switch
Flight Data Recorder Switch
Airframe De-Ice Mode Switch
ELT (Emergency Locator Transmitter) Switch
De-Ice Wing Boots Status Indicators
PFD (Primary Flight Display) Altimeter Units Switch (ft / ft+m)
Propeller De-Icing Status Indicator
Propeller De-Ice Mode Switch
Increase Reference Speeds Switch
Engine Intake De-Ice Indicators
DC CONTROL
ICE PROTECTION
FLIGHT DATA RCDR
ELT
PFD ALTIMETER UNITS
APU CONTROL
PANEL LIGHTING
ENGINE INTAKE
REF SPEEDS
WINDSHIELD
Academic License

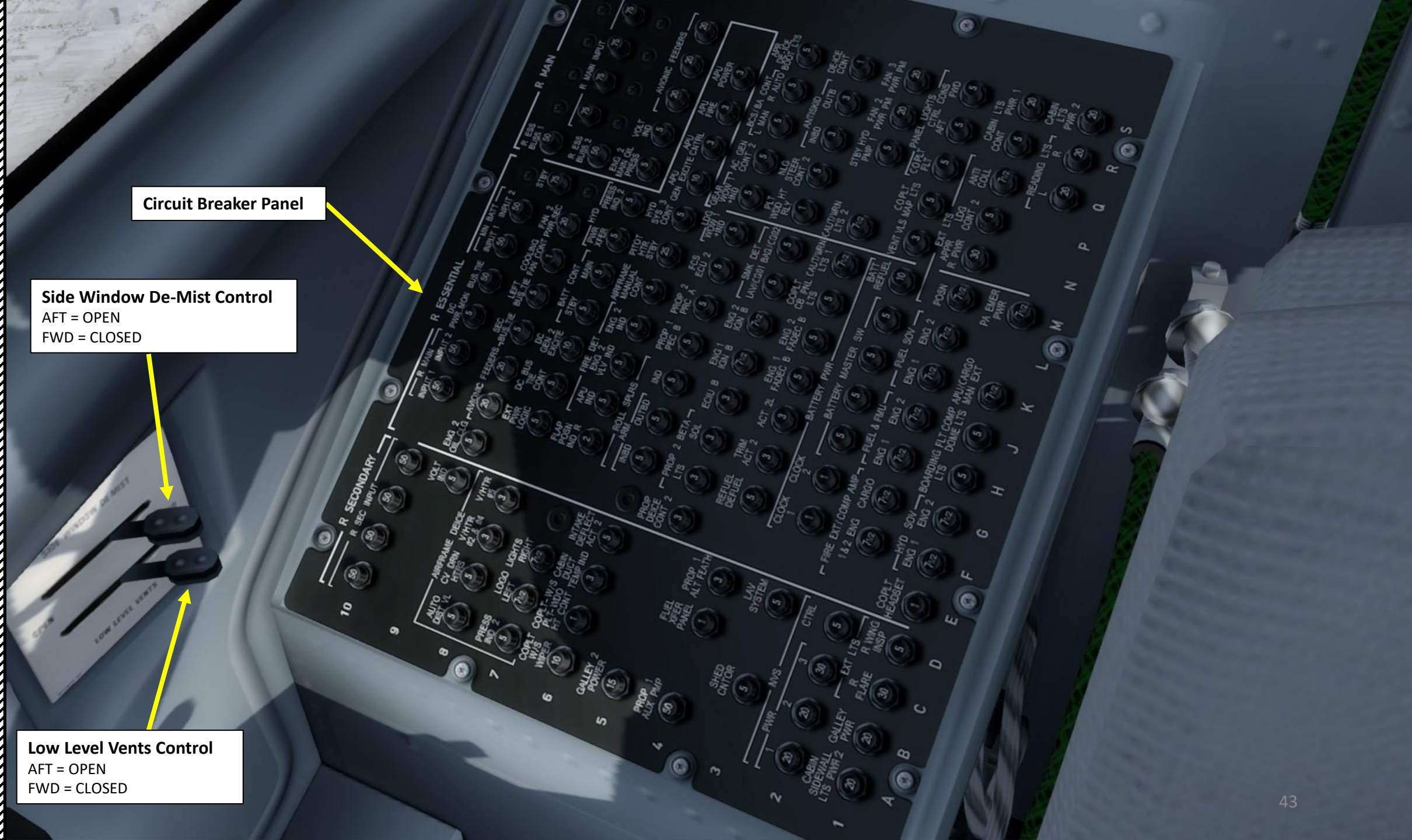

Standby Battery Switch
Auxiliary Battery Switch
Main Battery Switch
Battery Master Switch
External Power Switch
Bus Fault Reset Switch
Main Bus Tie Switch
Generator 2 Switch
Generator 1 Switch
DC CONTROL
STBY BATT
AUX BATT
MAIN BATT
BATTERY MASTER
GEN 1
GEN 2
MAIN BUS TIE
BUS FAULT RESET
EXT PWR
APU
FUEL VALVE
OPEN
CLOSED
ARM
FIRE TEST
EXTG
VALVES FUEL
FWD BTL
HYD
BTL LOW
TEST DETECTION
BAGGAGE AFT
VENT VALVE INLT
VENT VALVE OTLT
FIRE BOTTLE
BAGGAGE FWD
AC CONTROL
EXT PWR
GEN 1
GEN 2
OVERHEAD CONSOLE
GLARE SHIELD
CTR CONSOLE FWD
CTR CONSOLE AFT
PANEL LIGHTING
STORM
STORM / DOME
DOME
ICE PROTECTION
ELT
TEST
FAIL
RESET & TEST
ARMED
WARNING EMERGENCY USE ONLY UNAUTHORIZED OPERATION PROHIBITED
NORM
GND TEST
APU CONTROL
PWR
START
GEN
BL AIR
PFD ALTIMETER UNITS
FT+M
ENGINE START
IGNITION
SELECT
AIR CONDITIONING
RECIRC
BLEED
MIN
NORM
MAX
DUCT TEMP
CABIN
CAB DUCT
GAUGE
COOL
WARM
F/A
CABIN
TEMP CONTROL
FLT COMP
PROPS
ENGINE INTAKE
REF SPEEDS
TEST
PROP
INCR
BOOT AIR
ISO
PITOT STATIC
STBY
WINDSHIELD
HEAT
WIPER
PLT SIDE
CABIN ALT X1000
AT MAX PRESS(5.46PSI)
ALTITUDE X1000
CABIN ALTITUDE TO BE WITHIN 1000 FT OF AIRFIELD ALTITUDE BEFORE LANDING
CABIN
LDG ALT
CABIN ALTITUDE
DUMP
MAN
AUTO
FASTEN BELTS
NO SMOKING
TEST
CAUT
ADVSY
DIM
BRT
CAUT / ADVSY LIGHTS

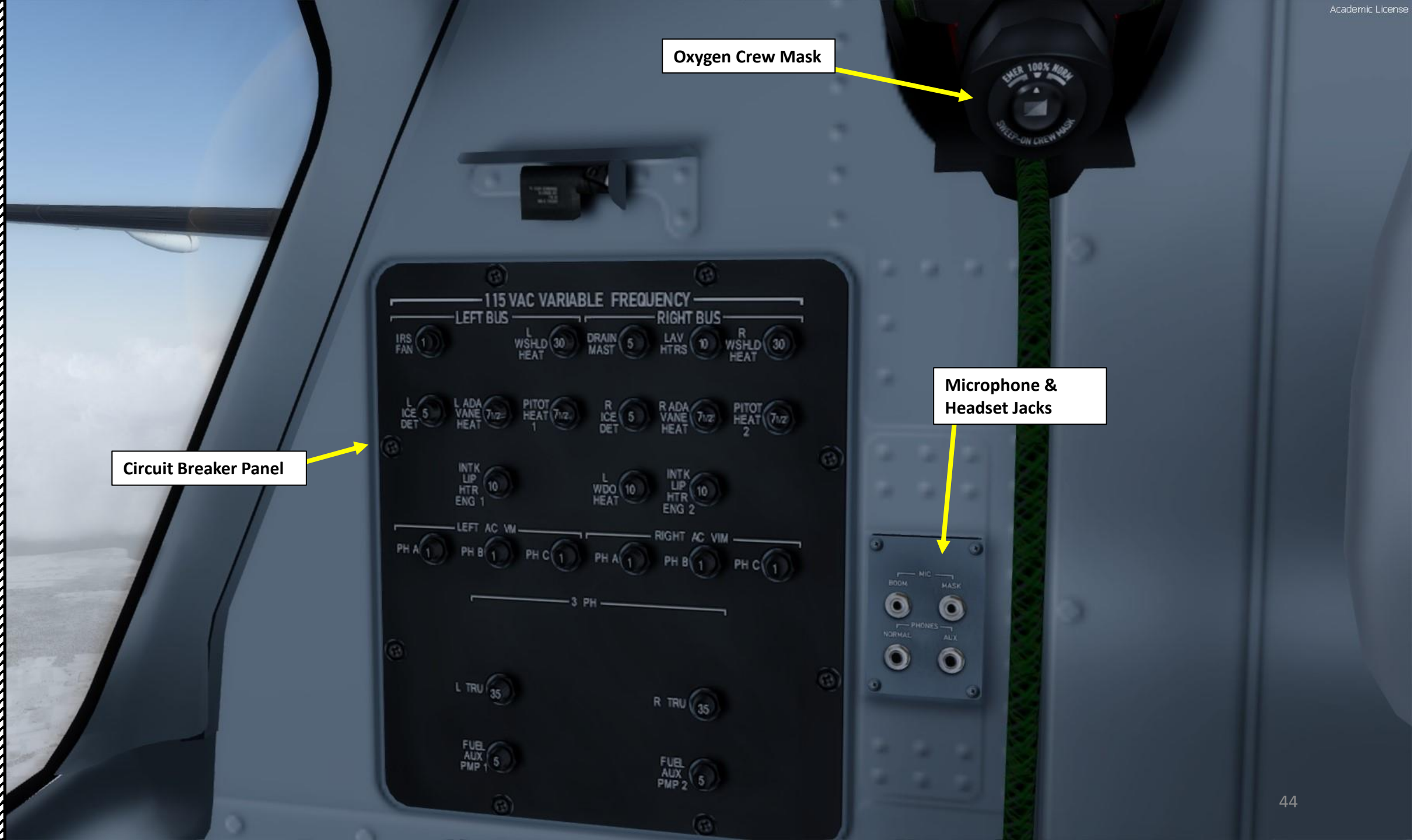

APU Extinguisher Bottle Arming Light
Engine 1 Extinguisher Aft/Forward Bottle Selector Switch
Engine 1 Fuel Valve Indicator
APU (Auxiliary Power Unit) Fuel Valve Indicator
APU Fire Extinguish Button
APU Fire Detected Light
APU Extinguisher Bottle Low / Fault light
APU Fire Test Switch
Engine 1 Fire Detection Fault Lights (Systems A & B)
Engine 1 Fire Extinguish Handle (Illuminates when fire is detected)
Engine 1/2 Fire Detection Test Selector Switch
Engine 2 Fire Extinguish Handle (Illuminates when fire is detected)
Aft Baggage Compartment Fire Detection Panel
APU
FUEL VALVE
OPEN CLOSED
BTL
ARM
EXTG
FIRE
FIRE TEST
BTL LOW FAULT
EXTG AFT BTL
FWD BTL
VALVES FUEL
OPEN CLOSED
HYD
BTL LOW
TEST DETECTION
BAGGAGE AFT
VENT VALVE INLT OTLT
CLOSED
TEST
FIRE BOTTLE
AFT
FWD
ICE PROTECTION
AIRFRAME MODE SELECT
OFF
MANUAL
SLOW
FAST
AIRFRAME MANUAL SELECT
APU CONTROL
PWR START GEN BL AIR
OVERHEAD CONSOLE
GLARE SHIELD
CONSOLE FWD AFT
OFF BRT
STORM / DOME
DOME


Aft Center Console Panel Lighting Brightness Control
Forward Center Console Panel Lighting Brightness Control
Glare Shield Panel Lighting Brightness Control
Overhead Console Panel Lighting Brightness Control
AC External Power Switch
AC Generator 1 Switch
AC Generator 2 Switch
Recirculation Fan Switch
Engine 1 Bleed Switch
Engine 2 Bleed Switch
Air Conditioning Duct Temperature (deg C)
Storm Lights Switch
Dome Lights Switch
Bleed Flow Mode Selector
MIN/NORM/MAX
Temperature Indicator Switch
Cabin Duct
Cabin
Flight Compartment Duct
Flight Compartment Temperature Regulator
PACKS (Pressurization & Air Conditioning Kit) 1 & 2 Switches
OFF / MANUAL / AUTOMATIC
Cabin Compartment Temperature Regulator
PANEL LIGHTING
AIR CONDITIONING
AC CONTROL
APU CONTROL
ENGINE START
FLIGHT DATA RCDR
ELT
PFD ALTIMETER UNITS
CABIN ALT X1000
AT MAX PRESS(5.46PSI)
ALTITUDE X1000
CABIN ALTITUDE TO BE WITHIN 1000 FT
OF AIRFIELD ALTITUDE BEFORE LANDING
LDG ALT
CABIN ALTITUDE


APU (Auxiliary Power Unit) Power Switch
APU (Auxiliary Power Unit) Start Switch
APU (Auxiliary Power Unit) Generator Switch
APU (Auxiliary Power Unit) Bleed Air Switch
Note: APU Bleed Air only works if engine bleed air switches are OFF
Engine 2 Ignition Selector
Engine 1 Ignition Selector
Pressurization Mode Selector
Selected Landing Altitude Indicator (x1000 ft)
Landing Altitude Selector
Pressurization Fault Light
Manual Pressure Control
Manual Forward Outflow Valve Control
Engine Start Selector Button (1/2)
Engine Start Button




Circuit Breaker Panel
Side Window De-Mist Control
AFT = OPEN
FWD = CLOSED
Low Level Vents Control
AFT = OPEN
FWD = CLOSED



PLANNING THE FLIGHT

In real life, you cannot just fly an Q400 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 Bombardier 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:
CYYZ SID **MIGLO** STAR **CYUL**

Provided by RouteFinder

METAR:

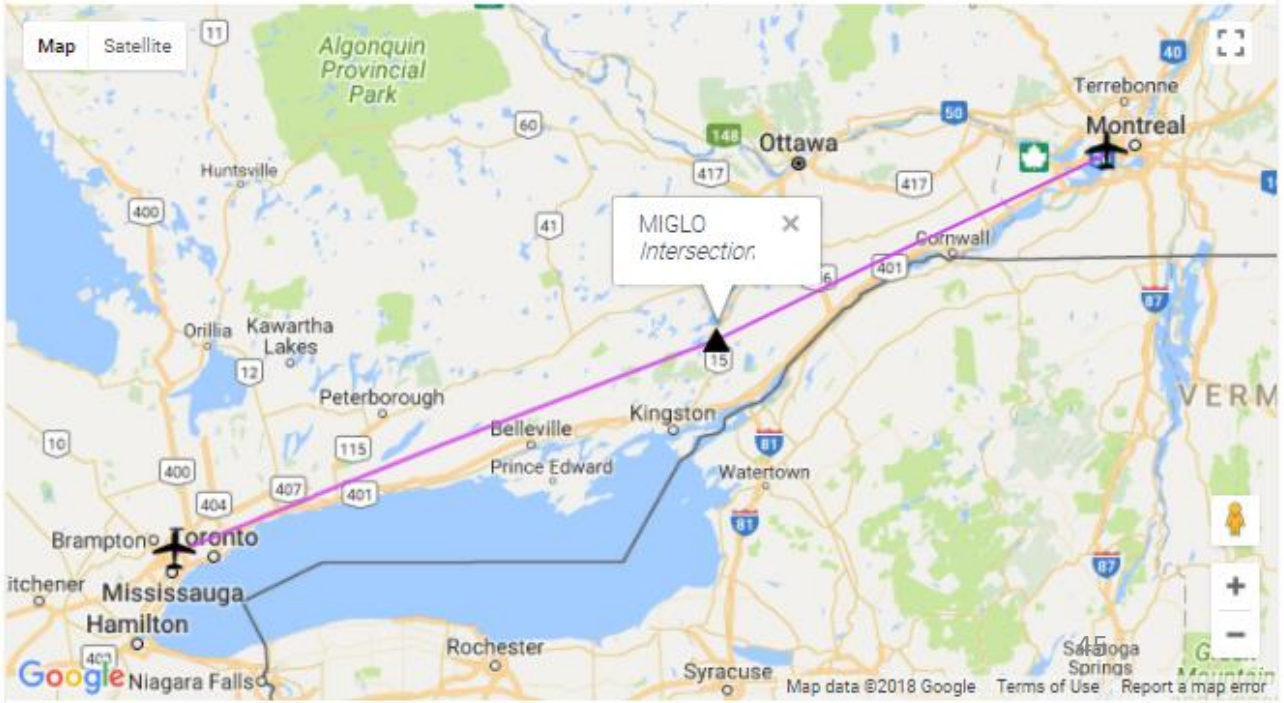
Departure: CYYZ 100500Z 21005KT 15SM BKN030 M01/M08 A3035 RMK SC7 SLP287
Destination: CYUL 100500Z 23005KT 200V280 15SM FEW240 M09/M13 A3035 RMK CI1 SLP282

Provided by AVIATION WEATHER CENTER

Fuel quantity for Bombardier Dash 8 Q400

	Fuel	Time
Fuel Usage	2149 lbs	01:02
Reserve Fuel	2562 lbs	01:15
Fuel on Board	4712 lbs	02:17

Provided by Fuelplanner.com

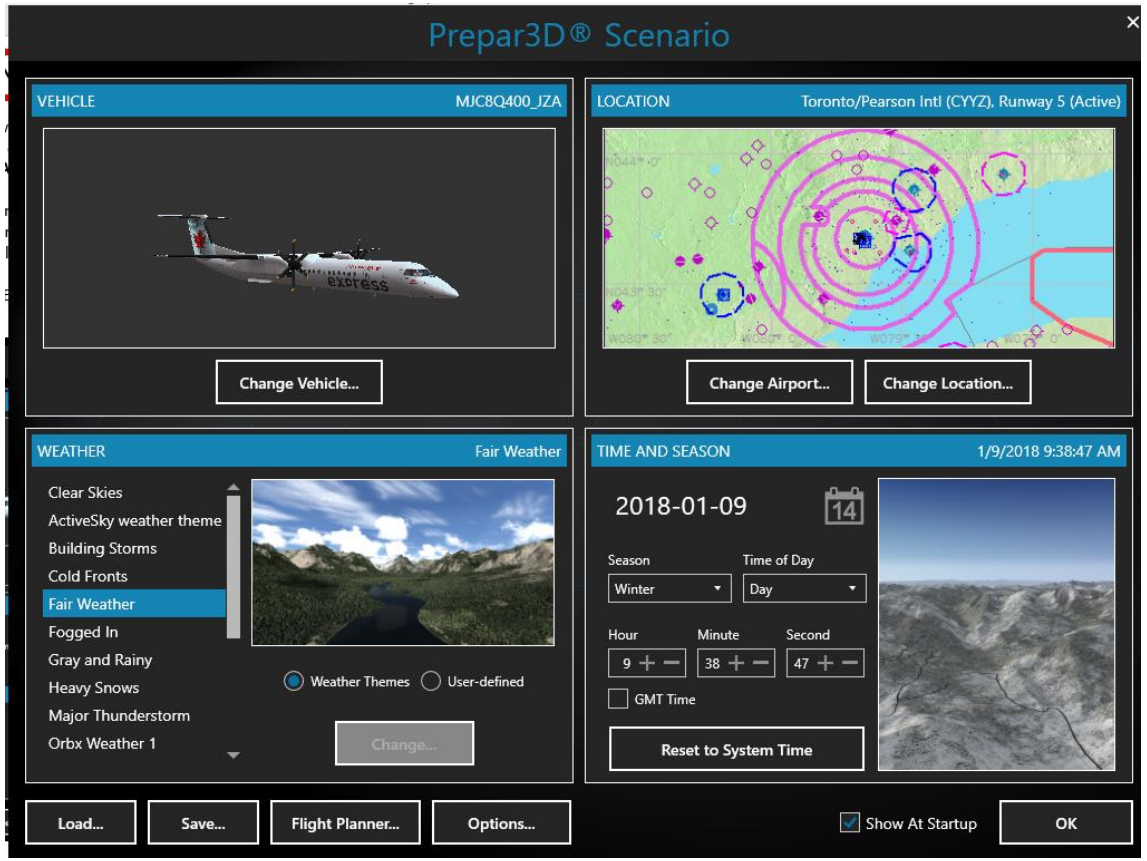


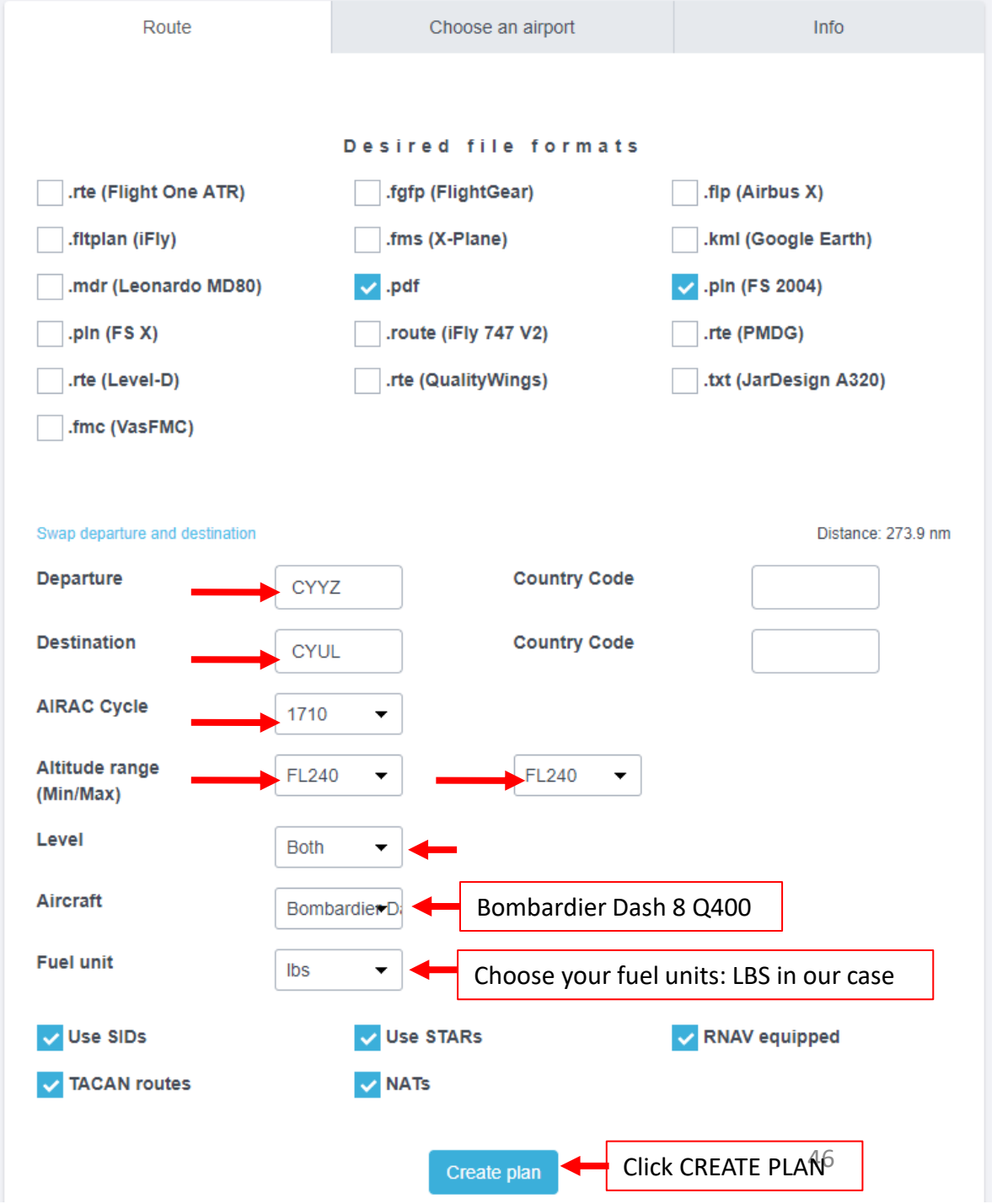
PLANNING THE FLIGHT

Today's flight will start from **TORONTO / LESTER B. PEARSON INTERNATIONAL AIRPORT (CYYZ)** and our destination will be **MONTREAL / PIERRE-ELLIOTT TRUDEAU INTERNATIONAL AIRPORT (CYUL).**

Using the "Online Flight Planner" available here: http://onlineflightplanner.org/ we will enter the Departure airport (CYYZ), the Destination airport (CYUL) and the AIRAC Cycle desired (we will use the **AIRAC cycle 1710** as explained on the next page).

Click on CREATE PLAN to generate a flight plan.





PLANNING THE FLIGHT

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

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

1. Plan your flight using the default AIRAC cycle programmed in the FMC when it was first released by Majestic Software during early October, 2017 (period **10)** 20**17** (AIRAC cycle **1710**), 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.)

Note:
- For the FSX version of the Q400, use AIRAC cycle **1304** since this version was released in late april 2013
- For the Prepar3d Version 4.1 of the Q400, use AIRAC cycle **1710**.

PLANNING THE FLIGHT

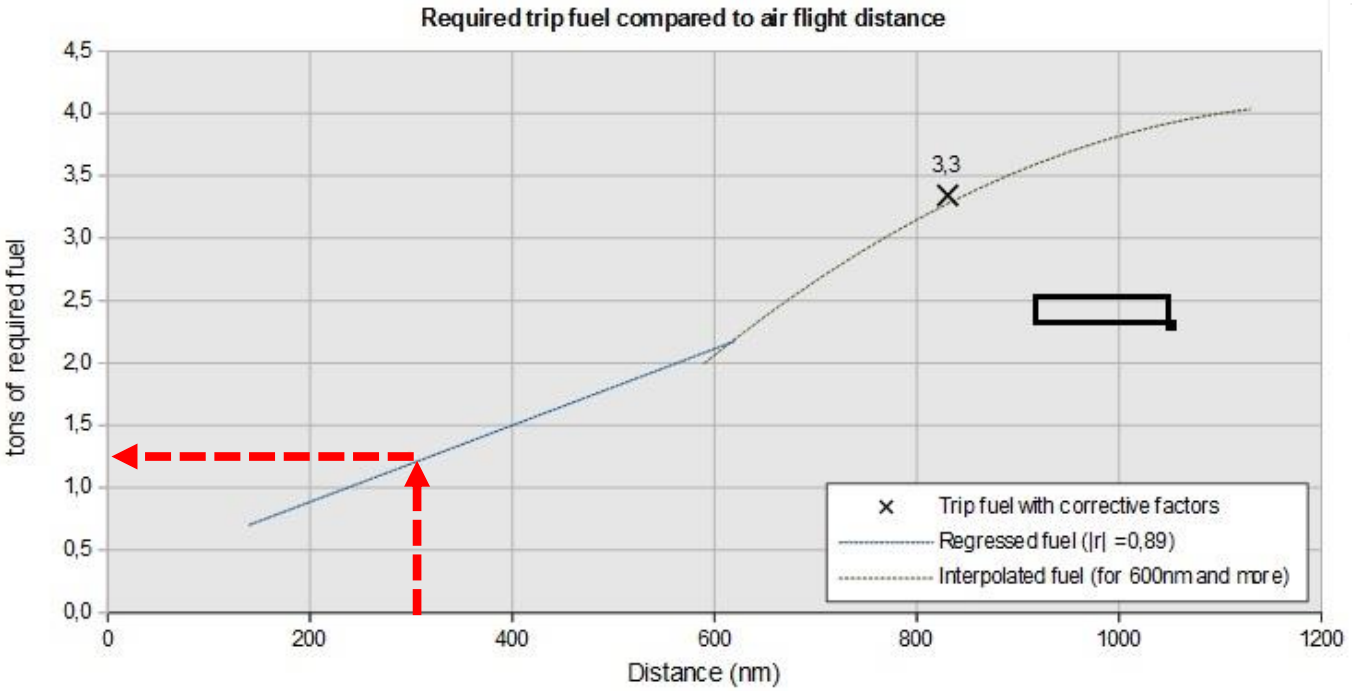
FUEL

For a flight of approx. **290 nm**, fuel planning can be estimated with the following graph from MJCJavelin (http://majesticsoftware.com/forums/discussion/344/fuel-planning/p1), which he obtained by programing a regression and an interpolation based on fuel consumption tables:

Imperial Units
Fuel for flight = Fuel Quantity for required distance (300 nm approx.) on graph below
= 1.3 tons = **2600 lbs** (or 1.3 tons x 2000 lbs/ton)
Reserve Fuel = 2500 lbs (approximative figure)
Total (Block) Fuel = Fuel for Flight + Reserve Fuel = 5100 lbs

Note: An alternate way to calculate the fuel for flight is to use a fuel consumption of 1300 lbs of fuel per engine per hour of flight. For an hour-long flight from Montreal to Toronto, the fuel quantity would be: Fuel for Flight = 1300 lbs/hour x 2 engines x 1 hour = 2600 lbs approx.

TRIP FUEL



Lester B. Pearson International Airport (CYYZ) ⇒ Montreal / Pierre Elliott Trudeau International Airport (CYUL)

ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
CYYZ	-	0	0	N43°40'36.18"	W079°37'50.36"	LESTER B. PEARSON INTL
MIGLO	-	72	158	N44°38'09.00"	W076°12'37.89"	MIGLO
CYUL	-	69	116	N45°28'13.67"	W073°44'27.35"	PIERRE-ELLIOTT-TRUDEAU INTL

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

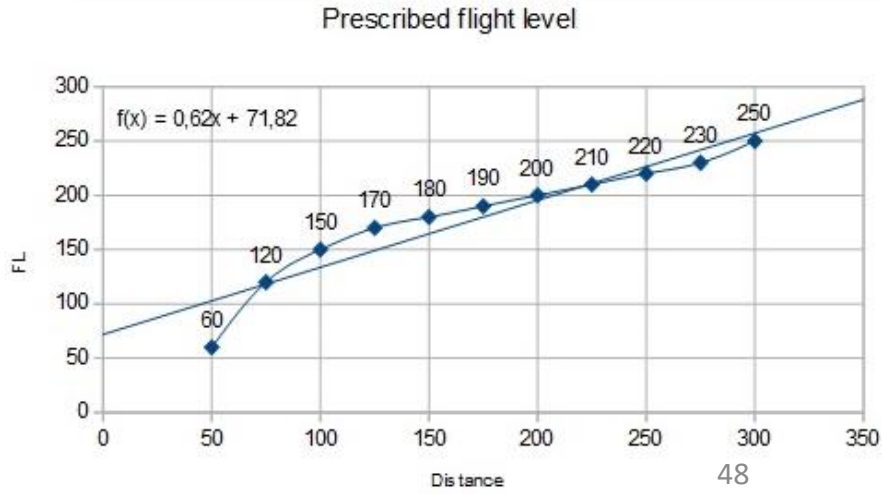
3 fixes, 274 nm.

Airways:
CYYZ *SID* ***MIGLO*** *STAR* ***CYUL***

Provided by RouteFinder

Fuel quantity for Bombardier Dash 8 Q400

	Fuel	Time
Fuel Usage	2149 lbs	01:02
Reserve Fuel	2562 lbs	01:15
Fuel on Board	4712 lbs	02:17



PLANNING THE FLIGHT

FLIGHT ROUTE (POTENTIAL)

The flight route we could take from onlineflightplanner.com is:
CYYZ SID **MIGLO** STAR **CYYZ**

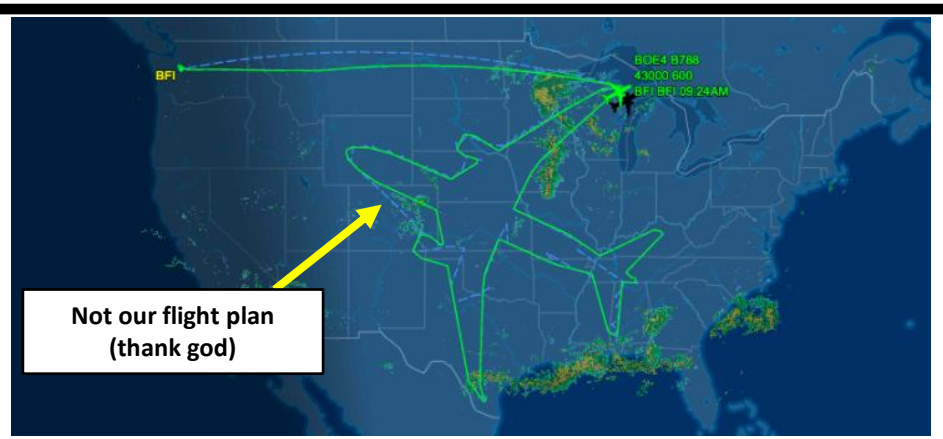
But what does it all mean? Here is a breakdown of this route:

- Depart from Toronto Lester B. Pearson Airport (CYYZ)
- Follow the SID (Standard Instrument Departure) route from CYYZ to MIGLO
- Navigate to MIGLO VOR
- Follow the STAR (Standard Terminal Arrival Route) from MIGLO to CYUL
- Land at Montreal Pierre-Elliott Trudeau Airport (CYUL)

WOAH, STOP RIGHT THERE!

Did you really think the flight plan would be that easy? No Sir/Madam! We will spice things up a bit and slightly modify the flight plan. Why? Because that simple flight plan will not force you to know how to plug in airways and use the FMS (Flight Management System) to do cool things like giving you lists of waypoints already stored in the database.

Relax, we won't do a complicated flight plan like Boeing's custom "787-shaped" flight plan. We will just modify a little bit the existing flight plan using Sky Vector, a great tool available for free online. See next page.



Lester B. Pearson International Airport (CYYZ) ⇒ Montreal / Pierre Elliott Trudeau International Airport (CYUL)

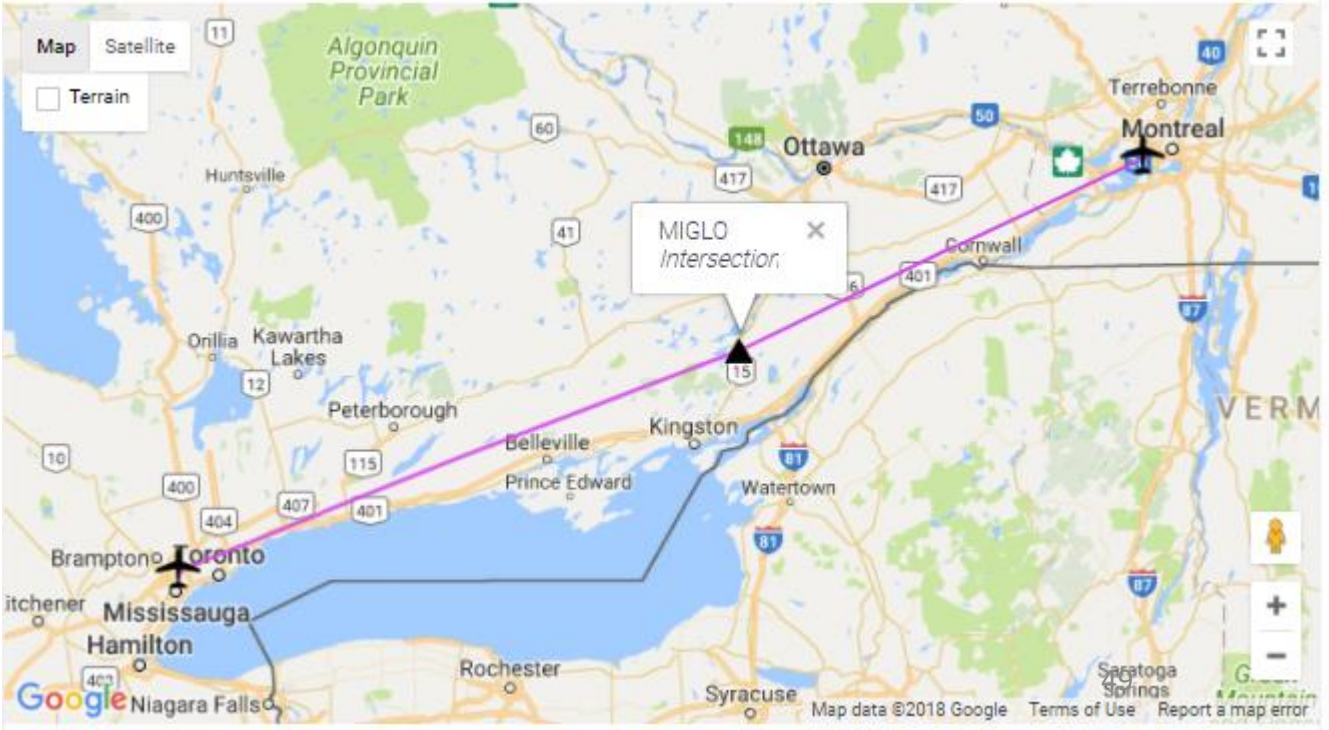
ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
CYYZ	-	0	0	N43°40'36.18"	W079°37'50.36"	LESTER B. PEARSON INTL
MIGLO	-	72	158	N44°38'09.00"	W076°12'37.89"	MIGLO
CYUL	-	69	116	N45°28'13.67"	W073°44'27.35"	PIERRE-ELLIOTT-TRUDEAU INTL

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

3 fixes, 274 nm.

Airways:
CYYZ *SID* ***MIGLO*** *STAR* ***CYUL***

Provided by RouteFinder



PLANNING THE FLIGHT

FLIGHT ROUTE (ACTUAL) <- This is what we'll use

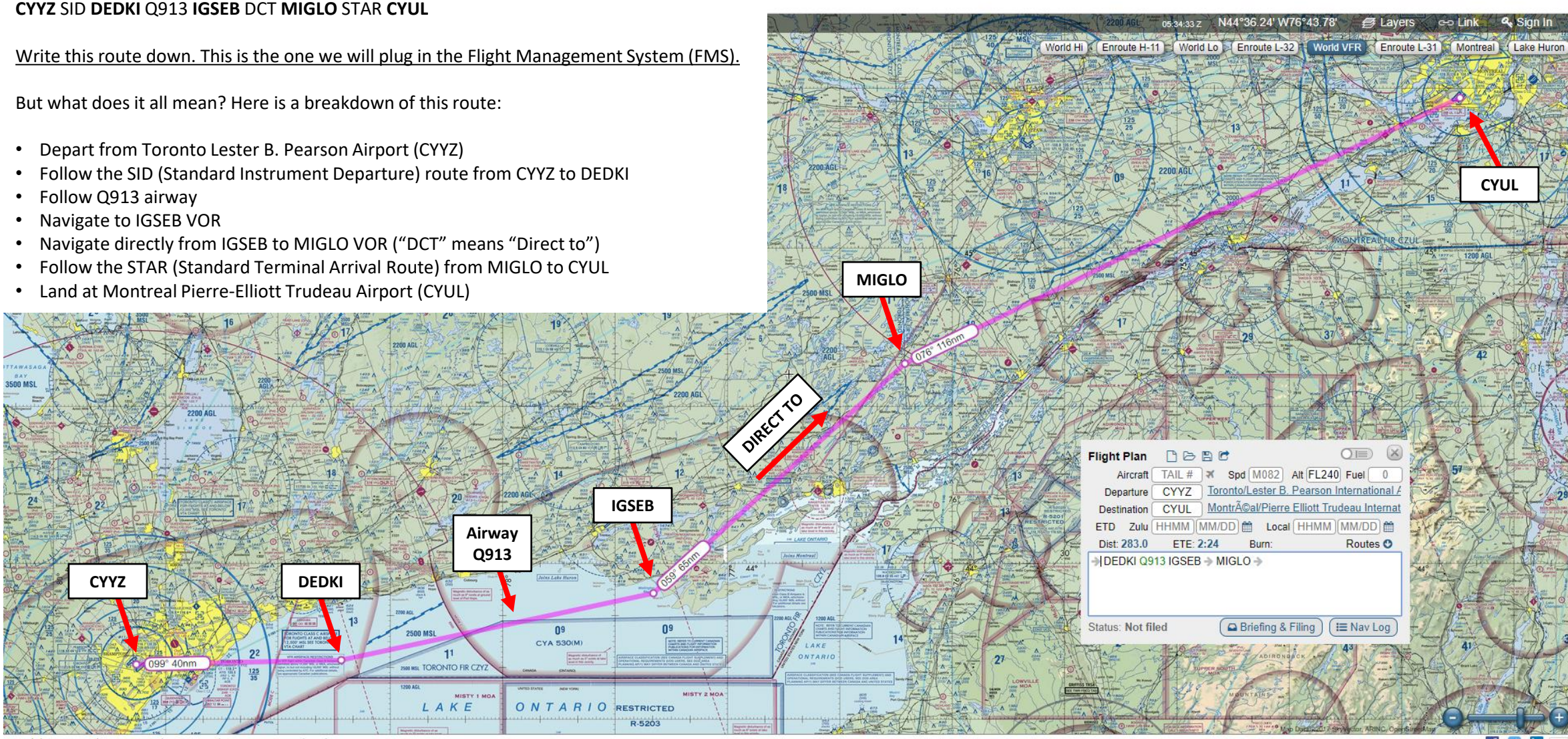
SKY VECTOR
https://skyvector.com/

The actual flight route we will take is:
CYYZ SID **DEDKI** Q913 **IGSEB** DCT **MIGLO** STAR **CYUL**

Write this route down. This is the one we will plug in the Flight Management System (FMS).

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

- Depart from Toronto Lester B. Pearson Airport (CYYZ)
- Follow the SID (Standard Instrument Departure) route from CYYZ to DEDKI
- Follow Q913 airway
- Navigate to IGSEB VOR
- Navigate directly from IGSEB to MIGLO VOR ("DCT" means "Direct to")
- Follow the STAR (Standard Terminal Arrival Route) from MIGLO to CYUL
- Land at Montreal Pierre-Elliott Trudeau Airport (CYUL)



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

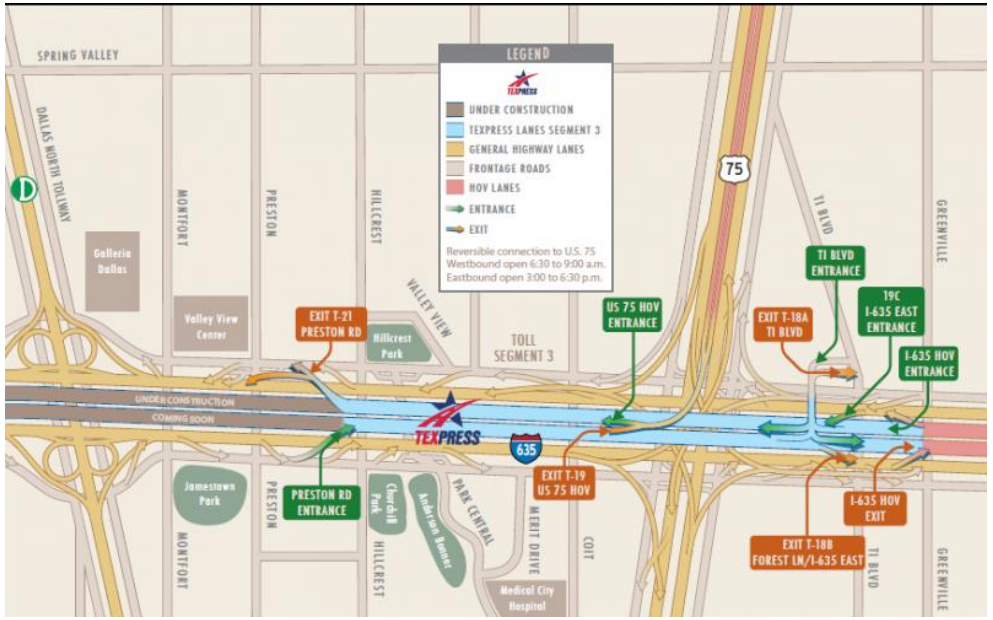
A **SID** (Standard Instrument Departure) is a small initial route which leads an aircraft from the runway they've just taken off from to the first point in his/her intended route. An airport usually has a lot of aircraft departing from it's runways. To save confusion (and for safety), a busy airport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

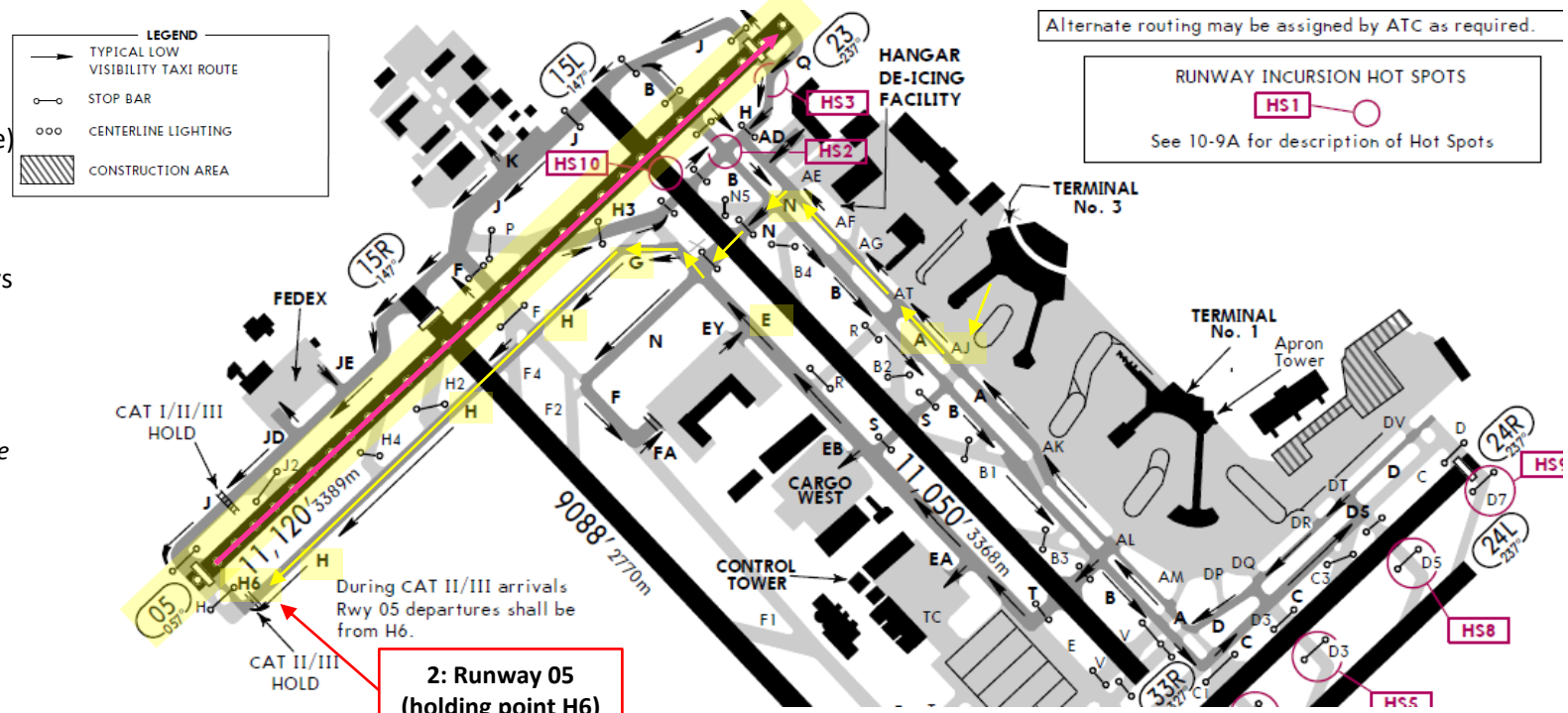
Typically, SIDs and STARs are provided by the ATC (Air Traffic Controller). Since we're doing a tutorial, I will just give you the SID and STAR to plug in the FMC.



PLANNING THE DEPARTURE - SID

These charts are for the SID (Standard Instrument Departure) from Toronto Pearson (CYYZ) to DEDKI. We intend to:

1. Spawn at Gate B22 (personal preference)
2. Taxi towards **runway 05** (orientation: 057) using taxiways 3, Alpha-Juliet (AJ), Alpha (A), November (N), Echo (E), Golf (G), Hotel (H) and holding point H6.
3. Depart from CYYZ using the SID from CYYZ to DEDKI (DEDKI4) to a target altitude of 3000 ft (FL030).
   ***NOTE**: the chart shows DEDKI3 (valid for November 2014) since I could not find the chart for DEDKI4 (valid for January 2018). Therefore, we will assume DEDKI3 and DEDKI4 are roughly the same for the purpose of this tutorial.*
4. Climb to a cruising altitude of 24,000 ft

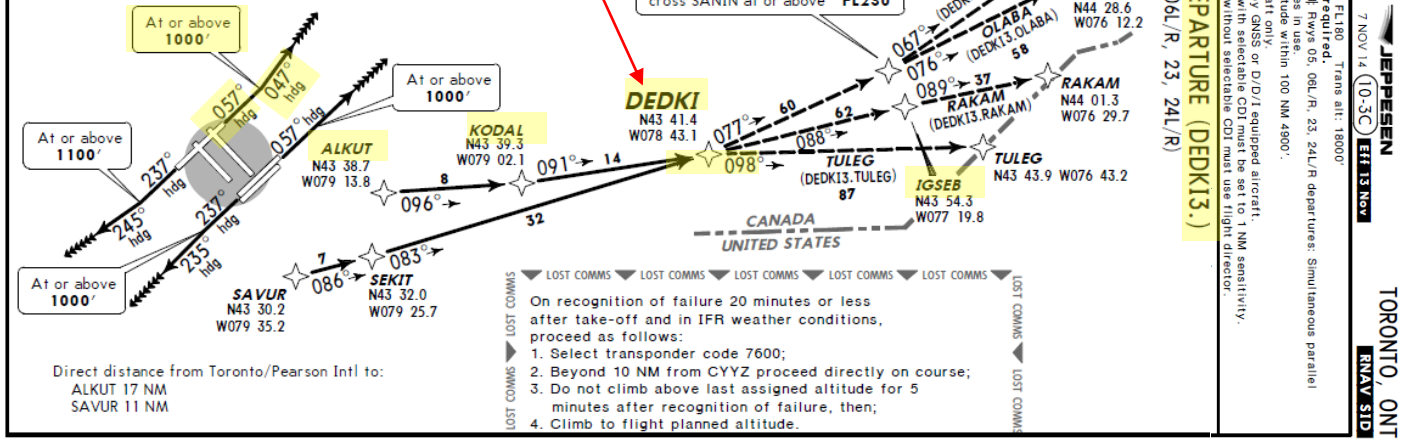


RWY	INITIAL CLIMB	ALTITUDE
05	Unless otherwise assigned by ATC: Climb heading 057° to 1000'. Climbing LEFT turn heading 047° or as assigned. EXPECT RADAR vectors to ALKUT (or as assigned), then proceed via depicted route.	Unless otherwise assigned by ATC: MAINTAIN 5000'
06L/R	Unless otherwise assigned by ATC: Climb heading 057° to 1000'. Continue climb heading 057° or as assigned. EXPECT RADAR vectors to ALKUT (or as assigned), then proceed via depicted route.	
23	Unless otherwise assigned by ATC: Climb heading 237° to 1100'. Climbing RIGHT turn heading 245° or as assigned. EXPECT RADAR vectors to SAVUR (or as assigned), then proceed via depicted route.	
24L/R	Unless otherwise assigned by ATC: Climb heading 237° to 1000'. Climbing LEFT turn heading 235° or as assigned. EXPECT RADAR vectors to SAVUR (or as assigned), then proceed via depicted route.	

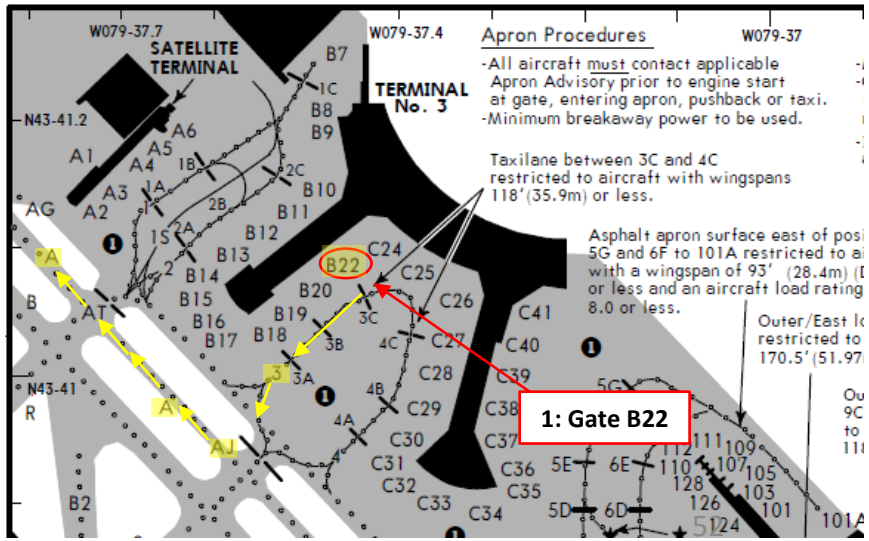
This SID requires minimum climb gradients of:
Rwy 06L: 220' per NM to 1100'.
Rwy 06R: 210' per NM to 1500'.

Gnd speed-KT	75	100	150	200	250	300
210' per NM	263	350	525	700	875	1050
220' per NM	275	367	550	733	917	1100

3: SID towards DEDKI



DEDKI THREE DEPARTURE (DEDKI3.) (RWYS 05, 06L/R, 23, 24L/R)
CYYZ/YYZ TORONTO/PEARSON INTL
JEPPESEN 7 NOV 14 (10-3C) Eff 13 Nov
TORONTO, ONT RNAV SID
TORONTO Departure 128.8 127.57
Apt Elev 569'
Trans level: FL180 Trans alt: 18000'
1. RADAR required.
2. CAUTION: Rwys 05, 06L/R, 23, 24L/R departures: Simultaneous parallel departures in use.
3. Safe Altitude within 100 NM 4900'.
4. Jet aircraft only.
5. For use by GNSS or D/D/I equipped aircraft.
6. Aircraft with selectable CDI must be set to 1 NM sensitivity. Aircraft without selectable CDI must use flight director.

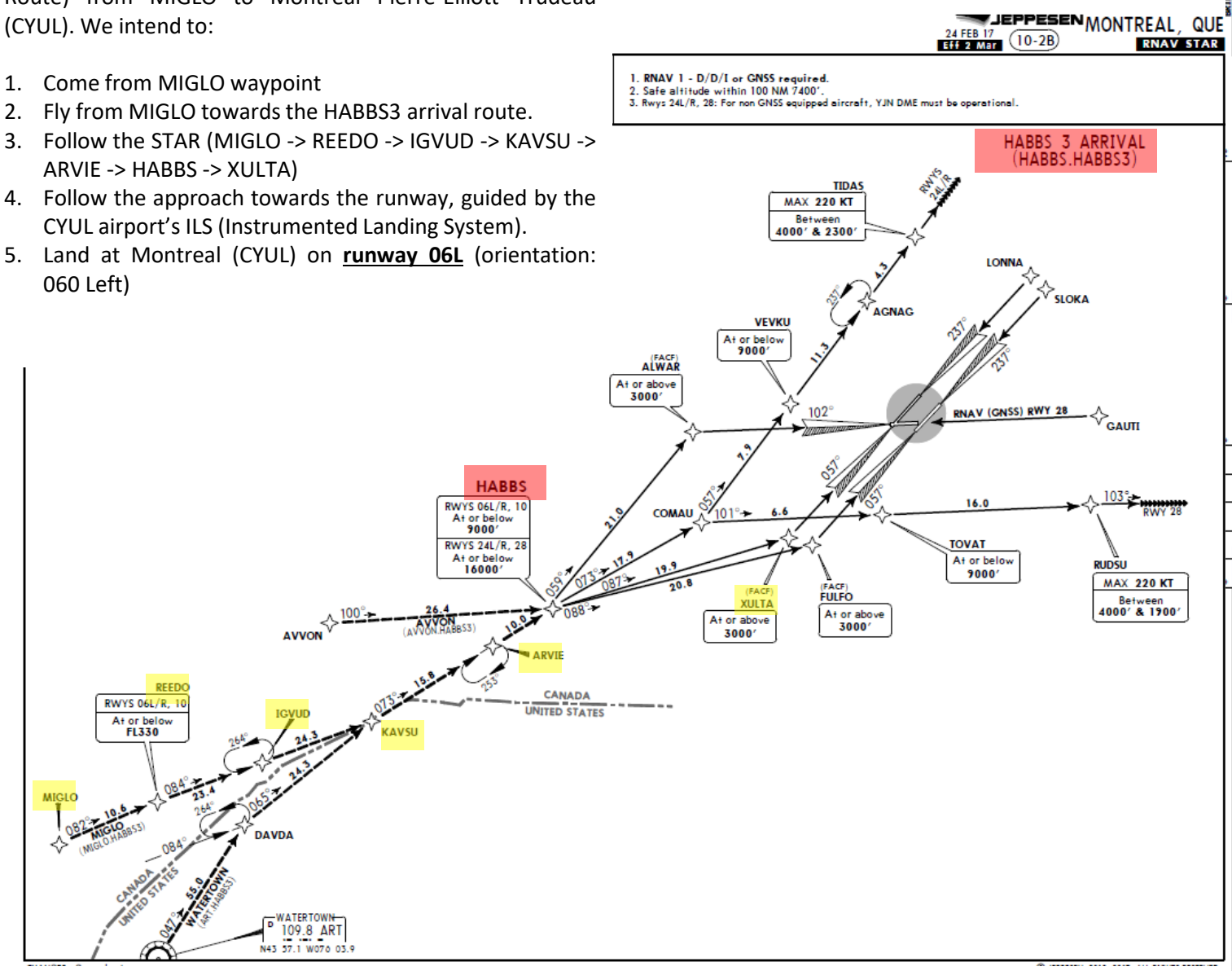


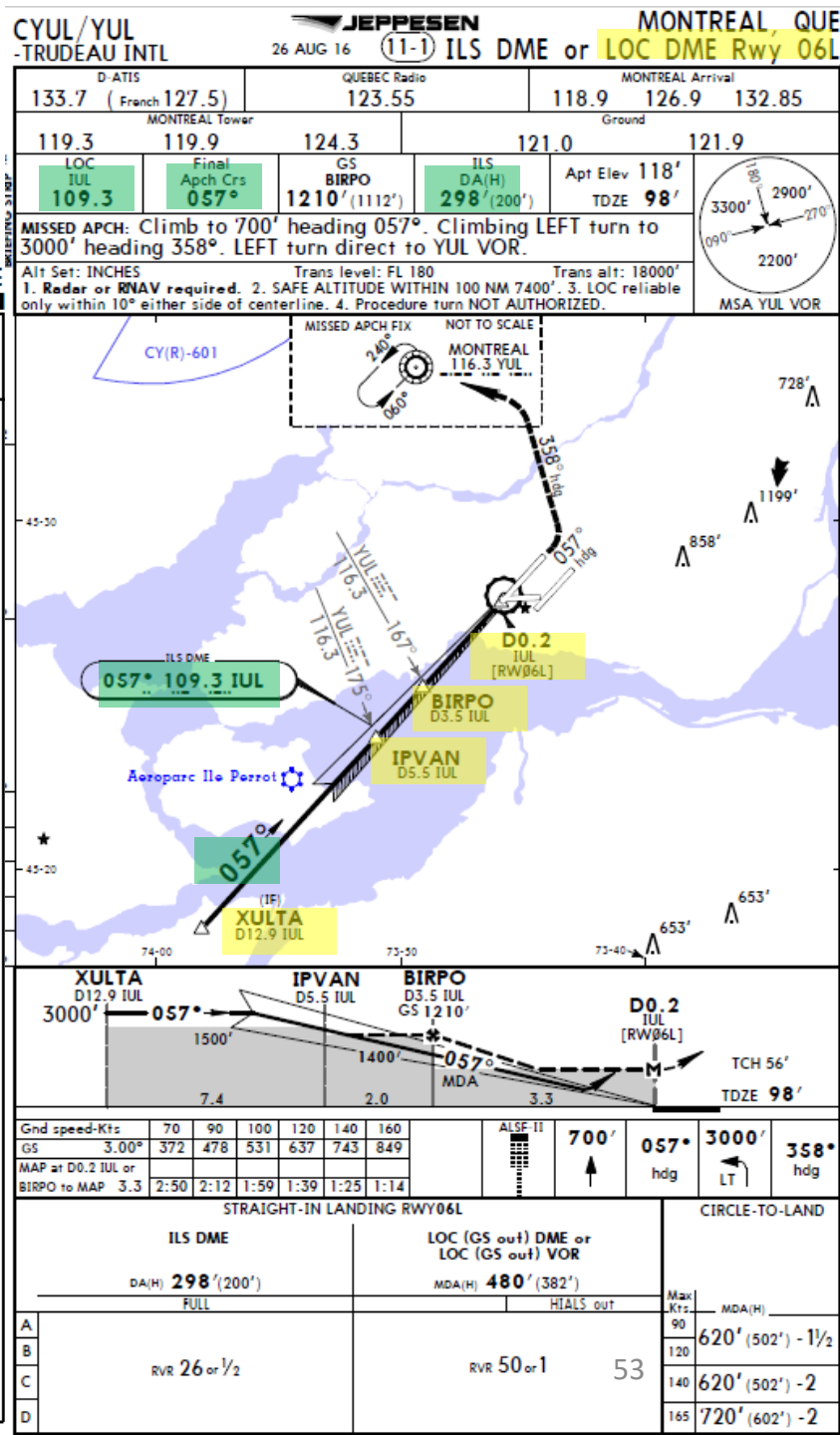
PLANNING THE APPROACH - STAR

These charts are for the STAR (Standard Terminal Arrival Route) from MIGLO to Montreal Pierre-Elliott Trudeau (CYUL). We intend to:

1. Come from MIGLO waypoint
2. Fly from MIGLO towards the HABBS3 arrival route.
3. Follow the STAR (MIGLO -> REEDO -> IGVUD -> KAVSU -> ARVIE -> HABBS -> XULTA)
4. Follow the approach towards the runway, guided by the CYUL airport's ILS (Instrumented Landing System).
5. Land at Montreal (CYUL) on **runway 06L** (orientation: 060 Left)

Fun fact: The HABBS STAR name actually comes from the Montreal Canadiens hockey team, nicknamed the "Habs".



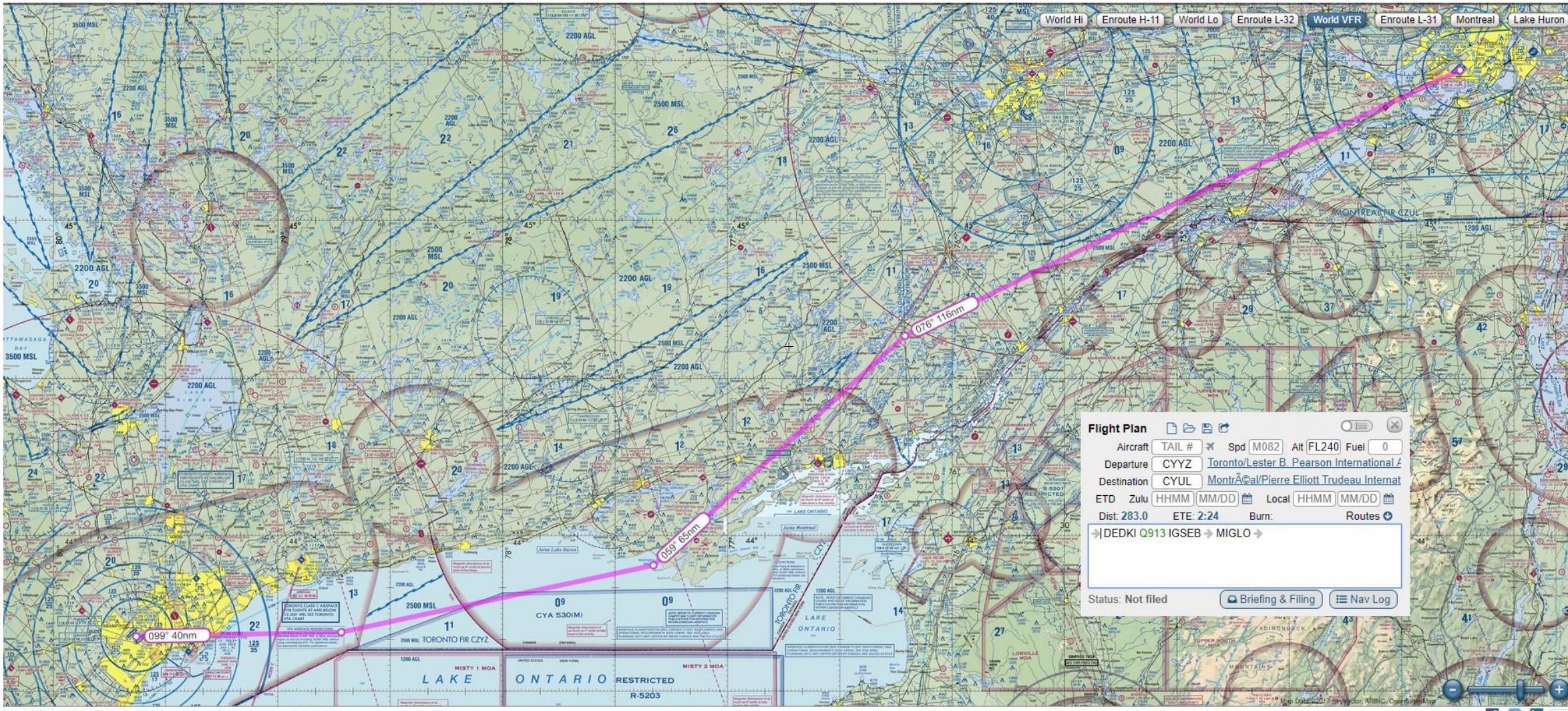


PLANNING THE FLIGHT - SUMMARY

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

Flight Plan Input to FMC

CYYZ SID **DEDKI** Q913 **IGSEB** DCT **MIGLO** STAR **CYUL**



MCDU/FMC IN A NUTSHELL

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

MCDU: Multifunction Control Display Unit

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).

Fun fact: FMS installed on the Q400 is the UNS-1E by Universal Avionics Systems Corporation. It differs significantly from the usual Thales or Rockwell Collins FMCs you might have already seen on Boeing or Airbus aircraft.

MCDU DATA PAGE

MCDU/FMC IN A NUTSHELL

FMC -> Flight Management Computer

- **DATA** : Obtains information and status about the FMS, Navigation database and attached sensors. It also has the "SERVICES" page which is used to simulate ground crew behavior such as setting a GPU (Ground Power Unit), or removing/installing landing gear locking pins.
- **NAV** : Displays navigation data pages.
- **VNAV** : Vertical Navigation page allows a pilot to define a desired vertical flight profile along the flight plan route. It also computes deviation from that profile.
- **DTO** : The "Direct To" key allows the pilot to alter his flight plan.
- **FUEL** : displays fuel and weight pages.
- **FPL** : The "Flight Plan" pages access waypoints, stored arrivals, departures, SIDs, and STARs.
- **PERF** : The "Flight Performance" page displays in flight performance information (read-only).
- **TUNE** : Selects and stores preselected frequencies for each radio.

- **LIST** : Displays a list of options during data entry
- **MENU** : Displays a list of alternate formats or options for the FUEL, FPL, NAV, VNAV or TUNE pages when selected. When the MENU key is active, the letter "M" will appear in a box on the title line of the selected page.

- **PREV/NEXT**: Cycles through previous and next page of selected FMC page
- **BACK**: Backspace (deletes text)
- **MSG**: Displays messages
- **ON/OFF DIM**: Turns ON or OFF Flight Management Computer
- **ENTER**: Enters data

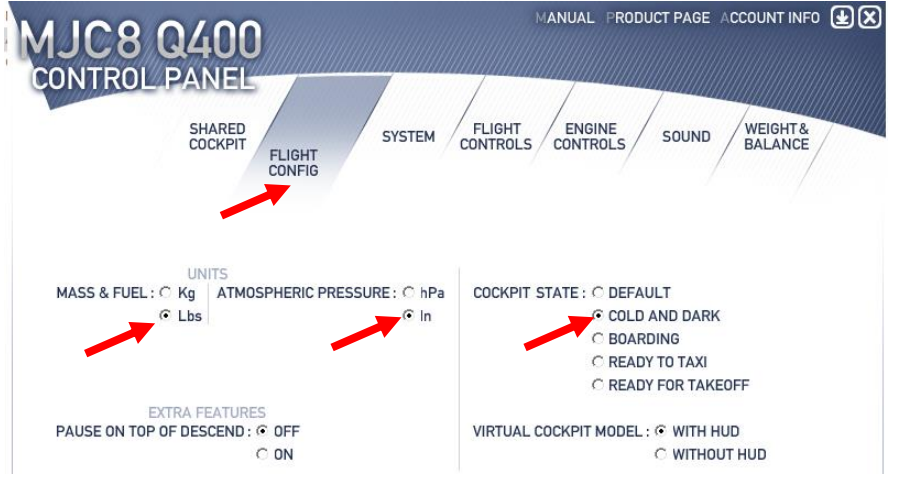
Sounds complicated? Don't worry, it's much simpler than it looks. We'll see how it works in the tutorial section.

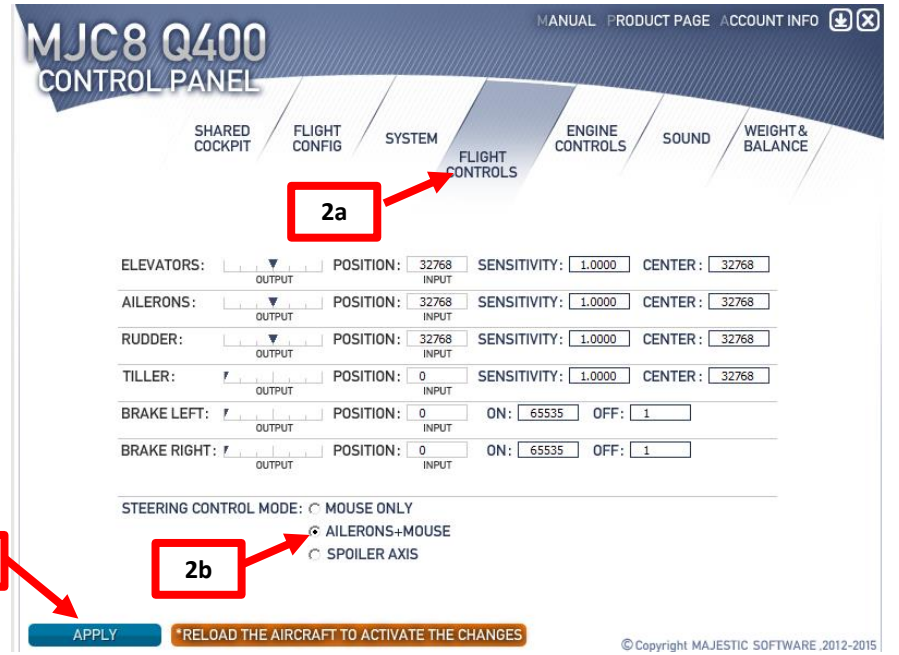
SET UP CONTROLS

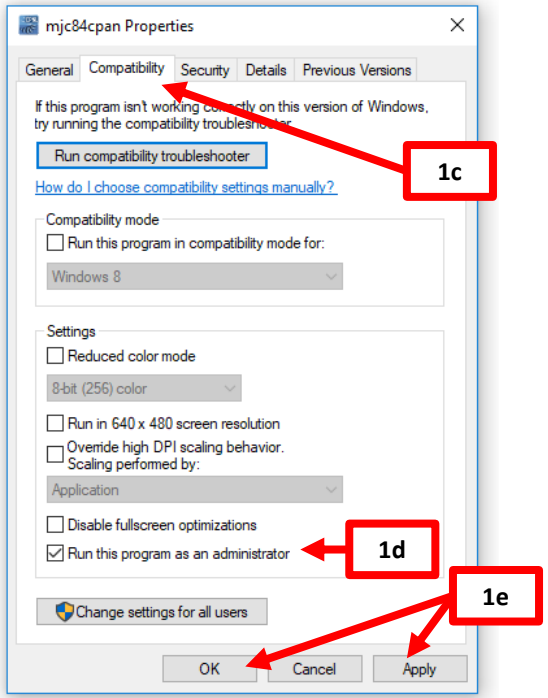
The Q400 is steered on the ground by using a tiller.

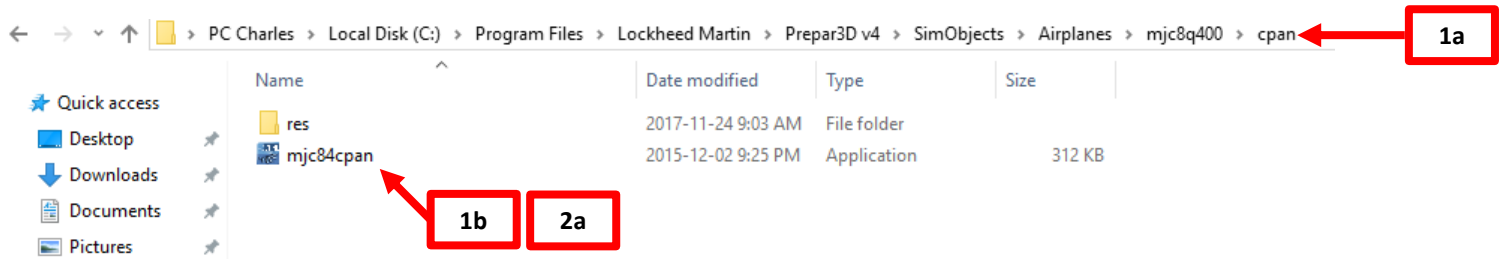
However, in Prepar3d or FSX you cannot map a joystick axis to your nosewheel steering tiller: it's a limitation of the sim itself. In order to steer the aircraft, Majestic programmed different options available in their own custom Control Panel; you can either use the mouse to click and drag on the tiller lever, or you can have the tiller axis mapped to your stick aileron control. I suggest you use the latter option.

1. The Control Panel will not work properly if it is not run in "Administrator Mode". Make sure you have the Control Panel executable "mjc84cspan.exe" property "Run the program as an administrator" ticked (right-click file & click "Properties" tab). This executable is available in: **C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes\mjc8q400\cpan**
2. Open the MJC8 Q400 control panel (mjc74cpsan.exe file) before starting Prepar3d
   a) Open "mjc84cspan.exe" and go in "Flight Controls" tab
   b) Click "Ailerons+Mouse" option
   c) Click "Apply"
   d) You can now start Prepar3d with the desired steering control mode set.





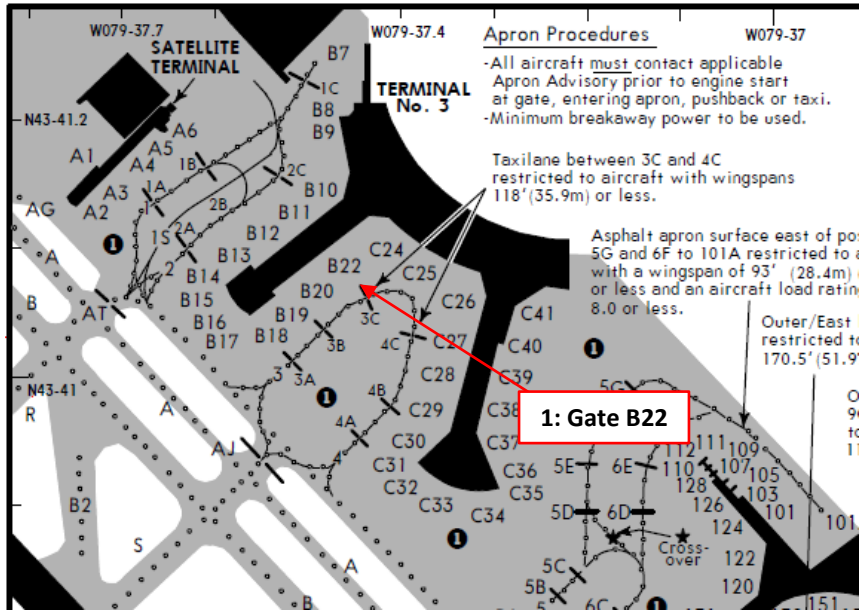


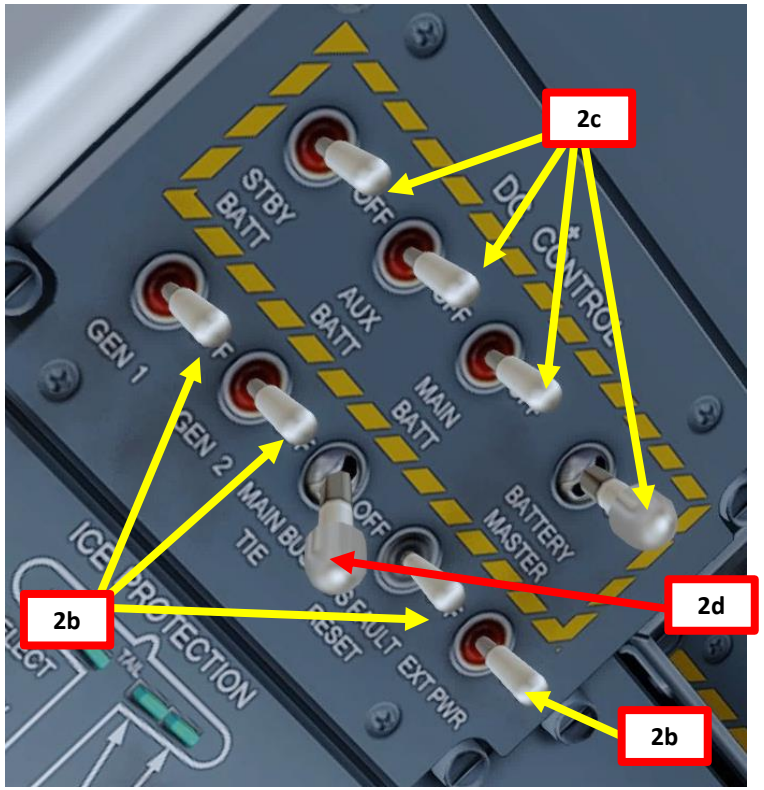


SPAWN COLD & DARK

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 B22 in CYYZ (departure airport) in the MJC8Q400
2. Set cockpit in cold & dark state
    a) Engage Parking Brake lever (AFT = ENGAGED)
    b) Set GEN1, GEN2, BUS FAULT RESET, and EXT PWR switches to OFF
    c) Set STBY BATT, AUX BATT, MAIN BATT and BATTERY MASTER switches to OFF (in that order)
    d) Set MAIN BUS TIE to TIE

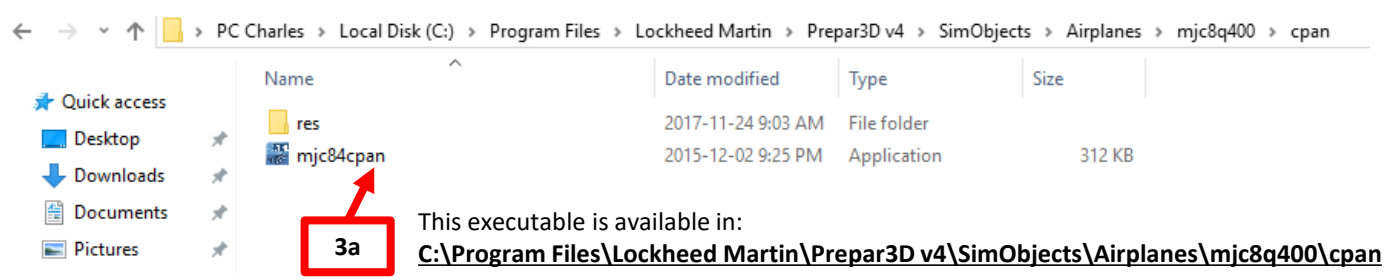




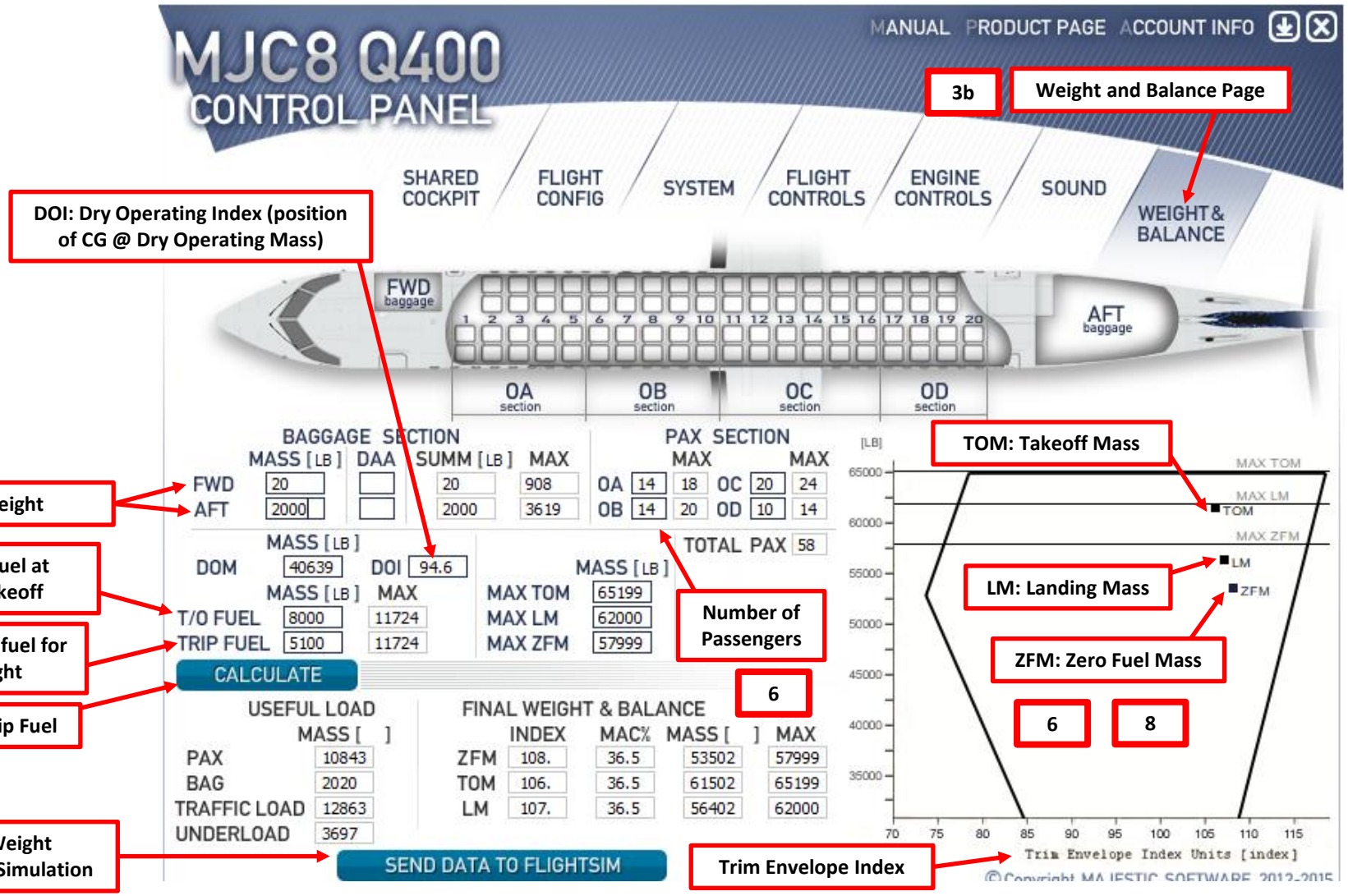
LOAD FUEL, CARGO & PASSENGERS

We will dynamically set our fuel, cargo and passenger loads using the Majestic Control Panel.

3. Open the MJC8 Q400 control panel (mjc74cpsan.exe file)
   a) Open "mjc84cspan.exe"
   b) Go in "Weight & Balance" tab
4. Set fuel loads (we will use 8000 lbs takeoff fuel and 5100 trip fuel, leaving us 1900 lbs extra fuel)
5. Set baggage weight (2000 lbs for this flight)
6. Set number of passengers (58 in our case) through the PAX sections and make sure that the TOM, LM and ZFM are within the Trim Envelope
7. Click "Calculate"
8. Verify that the Takeoff Mass, Landing Mass and Zero Fuel Mass are all under their respective MAX limits as shown on the graph.
9. Once Weight and Balance configuration is deemed correct, click on "Send Data to Flightsim" to set the loads on the aircraft.



This executable is available in:
C:\Program Files\Lockheed Martin\Prepar3D v4\SimObjects\Airplanes\mjc8q400\cpan

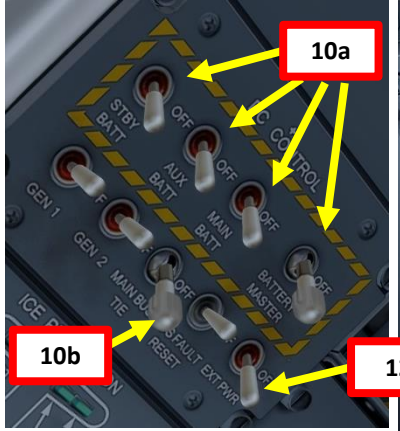


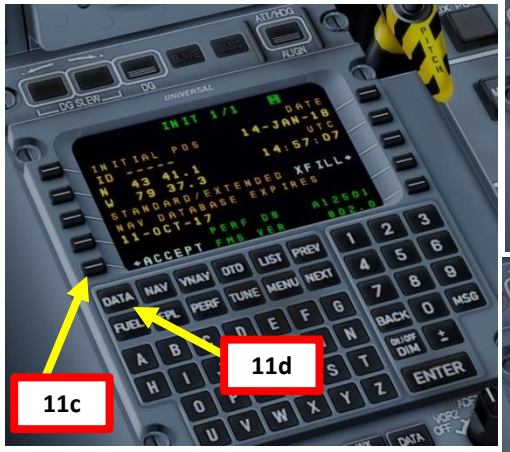
POWER UP AIRCRAFT

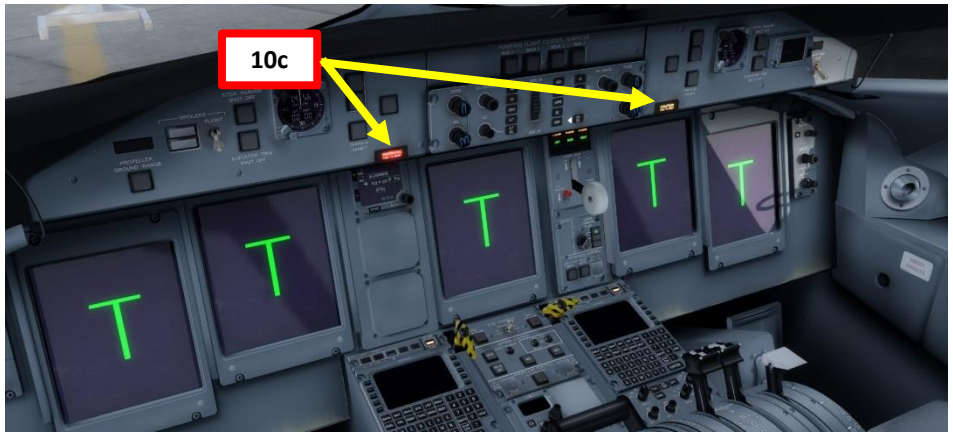
10. On Overhead panel, turn on battery power
    a) Set BATTERY MASTER, MAIN BATT, AUX BATT and STBY BATT switches to ON (in that order)
    b) Set Main Bus Tie to TIE
    c) Press Master Warning and Master Caution lights to reset them

    Note: the aircraft will begin a series of Automatic BITs (built-in tests).
11. ***OPTIONAL***: Go on MCDU main menu to connect ground power unit (GPU) to the aircraft
    a) Power up FMC by pressing and holding the "DIM ON/OFF" button on the MCDU.
    b) Wait for FMC BIT to complete
    c) Click on the "ACCEPT" LSK (Line Select Key) once the INIT page is displayed
    d) Press the MCDU "DATA" button
    e) Click on the "SERVICES" LSK to enter ground crew services page.
    f) Click on the "GPU REQUEST" LSK to set ground power. The MCDU will then display "CANCEL" when GPU is set.
12. ***OPTIONAL***: On overhead panel, click on the "EXT PWR" switch to power connect aircraft to GPU
13. ***OPTIONAL***: On Electrical Systems page, confirm that the "DC EXT PWR ON" indication is illuminated

NOTE: Steps 11 to through 13 are optional.







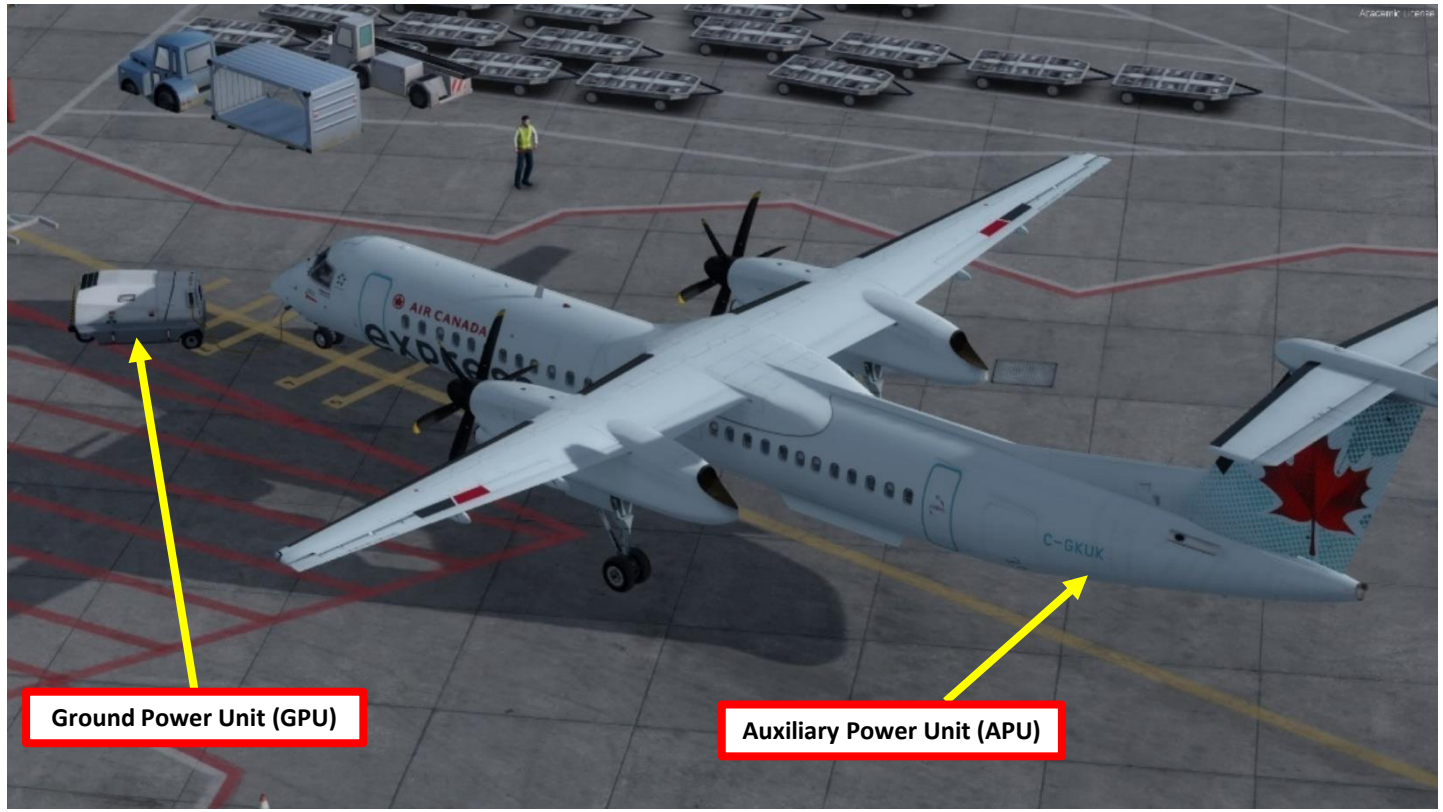
Note: In real life, when using external power, the pilot switches the battery switches OFF after switching to the external battery source. This helps protect batteries from depleting while the ground power unit is in use, or from GPU surges, or in the case of a weak GPU which will make the batteries "discharge" into the GPU. For simplicity's sake, we will simply leave the batteries ON.

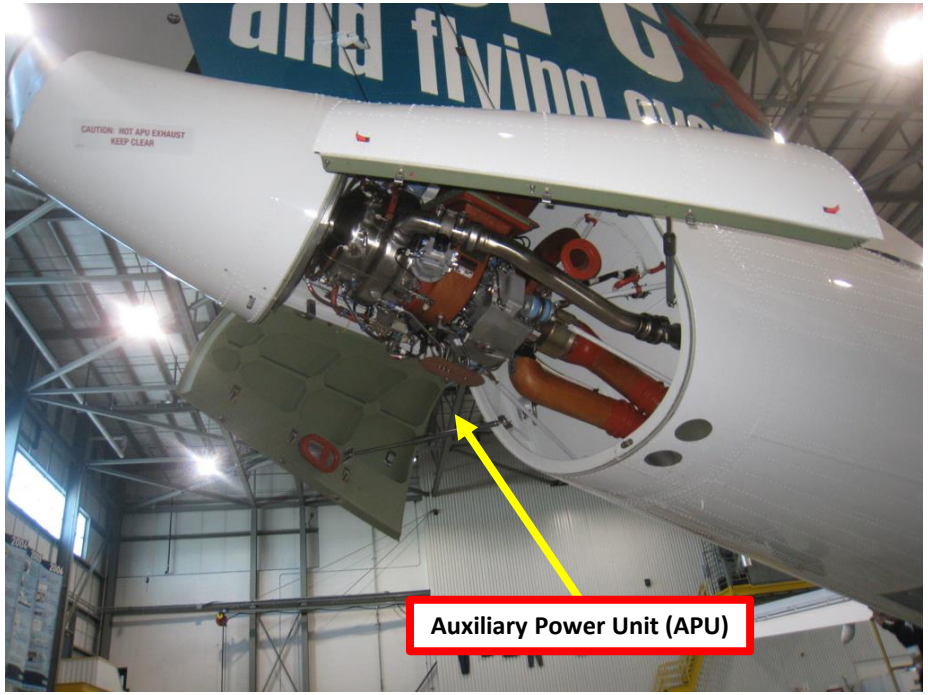
POWER UP AIRCRAFT

Fun fact: the engines of the Q400 can be started either with the APU (Auxiliary Power Unit) or with an external electrical power source like a GPU (Ground Power Unit). The aircraft start-up procedures vary from company to company. There is a debate as to whether you should use the GPU or not.

The APU of the Dash 8 Q400 are considered by some to be fragile and unreliable. It supplies electrical power and bleed air, while the GPU provides electrical power only. Why would we need to use a GPU then? Well, a reason for using the GPU when the APU is running is to lessen on the load on the APU. Certain Canadian airlines will use the APU for air conditioning and the GPU for electrical power during the engine start. The Q400 uses electrical starter generators instead of a pneumatic starter, meaning the engines can start with electric motors cranking the engines instead of a starter powered by APU bleed air like standard airliners like the Airbus A320 or the Boeing 737.

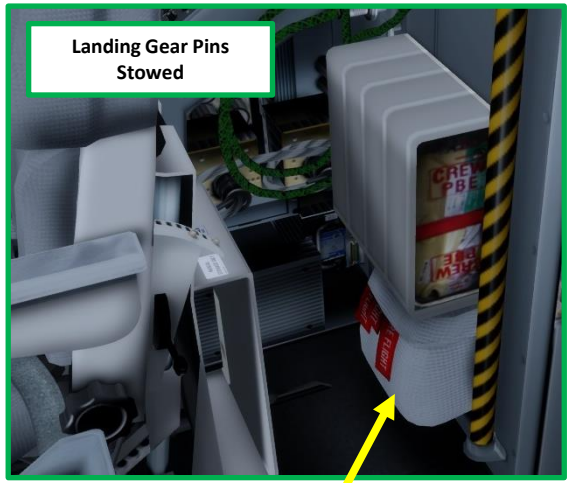
Therefore, for simplicity's sake, we will use both the GPU and the APU in our tutorial, even if real life procedures are a bit different. Keep in mind that this tutorial is done within the scope of a simulation and should not be used for real life operation of the aircraft.

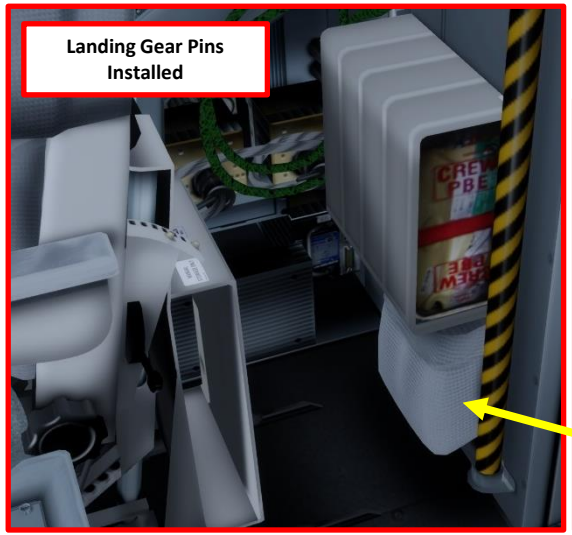




CHECK LANDING GEAR PINS

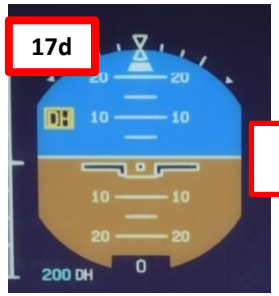
14. Go on MCDU "DATA -> SERVICES -> EXITS" menu to open doors to communicate with ground crew personnel
    a) In DATA -> SERVICES page, click "EXITS" LSK
    b) Click on the LSKs next to FWD PAX, AFT PAX, AFT BAG, and SERVICE doors to open them (or use the "LSHIFT + E" key binding)
    c) Doors will now be open
15. Click on "RETURN" to go back to the "SERVICES" page
16. Make sure the landing gear pins are removed
    a) **If the GEAR PINS option shows "GND OPS ONLY"**, this means that either the parking brake is not set or that doors are not open
    b) **If the GEAR PINS option shows "INSTALL"**, this means that the landing gear pins are removed and are stored in the bag with red flags behind the copilot's seat. Your landing gears will now deploy or retract normally. In that case, you can proceed to the next page
    c) **If the GEAR PINS option shows "STOW"**, this means that the landing gear pins are still installed (notice the empty bag behind the copilot's seat). Your landing gears will remain locked in their current position no matter what you do with the landing gear lever. In that case, you should click on the LSK next to "STOW" to stow the landing gear pins.

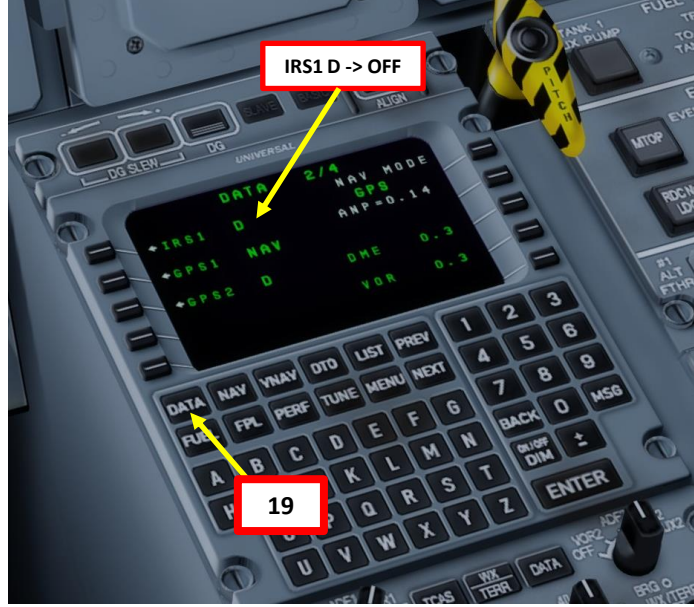


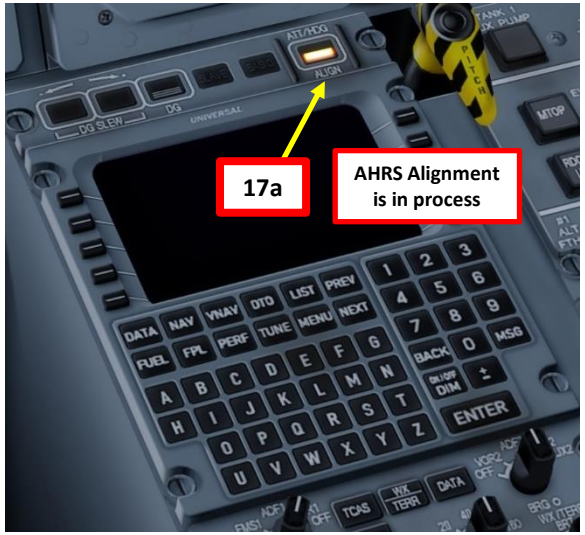


AHRS & IRS ALIGNMENT

17. The AHRS (Attitude & Heading Reference System, which drives the flight instruments) alignment starts immediately when the battery switches are ON. The alignment phase is on-going when the ATT/HDG ALIGN light illuminates and lasts between 45 sec and 2 minutes.
18. The positional information of the navigation systems are provided by GPS and/or VOR-based RNAV, which do not require any alignment. The IRS, on the other hand, acts as a short time supplement to the GPS in this aircraft. If you see the "GPS INTEG" caution on the PFD (Primary Flight Display), this means that the FMC is not turned on.
19. Make sure the IRS (Inertial Reference System) switch is set to NAV. If it's not, set it to OFF for 5-10 sec, then set it back to NAV to restart IRS alignment. You can monitor the alignment process in the second DATA page of the FMC by pressing the DATA button two times.

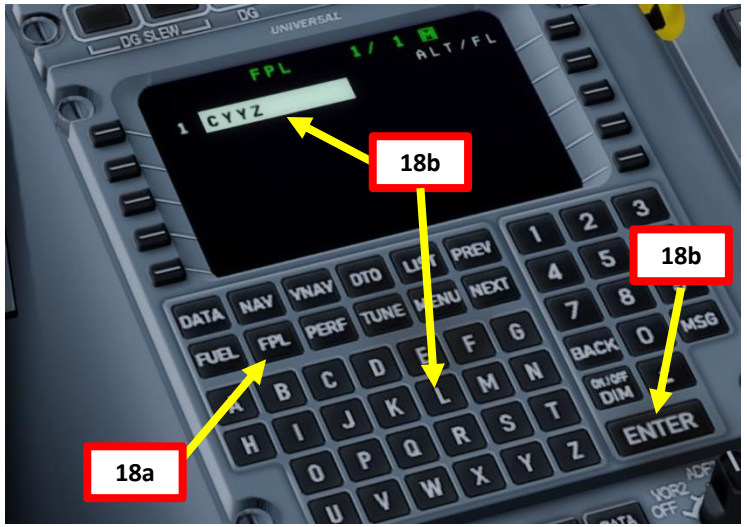






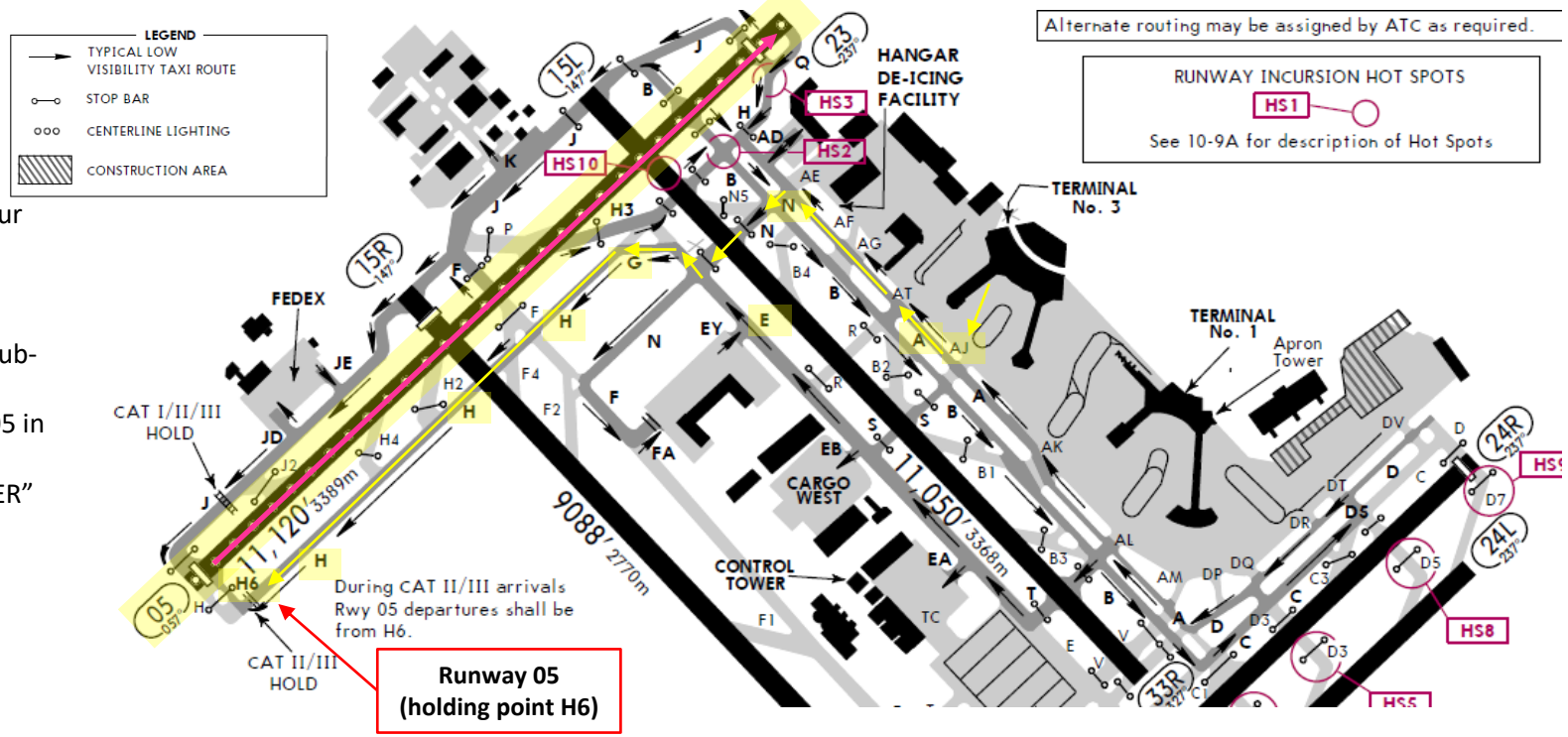
FMC SETUP – FLIGHT PLAN

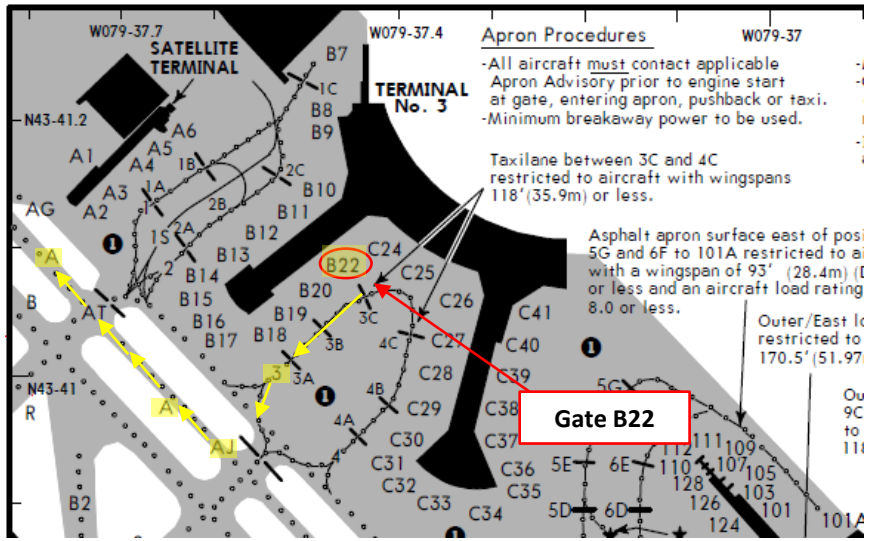
17. Initialize the FMC (Flight Management Computer) if you have not done it already
    a) Power up FMC by pressing and holding the "DIM ON/OFF" button on the MCDU.
    b) Wait for FMC BIT (Built-In Test) to complete
    c) Click on the "ACCEPT" LSK (Line Select Key) once the INIT page is displayed
18. Go on FMC (Flight Management Computer) and initialize your flight plan
    a) Press the FPL page button
    b) Type "CYYZ" (Pearson Airport) on the MCDU keypad and press "ENTER".
    c) Click LSK next to "ACCEPT" on the confirmation screen to validate entry.
    d) Type "CYUL" (Trudeau Airport) on the MCDU keypad and press "ENTER".
    e) Click LSK next to "ACCEPT" on the confirmation screen to validate entry.



FMC SETUP – FLIGHT PLAN (DEPARTURE)

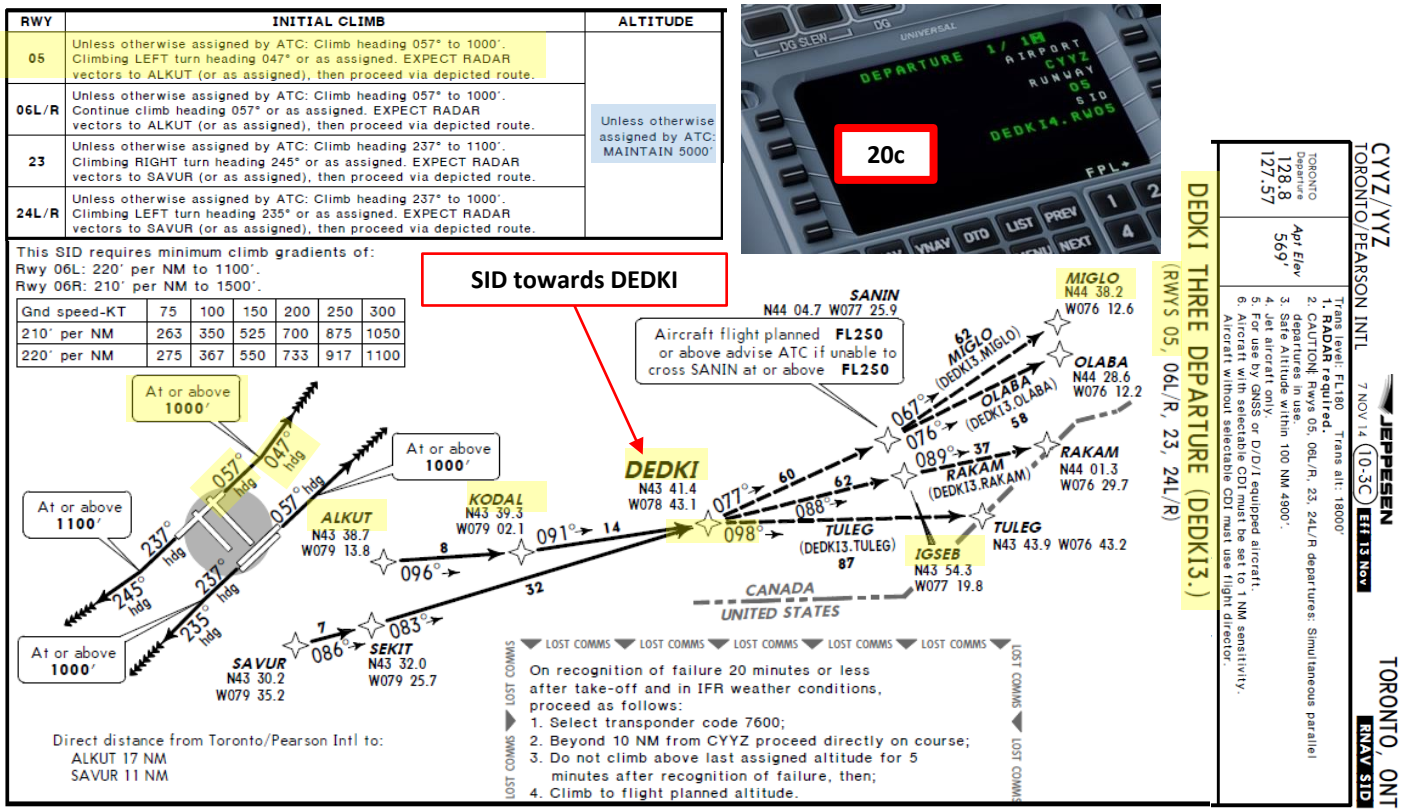
19. Go on FMC (Flight Management Computer) and set up your departure parameters
    a) Press the FPL page button
    b) Press the MENU page button
    c) Select LSK next to “DEPART” to enter Departure sub-menu
    d) Type desired runway selection number (runway 05 in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”

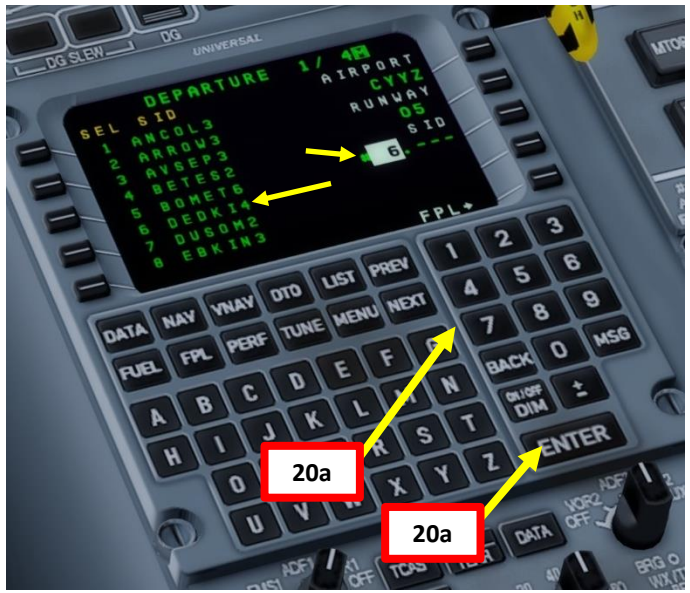


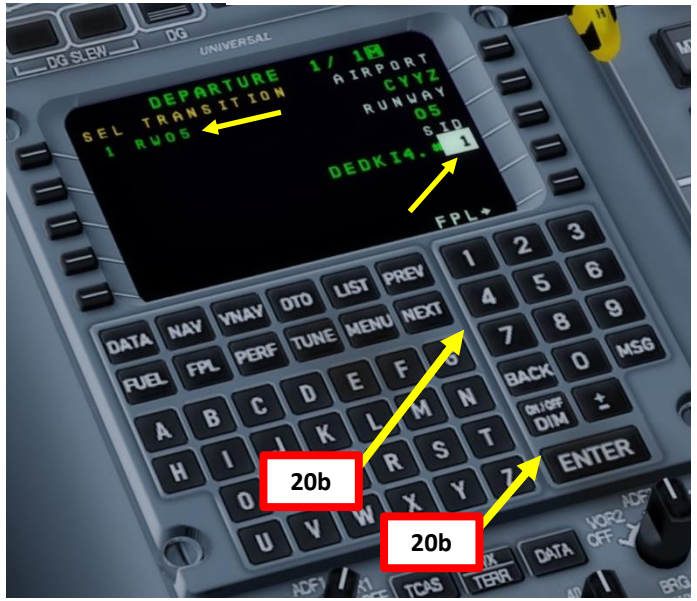


FMC SETUP – FLIGHT PLAN (DEPARTURE)

20. Go on FMC (Flight Management Computer) and set up your departure parameters for the SID (Standard Instrument Departure)
    a) Type desired SID selection number (DEDKI4 in our case, so we type “6” since it is selection item number 6) on the MCDU keypad and press “ENTER”
    b) Type desired SID transition selection number (Runway 05 in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”
    c) All departure data is now entered in the FMC.
    d) You can click on the FPL page button to verify new entries.

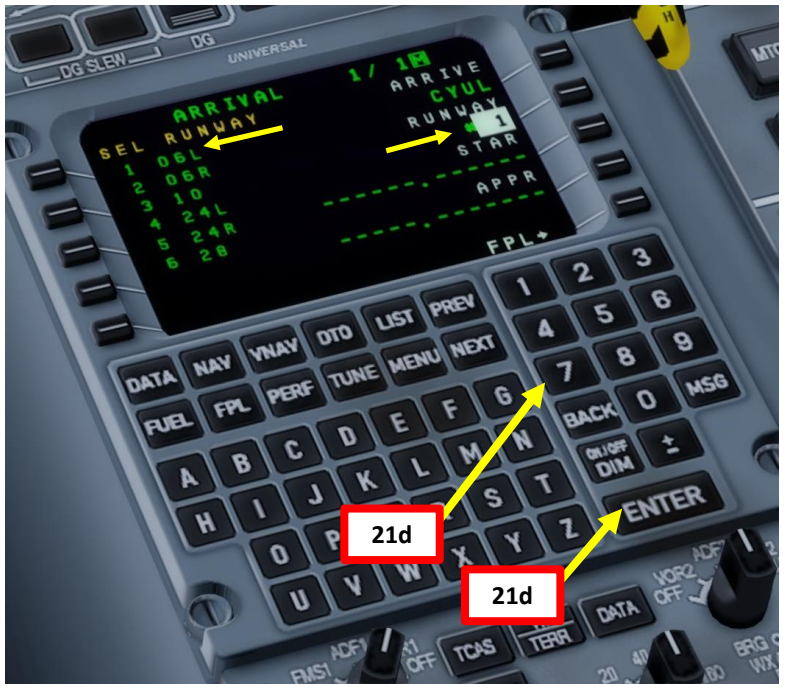


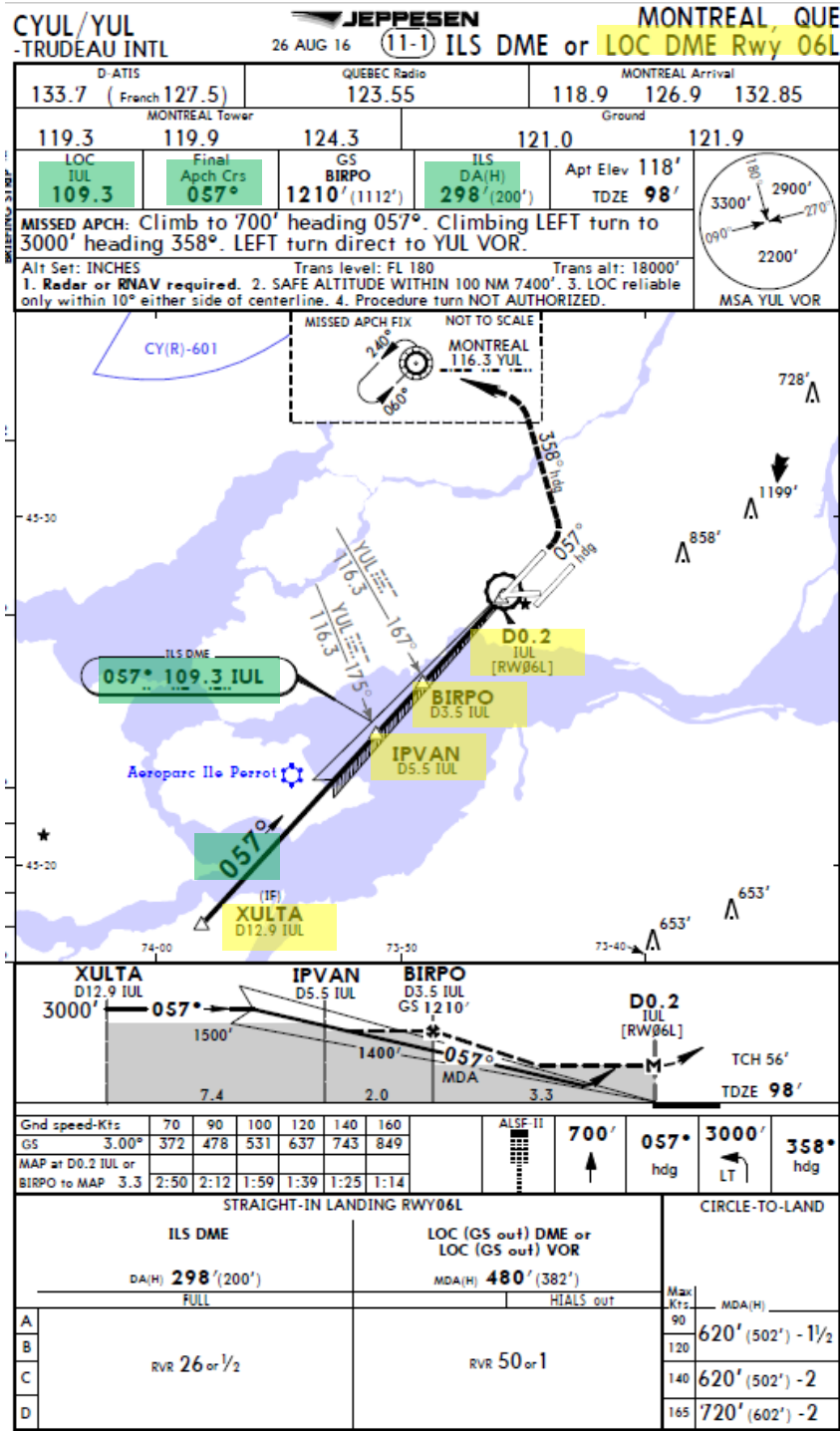




FMC SETUP – FLIGHT PLAN (ARRIVAL)

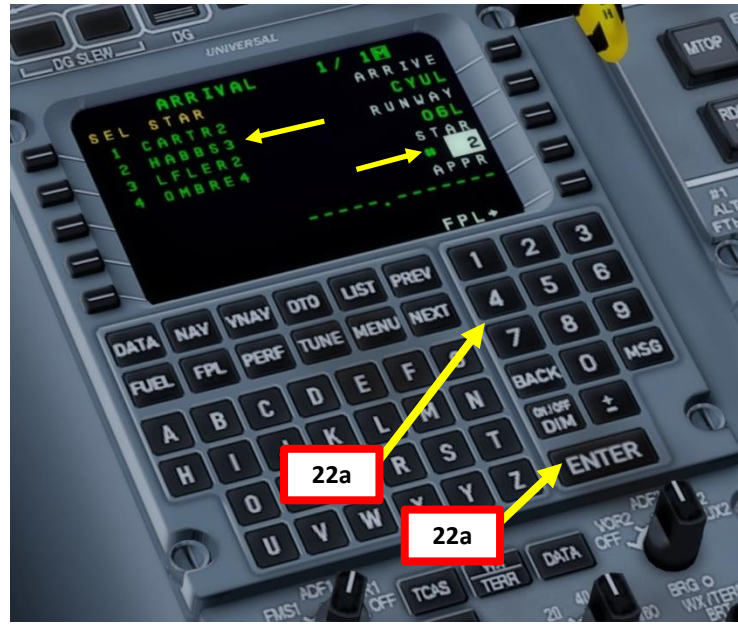
21. Go on FMC (Flight Management Computer) and set up your arrival parameters
    a) Press the FPL page button
    b) Press the MENU page button
    c) Select LSK next to “ARRIVE” to enter Arrival sub-menu
    d) Type desired runway selection number (runway 06 Left in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”

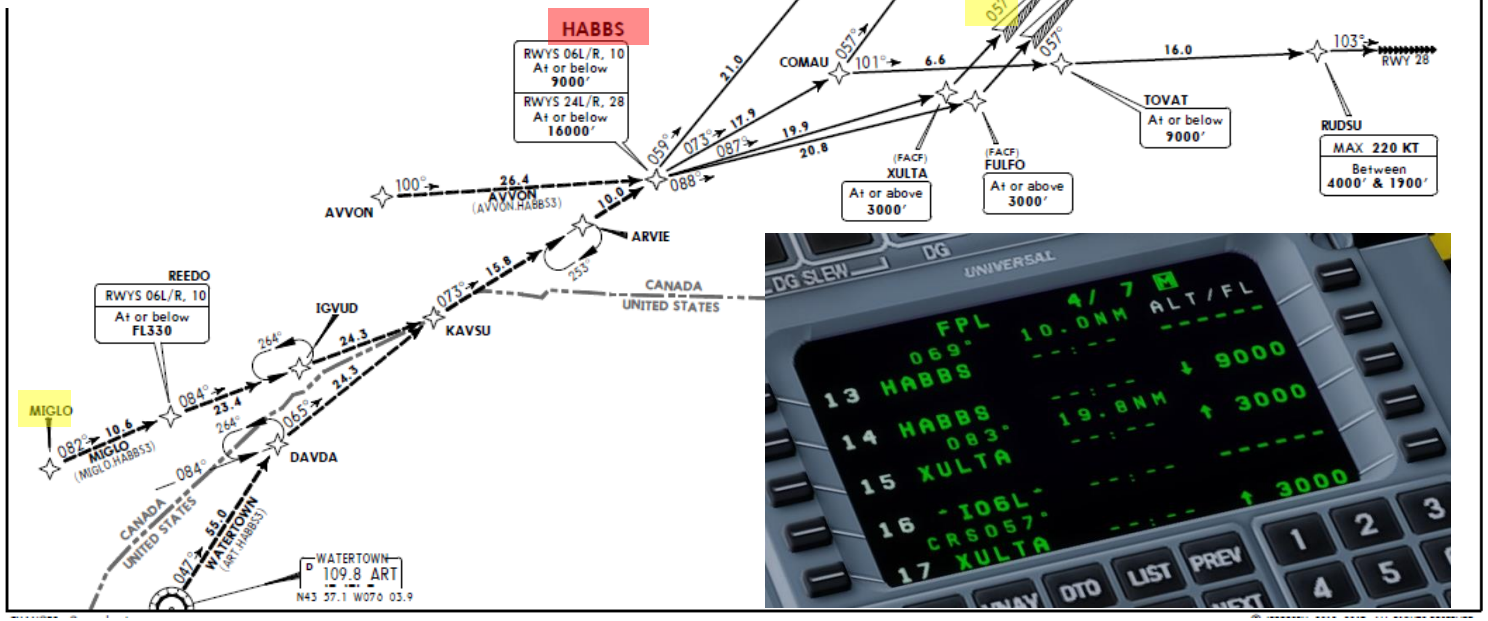




FMC SETUP – FLIGHT PLAN (ARRIVAL)

22. Go on FMC (Flight Management Computer) and set up your arrival parameters for the STAR (Standard Terminal Arrival Route)
    a) Type desired STAR selection number (HABBS3 in our case, so we type “2” since it is selection item number 2) on the MCDU keypad and press “ENTER”
    b) Type desired STAR transition selection number (MIGLO VOR waypoint in our case, so we type “3” since it is selection item number 3) on the MCDU keypad and press “ENTER”. In other words, we will enter the STAR from the MIGLO transition point.
    c) Type desired approach selection number (I06L ILS in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”.
    d) All arrival data is now entered in the FMC.
    e) You can click on the FPL page button to verify new entries.

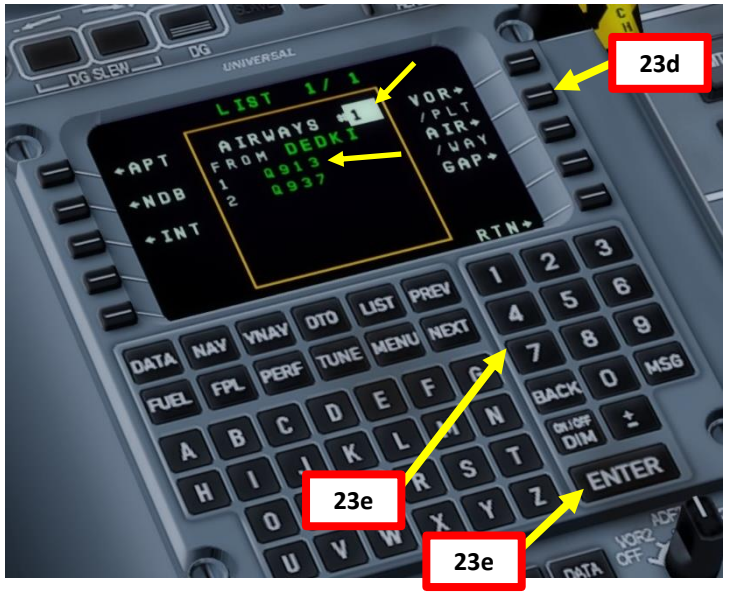




FMC SETUP – FLIGHT PLAN (COMPLETE ROUTE)

CYYZ SID **DEDKI** Q913 **IGSEB** DCT **MIGLO** STAR **CYUL**

23. Go on FMC (Flight Management Computer) and set up your remaining waypoints and airways
    a) Press the FPL page button and click NEXT button to show page 2
    b) Click on LSK next to the next waypoint after DEDKI to select it (it should be a discontinuity reading “NO LINK” in flashing amber).
    c) Press the LIST button
    d) Click on LSK next to the AIRWAYS sub-menu
    e) Type desired airway selection number from DEDKI waypoint (airway Q913 in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”
    f) Type desired next waypoint selection number after DEDKI (IGSEB VOR waypoint in our case, so we type “1” since it is selection item number 1) on the MCDU keypad and press “ENTER”.
    g) IGSEB waypoint has now been added after DEDKI and will be accessible through airway Q913
    h) We will now have to check for discontinuities

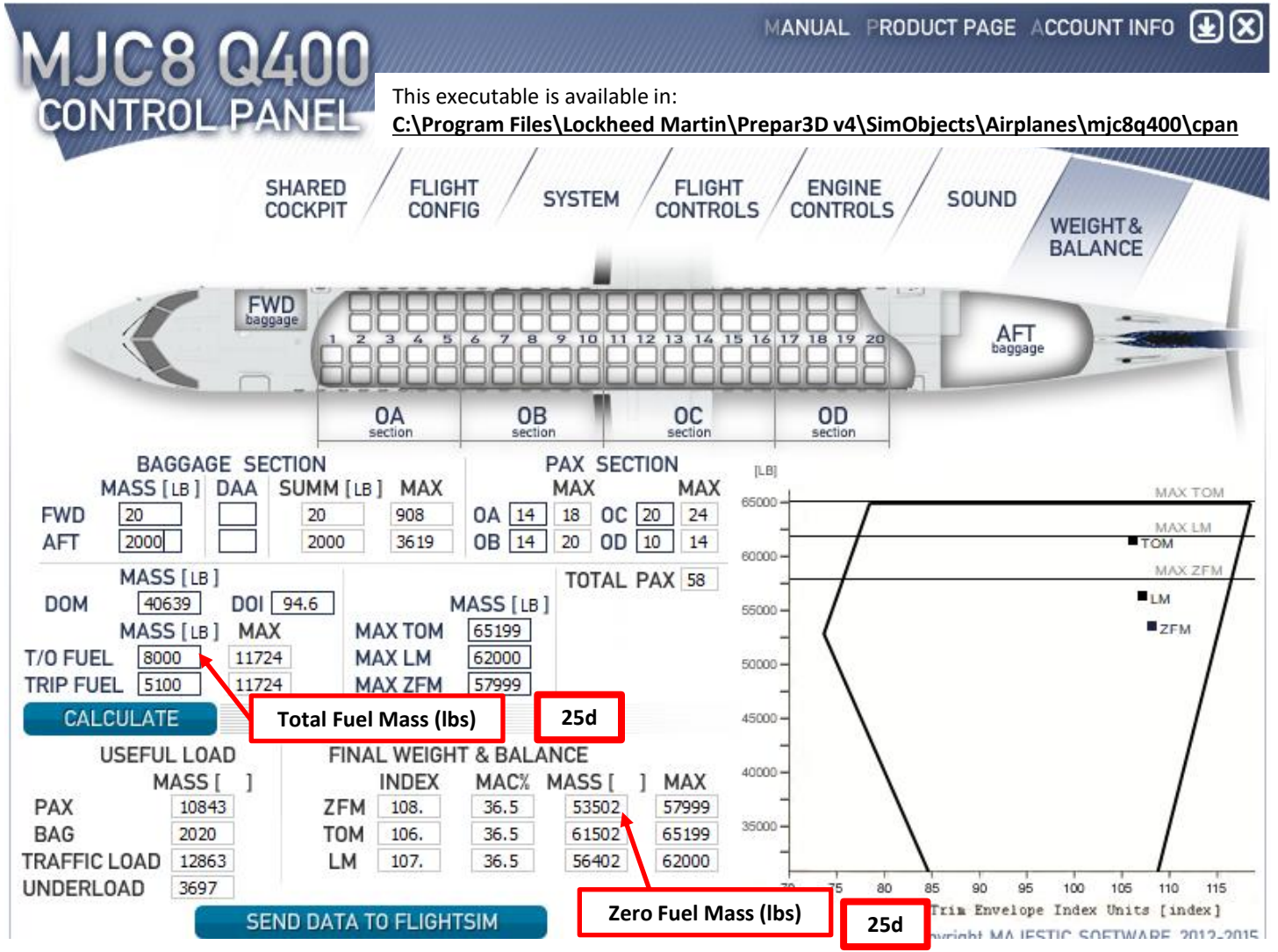


FMC SETUP – FLIGHT PLAN (CLEAN UP DISCONTINUITIES)

24. Go on FMC (Flight Management Computer) and remove remaining discontinuities from the flight plan
    a) Click on LSK next to the next “NO LINK” waypoint (in our case after IGSEB).
    b) Click on LSK next to “DELETE” two times to delete discontinuity between IGSEB and MIGLO.
    c) Click on NEXT button until you reach page 4 of the FPL menu.
    d) Click on LSK next to the next “NO LINK” waypoint (in our case after XULTA).
    e) Click on LSK next to “DELETE” two times to delete discontinuity between XULTA and the I06L approach fix.
    f) Most discontinuities should now be removed. You can cycle through waypoints by pressing the “FORMAT” button while being in the FPL page and pressing “NEXT” or “PREV” to cycle through waypoints on the MFD. Press the “FORMAT” button again to return to the normal navigation display.

FMC SETUP – FUEL & WEIGHT

25. Check the MJC8 Q400 control panel and find your resulting Zero Fuel Mass (ZFM)
    a) Open “mjc84cspan.exe”
    b) Go in “Weight & Balance” tab
    c) Zero Fuel Weight/Mass is 53502 lbs
    d) Our total fuel is 8000 lbs
26. Enter Fuel & Weight information in FMC (Flight Management Computer)
    a) Press the FUEL page button. You will see a BASIC WT entry that is erroneous. Let’s fix this.
    b) Press LSK next to ZFW, type “53502” ZFW value we obtained from the control panel and press ENTER.
    c) Press LSK next to FUEL ONBOARD, type “8000” total fuel value we obtained from the control panel and press ENTER.
    d) The Gross Weight will automatically be calculated based on the two values we entered previously. We’re good to go!

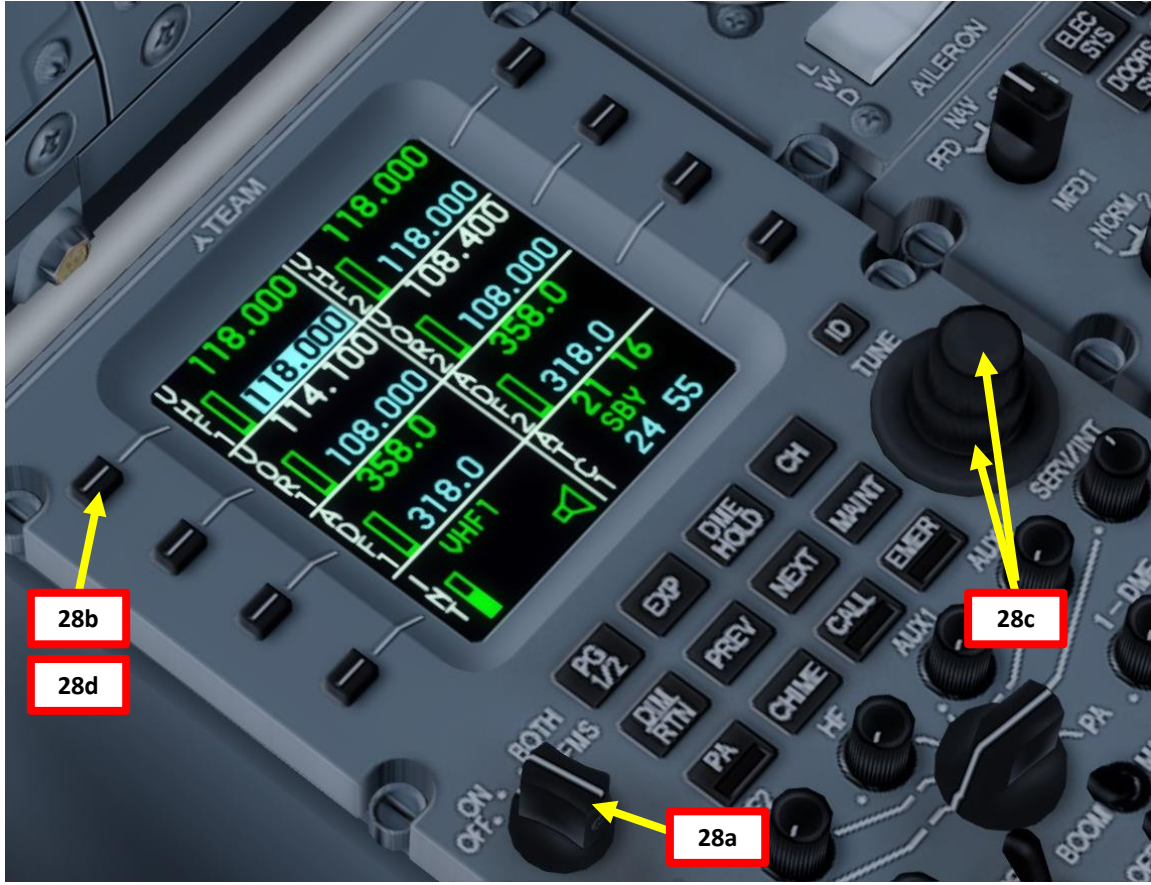


FMC SETUP – CROSS-FILL

27. Initialize the second FMC (Flight Management Computer) on the First Officer's side
    a) Power up FMC by pressing and holding the "DIM ON/OFF" button on the MCDU.
    b) Wait for FMC BIT (Built-In Test) to complete
    c) Click on the "ACCEPT" LSK (Line Select Key) once the INIT page is displayed
    d) Press the DATA button to open up the Data page
    e) Press the LSK next to the XFILL sub-menu
    f) Press the LSK next to the XFILL FLIGHT PLAN sub-menu to start transfer the flight information from the captain's FMC to the first officer's FMC
    g) Wait for the CROSSFILL RECEIVE IN PROGRESS to complete
    h) Press the LSK next to the XFILL FUEL sub-menu to start transfer the fuel information from the captain's FMC to the first officer's FMC
    i) Wait for the CROSSFILL RECEIVE IN PROGRESS to complete

ARCDU – UHF RADIO

28. Set ARCDU (Audio & Radio Control Display Unit) radio frequencies to CYYZ (Toronto) and CYUL (Montreal) airport ATIS (Automatic Terminal Information Service) in order to gather meteo conditions and atmospheric pressure
    a) Power up ARCDU by setting radio power switch to ON.
    b) Press the LSK next to UHF1 to select frequency 1. Frequency 1 will be highlighted in white.
    c) Scroll mousewheel over TUNE knob to tune UHF1 radio frequency 1 to the Toronto ATIS (120.825 MHz).
    d) Press LSK next to UHF1 to validate frequency 1.
    e) Repeat steps b) to d) to set UHF1 frequency 2 to the Montreal ATIS (133.700).
    f) Press LSK next to UHF1 to cycle active frequency (in green) to CYYZ ATIS (120.825).
    g) Write down the altimeter setting broadcast by Toronto ATIS. In our case, altimeter setting is 29.52 in Hg (inches of mercury).
    h) Set COM1 radio switch to ON



CYYZ/YYZ
Apt Elev 569′
N43 40.6 W079 37.8

D-ATIS	*TORONTO Clearance	APRON ADVISORY		
		North Apron	South Apron	Pad Control
120.825 133.1	121.3	122.275	122.075	131.17 130.87 131.95

Ground	Tower	LONDON Radio	TORONTO Departure
121.9 121.65 119.1	118.35 118.7	123.275	128.8 127.575

CYUL/YUL -TRUDEAU INTL — JEPPESEN — 26 AUG 16 (11-1) — MONTREAL, QUE ILS DME or LOC DME Rwy 06L

D-ATIS	QUEBEC Radio	MONTREAL Arrival
133.7 (French 127.5)	123.55	118.9 126.9 132.85

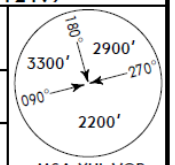
MONTREAL Tower			Ground	
119.3	119.9	124.3	121.0	121.9

LOC IUL	Final Apch Crs	GS	ILS DA(H)	Apt Elev / TDZE
109.3	057°	BIRPO 1210′ (1112′)	298′ (200′)	Apt Elev 118′ TDZE 98′

BRIEFING STRIP™

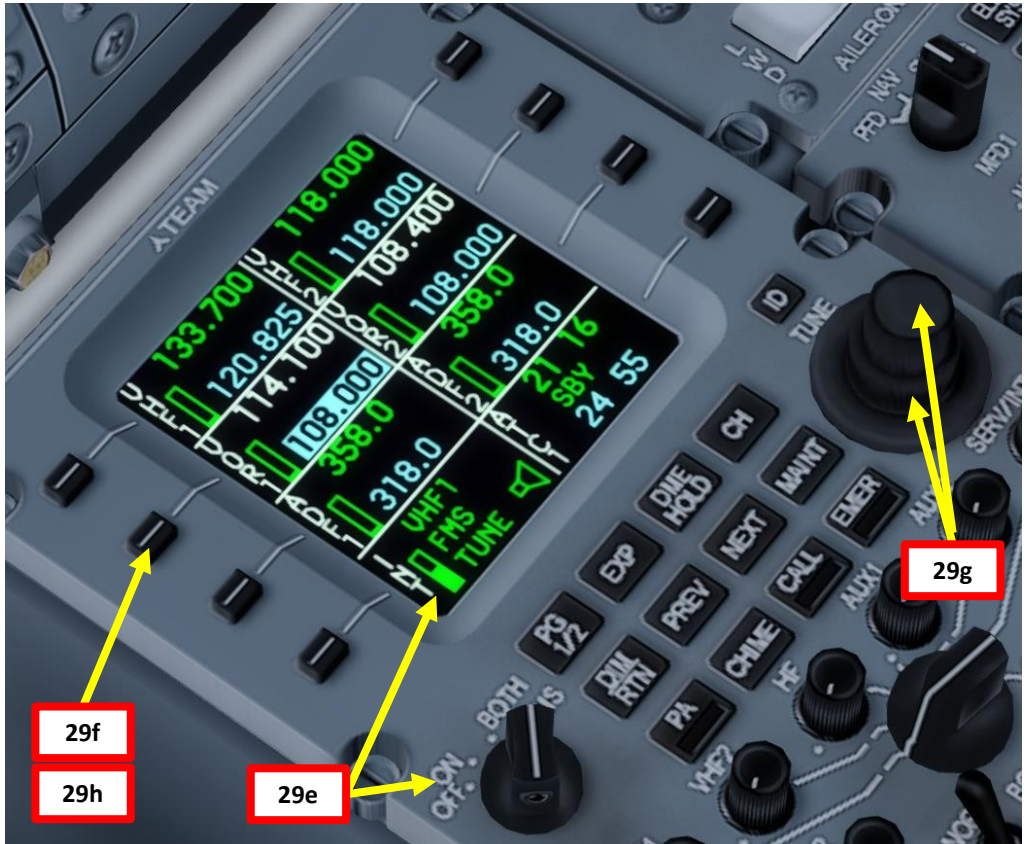
MISSED APCH: Climb to 700′ heading 057°. Climbing LEFT turn to 3000′ heading 358°. LEFT turn direct to YUL VOR.

Alt Set: INCHES Trans level: FL 180 Trans alt: 18000′
1. Radar or RNAV required. 2. SAFE ALTITUDE WITHIN 100 NM 7400′. 3. LOC reliable only within 10° either side of centerline. 4. Procedure turn NOT AUTHORIZED.



ARCDU – RADIO NAV

29. Set ARCDU (Audio & Radio Control Display Unit) ILS frequency to CYUL (Montreal) airport ILS frequency
    a) Press the « FPL » button to enter the Flight Plan page
    b) Press the « MENU » button to enter the FPL MENU
    c) Click the LSK next to « APPR PLAN ».
    d) ILS frequency for Montreal runway 06L is 109.30 MHz.
    e) Link ARCDU to FMS (Flight Management System) by setting radio power switch to FMS.
    f) Press the LSK next to VOR1 to select frequency 1. Frequency 1 will be highlighted in white.
    g) Scroll mousewheel over TUNE knob to tune VOR1 radio frequency 1 to the Montreal ILS (109.30 MHz).
    h) Press LSK next to VOR1 to validate frequency 1. Frequency will now read “ILS1” instead of “VOR1”.
    i) Repeat steps f) to h) to set VOR2 frequency 1 to the Montreal ILS (109.30 MHz) to make sure both FMCs track the same ILS frequency.



CYUL/YUL -TRUDEAU INTL — JEPPESEN 26 AUG 16 — (11-1) ILS DME or LOC DME Rwy 06L — MONTREAL, QUE

D-ATIS	QUEBEC Radio	MONTREAL Arrival
133.7 (French 127.5)	123.55	118.9 126.9 132.85

MONTREAL Tower		Ground	
119.3	119.9	124.3	121.0 121.9

LOC IUL	Final Apch Crs	GS	ILS	Apt Elev 118′
109.3	057°	BIRPO 1210′ (1112′)	DA(H) 298′ (200′)	TDZE 98′

MISSED APCH: Climb to 700′ heading 057°. Climbing LEFT turn to 3000′ heading 358°. LEFT turn direct to YUL VOR.

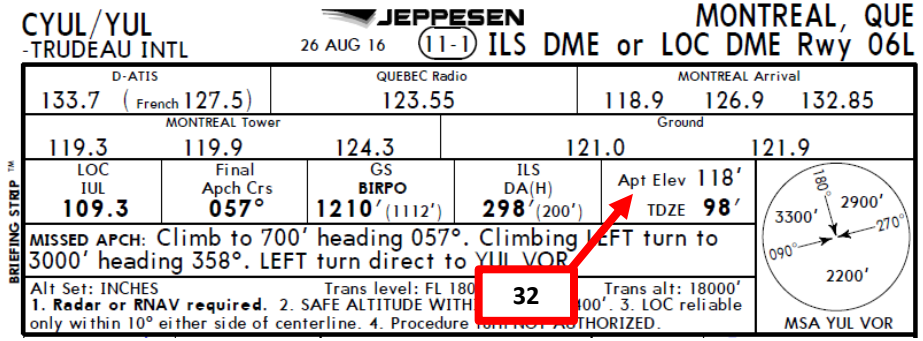
Alt Set: INCHES Trans level: FL 180 Trans alt: 18000′
1. Radar or RNAV required. 2. SAFE ALTITUDE WITHIN 100 NM 7400′. 3. LOC reliable only within 10° either side of centerline. 4. Procedure turn NOT AUTHORIZED.

MSA YUL VOR: 180° 2900′ 270° 090° 3300′ 2200′

BRIEFING STRIP™

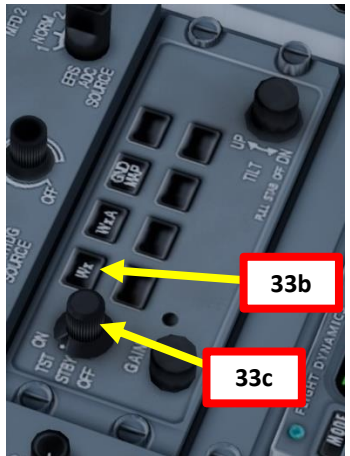
CABIN PRESSURE & ALTIMETER SETTING

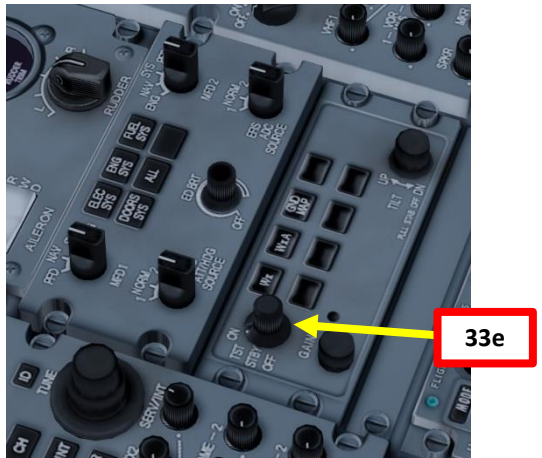
30. Set altimeter barometric setting on the PFD (Primary Flight Display) to 29.52 in Hg, as stated by the Toronto ATIS.
31. Set standby ADI (Attitude Director Indication) barometric setting to 29.52 in Hg, as stated by the Toronto ATIS.
32. Set landing cabin pressure altitude setting to approx. 100 ft (CYUL airport elevation is 118 ft). Take note that the gauge is in thousands of feet.



WEATHER RADAR TEST

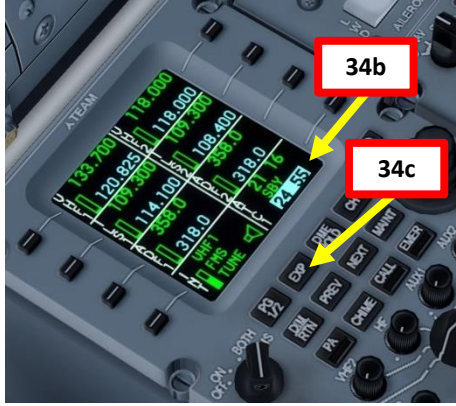
33. Power up and test Weather radar
    a) Press the WX/TERR button to toggle between TERRAIN MAP (EGPWS, or Enhanced Ground Proximity Warning System) and WEATHER RADAR display
    b) Set weather radar mode to WX
    c) Set weather radar switch to TEST
    d) Check that WX TEST occurs correctly
    e) Set weather radar switch to ON
    f) Confirm that WEATHER RADAR display shows WX ON
    g) Press WX/TERR button back to TERRAIN MAP





TCAS TEST

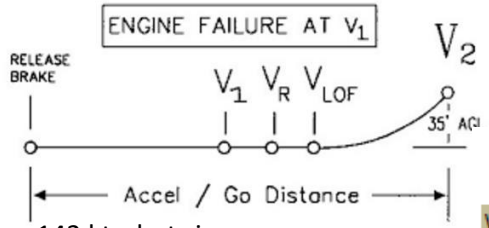
34. Power up and test TCAS (Traffic & Collision Avoidance System)
    a) Click the LSK next to ATC1 on the ARCDU to select TCAS menu
    b) ATC1 transponder frequency will be highlighted in white when selected
    c) Click on the EXP button to expand TCAS menu
    d) Press the LSK next to the TEST option to start TCAS BIT (Built-In Test)
    e) Wait for the BIT to complete
    f) Confirm that TEST OK appears on navigation display
    g) Click and hold LSK next to ATC1 to set TCAS mode to TA ONLY (Traffic Advisory Only)
    h) Confirm that TA ONLY is in AUTO mode. If not, press the TCAS power button.
    i) To return ARCDU to main page, click on PG 1/2 button.



V-SPEEDS SETTING

35. Find V-Speeds
    a) Press FUEL button on the MCDU to find our Gross Weight: 61502 lbs
    b) The airport altitude at CYYZ (Toronto) is 173 m, or 567 ft
    c) Find VR, V2, VFRI & VCLIMB for a Flaps 5 takeoff for 62000 lbs and 2000 ft to be conservative. V1 is assumed equal to VR.
    d) V_1: 131 kts
    e) V_R: 131 kts
    f) V_2: 132 kts
    g) V_{FRI}: 162 kts (142 + 20 kts)
    Flaps Retraction Initiation Speed. Table gives us 142 kts, but since we have possible snow and icing conditions above 1000 ft, we will increase that value by 20 kts since Bombardier requires to have the INCR REF SPEEDS switch to ON, which increases the stall warning speed by 20 kts and provides us a safe margin.
    h) V_{CLIMB}: 174 kts (154 + 20 kts)
    Final Takeoff Speed. Table gives us 154 kts, but we will increase that value by 20 kts for the same reason as mentioned above.
    i) To set V-Speeds, press the SEL button to select V1 (highlighted) and scroll mousewheel on SPEED BUG knob to set its value.
    j) Repeat previous step for VR, V2, VFRI (full triangle) and VCLIMB (empty triangle).
    k) V-Speed selector will automatically be unselected.
36. Set DH/MDA switch (Decision Height / Mean Descent Altitude) to MDA and scroll mousewheel on knob to set acceleration altitude to the airport elevation + 1000 ft (567 ft + 1000 ft = **1567** ft) rounded up to 1570 ft.

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).



MJC8 Q400 TAKEOFF SPEEDS CARD

1. Look up the Vr/V2 from the appropriate **Vr/V2 table** below. Assume V1=Vr
2. In Vr exceeds V2 , assume V2 = Vr
3. If **icing protection** is ON above 500 ft AGL, add 20 kts to V2
4. For **wet runway** reduce V1 by 8kts - 0.1kts for each kt headwind, or 8 kts + 0.3kts for each kt tailwind
5. Check Vr **not below** 108kts for Flaps 5, 104kts for Flaps 10, 100 kts for Flaps 15
6. Check V1 **not below** 97 kts for Flaps 5, 96 kts for Flaps 10 and Flaps 15

Flap Retraction Initiation Speed (VFRI)
Final Takeoff Speed (V CLMB)

When flying in icing conditions: Above 400ft AGL, add 20 kts to V FRI Add 20 kts to V CLMB

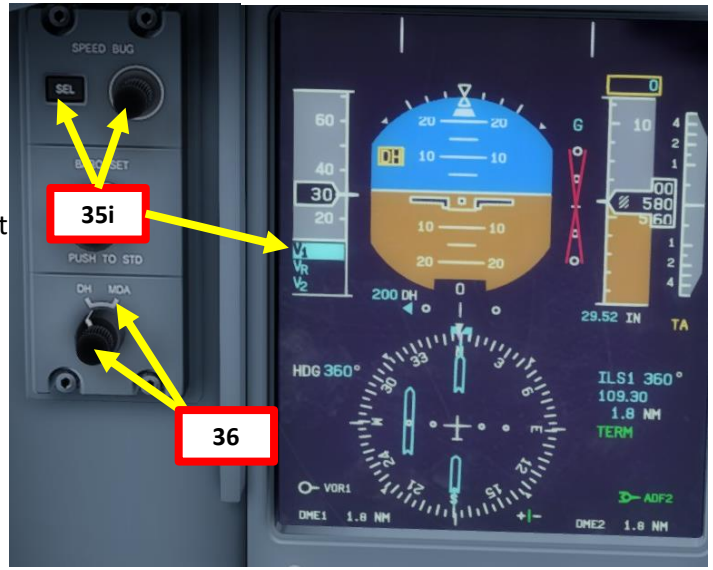
WEIGHT	V FRI Flap 5°	V FRI Flap 10°	V FRI Flap 15°	V CLMB
39.500 LB	116	110	107	130
44.000 LB	120	112	109	131
48.500 LB	126	118	115	137
53.000 LB	132	123	120	143
57.000 LB	137	128	125	148
62.000 LB	142	134	130	154
64.000 LB	14	137	133	1

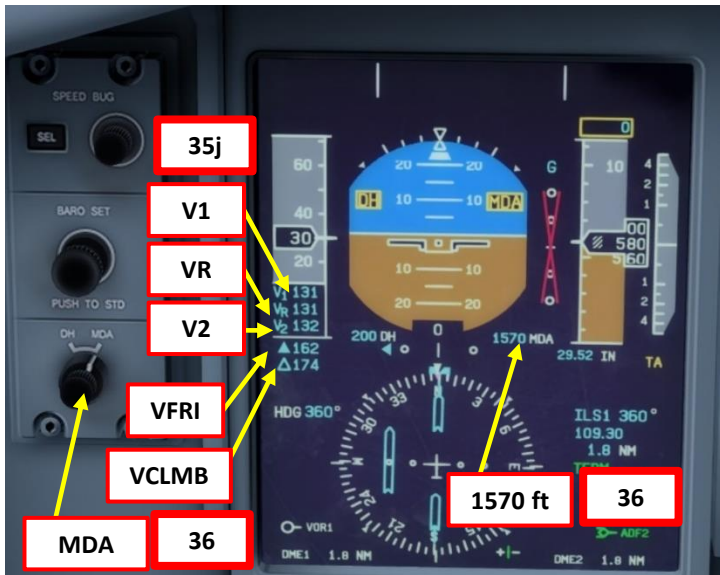
35c

FLAPS 5° Vr/V2

	AT OR BELOW 20° C OAT						ABOVE 20° C OAT					
WEIGHT/ ALTITUDE	0	2000	4000	6000	8000	10000	0	2000	4000	6000	8	00
39.500 LB	102/116	102/115	102/114	102/113	102/112	103/111	102/114	102/113	102/112	103/111	103/110	105/109
44.000 LB	105/115	106/114	107/113	107/112	108/112	110/111	107/113	108/112	108/112	110/111	110/111	112/111
48.500 LB	112/117	113/117	113/117	114/117	115/117	116/117	113/117	114/117	115/117	116/117	117/117	118/117
53.000 LB	118/122	119/122	120/122	120/122	121/122	122/122	120/122	120/122	121/122	122/122	123/122	124/122
57.000 LB	124/127	125/127	126/127	12		127	128/127	126/127	126/127	127/127	128/127	129/127	130/127
62.000 LB	130/132	131/132				132	134/132	131/132	132/132	133/132	134/132	135/132	136/132
64.000 LB	133/135	134/135	135/135	136/135	137/135	138/135	135/135	136/135	137/135	138/135	138/135	140/135

35c





V-SPEEDS REFERENCE TABLES

FLAPS 5° Vr/V2

WEIGHT/ ALTITUDE	AT OR BELOW 20° C OAT						ABOVE 20° C OAT					
	0	2000	4000	6000	8000	10000	0	2000	4000	6000	8000	10000
39.500 LB	102/116	102/115	102/114	102/113	102/112	103/111	102/114	102/113	102/112	103/111	103/110	105/109
44.000 LB	105/115	106/114	107/113	107/112	108/112	110/111	107/113	108/112	108/112	110/111	110/111	112/111
48.500 LB	112/117	113/117	113/117	114/117	115/117	116/117	113/117	114/117	115/117	116/117	117/117	118/117
53.000 LB	118/122	119/122	120/122	120/122	121/122	122/122	120/122	120/122	121/122	122/122	123/122	124/122
57.000 LB	124/127	125/127	126/127	126/127	127/127	128/127	126/127	126/127	127/127	128/127	129/127	130/127
62.000 LB	130/132	131/132	131/132	132/132	133/132	134/132	131/132	132/132	133/132	134/132	135/132	136/132
64.000 LB	133/135	134/135	135/135	136/135	137/135	138/135	135/135	136/135	137/135	138/135	138/135	140/135

FLAPS 10° Vr/V2

WEIGHT/ ALTITUDE	AT OR BELOW 20° C OAT						ABOVE 20° C OAT					
	0	2000	4000	6000	8000	10000	0	2000	4000	6000	8000	10000
39.500 LB	100/111	100/110	100/110	100/109	100/108	100/107	100/109	100/109	100/109	100/107	---/106	---/105
44.000 LB	100/110	100/109	100/109	100/108	100/107	101/106	100/108	100/108	100/107	100/106	---/105	---/105
48.500 LB	103/109	105/109	105/108	105/108	106/108	108/108	104/108	106/108	106/108	106/108	---/108	---/108
53.000 LB	109/113	110/113	111/113	111/113	112/113	113/113	110/113	111/113	112/113	112/113	---/113	---/113
57.000 LB	115/118	116/118	116/118	117/118	118/118	119/118	116/118	117/118	117/118	118/118	---/118	---/118
62.000 LB	120/122	121/122	122/122	122/122	123/122	124/122	121/122	122/122	123/122	123/122	---/122	---/122
64.000 LB	124/125	125/125	125/125	126/125	127/125	128/125	125/125	125/125	126/125	127/125	---/125	---/125

FLAPS 15° Vr/V2

WEIGHT/ ALTITUDE	AT OR BELOW 20° C OAT						ABOVE 20° C OAT					
	0	2000	4000	6000	8000	10000	0	2000	4000	6000	8000	10000
39.500 LB	98/106	98/106	987/105	98/104	98/103	98/102	98/105	98/104	98/103	98/102	98/102	98/102
44.000 LB	98/105	98/105	98/104	98/103	98/102	98/102	98/103	98/103	98/102	98/102	99/102	99/102
48.500 LB	100/104	101/104	101/104	102/104	103/104	104/104	101/104	102/104	103/104	104/104	104/104	104/104
53.000 LB	106/109	106/109	107/109	108/109	108/109	109/109	107/109	108/109	108/109	109/109	110/109	110/109
57.000 LB	111/113	112/113	112/113	113/113	114/113	114/113	112/113	113/113	114/113	114/113	115/113	115/113
62.000 LB	116/118	117/118	117/118	118/118	118/118	119/118	117/118	118/118	119/118	119/118	120/118	120/118
64.000 LB	119/120	120/120	120/120	121/120	122/120	122/120	120/120	121/120	121/120	122/120	123/120	123/120

These speed tables are available on the Majestic Software website:
http://majesticsoftware.com/mjc8q400/downloads.html

MJC8 Q400 TAKEOFF SPEEDS CARD

1. Look up the Vr/V2 from the appropriate **Vr/V2 table** below. Assume V1=Vr
2. In Vr exceeds V2 , assume V2 = Vr
3. If **icing protection** is ON above 500 ft AGL, add 20 kts to V2
4. For **wet runway** reduce V1 by 8kts - 0.1kts for each kt headwind, or 8 kts + 0.3kts for each kt tailwind
5. Check Vr **not below** 108kts for Flaps 5, 104kts for Flaps 10, 100 kts for Flaps 15
6. Check V1 **not below** 97 kts for Flaps 5, 96 kts for Flaps 10 and Flaps 15

Flap Retraction Initiation Speed (VFRI)
Final Takeoff Speed (V CLMB)

When flying in icing conditions:
Above 400ft AGL, add 20 kts to V FRI
Add 20 kts to V CLMB

WEIGHT	V FRI Flap 5°	V FRI Flap 10°	V FRI Flap 15°	V CLMB
39.500 LB	116	110	107	130
44.000 LB	120	112	109	131
48.500 LB	126	118	115	137
53.000 LB	132	123	120	143
57.000 LB	137	128	125	148
62.000 LB	142	134	130	154
64.000 LB	146	137	133	158

FLAPS 5°

WEIGHT	V app	V ref	V ga
39.500 LB	115	---	109
44.000 LB	120	---	110
48.500 LB	126	---	115
53.000 LB	131	---	120
57.000 LB	137	---	125
62.000 LB	142	---	130
64.000 LB	146	---	134

FLAPS 10°

WEIGHT	V app	V ref	V ga
39.500 LB	109	108	108
44.000 LB	112	112	108
48.500 LB	117	117	108
53.000 LB	122	122	112
57.000 LB	127	127	117
62.000 LB	132	132	122
64.000 LB	136	136	125

FLAPS 15°

WEIGHT	V app	V ref	V ga
39.500 LB	106	105	105
44.000 LB	106	106	105
48.500 LB	112	112	105
53.000 LB	117	117	107
57.000 LB	122	121	111
62.000 LB	126	126	116
64.000 LB	129	129	119

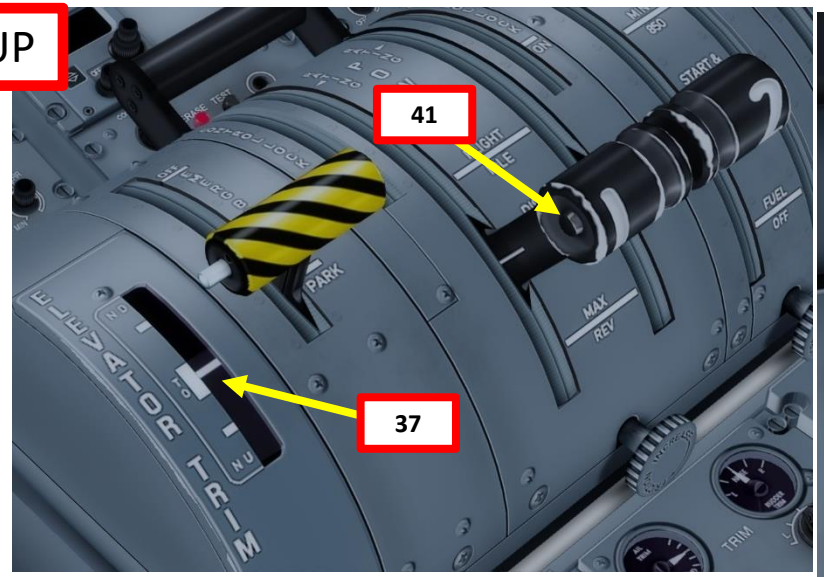
FLAPS 35°

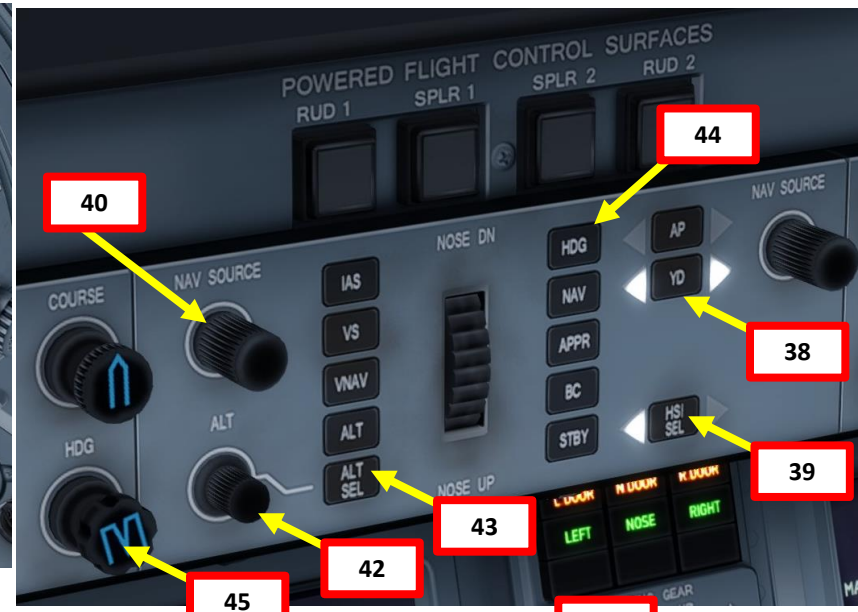
WEIGHT	V app	V ref	V ga
39.500 LB	---	101	---
44.000 LB	---	102	---
48.500 LB	---	107	---
53.000 LB	---	112	---
57.000 LB	---	116	---
62.000 LB	---	120	---
64.000 LB	---	123	---

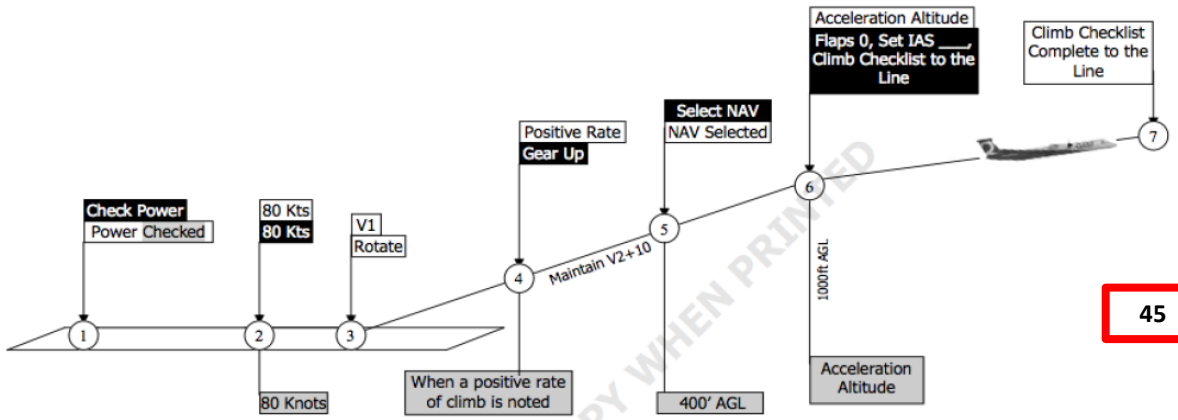
* When flying in icing conditions,
Add 20 kts to V app, V ref, V ga for flaps 10°, 15° and 35°

TRIM SETTING & AUTOPILOT SETUP

37. Set elevator trim in the middle of the TO (Takeoff) white line as shown.
38. Press the YD (Yaw Damper) button to set it to ON
39. Make sure the HSI (Horizontal Situation Indicator) SELECT button has the arrow pointing to the pilot's seat (left).
40. Rotate the NAV SOURCE knob to make sure the navigation systems source is the FMS1 (pilot's Flight Management System)
41. Click on the TAKEOFF/GO AROUND button on the throttles to arm the Go Around (GA) autopilot mode
42. Rotate the ALT knob and set the autopilot altitude target to 3000 ft
    Note: Canadian law restricts our speed below 3000 ft to 200kts
43. Press the ALT SEL button to arm the altitude select autopilot mode
44. Press the HDG (Heading) button to arm the heading autopilot mode
45. Rotate the HDG knob and set the autopilot heading target to 057 (CYYZ runway 05 heading is 057 according to Jeppesen chart)

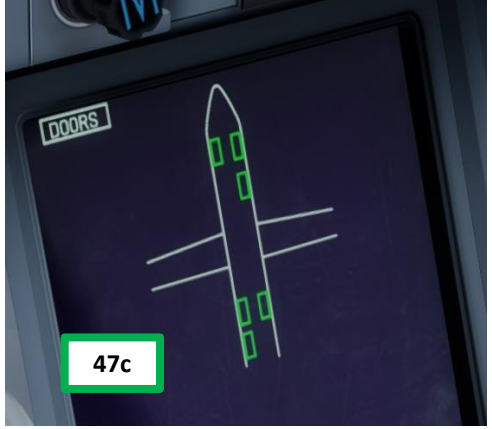


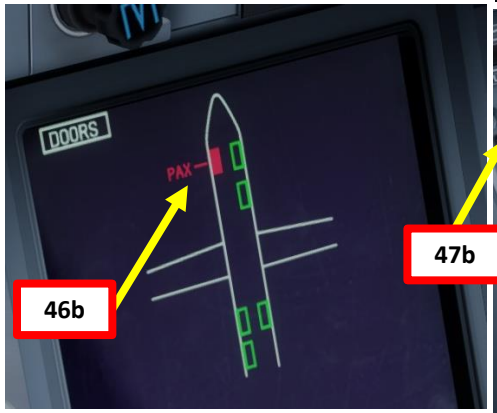


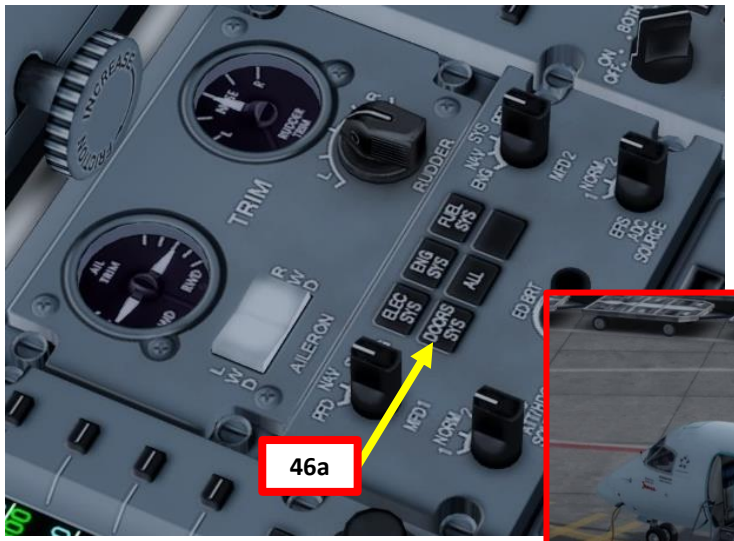


DOORS

46. Verify that all doors are closed
    a) Press the DOORS SYS page
    b) Look for any door that is open (red)
47. Close any door that is still open by going on MCDU "DATA -> SERVICES -> EXITS" menu
    a) In DATA -> SERVICES page, click "EXITS" LSK
    b) Click on the LSKs next to FWD PAX, AFT PAX, AFT BAG, or SERVICE doors to close them if required (or use the "LSHIFT + E" key binding)
    c) All doors should be in green (closed)







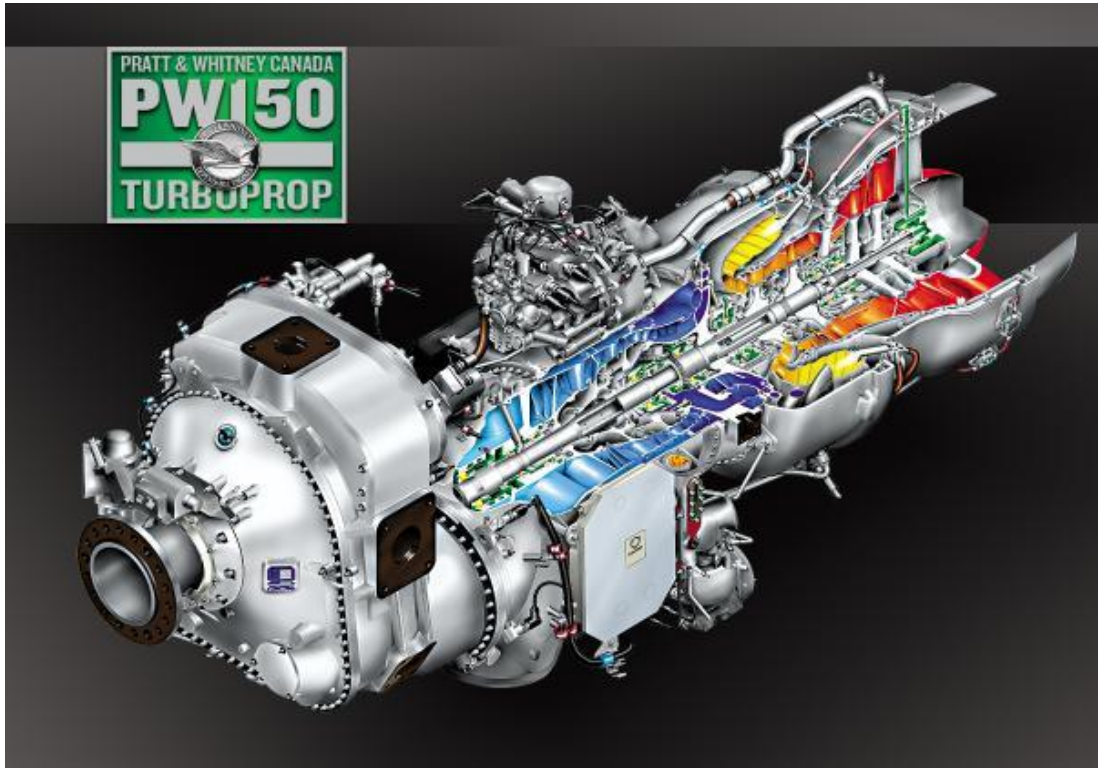
ENGINE START-UP

NOTE: For those who are used to fly Boeing and Airbus aircraft, you will notice that the Q400 PW150A engine does not require bleed air to start since it has an electrical starter instead of a pneumatic one. This is pretty common among smaller regional aircraft.

- APU AUXILIARY POWER UNIT
  - → APU GENERATOR
  - → APU BLEED AIR (USED FOR PNEUMATIC SYSTEMS)
- GROUND POWER CART
  - → EXTERNAL POWER
- ENGINE (RUNNING)
  - → ENGINE GENERATOR (ENGINE CROSS-START)
  - → ENGINE BLEED AIR (USED FOR PNEUMATIC SYSTEMS)
- ENGINE START SELECTOR & ENGINE START BUTTON & THROTTLE POSITION
  - → ENGINE START SELECTOR AT 1 OR 2, ENGINE START BUTTON PUSHED & THROTTLE AT DISC FUEL STARTER VALVE CONTROLS FUEL FLOW CONTROLLED BY FADEC
- ENGINE IGNITION SWITCH
  - → IGNITION SELECTION SWITCH – NORM IGNITION CONTROLLED BY FADEC

FUEL → ENGINE START
IGNITION → ENGINE START
ELECTRICAL POWER (ELECTRICAL STARTER) → ENGINE START

ENGINE START-UP



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

BATTERY SWITCHES ON
EXTERNAL POWER
APU POWER SWITCH & APU START SWITCH ON
→ APU AUXILIARY POWER UNIT → APU GENERATOR

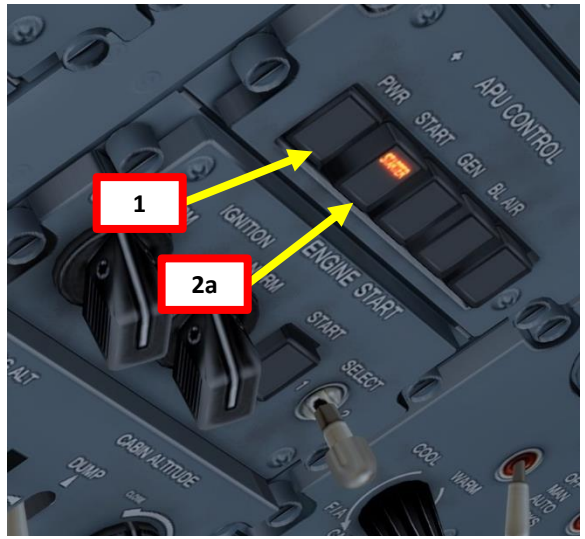
ENGINE START SELECTOR AT 1 OR 2
ENGINE START BUTTON PRESSED
THROTTLE AT DISC
→ FUEL STARTER VALVE

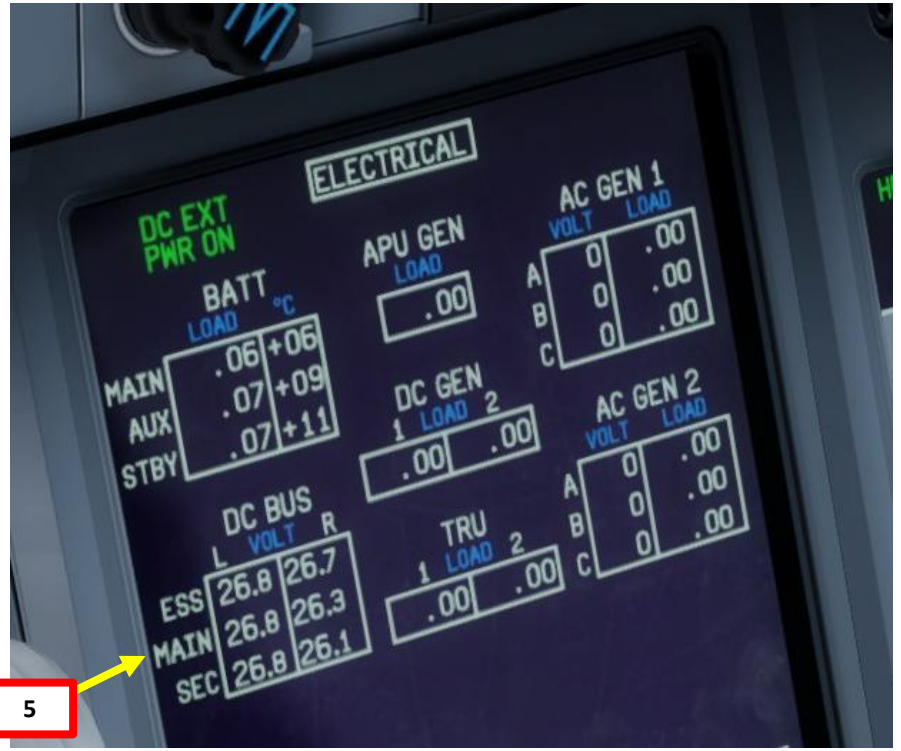
ENGINE IGNITION SELECTOR - NORM
→ IGNITER

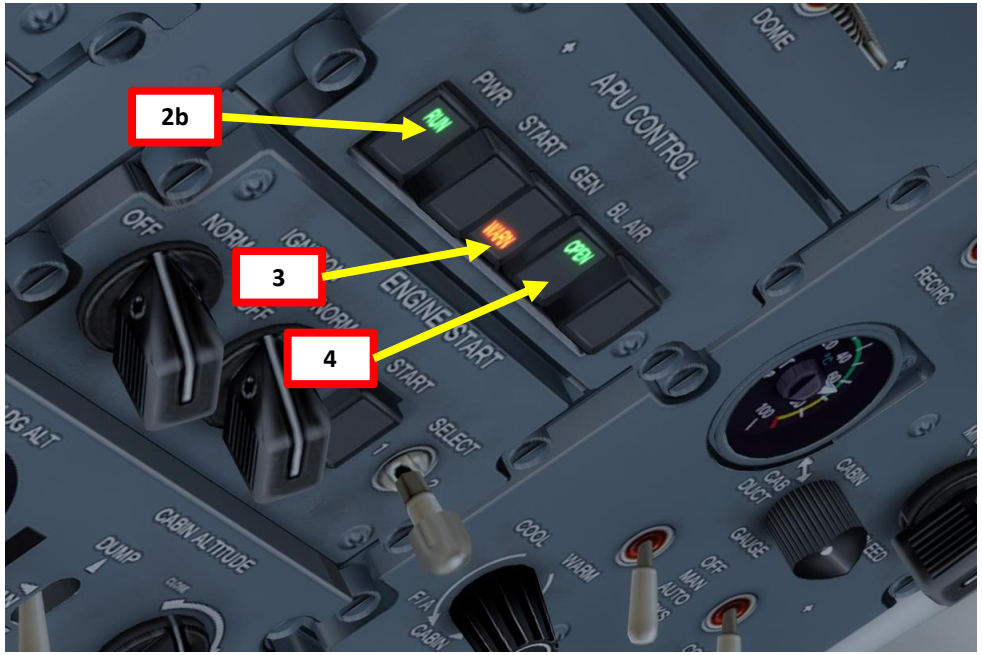
→ ENGINE START

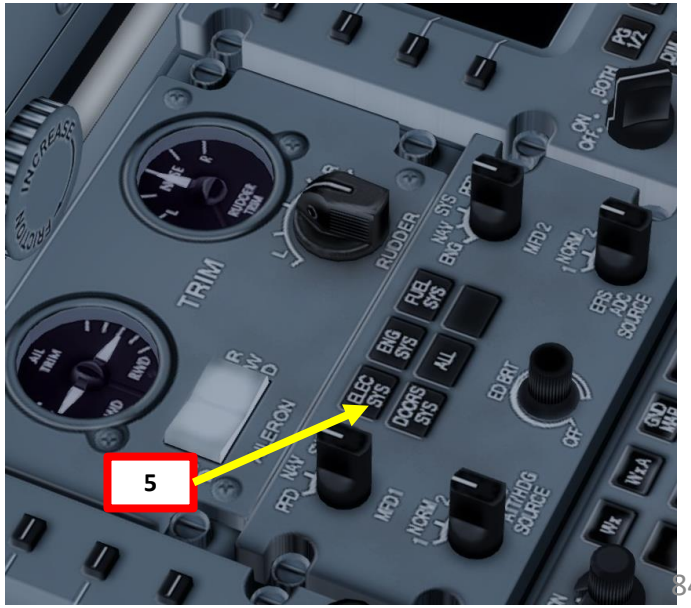
APU (AUXILIARY POWER UNIT) START

1. On Overhead Panel, press on the APU PWR switch. Wait 5-6 seconds for the BIT (Built-In Test) to complete after the switchlights have flashed.
2. Press the APU START switch. The “START” indication will illuminate while the start sequence is active and extinguish once it is complete. The APU PWR switch will then display “RUN”.
3. Once APU start cycle is finished, press the GEN switch to turn the APU generator ON. The “WARN” indication appears since we are running on the Ground Power Unit. Don’t worry, it’s normal. In case the GPU fails, the power will be provided by the APU automatically.
4. Press the APU BL AIR (Bleed Air) pushbutton
5. Look on the Electrical Systems page and make sure that the APU/External Power is producing sufficient voltage (at least 24.5 volts)





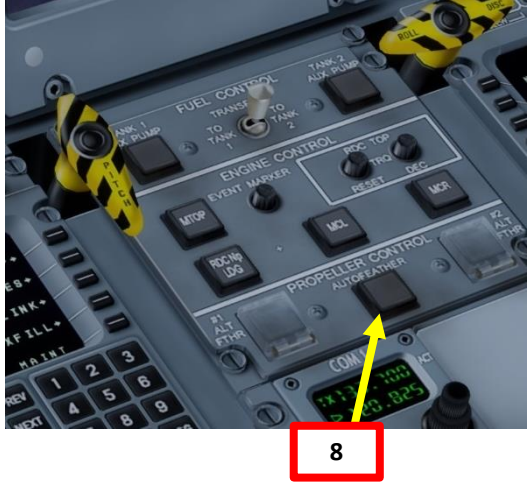




AUTOFEATHER TEST

6. Press the AUTOFEATHER button to select autofeather test.
7. The AUTOFEATHER BIT (Built-In Test) will be complete once the “A/F TEST PASSED” caution appears on the engine page.
8. Once test is complete, press the AUTOFEATHER button to set it to OFF. We will use autofeather only when the engines are running.

6a



8

7

6b

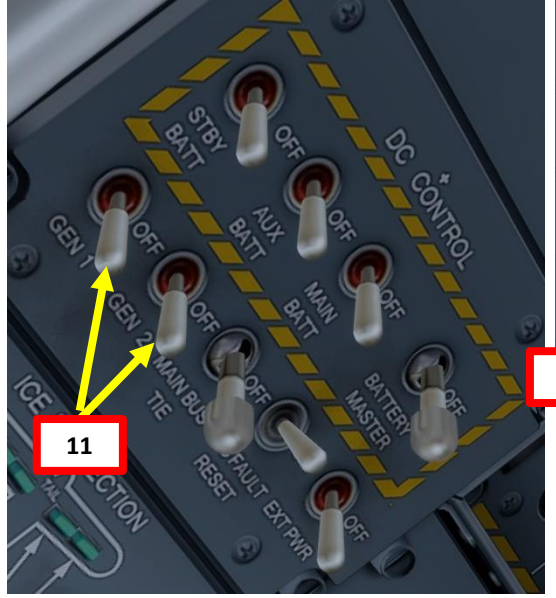
6c

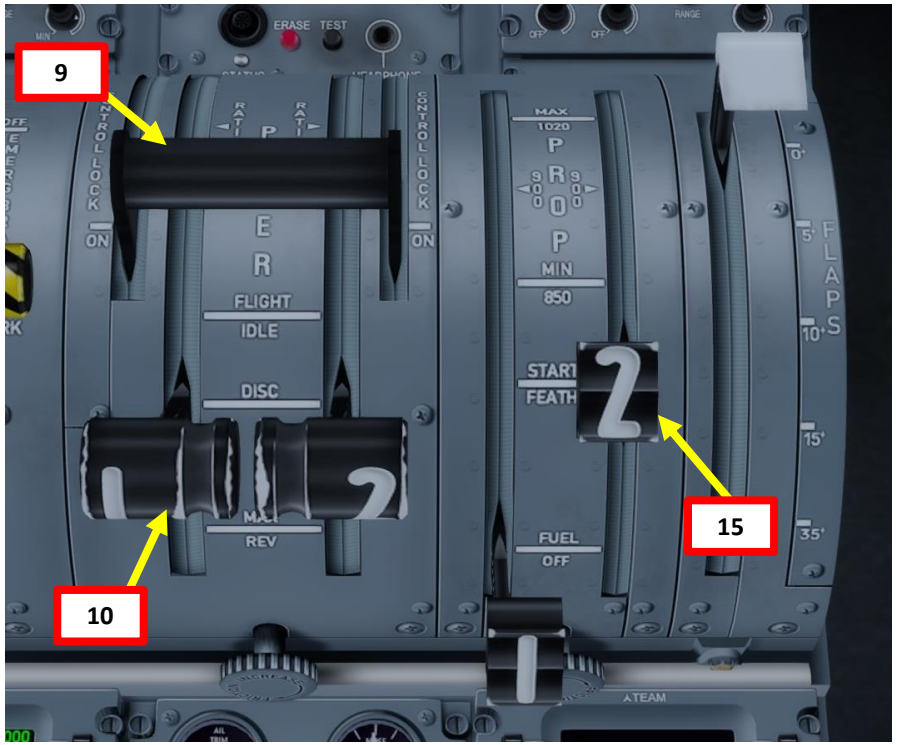
6d

6e

ENGINE START-UP

9. Set Control Lock lever aft after FLIGHT IDLE.
10. Set both throttles to DISC
11. Set GEN 1 and GEN 2 switches ON on both the DC CONTROL and the AC CONTROL panel.
12. Set both Ignition switches to NORM
13. Set Engine Start SELECT switch to 2 (right engine)
14. Press the ENGINE START button
15. Once NH starts increasing, set Condition Lever #2 to START/FEATHER
16. Once NH is greater than 50 %, the starter will automatically disengage (you should hear a "click" of the Engine Start SELECT switch going back to the middle position).





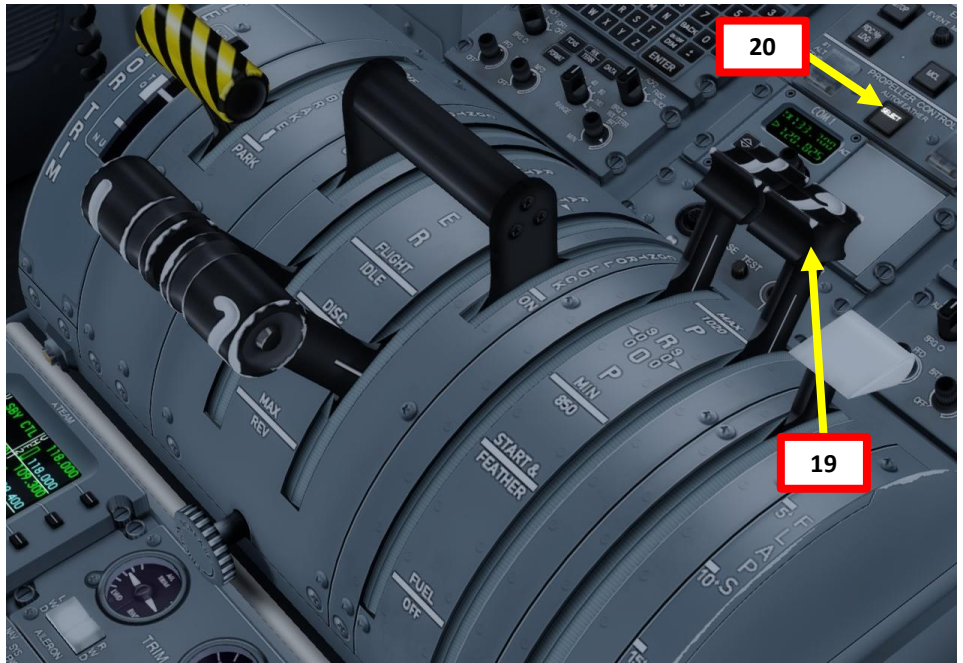
ENGINE START-UP

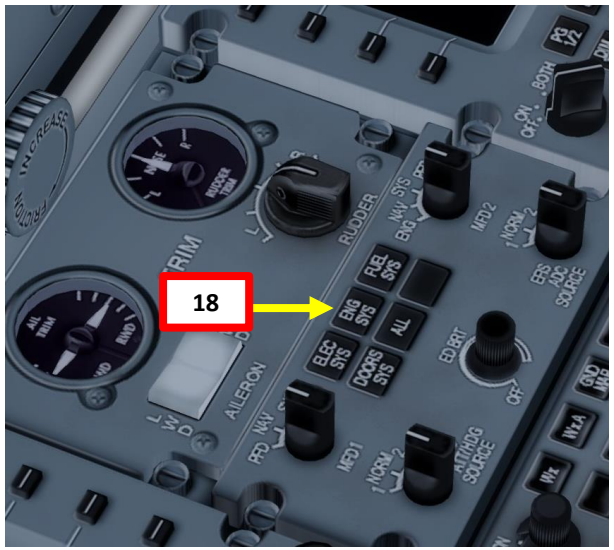
17. Repeat steps 13 through 16 to start left engine (#1).
18. You can monitor engine parameters on the Engine page too.
19. Set Condition Levers 1 and 2 to MAX/1020.
20. Once engines have stabilized, press the AUTOFEATHER button to arm the auto-feathering system. You should see the A/F SELECT indication on the engine page.

17

20

NOTE: The autofeather system on the Dash 8 is only designed to be used on takeoff. If it is armed for the approach it would not work as designed if you had an engine failure due to the other parameters such as the torque settings/requirements and angle of the power levers which would unlikely be met in order for the system to function. Autofeathering is triggered from the armed state when the torque of the failed engine, as detected by dual torque sensors, falls below 25% for at least three seconds. The ATPCS system sends dual uptrim signals to the FADEC of the working engine to increase its power by approximately 10%. The effect of this is to replace the NTOP (Normal Takeoff Power) rating with an MTOP (Maximum Takeoff Power) rating.

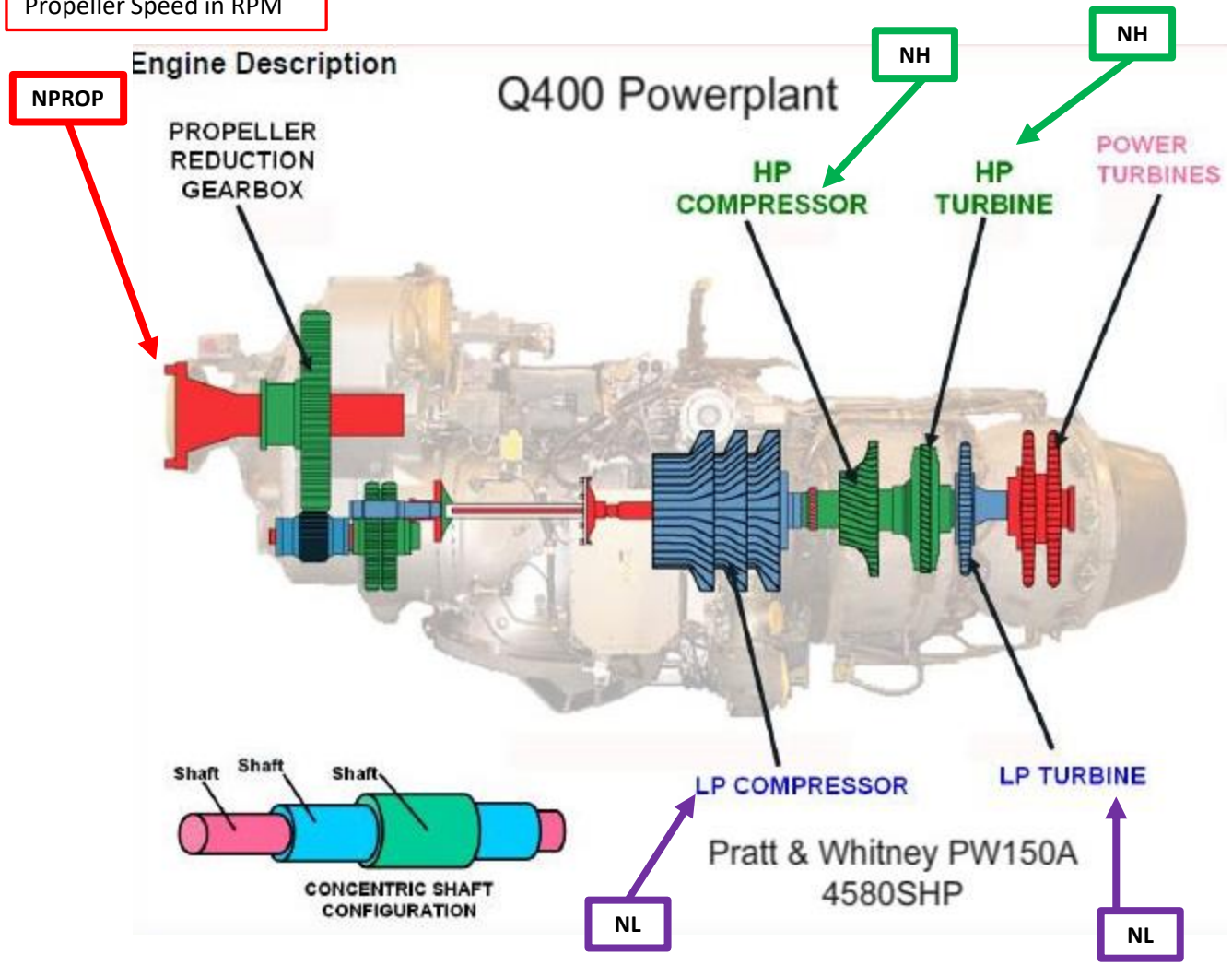




ENGINE START-UP

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

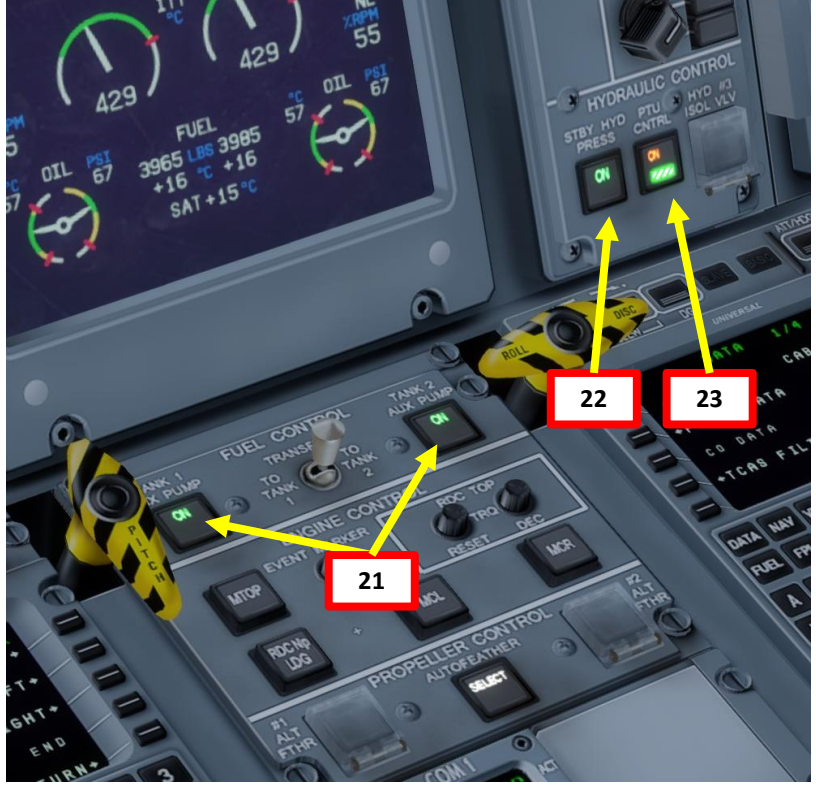
Propeller Speed in RPM

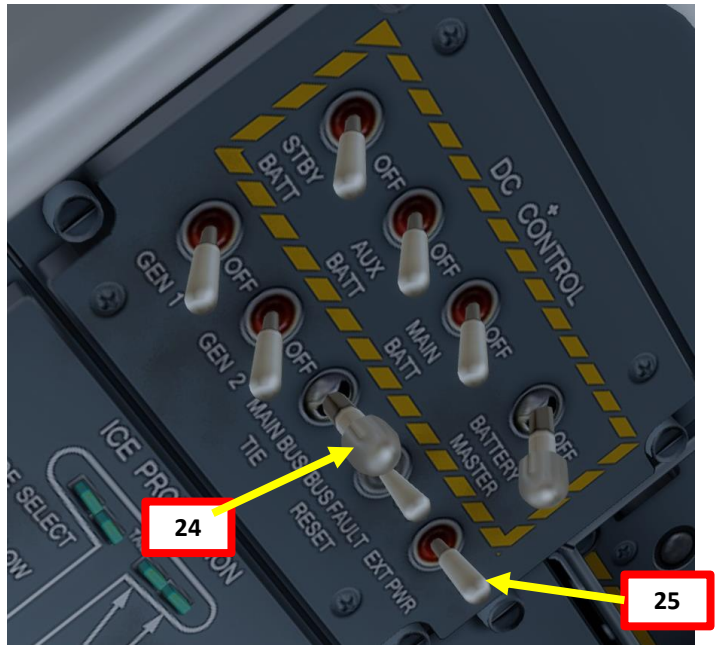


Low-pressure compressor and low-pressure turbine are driven by the same shaft. This is NL speed in percentage of maximum RPM.

ENGINE START-UP

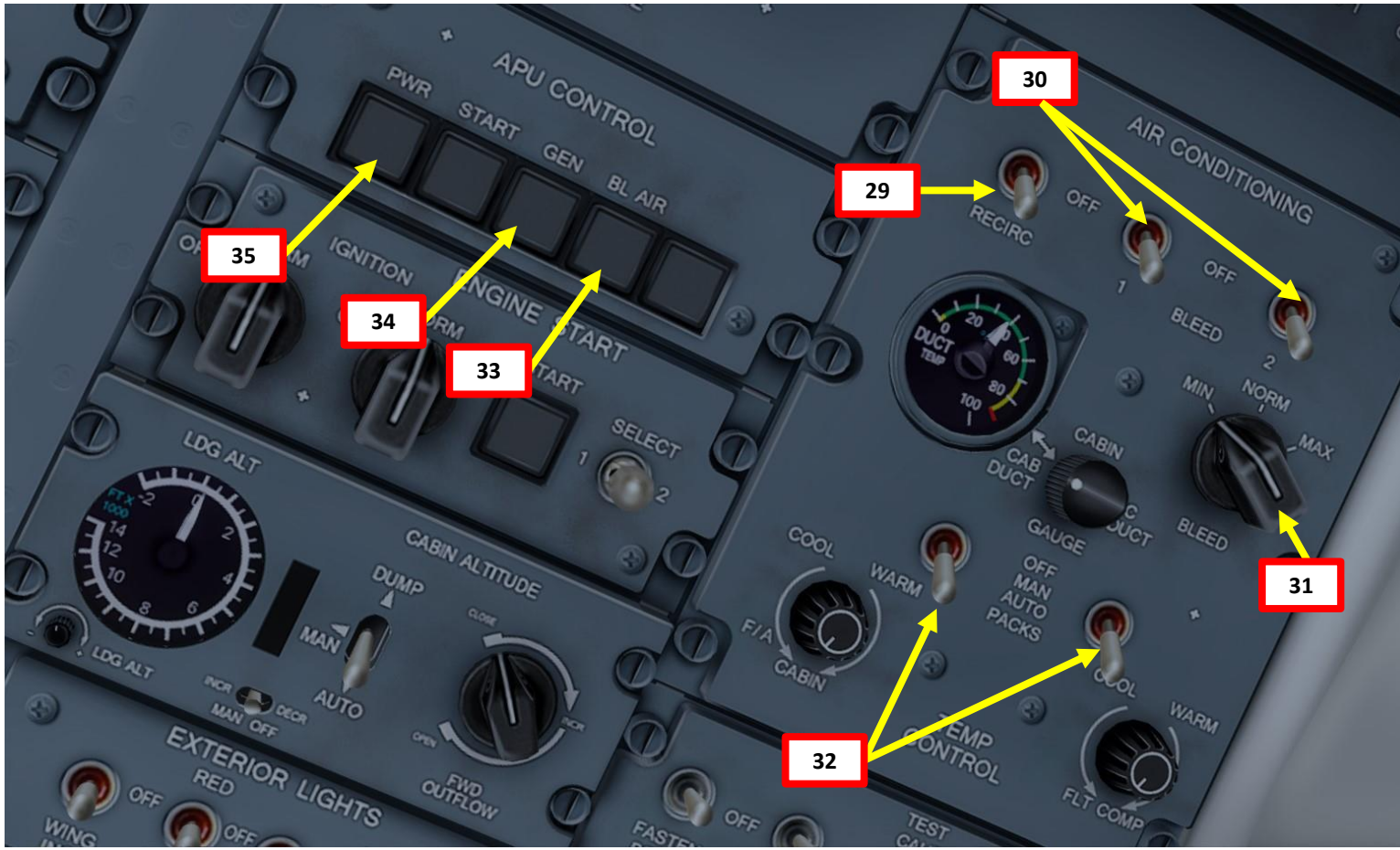
21. Set TANK 1 and TANK 2 AUX PUMP switches ON
22. Set STANDBY HYDRAULIC PRESSURE pump switch ON
23. Set PTU (Power Transfer Unit) CONTROL switch ON
24. Set MAIN BUS TIE switch OFF
25. Set EXT PWR switch to OFF to remove ground power
26. Remove Ground Power Unit
27. APU GEN indication should illuminate normally now





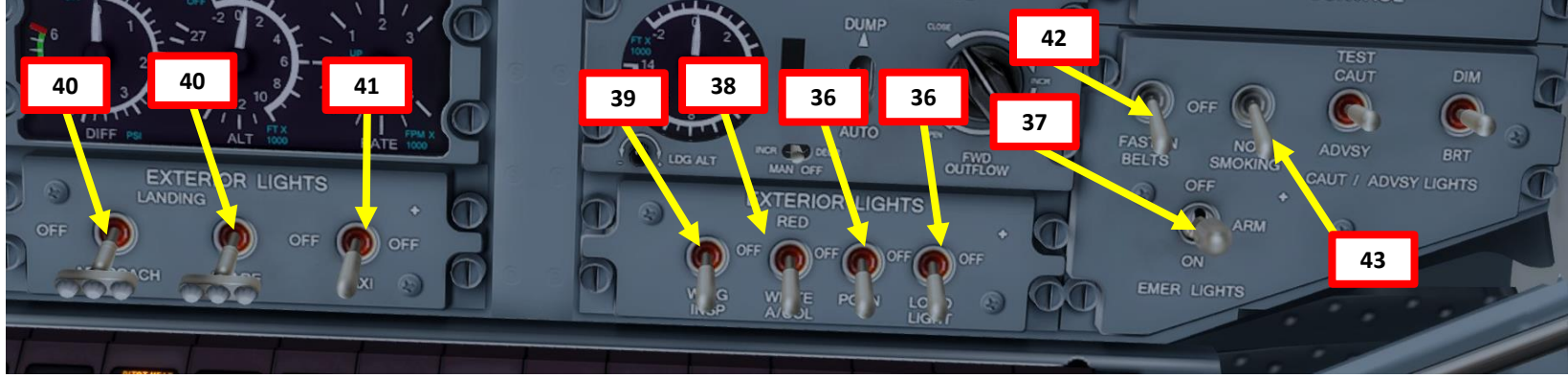
COMPLETE PRE-FLIGHT

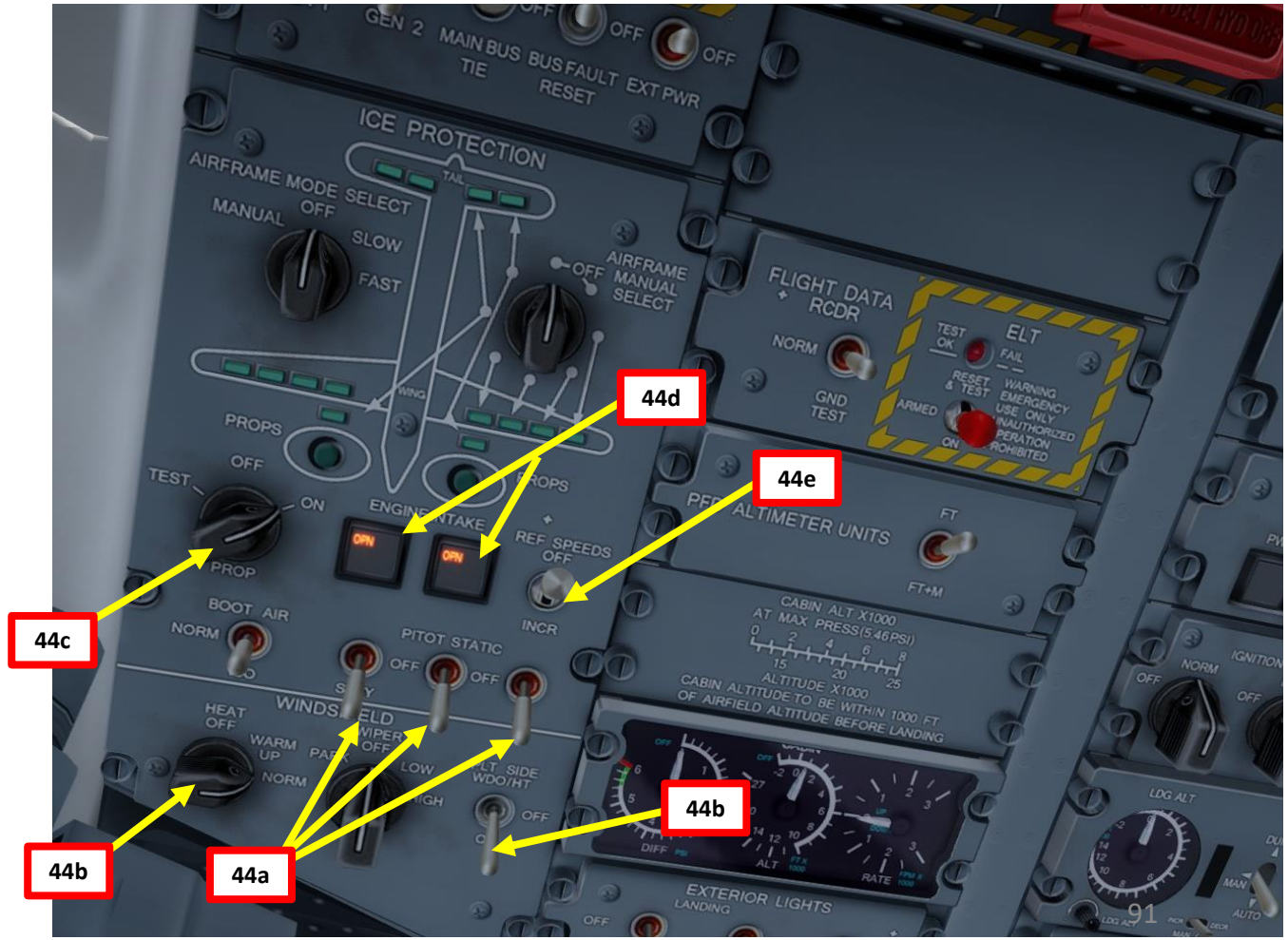
28. Set De-Misters and Side Vent levers to OPEN (AFT) for both pilot and copilot's sides
29. Set RECIRC switch – ON
30. Set engine BLEED switches 1 & 2 – ON
    Note: Wait a few seconds before you set switch 2 to avoid a pressure bump
31. Set BLEED FLOW Controller switch – MIN
    ***Note**: you can keep it at NORM until you start your takeoff roll to make sure the passengers are comfortable during the taxi phase. The bleed flow is set to MIN on takeoff simply to maximize engine power available during takeoff.*
32. Set PACK (Pneumatic Air Conditioning Kit) switches – AUTO
33. Set APU BLEED switch – OFF
34. Set APU GEN switch – OFF
35. Press APU PWR button to shut APU down. Make sure you let the APU cool off at least 1 minute after you set the BLEED and GEN switches to OFF before you shutdown the APU.



COMPLETE PRE-FLIGHT

36. Set Position Lights – ON
37. Set Emergency Lights – ARM
38. Set Anti-collision lights – ON (WHT/ON STROBES)
39. Set Wing lights – ON
40. Set Landing lights – ON
41. Set TAXI lights – ON
42. Set FASTEN SEAT BELTS switch – ON
43. Set NO SMOKING switch – ON
44. Set Icing Protection systems based on icing level (see more in the ICE PROTECTION section). Since we are at LEVEL 2 (icing conditions exist), we will:
    a) Set PITOT HEAT switches – ON
    b) Set WINDSHIELD & WINDOW HEAT switch – ON / NORM
    c) Set PROP HEAT switch – ON
    d) Set Engine Intake Doors – OPEN
    e) Make sure the REF SPEEDS INCR switch is OFF





ICING LEVEL 1: used in all conditions

ICING LEVEL 2: used on ground when icing conditions exist, temperature + 10 deg C or below, in-flight + 5 deg C or below

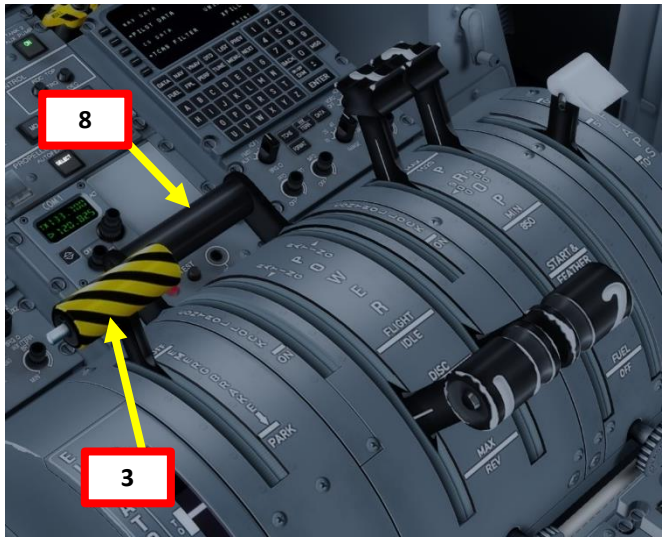
ICING LEVEL 3: used in flight during visual accretion or ICE DETECTED is displayed on Engine Display

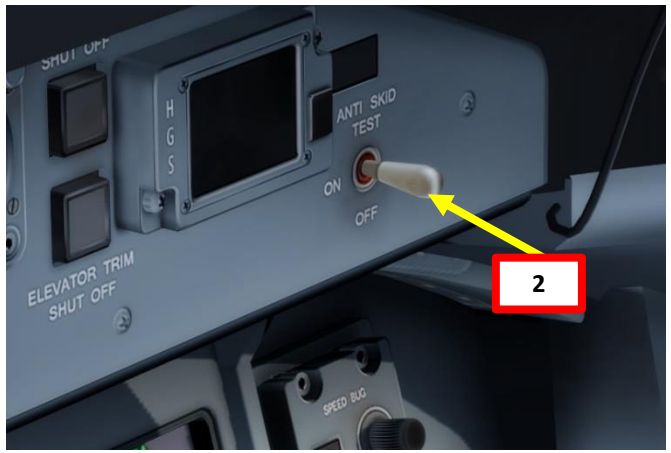
COMPLETE PRE-FLIGHT

45. Select Engine Rating – NTOP (you could use RTOP for Reduce-Takeoff Power too but we will assume this is the first flight of the day)
46. Set FLIGHT/TAXI spoilers switch – TAXI
47. Set Flaps Lever to 5 deg for takeoff
48. Release Parking Brake
49. Press T/O Warning Test switch and make sure you hear no alarm sound. You will hear an alarm sound if:
    - Parking brake is set
    - Flaps still at 0 deg
    - Spoilers up with power levers more than Flight Idle + 12 deg angle
    - Trim not in white arc
    - Condition levers not at MAX

PUSHBACK

1. Set Nosewheel Steering switch – OFF
2. Set Anti-Skid switch – ON
3. Make sure parking brake is released
4. On FMC, press the DATA button, then click the LSK next to the SERVICES sub-menu.
5. Click the LSK next to “PUSHBACK – STRAIGHT” to start pushback
6. Click the LSK next to “PUSHBACK – END” to stop pushback about 100 m from your initial parking spot.
7. Set Nosewheel Steering switch – ON
8. Push Control Lock Lever FORWARD





PUSHBACK

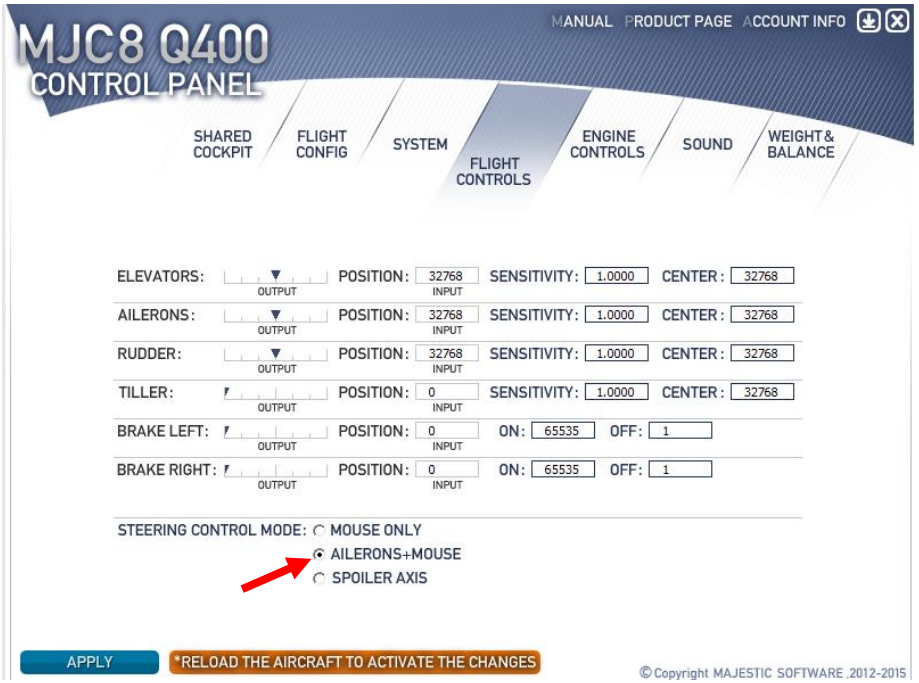
TAXI

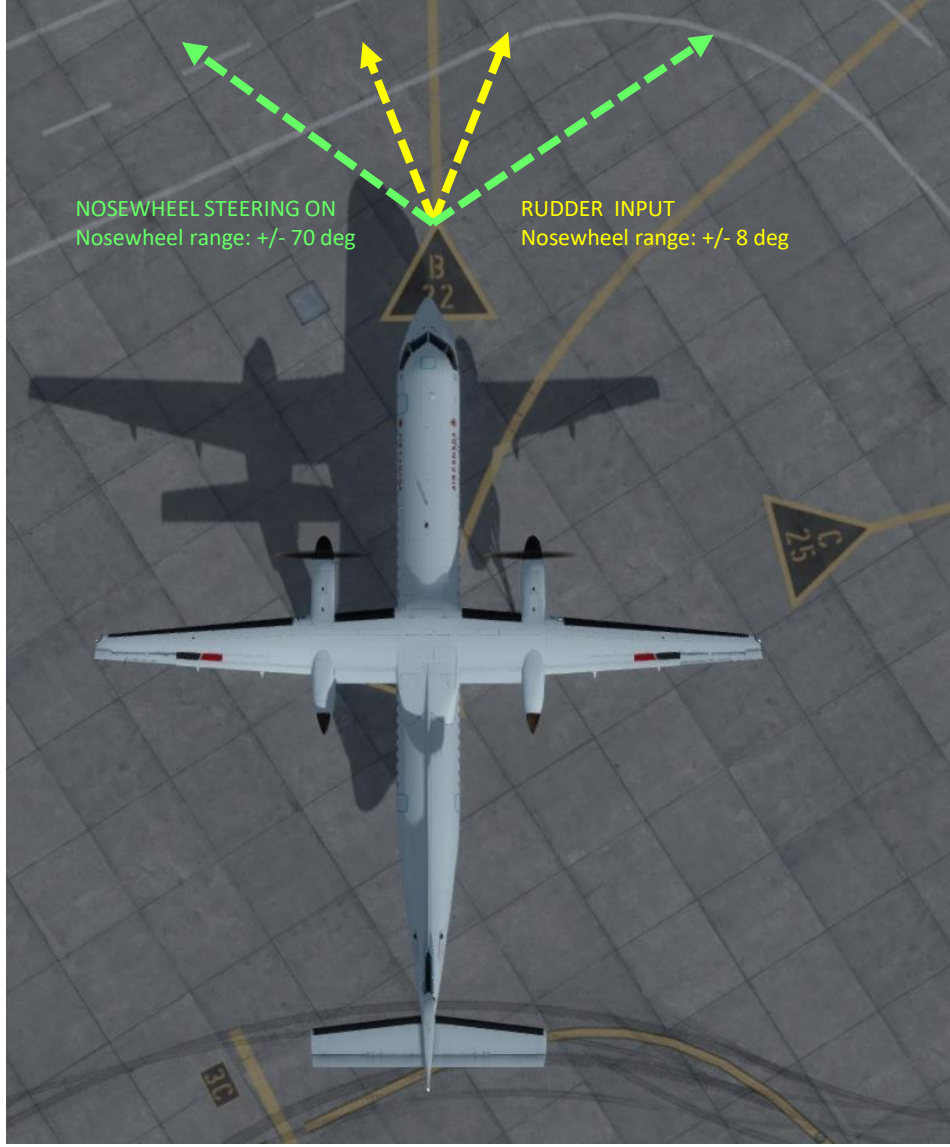
The Q400 is steered on the ground by using a tiller.

However, in FSX or Prepar3d you cannot map a joystick axis to your nosewheel steering tiller: it's a limitation of the sim itself. In order to steer the aircraft, Majestic Software gives you options in the Control Panel (see section 4) as to how you want to use the tiller: you can either use your mouse to click and drag the tiller lever, or you can use your aileron controls while on the ground to act as an axis for tiller control. Both options are equally valid, so pick whichever suits you best.

Using rudder pedals to taxi will give you a range of about +/- 8 degrees of nosewheel deflection while taxiing.

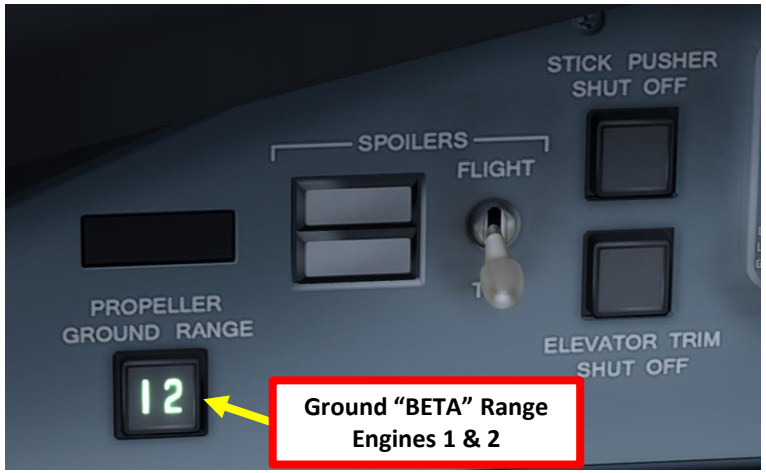
Using the tiller to taxi will give you a range of about +/- 70 degrees of nosewheel deflection while taxiing.

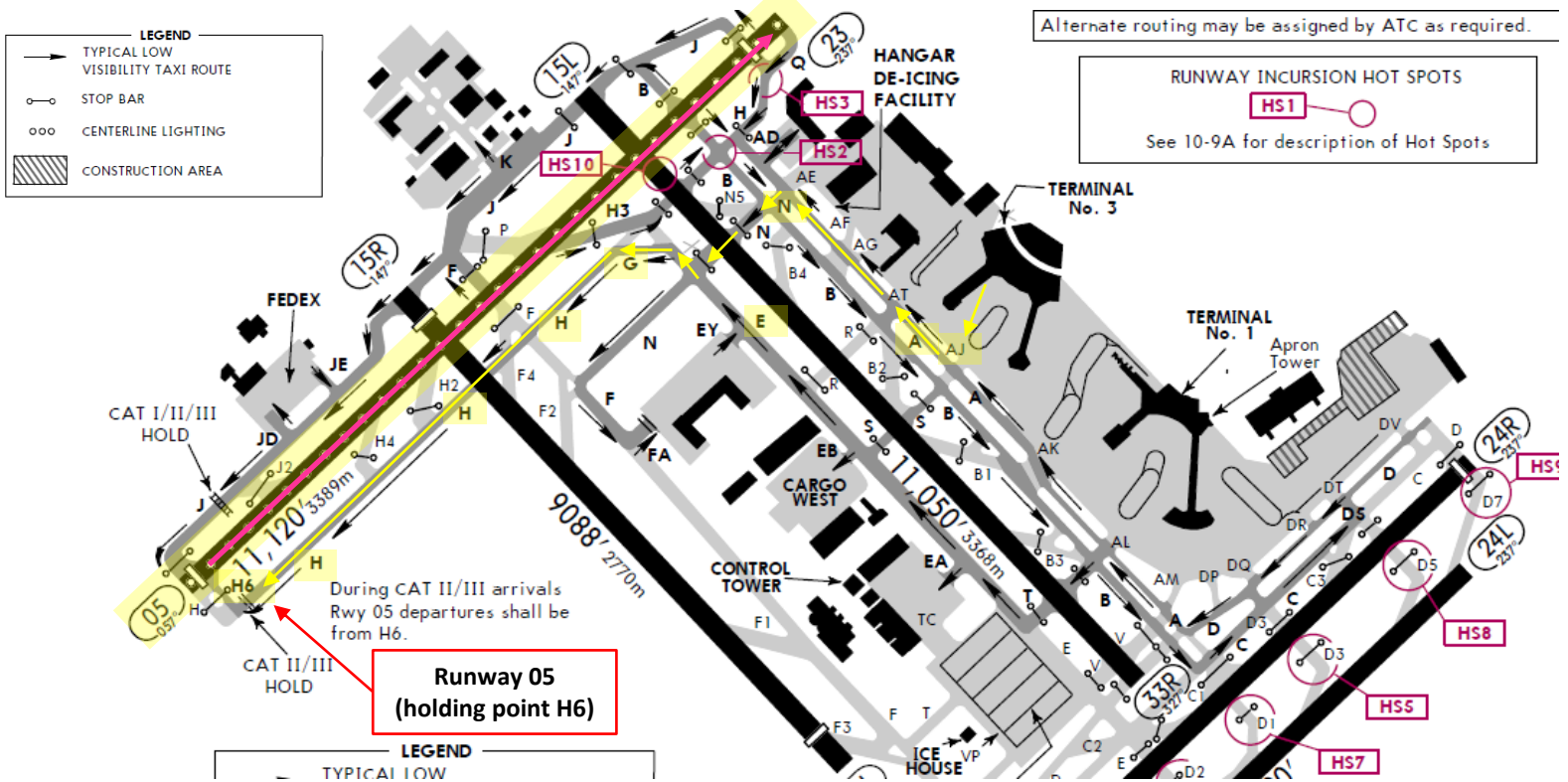


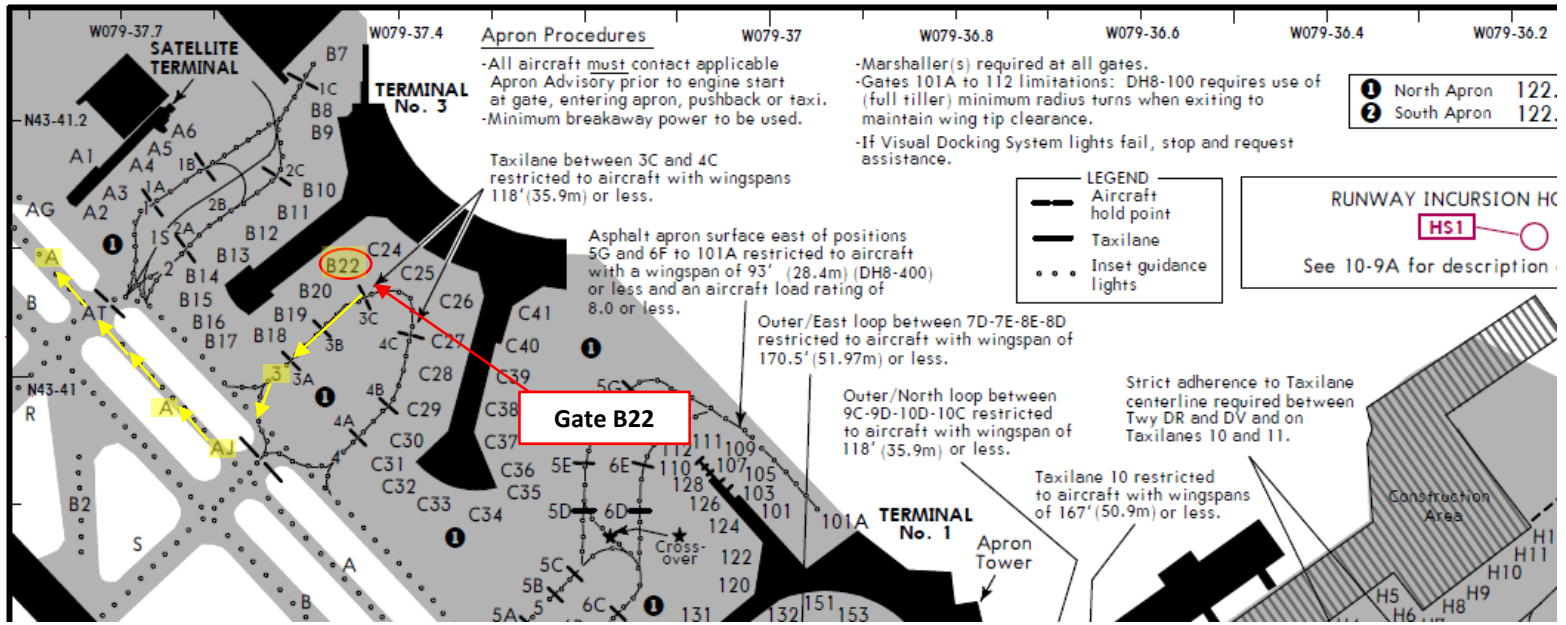


TAXI

- Our Flight Number for today will be ACA119 and we spawned at gate B22.
- After we performed pushback from gate B22, we would typically contact the tower for guidance by saying « ACA119, requesting taxi. »
- The tower would then grant you taxi clearance by saying « ACA119, taxi to holding position H6 Runway 05 via taxiways 3, Alpha-Juliet (AJ), Alpha (A), November (N), Echo (E), Golf (G), Hotel (H).
- This means that we will follow the A line, then turn left to the N line, then follow G and H line until holding point H6… and then hold there until we get our clearance for takeoff.
- Throttle up until you see the « PROPELLER GROUND RANGE » lights 1 and 2, which means that the propellers for engines 1 and 2 are in the Ground « BETA » Range or power setting. The FADEC (Full Authority Digital Engine Control) will control your propeller speed to 660 RPM.





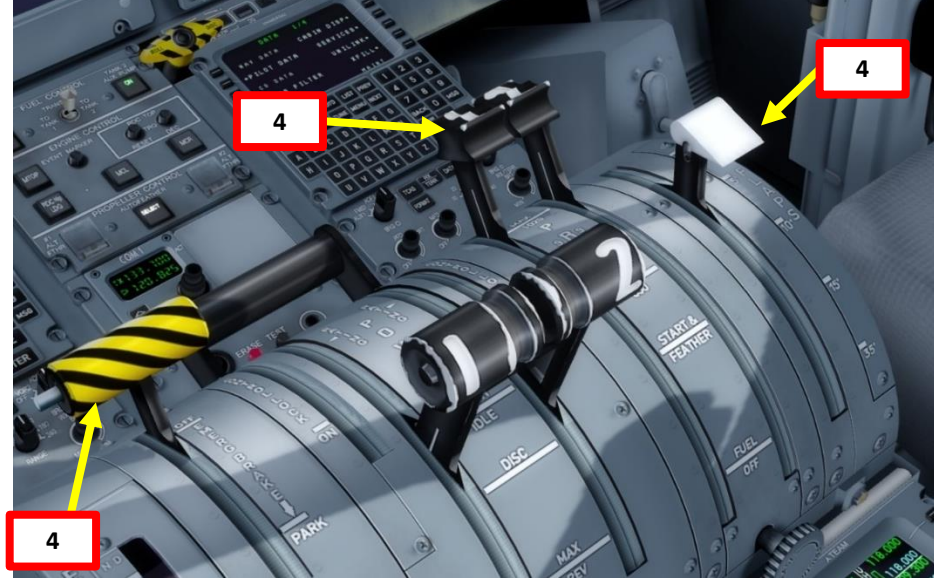



Academic License
Check signs to follow the taxi route towards the holding point (H6)


Academic License
H6 5-23

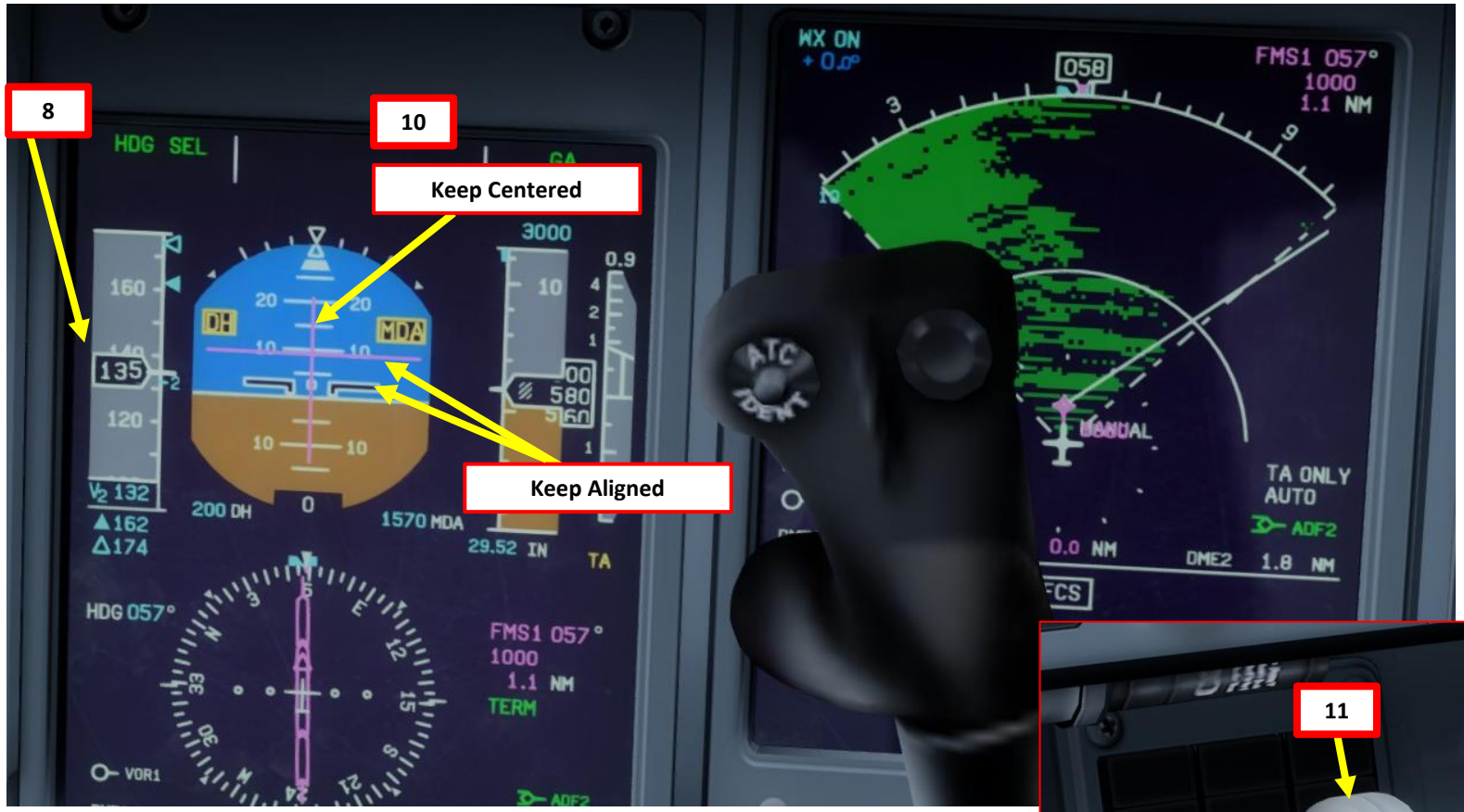
TAKEOFF

1. Line up on the runway
2. Set FLIGHT/TAXI spoilers switch – FLIGHT
3. Set Terrain/Radar display to either TERRAIN for mountain areas or to WEATHER RADAR for storms. In our case, we will use the weather radar.
4. Check that parking brake is off, condition levers are at MAX and flaps lever is at 5 deg (takeoff configuration)



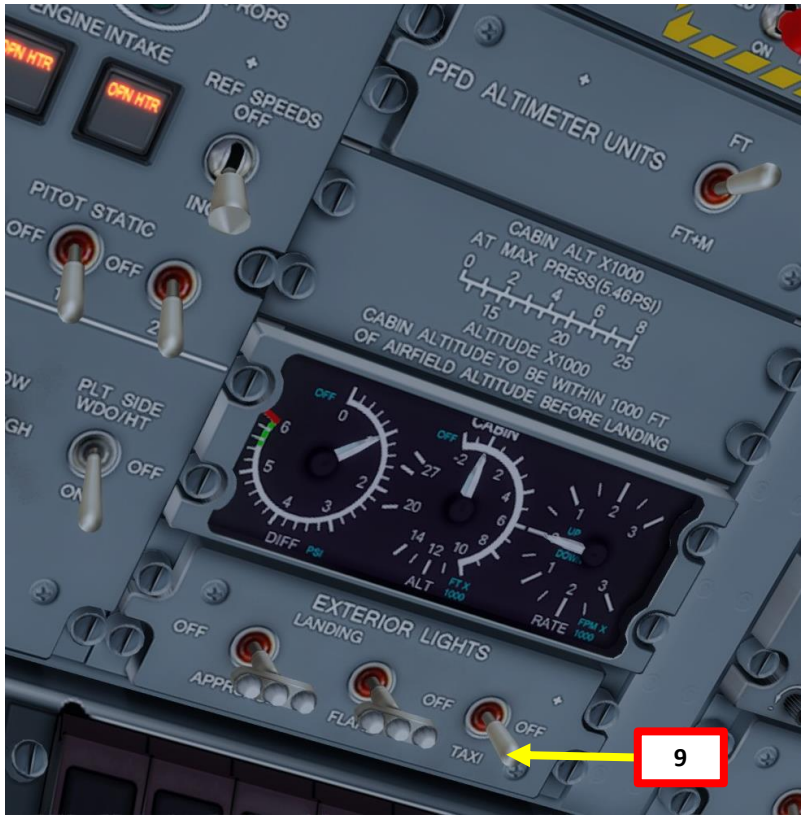
TAKEOFF

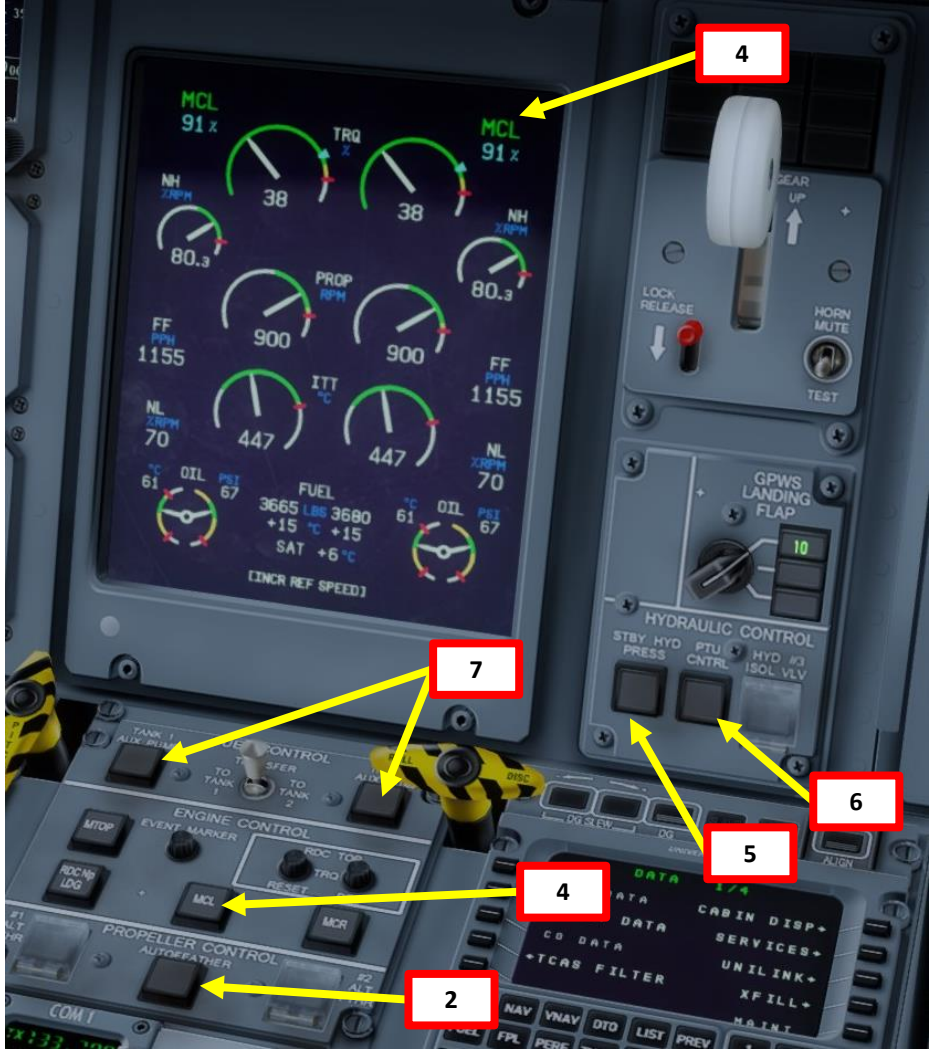
5. Hold brakes.
6. Throttle up until engines stabilize to 90 % torque
7. Release brakes and start your takeoff roll
8. Rotate smoothly and continuously when reaching VR (131 kts) until reaching 15 degrees of pitch angle
9. Maintain 15 deg of pitch until 1000 ft AGL
10. Follow the Flight Director (pink lines)
11. Raise landing gear by left-clicking the landing gear lever

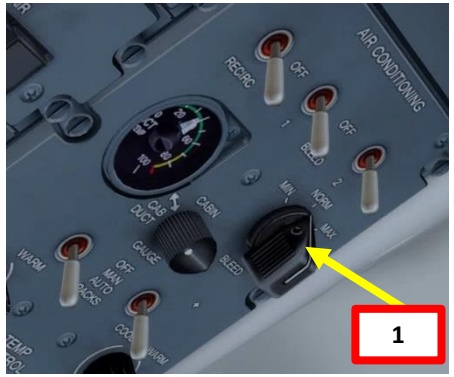


CLIMB

1. Set BLEED FLOW switch – NORM
2. Set AUTOFEATHER switch – OFF
3. When climbing, set Condition Levers to 900 RPM
4. Press the MCL button to set CLIMB engine power rating
5. STBY HYD PRESS switch – OFF
6. PTU (Power Transfer Unit) switch - OFF
7. AUX PUMP switches – OFF
8. Scroll mousewheel on HDG (Heading) knob to make sure the cyan line reference is always lined up with the current segment on the navigation display
9. TAXI lights – OFF

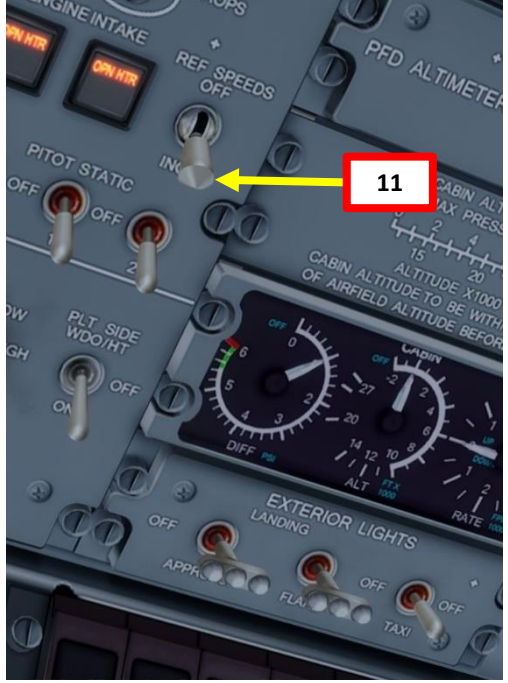


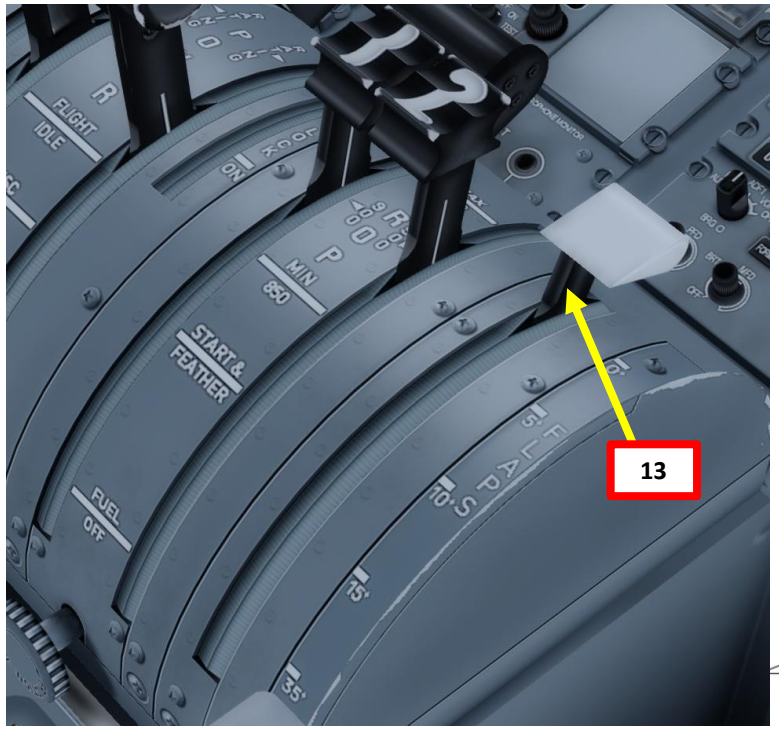


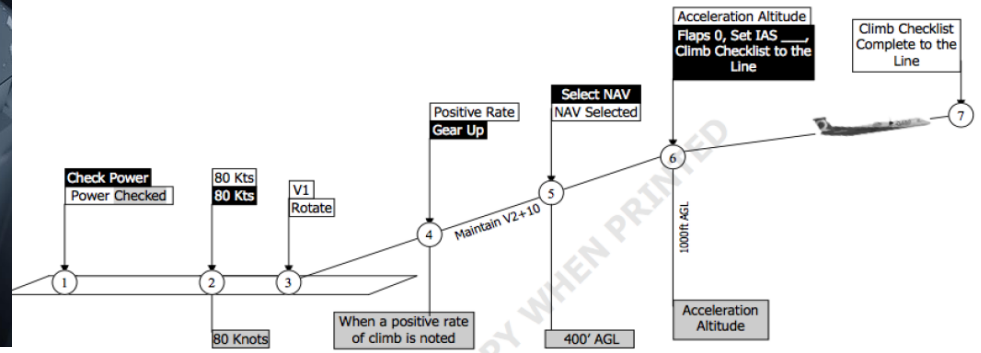


CLIMB

10. Once we are 1000 ft above airport elevation, we hit our acceleration altitude (denoted by the MDA line on our altimeter). We can lower the nose and accelerate for climb.
11. Set REF SPEED INCR switch to ON when reaching 1000 ft above airport elevation since we are in icing conditions
12. Climb by maintaining a speed of 185 kts, which provides the best speed/climb rate balance while protecting the flaps 5 limit speed of 200 kts.
13. Set flaps lever to 0 when you fly above VFRI (Flaps retraction initiation speed)

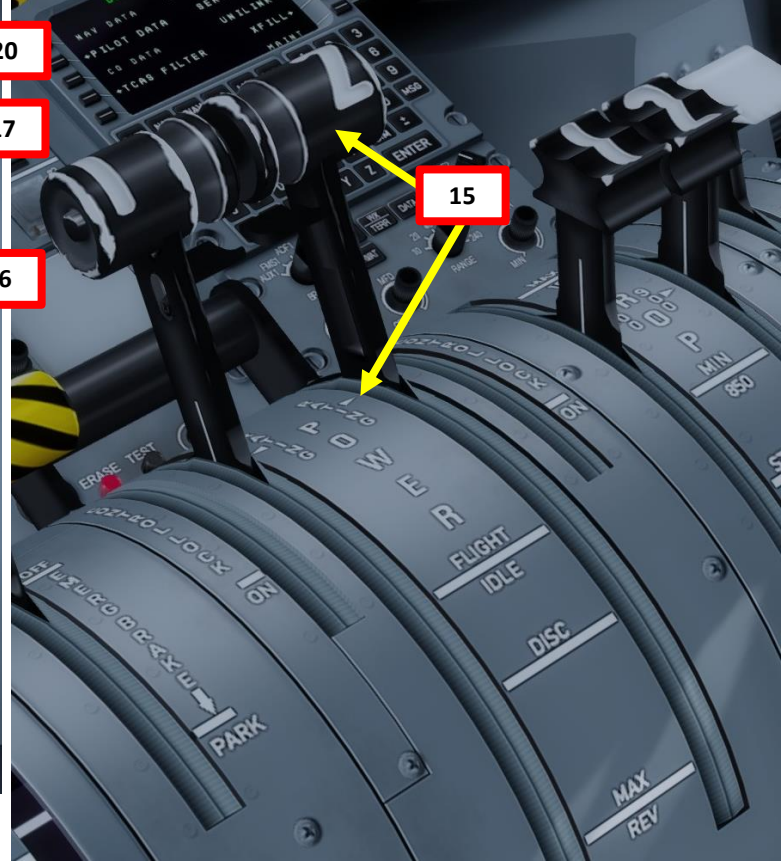






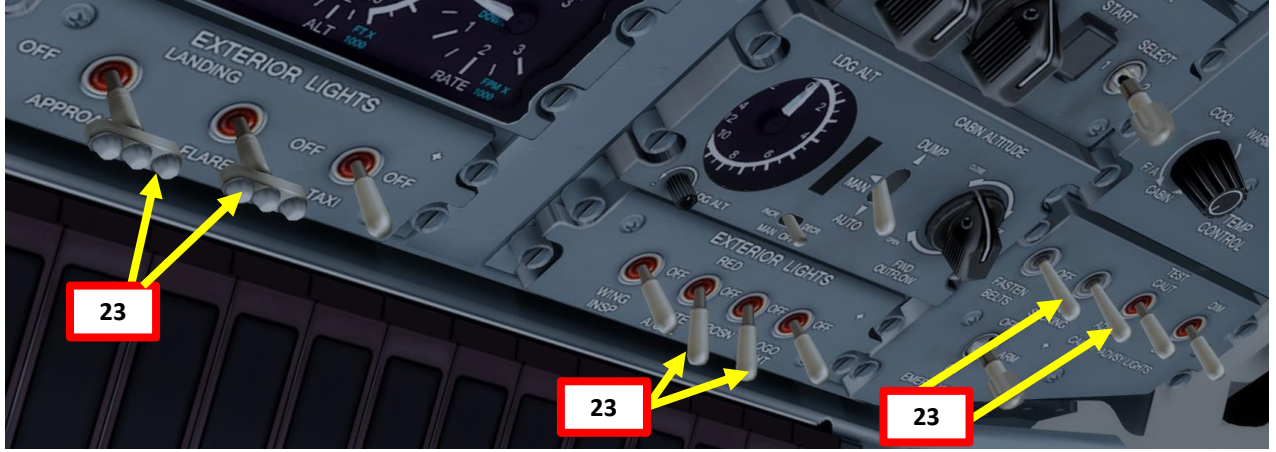
CLIMB

14. Once you have reached ALKUT at 3000 ft, begin our main climb segment
15. Set throttles at RATING detent
16. Scroll mousewheel on ALT setter to set 24000 ft for our cruise altitude target
17. Press ALT SEL to arm altitude target autopilot mode
18. Press the NAV button to arm the LNAV (Lateral Navigation) autopilot mode
19. Press the IAS button to arm the INDICATED AIRSPEED autopilot mode
20. Scroll mousewheel over the autopilot pitch control to modify IAS target value to 185 kts
21. Press the AP button to engage autopilot
22. You can increase or decrease climb rate by either throttling back a bit or by using the autopilot VS (Vertical Speed) mode. I prefer to leave my throttle at the RATING detent to maximize climb rate.



CLIMB

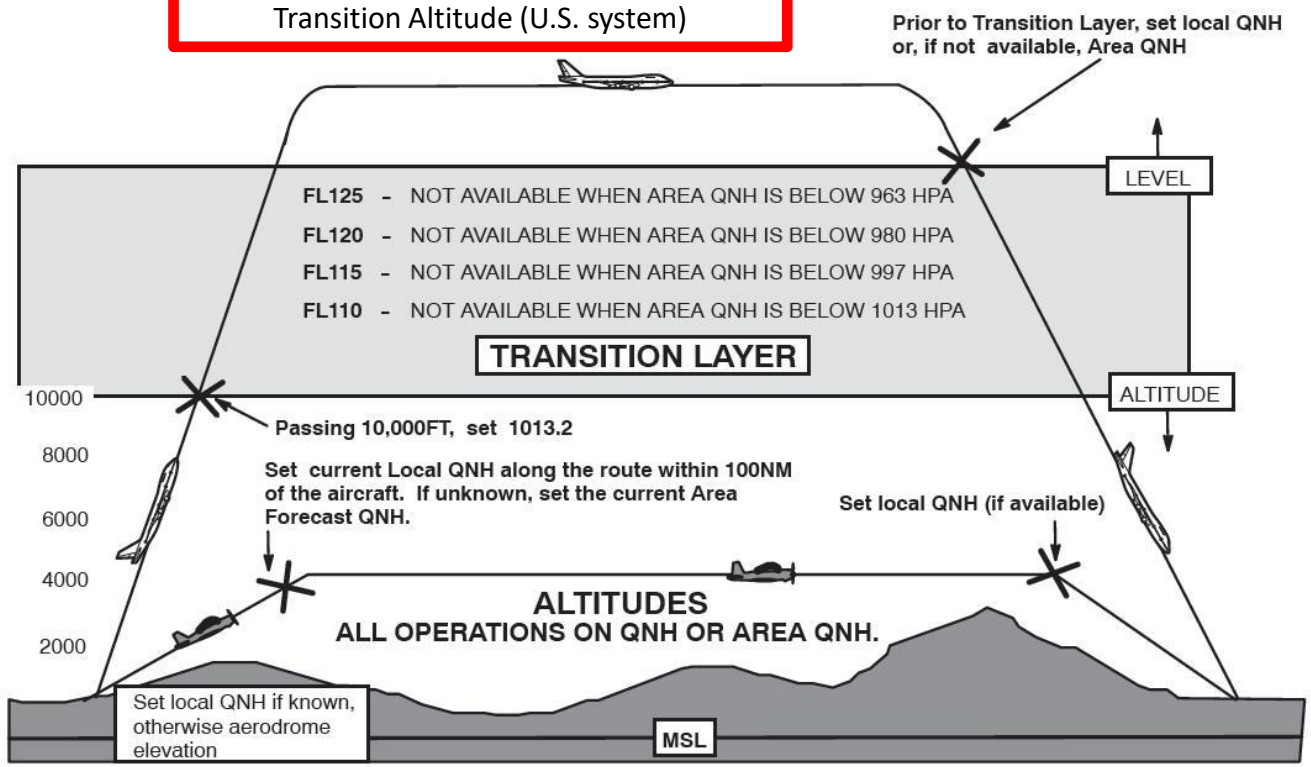
23. At 10,000 ft, set APPROACH & FLARE lights, WING INSPECTION lights, the LOGO light, the FASTEN BELTS sign and the NO SMOKING sign switches OFF.
24. Press the PERF button on the FMC to access the performance page. You can monitor your performance parameters from there.
25. When you reach your cruising ceiling (24,000 ft), the autopilot will automatically set itself in the Altitude Hold mode.

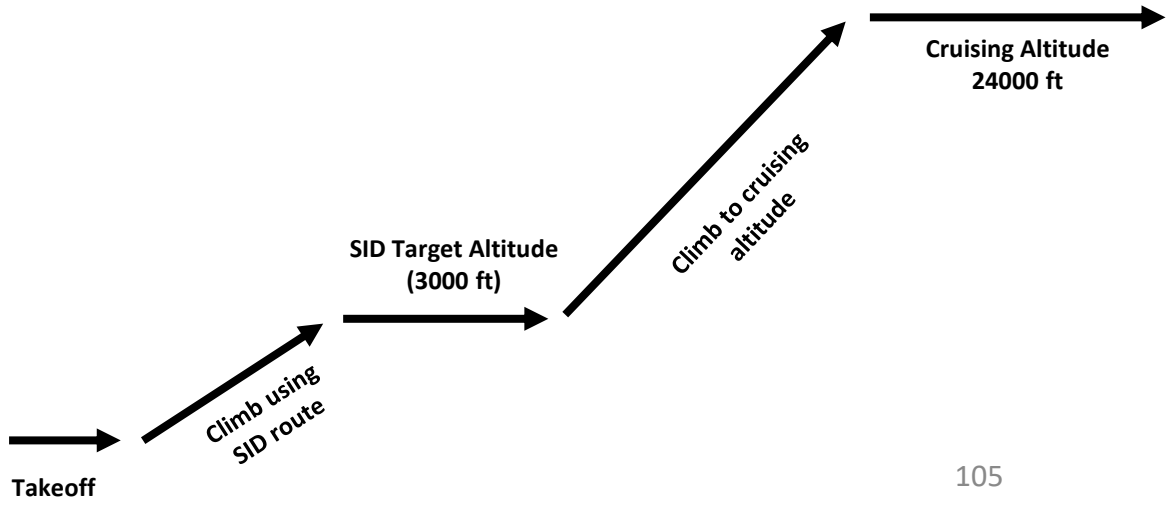


CLIMB

26. Once you pass transition altitude (3000 ft in Europe, 18000 ft in the US), adjust altimeter setting to standard barometric pressure (29.92 in Hg). Do it SLOWLY or your autopilot will start freaking out since you are changing his pressure reference. Using STANDARD pressure is done 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. FL240 would be 24000 ft).

Transition Altitude (U.S. system)





CLIMB

CRUISE

1. During cruise, set power limit to MCR (Max Cruise)
2. There is no autothrottle system here: manage your speed using the throttle.
3. Use the chart below to get an approximate recommended torque value. For a cruise at 24000 ft, I would recommend around 50 % TRQ. More detailed charts are available in the Bombardier POH (Pilot Operating Handbook).
4. You can set your condition levers to 850 RPM if you prefer to have a quieter cabin. However, this is optional.
5. Keep monitoring your instruments in case of icing conditions. We will have an example in the ICING PROTECTION section.

50000 LBS

	ISA -10									ISA								
	Long Range			Intermediate			High Speed			Long Range			Intermediate			High Speed		
FL	KIAS	TRQ %	FF lb/hr	KIAS	TRQ %	FF lb/hr	KIAS	TRQ %	FF lb/hr	KIAS	TRQ %	FF lb/hr	KIAS	TRQ %	FF lb/hr	KIAS	TRQ %	FF lb/hr
60	228	39.0	2039	235	43.5	2174	245	46.1	2251	226	38.9	2054	234	43.5	2195	245	46.8	2292
100	216	36.6	1840	248	51.7	2260	282	70.1	2218	214	36.5	1857	246	51.9	2291	282	71.4	2833
140	211	37.0	1734	246	53.2	2163	284	75.9	2834	210	37.3	1764	246	54.0	2211	284	77.6	2918
180	211	39.0	1667	246	56.3	2162	285	82.5	3011	209	39.2	1693	240	54.1	2120	274	75.3	2789
220	199	37.0	1517	231	51.0	1923	264	71.3	2598	200	37.9	1559	227	50.4	1929	257	67.3	2484
250	191	36.1	1437	219	47.5	1766	248	63.5	2309	191	36.9	1476	216	47.1	1778	241	60.4	2225

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. This is why you need to be familiar with its capabilities and be able to read what the FMA (flight mode annunciator) is telling you.

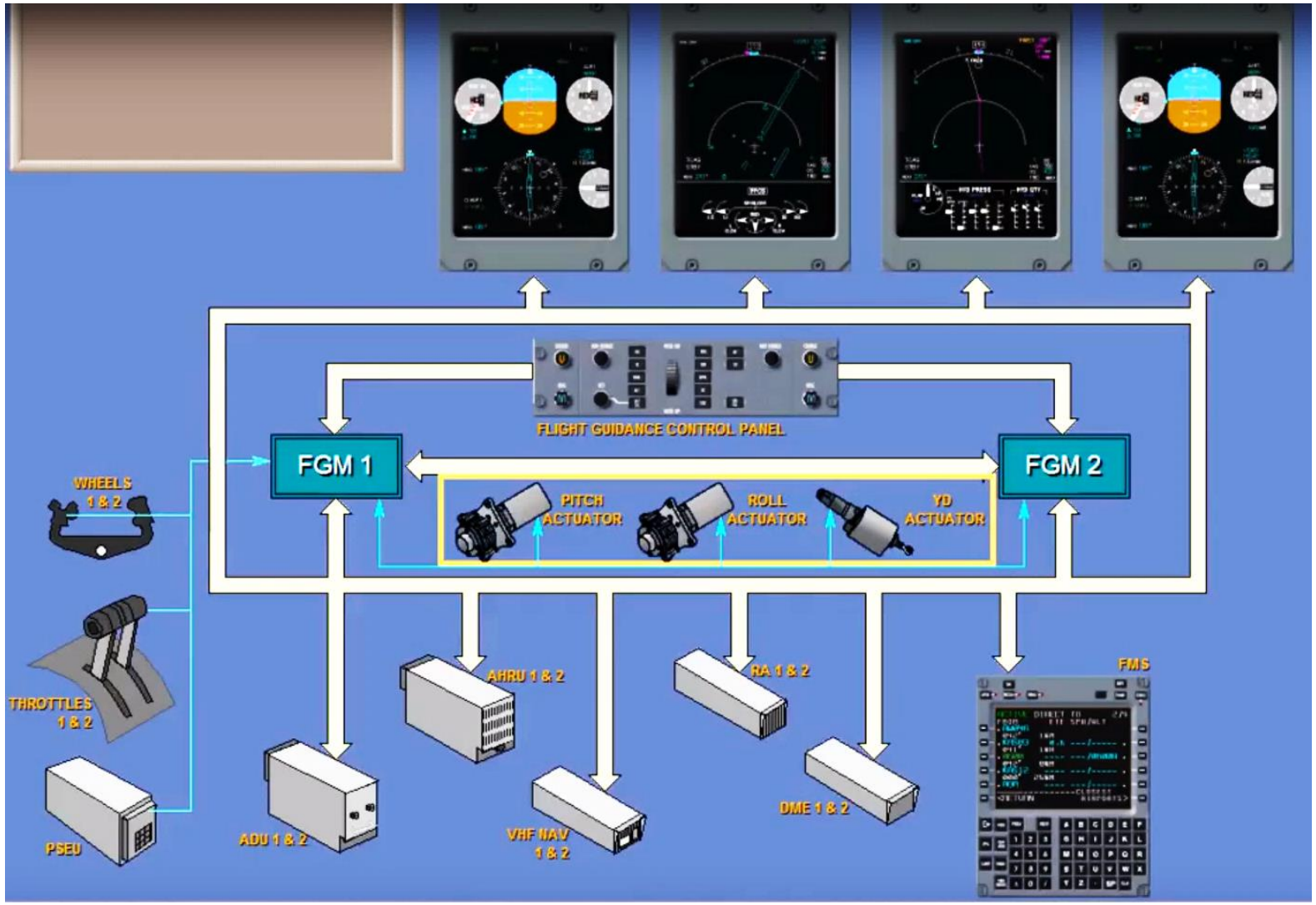
It is important to take note that there is no autothrottle system on the Dash 8. Why? Because autothrottle systems are expensive and a regional turboprop may not need it much for short flights. Instead, you will be managing your airspeed with a combination of aircraft attitude and throttle input. This means you will be changing throttle position during most of the flight.

AFCS: Automatic Flight Control System

The AFCS provides several major functions: the flight director (FD) provides lateral and vertical guidance to fly the aircraft, either manually or automatically.

While most airliners like the 737 or the A320 use an autothrottle system, the Q400 does not have one. The AFCS will move the control surfaces and trim tabs to match what command you send the autopilot. As an example, if you set a target altitude and IAS, the control surfaces will set the aircraft in an attitude that allows the aircraft to reach the target altitude at the set IAS, meaning that you will control your climb/descent rate with the throttle.

In other words, the autopilot will change your aircraft's attitude based on what you want to do, but you need to make sure that your throttle and propeller speed (condition levers) give you enough power.



Button	Description
IAS	Vertical autopilot changes aircraft attitude to hold indicated airspeed
VS	Vertical autopilot changes aircraft attitude to hold vertical speed
VNAV	Vertical autopilot changes aircraft attitude to follow vertical navigation path determined by the FMS
ALT	Vertical autopilot changes aircraft attitude to fly to target altitude
ALT SEL	Arms vertical guidance to capture the pre-selected altitude
HDG	Lateral autopilot tracks selected heading
NAV	Lateral autopilot tracks navigation flight plan determined by the FMS
BC	Lateral autopilot tracks backcourse localizer displayed on active PFD
STBY	Standby clears all active lateral and vertical flight director modes.
APPR	Lateral and vertical autopilots track localizer and glide slope targets for approach
AP	Engages/Disengages Autopilot
YD	Yaw Damper
HSI SEL	Selects which PFD (Primary Flight Display), either the pilot's or copilot's, the FD (Flight Director) is coupled to.

Knobs	Description
COURSE	Sets ILS course
HDG	Sets autopilot heading for HDG mode
NAV SOURCE	Selects which system is used as a navigation source (Flight Management System 1 or 2, Instrument Landing System, etc.)
ALT	Sets target altitude
AUTOPILOT PITCH THUMBWHEEL (NOSE DN/ NOSE UP)	Sets autopilot pitch attitude (which can be used by flight guidance modes VS, PITCH HOLD and IAS.)

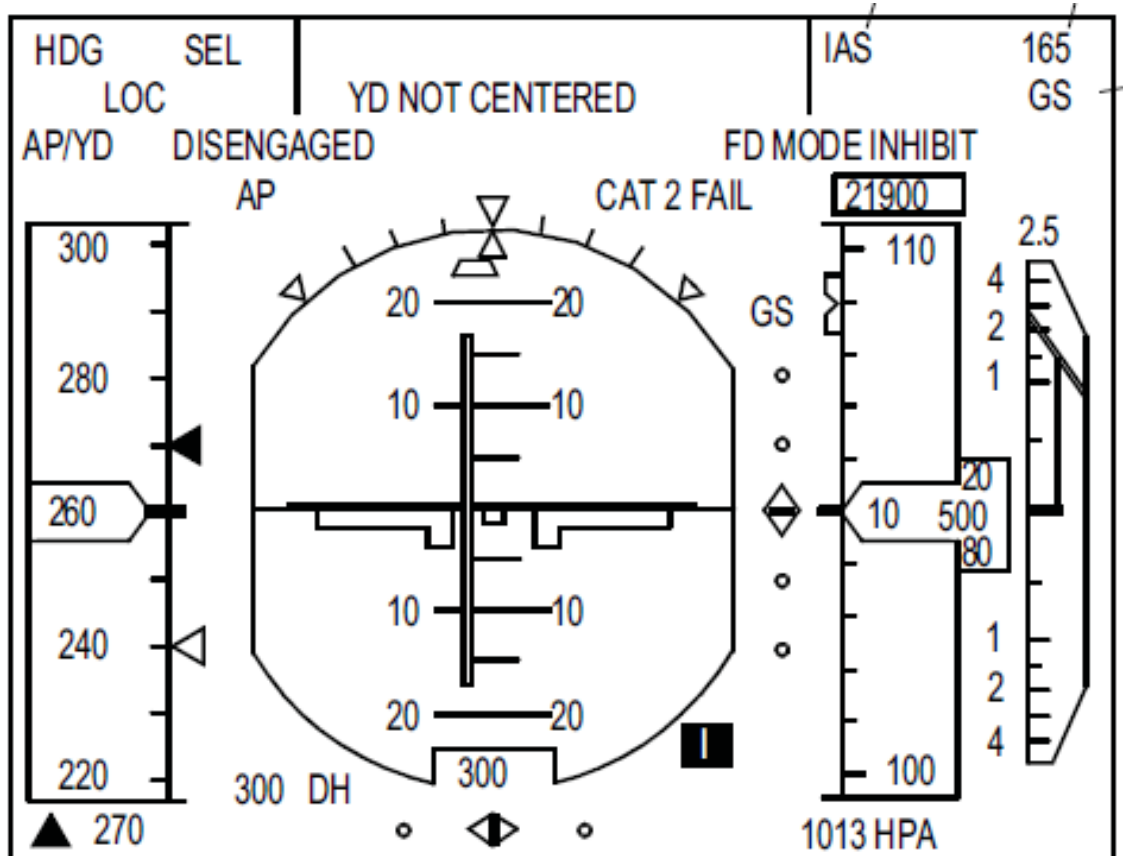
FMA (Flight Mode Annunciator)

The FMA displays the status of the autopilot vertical mode, lateral mode, and autopilot status.

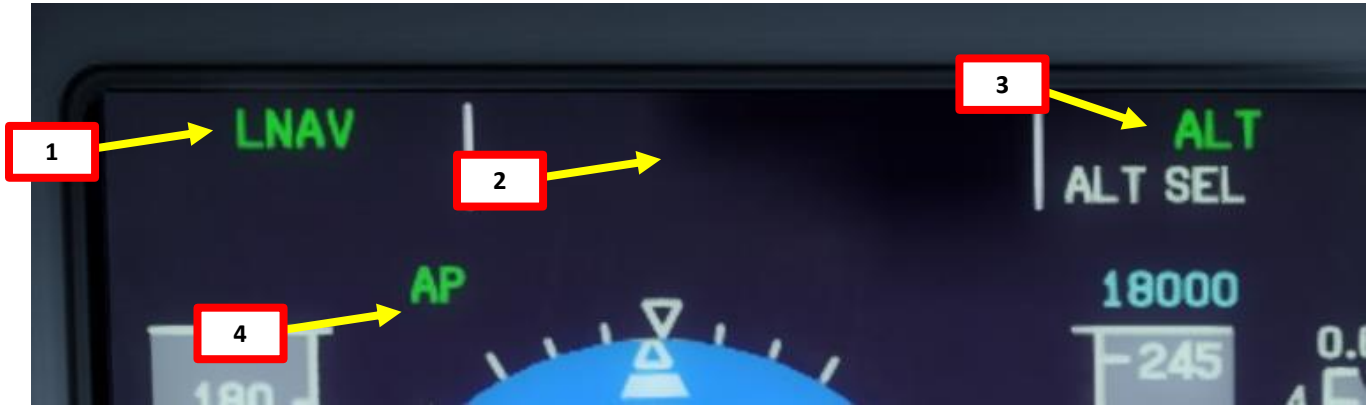
First row is for ENGAGED systems, second row if for ARMED systems, third row is for reminders.

First column is for the LATERAL autopilot modes, center column is for the error messages, and right column is for the VERTICAL modes.

White messages indicated that the autopilot mode is ARMED but not ENGAGED.



FMA (Flight Mode Annunciator)



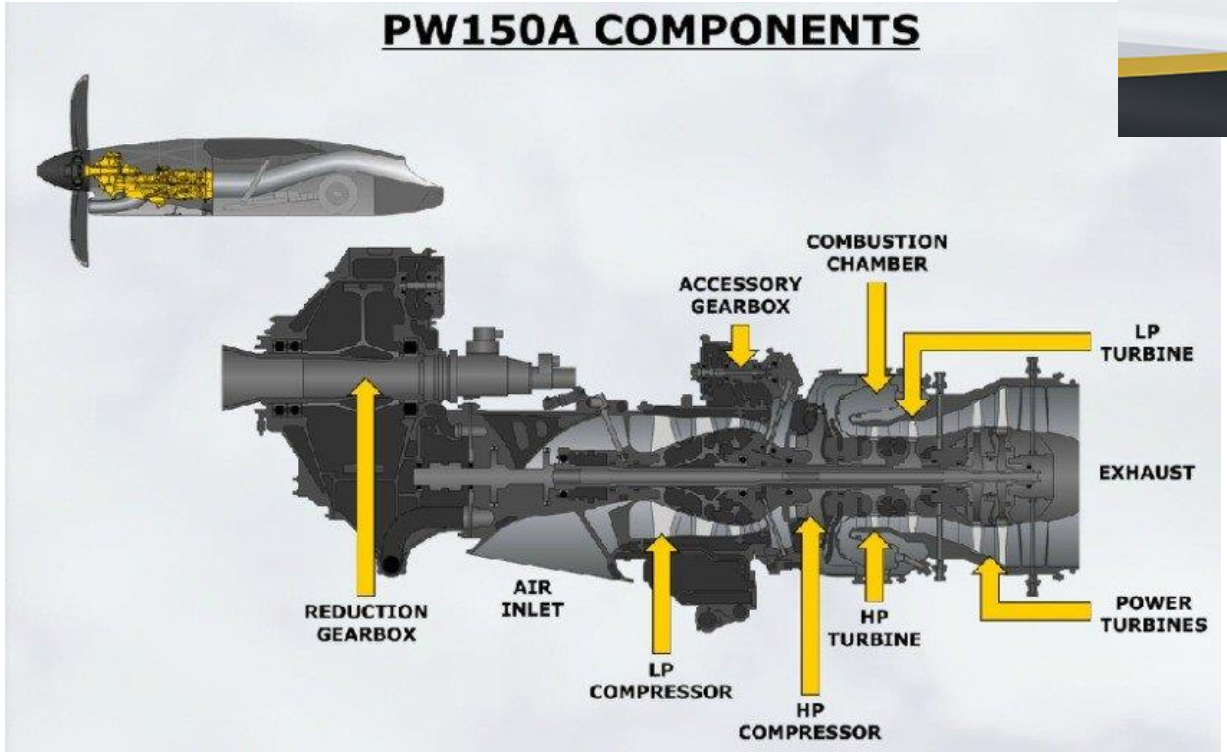
1: Lateral	2: Failures	3: Vertical	4: Autopilot & Yaw Damper
ROLL HOLD: holds target roll attitude	AFCS FAIL: Failure of the Automatic Flight Control System	PITCH HOLD: holds current attitude or pitch	TCS: Tactile Control Steering allows the pitch and roll autopilot actuators to declutch and allow the pilot to manually control pitch and roll while autopilot is active.
HDG HOLD: holds current heading	AP PITCH TRIM FAIL: autopilot pitch trim failure	IAS: indicated airspeed mode	AP: autopilot engaged
WING LVL: holds wings level	AUTO TRIM FAIL: auto-trim system failure	VS: vertical speed mode	AP INHIBIT: autopilot inhibited
HDG SEL: holds selected heading	YD NOT CENTERED: yaw damper not centered	ALT: altitude hold mode	YD INHIBIT: yaw damper inhibited
VOR: VHF Omnidirectional Range mode	L or R FD FAIL: Left or Right Flight Director failure	GA: go-around mode	AP/YD: DISENGAGED: Autopilot/Yaw Damper disengaged
VOR OS: VOR overstation mode	AFCS CONTROLLER INOP: Automatic Flight Control System controller is inoperative	GS: glide slope mode	MISTRIM TRIM NOSE UP: aircraft is mistrimmed and needs nose up trim
LOC: localizer mode		EL: EL mode	MISTRIM TRIM NOSE DOWN: aircraft is mistrimmed and needs nose down trim
VOR APP: VOR approach mode		VNAV PATH: Vertical navigation path mode	MISTRIM TRIM L WING DN: aircraft is mistrimmed and needs left down aileron trim
VOR APP OS: VOR approach mode overstation		VNAV FLC: Vertical navigation flight level change mode	MISTRIM TRIM R WING DN: aircraft is mistrimmed and needs right down aileron trim
BC: Backcourse localizer		VNAV ALT: Vertical navigation altitude capture mode	
LNAV: Lateral navigation mode			
LNAV HDG SEL: LNAV heading select mode			
LNAV HDG INT: LNAV heading intercept mode			

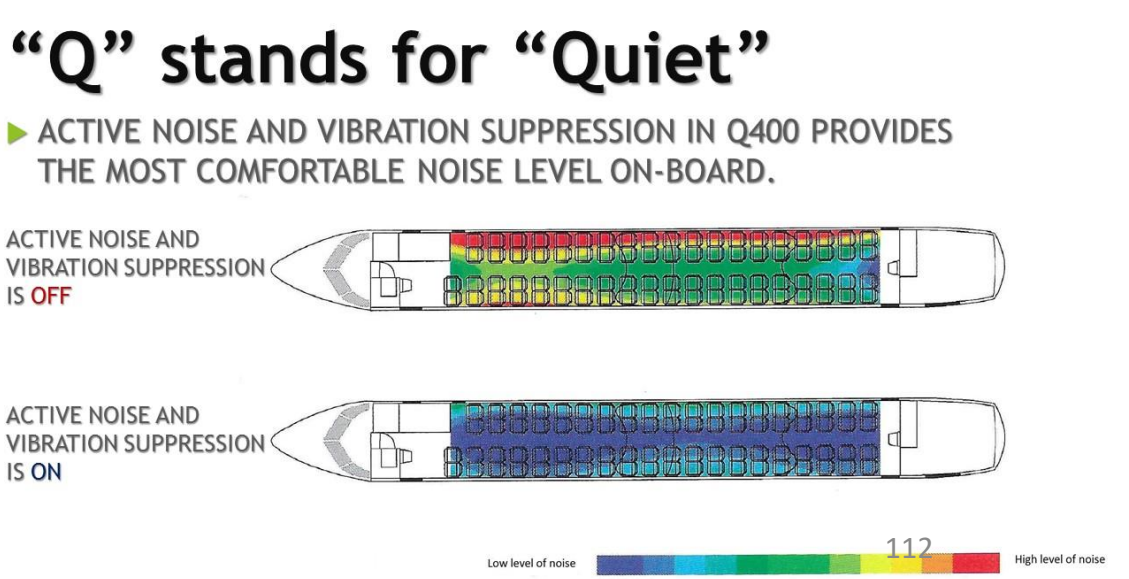
Engines

Turboprops like the Q400 A turboprop engine is a turbine engine that drives an aircraft propeller. In contrast to a turbojet, the engine's exhaust gases do not contain enough energy to create significant thrust, since almost all of the engine's power is used to drive the propeller.

The Q400's "Q" stands for "Quiet". All Dash 8s delivered from the second quarter of 1996 (including all Series 400s) include the Active Noise and Vibration Suppression system designed to reduce cabin noise and vibration levels to nearly those of jet airliners. To emphasize their quietness, Bombardier renamed the Dash 8 models as the Q-Series turboprops (Q200, Q300, and Q400).

Turboprops being quite noisy, this is why there are certain power management modes to minimize engine noise for passenger comfort and to follow airport noise restriction rules.





Engines

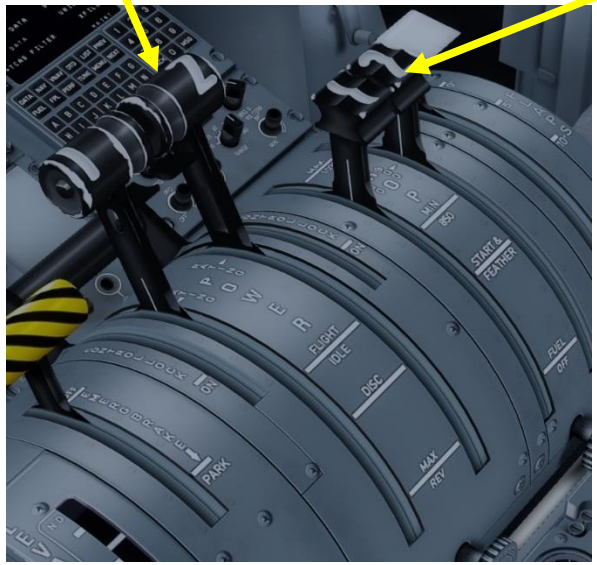
The engines are controlled with:

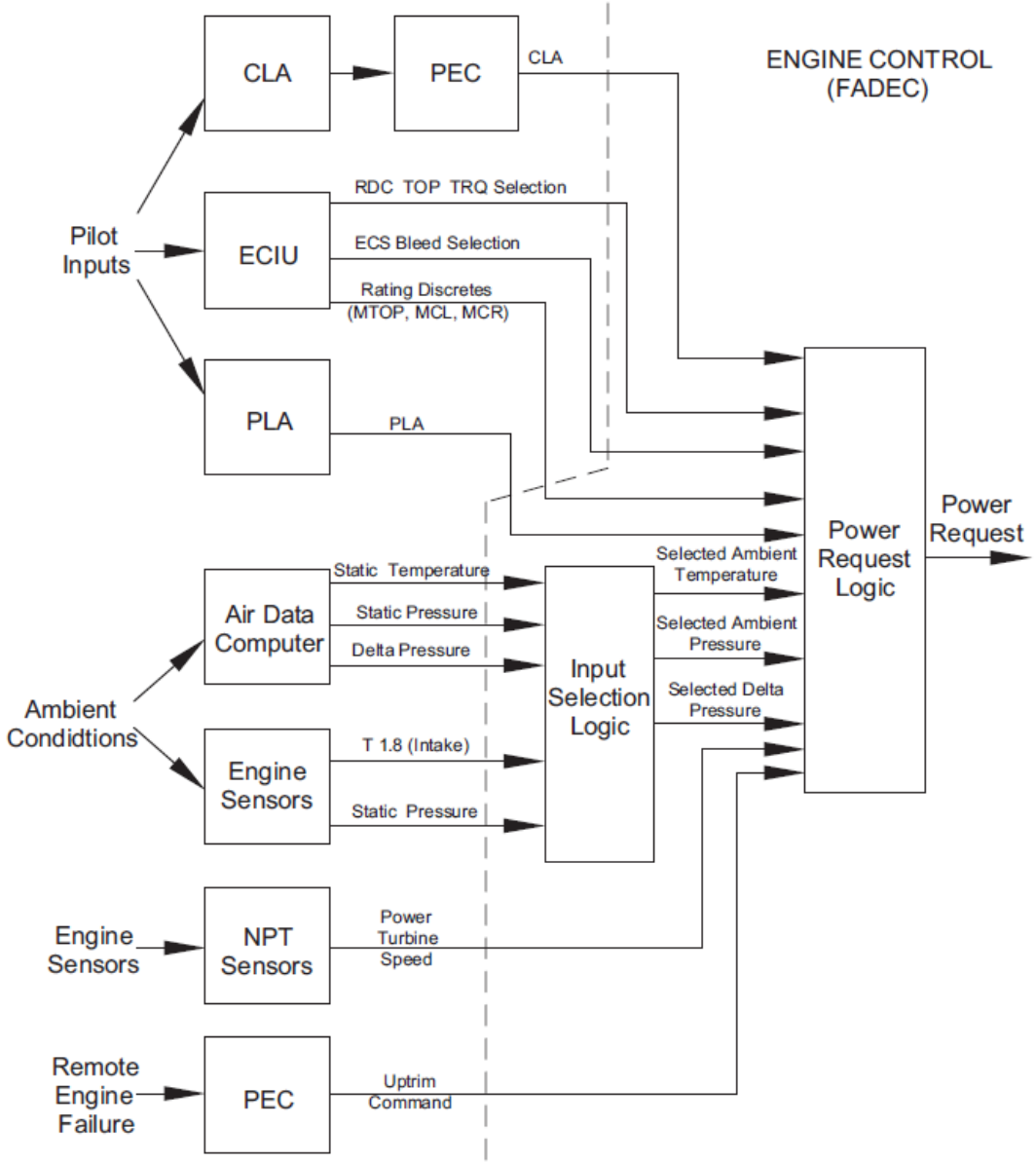
- Throttles (controls power level, mainly monitored through Torque indication)
- Condition levers (controls propeller speed).
- Power mode buttons restrict engine power limits (MTOP = Maximum Takeoff Power, NTOP = Normal Takeoff Power, RDC NP LDG = Reduced Propeller Speed Landing, MCL = Maximum Climb, MCR = Maximum Cruise).
- FADEC (Full Authority Digital Electronic Control) controls all engine parameters based on flight conditions and the pilot's control input.
- PEC (Propeller Electronic Control) controls propeller blade angle and speed, based on condition lever position and protection sub-systems like autofeathering.
- ANVS (Active Noise and Vibration Suppression) system is active if the condition levers are at 850 RPM (minimal noise and vibration, which makes flight more comfortable for passengers)

Condition Levers

- MAX: 1020 RPM (Normal Takeoff Rating)
- MCL: 900 RPM (Maximum Climb Rating)
- MIN: 850 RPM (Maximum Cruise Rating)
- START & FEATHER: Propeller Blade Angle is Feathered during engine start
- FUEL OFF: Fuel shutoff

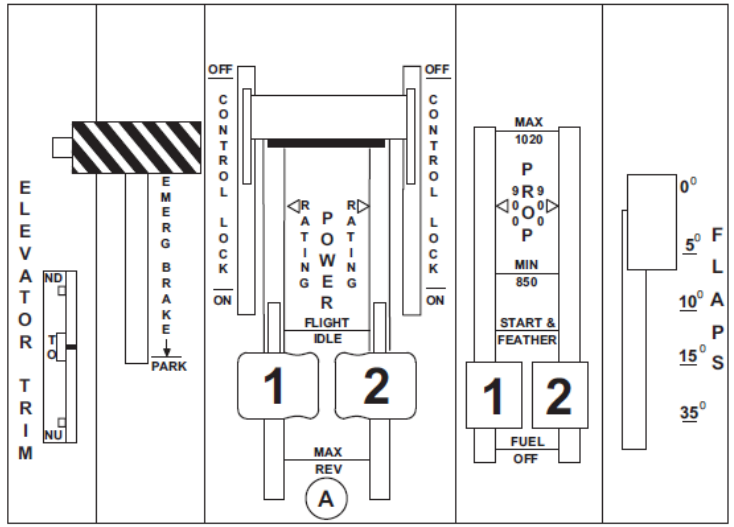
Throttle Power Levers
Positions: MAX / FLIGHT IDLE / DISC / MAX REV

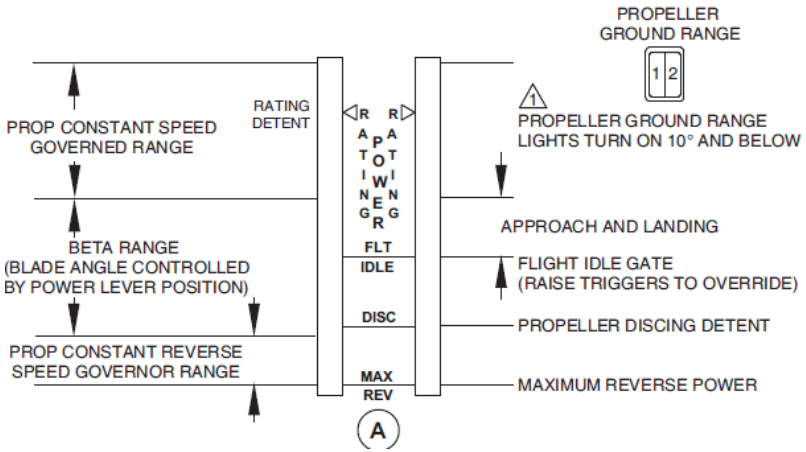




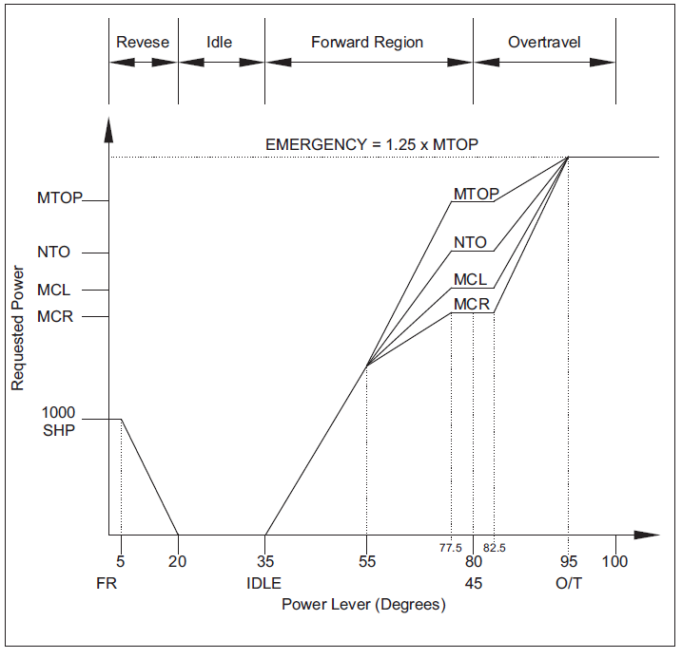
Power Setting Logic

Power & Condition Levers Logic

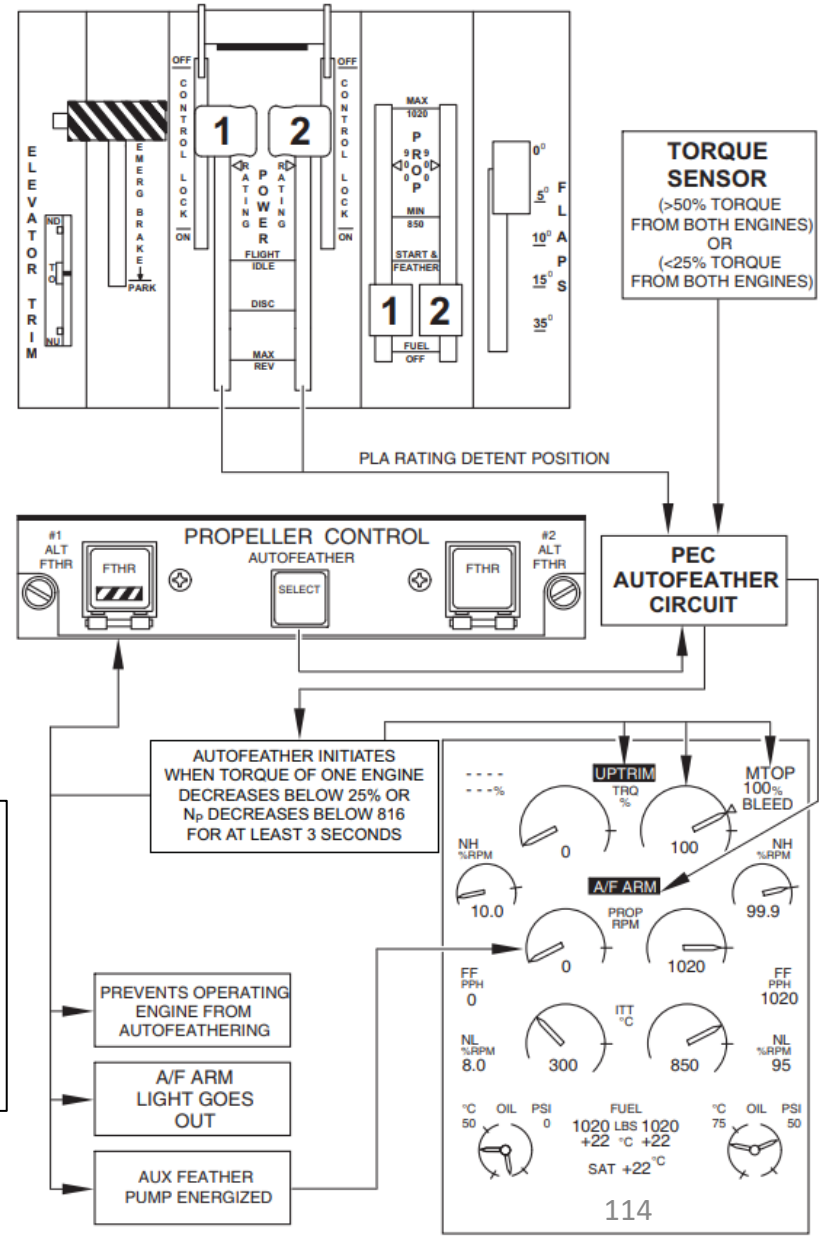




Power Setting Logic



Propeller Autofeathering Logic



NOTE: Autofeathering is triggered from the armed state when the torque of the failed engine, as detected by dual torque sensors, falls below 25% for at least three seconds. The ATPCS system sends dual uptrim signals to the FADEC of the working engine to increase its power by approximately 10%. The effect of this is to replace the NTOP (Normal Takeoff Power) rating with an MTOP (Maximum Takeoff Power) rating.

Effects of Turboprops

ATR72 Propeller Pitch in Reverse

Throttle: Flight Idle
Condition Lever: MIN 850
Forward/Normal Prop Pitch

Throttle: Flight Idle
Condition Lever: START/FEATHER
Feathered Prop Pitch

Throttle: DISC
Condition Lever: MIN 850
Flat Prop Pitch (Disc shape)

Throttle: MAX REV
Condition Lever: MIN 850
Reverse Prop Pitch

Asymmetric Propeller Loading Effect

Propeller Asymmetric propeller loading is the result of dissimilar thrust from rotating propeller blades during certain flight conditions. Downward moving propeller blades have a greater local angle of attack than upward moving blades when the relative airflow striking the blades is not aligned with the thrust line. In conventional engines where the propeller rotates clockwise when viewed from the rear, asymmetric propeller loading results in the center of thrust shifting to the right of the propeller's centerline. As a result, the yaw moment of the right engine is greater than the corresponding one of the left engine (see figure below). The effects of asymmetric propeller loading are most pronounced when engines are operating at a high power setting and the airplane is flown at high angles of attack (low speeds).

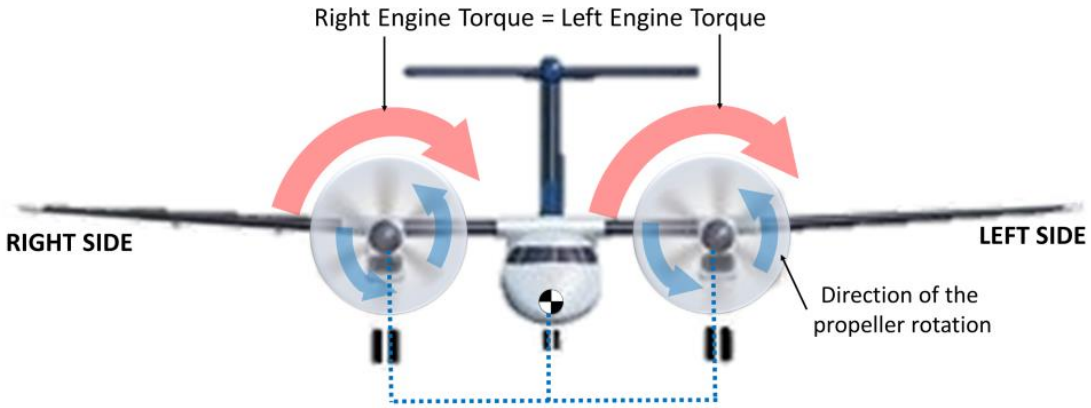
Propeller Slipstream Effect

Propeller slipstream refers to the accelerated airflow present in the wake of the propellers.
As a spinning propeller produces thrust, it also imparts a spin and a lateral displacement to the airflow behind it - referred to as slipstream "swirl" or "spiraling".

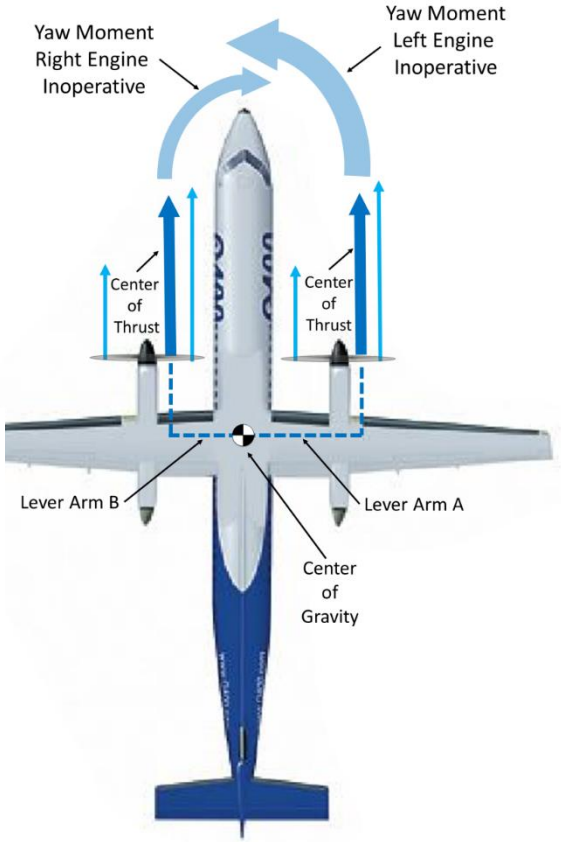
If the propellers rotate clockwise (when viewed from the rear), the wake from the left propeller is displaced inboard with the result that the flow immerses the aft portion of the fuselage and tail in slipstream, as illustrated in figure below.

Engine Torque Effect

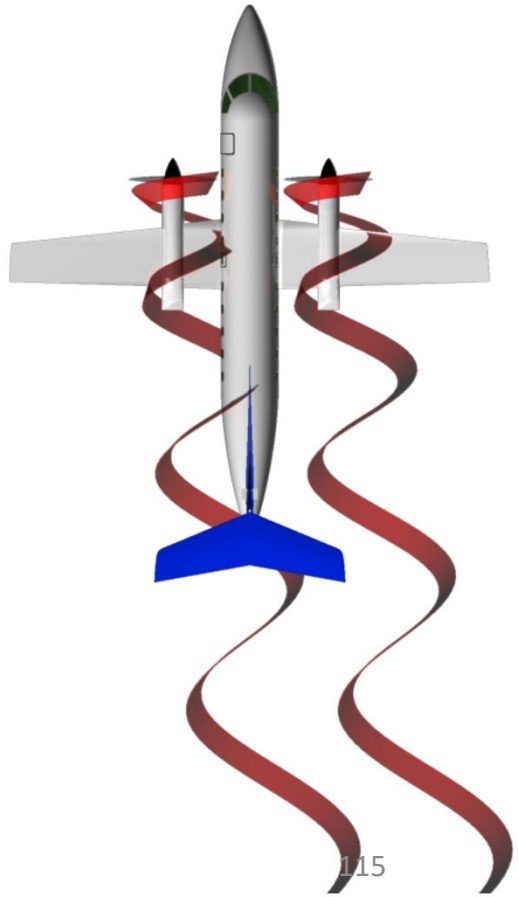
The Q400 does not have contra-rotating propellers, which means that the torque effect of each engine will add itself to the other's instead of cancelling it. This means that you will have to constantly compensate that torque effect with rudder input and rudder trim.



Torque effect



Asymmetric propeller loading

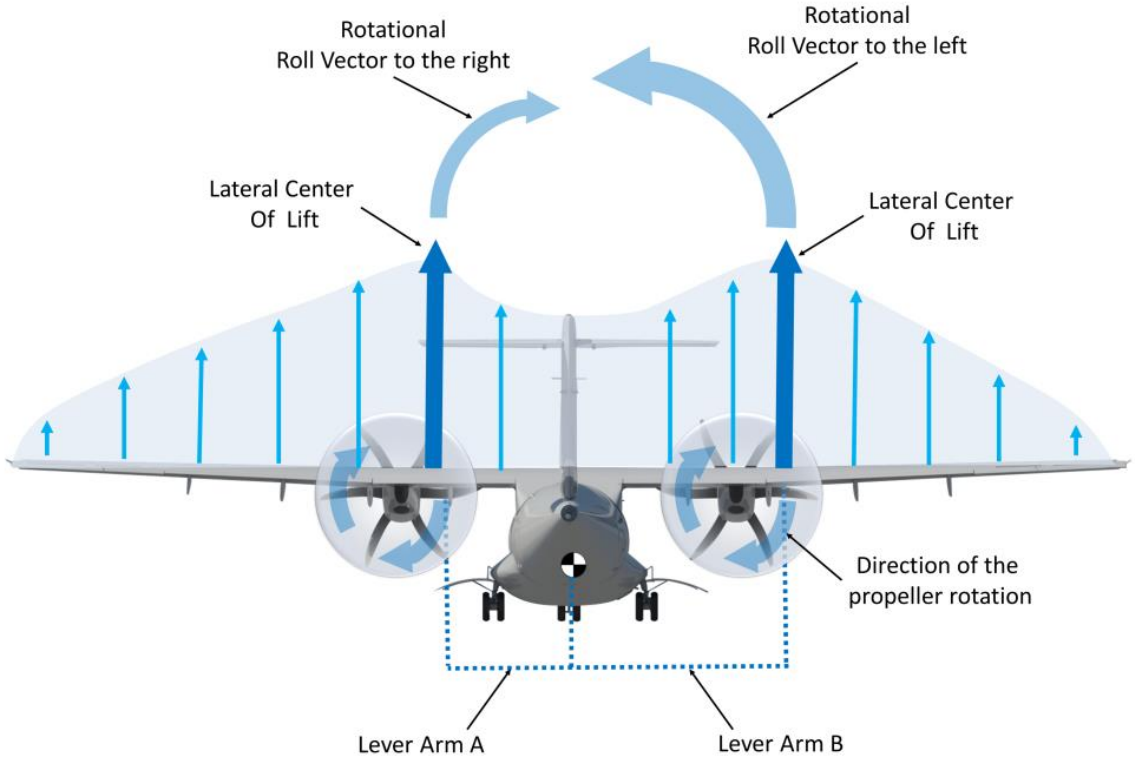


Effects of Turboprops

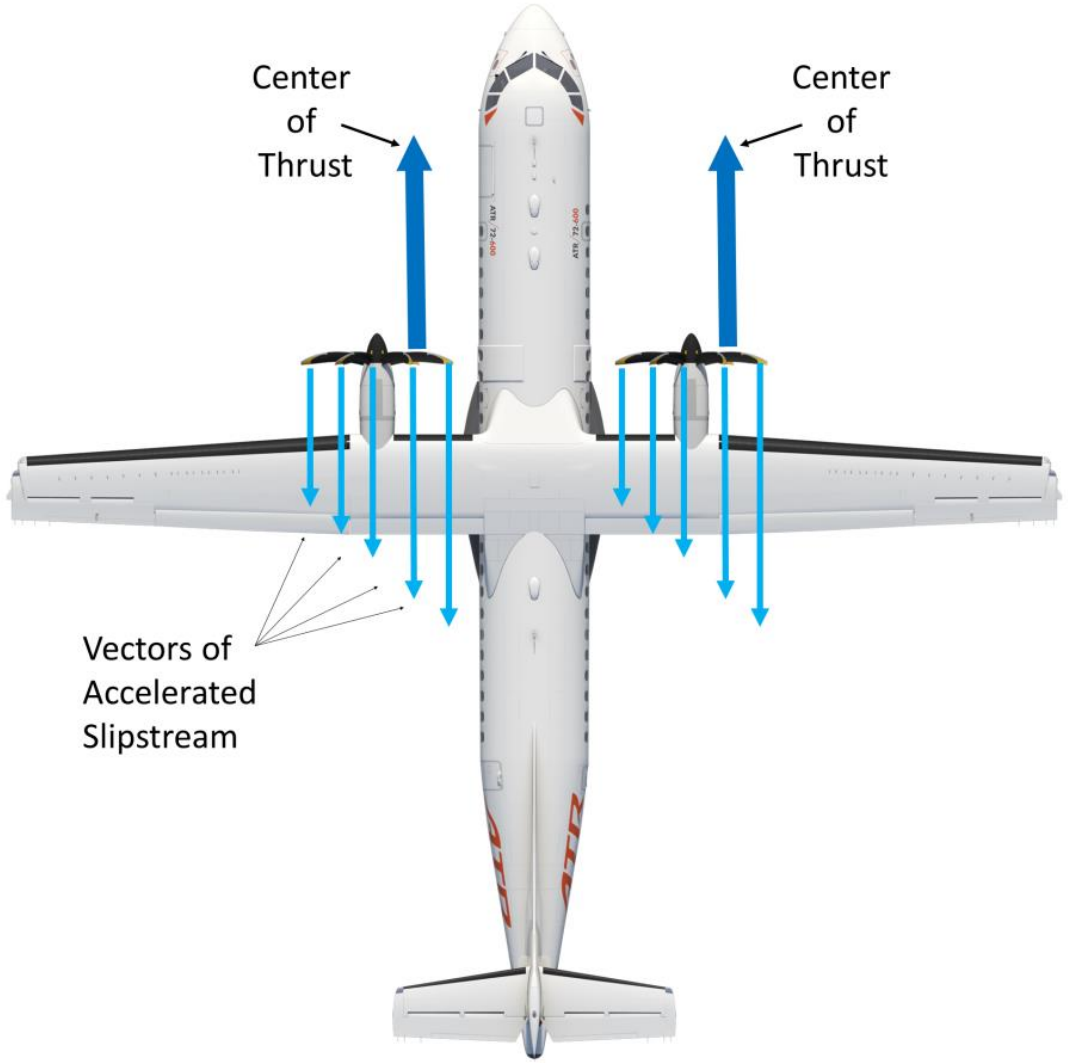
Propeller Asymmetric Lift Distribution Effect

At high engine power, the air moving through the propellers is accelerated in order to produce the thrust. This also increases the local velocity of air flowing over the parts of the wing behind the propellers which generate more lift at a given airspeed.

The accelerated flow behind the propeller also causes a rolling phenomenon that is the result of asymmetric propeller loading. As you can see, when the center of thrust shifts right as the angle of attack is increased, the accelerated air behind the propeller shifts in a similar fashion.



Accelerated slipstream – roll moment



Accelerated slipstream

Hydraulics

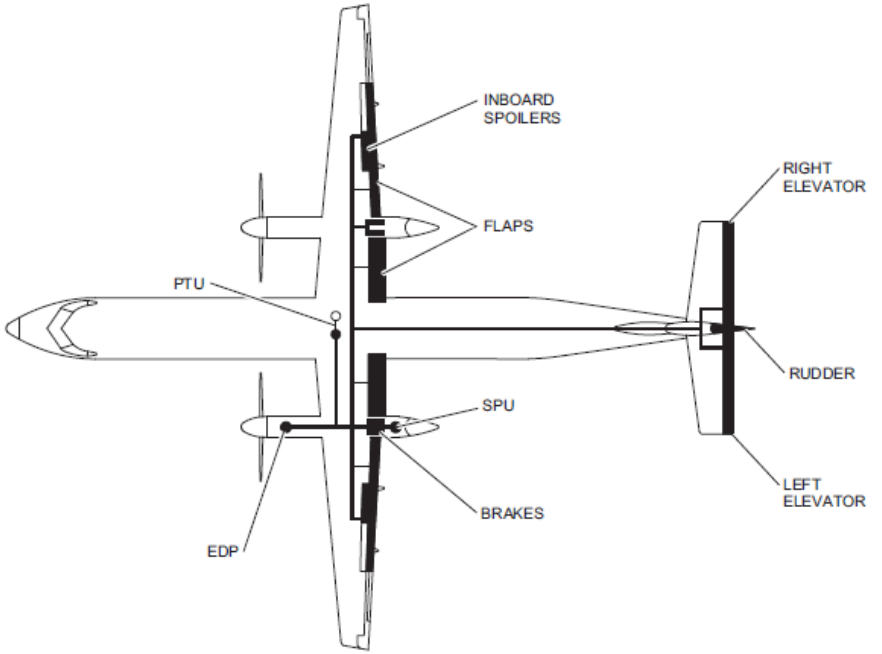
The Q400 has four main hydraulic systems.

An electrically driven Standby Hydraulic Pump operates as a backup to the No. 1 hydraulic system. It operates during takeoff and landing phases.

A Power Transfer Unit (PTU) operates as a backup to the No. 2 hydraulic system. The PTU is powered by the No. 1 hydraulic system.

If both engines fail, where No. 1, No. 2 and Standby Hydraulic pumps are all unavailable, the DC-Motor-Driven_Pump (DCMP) in the No. 3 hydraulic system provides sufficient hydraulic power to the elevators for pitch control.

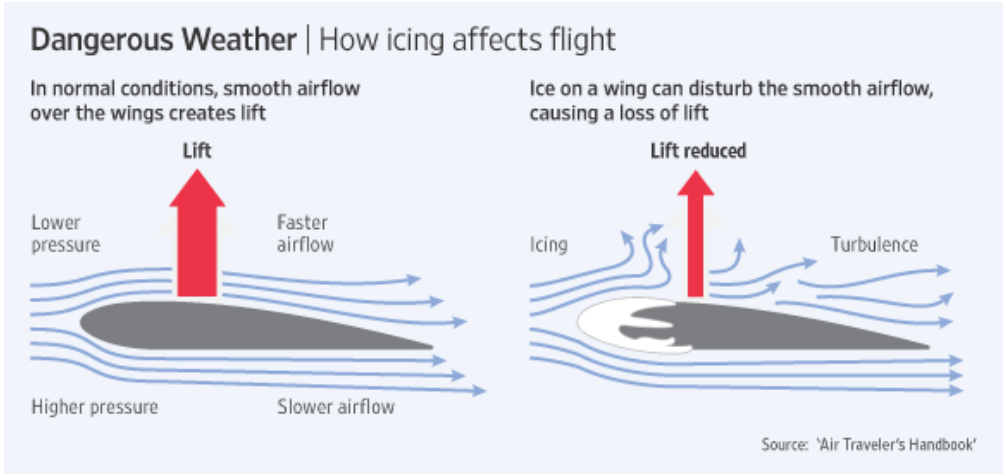
HYDRAULIC SYSTEM	SYSTEMS POWERED
No. 1 (Left)	• Flaps • Rudder (Lower Power Control Unit) • Inboard roll spoilers • Elevators (Outboard Power Control Units) • Main Wheel Brakes/Anti Skid
No. 2 (Right)	• Landing Gear • Nosewheel Steering • Outboard Roll Spoilers • Emergency/Parking Brake • Rudder (Upper Power Control Unit) • Elevators (Centre Power Control Units)
No. 3 (Aft)	• Left Elevator (Inboard Power Control Unit) • Right Elevator (Inboard Power Control Unit)
Emergency Hydraulic System	• Alternate Landing Gear Extension System



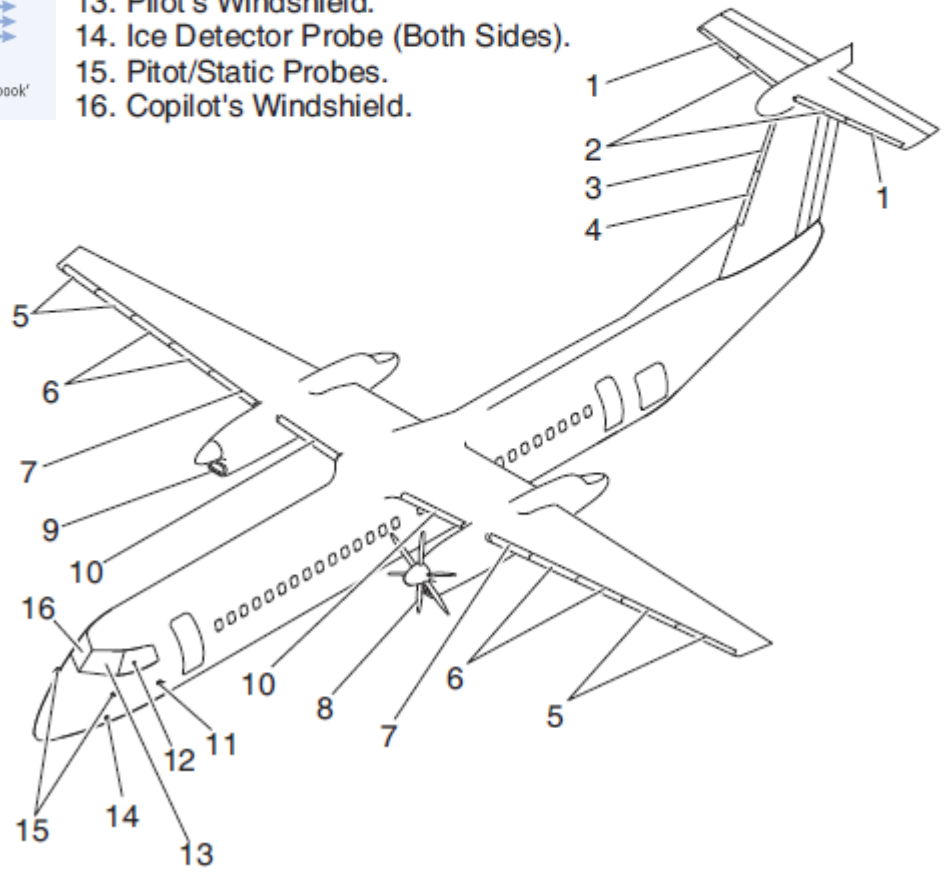
Ice Protection System - Intro

The Q400 was built to fly in cold northern countries like Canada, where icing is a common reality for regional turboprops. Icing can have a significant impact on flight performances and can make an aircraft stall even if it remains in airspeeds above stall speeds.

Therefore, a system of sensors allows you to monitor icing conditions and accumulation, in addition to another system of heaters and inflatable rubber deicer boots is used to break the ice if it starts accumulating.



1. Outboard Horizontal Stabilizer Boots.
2. Inboard Horizontal Stabilizer Boots.
3. Upper Vertical Stabilizer Boot.
4. Lower Vertical Stabilizer Boot.
5. Extension and Outboard Wing Boots.
6. Outboard and Inboard Centre Wing Boots.
7. Inboard Wing Boots.
8. Propeller Blade Heaters (All Blades).
9. Nacelle Inlet Lip Boot (Both Sides).
10. Centre Boots.
11. Angle of Attack Vane (Both Sides).
12. Pilot's Side Window.
13. Pilot's Windshield.
14. Ice Detector Probe (Both Sides).
15. Pitot/Static Probes.
16. Copilot's Windshield.



Wing Deicer Boots

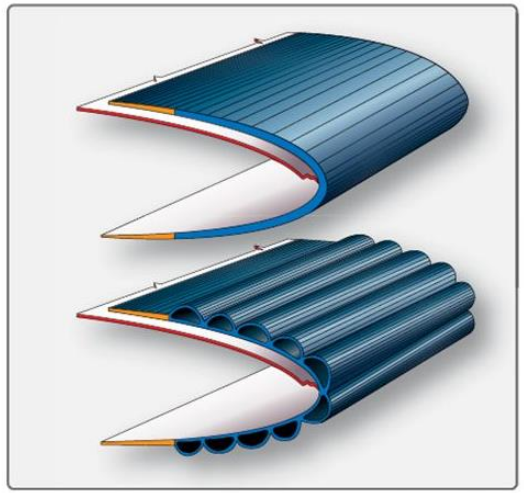


Figure 15-17. *Cross-section of a pneumatic deicing boot uninflated (top) and inflated (bottom).*

Ice Protection System – Ice Detection & Deicing

If ice is detected, an amber "ICE DETECTED" caution will appear on the engine page. You must :

- Set Pitot Heat switches ON
- Set Boot Air to NORM
- Set Engine Intake heaters ON
- Set prop de-icing switch ON
- Set windshield and window heat ON
- Set airframe de-icing mode to either SLOW or FAST
- Set REF SPEEDS switch to INCR
- Once ice is being either thawed or broken, the ICE DETECTED caution will turn to white. If the caution stays on, don't worry, it's normal. It's how the system is in real life.

Ice Protection System – Icing Levels

Keep in mind that there are different icing levels that require different actions.

ICING LEVEL 1: used in all conditions
- PITOT HEAT switches – ON
- WINDSHIELD HEAT – ON (AS NECESSARY)

ICING LEVEL 2: used on ground when icing conditions exist, temperature + 10 deg C or below, in-flight + 5 deg C or below
- PITOT HEAT switches – ON
- WINDSHIELD HEAT switch – ON
- PROP HEAT switch – ON
- Engine Intake Doors – OPEN
- REF SPEEDS INCR switch – ON (only while in-flight above 1000 ft)

ICING LEVEL 3: used in flight during visual accretion or ICE DETECTED is displayed on Engine Display
- PITOT HEAT switches – ON
- WINDSHIELD HEAT switch – ON
- PROP HEAT switch – ON
- Engine Intake Doors – OPEN
- REF SPEEDS INCR switch – ON (only while in-flight above 1000 ft)
- Airframe Mode Select – FAST (during takeoff when above 1000 ft AGL, Holds, approaches, landings) or SLOW (during cruise when sufficient to remove ice)

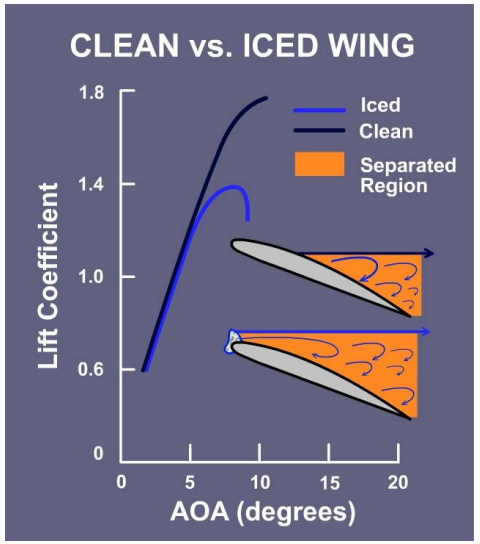
Ice Protection System - Airspeeds

De-icing systems are not used on takeoff. Why? The reason is because with airframe de-ice operative, the de-ice boots on the leading edges of the wing and tail are inflated, altering the shape of the leading edge, and so the stall speed is increased by 20 kts (this is why you operate the VREF+20 switch with de-ice boots ON). Concretely, this means:

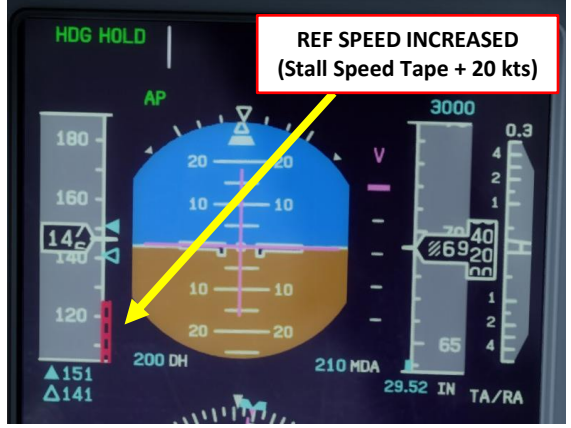
- If your aircraft would normally stall at 100 kts and you currently fly at 110 kts to be 10 kts above stall speed, you would be fine in normal weather conditions.
- However, with icing conditions, the 110 kts speed that you would normally consider to be "above stall" is now dangerous since your stall speed "with icing" is now 120 kts.

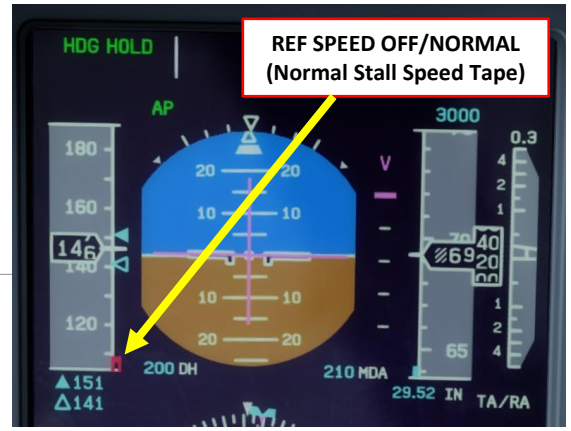
You will often hear about this "REF SPEEDS INCREASE" switch. The only thing this REF SPEEDS INCREASE switch will do is that it will change the stall speed tape on your Primary Flight Display's speed tape to make sure that you fly without stalling. This will make sure to warn you: "Hey, make sure you fly faster since all that ice and those inflating boots are making your wings generate much less lift than usual."

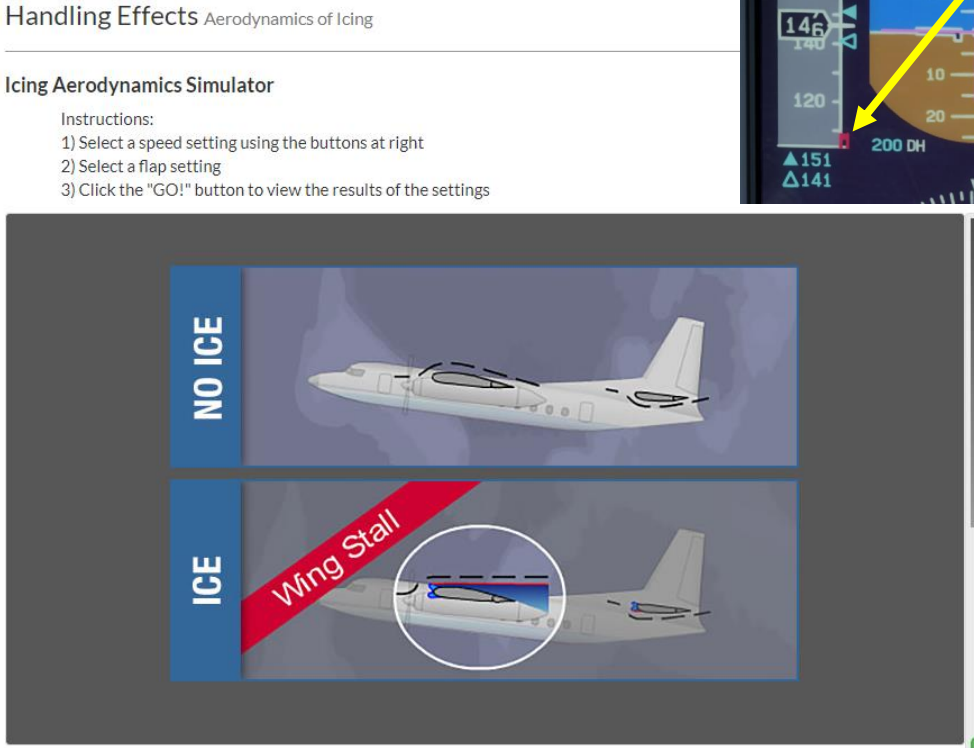
Here is a very cool website that explains the effects of icing on stall speed: https://aircrafticing.grc.nasa.gov/1_1_3_3.html

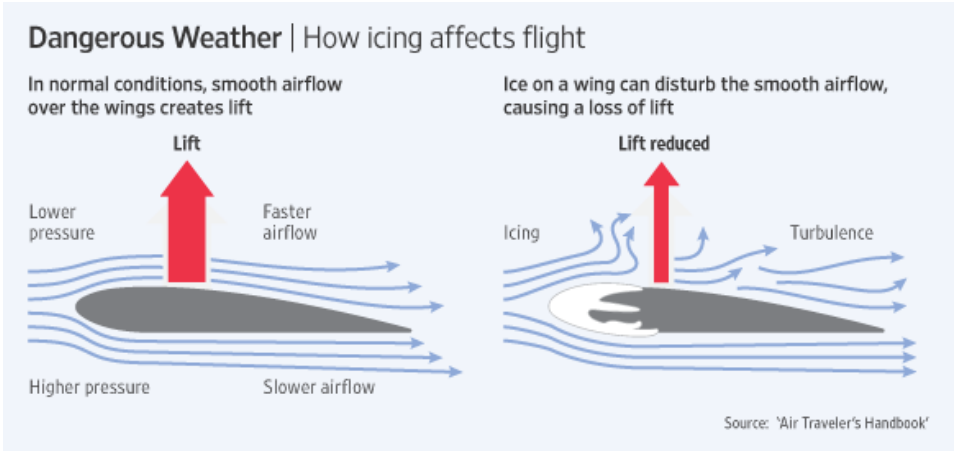


REF SPEEDS INCREASE switch







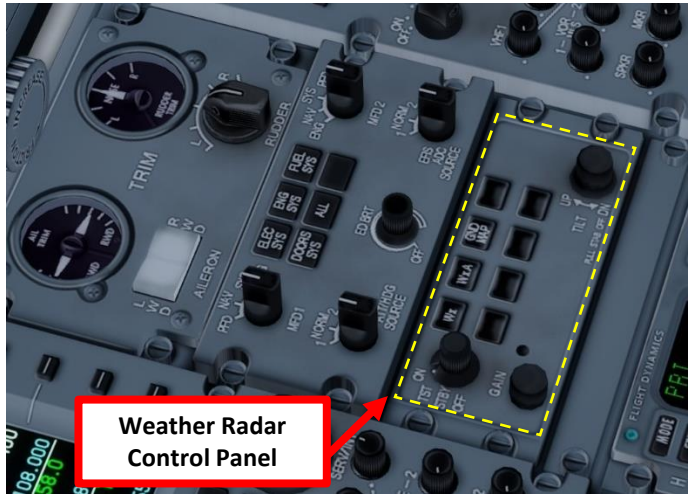


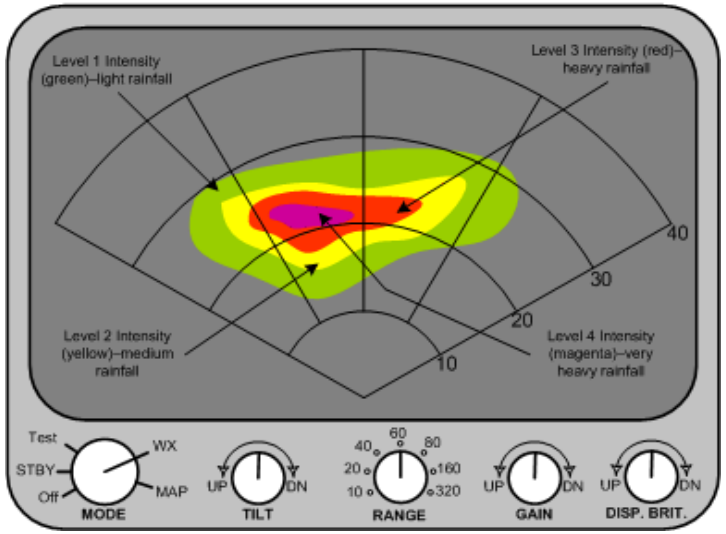
Weather Radar

The weather radar can help you determine what icing zones are ahead.

The color code indicates the intensity of precipitations:

- **Green**: Level 1 Intensity, light precipitations
- **Yellow**: Level 2 intensity, medium precipitations
- **Red**: Level 3 intensity, heavy precipitations
- **Purple**: Level 4 intensity, very heavy precipitations





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.

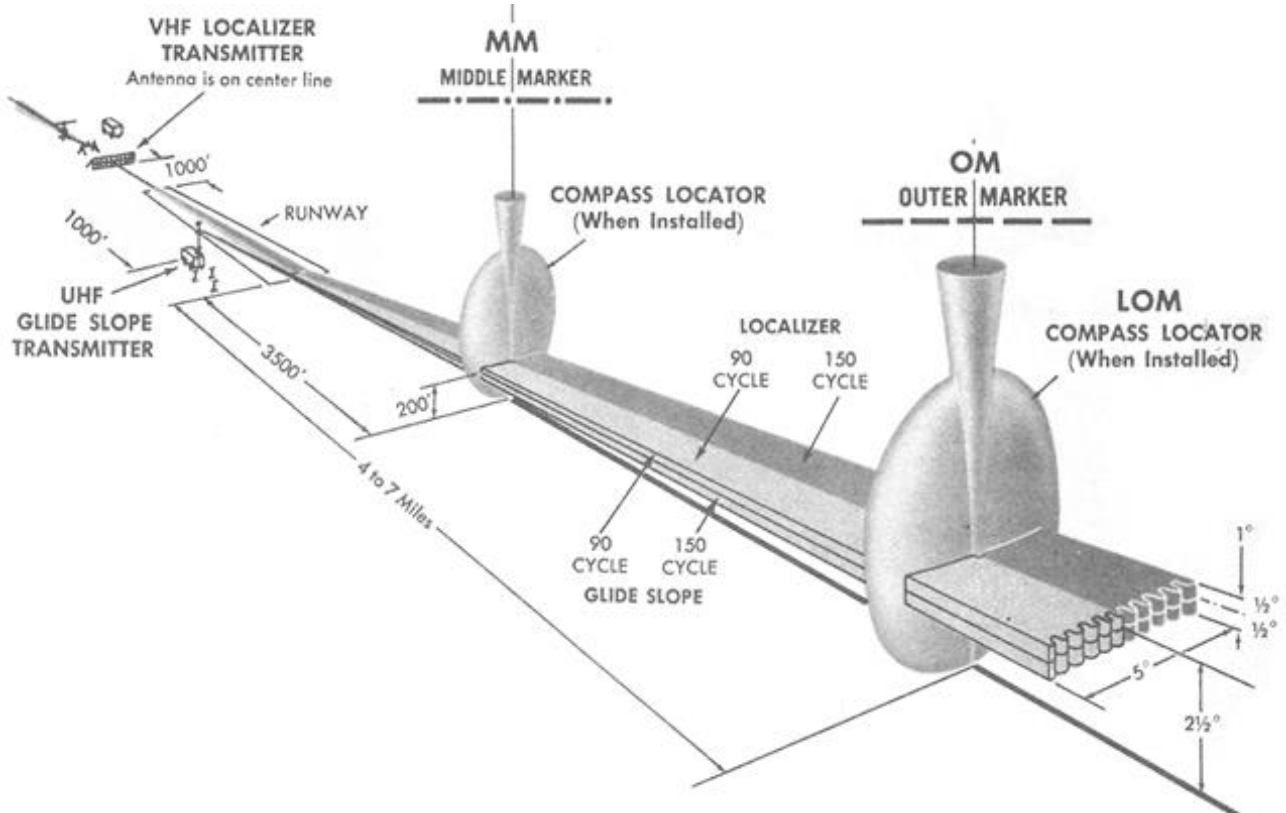
First, let's introduce you to the ILS (Instrument Landing System). This system exists to guide you during your approach.

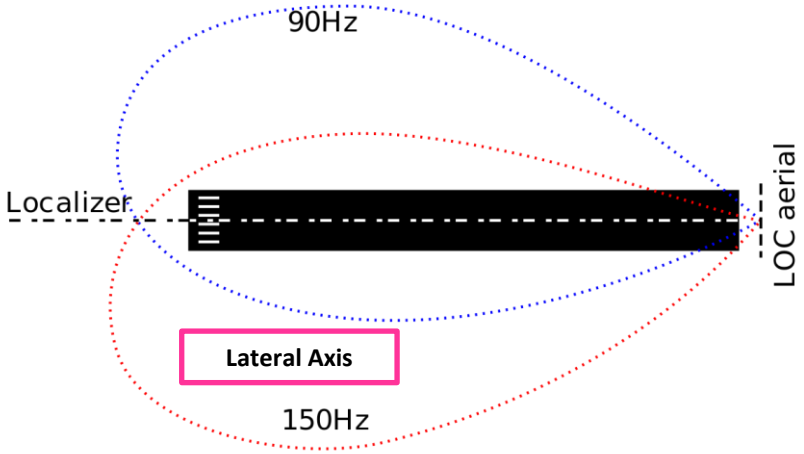
- The Localizer is generally an array of antennas that will give you a lateral reference to the center of the runway.
- The Glide Slope station will help you determine the descent speed you need in order to not smack the runway in a smoldering ball of fire.

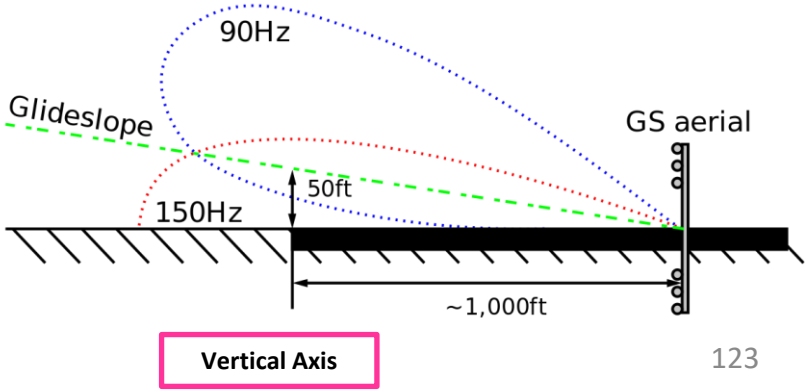
Localizer Array Station at Hannover

Glide Slope Station at Hannover

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



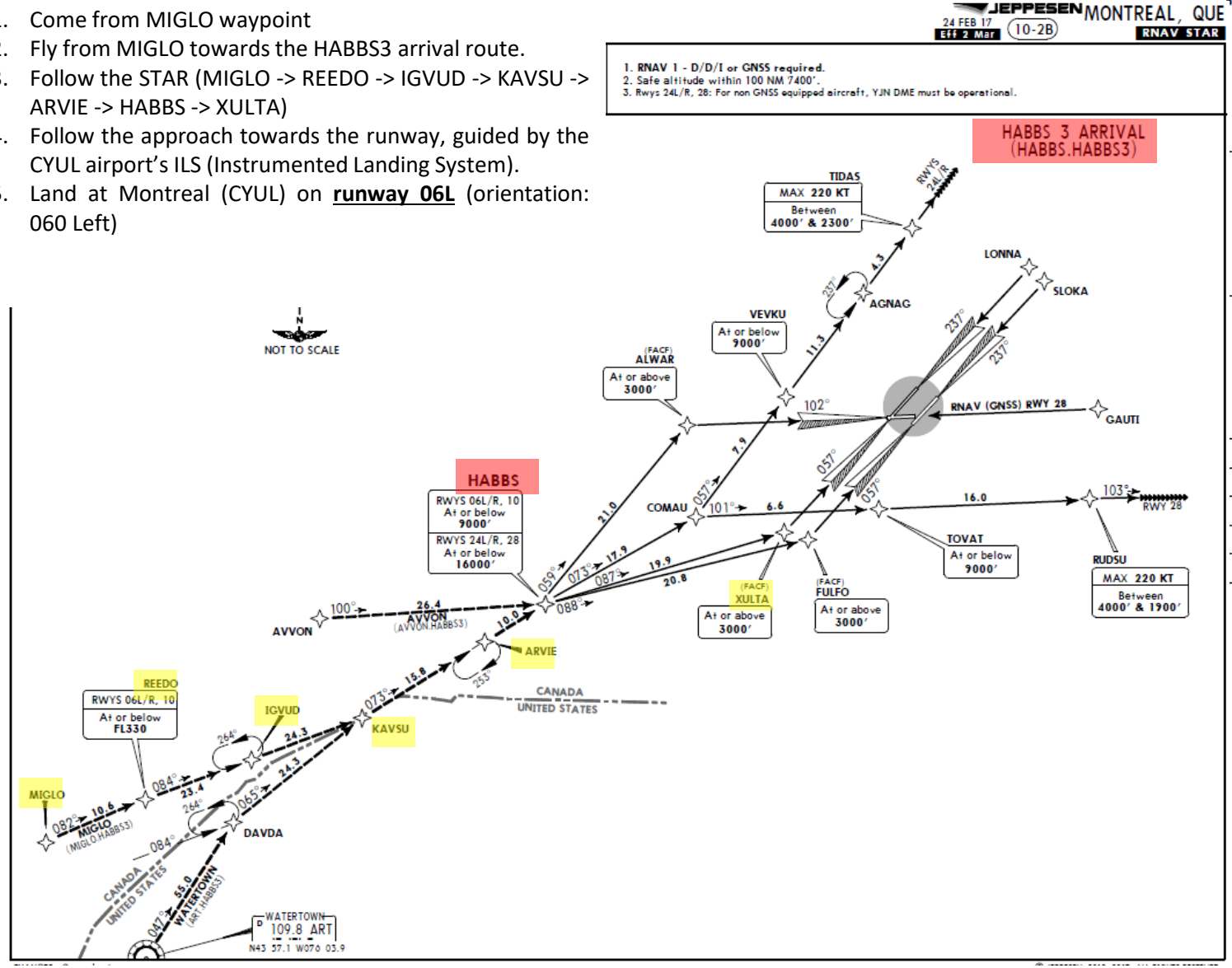


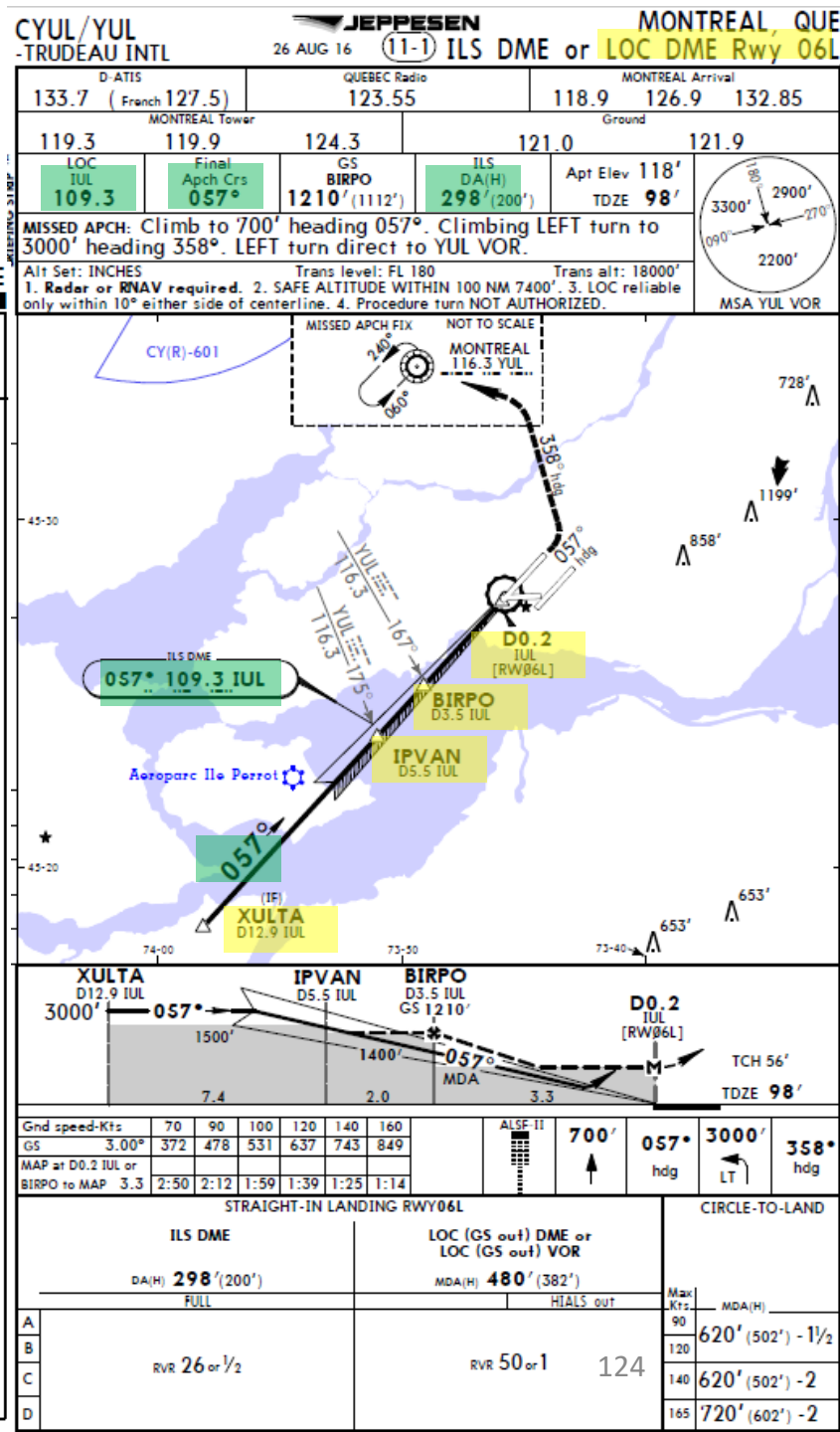


PLANNING DESCENT

These charts are for the STAR (Standard Terminal Arrival Route) from MIGLO to Montreal Pierre-Elliott Trudeau (CYUL). We intend to:

1. Come from MIGLO waypoint
2. Fly from MIGLO towards the HABBS3 arrival route.
3. Follow the STAR (MIGLO -> REEDO -> IGVUD -> KAVSU -> ARVIE -> HABBS -> XULTA)
4. Follow the approach towards the runway, guided by the CYUL airport's ILS (Instrumented Landing System).
5. Land at Montreal (CYUL) on **<u>runway 06L</u>** (orientation: 060 Left)





PLANNING DESCENT

Final Approach Course: 057

This is the heading you will take when approaching for final landing.

Minimums Decision Height: 200 ft (or 298 ft Decision Altitude)

This is the minimum "decision altitude" (DA) during landing. If you go lower than 298 ft, you are committed to land no matter what happens. Above 298 ft, you can still miss your approach and go around. You can also use the Decision Height (DH) of 200 ft, which is what we will use.

ILS Frequency: 109.30 MHz

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

Missed Approach Standby Frequency: 116.30 MHz

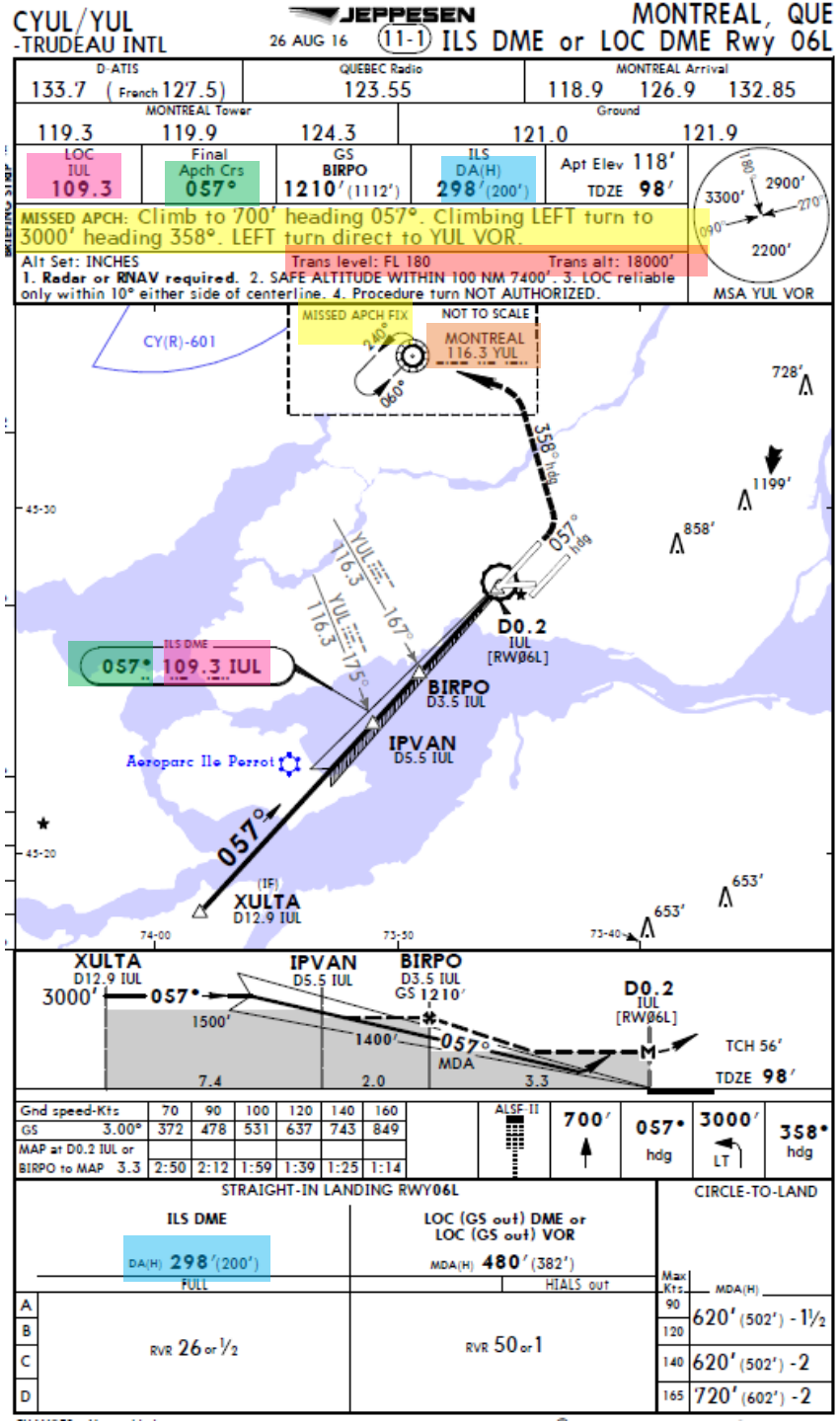
VOR "MONTREAL" (YUL) will be the beacon we will track in case we miss our approach and have to go around.

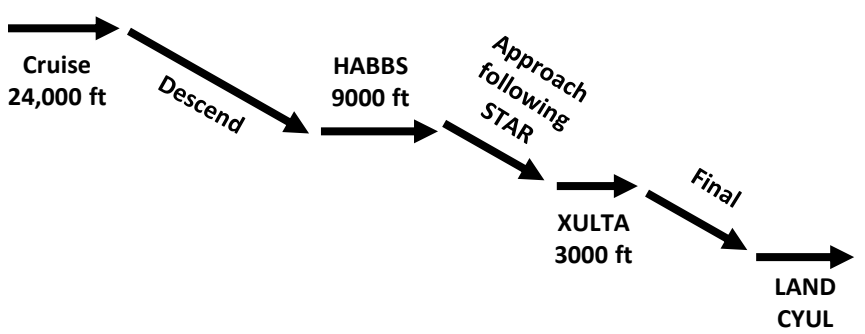
Missed Approach Procedure

In case we miss our approach, the procedure is to climb straight ahead. When passing 700 ft, we climb LEFT on heading 358 to 3000 ft. We then turn left directly towards YUL VOR.

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 (18000 ft on chart). The transition level is the lowest flight level available for use above the transition altitude. According to the chart, the transition altitude gives us FL180 as well, or 18000 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

SET VNAV PROFILE

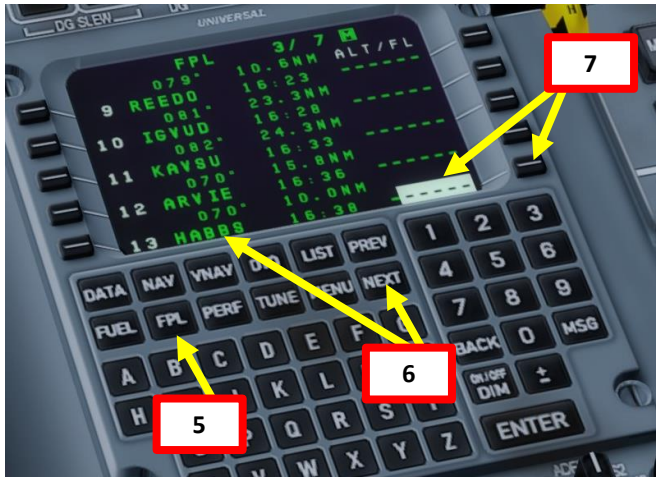
While we are cruising, we can plan our VNAV (Vertical Navigation) planning for the descent and approach to Montreal.

1. Adjust your navigation display scale to get a good view of the waypoints ahead of you.
2. We intend to descend to HABBS waypoints to the restriction of 9000 ft. We have to first set the autopilot to its target altitude, then program a vertical navigation profile to follow in order to reach this target altitude.
3. Scroll mousewheel on ALT knob to set 9000 ft as the autopilot's target altitude.
4. Press ALT SEL to enter the new altitude target.

SET VNAV PROFILE

Now, we will set a restriction altitude of 9000 ft to the HABBS waypoint via the FPL page.

5. Go in FPL page
6. Click NEXT until you reach the HABBS waypoint
7. Set altitude restriction by clicking LSK next to HABBS in the ALT/FL column.
8. Type 9000 in the MCDU keypad.
9. Click ENTER to set altitude restriction to HABBS.



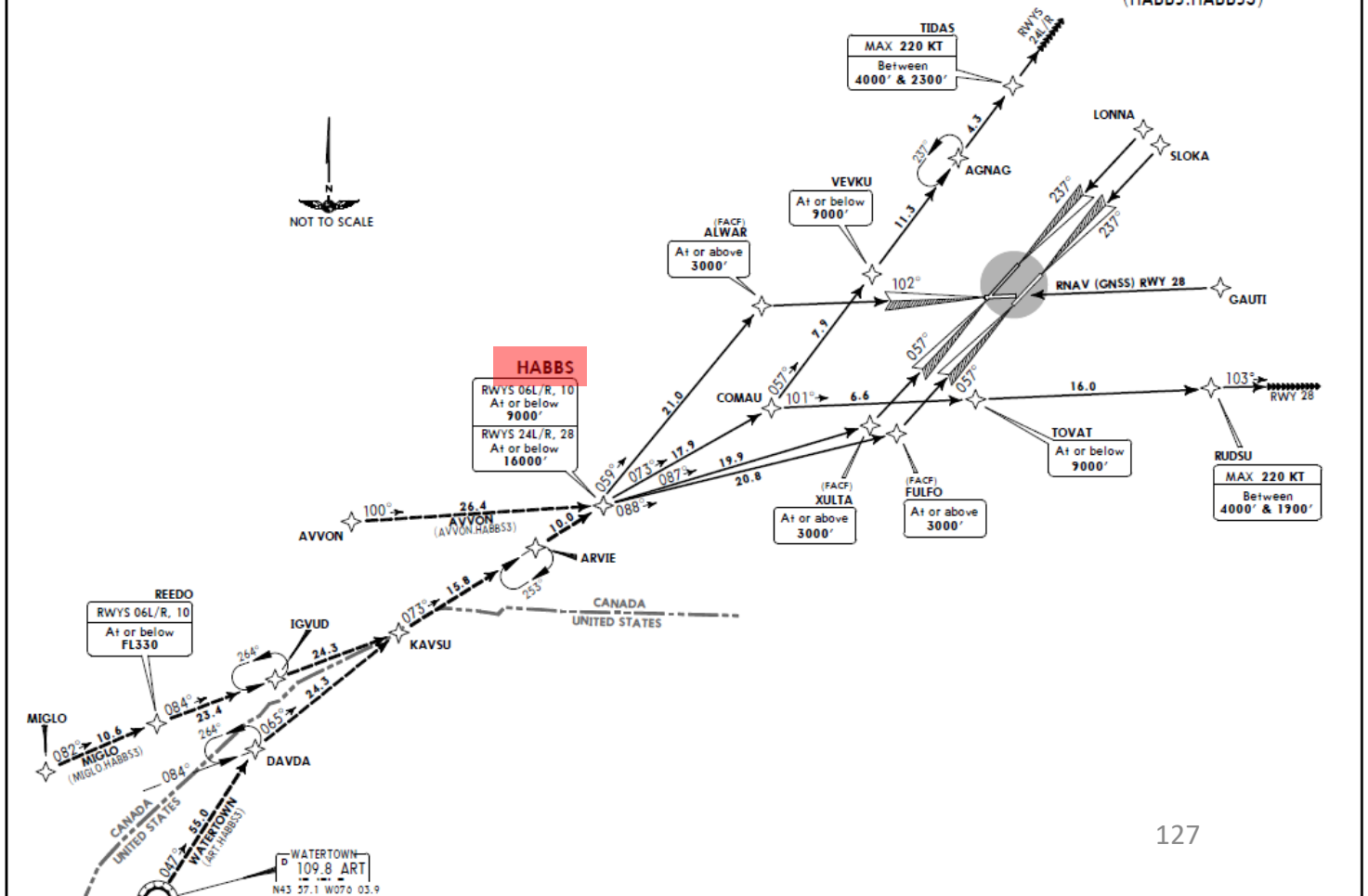
CYUL/YUL
-TRUDEAU INTL

JEPPESEN MONTREAL, QUE
24 FEB 17
Eff 2 Mar
10-2B
RNAV STAR

D-ATIS	Apt Elev	Alt Set: INCHES	
133.7 (French 127.5)	118′	Trans level: FL180	Trans alt: 18000′

1. RNAV 1 - D/D/I or GNSS required.
2. Safe altitude within 100 NM 7400′.
3. Rwys 24L/R, 28: For non GNSS equipped aircraft, YJN DME must be operational.

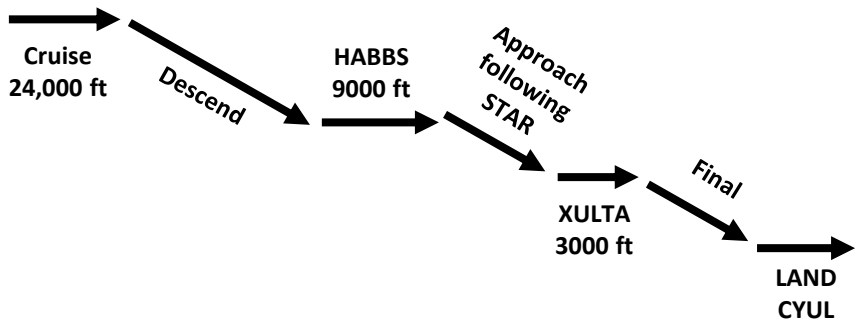
HABBS 3 ARRIVAL
(HABBS.HABBS3)

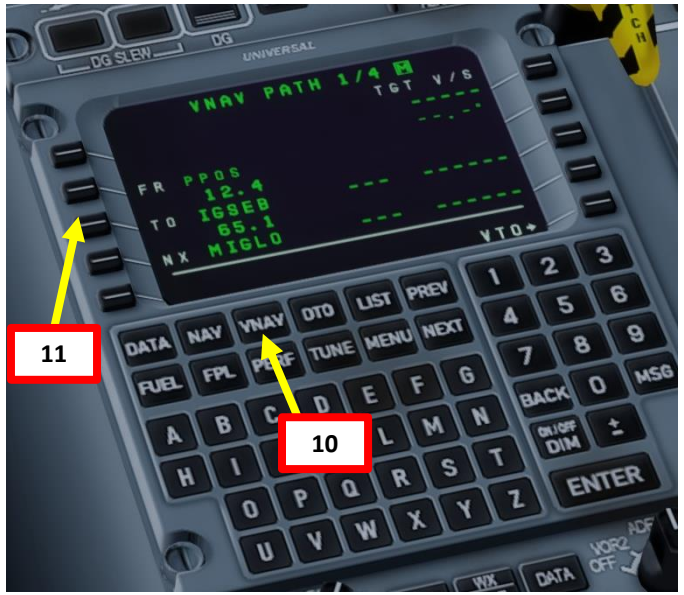


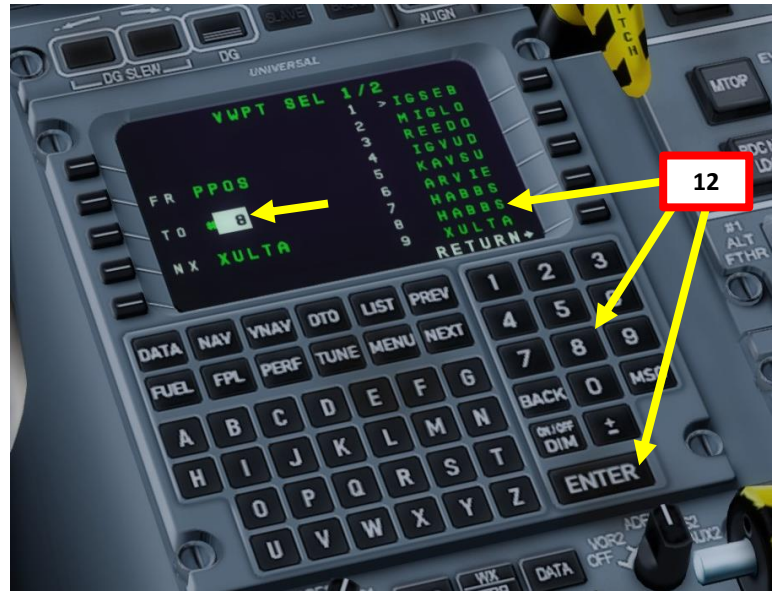
SET VNAV PROFILE

Now, we will program our vertical descent profile in order to reach HABBS waypoint at a restriction altitude of 9000 ft.

10. Go in VNAV page
11. Click on the LSK next to the « TO » field to set a new target waypoint for the end of the VNAV descent profile.
12. On MCDU keypad, type « 8 » since it is selection item number 8 on the MCDU keypad (HABBS waypoint will be the target waypoint for the end of the VNAV descent profile) and press ENTER.
13. On MCDU keypad, leave the « Distance/Offset to waypoint » field (nm) empty and press ENTER.
14. On MCDU keypad, type « 9000 » to set a target/restriction altitude of 9000 ft to HABBS and press ENTER.
15. On MCDU keypad, type « 1500 » to set a vertical descent speed target of 1500 ft/min and press ENTER.
16. And there you go! Your vertical navigation profile to the HABBS waypoint at 9000 ft is set. You just need to arm the autopilot VNAV mode.







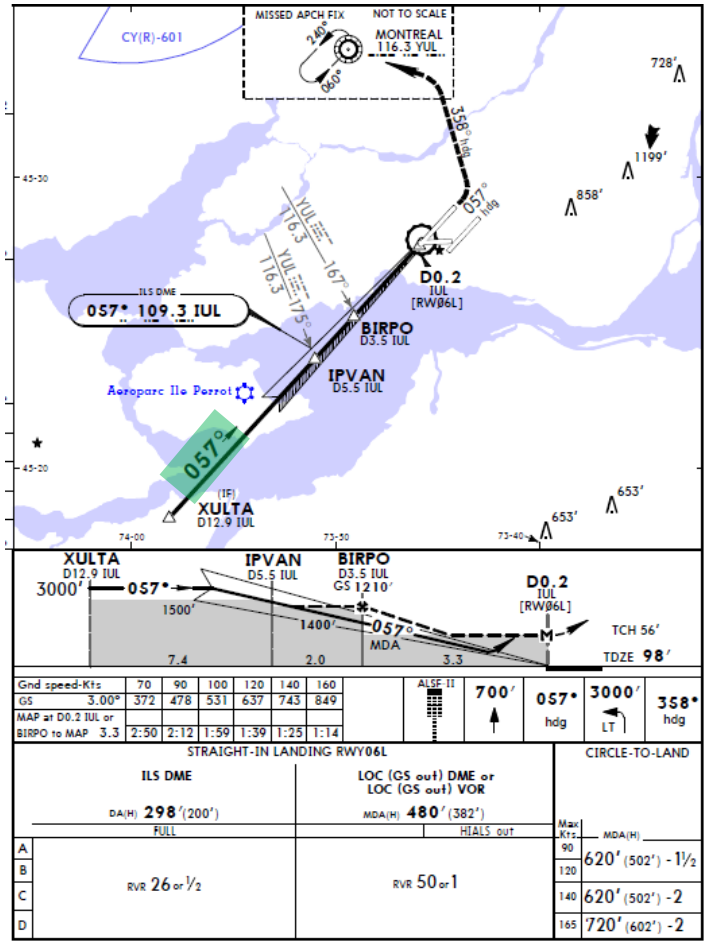
ENGAGE AUTOPILOT VNAV & START DESCENT

17. Your TOD (Top of Descent) point will be identified by a circle marker with « TOD » on your navigation display.
18. When you are near the TOD point, a pink « V » will appear with a glide slope scale.
19. When you receive the « VERT ALERT » (top of descent alert) 2 minutes prior to TOD, press the VNAV autopilot mode button. If you attempt to engage VNAV without seeing this message, it will not work.
20. You will begin your descent following the VNAV profile once the « VNAV PATH » autopilot indication is displayed.
21. Control your airspeed by throttling back but keep enough power to maintain 250 kts or less.

TOD (Top of Descent) Point

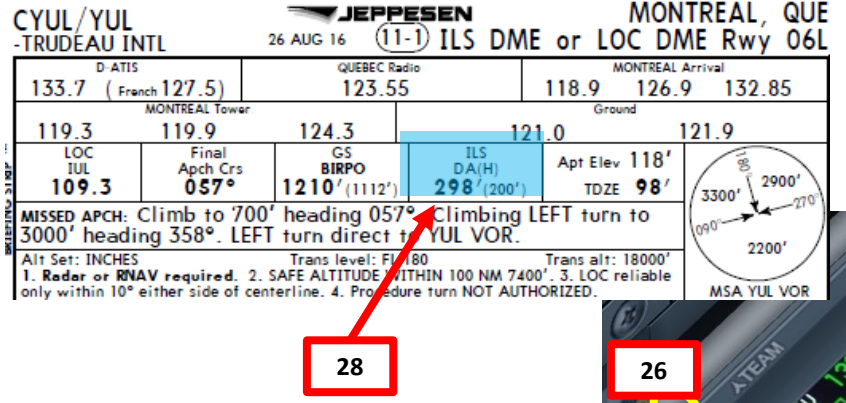
SET UP APPROACH

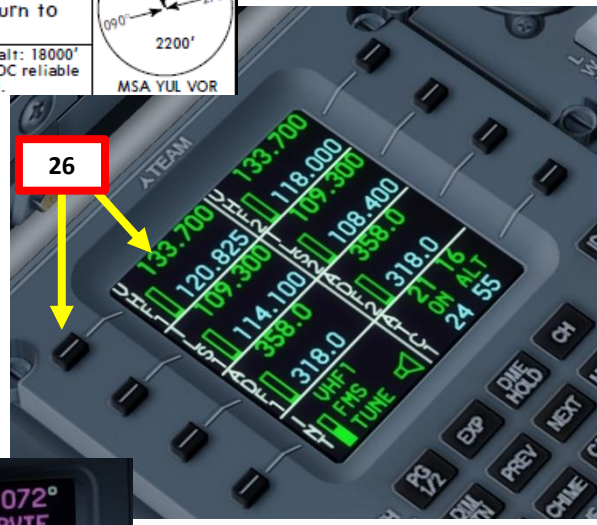
22. Hold the FORMAT button a few seconds to display the ILS format page on the navigation display (cyan lines)
23. Rotate the COURSE autopilot knob to set the ILS course to 057 (heading of Montreal Runway 06L).
24. Hold the FORMAT button a few seconds to display the normal NAV page on the navigation display.



SET UP APPROACH

25. Continue your descent to HABBS.
26. Set your radio frequency to CYUL (Montreal) ATIS (133.700).
27. Listen to ATIS broadcast and adjust your altimeter setting to the Dorval setting (29.52 in Hg in our case)
28. Set Decision Height to 200 (DH) by setting DH/MDA outer knob to DH and rotating inner knob. *(Note: You could alternatively set MDA to 298 ft as per CYUL chart.)*
29. Set up GPWS (Ground Proximity Warning System) switch to 15 as we intend to land with 15 degrees of flap.





SET UP APPROACH

30. We will use flaps 15 for landing since our runway is 11000 ft and we want to have the best recovery performance.
31. Select the PERF page to get estimated weight on landing (58846 lbs).
32. Use table to gain FLAPS 15 V-SPEEDS.
    - We plan for icing conditions
    - ATIS information gives us a 10 kts wind with no gust
    - VAPP (Approach Speed) @ 62000 lbs = 126 kts
        - Add 20 kts since flying in icing conditions
        - Add half of wind speed (5 kts)
        - Add gust wind (0 kts in our case)
        - Final **VAPP** = 126 + 20 + 5 + 0 = **151 kts**
    - VREF (Reference Speed) @ 62000 lbs = 126 kts
        - Add 20 kts since flying in icing conditions
        - Add half of wind speed (5 kts)
        - Add gust wind (0 kts in our case)
        - Final **VREF** = 126 + 20 + 5 + 0 = **151 kts**
    - VGA (Go-Around Speed) @ 62000 lbs = 116 kts
        - Add 20 kts since flying in icing conditions
        - Add half of wind speed (5 kts)
        - Add gust wind (0 kts in our case)
        - Final **VGA** = 116 + 20 + 5 + 0 = **141 kts**
33. Click on SEL button to select speed bugs and turn SPEED BUG knob to set VAPP (WHITE TRIANGLE, 151 kts) and VGA (BLACK TRIANGLE, 141 kts).

Use Flaps 15º
- Runways greater than 7000ft
- Dry conditions with no tailwind
- Gusty conditions,
- Windshear conditions are forecast, Flaps 15 gives best recovery performance.

Use Flaps 35º
- Runways less than 7000ft
- Tailwind operations
- When the runway is contaminated
- Icing conditions during landing (with the REF SPEEDS INCR switch on)

32

FLAPS 15° 32

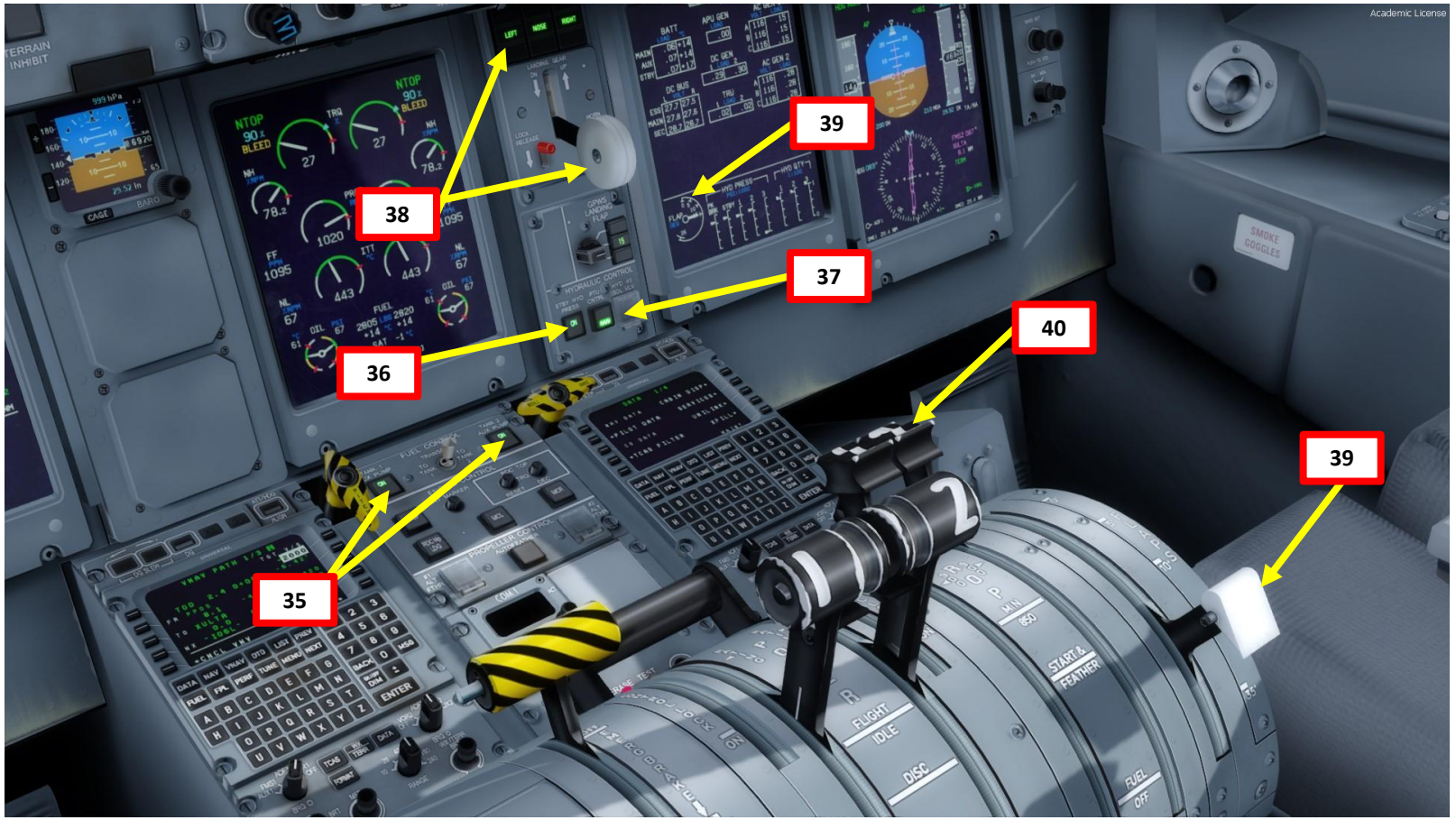
WEIGHT	V app	V ref	V ga
39.500 LB	106	105	105
44.000 LB	106	106	105
48.500 LB	112	112	105
53.000 LB	117	117	107
57.000 LB	122	121	111
62.000 LB	126	126	116
64.000 LB	129	129	119

* When flying in icing conditions,
Add 20 kts to V app, V ref, V ga for flaps 10°, 15° and 35°

Dorval airport information Sierra, 1631 zulu. Wind 315 at 10 . Visibility: greater than 20 miles. Sky condition: few clouds at 3,400. Temperature: 18. Dewpoint: 12. Altimeter 2952. Visual runway 28, Visual runway 27, Visual runway 26, Visual runway 25, Visual runway

SECURING APPROACH

34. When reading 9,000 ft at HABBS waypoint, set your lights for landing (APPROACH, FLARE, FASTEN BELTS, NO SMOKING lights all ON)
35. Set TANK 1 and TANK 2 AUX PUMP switches ON
36. Set STANDBY HYDRAULIC PRESSURE pump switch ON
37. Set PTU (Power Transfer Unit) CONTROL switch ON
38. Set landing gear down
39. Set flaps lever to 15 deg
40. Set condition levers to MAX
41. Set throttle to maintain airspeed above 145 kts



Minimum Flaps Speeds

Flaps 0 (clean) = 175kts
Flaps 5 = 160 kts
Flaps 10 = 150 kts*
Flaps 15 = 145*

*The gear must be down in this situation, or else you'll get a configuration/gear warning.

SECURING APPROACH

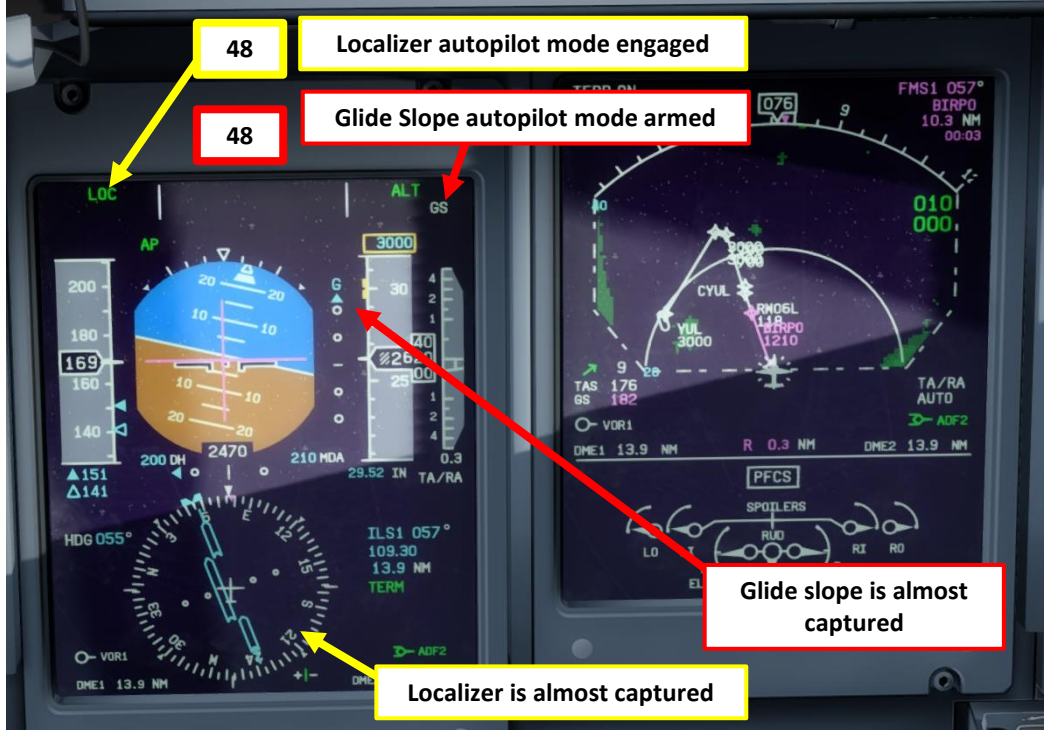
42. Once HABBS waypoint is reached, descend to XULTA waypoint aiming for a target altitude of 3000 ft. You can set another VNAV profile as shown previously.
43. Select altitude target of 3000 ft by rotating ALT knob.
44. Press ALT SEL to set altitude target.

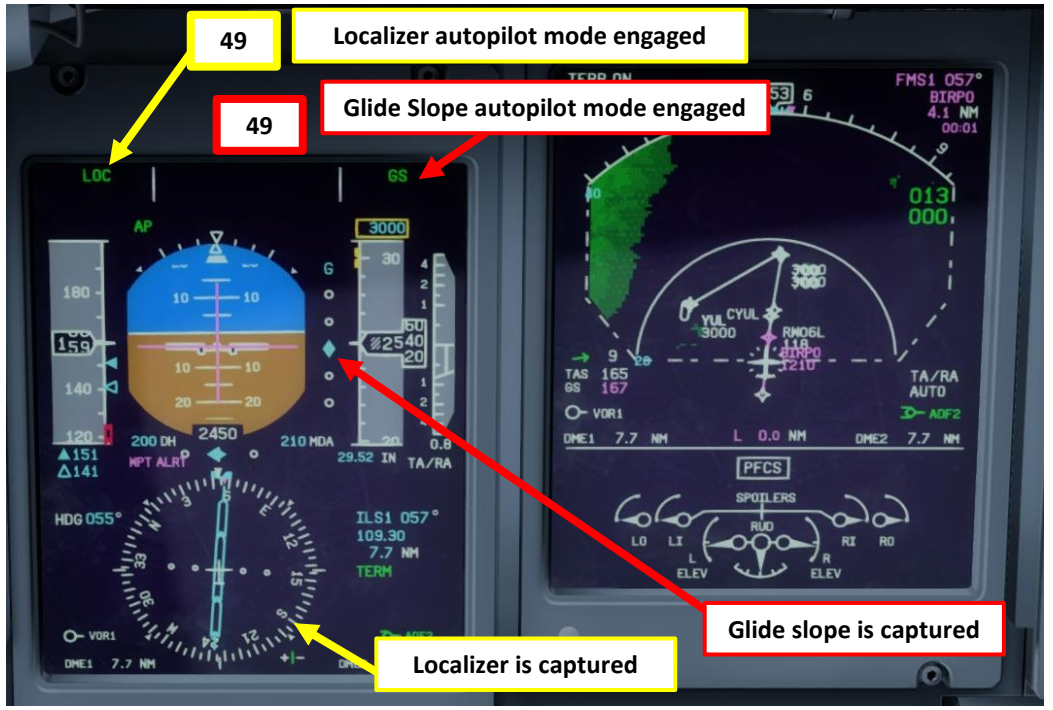
FINAL APPROACH

45. Switch NAV source to ILS1 (cyan). Press and the FORMAT button to show ILS (Instrument Landing System) localizer data on your navigation display page.
46. Once you have reached XULTA, press the APPR (Approach) autopilot mode
47. The autopilot will follow your approach in LNAV mode until you can capture the localizer and align yourself laterally with the ILS approach. Once the localizer is captured, the autopilot in APPR mode will try to capture the glide slope.

FINAL APPROACH

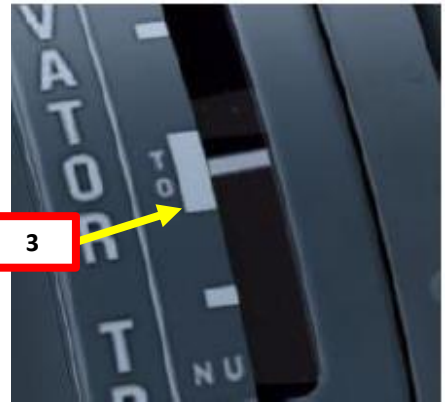
48. When LOC (localizer) is captured, the PFD will indicate in green that the “LOC” autopilot mode is active.
49. When glide slope is captured, the PFD will indicate in green that the “G/S” autopilot mode is active.
50. Once localizer (lateral guidance) and glide slope (vertical guidance) are both captured, you can now set your autopilot altitude to the Go-Around Altitude of 3000 .





LANDING

1. The APPR autopilot mode will guide you to the runway, but keep in mind that it is not an auto-land system. You will have to land manually.
2. Set BLEED FLOW switch to MIN to maximize available engine power
3. Make sure you are trimmed appropriately
4. Throttle back to around 18 % Torque to stabilize speed on final. DO NOT CHOP THE POWER.
5. Limit your pitch to 5 deg maximum. Tailstrike happens approximately at 7 deg nose-up pitch.

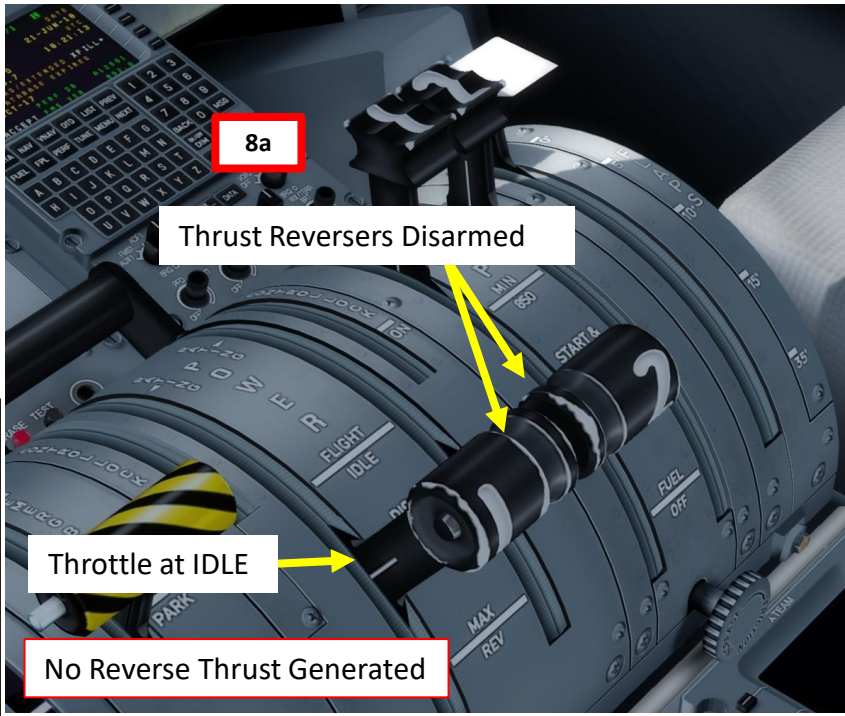


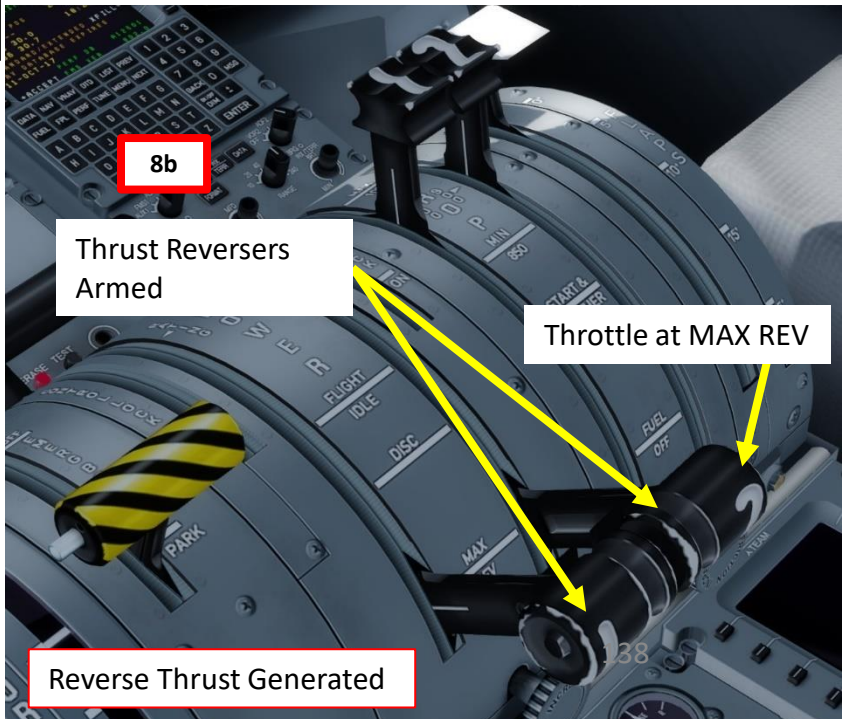
LANDING

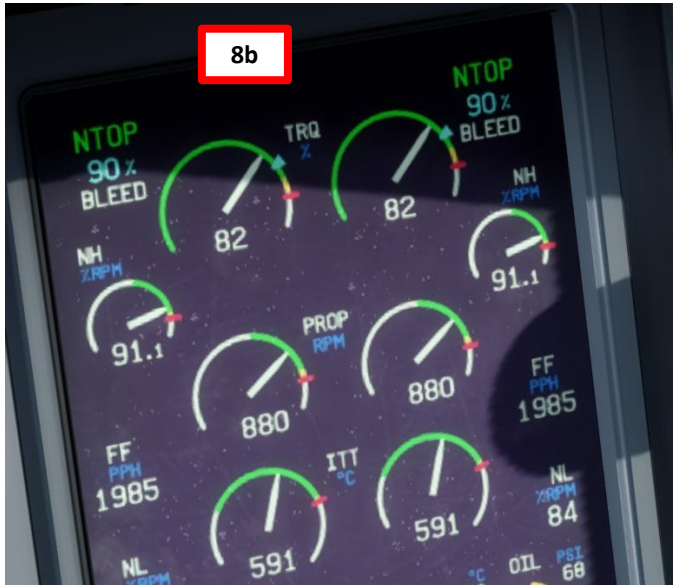
6. When 200 ft above runway, disconnect autopilot.
7. Touchdown at approx. 5 kts below VREF, which is 151 – 5 = 146 kts. This may seem hella fast, but keep in mind that we have the REFERENCE SPEED INCREASE switch ON still because of icing conditions.
8. Once all wheels are down, press and hold “F2” (“Throttle 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”.

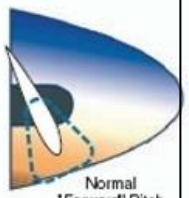
Take note that the Reverse Thrust lever can only be engaged if your throttle is at DISC (flat propeller pitch) first, then to MAX REV once the engine has stabilized to IDLE regime and all landing gear wheels are on the ground. There is a mechanical stopper that prevents you from engaging thrust reversers directly from high throttle settings.



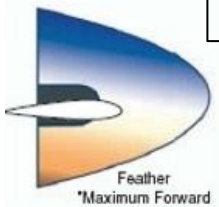




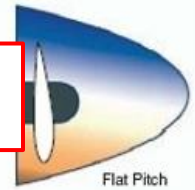
Throttle: Flight Idle
Condition Lever: MIN 850
Forward/Normal Prop Pitch



Throttle: Flight Idle
Condition Lever: START/FEATHER
Feathered Prop Pitch



Throttle: DISC
Condition Lever: MIN 850
Flat Prop Pitch (Disc shape)



Throttle: MAX REV
Condition Lever: MIN 850
Reverse Prop Pitch

ATR72 Propeller Pitch in Reverse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