X-PLANE 11 GUIDE
FLYJSIM
737-200

BY CHUCK

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TABLE OF CONTENTS

PLATFORM: X-PLANE 11

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

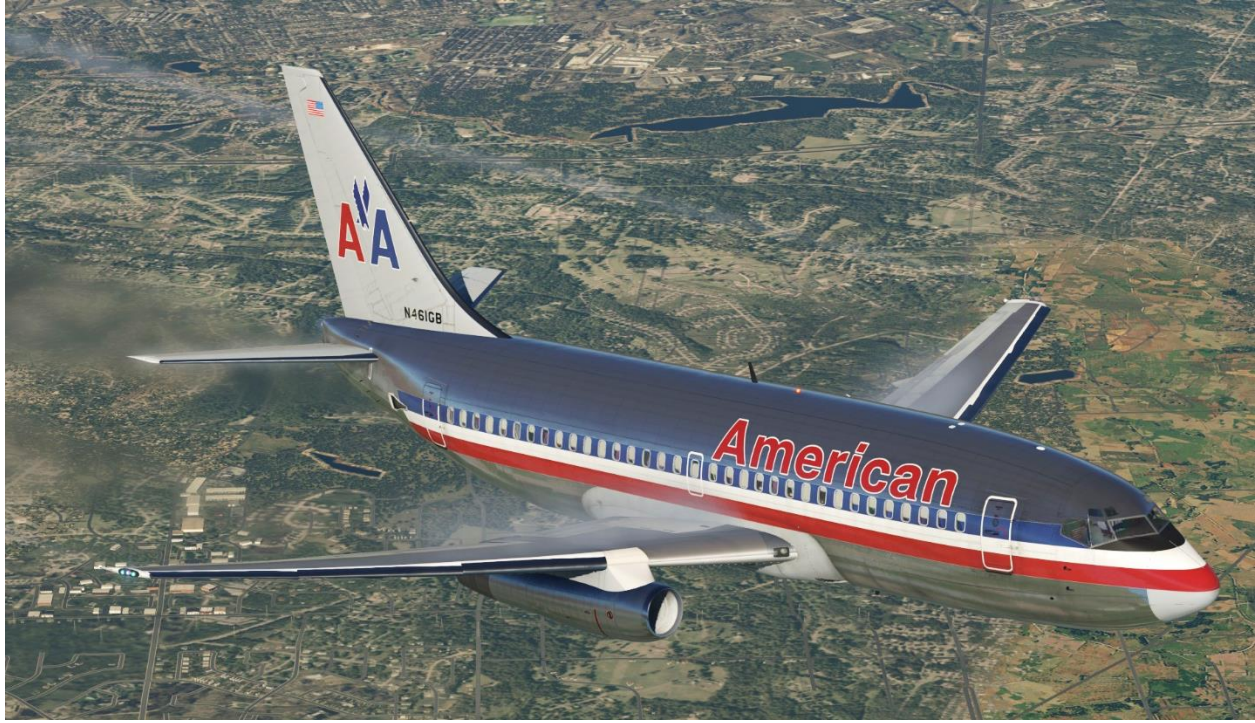
The **Boeing 737** is a short- to medium-range twinjet narrow-body airliner developed and manufactured by Boeing Commercial Airplanes in the United States. Originally developed as a shorter, lower-cost twin-engine airliner derived from the 707 and 727, the 737 has developed into a family of ten passenger models with capacities from 85 to 215 passengers. The 737 was originally envisioned in 1964. The initial 737-100 made its first flight in April 1967, and entered airline service in February 1968 at Lufthansa. Next, the lengthened 737-200 entered service in April 1968. The 737 is Boeing's only narrow-body airliner in production, with the 737 Next Generation (-700, -800, and -900ER) and the re-engined and redesigned 737 MAX variants currently being built.

The original engine nacelles incorporated thrust reversers taken from the 727 outboard nacelles. They proved to be relatively ineffective and tended to lift the aircraft up off the runway when deployed. This reduced the downforce on the main wheels thereby reducing the effectiveness of the wheel brakes. In 1968, an improvement to the thrust reversal system was introduced. A 48-inch tailpipe extension was added and new, target-style, thrust reversers were incorporated. The thrust reverser doors were set 35 degrees away from the vertical to allow the exhaust to be deflected inboard and over the wings and outboard and under the wings. The improvement became standard on all aircraft after March 1969, and a retrofit was provided for active aircraft. Boeing fixed the drag issue by introducing new longer nacelle/wing fairings, and improved the airflow over the flaps and slats.

The production line also introduced an improvement to the flap system, allowing increased use during takeoff and landing. All these changes gave the aircraft a boost to payload and range, and improved short-field performance. In May 1971, after aircraft #135, all improvements, including more powerful engines and a greater fuel capacity, were incorporated into the 737-200, giving it a 15% increase in payload and range over the original -200s. This became known as the 737-200 Advanced, which became the production standard in June 1971.

In 1970, Boeing received only 37 orders. Facing financial difficulties, Boeing considered closing the 737 production-line and selling the design to Japanese aviation companies. After the cancellation of the Boeing Supersonic Transport, and scaling back of 747 production, enough funds were freed up to continue the project. In a bid to increase sales by offering a variety of options, Boeing offered a 737C (Convertible) model in both -100 and -200 lengths. This model featured a 134 in × 87 in (340 cm × 221 cm) freight door just behind the cockpit, and a strengthened floor with rollers, which allowed for palletized cargo.

A 737QC (Quick Change) version with palletized seating allowed for faster configuration changes between cargo and passenger flights. With the improved short-field capabilities of the 737, Boeing offered the option on the -200 of the gravel kit, which enables this aircraft to operate on remote, unpaved runways. Until retiring its -200 fleet in 2007, Alaska Airlines used this option for some of its combi aircraft rural operations in Alaska. Northern Canadian operators Air Inuit, Air North, Canadian North, First Air and Nolinor Aviation still operate the gravel kit aircraft in Northern Canada, where gravel runways are common.



This plane feels old. Hell, even the CIVA (Delco Carousel IV-A) that can be equipped in the cockpit feels like something that no one knows how to use anymore. Researching information on that plane felt like a history lesson just as much as a lesson on where this myth about the “golden age of aviation” comes from. The 737-200 modelled by FlyJSim is a real gem of intricacies. The old JT8D-15A engines can frequently enter compressor stalls (various popping sounds followed by loss of power) if the pilot slams the throttle too aggressively. Exceeding engine safety limits also causes engines fires, which means that following the procedures of this temperamental jet is not an option.

However, “old” does not necessarily mean “boring”. If you ever step into a 737 NG or 737 MAX’s cockpit, you will notice that there is a lot of commonality between the early 737 cockpit layout and its modern derivatives, especially on the overhead panel. You will never get bored, trust me. There is definitely a lot to do in there during the whole flight. The lack of autothrottle makes the use and monitoring of the autopilot a full-time job by itself. Landing this bird is relatively easy if you control your speed properly with the throttle, but practicing your flare is essential if you don’t want to end up with a burst tyre. The experience is even more interesting since the JT8 engine’s slow response time forces you to fly “ahead of the aircraft” and leaves little room for error. This is a pilot’s aircraft; flying it manually is quite enjoyable and mastering it in difficult weather conditions feels really rewarding. The Sperry SP-77 autopilot is old school and clunky; it gives you limited functionalities, but I think it’s part of the charm of flying one of these early jets.

Overall, this simulation by FlyJSim is a real trip back through time and is well worth the time spent learning its aging systems and rustic interfaces.

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 CIVA (Delco Carousel IV-A INS system)
- Start–up the aircraft and make it ready for flight
- Taxi
- Takeoff
- Climb and cruise
- Explore autopilot capabilities
- Descend, approach and land

BEST RESOURCES

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

FlyJSim's 737-200 (732) Manual

CIVA Tutorial by TheAlmightySnark (Mudspike)
http://www.mudspike.com/civa-ins-navigation-tutorial/

Virtual Airlines' 737-200 / -300 / -400 Procedures by Matt Zagoren
http://edusapco-va.weebly.com/uploads/8/9/7/6/8976510/737procedures.pdf

The Boeing 737 Technical Site – Pilot Notes
http://www.b737.org.uk/pilotnotes.htm#Originals

Boeing 737 Sperry SP-77 Autopilot Operation
https://forums.x-plane.org/index.php?/forums/topic/151161-737-sp77-autopilot-info/

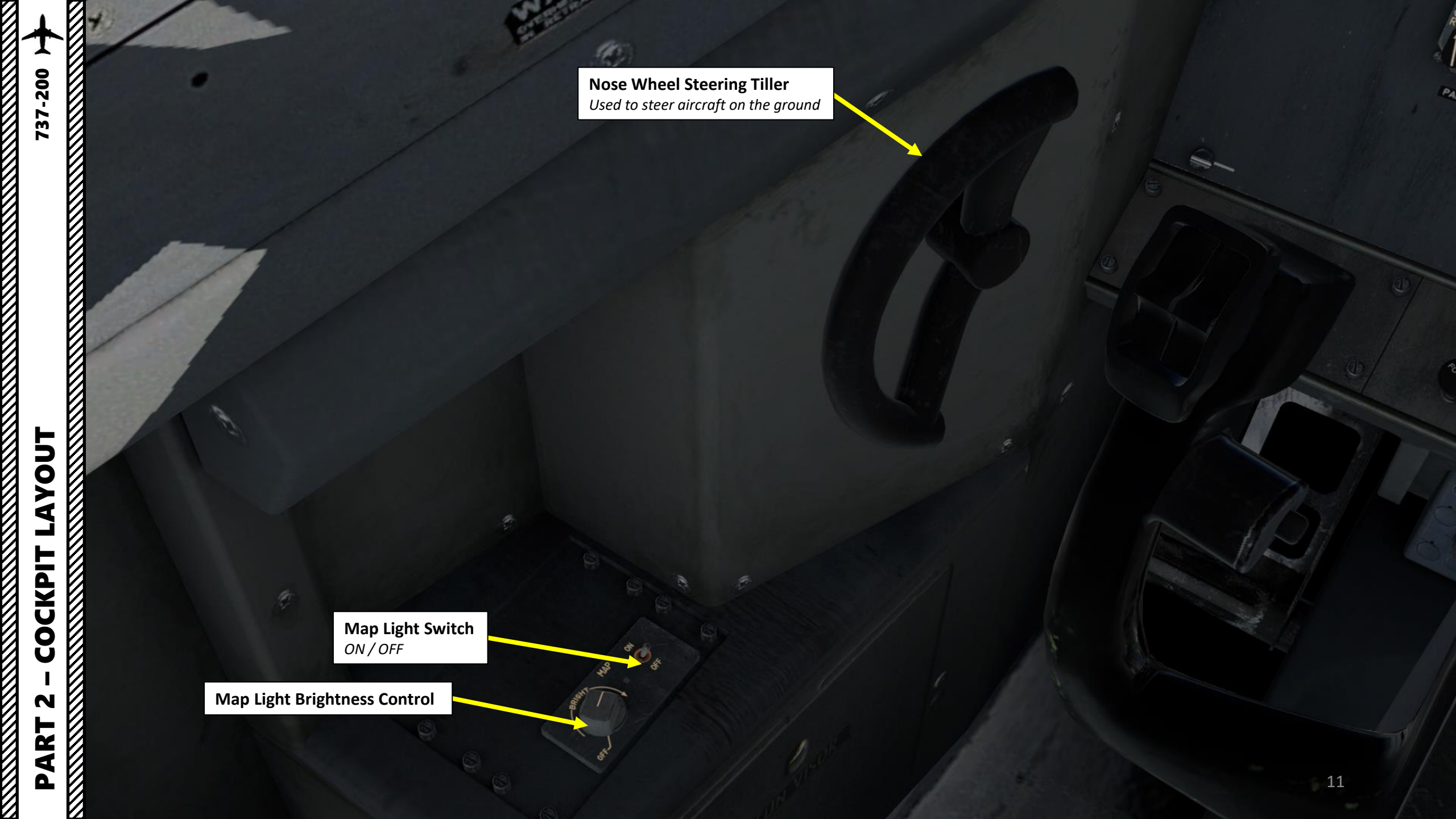
FlyJSim 732 Twinjet V3 Pro Tutorial by Simulation Channel Deluxe (Youtube)
https://youtu.be/883IxKYEMHA

FlyJSim Boeing 737-200 Flight by 737NG Captain - Flightdeck2sim (Youtube)
https://youtu.be/a1OfzZ5ncCw

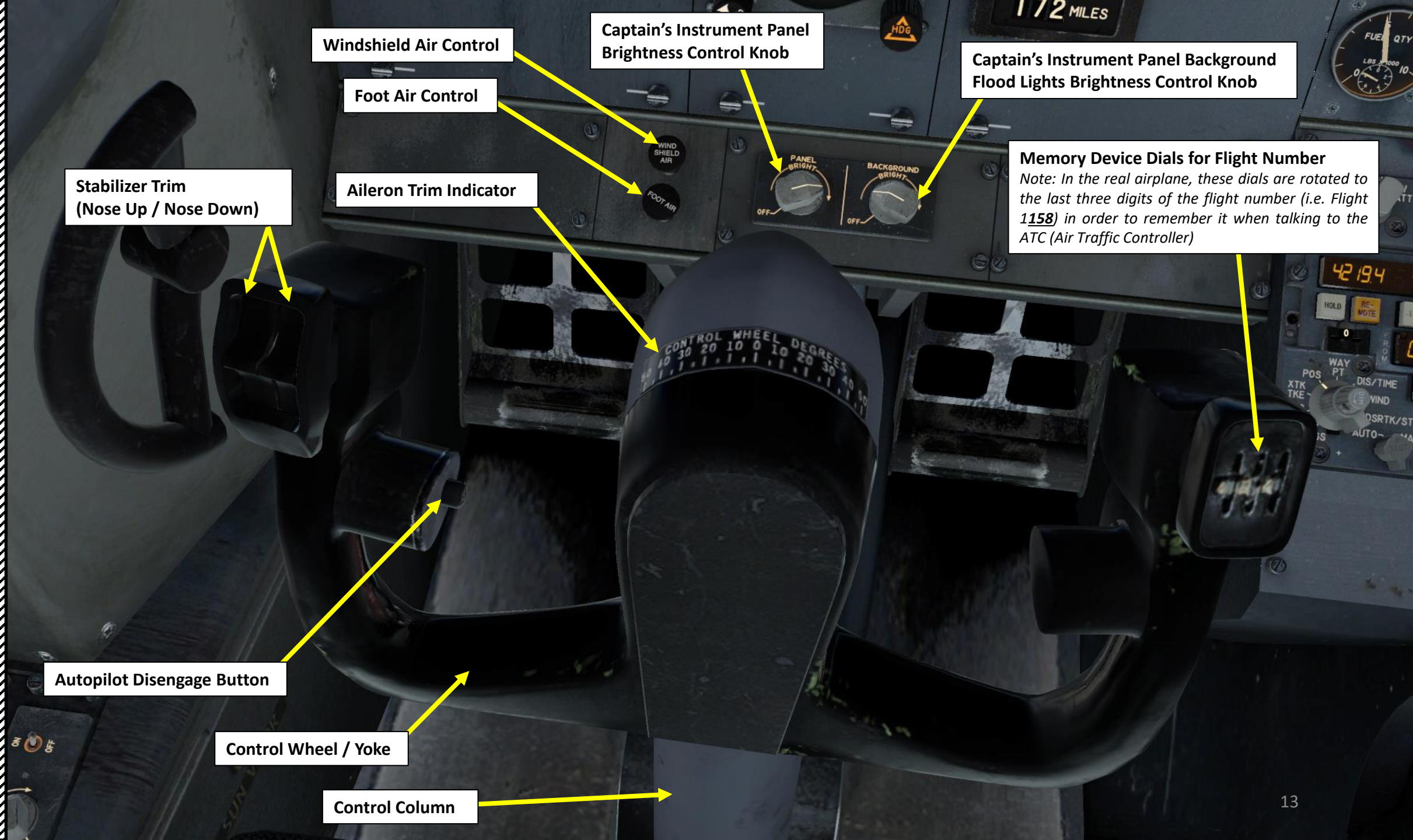
FlyJSim 737-200 VOR Navigation Tutorial Flight by Q8Pilot (Youtube)
https://youtu.be/ZhIs2xBP0BI


Circuit Breakers
A
STABILIZER TRIM
AC BUS NO.1 ELECTRONICS
DC BUS
NO.1 NAVIGATION
VHF NAV-1 VOR/ILS
MARKER BEACON
GND PROX WARN
B
ATC-1
ADF-1 AC
ADF-1 DC
RADIO ALTM-1
DME-1
DME-2
C
AUTO FLIGHT CONTROL
AFDS MCP DC
AUTO THROTTLE AC
AUTO THROTTLE DC
YAW DAMPER AC
YAW DAMPER DC
D
AUTO FLIGHT CONTROL SYS A
SNSR EXC AC
FCC DC
ENGAGE INTLK A
WARN LIGHT (BAT)
MACH TRIM AC
MACH TRIM DC
E
1 2 3 4 5 6 7
P18-1
NO.1 INSTRUMENTS
INSTR XFMR-1
INSTR XFR
CAPT RDDMI
NO.1 AIR DATA
AUTO XFMR
TAT IND
COMPUTER-1 AC
COMPUTER-1 28V AC
A
CAPT RDDMI (ALTN)
VERT SPEED IND
MACH WARN SYS-1
ALTM 28V AC
STBY ALT ASI VIBR
MACH ASI 28V AC
B
FLIGHT RECORDER

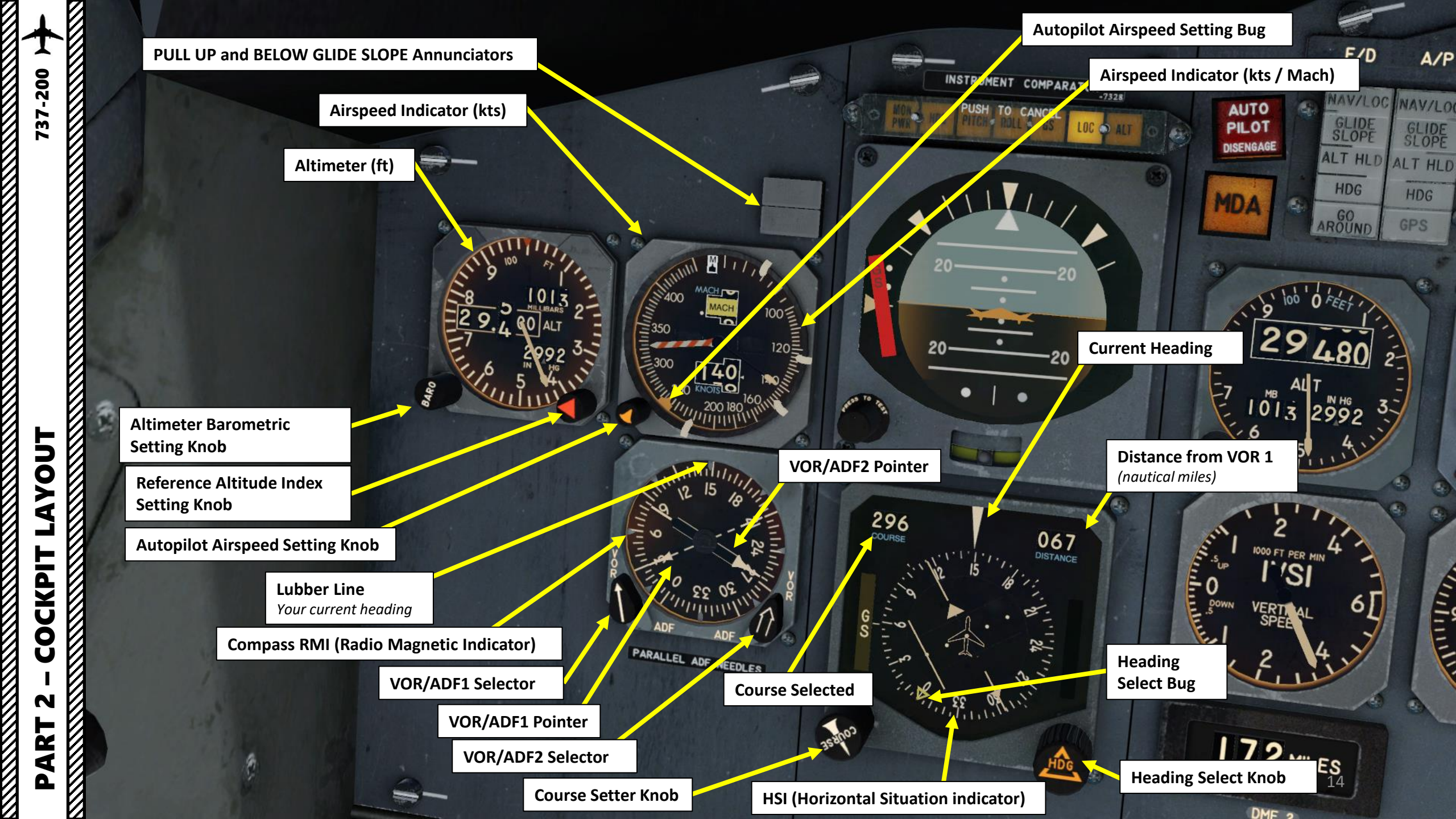

Circuit Breakers


Nose Wheel Steering Tiller
Used to steer aircraft on the ground
Map Light Switch
ON / OFF
Map Light Brightness Control
MAP
ON
OFF
BRIGHT
OFF

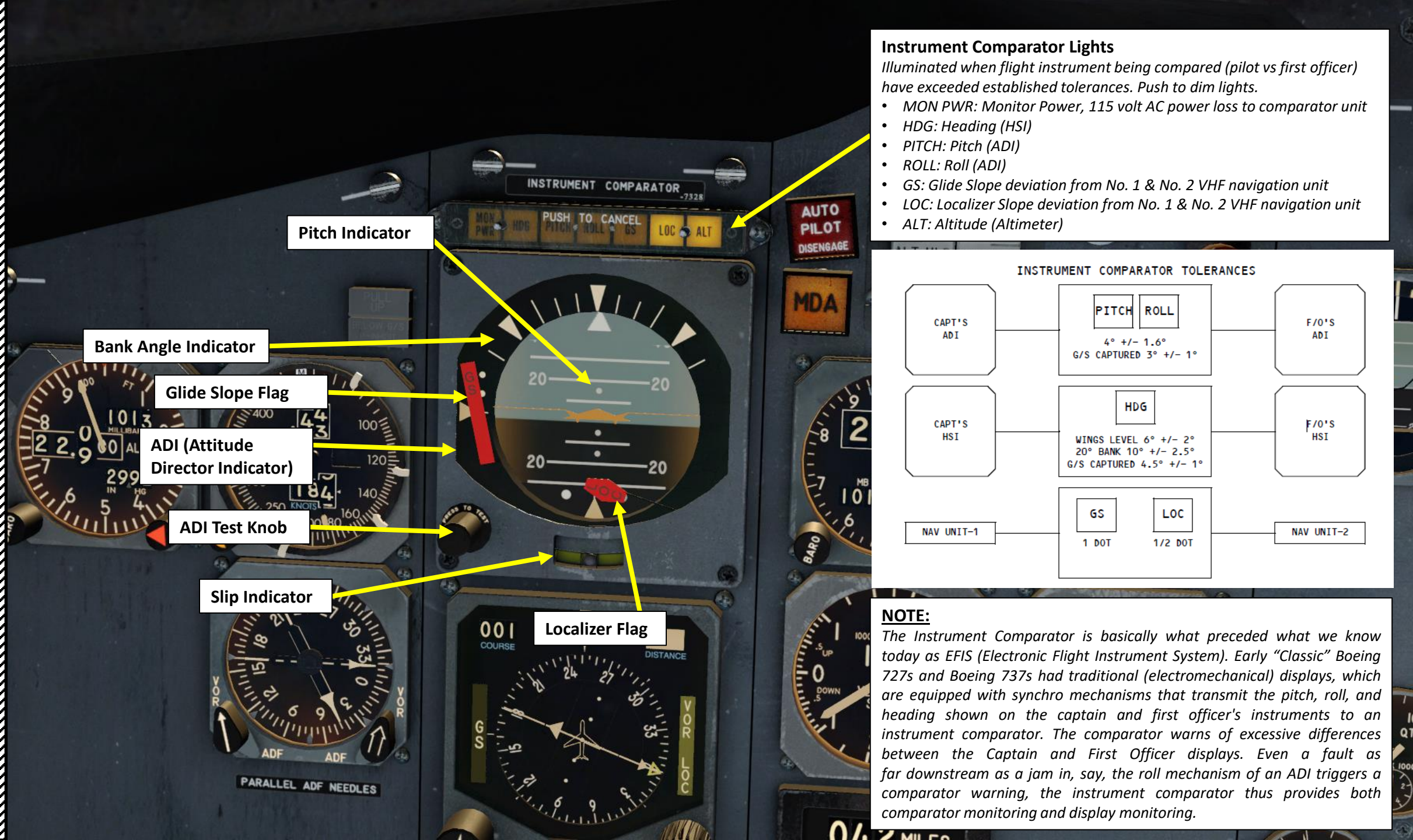

Cockpit Utility Light
Can be rotated


Windshield Air Control
Captain's Instrument Panel Brightness Control Knob
Captain's Instrument Panel Background Flood Lights Brightness Control Knob
Foot Air Control
Stabilizer Trim (Nose Up / Nose Down)
Aileron Trim Indicator
Memory Device Dials for Flight Number
Note: In the real airplane, these dials are rotated to the last three digits of the flight number (i.e. Flight 1158) in order to remember it when talking to the ATC (Air Traffic Controller)
Autopilot Disengage Button
Control Wheel / Yoke
Control Column

PART 2 – COCKPIT LAYOUT



PART 2 – COCKPIT LAYOUT



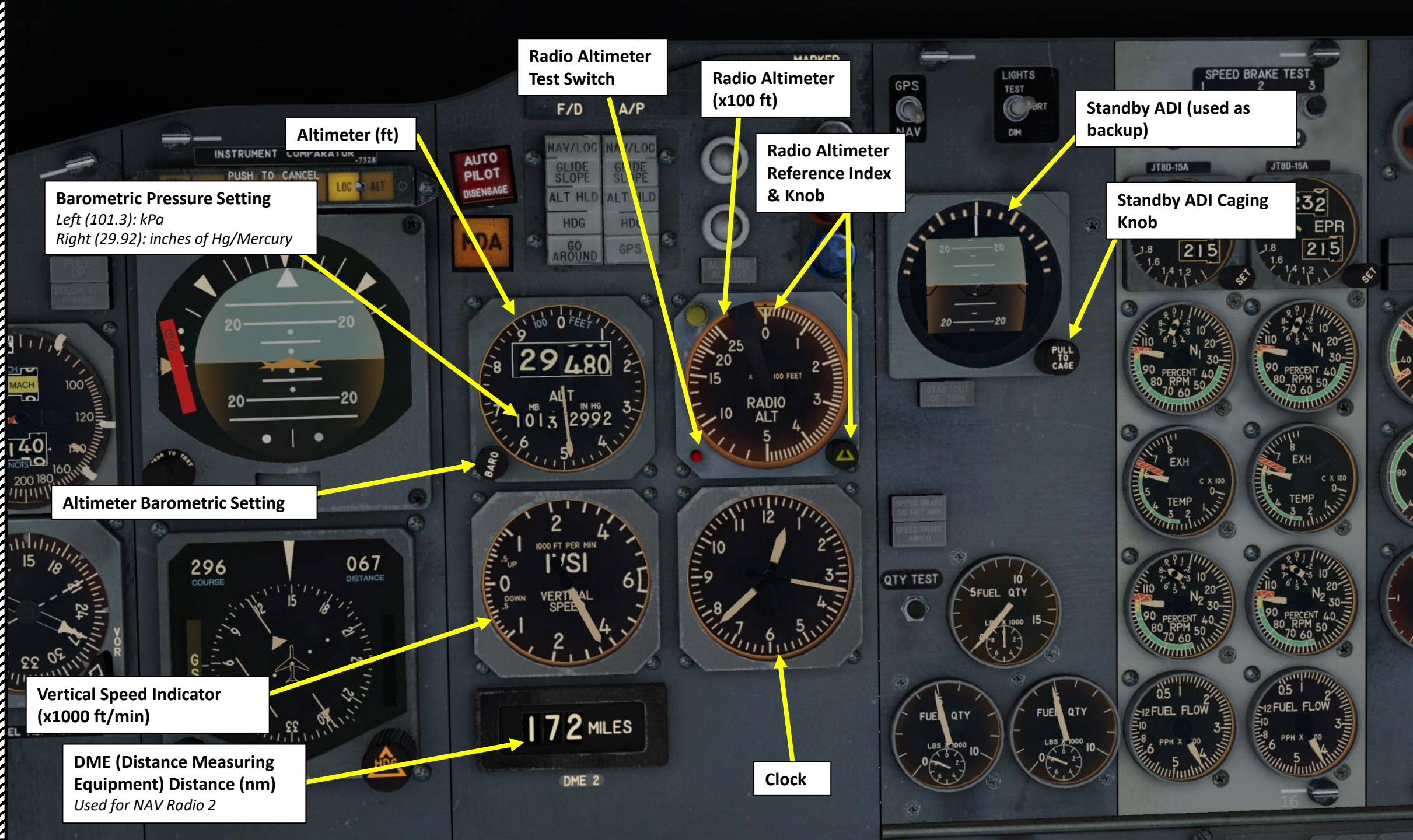
Instrument Comparator Lights

Illuminated when flight instrument being compared (pilot vs first officer) have exceeded established tolerances. Push to dim lights.

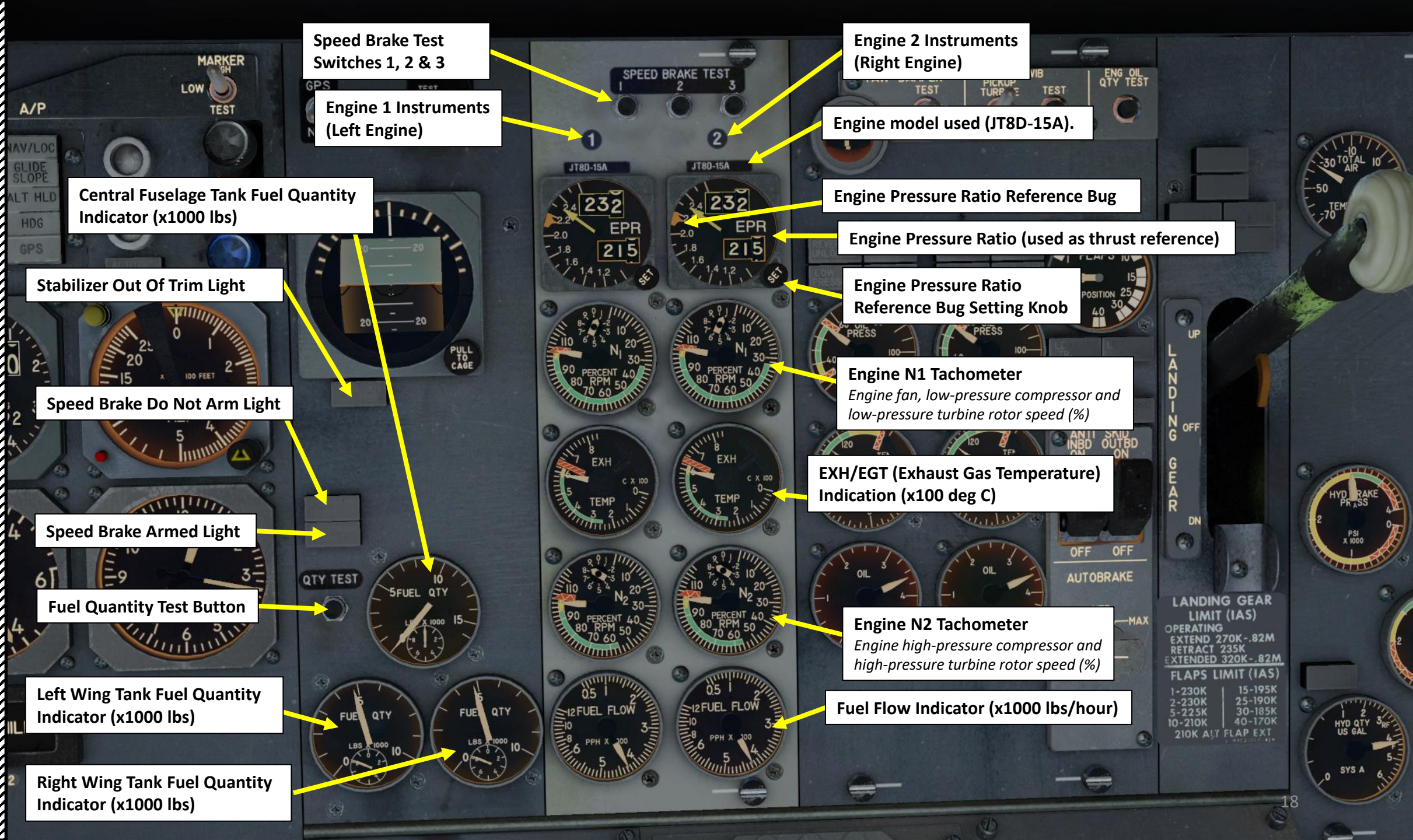
- *MON PWR: Monitor Power, 115 volt AC power loss to comparator unit*
- *HDG: Heading (HSI)*
- *PITCH: Pitch (ADI)*
- *ROLL: Roll (ADI)*
- *GS: Glide Slope deviation from No. 1 & No. 2 VHF navigation unit*
- *LOC: Localizer Slope deviation from No. 1 & No. 2 VHF navigation unit*
- *ALT: Altitude (Altimeter)*

NOTE:

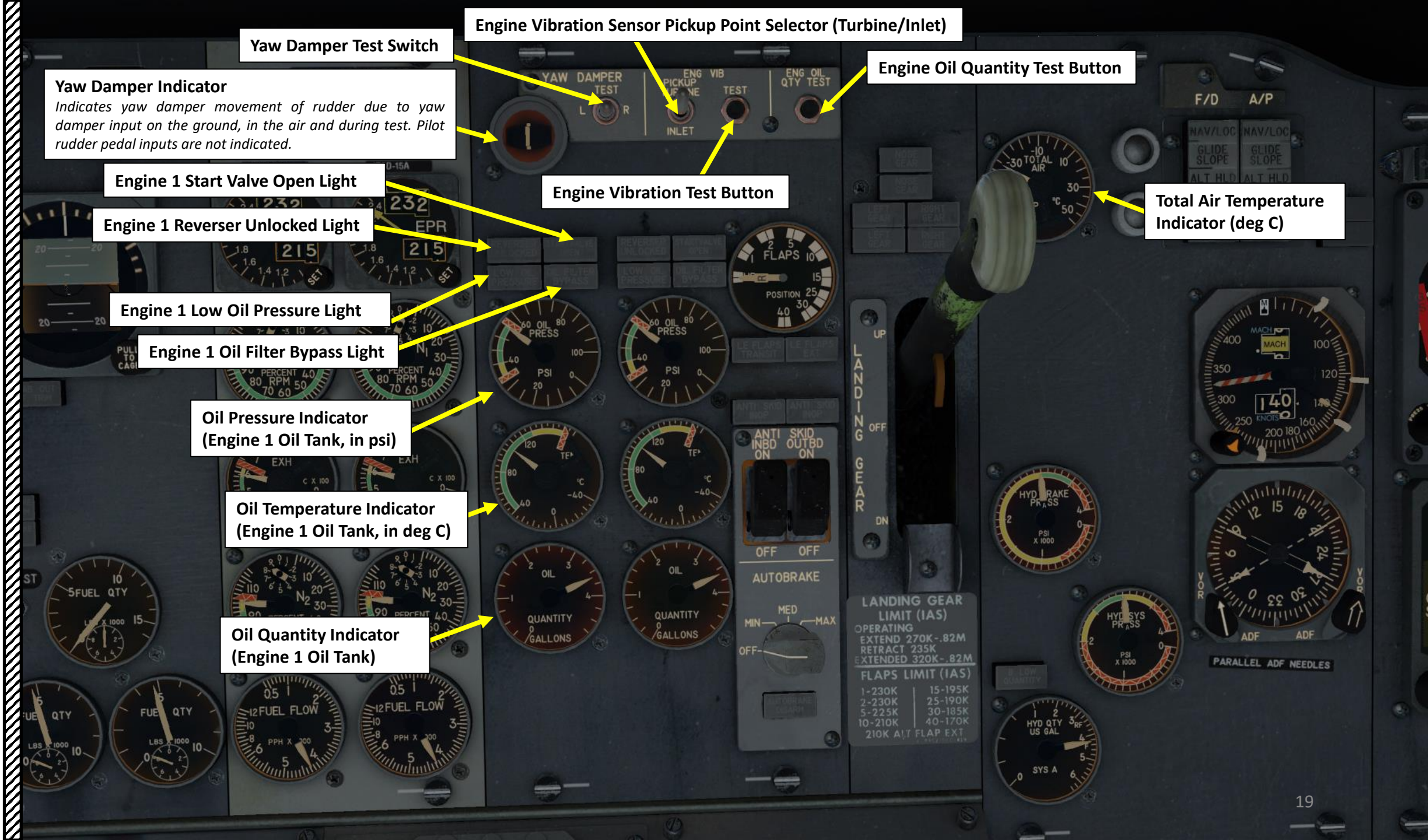
The Instrument Comparator is basically what preceded what we know today as EFIS (Electronic Flight Instrument System). Early "Classic" Boeing 727s and Boeing 737s had traditional (electromechanical) displays, which are equipped with synchro mechanisms that transmit the pitch, roll, and heading shown on the captain and first officer's instruments to an instrument comparator. The comparator warns of excessive differences between the Captain and First Officer displays. Even a fault as far downstream as a jam in, say, the roll mechanism of an ADI triggers a comparator warning, the instrument comparator thus provides both comparator monitoring and display monitoring.

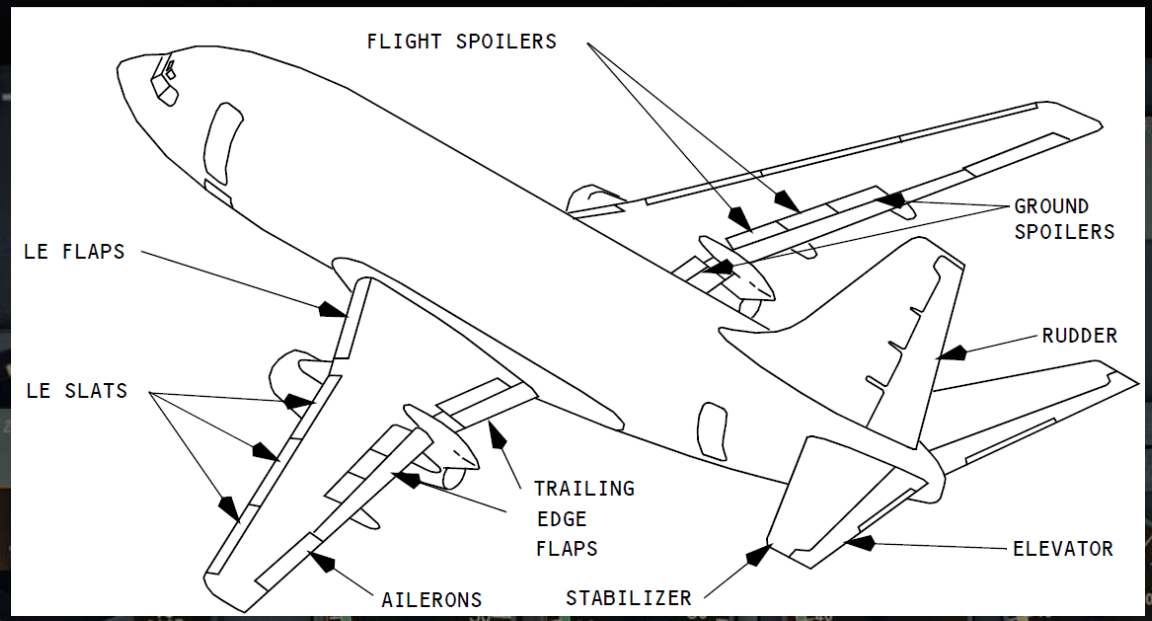

Radio Altimeter Test Switch
Radio Altimeter (x100 ft)
Altimeter (ft)
Radio Altimeter Reference Index & Knob
Standby ADI (used as backup)
Barometric Pressure Setting
Left (101.3): kPa
Right (29.92): inches of Hg/Mercury
Standby ADI Caging Knob
Altimeter Barometric Setting
Vertical Speed Indicator (x1000 ft/min)
DME (Distance Measuring Equipment) Distance (nm)
Used for NAV Radio 2
Clock
29480
ALT
1013
2992
RADIO ALT
296
COURSE
067
DISTANCE
172 MILES
DME 2
F/D
A/P
AUTO PILOT DISENGAGE
PULL TO CAGE
QTY TEST

PART 2 – COCKPIT LAYOUT


Speed Brake Test Switches 1, 2 & 3
Engine 1 Instruments (Left Engine)
Engine 2 Instruments (Right Engine)
Engine model used (JT8D-15A).
Central Fuselage Tank Fuel Quantity Indicator (x1000 lbs)
Engine Pressure Ratio Reference Bug
Engine Pressure Ratio (used as thrust reference)
Stabilizer Out Of Trim Light
Engine Pressure Ratio Reference Bug Setting Knob
Engine N1 Tachometer
Engine fan, low-pressure compressor and low-pressure turbine rotor speed (%)
Speed Brake Do Not Arm Light
EXH/EGT (Exhaust Gas Temperature) Indication (x100 deg C)
Speed Brake Armed Light
Fuel Quantity Test Button
Engine N2 Tachometer
Engine high-pressure compressor and high-pressure turbine rotor speed (%)
Left Wing Tank Fuel Quantity Indicator (x1000 lbs)
Fuel Flow Indicator (x1000 lbs/hour)
Right Wing Tank Fuel Quantity Indicator (x1000 lbs)
SPEED BRAKE TEST
JT8D-15A
EPR
232
215
N1
N2
EXH
TEMP
FUEL QTY
FUEL FLOW
QTY TEST
AUTOBRAKE
LANDING GEAR
LANDING GEAR LIMIT (IAS)
FLAPS LIMIT (IAS)

PART 2 – COCKPIT LAYOUT





Left/Right Trailing Edge Flaps Position Indicator (deg)

Landing Gear Annunciator
Green: Down and Locked
Red: In transition or Unsafe

Landing Gear Lever
UP / OFF / DOWN

Leading Edge Flaps Extended Light

Outboard Wheels Anti-Skid System Inoperative Light

Leading Edge Flaps In Transition Light

Inboard Wheels Anti-Skid System Inoperative Light

Inboard Wheels Anti-Skid System Control Switch

Outboard Wheels Anti-Skid System Control Switch

Landing Gear Limits (Indicated Airspeed)
EXTEND: 270 kts, Mach 0.82
RETRACT: 235 kts
EXTENDED: 320 kts, Mach 0.82

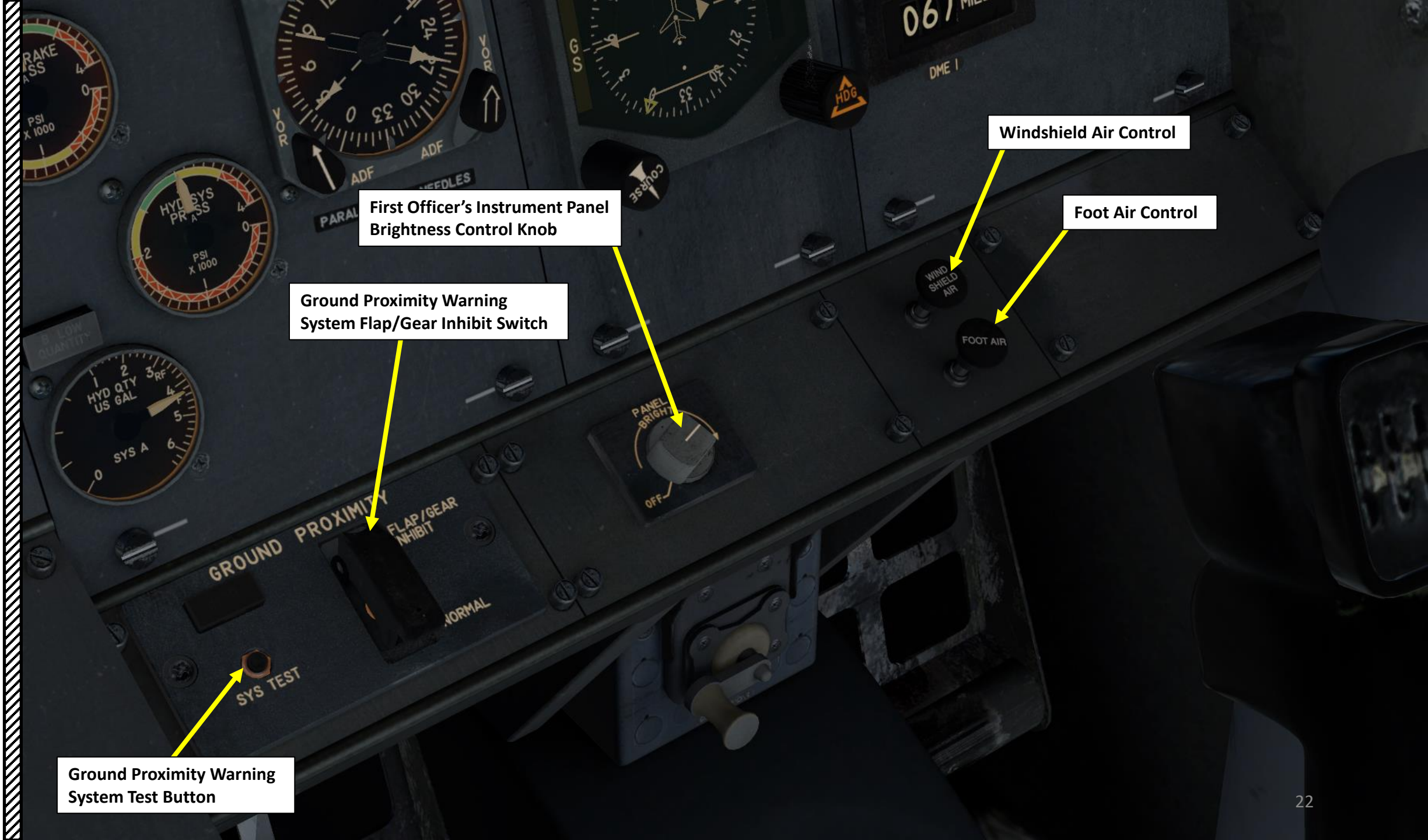
Auto-Brake Selector Switch
OFF: Disarmed
MIN: Minimum Braking
MED: Medium Braking
MAX: Maximum Braking

Flaps Limits (Indicated Airspeed)
1 deg – 230 kts
2 deg – 230 kts
5 deg – 225 kts
10 deg – 210 kts
15 deg – 195 kts
25 deg – 190 kts
30 deg – 185 kts
40 deg – 170 kts

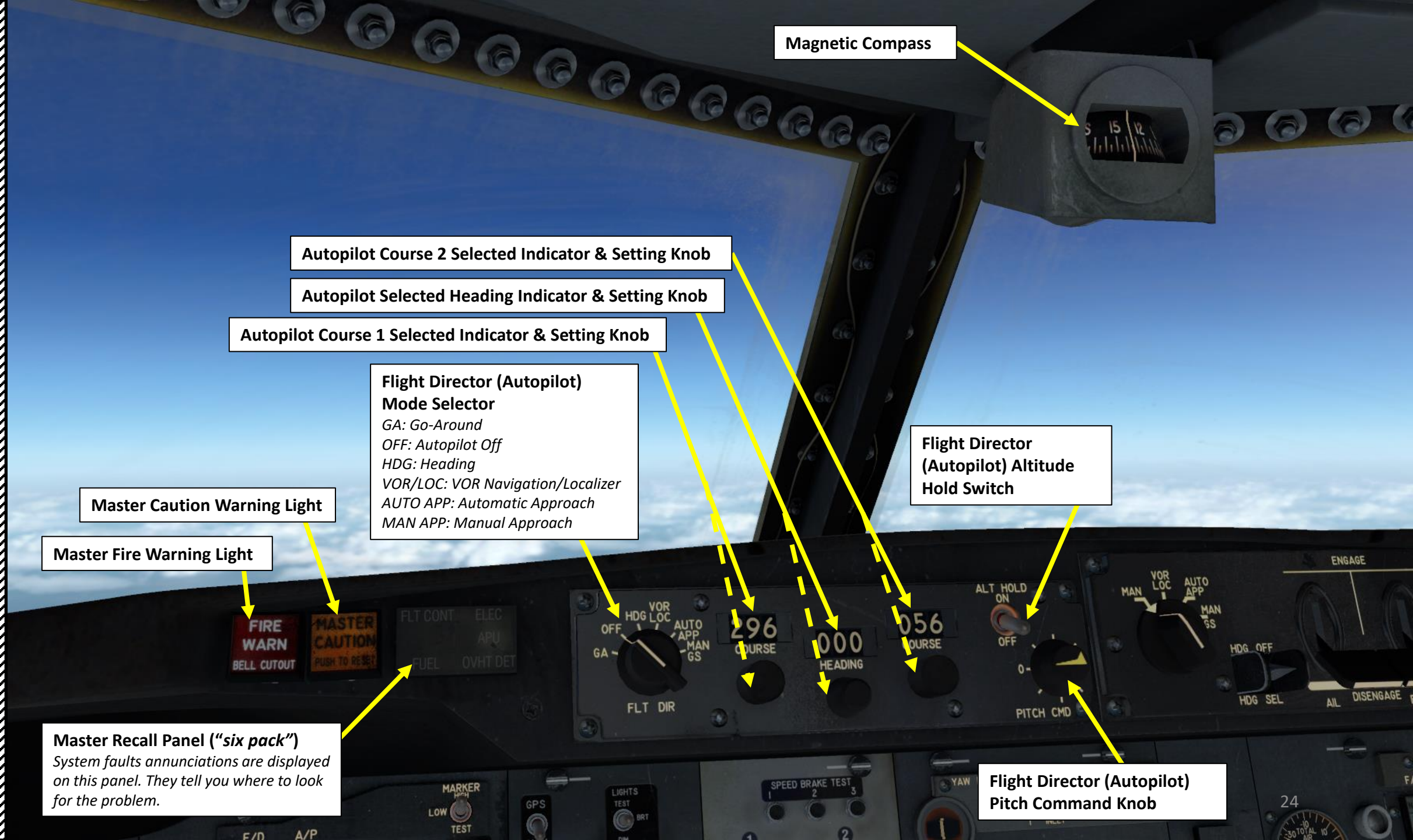
NOTE: Alternate Flaps Extension Speed: 210 kts

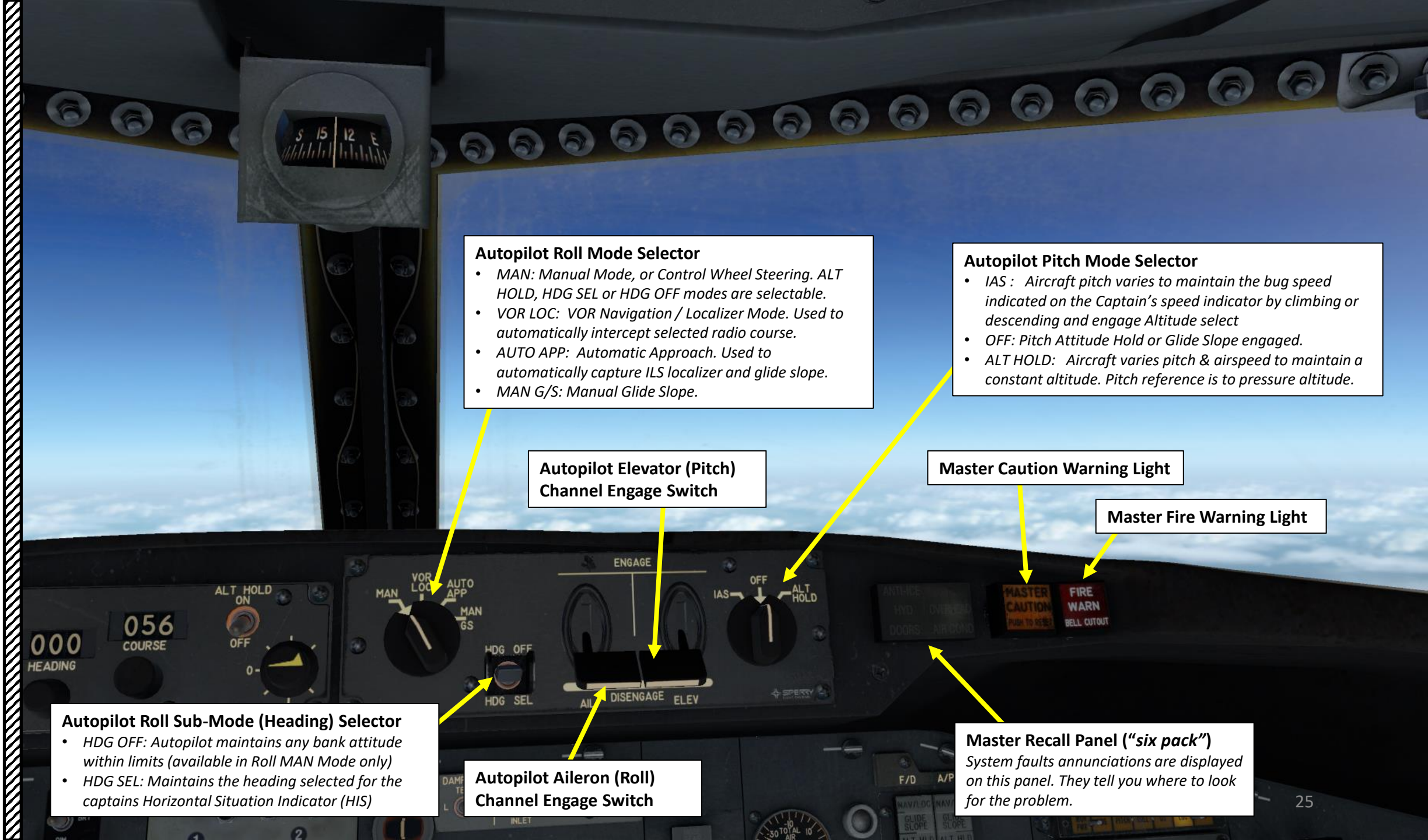
Autobrake System Disarm Light
Illuminates when a malfunction exists in the automatic braking system

PART 2 – COCKPIT LAYOUT


Windshield Air Control
Foot Air Control
First Officer's Instrument Panel Brightness Control Knob
Ground Proximity Warning System Flap/Gear Inhibit Switch
Ground Proximity Warning System Test Button
WIND SHIELD AIR
FOOT AIR
PANEL BRIGHT
OFF
GROUND PROXIMITY
FLAP/GEAR INHIBIT
NORMAL
SYS TEST
HYD QTY US GAL
SYS A
HYD SYS PRESS
PSI X 1000
ADF
VOR
HDG
COURSE
DME I

PART 2 – COCKPIT LAYOUT


Magnetic Compass
Autopilot Course 2 Selected Indicator & Setting Knob
Autopilot Selected Heading Indicator & Setting Knob
Autopilot Course 1 Selected Indicator & Setting Knob
Flight Director (Autopilot) Mode Selector
GA: Go-Around
OFF: Autopilot Off
HDG: Heading
VOR/LOC: VOR Navigation/Localizer
AUTO APP: Automatic Approach
MAN APP: Manual Approach
Flight Director (Autopilot) Altitude Hold Switch
Master Caution Warning Light
Master Fire Warning Light
Master Recall Panel ("six pack")
System faults annunciations are displayed on this panel. They tell you where to look for the problem.
Flight Director (Autopilot) Pitch Command Knob
FIRE WARN
BELL CUTOUT
MASTER CAUTION
PUSH TO RESET
FLT CONT
ELEC
APU
FUEL
OVHT DET
HDG
VOR LOC
OFF
AUTO APP
MAN GS
GA
FLT DIR
296
COURSE
000
HEADING
056
COURSE
ALT HOLD
ON
OFF
PITCH CMD
MAN
VOR LOC
AUTO APP
MAN GS
ENGAGE
HDG OFF
HDG SEL
AIL
DISENGAGE
MARKER
LOW
TEST
GPS
LIGHTS
TEST
BRT
SPEED BRAKE TEST
YAW



Autopilot Roll Mode Selector

- *MAN: Manual Mode, or Control Wheel Steering. ALT HOLD, HDG SEL or HDG OFF modes are selectable.*
- *VOR LOC: VOR Navigation / Localizer Mode. Used to automatically intercept selected radio course.*
- *AUTO APP: Automatic Approach. Used to automatically capture ILS localizer and glide slope.*
- *MAN G/S: Manual Glide Slope.*

Autopilot Pitch Mode Selector

- *IAS : Aircraft pitch varies to maintain the bug speed indicated on the Captain's speed indicator by climbing or descending and engage Altitude select*
- *OFF: Pitch Attitude Hold or Glide Slope engaged.*
- *ALT HOLD: Aircraft varies pitch & airspeed to maintain a constant altitude. Pitch reference is to pressure altitude.*

Autopilot Elevator (Pitch) Channel Engage Switch

Master Caution Warning Light

Master Fire Warning Light

Autopilot Roll Sub-Mode (Heading) Selector

- *HDG OFF: Autopilot maintains any bank attitude within limits (available in Roll MAN Mode only)*
- *HDG SEL: Maintains the heading selected for the captains Horizontal Situation Indicator (HIS)*

Autopilot Aileron (Roll) Channel Engage Switch

Master Recall Panel ("*six pack*")

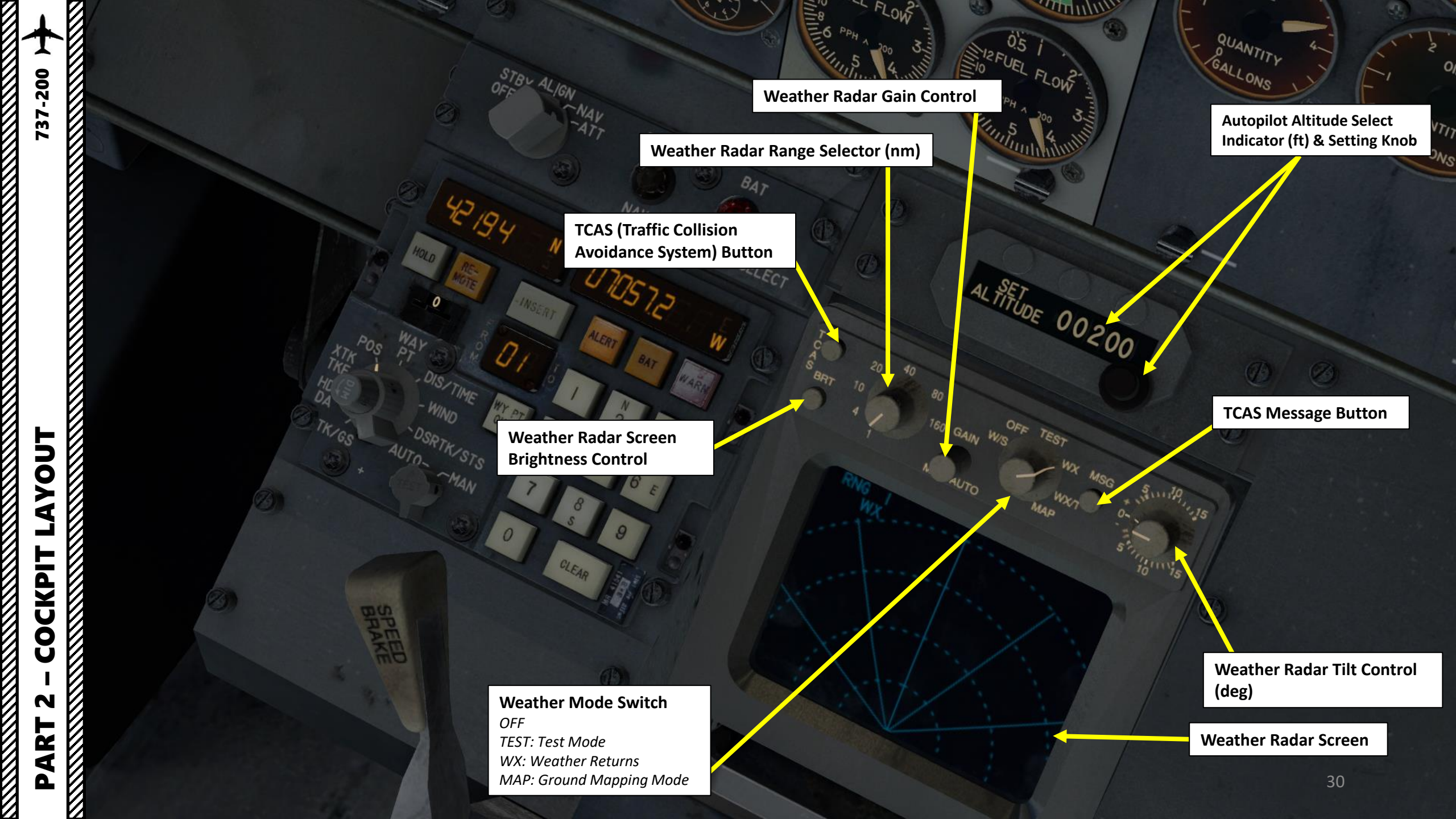
System faults annunciations are displayed on this panel. They tell you where to look for the problem.

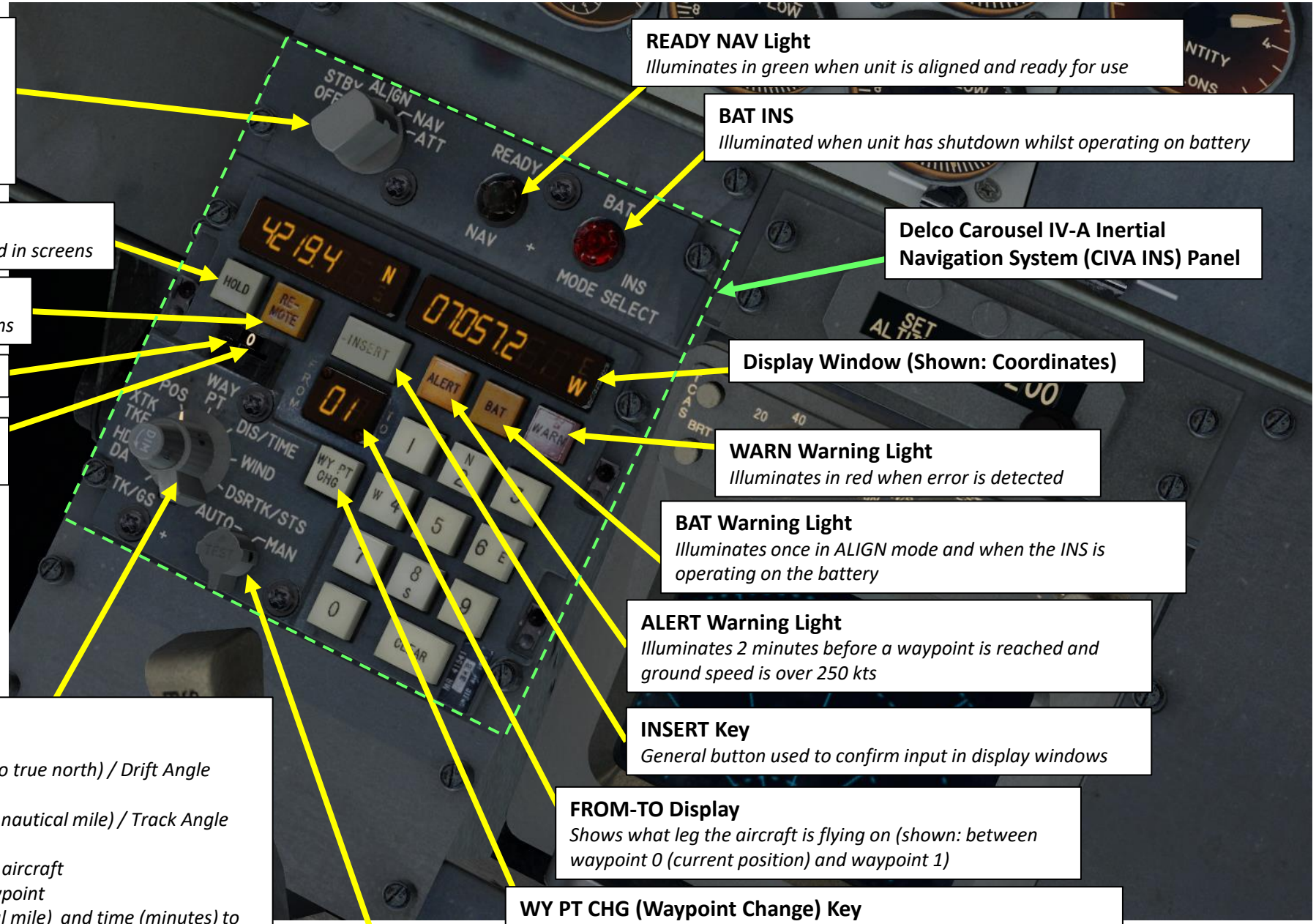

NO.2 INSTRUMENTS
SNSR EXC AC
CMPTR DC
VERT GYRO-2
COMPARATOR AC
DC
INSTR XFMR-2
NO.2 NAVIGATION
VHF VOR/LOC
NAV 2 G/S
EXP/LOC
NO.2 AIR DATA
ALTM-2 AC
AUTO XFMR
COMPUTER-2 28 VAC
AC
ADF-2
AC
DC
NO.2 COMMUNICATIONS
VHF-2
ALTM VIB
A/S IND
STBY ALT VIB
HRZN
AUX VERT GYRO
RATE OF TURN
AC
DC
RADIO ALTM-2
DME-2
PASS ADDRESS
TAPE SYSTEM
AC
DC
SELCAL-2
FLT DIR-2
AC
DC
WEATHER RADAR
ATC-2
ATC ANT
MASTER SWITCH ON
NO.2 ELECTRONICS
AC BUS 30
DC BUS UNSW
SW
NO.1 ELECTRONICS
DC BUS SW
UNSW
AC BUS 30
MASTER SWITCH ON
P6-1
ENGINES
EGT IND ENG-2
ENG-1
MASTER CAUTION
START VALVE ENG-2
ENG-1
IDLE CONT
FLIGHT CONTROLS
SHUTOFF VALVES
FLT CONT
FLT CONT
SPOILER
STBY RUD
FLAP
HYD SYSTEM
ELEC HYD PUMP SYS B
CONT SYS A
BRAKE PRESS IND
INTERPHONE
POWER
CAPT BAT
NO.2 BUS
FIRE PROTECTION
DETECTION
ENG NO 2
APU
ENG NO 1
AUTO FLT CONT SYS B MACH TRIM
DC
AC
AFDS MCP CRS.2
DC
ENG VIB MON
IGNITION
ENGINE NO.2
RIGHT
LEFT
ENGINE NO.1
RIGHT
LEFT
STABILIZER TRIM
AUTO SPEED BRAKE
ACTUATOR 30
CONT
AUTO SLAT NO.1
DC
ENG PUMP DEPRESS NO.2
VALVE NO.1
HYD SCV ENG NO.2
NO.1
F/O AUDIO
CAPT AUDIO
MASTER WARN & CONTR
OV HT WHL WELL WING BDY
AUTO FLT CONT SYS B
SNSR EXC AC
FCC DC
ENGAGE INTLK B
WARN LIGHT BAT
THRUST REVERSER IND SYS
CONT SYS
THRUST REVERSER IND SYS
CONT SYS
TRIM AIL
CONT RUD
RUD TRIM IND
FLAP POS IND LE
TE
AUTO SLAT NO.2
DC
OIL QTY IND SYS B
SYS A
INPH AND WARN
OBS AUDIO
EXTINGUISHER BOTTLES
RIGHT
APU
LEFT
TACH IND ENG 2 NO.1
NO.2
ENG 1 NO.1
NO.2
OIL QTY
OIL TEMP PRESS AC
OIL QTY
OIL TEMP PRESS AC
ALT TE FLAP DRIVE AC
FLAP LOAD RELIE
LG SYS XFR VALVE PRI CONT
SEC CONT
PRESS IND SYS B
SYS A
PTU/LG BYP V CONT 1
2
F/O BAT
NO.2 BUS
EXTINGUISHER BOTTLE RIGHT
LEFT
EXIT
INWARD
TO REMOVE
CAUTION


AUTO FLT CONT SYS B
AFD3 MCP CRS 2 DC
ENGINE NO.2 IGNITION
ENGINE NO.1 IGNITION
AUTO SPEED BRAKE
STABILIZER TRIM
ACTUATOR 30
AUTO SLAT NO.1 DC
ENG PUMP DEPRESS NO.2
HYD SCV ENG NO.1
F/O AUDIO
CAPT AUDIO
THRUST REVERSER
TRIM CONT AIL
RUD TRIM IND
FLAP POS IND
EXTINGUISHER BOTTLES
TACH IND
OIL QTY
OIL TEMP PRESS AC
ALT TE FLAP DRIVE AC
FLAP LOAD RELIEF
LG SYS XFR VALVE
PTU/LG BYP V CONT
F/O BAT
EXTINGUISHER BOTTLE
MISC
FUEL SYSTEMS
CONTROL CABIN LIGHT
AUTO BRAKE
CLOCK
PANEL
BOOST PUMP TANK 2 FWD
FUEL SHUTOFF VALVE
BOOST PUMP TANK 1 FWD
DOOR LOCK
CROSS FEED VALVE
BOOST PUMP TANK 1 AFT
LAV MIRROR EXT PWR
SHUTOFF VALVE ENG 2
BOOST PUMP CTR TANK RIGHT
SHUTOFF VALVE ENG 1
SERVICE OUTLETS 86V AC
FUEL CONT AFT FWD CTR
BOOST PUMP CTR TANK LEFT
FUEL CONT NO.1 FWD NO.2 AFT CTR
CHEM TRAILS 28V DC
FUEL QTY IND
R TANK CTR TANK L TANK FUEL PANEL
TEMP CONTROL
AUTOMATIC
MANUAL
AIR CONDITIONING
BLEED AIR VALVES
RECIRC FAN
DC BUS
VALVES
PACK
FWD OUTFLOW
TURBOFAN
PRESS IND
TEMP IND
VALVE POS IND
OVER HEAT
OUTFLOW VALVE HEATER


CHEM TRAILS 28V DC
FUEL QTY IND
R TANK
CTR TANK
L TANK
FUEL PANEL
TEMP CONTROL
35°F CONT
AUTOMATIC
MANUAL
AIR CONDITIONING
BLEED AIR VALVES
ISOLAT
RECIRC FAN
CONT
EMERG
DC BUS
VALVES
TURBOFAN
PACK
FWD OUTFLOW
PRESS IND
TEMP IND
VALVE POS IND
OVER HEAT
OUTFLOW VALVE HEATER
RAM MOD
CABIN AIR RECIRCULATION FAN
PRESSURIZATION CONTROL
AUTOMATIC
STBY
MAN
INVERTER CONT
BAT TRANS CONT
STANDBY POWER
IND LT AUTO CONT
APU CONT
BAT BUS AUTO
CONT MANUAL
FUELING & EXT PWR CONT
GEN PWR CONT
ENTRY LIGHT DIM
DC BUS POWER NO 2
NO 1
STBY
BAT
HOT BUS
DC BUS NO 1
INDICATION BUS NO 2
GALLEY PWR CONT
TR NO 3
BAT BUS
DC STBY POWER
BAT
TR
EXT PWR CONT
AC TRANSFER BUS IND
NO 2 GEN BUS

CENTRAL PEDESTAL


Weather Radar Gain Control
Weather Radar Range Selector (nm)
Autopilot Altitude Select Indicator (ft) & Setting Knob
TCAS (Traffic Collision Avoidance System) Button
TCAS Message Button
Weather Radar Screen Brightness Control
Weather Radar Tilt Control (deg)
Weather Mode Switch
OFF
TEST: Test Mode
WX: Weather Returns
MAP: Ground Mapping Mode
Weather Radar Screen
SET ALTITUDE 00200
GAIN
OFF TEST
WX MSG
WX/T
MAP
AUTO
RNG
WX



CIVA Mode Selector Knob
OFF
STBY: Standby Mode
ALIGN: INS Alignment Mode
NAV: Navigation Mode
ATT: Attitude Mode (Emergency)

READY NAV Light
Illuminates in green when unit is aligned and ready for use

BAT INS
Illuminated when unit has shutdown whilst operating on battery

HOLD Key
Freezes data displayed in screens

Delco Carousel IV-A Inertial Navigation System (CIVA INS) Panel

RE-MOTE Key
Only used for X-Plane Flight Plans

Display Window (Shown: Coordinates)

Waypoint Selector Rotary

Waypoint Selected
0 = CURRENT POSITION

WARN Warning Light
Illuminates in red when error is detected

BAT Warning Light
Illuminates once in ALIGN mode and when the INS is operating on the battery

ALERT Warning Light
Illuminates 2 minutes before a waypoint is reached and ground speed is over 250 kts

INSERT Key
General button used to confirm input in display windows

FROM-TO Display
Shows what leg the aircraft is flying on (shown: between waypoint 0 (current position) and waypoint 1)

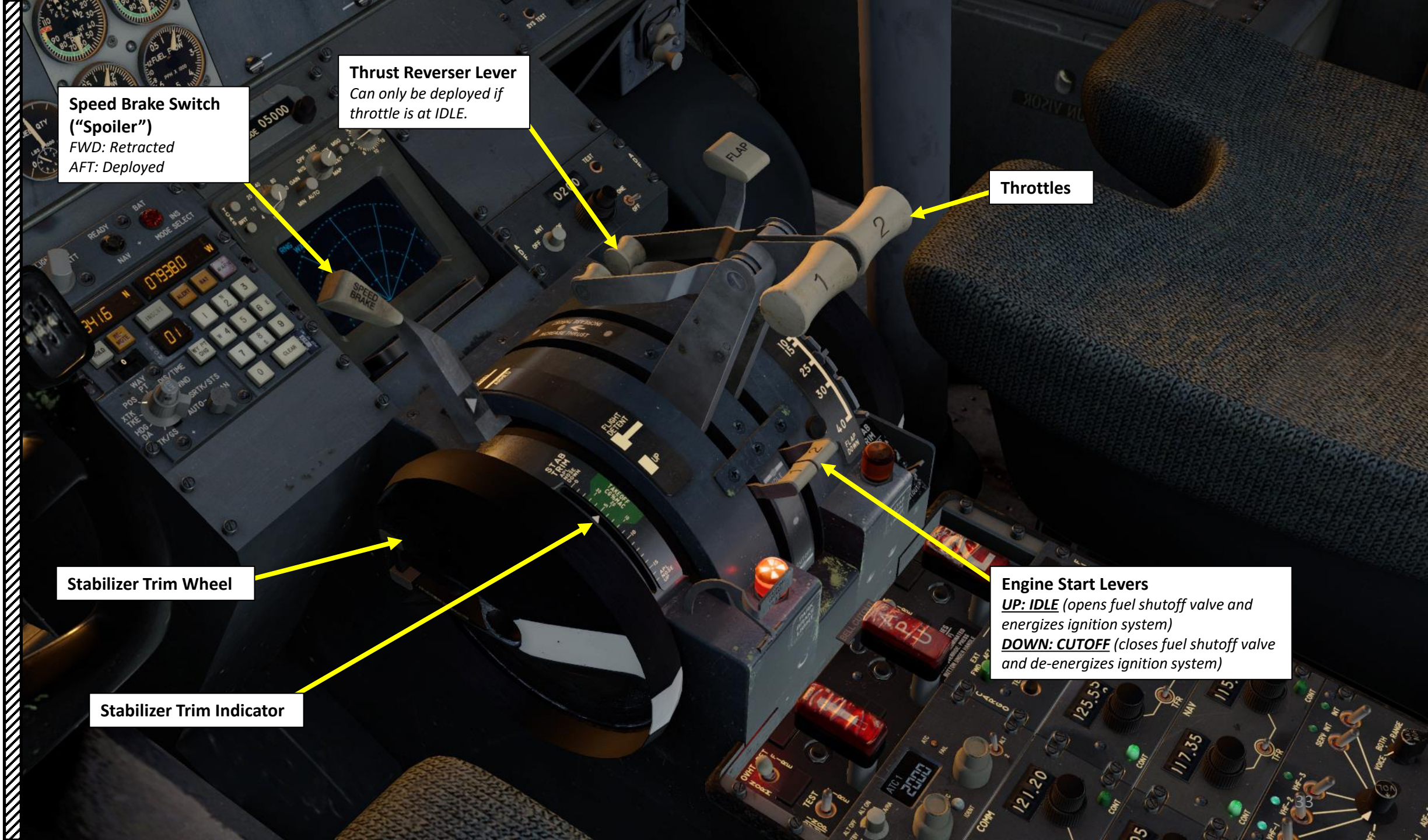
WY PT CHG (Waypoint Change) Key
Allows to either directly navigate to any waypoint or intercept a leg

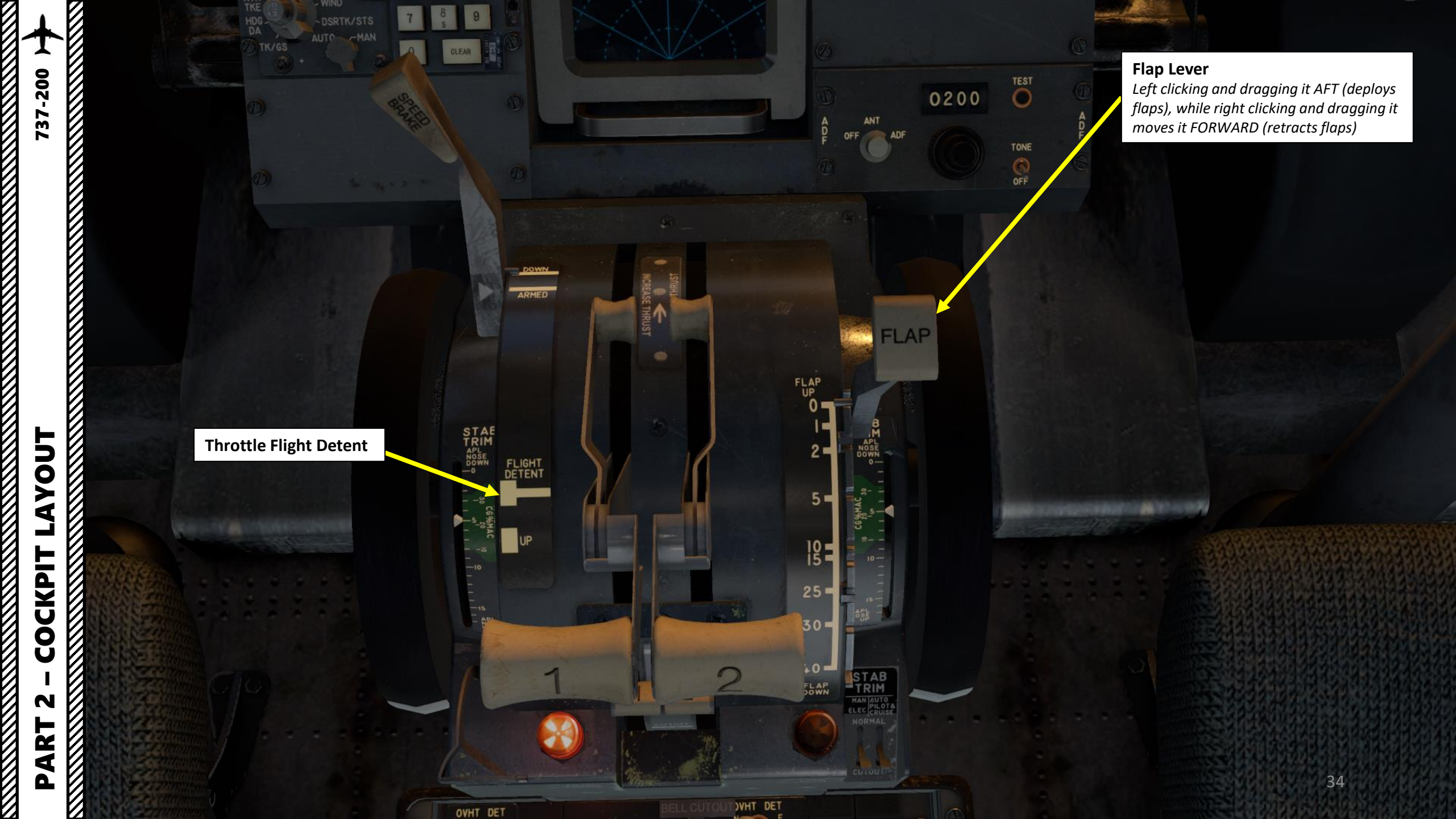
CIVA Data Selector Switch

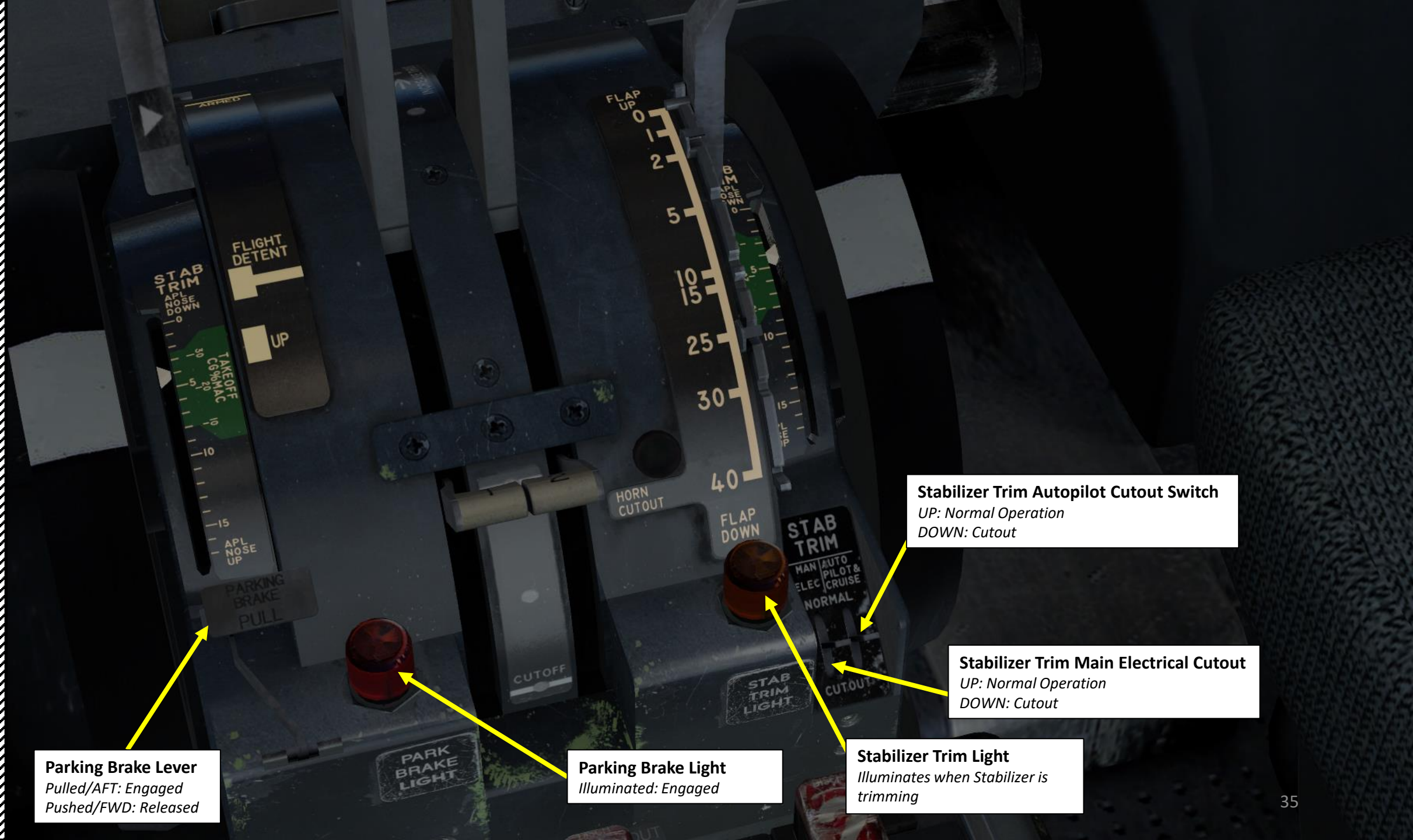
- ***TK/GS***: *Ground Track/Ground Speed*
- ***HDG/DA***: *Current heading (relative to true north) / Drift Angle relative to wind*
- ***XTK/TKE***: *Cross Track Error (tenth of nautical mile) / Track Angle Error*
- ***POS***: *Current position coordinates of aircraft*
- ***WAYPT***: *Coordinates of selected waypoint*
- ***DIS/TIME***: *Distance (tenth of nautical mile) and time (minutes) to selected waypoint*
- ***WIND***: *Wind direction (deg relative to true north) and speed (kts)*
- ***DSRTK/STS***: *Desired Track Angle to selected waypoint / Status codes of INS*

AUTO/MAN Switch
Selects either automatic or manual leg switching


ADF-1 Radio Navigation Panel
ADF
OFF
ANT
ADF
0200
TEST
TONE
OFF
ADF
SET ALTITUDE 00200
GROUND PROXIMITY
SYS TEST
FLAP/GEAR INHIBIT
NORMAL
FLAP


Speed Brake Switch ("Spoiler")
FWD: Retracted
AFT: Deployed
Thrust Reverser Lever
Can only be deployed if throttle is at IDLE.
Throttles
Stabilizer Trim Wheel
Stabilizer Trim Indicator
Engine Start Levers
UP: IDLE (opens fuel shutoff valve and energizes ignition system)
DOWN: CUTOFF (closes fuel shutoff valve and de-energizes ignition system)


Flap Lever
Left clicking and dragging it AFT (deploys flaps), while right clicking and dragging it moves it FORWARD (retracts flaps)
Throttle Flight Detent
SPEED BRAKE
DOWN
ARMED
INCREASE THRUST
FLAP
FLAP UP
0
1
2
5
10
15
25
30
40
FLAP DOWN
STAB TRIM
FLIGHT DETENT
UP
1
2
0200
TEST
TONE
OFF
ANT
ADF
OVHT DET



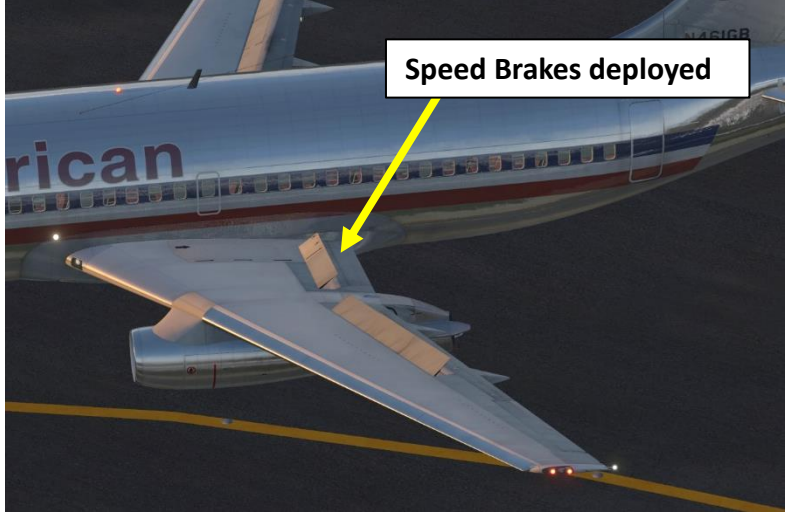
Parking Brake Lever
Pulled/AFT: Engaged
Pushed/FWD: Released

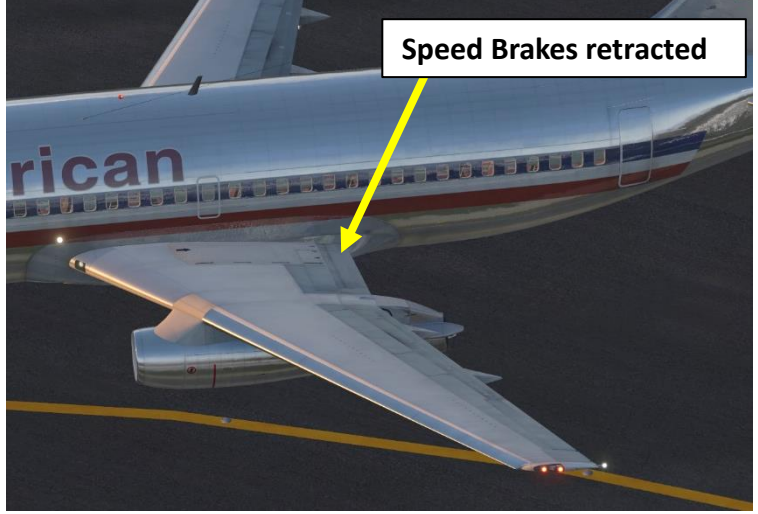
Parking Brake Light
Illuminated: Engaged

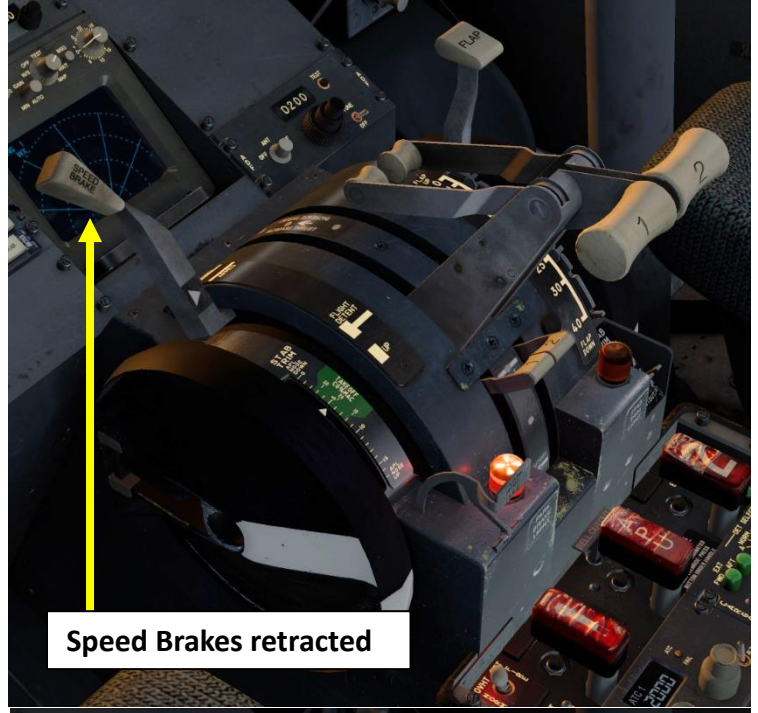
Stabilizer Trim Light
Illuminates when Stabilizer is trimming

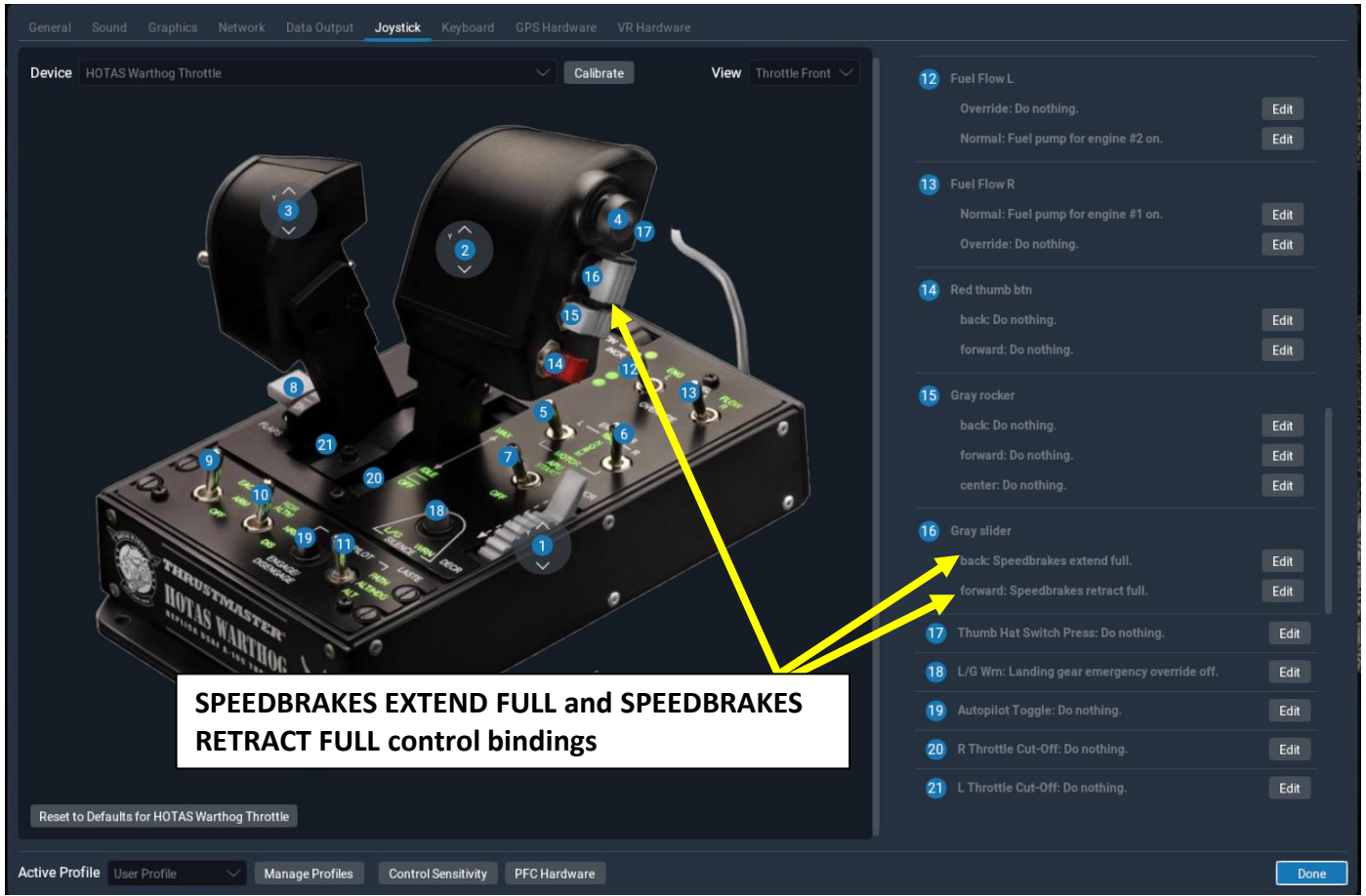
Stabilizer Trim Main Electrical Cutout
UP: Normal Operation
DOWN: Cutout

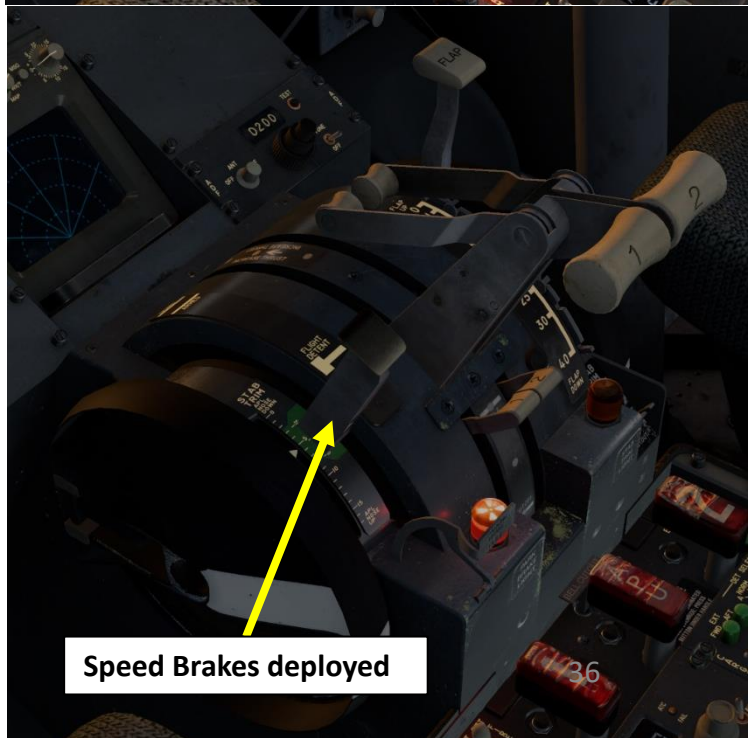
Stabilizer Trim Autopilot Cutout Switch
UP: Normal Operation
DOWN: Cutout

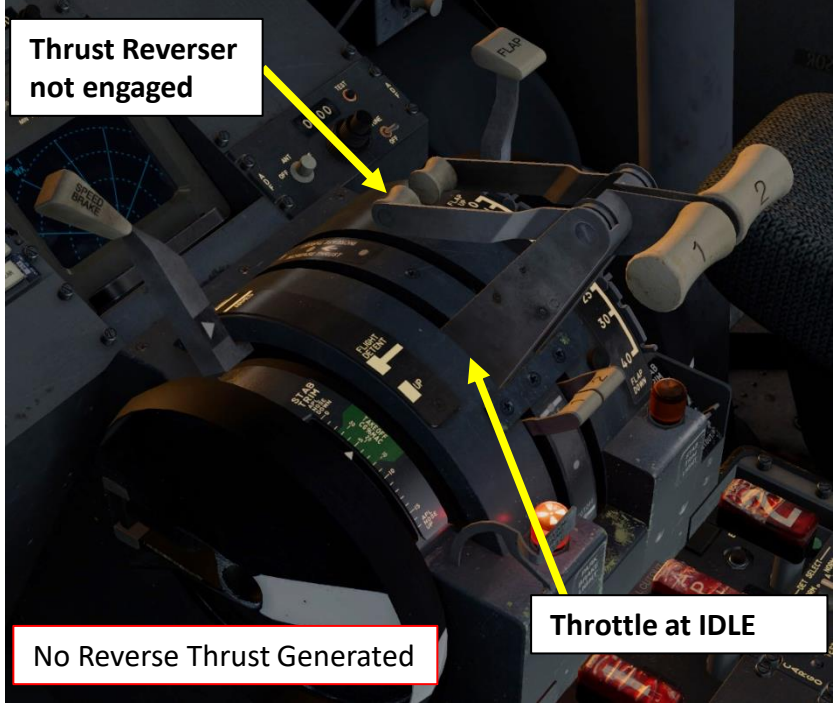

Speed Brakes deployed

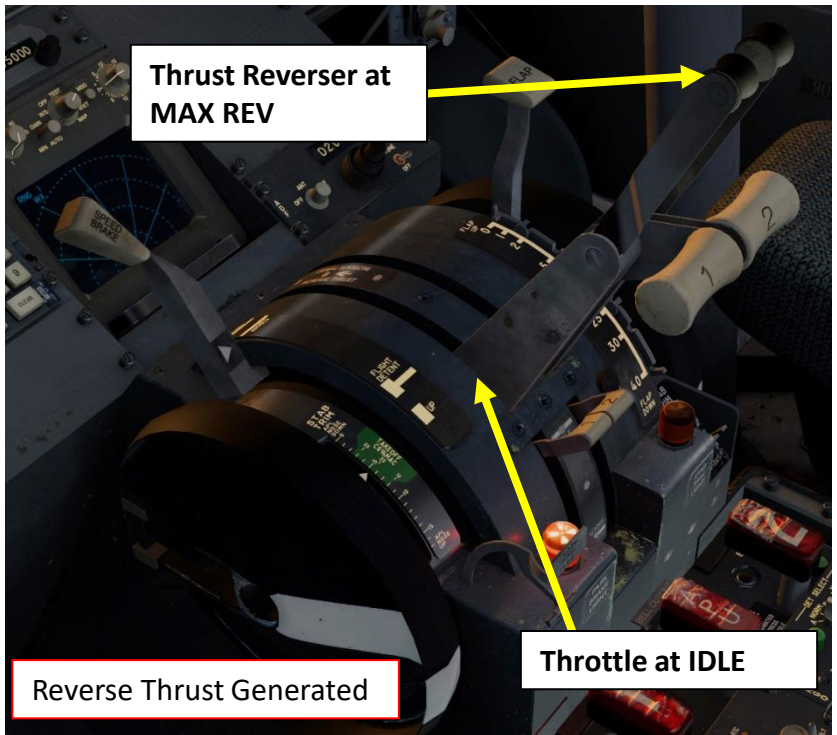

Speed Brakes retracted

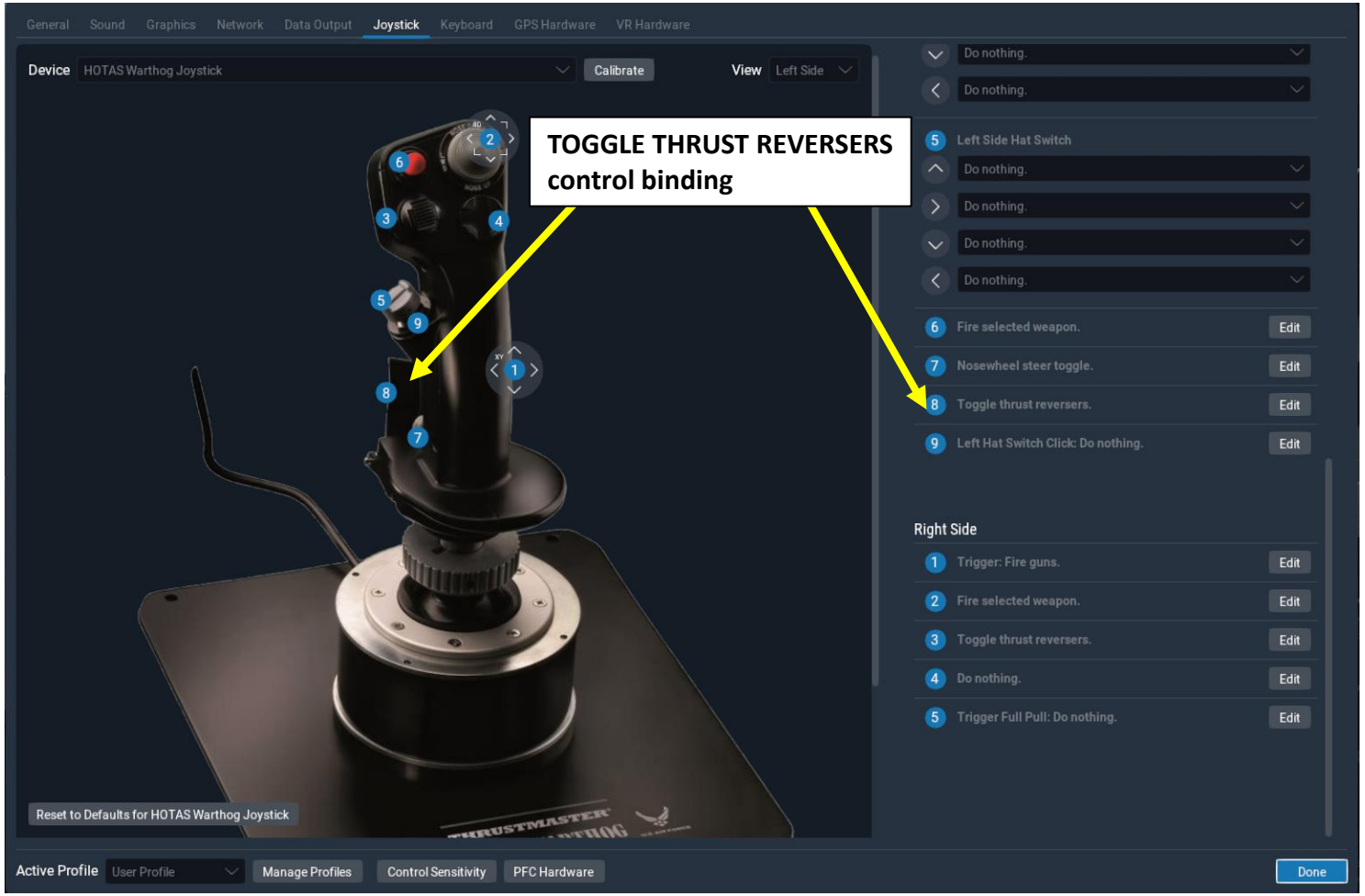

Speed Brakes retracted


General
Sound
Graphics
Network
Data Output
Joystick
Keyboard
GPS Hardware
VR Hardware
Device
HOTAS Warthog Throttle
Calibrate
View
Throttle Front
12 Fuel Flow L
Override: Do nothing.
Edit
Normal: Fuel pump for engine #2 on.
Edit
13 Fuel Flow R
Normal: Fuel pump for engine #1 on.
Edit
Override: Do nothing.
Edit
14 Red thumb btn
back: Do nothing.
Edit
forward: Do nothing.
Edit
15 Gray rocker
back: Do nothing.
Edit
forward: Do nothing.
Edit
center: Do nothing.
Edit
16 Gray slider
back: Speedbrakes extend full.
Edit
forward: Speedbrakes retract full.
Edit
17 Thumb Hat Switch Press: Do nothing.
Edit
18 L/G Wrn: Landing gear emergency override off.
Edit
19 Autopilot Toggle: Do nothing.
Edit
20 R Throttle Cut-Off: Do nothing.
Edit
21 L Throttle Cut-Off: Do nothing.
Edit
Reset to Defaults for HOTAS Warthog Throttle
Active Profile
User Profile
Manage Profiles
Control Sensitivity
PFC Hardware
Done
SPEEDBRAKES EXTEND FULL and SPEEDBRAKES RETRACT FULL control bindings


Speed Brakes deployed





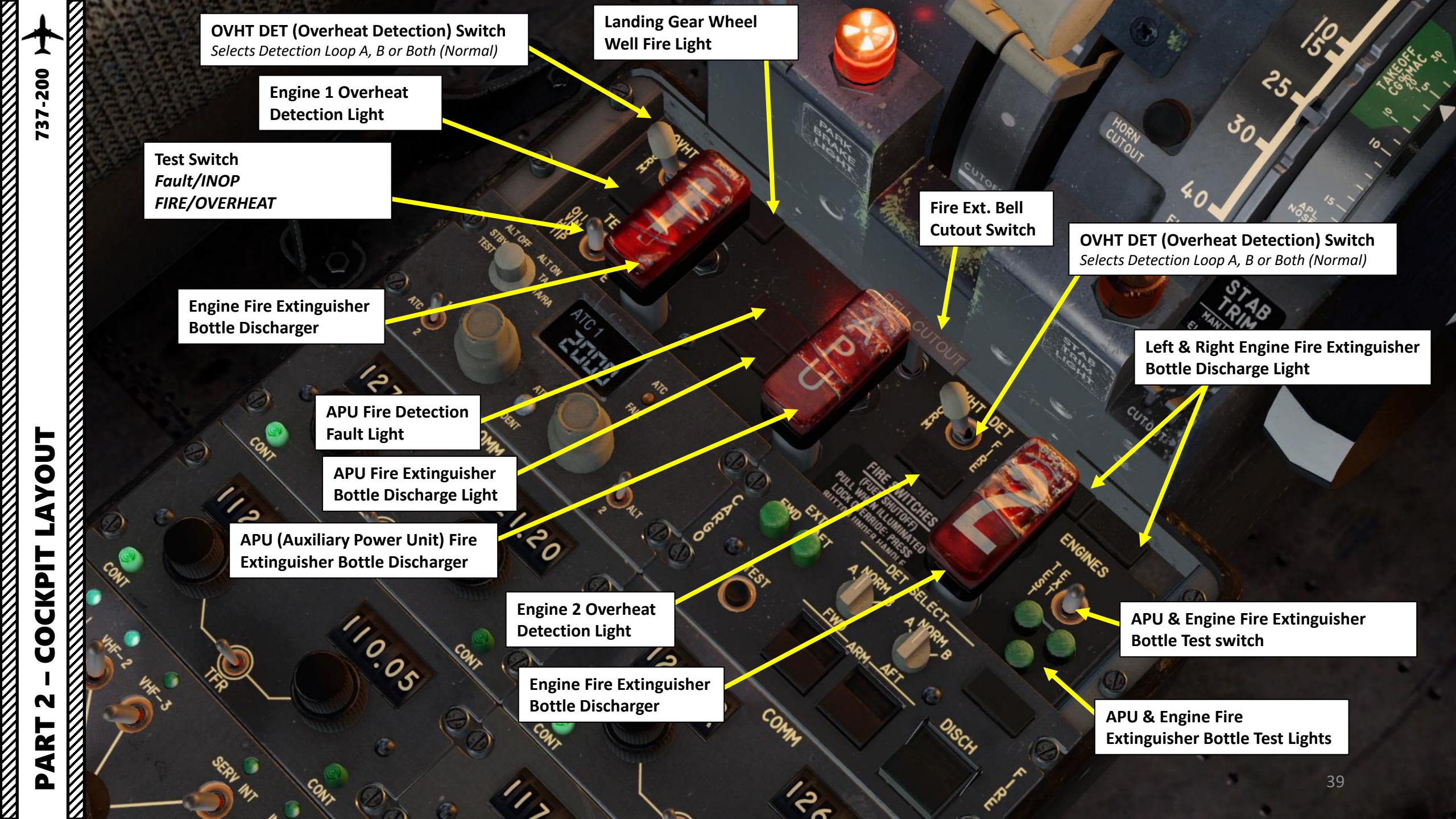


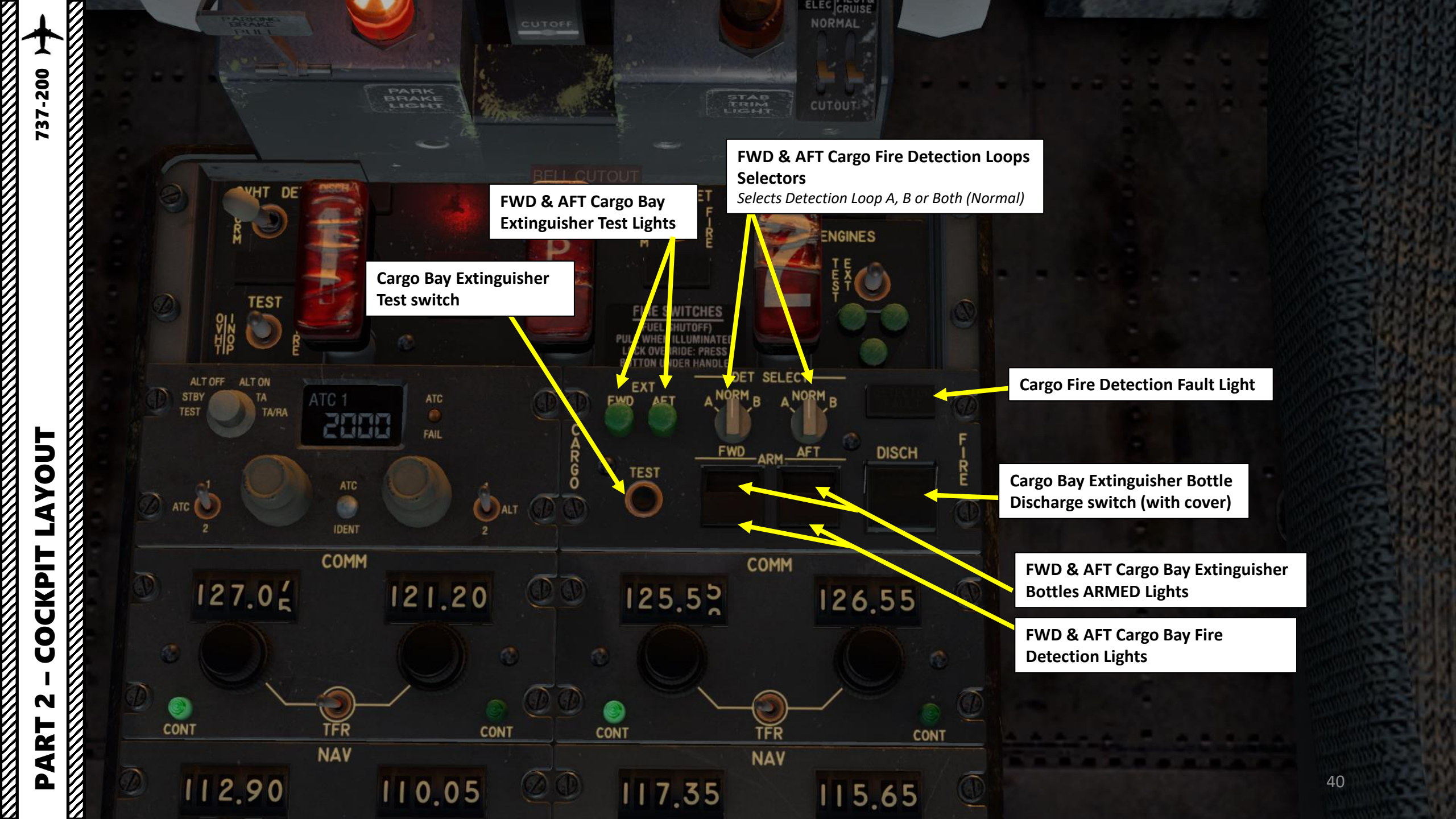
The Thrust Reverser lever can be moved by setting the throttle at IDLE first, then pressing the “TOGGLE THRUST REVERSERS” binding. This will then link your throttle axis to the thrust reverser lever axis. Moving your throttle forward will then move the thrust reverser lever AFT, engaging internal clam-shell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

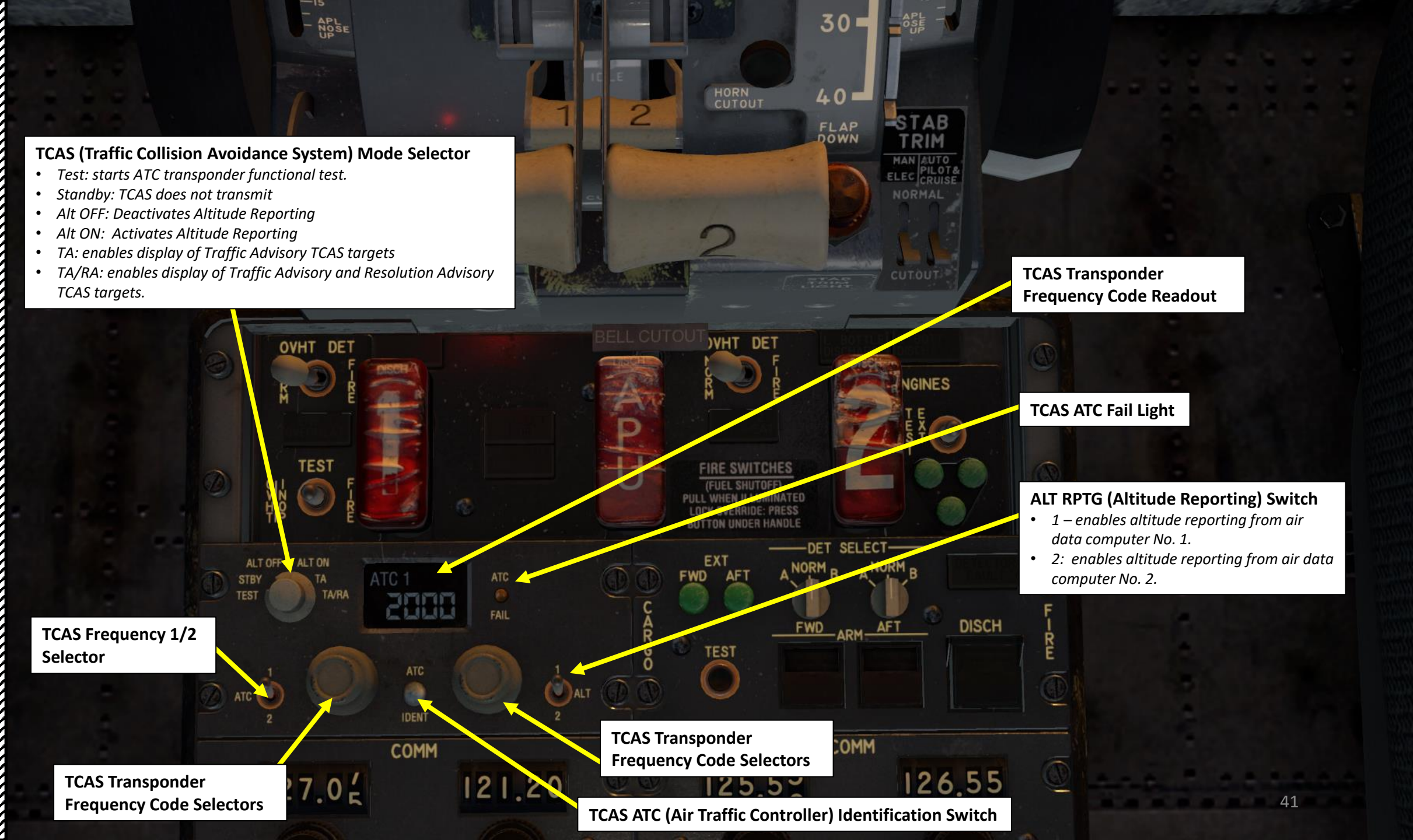
Take note that the Reverse Thrust lever can only be engaged if your throttle is at IDLE. The reason for that is a mechanical stopper that prevents you from engaging thrust reversers at high throttle settings.

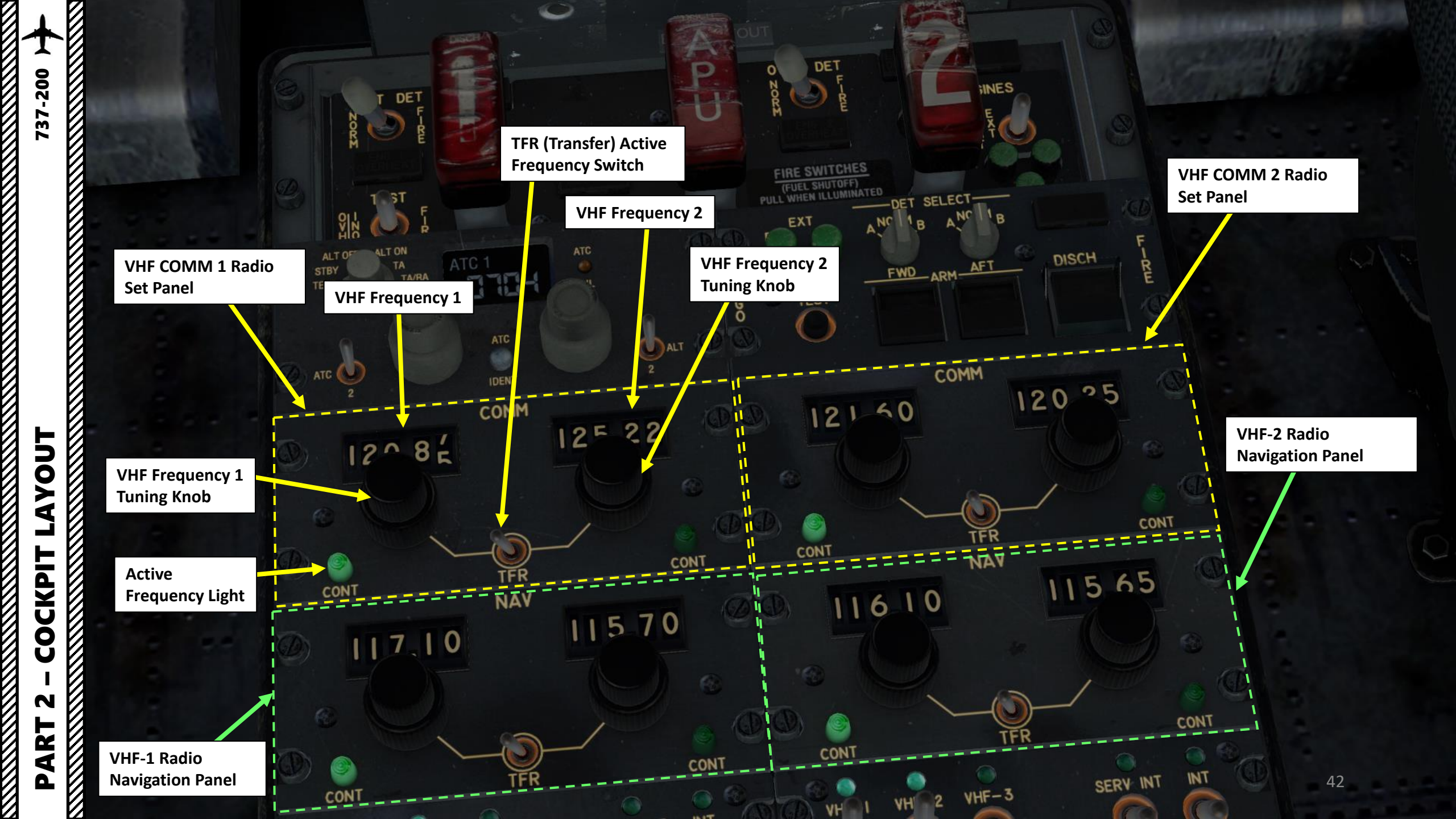

Thrust Reversers not engaged
No Reverse Thrust Generated
Target-Type Thrust Reverser Deflectors (Stowed)

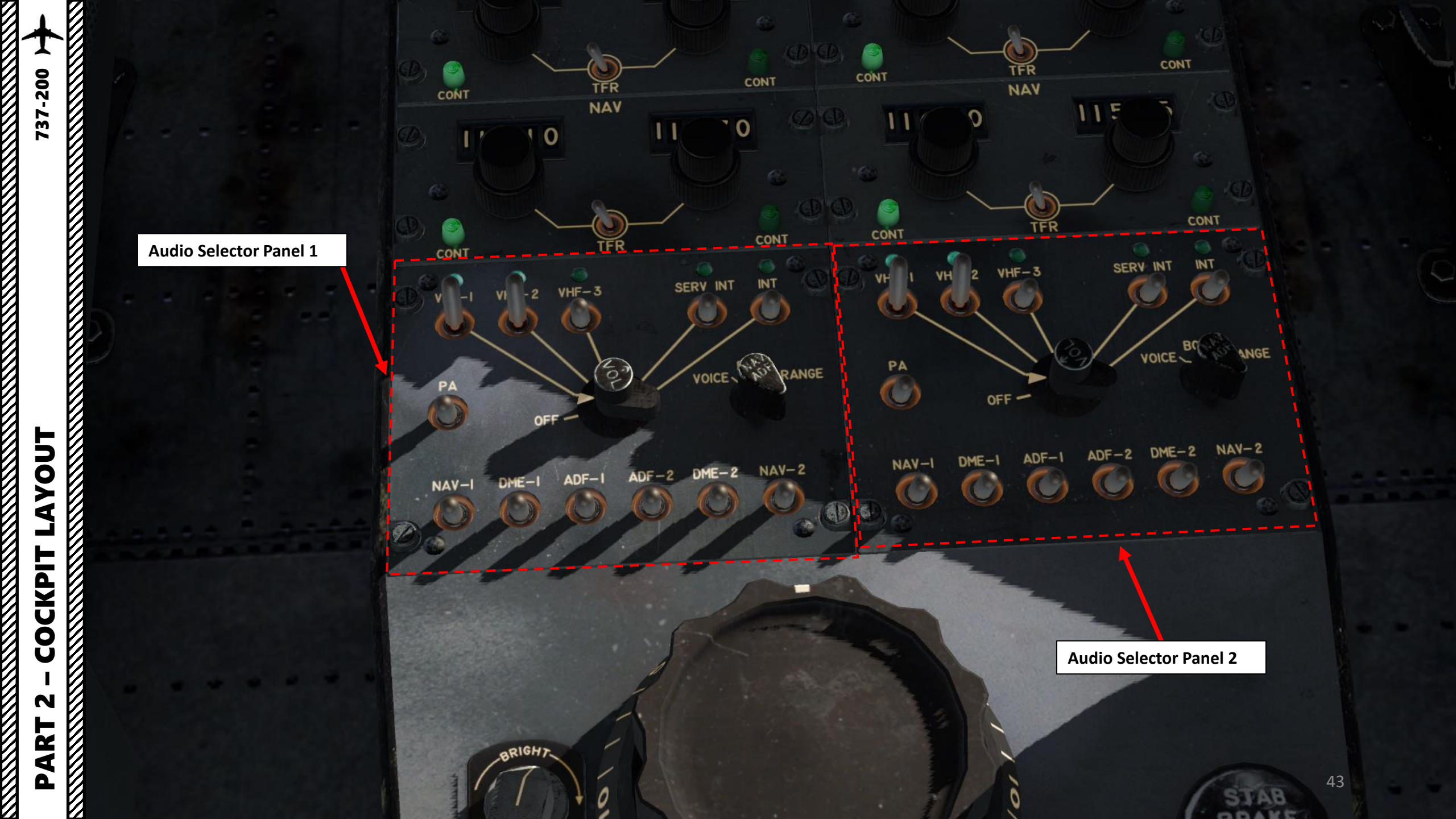

Thrust Reversers at MAX REV
Reverse Thrust Generated
Target-Type Thrust Reverser Deflectors (Deployed)

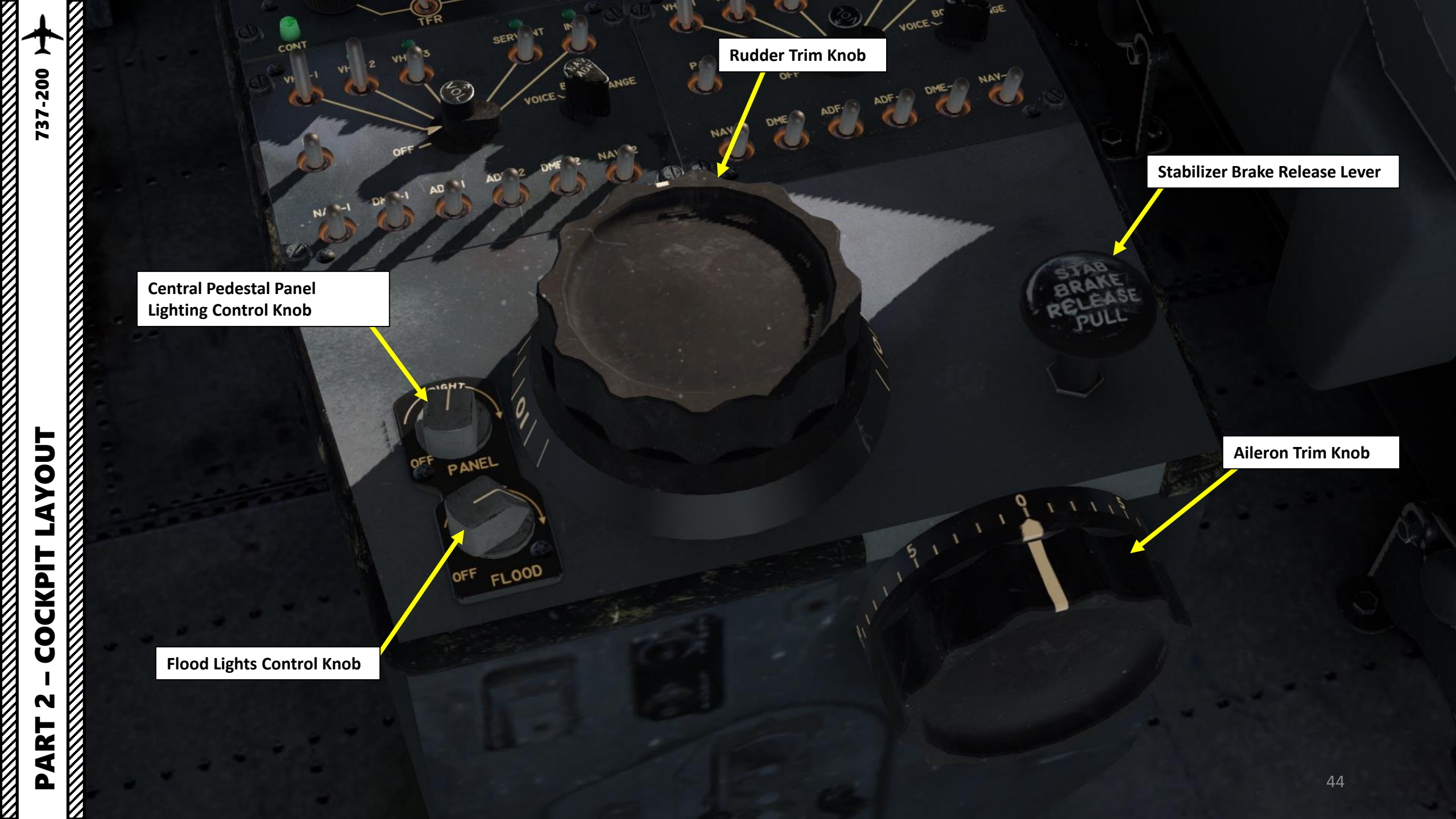

OVHT DET (Overheat Detection) Switch
Selects Detection Loop A, B or Both (Normal)
Landing Gear Wheel Well Fire Light
Engine 1 Overheat Detection Light
Test Switch
Fault/INOP
FIRE/OVERHEAT
Fire Ext. Bell Cutout Switch
OVHT DET (Overheat Detection) Switch
Selects Detection Loop A, B or Both (Normal)
Engine Fire Extinguisher Bottle Discharger
Left & Right Engine Fire Extinguisher Bottle Discharge Light
APU Fire Detection Fault Light
APU Fire Extinguisher Bottle Discharge Light
APU (Auxiliary Power Unit) Fire Extinguisher Bottle Discharger
Engine 2 Overheat Detection Light
APU & Engine Fire Extinguisher Bottle Test switch
Engine Fire Extinguisher Bottle Discharger
APU & Engine Fire Extinguisher Bottle Test Lights


FWD & AFT Cargo Fire Detection Loops Selectors
Selects Detection Loop A, B or Both (Normal)
FWD & AFT Cargo Bay Extinguisher Test Lights
Cargo Bay Extinguisher Test switch
Cargo Fire Detection Fault Light
Cargo Bay Extinguisher Bottle Discharge switch (with cover)
FWD & AFT Cargo Bay Extinguisher Bottles ARMED Lights
FWD & AFT Cargo Bay Fire Detection Lights
DET SELECT
EXT
FWD
AFT
NORM
TEST
ARM
DISCH
CARGO
FIRE
ENGINES
COMM
NAV
CONT
TFR
ATC
IDENT
ALT
127.05
121.20
125.55
126.55
112.90
110.05
117.35
115.65


TCAS (Traffic Collision Avoidance System) Mode Selector
• Test: starts ATC transponder functional test.
• Standby: TCAS does not transmit
• Alt OFF: Deactivates Altitude Reporting
• Alt ON: Activates Altitude Reporting
• TA: enables display of Traffic Advisory TCAS targets
• TA/RA: enables display of Traffic Advisory and Resolution Advisory TCAS targets.
TCAS Transponder Frequency Code Readout
TCAS ATC Fail Light
ALT RPTG (Altitude Reporting) Switch
• 1 – enables altitude reporting from air data computer No. 1.
• 2: enables altitude reporting from air data computer No. 2.
TCAS Frequency 1/2 Selector
TCAS Transponder Frequency Code Selectors
TCAS Transponder Frequency Code Selectors
TCAS ATC (Air Traffic Controller) Identification Switch
ALT OFF
ALT ON
STBY
TA
TEST
TA/RA
ATC 1
2000
ATC
FAIL
IDENT
ALT
DET SELECT
EXT
FWD
AFT
NORM
ARM
DISCH
TEST
COMM
121.20
126.55


TFR (Transfer) Active Frequency Switch
VHF Frequency 2
VHF COMM 2 Radio Set Panel
VHF COMM 1 Radio Set Panel
VHF Frequency 1
VHF Frequency 2 Tuning Knob
VHF-2 Radio Navigation Panel
VHF Frequency 1 Tuning Knob
Active Frequency Light
VHF-1 Radio Navigation Panel
FIRE SWITCHES
(FUEL SHUTOFF)
PULL WHEN ILLUMINATED
DET SELECT
COMM
NAV
TFR
CONT
VHF-3
SERV INT
INT

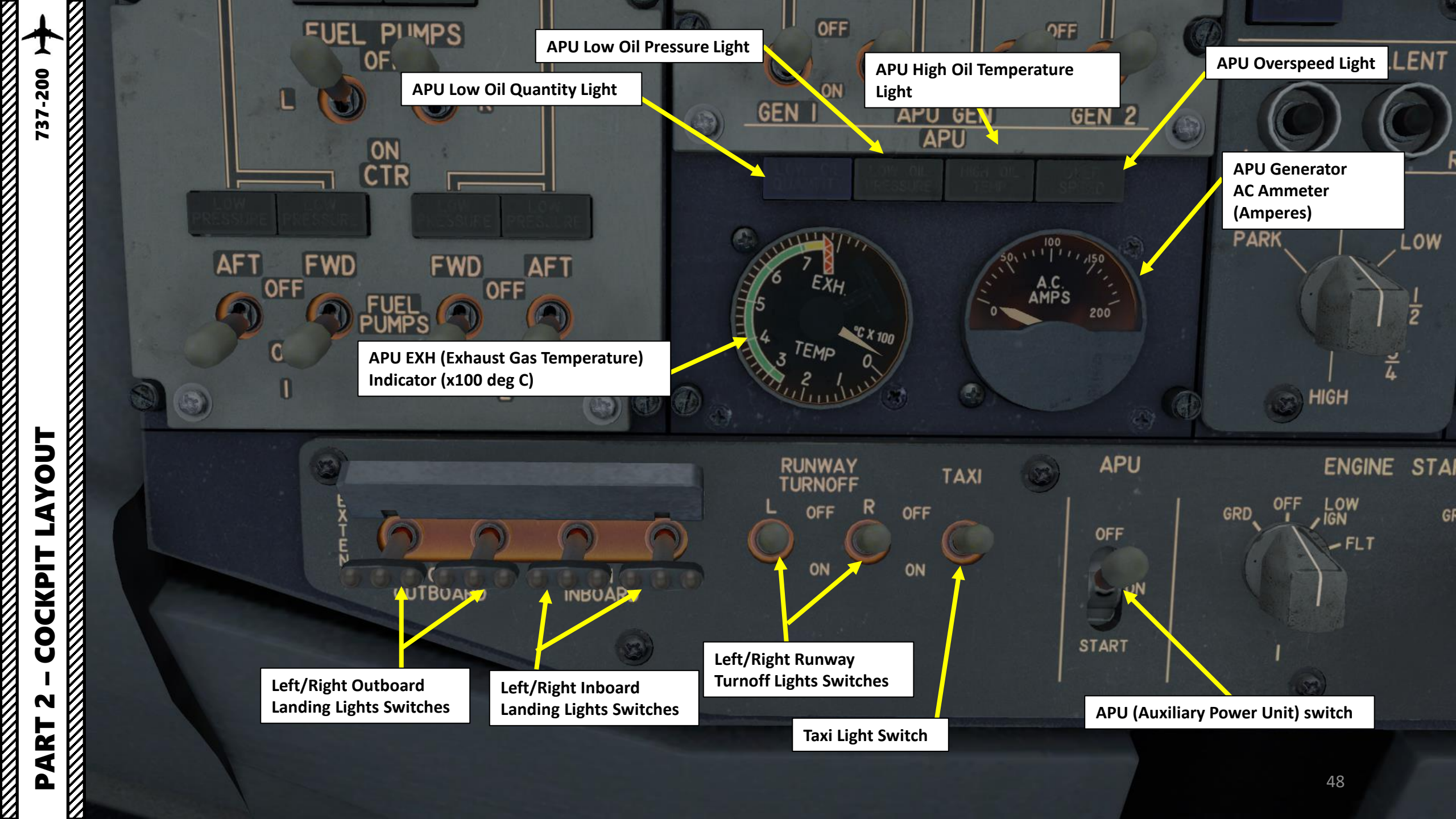

Audio Selector Panel 1
Audio Selector Panel 2
CONT
TFR
NAV
VHF-3
SERV INT
INT
PA
OFF
VOL
VOICE
RANGE
NAV-1
DME-1
ADF-1
ADF-2
DME-2
NAV-2
BRIGHT

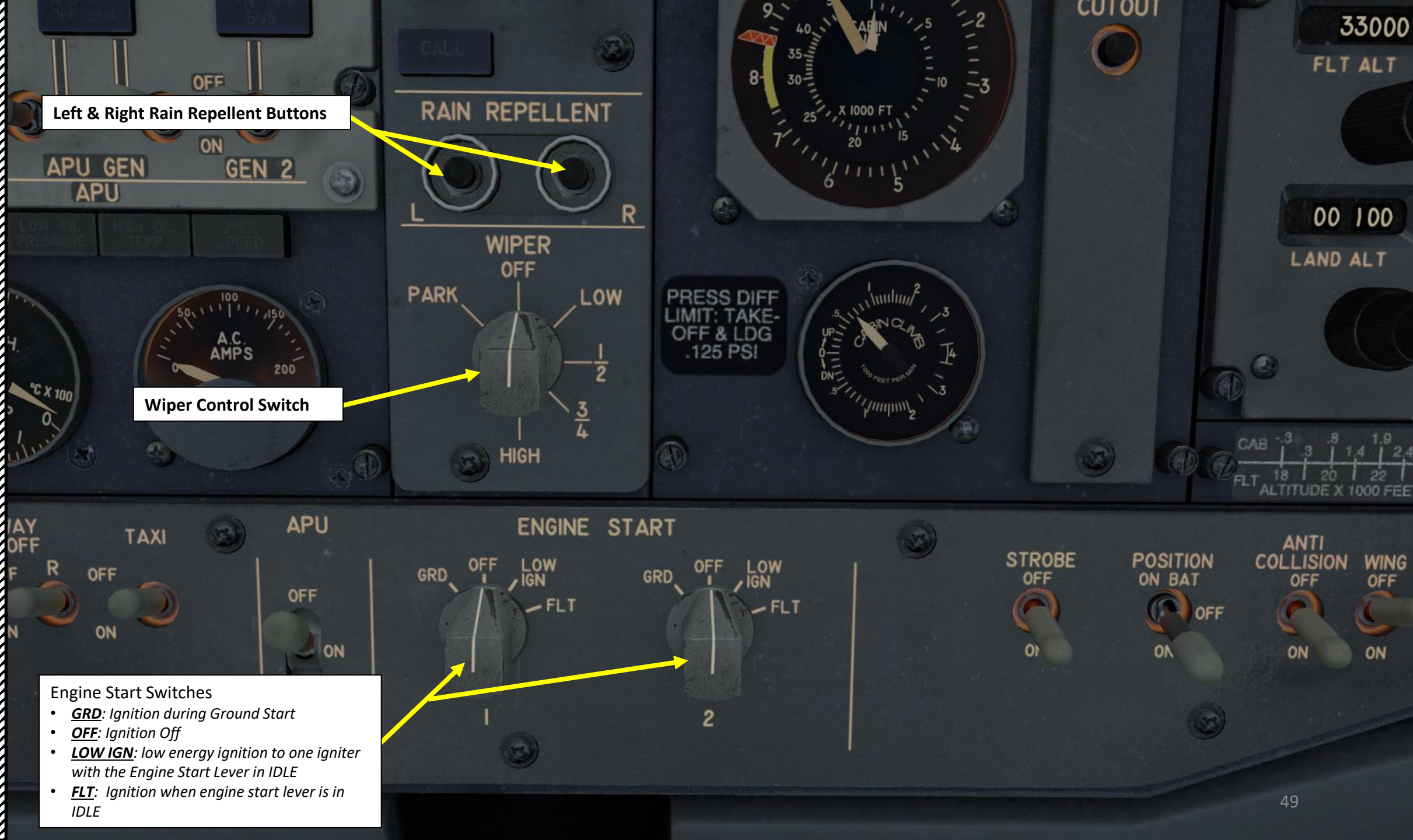

Rudder Trim Knob
Stabilizer Brake Release Lever
Central Pedestal Panel Lighting Control Knob
Aileron Trim Knob
Flood Lights Control Knob
STAB BRAKE RELEASE PULL
PANEL
OFF
FLOOD
OFF

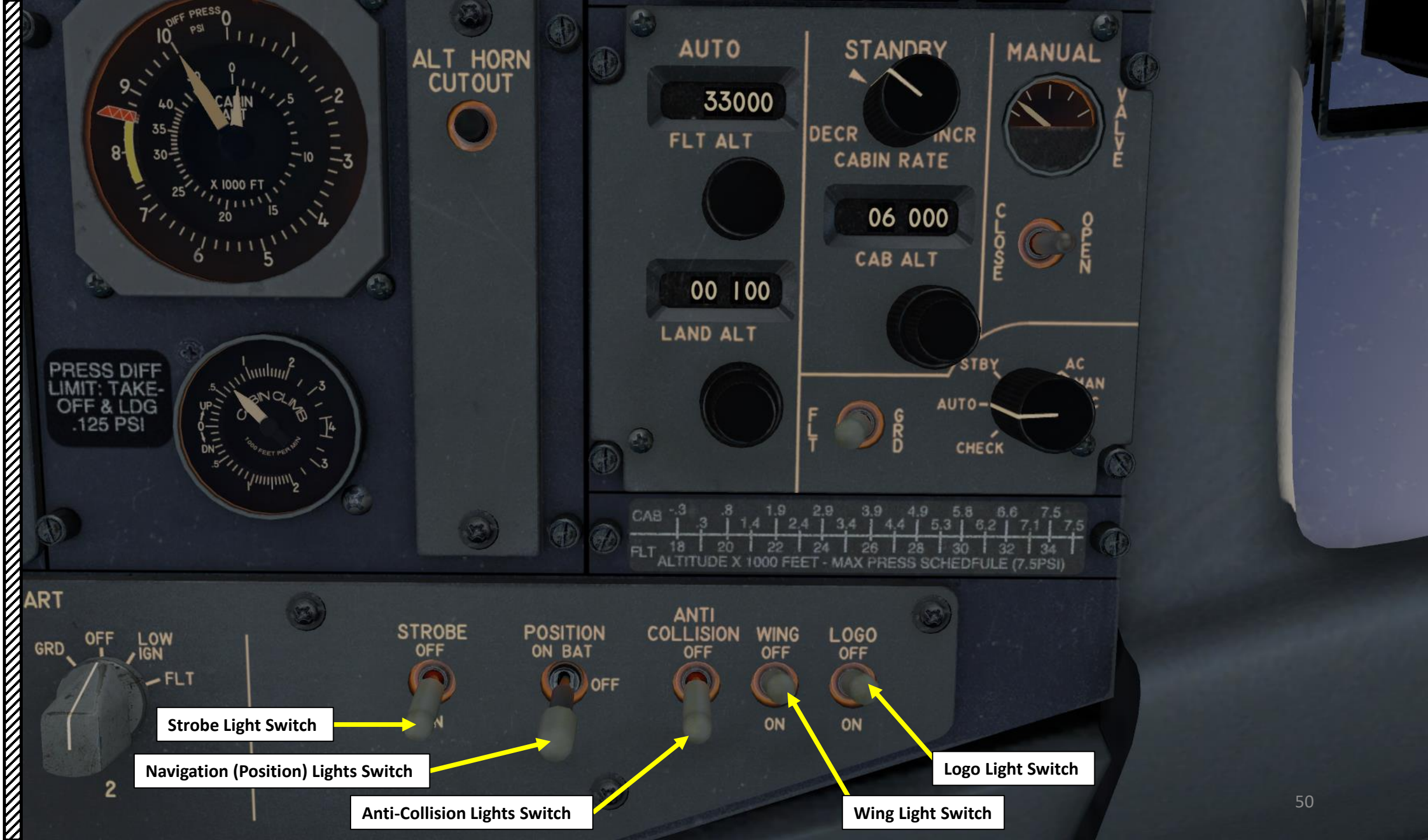

STBY BUS PWR
STBY BUS
INVERTER VOLTS
MAIN DISTRIBUTION
STBY HYD PUMP (ALT)
STBY HYD PUMP NORMAL
NO 2 ALT
NO 2 NORMAL
WINDOW HEAT
ANTI-ICE
GALLEY
START RELAY

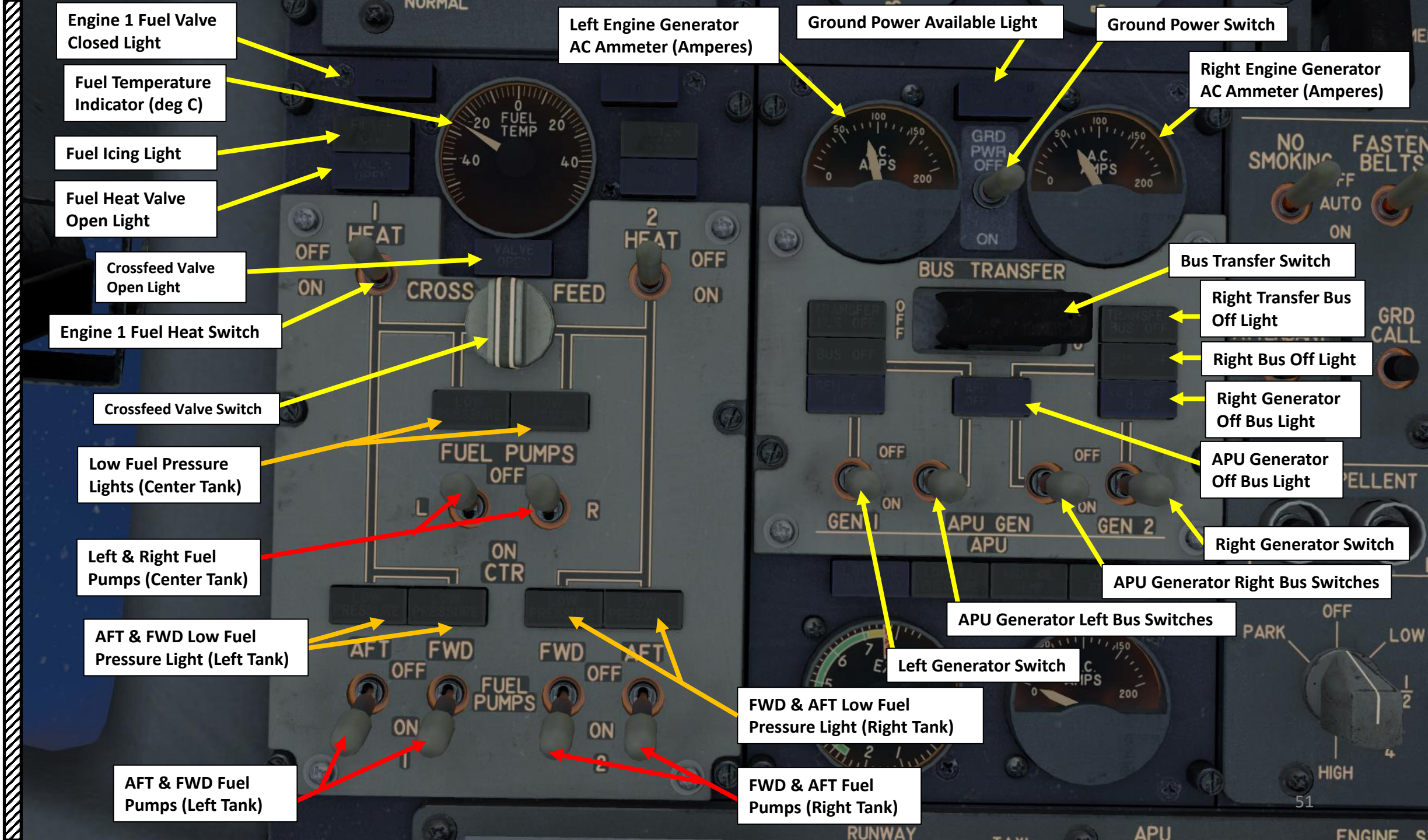
OVERHEAD PANEL

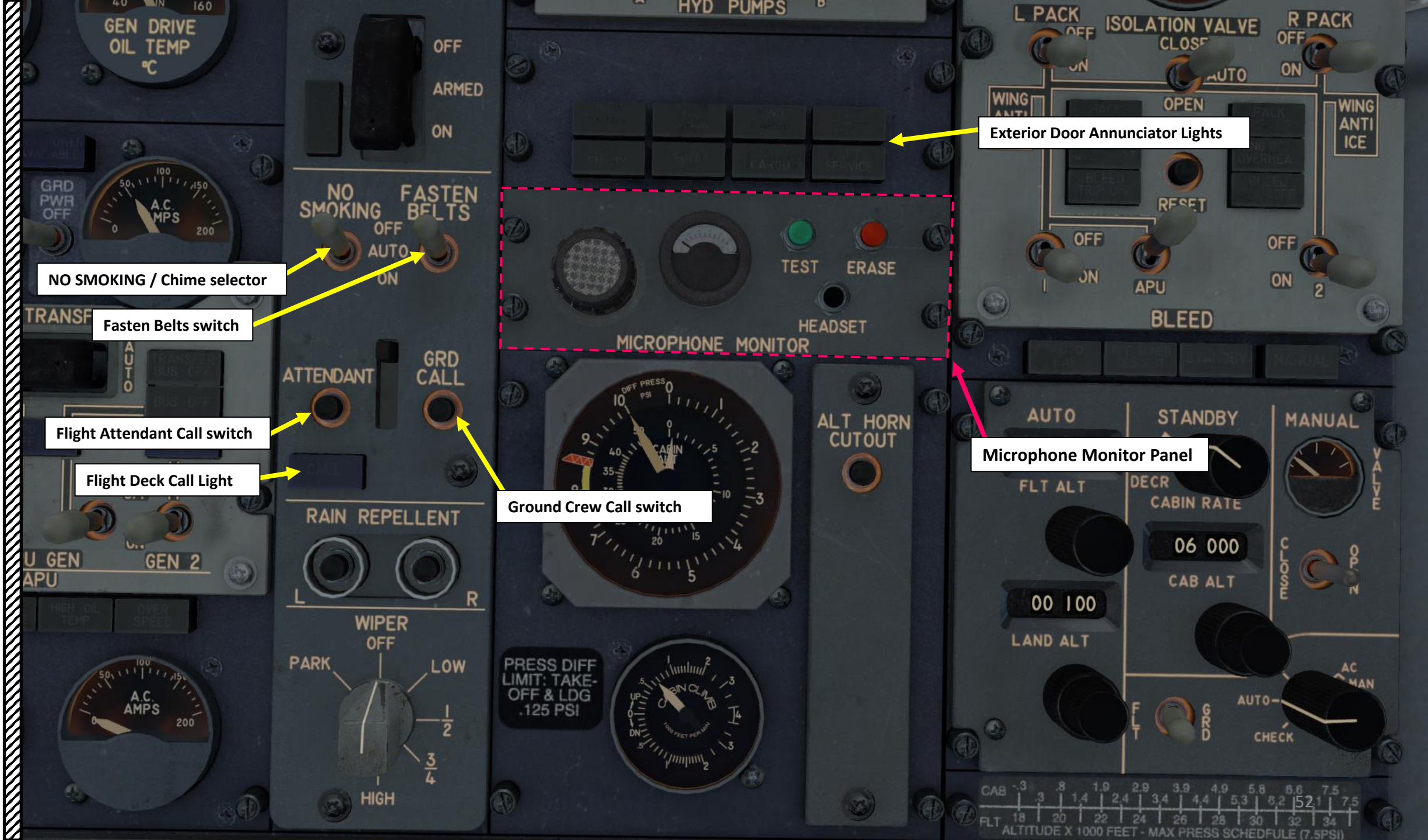

Standby Magnetic Compass


APU Low Oil Pressure Light
APU Low Oil Quantity Light
APU High Oil Temperature Light
APU Overspeed Light
APU Generator AC Ammeter (Amperes)
APU EXH (Exhaust Gas Temperature) Indicator (x100 deg C)
Left/Right Outboard Landing Lights Switches
Left/Right Inboard Landing Lights Switches
Left/Right Runway Turnoff Lights Switches
Taxi Light Switch
APU (Auxiliary Power Unit) switch
FUEL PUMPS
AFT
FWD
OFF
ON CTR
GEN 1
APU
GEN 2
EXH.
TEMP
°C X 100
A.C. AMPS
RUNWAY TURNOFF
TAXI
APU
ENGINE START
PARK
LOW
HIGH
GRD
IGN
FLT
START


Left & Right Rain Repellent Buttons
Wiper Control Switch
RAIN REPELLENT
L
R
WIPER
OFF
PARK
LOW
HIGH
1/2
3/4
APU GEN
GEN 2
APU
ON
OFF
A.C. AMPS
PRESS DIFF LIMIT: TAKE-OFF & LDG .125 PSI
CUTOUT
33000
FLT ALT
00 100
LAND ALT
TAXI
APU
ENGINE START
GRD
OFF
LOW IGN
FLT
STROBE
POSITION
ON BAT
ANTI COLLISION
WING
Engine Start Switches
• GRD: Ignition during Ground Start
• OFF: Ignition Off
• LOW IGN: low energy ignition to one igniter with the Engine Start Lever in IDLE
• FLT: Ignition when engine start lever is in IDLE


DIFF PRESS PSI
CABIN ALT
X 1000 FT
ALT HORN CUTOUT
PRESS DIFF LIMIT: TAKE-OFF & LDG .125 PSI
CABIN CLIMB
1000 FEET PER MIN
UP
DN
AUTO
STANDBY
MANUAL
33000
FLT ALT
DECR
INCR
CABIN RATE
06 000
CAB ALT
00 100
LAND ALT
VALVE
CLOSE
OPEN
STBY
AUTO
CHECK
FLT
GRD
CAB
FLT
ALTITUDE X 1000 FEET - MAX PRESS SCHEDFULE (7.5PSI)
ART
GRD
OFF
LOW IGN
FLT
STROBE OFF
POSITION ON BAT OFF
ANTI COLLISION OFF
WING OFF ON
LOGO OFF ON
Strobe Light Switch
Navigation (Position) Lights Switch
Anti-Collision Lights Switch
Wing Light Switch
Logo Light Switch


Engine 1 Fuel Valve Closed Light
Fuel Temperature Indicator (deg C)
Fuel Icing Light
Fuel Heat Valve Open Light
Crossfeed Valve Open Light
Engine 1 Fuel Heat Switch
Crossfeed Valve Switch
Low Fuel Pressure Lights (Center Tank)
Left & Right Fuel Pumps (Center Tank)
AFT & FWD Low Fuel Pressure Light (Left Tank)
AFT & FWD Fuel Pumps (Left Tank)
Left Engine Generator AC Ammeter (Amperes)
Ground Power Available Light
Ground Power Switch
Right Engine Generator AC Ammeter (Amperes)
Bus Transfer Switch
Right Transfer Bus Off Light
Right Bus Off Light
Right Generator Off Bus Light
APU Generator Off Bus Light
Right Generator Switch
APU Generator Right Bus Switches
APU Generator Left Bus Switches
Left Generator Switch
FWD & AFT Low Fuel Pressure Light (Right Tank)
FWD & AFT Fuel Pumps (Right Tank)
FUEL TEMP
HEAT
CROSS FEED
FUEL PUMPS
ON CTR
AFT FWD
FUEL PUMPS
BUS TRANSFER
GRD PWR
GEN 1
APU GEN
APU
GEN 2
NO SMOKING
FASTEN BELTS
GRD CALL
PARK
HIGH
RUNWAY
APU



Exterior Door Annunciator Lights

NO SMOKING / Chime selector

Fasten Belts switch

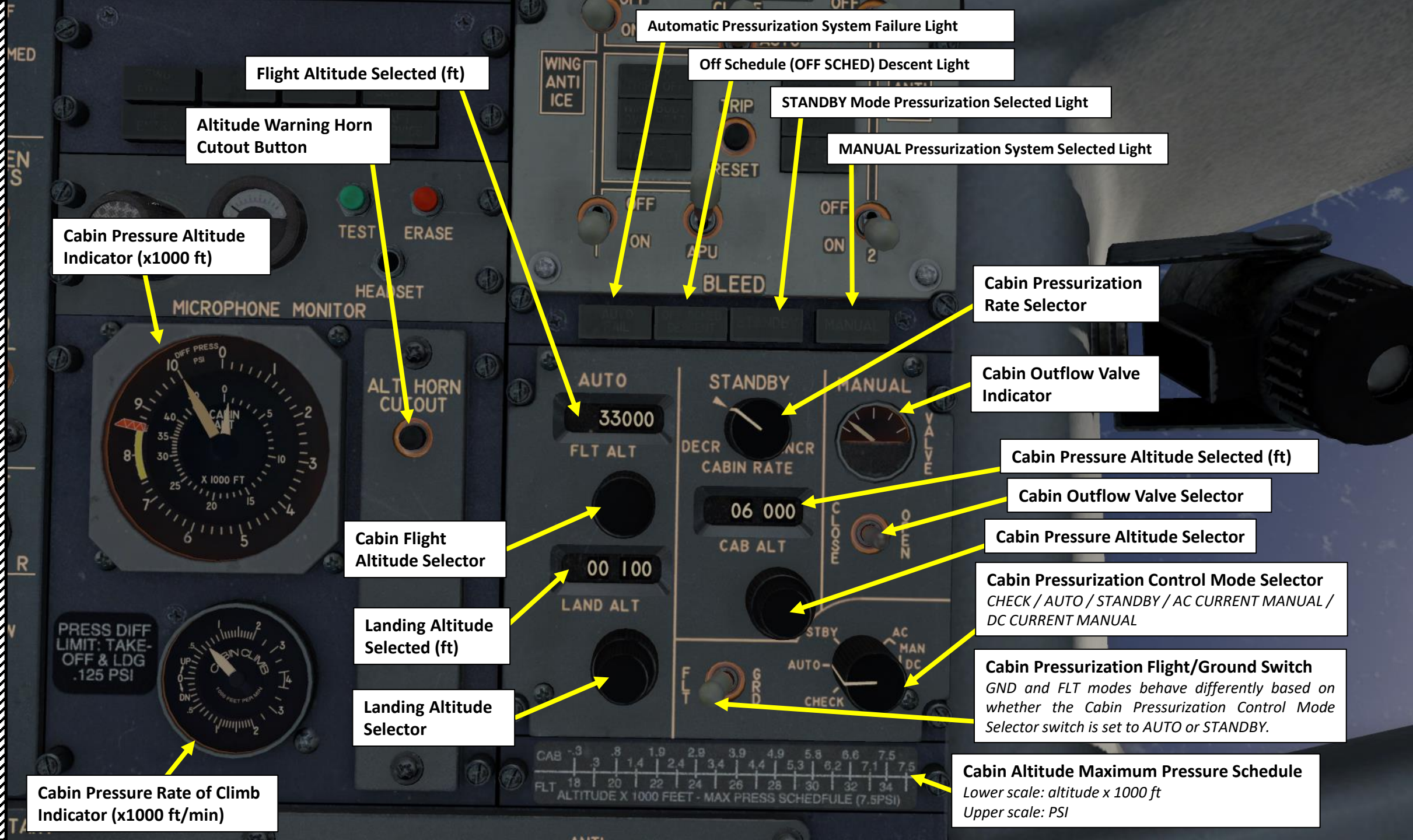
Flight Attendant Call switch

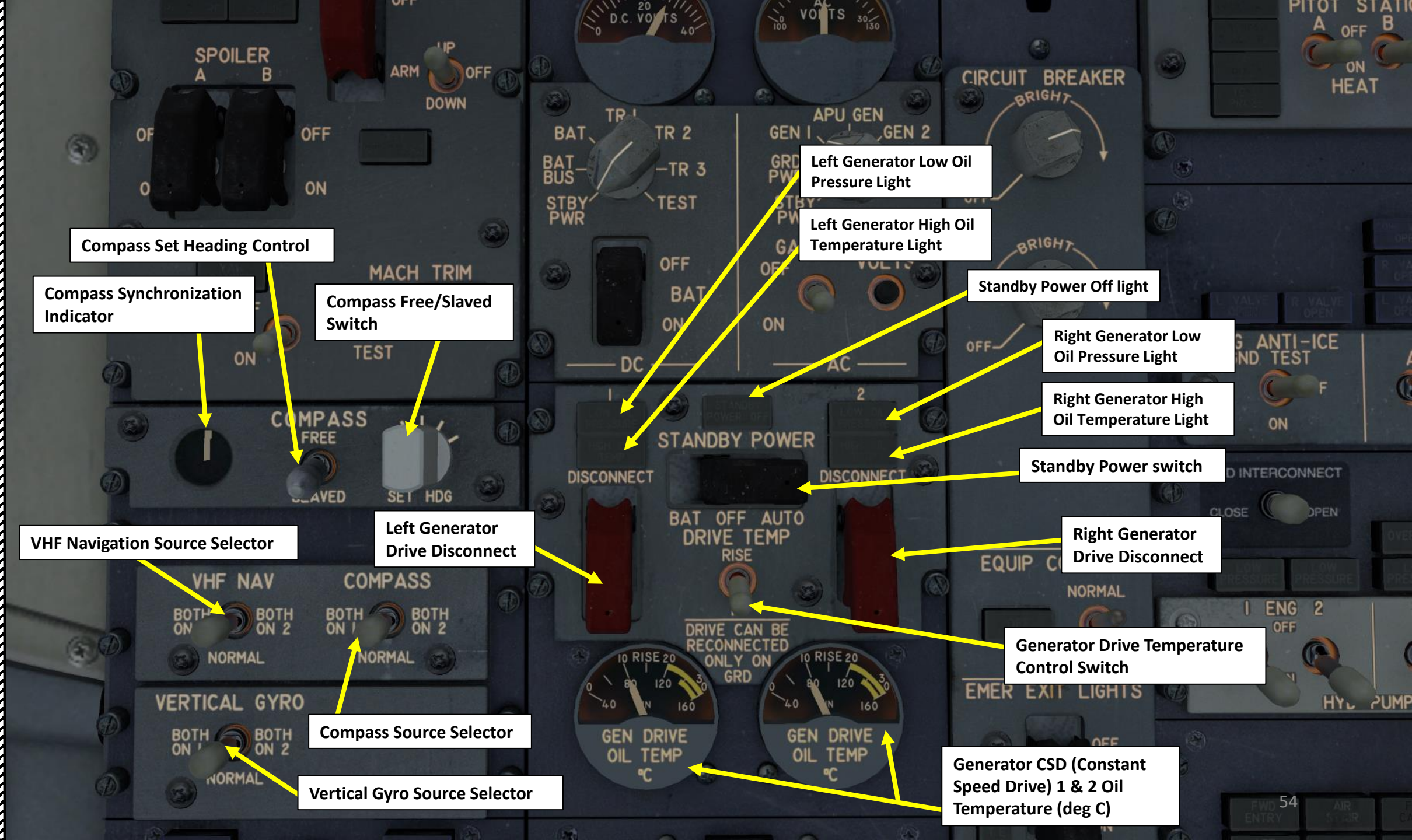
Flight Deck Call Light

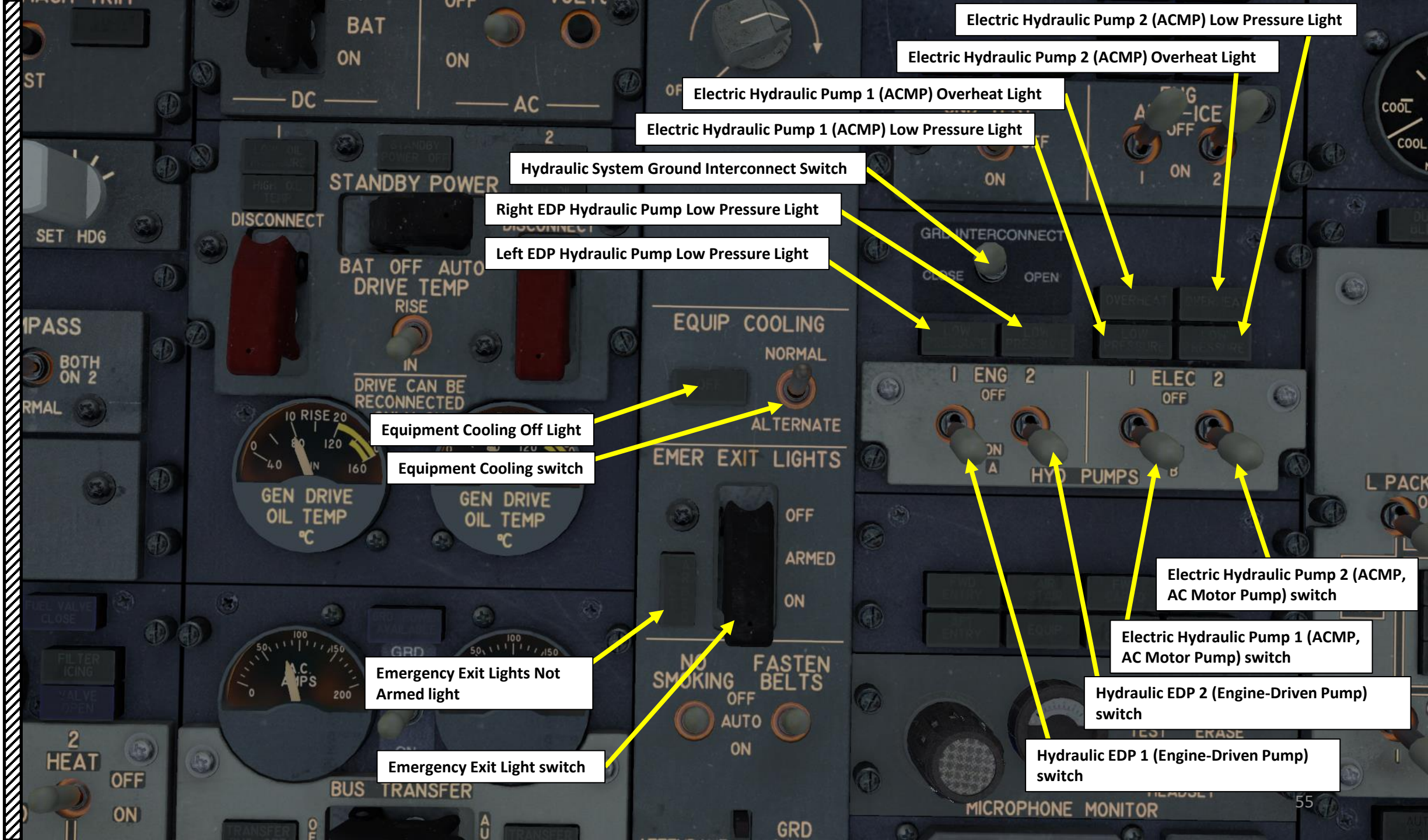
Ground Crew Call switch

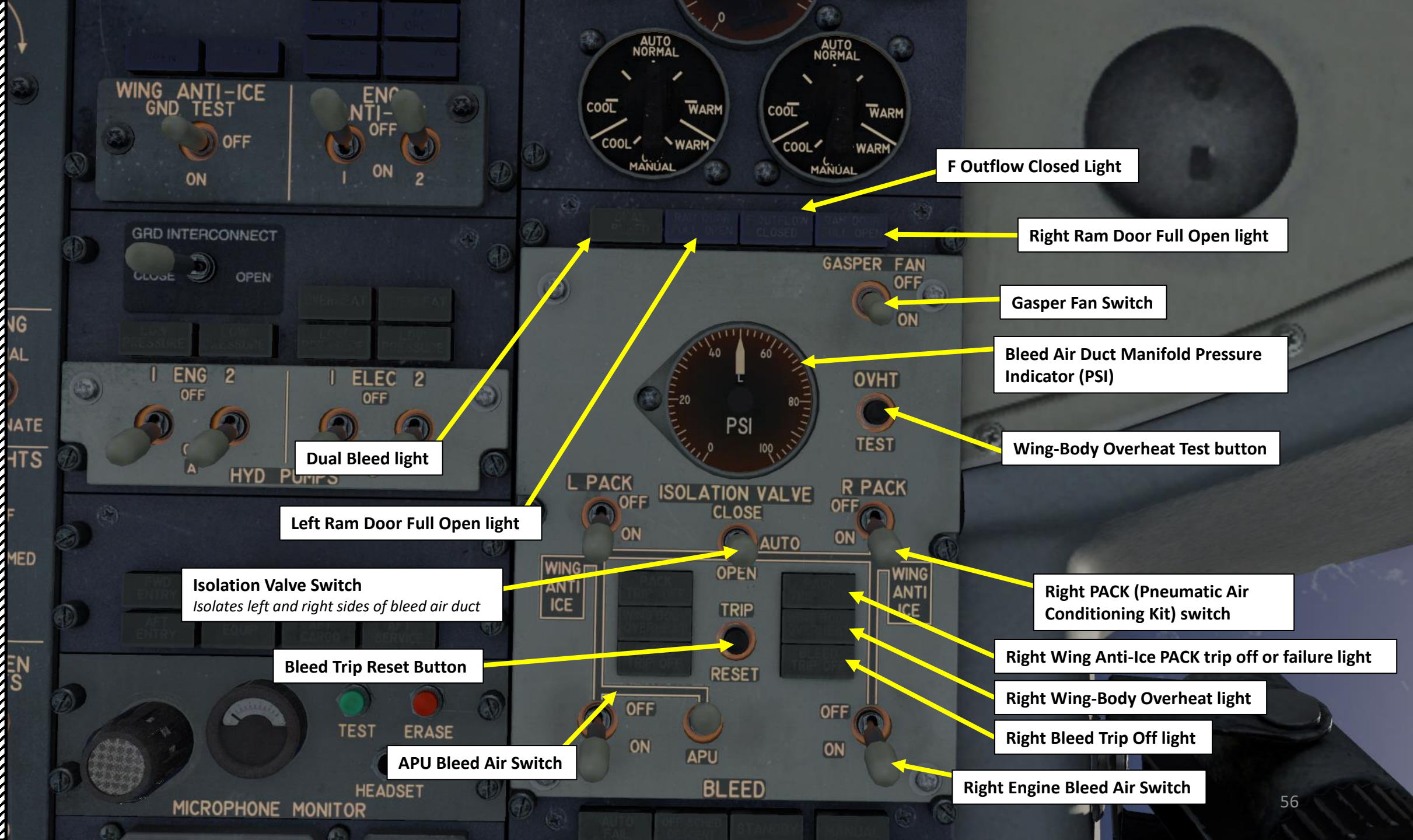
Microphone Monitor Panel

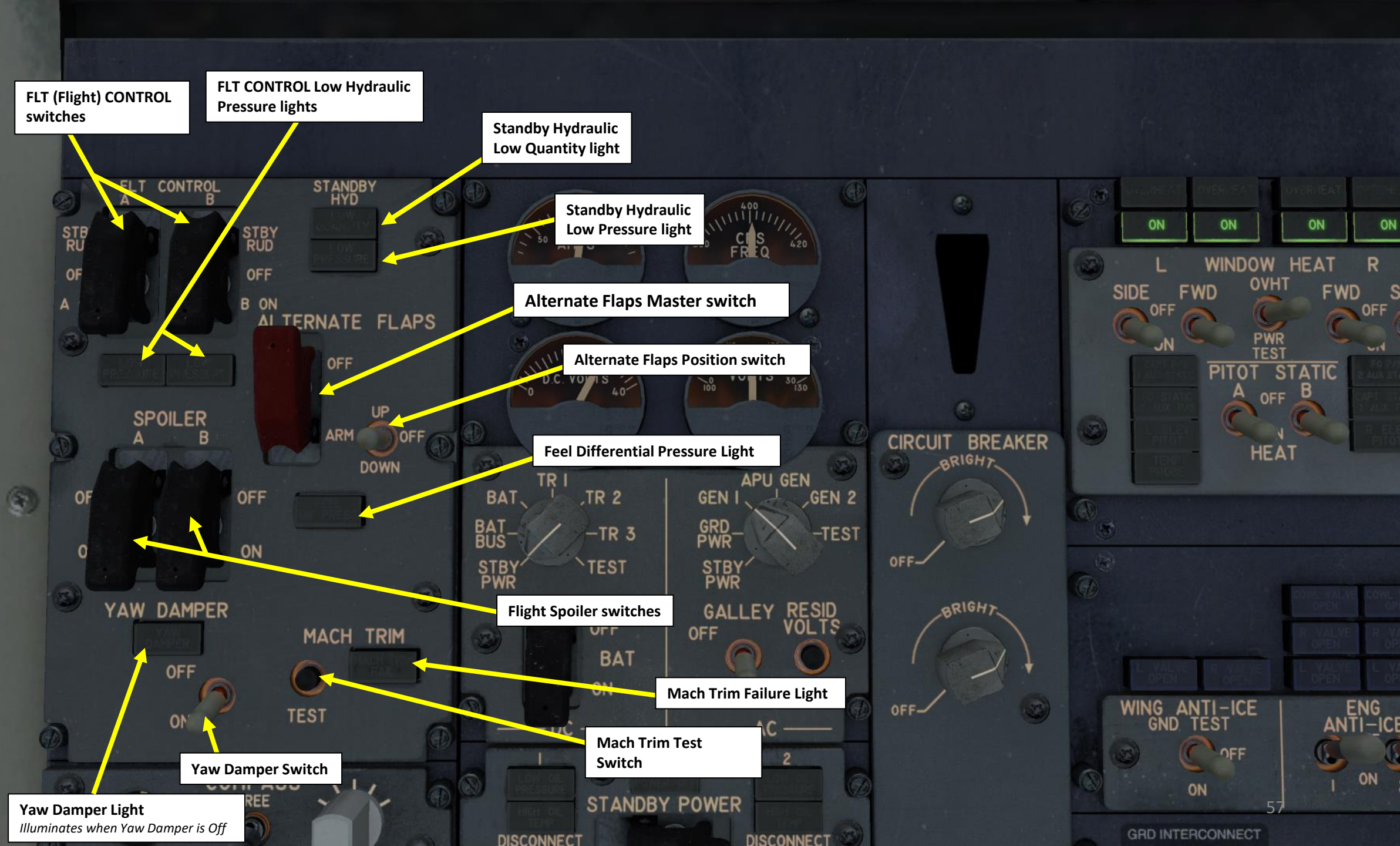
PART 2 – COCKPIT LAYOUT



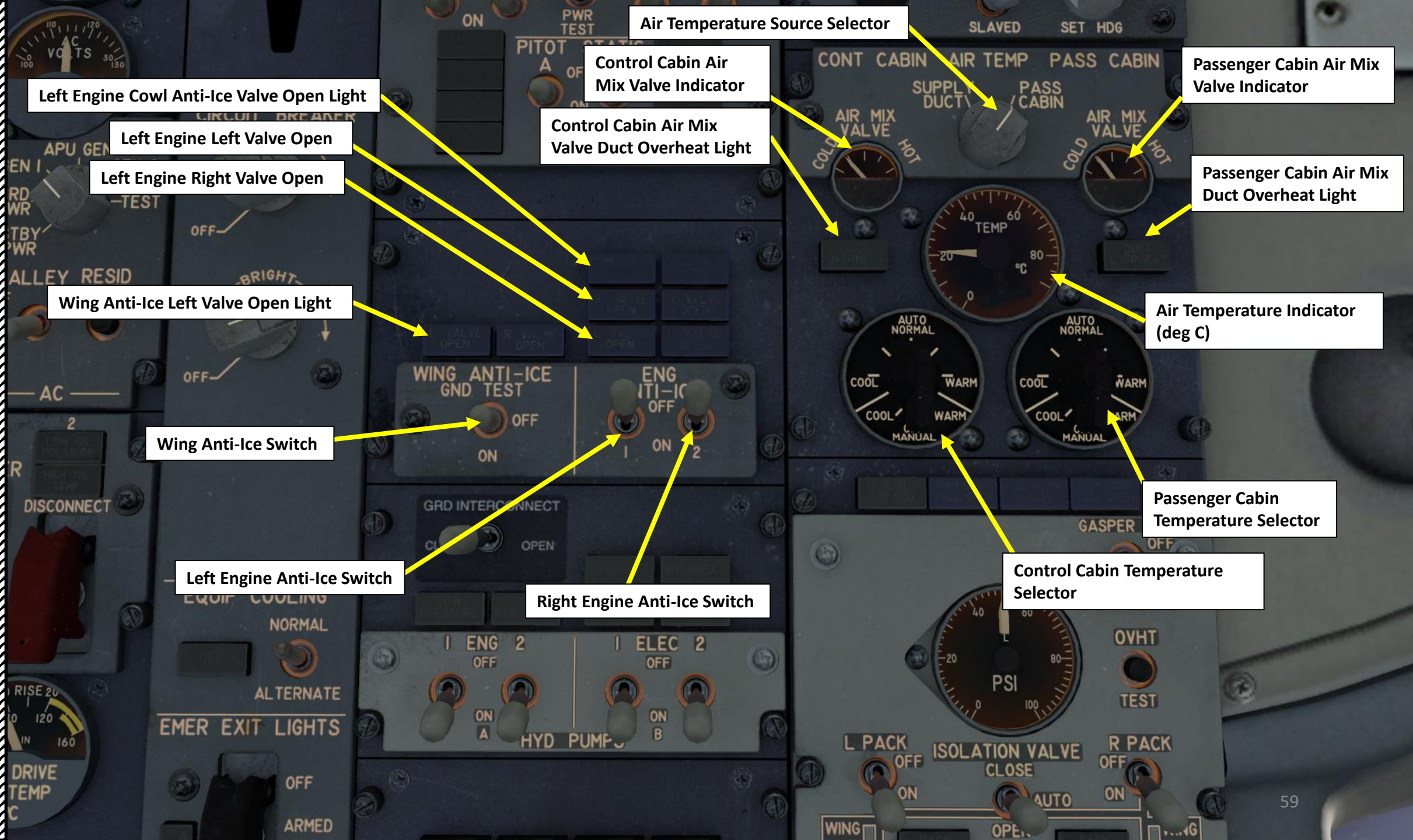

Left Generator Low Oil Pressure Light
Left Generator High Oil Temperature Light
Standby Power Off light
Right Generator Low Oil Pressure Light
Right Generator High Oil Temperature Light
Standby Power switch
Right Generator Drive Disconnect
Generator Drive Temperature Control Switch
Generator CSD (Constant Speed Drive) 1 & 2 Oil Temperature (deg C)
Compass Set Heading Control
Compass Synchronization Indicator
Compass Free/Slaved Switch
VHF Navigation Source Selector
Left Generator Drive Disconnect
Compass Source Selector
Vertical Gyro Source Selector
STANDBY POWER
DISCONNECT
BAT OFF AUTO
DRIVE TEMP
RISE
DRIVE CAN BE RECONNECTED ONLY ON GRD
GEN DRIVE OIL TEMP °C
CIRCUIT BREAKER
COMPASS
FREE
SET HDG
VHF NAV
VERTICAL GYRO
NORMAL
MACH TRIM
SPOILER
APU GEN

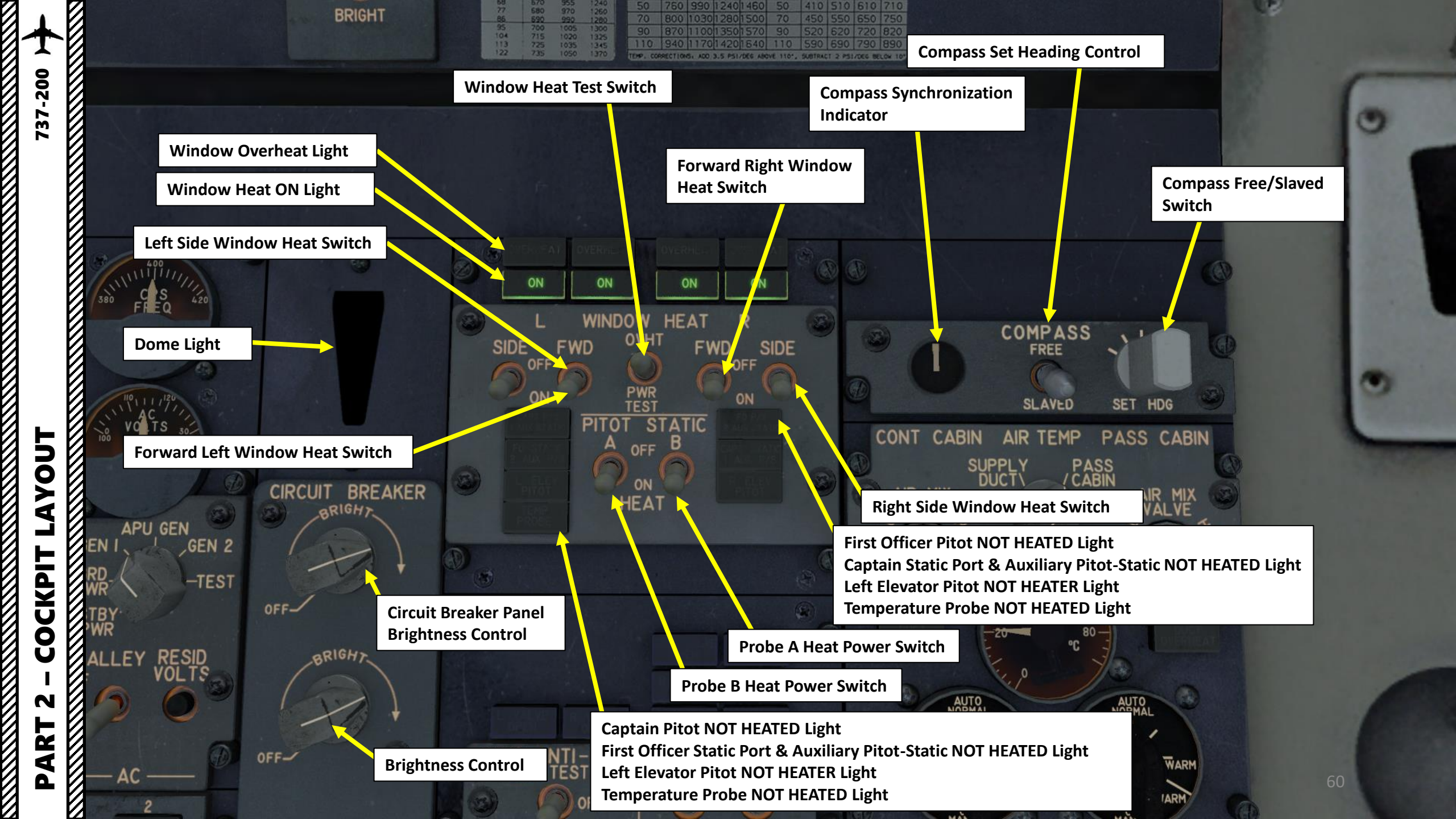

Electric Hydraulic Pump 2 (ACMP) Low Pressure Light
Electric Hydraulic Pump 2 (ACMP) Overheat Light
Electric Hydraulic Pump 1 (ACMP) Overheat Light
Electric Hydraulic Pump 1 (ACMP) Low Pressure Light
Hydraulic System Ground Interconnect Switch
Right EDP Hydraulic Pump Low Pressure Light
Left EDP Hydraulic Pump Low Pressure Light
Equipment Cooling Off Light
Equipment Cooling switch
Emergency Exit Lights Not Armed light
Emergency Exit Light switch
Electric Hydraulic Pump 2 (ACMP, AC Motor Pump) switch
Electric Hydraulic Pump 1 (ACMP, AC Motor Pump) switch
Hydraulic EDP 2 (Engine-Driven Pump) switch
Hydraulic EDP 1 (Engine-Driven Pump) switch
STANDBY POWER
DISCONNECT
BAT OFF AUTO
DRIVE TEMP
RISE
IN
DRIVE CAN BE RECONNECTED
EQUIP COOLING
NORMAL
ALTERNATE
EMER EXIT LIGHTS
OFF
ARMED
ON
NO SMOKING
FASTEN BELTS
OFF
AUTO
ON
GEN DRIVE OIL TEMP
BUS TRANSFER
I ENG 2
OFF
I ELEC 2
OFF
HYD PUMPS
MICROPHONE MONITOR
GRD INTERCONNECT
OPEN
SET HDG
BAT
ON
DC
AC

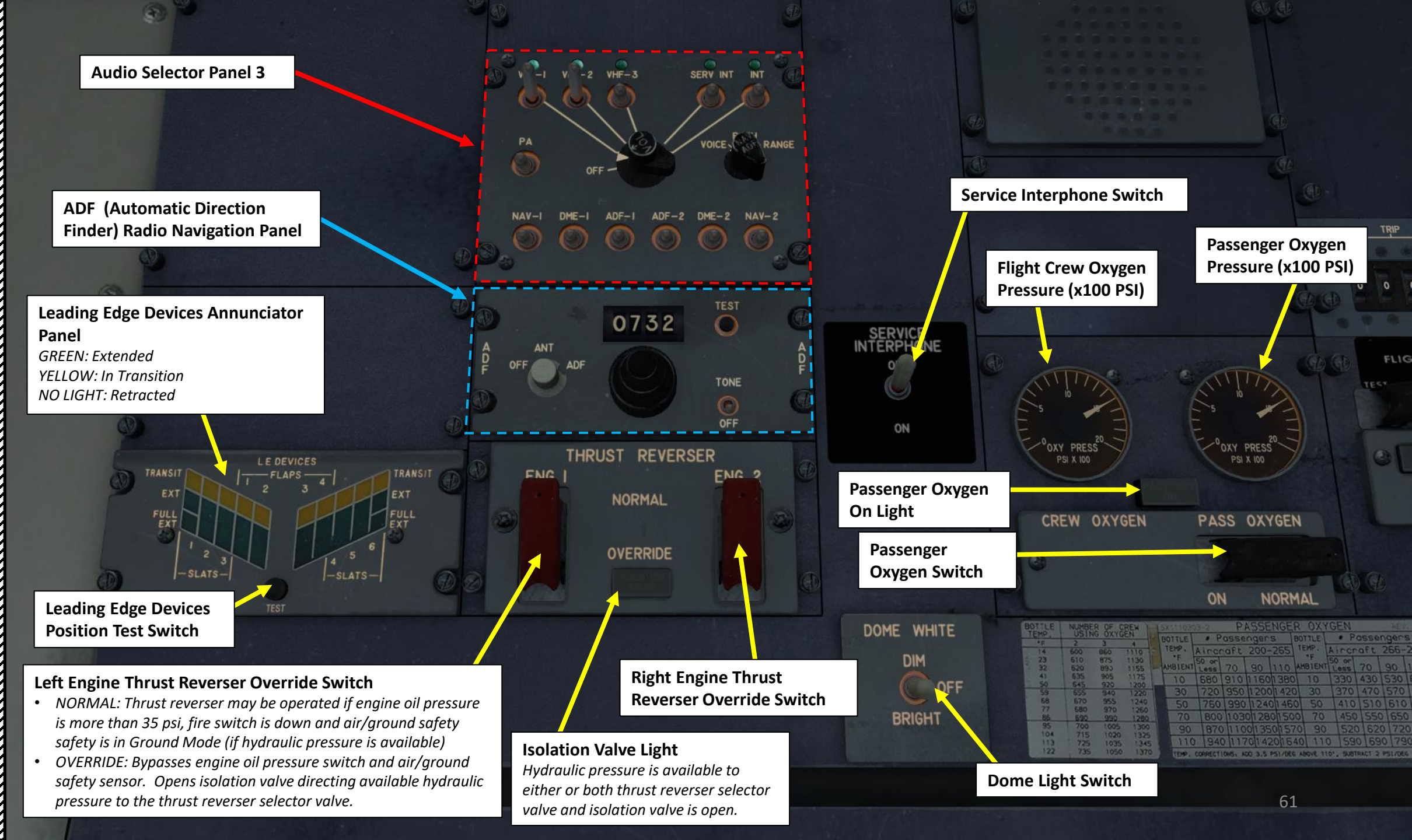

F Outflow Closed Light
Right Ram Door Full Open light
Gasper Fan Switch
Bleed Air Duct Manifold Pressure Indicator (PSI)
Wing-Body Overheat Test button
Dual Bleed light
Left Ram Door Full Open light
Isolation Valve Switch
Isolates left and right sides of bleed air duct
Right PACK (Pneumatic Air Conditioning Kit) switch
Right Wing Anti-Ice PACK trip off or failure light
Bleed Trip Reset Button
Right Wing-Body Overheat light
Right Bleed Trip Off light
APU Bleed Air Switch
Right Engine Bleed Air Switch
WING ANTI-ICE
GND TEST
OFF
ON
GRD INTERCONNECT
CLOSE
OPEN
1 ENG 2
OFF
1 ELEC 2
OFF
HYD PUMPS
AUTO
NORMAL
COOL
WARM
MANUAL
GASPER FAN
OFF
ON
PSI
OVHT
TEST
L PACK
R PACK
ISOLATION VALVE
CLOSE
OPEN
AUTO
WING ANTI ICE
TRIP
RESET
APU
BLEED
TEST
ERASE
HEADSET
MICROPHONE
MONITOR


FLT (Flight) CONTROL switches
FLT CONTROL Low Hydraulic Pressure lights
Standby Hydraulic Low Quantity light
Standby Hydraulic Low Pressure light
Alternate Flaps Master switch
Alternate Flaps Position switch
Feel Differential Pressure Light
Flight Spoiler switches
Mach Trim Failure Light
Mach Trim Test Switch
Yaw Damper Switch
Yaw Damper Light
Illuminates when Yaw Damper is Off
FLT CONTROL
A
B
STBY RUD
STANDBY HYD
ALTERNATE FLAPS
SPOILER
YAW DAMPER
MACH TRIM
TEST
OFF
ON
UP
ARM
DOWN
TR 1
TR 2
TR 3
BAT
BAT BUS
STBY PWR
APU GEN
GEN 1
GEN 2
GRD PWR
GALLEY
RESID VOLTS
STANDBY POWER
DISCONNECT
CIRCUIT BREAKER
BRIGHT
L WINDOW HEAT R
SIDE
FWD
OVHT
PWR TEST
PITOT STATIC
HEAT
WING ANTI-ICE
GND TEST
ENG ANTI-ICE
GRD INTERCONNECT


DC Ammeter
Frequency Meter
DC Voltmeter
AC Voltmeter
AC (Alternative Current) Meters Selector
DC (Direct Current) Meters Selector
Residual Volts Switch
Galley Power Switch
Battery (BAT) Switch
FLT CONTROL
STANDBY HYD
ALTERNATE FLAPS
SPOILER
YAW DAMPER
MACH TRIM
COMPASS
FREE
D.C. VOLTS
AC VOLTS
CIRCUIT BREAKER
WINDOW HEAT
PITOT STATIC
HEAT
TR 1
TR 2
TR 3
BAT BUS
STBY PWR
APU GEN
GEN 1
GEN 2
GRD PWR
GALLEY RESID VOLTS
DISCONNECT
GRD INTERCONNECT


Air Temperature Source Selector
Control Cabin Air Mix Valve Indicator
Passenger Cabin Air Mix Valve Indicator
Left Engine Cowl Anti-Ice Valve Open Light
Control Cabin Air Mix Valve Duct Overheat Light
Passenger Cabin Air Mix Duct Overheat Light
Left Engine Left Valve Open
Left Engine Right Valve Open
Air Temperature Indicator (deg C)
Wing Anti-Ice Left Valve Open Light
Passenger Cabin Temperature Selector
Wing Anti-Ice Switch
Control Cabin Temperature Selector
Left Engine Anti-Ice Switch
Right Engine Anti-Ice Switch
CONT CABIN AIR TEMP PASS CABIN
AIR MIX VALVE
TEMP
WING ANTI-ICE GND TEST
ENG ANTI-ICE
GRD INTERCONNECT
HYD PUMPS
EMER EXIT LIGHTS
ISOLATION VALVE
L PACK
R PACK
OVHT
PSI


Window Heat Test Switch
Compass Set Heading Control
Compass Synchronization Indicator
Window Overheat Light
Window Heat ON Light
Forward Right Window Heat Switch
Compass Free/Slaved Switch
Left Side Window Heat Switch
Dome Light
Forward Left Window Heat Switch
Right Side Window Heat Switch
First Officer Pitot NOT HEATED Light
Captain Static Port & Auxiliary Pitot-Static NOT HEATED Light
Left Elevator Pitot NOT HEATER Light
Temperature Probe NOT HEATED Light
Circuit Breaker Panel Brightness Control
Probe A Heat Power Switch
Probe B Heat Power Switch
Brightness Control
Captain Pitot NOT HEATED Light
First Officer Static Port & Auxiliary Pitot-Static NOT HEATED Light
Left Elevator Pitot NOT HEATER Light
Temperature Probe NOT HEATED Light
L WINDOW HEAT R
SIDE FWD OVHT FWD SIDE
PWR TEST
PITOT STATIC
A OFF B
ON HEAT
COMPASS
FREE
SLAVED
SET HDG
CONT CABIN AIR TEMP PASS CABIN
SUPPLY DUCT
PASS CABIN
CIRCUIT BREAKER
BRIGHT
OFF
APU GEN
GEN 2
TEST
TBY PWR
ALLEY RESID VOLTS
AC
AUTO NORMAL
WARM
ARM



Audio Selector Panel 3

ADF (Automatic Direction Finder) Radio Navigation Panel

Leading Edge Devices Annunciator Panel
GREEN: Extended
YELLOW: In Transition
NO LIGHT: Retracted

Leading Edge Devices Position Test Switch

Left Engine Thrust Reverser Override Switch
- *NORMAL: Thrust reverser may be operated if engine oil pressure is more than 35 psi, fire switch is down and air/ground safety safety is in Ground Mode (if hydraulic pressure is available)*
- *OVERRIDE: Bypasses engine oil pressure switch and air/ground safety sensor. Opens isolation valve directing available hydraulic pressure to the thrust reverser selector valve.*

Isolation Valve Light
Hydraulic pressure is available to either or both thrust reverser selector valve and isolation valve is open.

Right Engine Thrust Reverser Override Switch

Service Interphone Switch

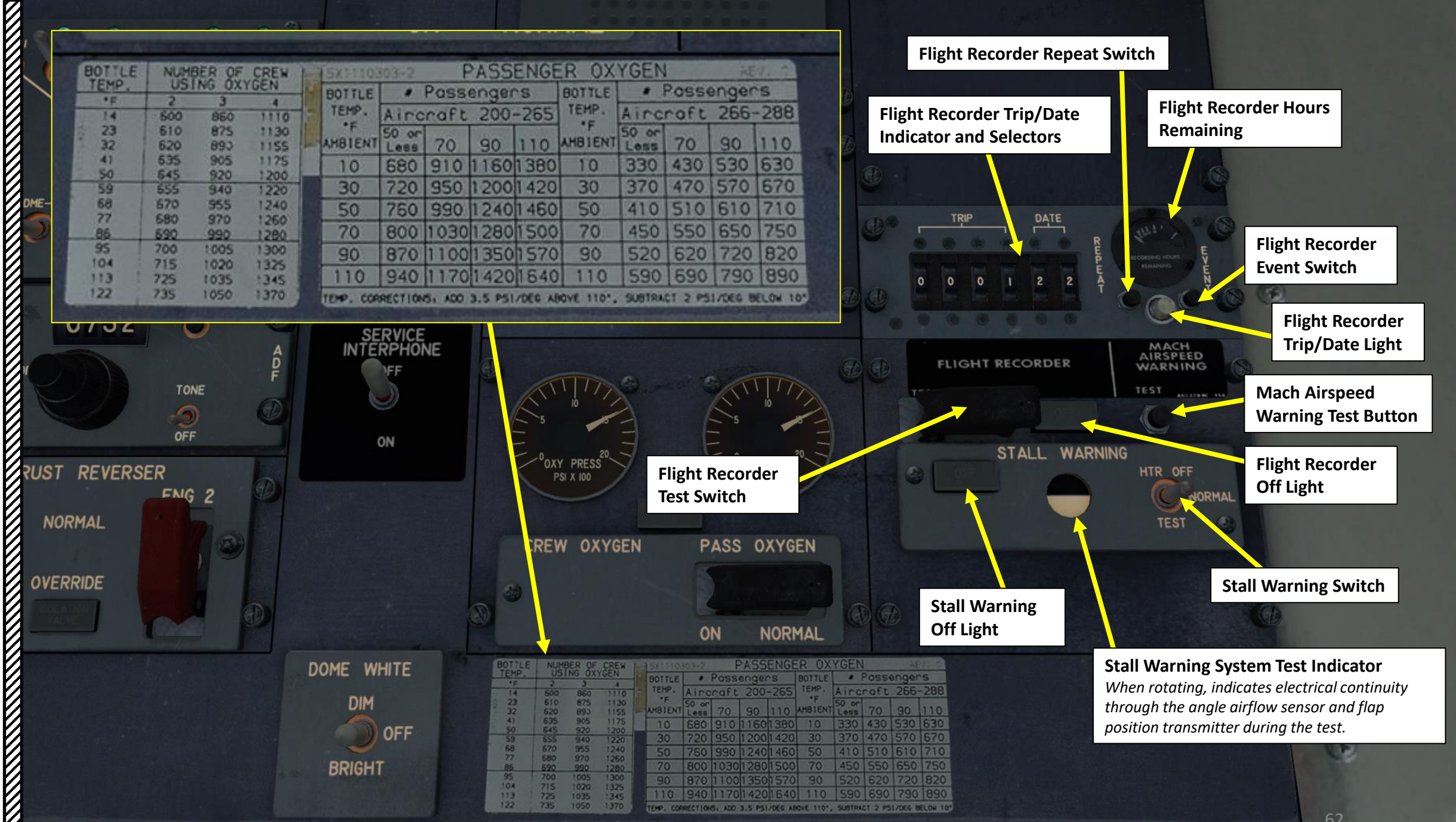
Flight Crew Oxygen Pressure (x100 PSI)

Passenger Oxygen Pressure (x100 PSI)

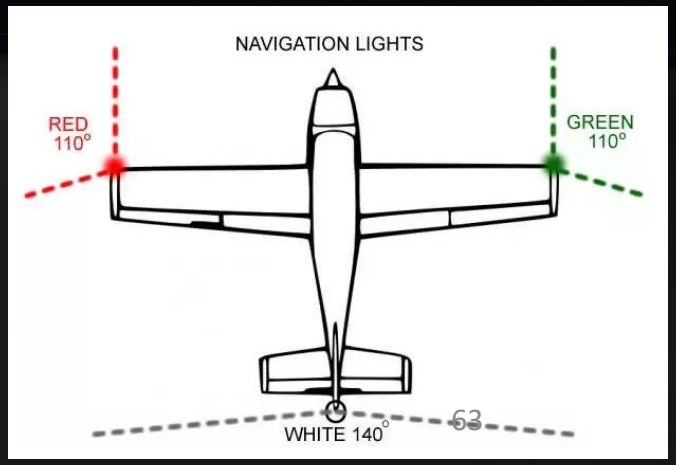
Passenger Oxygen On Light

Passenger Oxygen Switch

Dome Light Switch


PASSENGER OXYGEN
BOTTLE TEMP. °F AMBIENT
Passengers Aircraft 200-265
50 or Less
70
90
110
Passengers Aircraft 266-288
10 680 910 1160 1380 330 430 530 630
30 720 950 1200 1420 370 470 570 670
50 760 990 1240 1460 410 510 610 710
70 800 1030 1280 1500 450 550 650 750
90 870 1100 1350 1570 520 620 720 820
110 940 1170 1420 1640 590 690 790 890
TEMP. CORRECTIONS: ADD 3.5 PSI/DEG ABOVE 110°, SUBTRACT 2 PSI/DEG BELOW 10°
NUMBER OF CREW USING OXYGEN
2 3 4
14 600 860 1110
23 610 875 1130
32 620 890 1155
41 635 905 1175
50 645 920 1200
59 655 940 1220
68 670 955 1240
77 680 970 1260
86 690 990 1280
95 700 1005 1300
104 715 1020 1325
113 725 1035 1345
122 735 1050 1370
TRIP
DATE
0 0 0 1 2 2
REPEAT
EVENT
FLIGHT RECORDER
MACH AIRSPEED WARNING
TEST
SERVICE INTERPHONE
OFF
ON
TONE
OFF
ADF
OXY PRESS PSI X 100
STALL WARNING
HTR OFF
NORMAL
TEST
CREW OXYGEN
PASS OXYGEN
ON
NORMAL
RUST REVERSER
ENG 2
NORMAL
OVERRIDE
DOME WHITE
DIM
OFF
BRIGHT
Flight Recorder Repeat Switch
Flight Recorder Trip/Date Indicator and Selectors
Flight Recorder Hours Remaining
Flight Recorder Event Switch
Flight Recorder Trip/Date Light
Mach Airspeed Warning Test Button
Flight Recorder Test Switch
Flight Recorder Off Light
Stall Warning Switch
Stall Warning Off Light
Stall Warning System Test Indicator
When rotating, indicates electrical continuity through the angle airflow sensor and flap position transmitter during the test.

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




Strobe Light (Flashing White)
Navigation Light (Green)
Rear Navigation (White) Light
Logo Light
Wing Light
Rear Navigation (White) Light
Strobe Light (Flashing White)
Navigation Light (Red)
Strobe Light (Flashing White)


American
Runway Turnoff Light
Nosewheel Taxi Light

PLANNING THE FLIGHT

In real life, you cannot just fly a 737 wherever and whenever you please. Just like on land, the sky is littered with an intricate network of waypoints and aerial highways. Therefore, it is necessary to plan your flight route and to determine how much fuel you will need to carry in order to reach your destination.

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

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

Airways:

CYYZ DCT **SIKBO** Q140 **HANKK** Q935 **PONCT** STAR **KBOS**

Provided by RouteFinder

METAR:

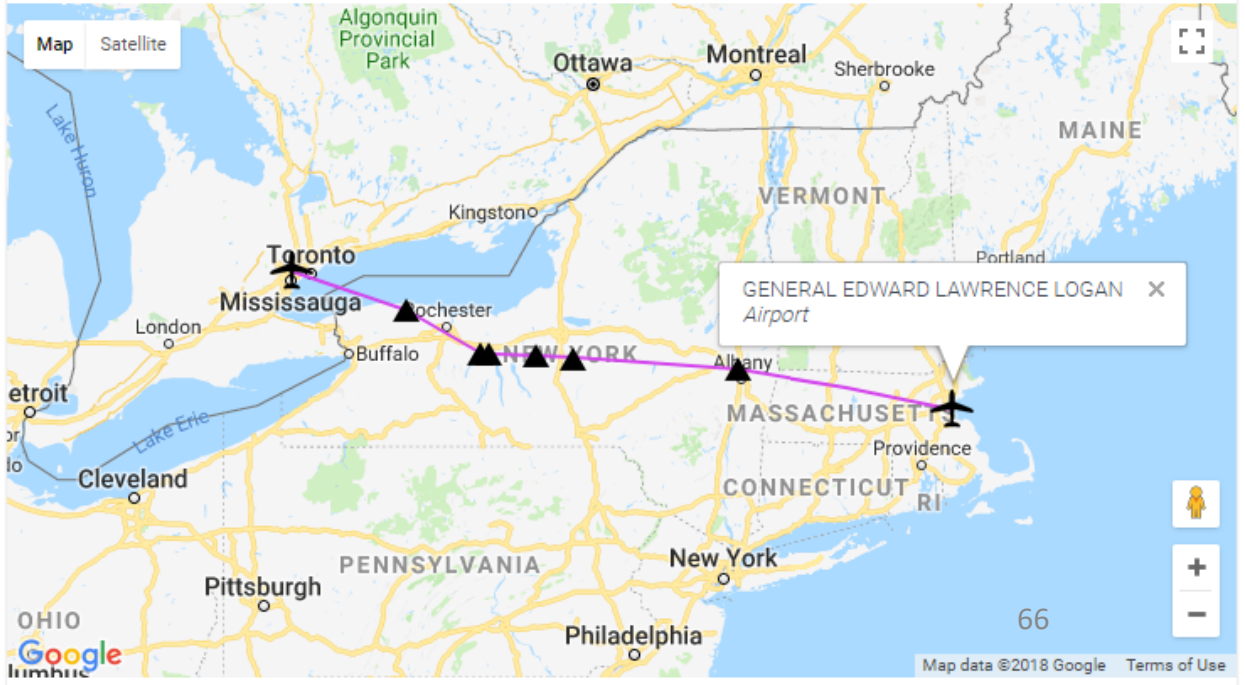
Departure: CYYZ 200200Z 16006KT 6SM BR BKN003 BKN045 13/11 A2983 RMK ST5SC2 SLP104 DENSITY ALT 600FT
Destination: KBOS 200254Z 00000KT 1 1/2SM BR OVC007 12/11 A3008 RMK AO2 SFC VIS 3 RAB0155E32 SLP184 P0001 60003 T01220111 58019

Provided by CheckWX API

Fuel quantity for Boeing 737-200

	Fuel	Time
Fuel Usage	7127 lbs	01:19
Reserve Fuel	6730 lbs	01:15
Fuel on Board	13857 lbs	02:34

Provided by Fuelplanner.com

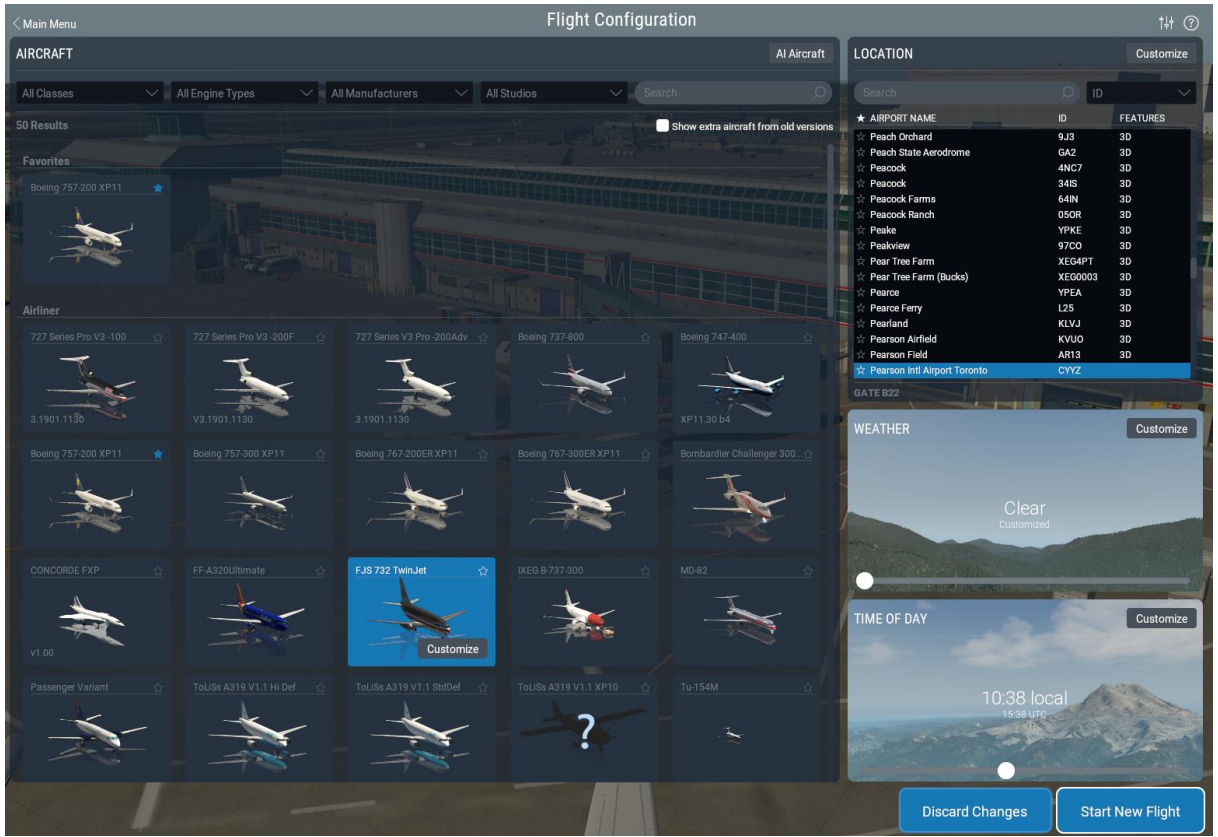


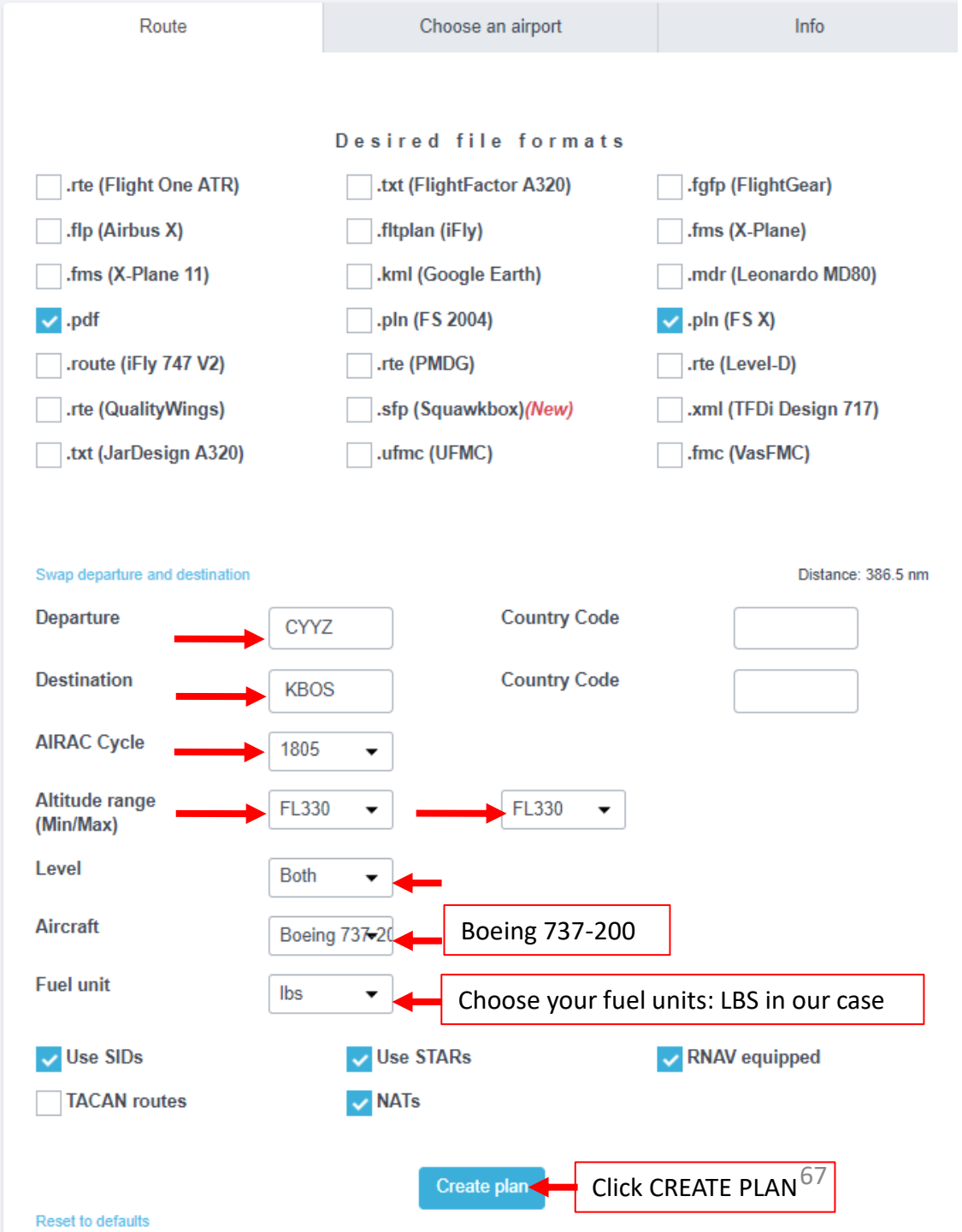
PLANNING THE FLIGHT

Today's flight will start from **TORONTO / LESTER B. PEARSON INTERNATIONAL AIRPORT (CYYZ)** and our destination will be **BOSTON LOGAN INTERNATIONAL AIRPORT (KBOS).**

Using the "Online Flight Planner" available here: http://onlineflightplanner.org/ we will enter the Departure airport (CYYZ), the Destination airport (KBOS) and the AIRAC Cycle desired (we will use the **AIRAC cycle 1805** 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. For the purpose of this tutorial, we will use AIRAC cycle 1805 since I'm writing this tutorial in early May, 2018 (period **05)** 20**18** (AIRAC cycle **1805**).

This is not ideal since some navigation aids may be out of date, but for the Boeing 737 it will not be that big of a deal since the old 737 variant we have does not have a modern FMS (Flight Management System) installed like the ones on the upgraded/modernized 737s. We will rely on the waypoint coordinates and plug them in the CIVA and we will track VOR beacons for departure and arrival routes.

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.)

Modern FMS installed on a 737-800WL

PLANNING THE FLIGHT

FLIGHT ROUTE

The flight route we could take from onlineflightplanner.com is:
CYYZ DCT **SIKBO** Q140 **HANKK** Q935 **PONCT** STAR **KBOS**

Write this route down!

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

- Depart from Toronto Lester B. Pearson Airport (CYYZ)
- Fly Directly to (DCT) SIKBO VOR or follow a SID (Standard Instrument Departure) route from CYYZ to SIKBO
- Navigate to SIKBO VOR
- Follow Q140 Airway
- Navigate to HANKK VOR
- Follow Q935 Airway
- Navigate to PONCT VOR
- Follow the STAR (Standard Terminal Arrival Route) from PONCT to KBOS
- Land at Boston Logan International Airport (KBOS)

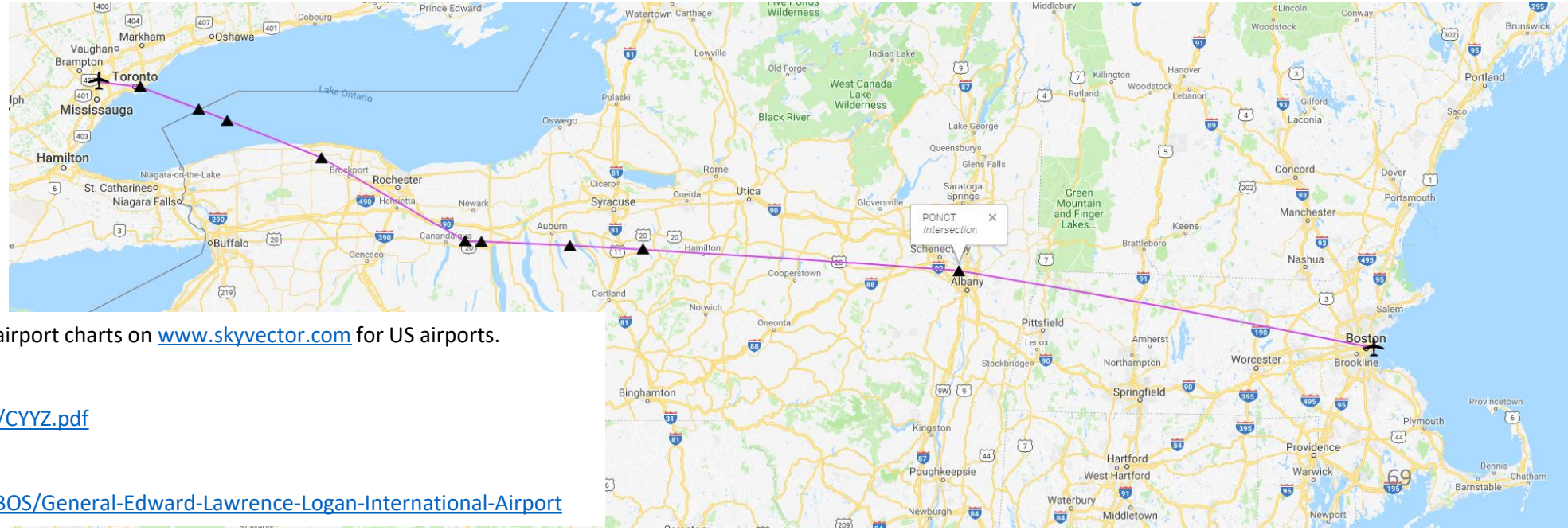
Lester B. Pearson International Airport (CYYZ) ⇒ General Edward Lawrence Logan International Airport (KBOS)

ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
CYYZ	-	0	0	N43°40'36.18"	W079°37'50.36"	LESTER B. PEARSON INTL
SIKBO	-	101	12	N43°39'13.00"	W079°20'57.00"	SIKBO
RAGIX	-	116	18	N43°32'37.78"	W078°57'26.89"	RAGIX
MEDAV	-	116	9	N43°29'19.00"	W078°45'46.00"	MEDAV
AHPAH	-	116	30	N43°18'19.00"	W078°07'35.11"	AHPAH
HANKK	-	124	49	N42°53'41.82"	W077°09'15.21"	HANKK
JOSSY	-	97	5	N42°53'29.93"	W077°02'36.80"	JOSSY
AUDIL	-	97	26	N42°52'18.74"	W076°26'35.07"	AUDIL
FABEN	-	97	22	N42°51'12.04"	W075°57'07.91"	FABEN
PONCT	-	98	94	N42°44'48.83"	W073°48'48.07"	PONCT
KBOS	-	105	126	N42°21'46.60"	W071°00'23.00"	GENERAL EDWARD LAWRENCE LOGAN

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

11 fixes, 391 nm.

Airways:
CYYZ *DCT* ***SIKBO*** *Q140* ***HANKK*** *Q935* ***PONCT*** *STAR* ***KBOS***



Keep in mind that you can find airport charts on www.skyvector.com for US airports.

CYYZ:
http://www.fly-sea.com/charts/CYYZ.pdf

KBOS:
https://skyvector.com/airport/BOS/General-Edward-Lawrence-Logan-International-Airport

PLANNING THE FLIGHT

FUEL PLANNING

For a flight of approx. **2.5 hours for a flight distance of approx. 400 nm**, fuel planning can be estimated by using http://onlineflightplanner.org/ or by using the Fuel Planning charts from X-Plane forum user Oculus_Rift.

The OnlineFlightPlanner fuel estimate gives us about 14000 lbs of fuel for a 2.5 hour flight, while the fuel planning chart Oculus_Rift gives us a less conservative estimate of approx. 12,700 lbs of fuel for a flight distance of approx. 400 nm.

Source for Fuel Planning Charts:

Boeing 737-200 Quick Reference chart:
https://forums.x-plane.org/applications/core/interface/file/attachment.php?id=340908

Boeing 737-200 WINAIR Pilot Handbook Fuel Planning chart:
https://forums.x-plane.org/applications/core/interface/file/attachment.php?id=338617

Forum Post:
https://forums.x-plane.org/index.php?/forums/topic/150639-simple-fuel-planning-chart/

To keep things simple, we'll take the more conservative estimate and go with **14,000** lbs of fuel. Write that number down, we'll need it later.

Write this fuel weight down!

Fuel estimate from Online Flight Planner

Fuel quantity for Boeing 737-200

	Fuel	Time
Fuel Usage	7127 lbs	01:19
Reserve Fuel	6730 lbs	01:15
Fuel on Board	13857 lbs	02:34

Fuel Planning Chart: 737-200
Oculus_Rift Quick Reference Chart

Quick Reference Flight Plan Fuel Data737-200 / JT8D-15A / LBS

Flight Distance (nm)	Flight Burn Off (1000 LBS)	Min. Takeoff Fuel (1000 LBS)	Initial FL	Final FL	ETE (hrs)
200	3.9	9.9	290	290	0.60
300	5.1	11.1	350	350	0.90
400	6.2	12.2	350	350	1.10
500	7.4	13.4	350	350	1.30
600	8.6	14.6	350	350	1.60
700	9.8	15.8	350	350	1.80
800	11.0	17.0	330	350	2.00
900	12.2	18.2	330	350	2.30
1000	13.4	19.4	330	350	2.50
1100	14.7	20.7	330	350	2.70
1200	15.9	21.9	330	350	3.00
1300	17.2	23.2	330	350	3.20
1400	18.5	24.5	330	350	3.40
1500	19.8	25.8	330	350	3.70
1600	21.1	27.1	310	350	3.90
1700	22.4	28.4	310	350	4.10
1800	23.8	29.8	310	350	4.40
1900	25.1	31.1	310	350	4.60
2000	26.5	32.5	310	350	4.80
2100	27.9	33.9	310	350	5.00

Assumptions:
Climb 250/300/M.74
Cruise M.74
Descent M.74/300/250
Empty Wt = 67330 LBS
Payload = 20000 LBS
Reserve Fuel = 6000 LBS
Landing Wt = 93300 LBS
NOT TO BE USED FOR REAL WORLD OPERATIONS

Fuel estimate from Oculus_Rift Chart
(12,200 lbs min Takeoff fuel) + (500 lbs for 10-15 min taxi-out fuel)
= 12,700 lbs

PLANNING THE FLIGHT

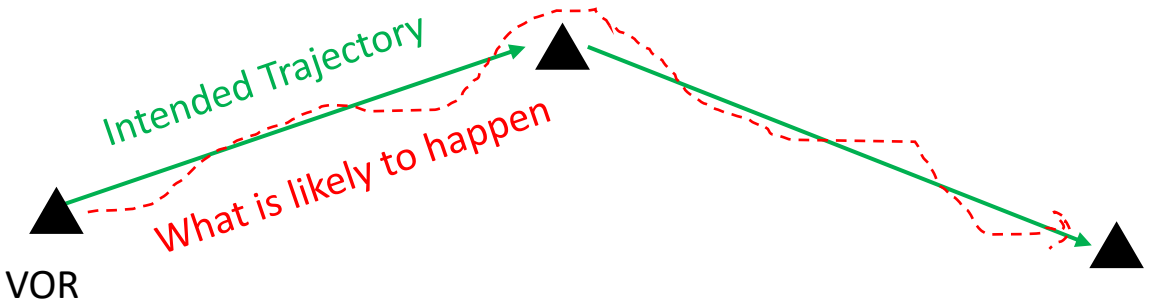
FLIGHT ROUTE – PECULIARITIES OF THE BOEING 737-200 OR WHAT DOES "SLANT ALPHA" MEAN?

Our flight plan is:
CYYZ DCT **SIKBO** Q140 **HANKK** Q935 **PONCT** STAR **KBOS**

However, back in the 1960's the network of navigation aids wasn't as elaborate as it is today. Nowadays, you can plug in the "PONCT" waypoint in the flight management system and the flight computer will know what kind of navigation aid it is, where it is and where you are in relationship to it… but back In the "good old days", airliners would fly from VOR beacon to VOR beacon, which gave trajectories that were approximative at best. This is why we will disregard Airways in this flight, which will not really help us since the 737 has no way to see anything else than basic navigation beacons.

This brings us to the term "**Slant Alpha**". You may hear that term in some Youtube tutorials, read about it in flight simulation forums or even air traffic controllers when they are asking what aircraft category a pilot is flying. In simple terms, "Slant Alpha" means that your aircraft only has a transponder mode C and DME (Distance Measuring Equipment) like VOR (VHF Omnidirectional Range). So, no fancy GPS tracking for you. You will have to navigate using VORs and the CIVA INS (Delco Carousel IV-A Inertial Navigation System), which will allow you to plug in waypoint coordinates but accumulates drift error over time, which can make precision flying for terminal navigation close to impossible.

Therefore, in order to have the "complete 737 experience", this tutorial will show you how to track VORs (mainly those used for our SIDs and STARs) and also how to track waypoints entered in the CIVA.



Glossary for Navigation/Communication Equipment

/X No transponder
/T Transponder with no Mode C
/U Transponder with Mode C
DME
/D No transponder
/B Transponder with no Mode C
/A Transponder with Mode C
TACAN only
/M No transponder
/N Transponder with no Mode C
/P Transponder with Mode C
Area navigation (RNAV with LORAN, VOR/DME, or INS)
/Y No transponder
/C Transponder with no Mode C
/I Transponder with Mode C
Advanced RNAV with transponder and Mode C
/E Flight Management System (FMS) with DME/DME and IRU positioning update
/F FMS with DME/DME position updating
/G Global Navigation Satellite System (GNSS)
/R Required Navigational Performance (RNP)
Reduced Vertical Separation Minimum (RVSM)
/J /E with RVSM
/K /F with RVSM
/L /G with RVSM
/Q /R with RVSM
/W RVSM

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

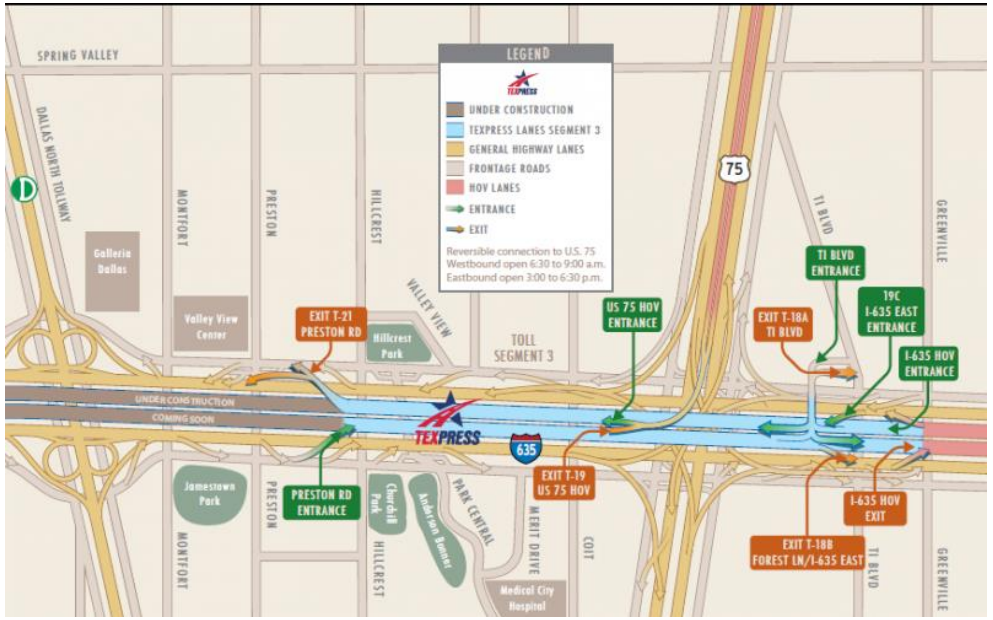
A **SID** (Standard Instrument Departure) is a small initial route which leads an aircraft from the runway they've just taken off from to the first point in his/her intended route. An airport usually has a lot of aircraft departing from it's runways. To save confusion (and for safety), a busy airport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

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.

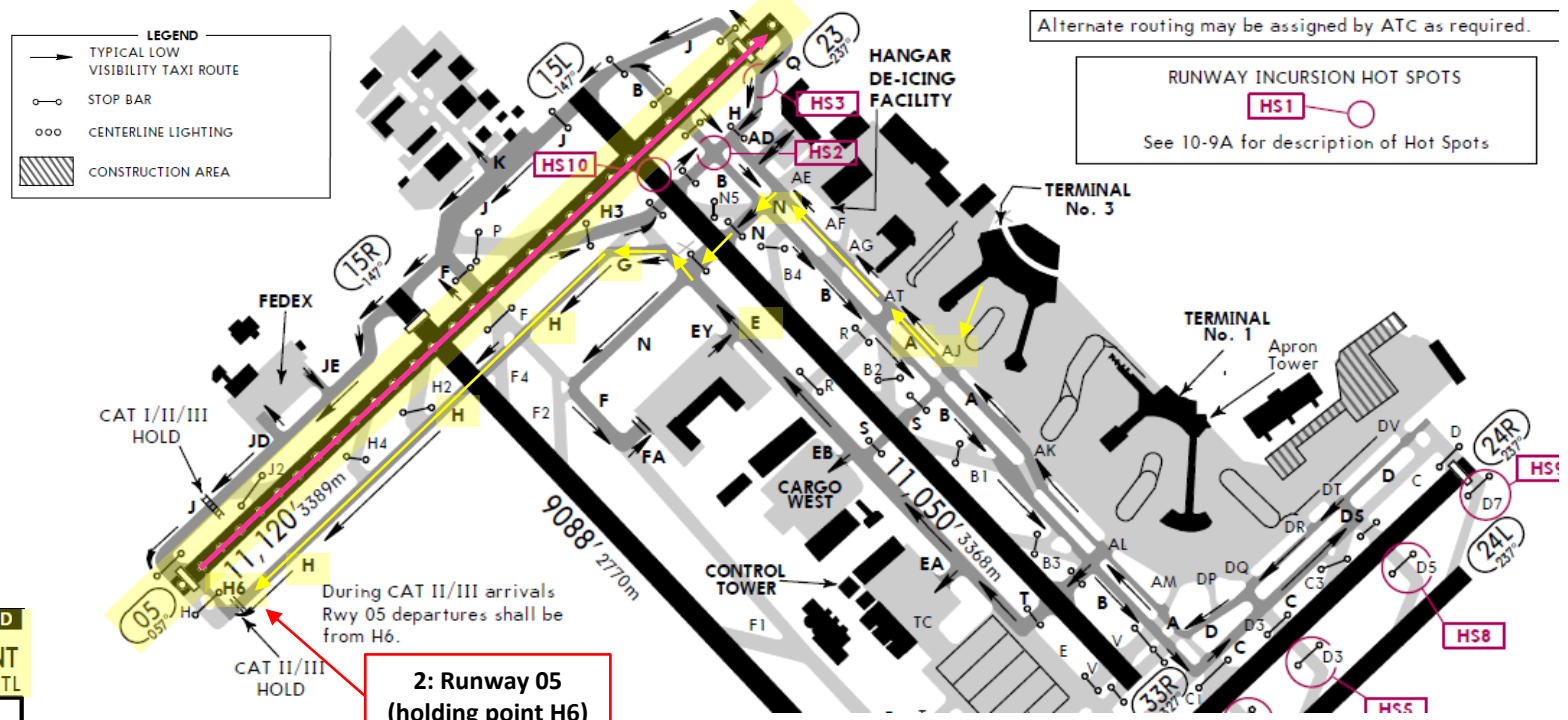
Typically, SIDs and STARs are provided by the ATC (Air Traffic Controller). Since we're doing a tutorial, I will just give you the SID and STAR that we'll use.

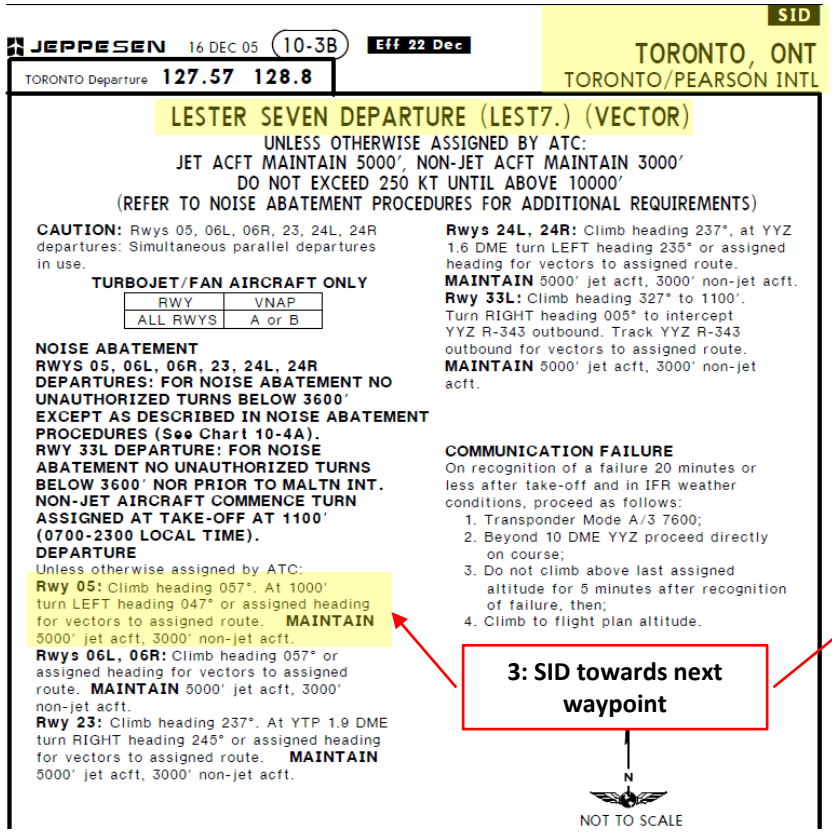


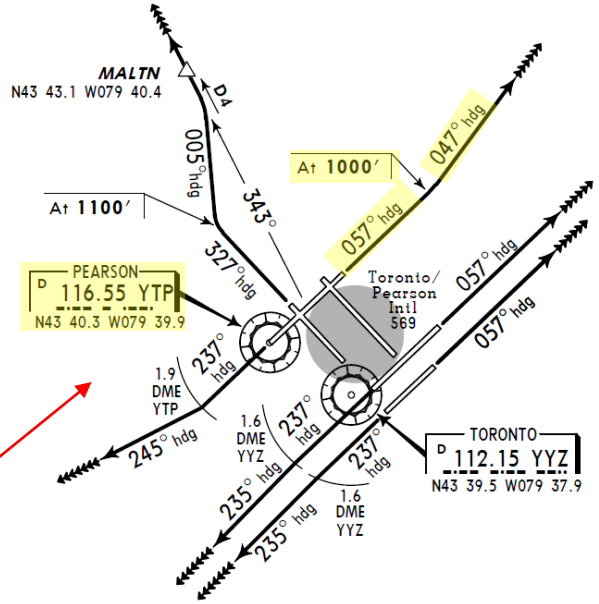
PLANNING THE DEPARTURE - SID

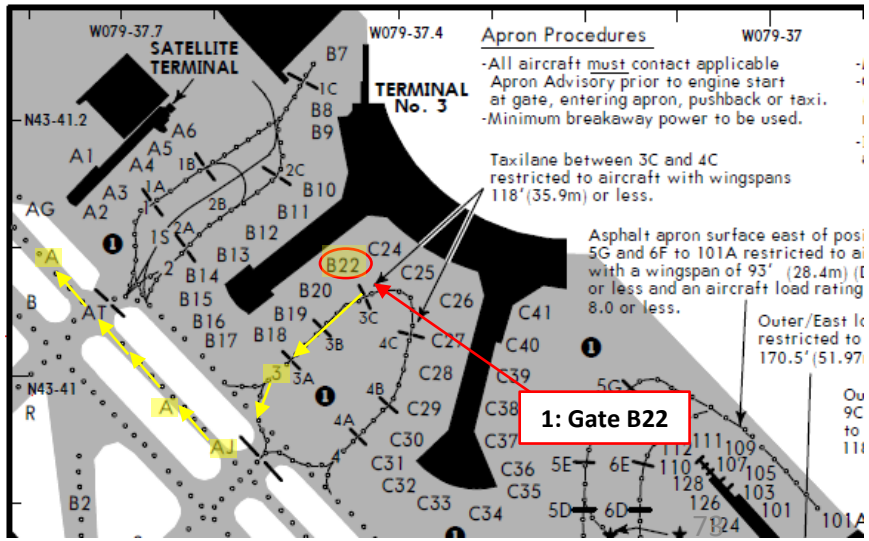
These charts are for the SID (Standard Instrument Departure) from Toronto Pearson (CYYZ). We intend to:

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 LESTER SEVEN SID from CYYZ. We will fly to a 057 heading until we reach 1000 ft, then we will steer to a 047 heading to a target altitude of 5000 ft (FL050). We will use the PEARSON (YTP) VOR as a reference navigation aid.
4. After that, we will climb to a cruising altitude of 33,000 ft





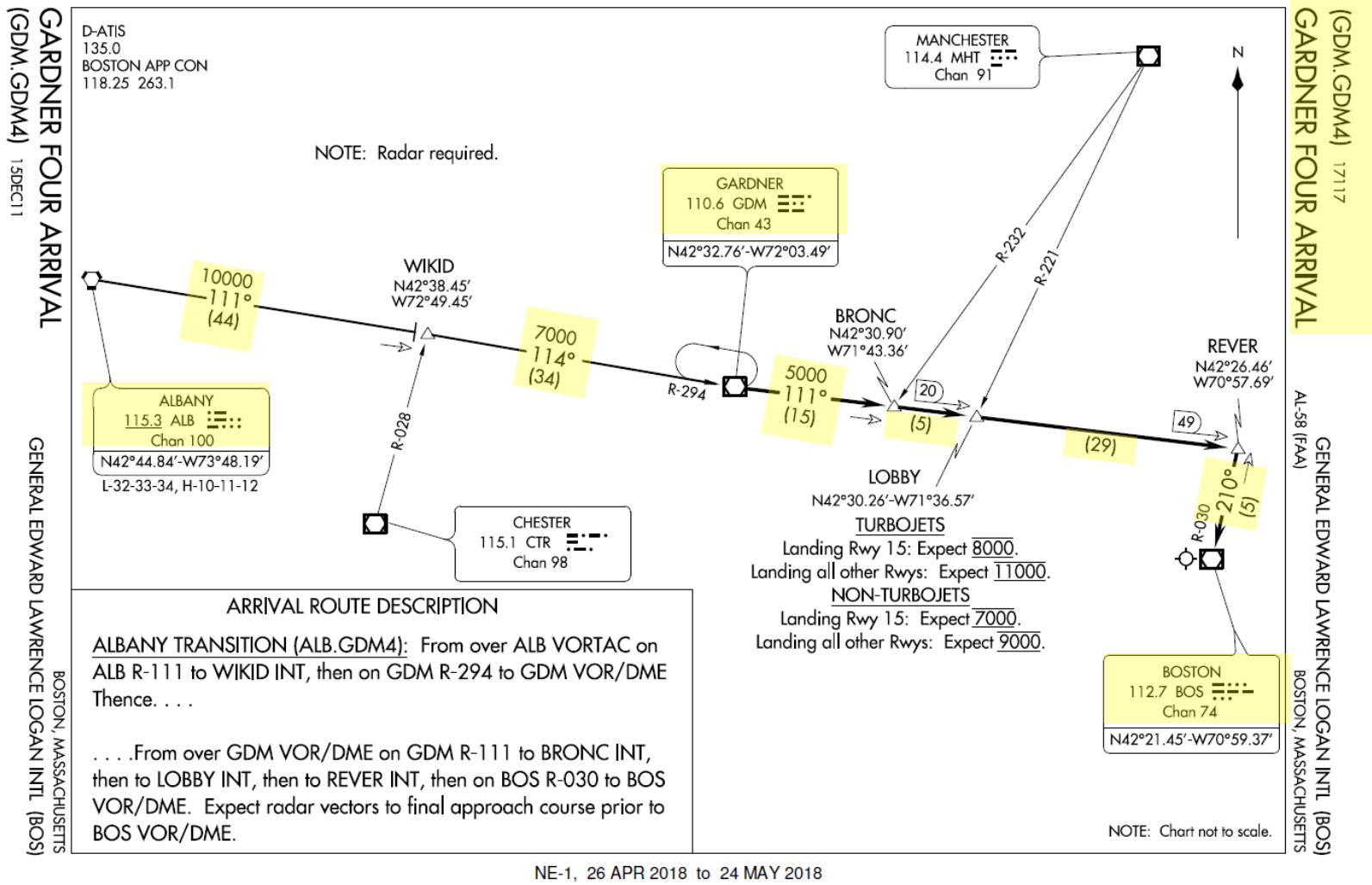


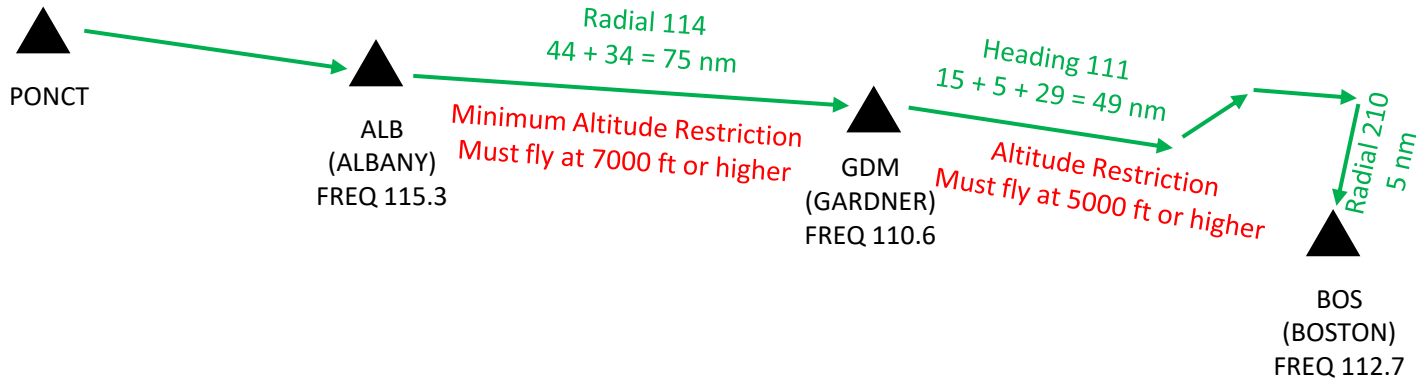


PLANNING THE APPROACH - STAR

These charts are for the STAR (Standard Terminal Arrival Route) from PONCT to Boston Logan International Airport (KBOS). This STAR is a little complicated for those not used to land by tracking VORs, so we will simplify it a little. We intend to:

1. Come from PONCT waypoint
2. Fly from PONCT towards the GARDNER FOUR arrival route via PONCT -> ALB.
3. Follow the STAR (ALB -> GDM -> BOS)
4. Follow the approach towards the runway, guided by the KBOS airport's ILS (Instrument Landing System).
5. Land at Boston (KBOS) on **runway 22L** (orientation: 215 Left)

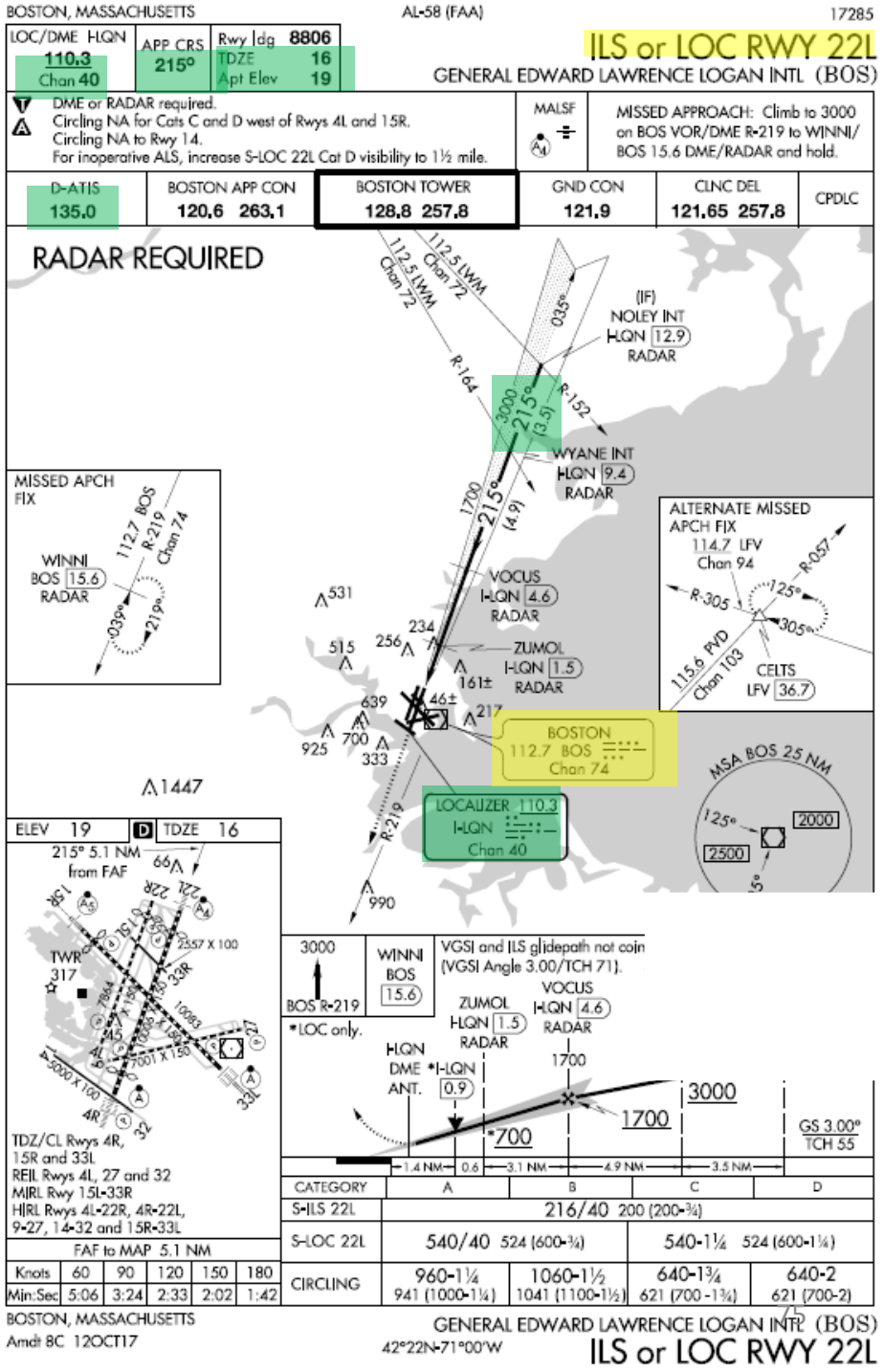




PLANNING THE APPROACH - ILS

These charts are for the ILS approach to Runway 22L for Boston Logan International Airport (KBOS). We intend to:

1. Follow the approach towards the runway, guided by the KBOS airport's ILS (Instrument Landing System) localizer (Freq 110.3) and by the BOSTON VOR (Freq 112.7).
2. Land at Boston (KBOS) on **runway 22L** (orientation: 215 Left)



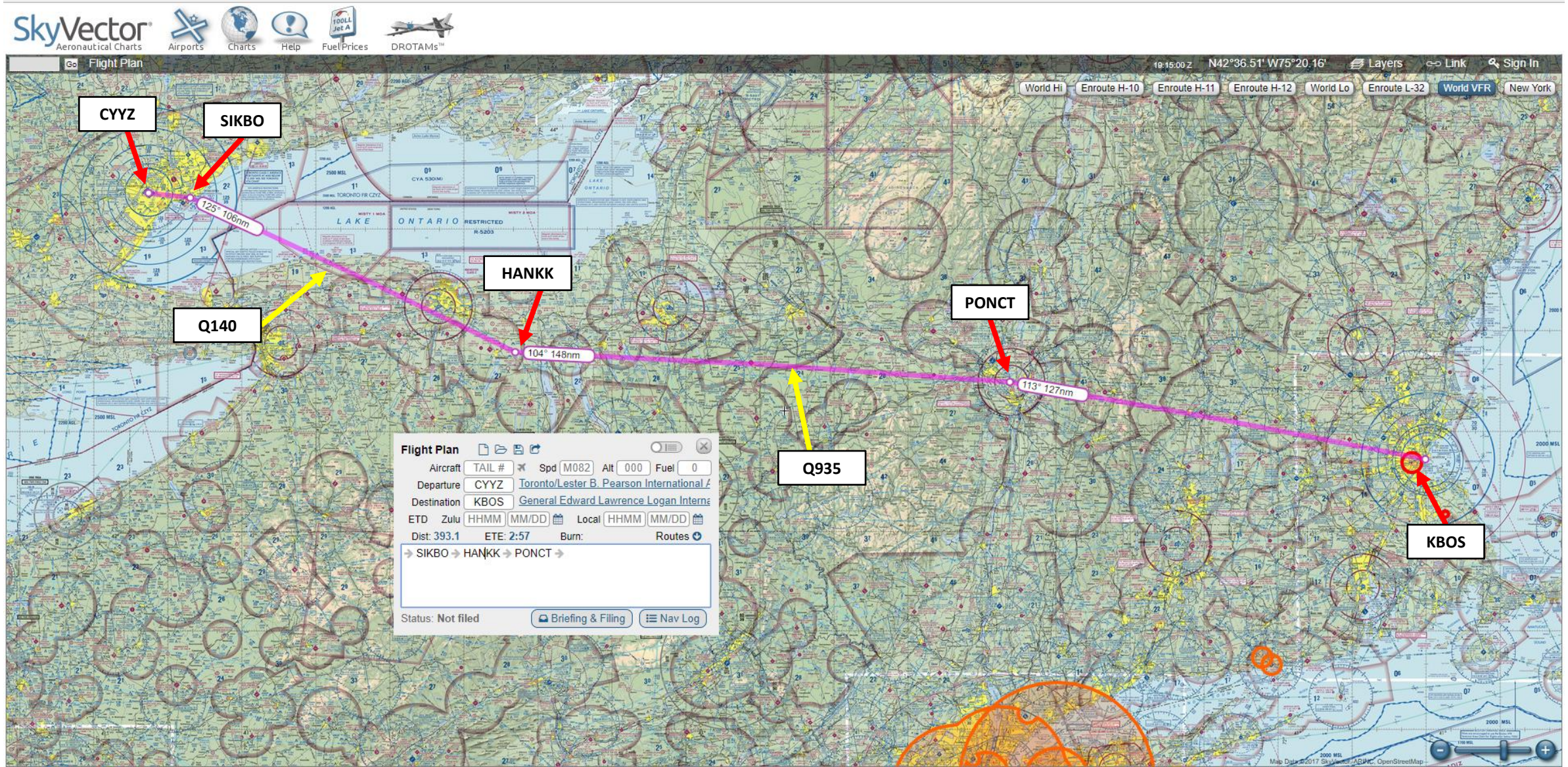
PLANNING THE FLIGHT - SUMMARY

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

SKY VECTOR
https://skyvector.com/

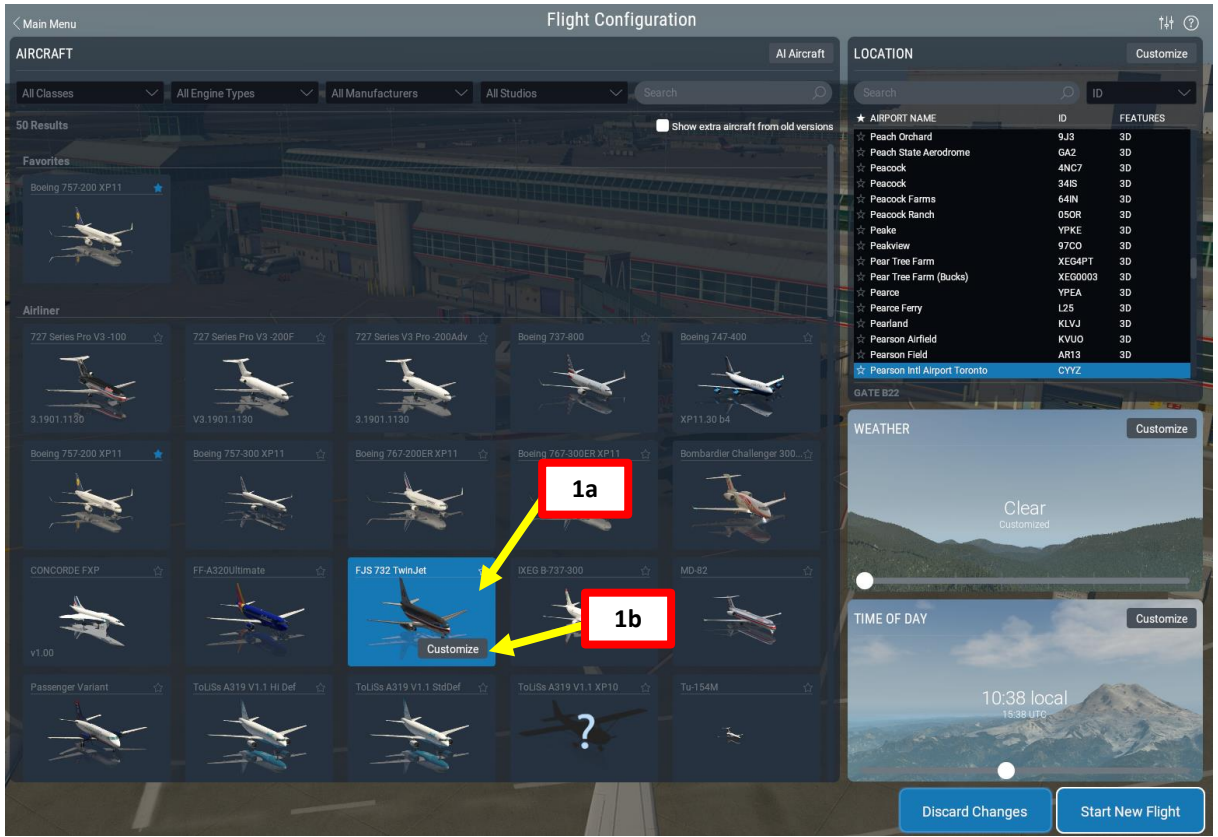
CYYZ DCT **SIKBO** Q140 **HANKK** Q935 **PONCT** STAR **KBOS**

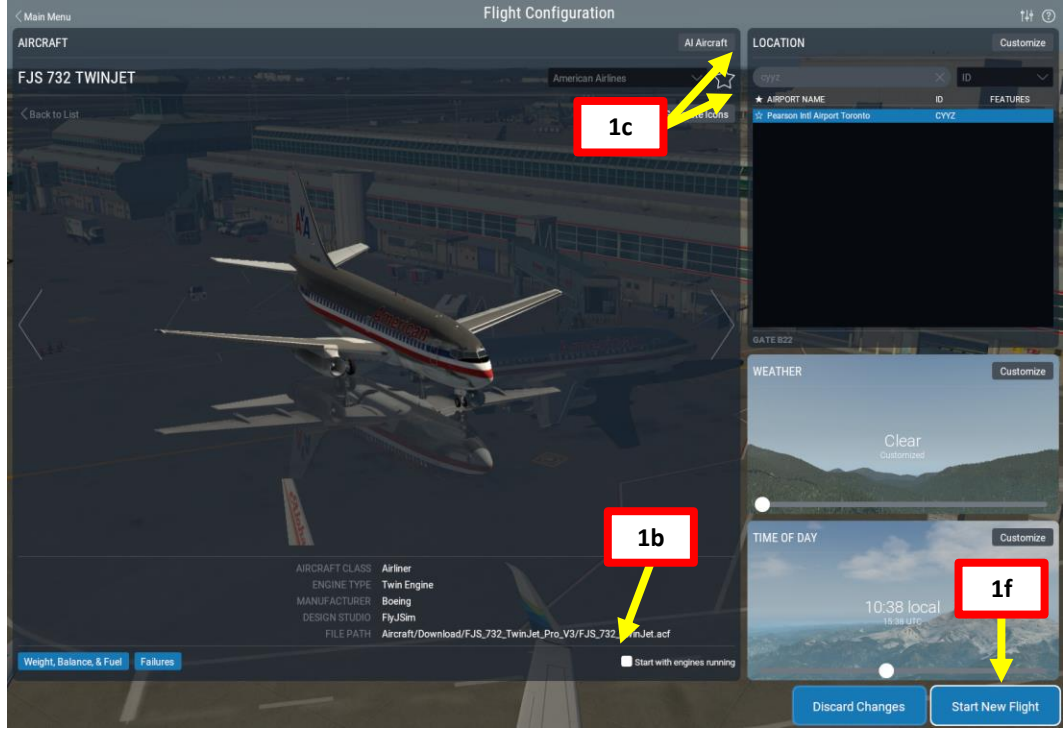
TOTAL FUEL: 14,000 lbs

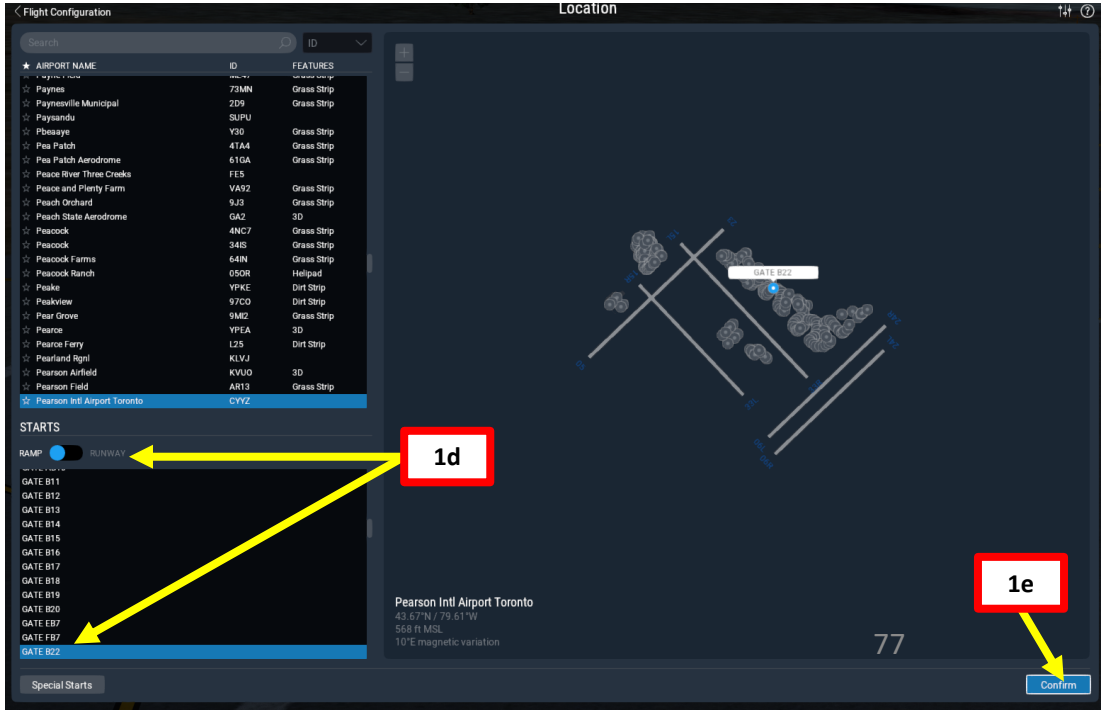


SPAWN IN COLD & DARK STATE

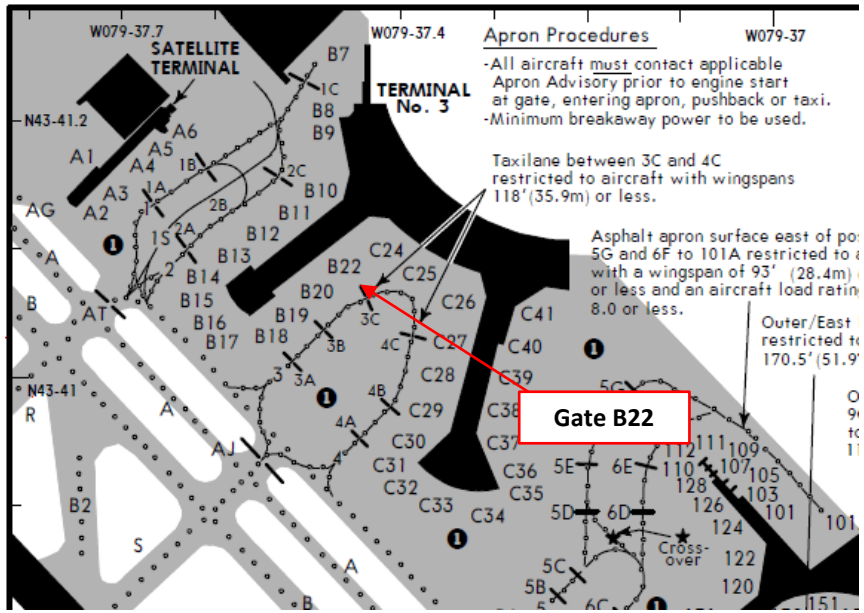
1. Spawn like you normally would at Gate 22 in CYYZ (departure airport) in the Boeing 737-200.
    a) Select the 737-200 (FJS 732 Twinjet)
    b) Click CUSTOMIZE and make sure the “Start with engines running” checkbox is not ticked.
    c) In the LOCATION menu, type CYYZ and click on Pearson Intl Airport Toronto.
    d) Click on LOCATION – CUSTOMIZE sub-menu, set the STARTS option to RAMP and select Gate B22.
    e) Click CONFIRM
    f) Click START FLIGHT

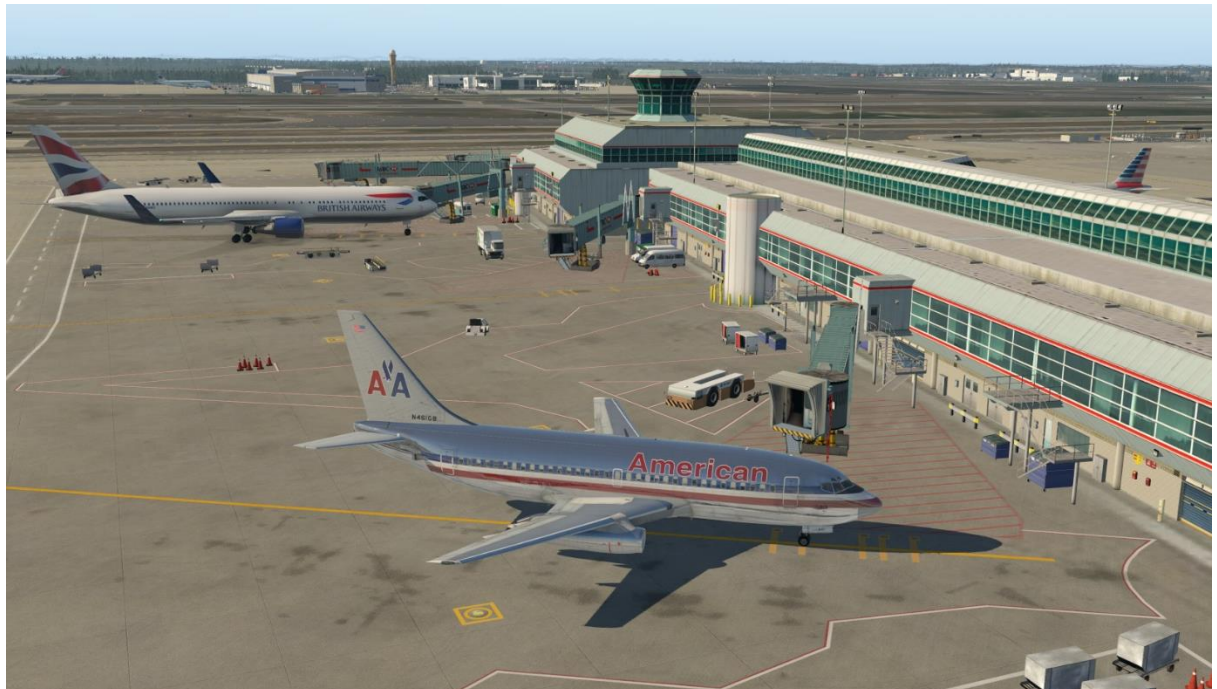




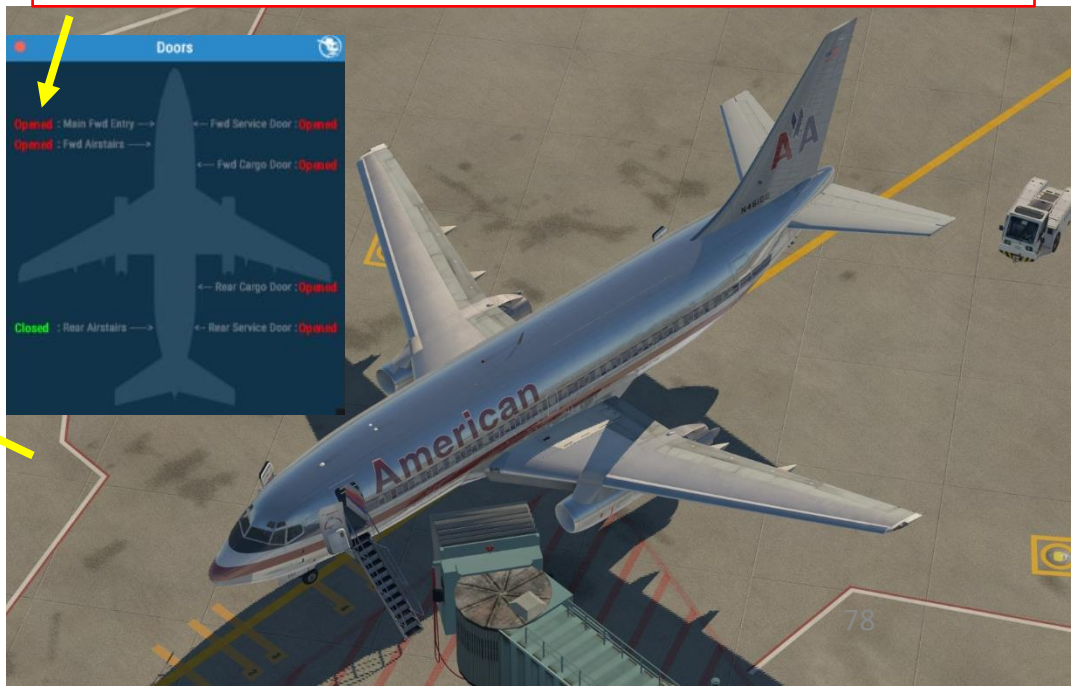


BOARD AIRCRAFT & OPEN DOORS





Deploy Stairs and Open Doors by using the Doors menu (click on the door-shaped icon)

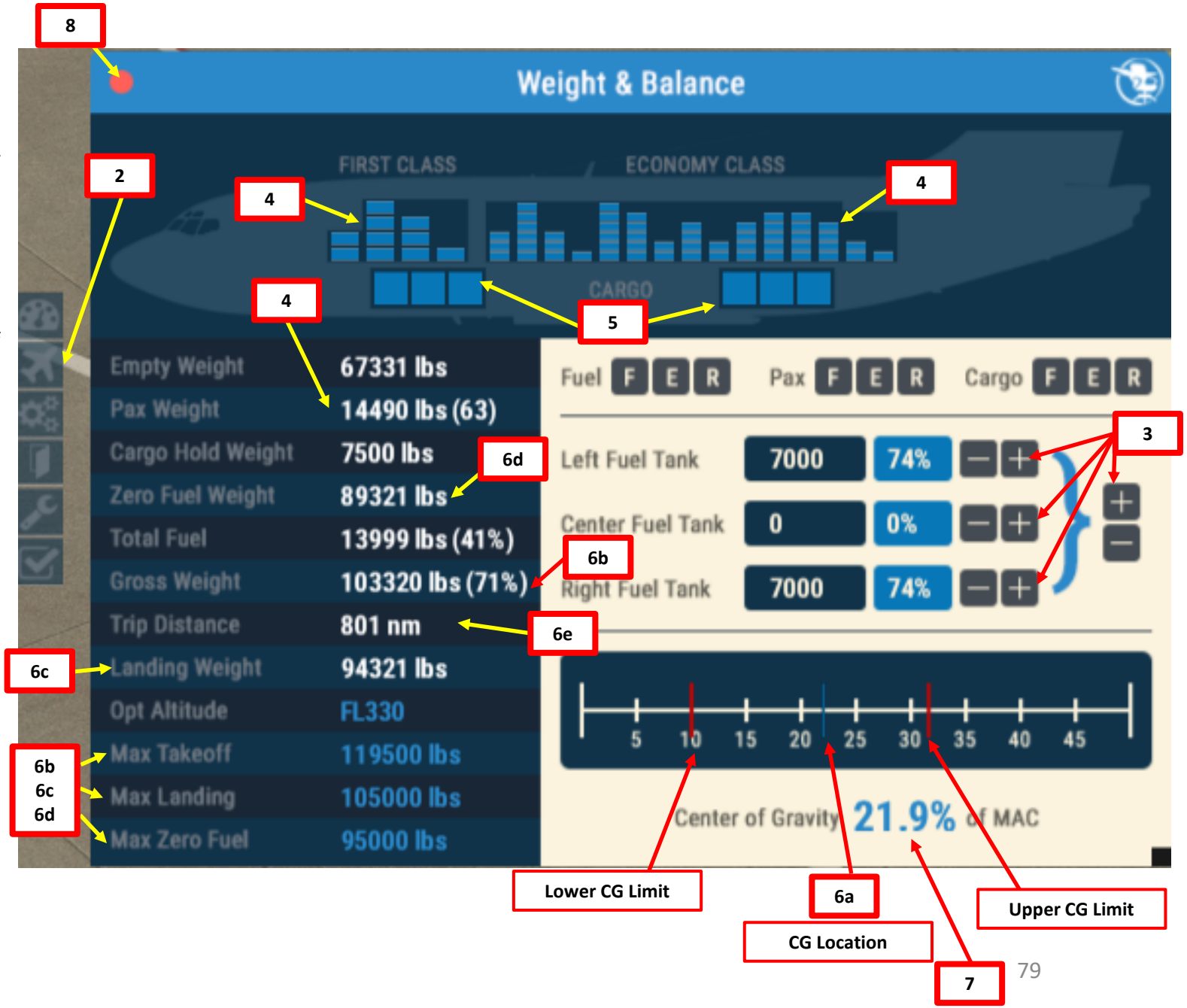


LOAD FUEL, CARGO & PASSENGERS

We will dynamically set our fuel, cargo and passenger loads using the Weight & Balance Load Manager Control Panel.

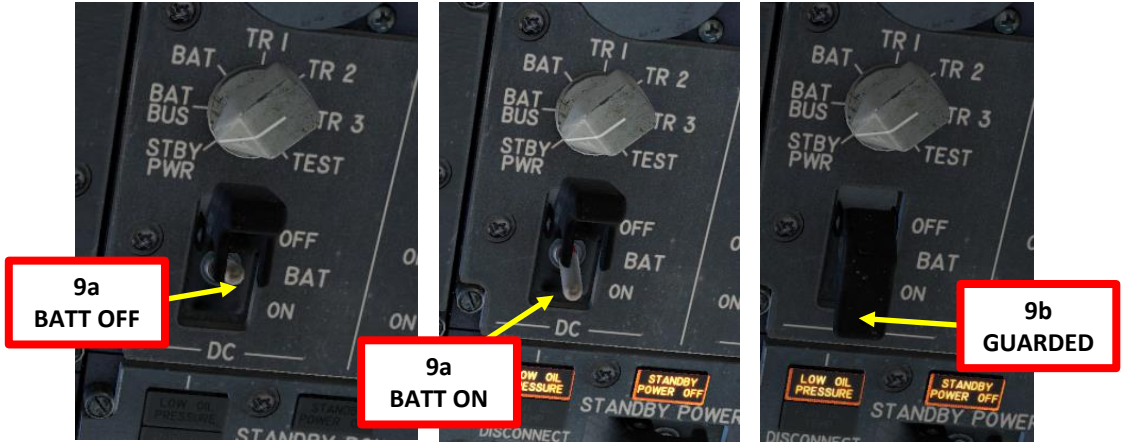
2. Click on Weight and Balance tab
3. Set Total Fuel to 14000 lbs by clicking on the + and – buttons. You can fine-tune the fuel load with the Fuel Load per Tank sub-menu.
4. Set Passengers by clicking in the blue squares in the First Class and Economy Class sections. We will use a PAX weight of 63 passengers.
5. Set Cargo by clicking in the blue squares in the Forward Cargo and Aft Cargo bays. We will use a cargo weight of 7500 lbs.
6. Now that we have decided what the aircraft will carry, we have to verify that:
   a) The CG (Center of Gravity) location (blue line) is within limits (red lines). If it isn't, you can shift around the Fuel Load, the Forward/Aft Cargo and the location of passengers within the First Class and Economy Class as shown in steps 3, 4 and 5.
   b) The Gross Weight of the aircraft (103,320 lbs) does not exceed Max Takeoff Weight (119,500 lbs).
   c) The Landing Weight of the aircraft (94,321 lbs) does not exceed the Max Landing Weight (105,000 lbs)
   d) The Zero Fuel Weight of the aircraft (89,321 lbs) does not exceed the Max Zero Fuel Weight (95,000 lbs).
   e) The Trip Distance available (801 nm) is greater than the flight plan distance (391 nm).
7. Take note of the resulting Center of Gravity (CG) position. In our case, we have **21.9 % of MAC** (Mean Aerodynamic Chord)
8. Once all that is done, you may now close the Weight & Balance tab by clicking the red circle on the Weight & Balance Manager window, and then power up the aircraft!

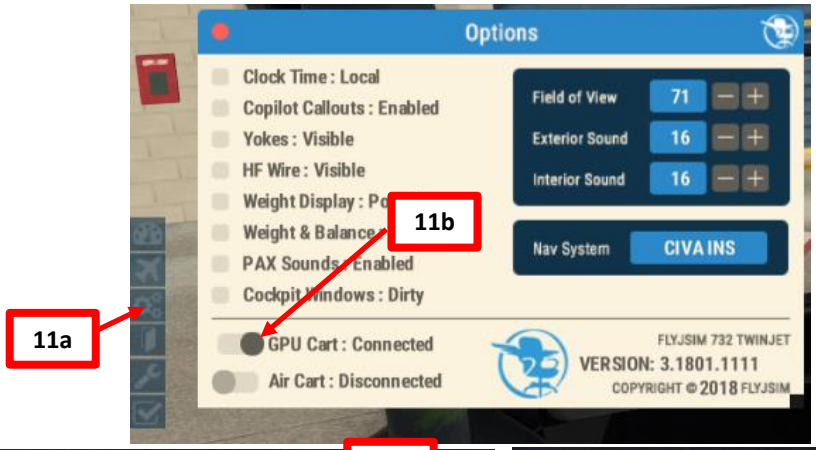
Note: Make sure to have all doors open or you will not be able to load passengers and cargo.

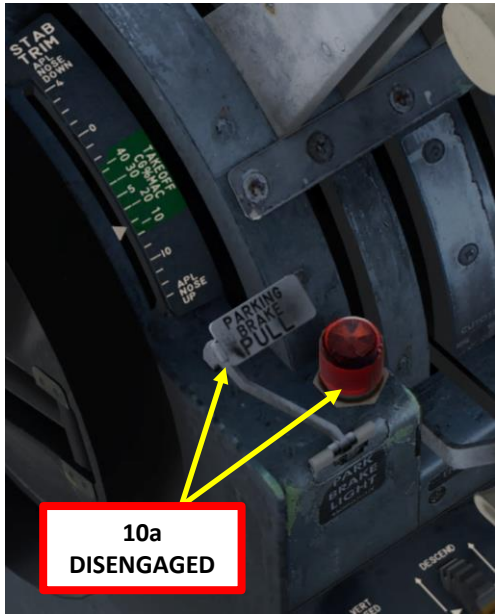


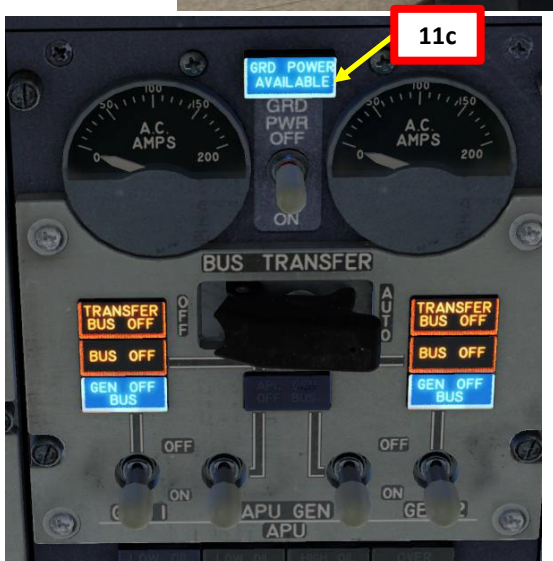
POWER UP AIRCRAFT

9. On Overhead panel, turn on battery power
    a) Set Battery switch to ON (DOWN)
    b) Lock battery switch by clicking on switch safety guard
10. Set Parking Brake (PULLED AFT = ENGAGED)
11. Set ground power ON
    a) Click on the Options Sub-Menu button
    b) Click on the GPU Cart button
    c) Ground crew will now connect ground power to the aircraft. The “GRD PWR AVAILABLE” light will illuminate when the GPU (Ground Power Unit) is connected.
    d) Set “GRD PWR” switch to ON (Down) to power the aircraft with the GPU. Once the ground power has kicked in, the TRANSFER BUS OFF and BUS OFF indicator lights should extinguish.







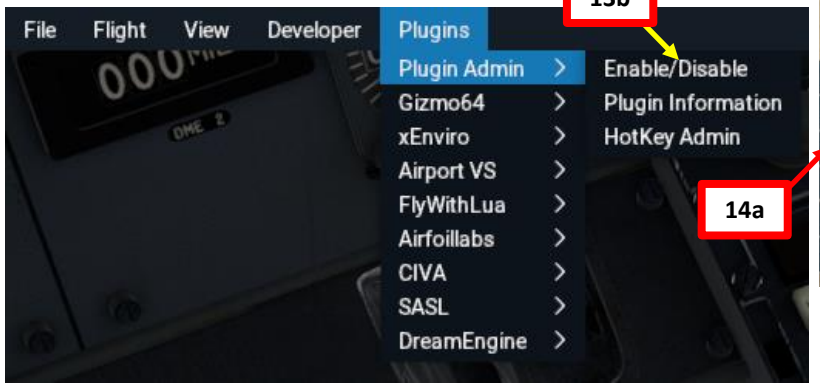


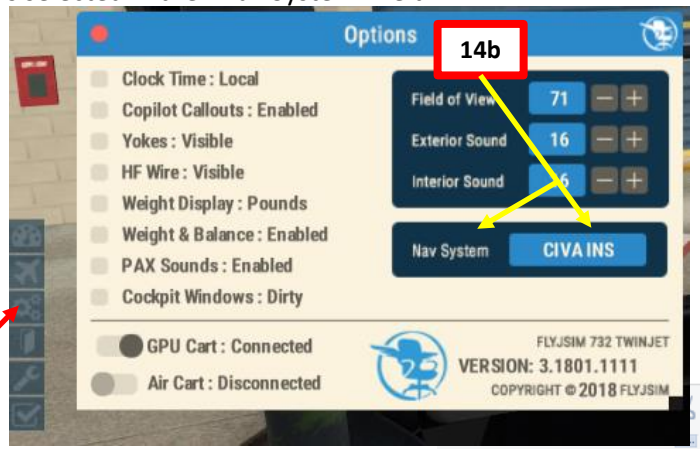
CIVA SETUP - INSTALLATION

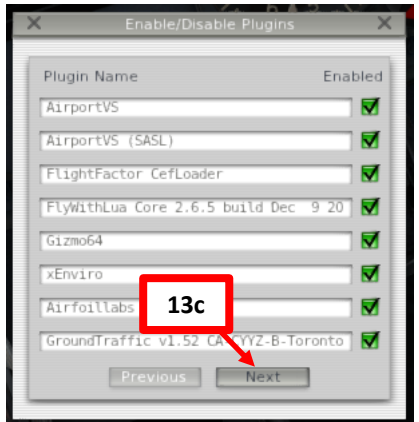
The CIVA (Delco Carousel IV-A) is a payware third-party add-on available on the X-Plane store. You need to buy it for 10 $ in order to use it and install it. Link: http://store.x-plane.org/CIVA-Navigation-System_p_196.html

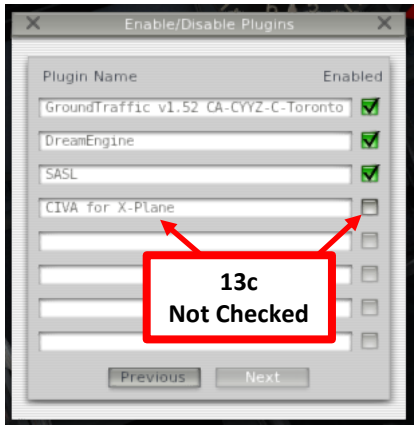
12. Make sure the CIVA system is installed correctly in the following directory:
    C:\Program Files\X-Plane\X-Plane 11\Aircraft\Download\FJS_732_TwinJet_Pro_V3\plugins\xciva
13. The CIVA is actually a plugin that needs to be activated in the Plugin Admin menu since it is de-activated by default.
    a) Move your cursor in the upper section of the screen to display the Main Menu
    b) Select the "Plugins –> Plugin Admin -> Enable/Disable" menu
    c) Find the "CIVA for X-Plane" plugin (click NEXT to cycle plugin pages if required) and make sure it is checked in green. The CIVA plugin will then be activated.
14. Click the Options menu and make sure the "CIVA INS" option is selected in the "Nav System" field.

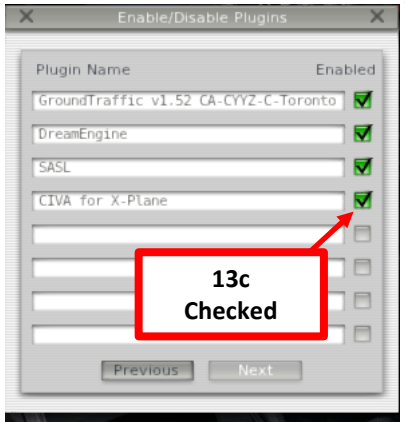
Delco Carousel IV-A Inertial Navigation System (CIVA INS) Panel

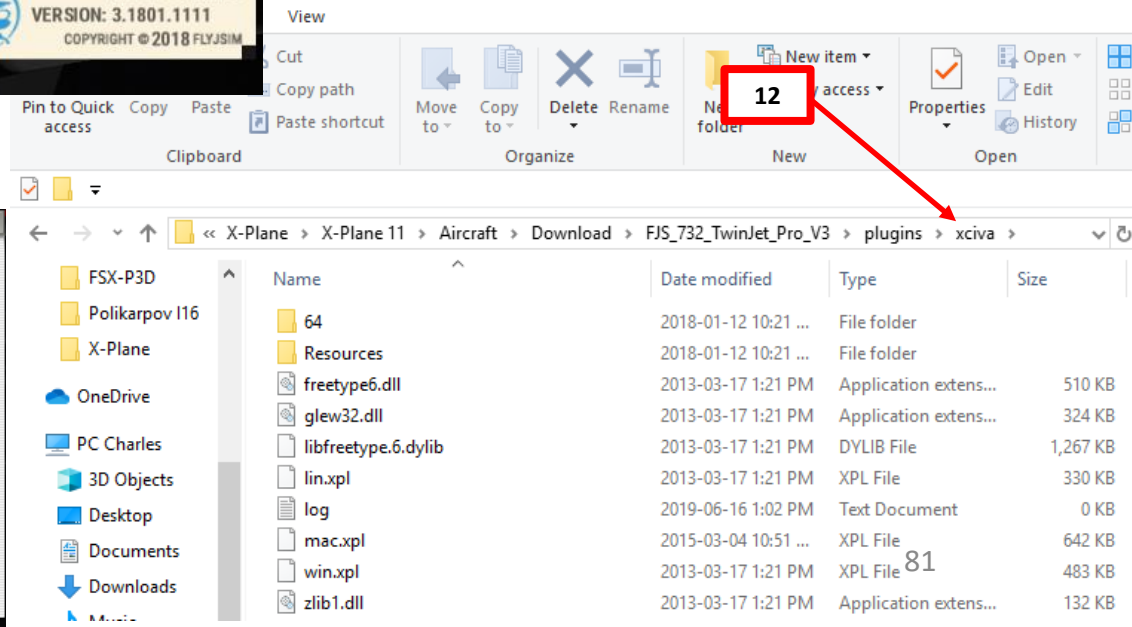










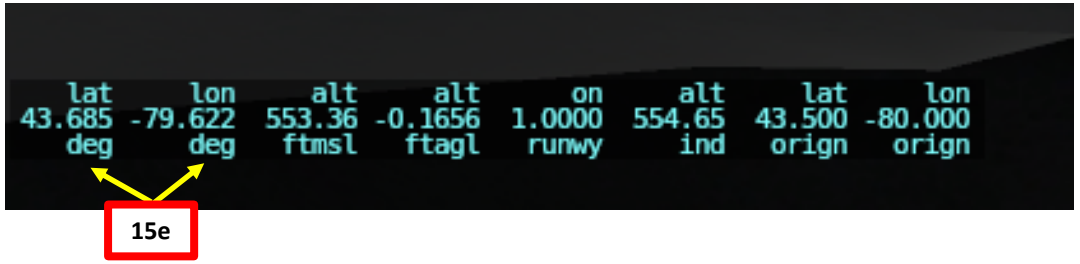


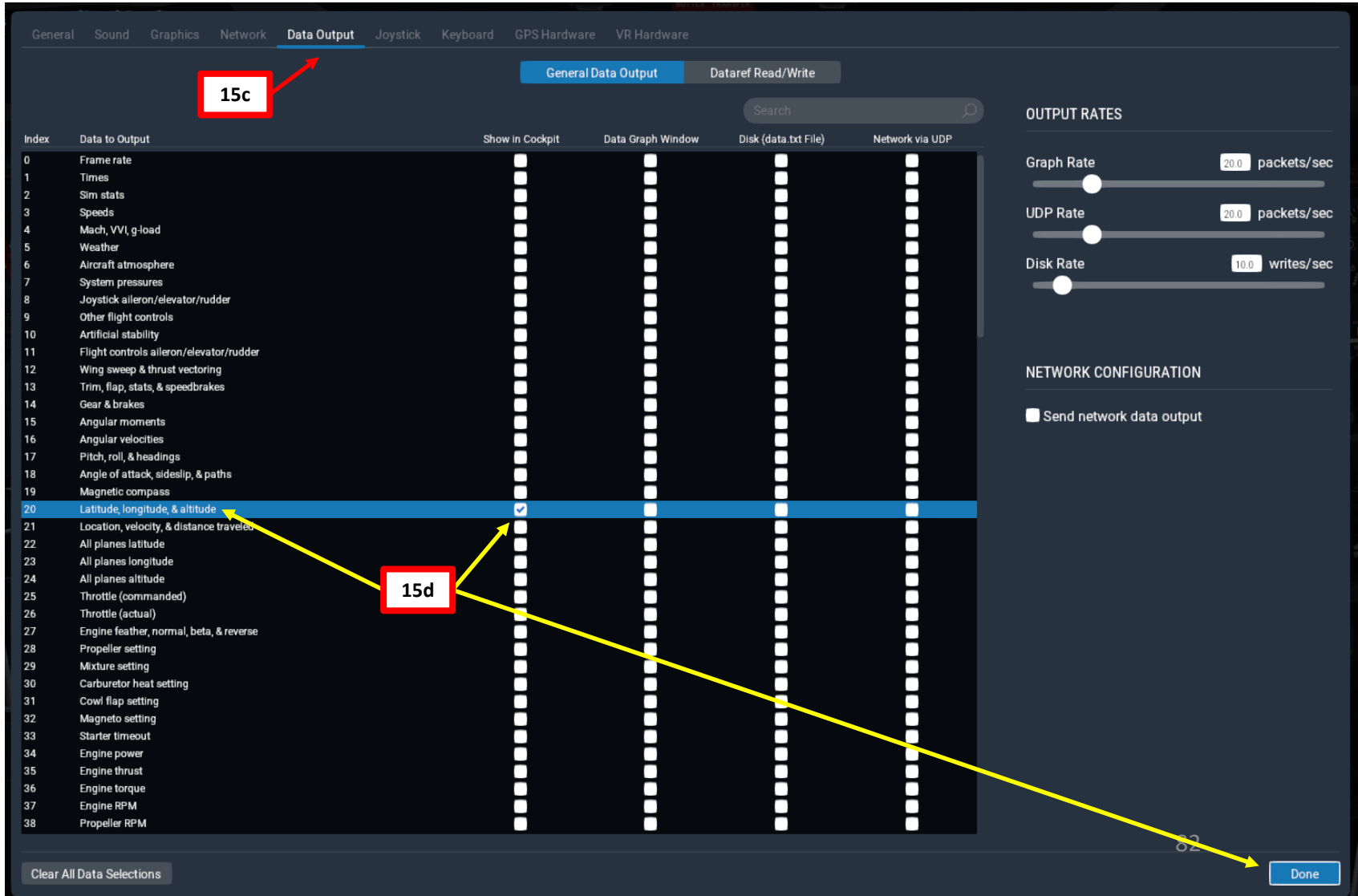
CIVA SETUP – FLIGHT PLAN

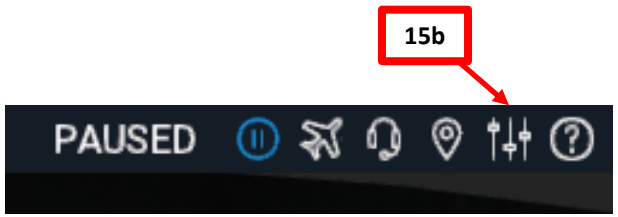
15. First, we need to find our current location in the world so the CIVA can have an idea of where we are. Luckily, X-Plane can show us that kind of data.
    a) Move your cursor in the upper section of the screen to display the Main Menu
    b) Click on the SETTINGS icon
    c) Select DATA OUTPUT menu
    d) Make sure the "Latitude, Longitude & Altitude" option is checked and click on DONE
    e) Coordinates of your current position will now be displayed:
    LATITUDE: 43.685 deg
    LONGITUDE: -79.622 deg

    AIRCRAFT COORDINATES
    43.69 DEG NORTH, 79.62 DEG WEST

    f) Un-check the "Latitude, Longitude & Altitude" option to hide the coordinates and click on DONE.







CIVA SETUP – FLIGHT PLAN

16. Next, we need to figure out our waypoint coordinates. Waypoint 0 is our current location (see previous step), which is given in **Decimal Degrees**. However, the CIVA only takes coordinates in **Degrees, Minutes, Tenths of Minutes (DM.m)**. We can use a quick conversion tool (https://www.directionsmag.com/site/latlong-converter/) to perform this conversion. Alternatively, you can simply multiply by 60 the decimal part of the Decimal Degrees coordinates to get the Minutes and Tenths of Minutes (M.m) part.

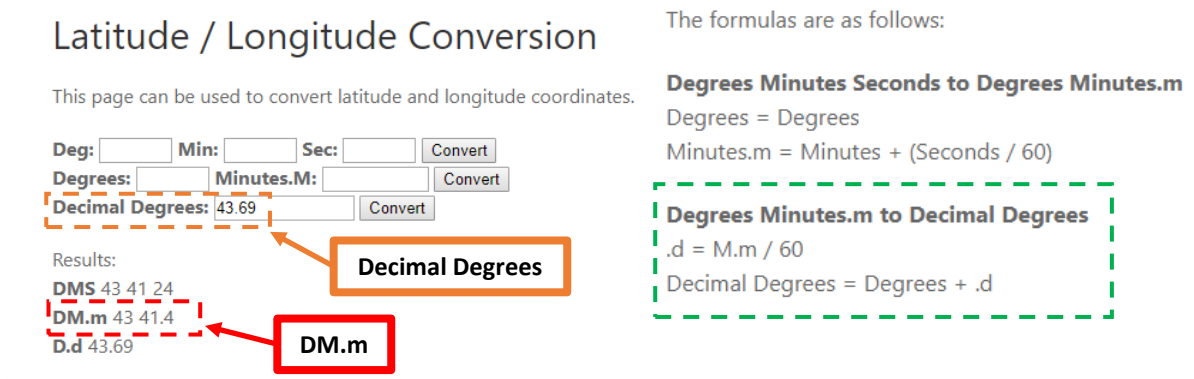
WAYPOINT 0 (CURRENT AIRCRAFT LOCATION):
LAT/LONG IN DECIMAL DEGREES: **43.69 deg North, 79.62 deg West**
LAT/LONG IN DEGREES, MINUTES, TENTHS OF MIN: **43°41.4' North, 79°37.2' West**
LAT/LONG ENTERED IN **CIVA** (FIRST 5 DIGITS ONLY): **43414 North, 079372 West**

17. The rest of the waypoint coordinates are already given in our Flight Plan generated on OnlineFlightPlanner.com, which are given in the **Degrees Minutes Seconds** format, which needs to be converted in Degrees, Minutes, Tenths of Minutes. Feel free to use the conversion tool linked above. Once again, only take the first five digits since the CIVA's precision is limited.

AIRCRAFT COORDINATES (DECIMAL DEGREES)
43.69 DEG NORTH, 79.62 DEG WEST

AIRCRAFT LOCATION		Decimal Degrees	
Waypoint	Reference	NORTH	WEST
0	CYYZ	49.69	79.62

INPUT TO CIVA		Degrees, Minutes, Tenths of Minutes	
Waypoint	Reference	NORTH	WEST
0	CYYZ	43414	079372
1	SIKBO	43392	079209
2	HANKK	42537	077092
3	PONCT	42448	073488
4	KBOS	42218	071004



Lester B. Pearson International Airport (CYYZ) ⇒ General Edward Lawrence Logan International Airport (KBOS)

DMS

ID	Frequency	Track	Distance (nm)	Coordinates		Name/Remarks
CYYZ	-	0	0	N43°40'36.18"	W079°37'50.36"	LESTER B. PEARSON INTL
SIKBO	-	101	12	N43°39'13.00"	W079°20'57.00"	SIKBO
RAGIX	-	116	18	N43°32'37.78"	W078°57'26.89"	RAGIX
MEDAV	-	116	9	N43°29'19.00"	W078°45'46.00"	MEDAV
AHPAH	-	116	30	N43°18'19.00"	W078°07'35.11"	AHPAH
HANKK	-	124	49	N42°53'41.82"	W077°09'15.21"	HANKK
JOSSY	-	97	5	N42°53'29.93"	W077°02'36.80"	JOSSY
AUDIL	-	97	26	N42°52'18.74"	W076°26'35.07"	AUDIL
FABEN	-	97	22	N42°51'12.04"	W075°57'07.91"	FABEN
PONCT	-	98	94	N42°44'48.83"	W073°48'48.07"	PONCT
KBOS	-	105	126	N42°21'46.60"	W071°00'23.00"	GENERAL EDWARD LAWRENCE LOGAN

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

11 fixes, 391 nm.

Airways:
CYYZ *DCT* ***SIKBO*** *Q140* ***HANKK*** *Q935* ***PONCT*** *STAR* ***KBOS***

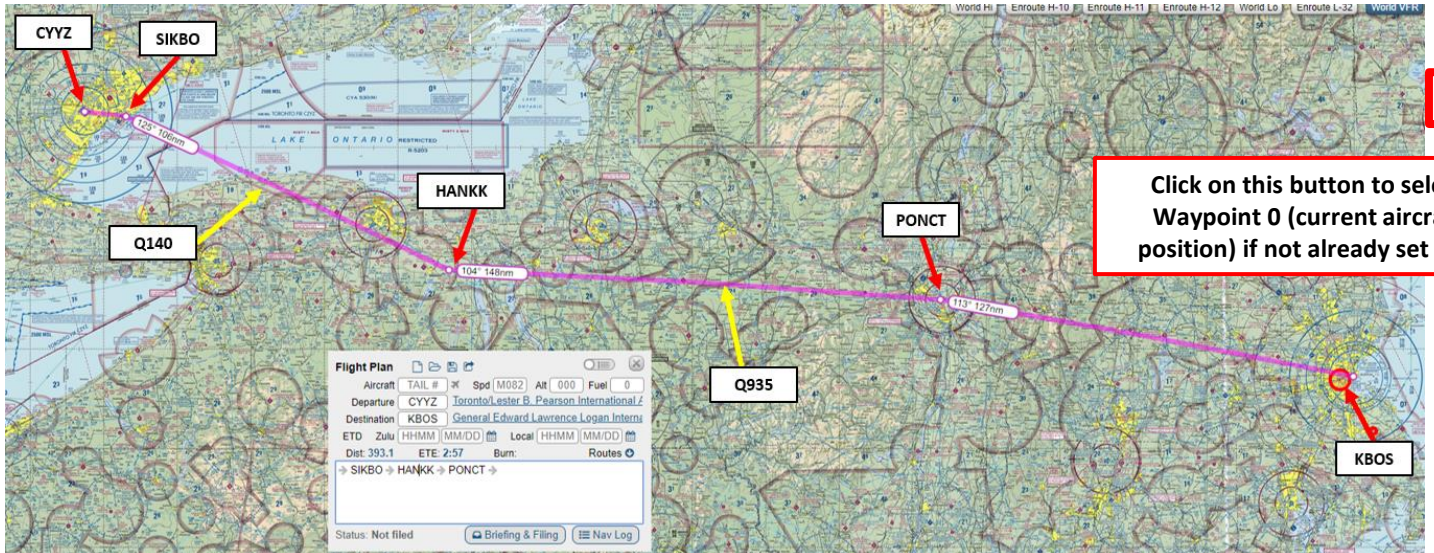
Provided by RouteFinder

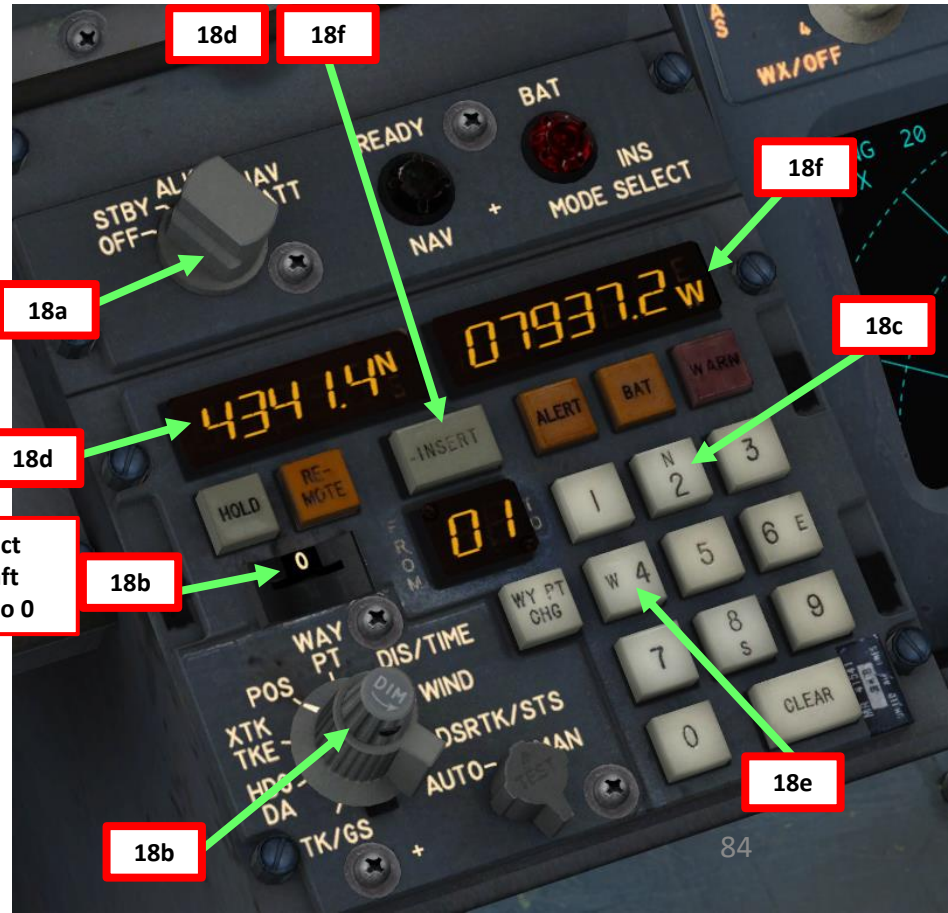
CIVA SETUP – FLIGHT PLAN INS ALIGNMENT

18. Enter your current coordinates in the CIVA (Waypoint 0) and begin alignment of the INS (Inertial Navigation System)
    a) Set Mode Selector Knob to STBY (Standby)
    b) Set Data Selector Switch to POS (Position) and make sure Waypoint Selected is 0
    c) Press the “N (2)” key to select North Latitude coordinates field of Waypoint 0
    d) Press “43414” on the keypad, then press the “INSERT” key to enter Latitude coordinates of Waypoint 0.
    e) Press the “W (4)” key to select the West Longitude coordinates field of Waypoint 0
    f) Press “079372”, then press the “INSERT” key to enter Longitude coordinates of Waypoint 0.

INPUT TO CIVA		Degrees, Minutes, Tenths of Minutes	
Waypoint	Reference	NORTH	WEST
0	CYYZ	43414	079372
1	SIKBO	43392	079209
2	HANKK	42537	077092
3	PONCT	42448	073488
4	KBOS	42218	071004

CYYZ DCT **SIKBO** Q140 **HANKK** Q935 **PONCT** STAR **KBOS**



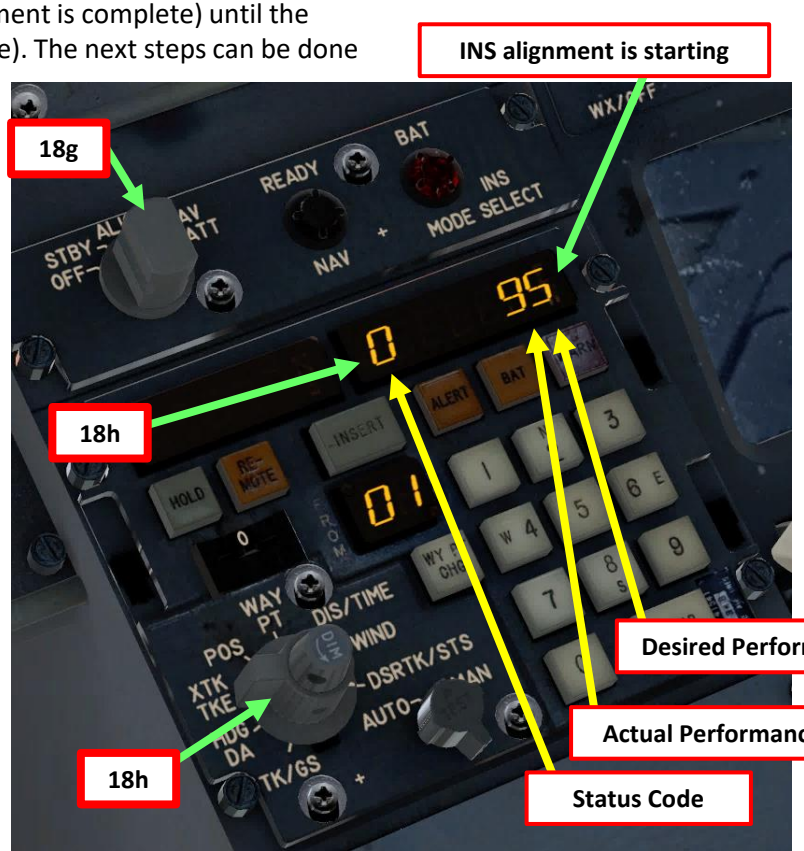


CIVA SETUP – FLIGHT PLAN
INS ALIGNMENT

18. Enter your current coordinates in the CIVA (Waypoint 0) and begin alignment of the INS (Inertial Navigation System)
    - g) Set Mode Selector Knob to ALIGN to begin INS alignment
    - h) Set Data Selector Switch to DSRTK/STS (Desired Track Angle / Status Code of INS)
        - The code "**0 95**" should appear once alignment phase has begun.
            - **0** is the Status Code (0 is when Mode is not in NAV, 1 is when Mode is in NAV)
            - **9** is the Actual Performance Index, or how precise the INS is. 9 is the least precise, and 0 is the most precise.
            - **5** is the Desired Performance Index.
    - i) The INS alignment counts down (0 95 is when alignment is starting, 0 55 when coarse alignment is complete, 0 05 when full alignment is complete) until the READY NAV light is illuminated (alignment complete). The next steps can be done while the INS aligning.

INPUT TO CIVA		Degrees, Minutes, Tenths of Minutes	
Waypoint	Reference	NORTH	WEST
0	CYYZ	43414	079372
1	SIKBO	43392	079209
2	HANKK	42537	077092
3	PONCT	42448	073488
4	KBOS	42218	071004

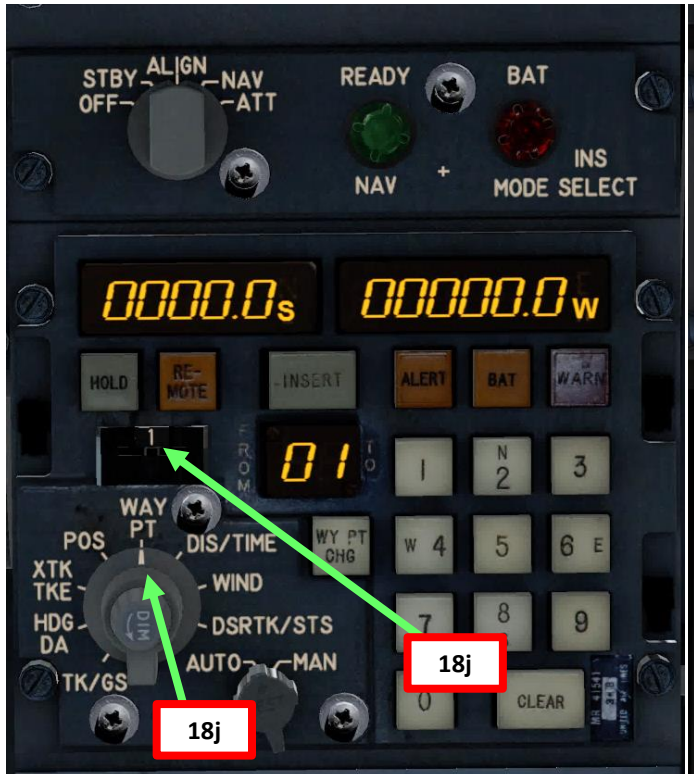
Status Code	Meaning
0 95	Standby INS Warmup. Gyros run up to speed 2 minutes after warmup is completed.
0 85	Coarse Level: Gimbals aligned to the horizontal plane. Battery Unit is tested.
0 75	Coarse Azimuth: Initial Estimate of True North.
0 65	Fine Alignment: Knowledge of True North is refined. Gyros and accelerometers are calibrated.
0 55 to 0 05	Refinement of alignment. The INS Mode Selector may be advanced to NAV at any time during this mode.

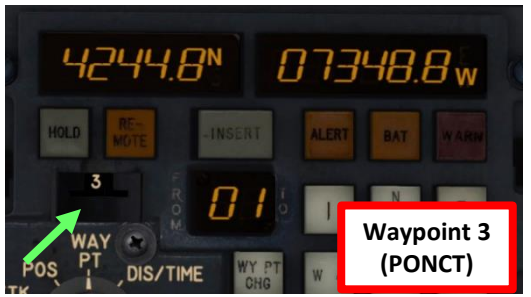


CIVA SETUP – FLIGHT PLAN INS ALIGNMENT

18. Enter your current coordinates in the CIVA (Waypoint 0) and begin alignment of the INS (Inertial Navigation System)
    - j) Set the Data Selector Switch to WAYPT (Waypoint) and select Waypoint 1 SIKBO with the Waypoint Selector Button (reminder: Waypoint 0 is the position of the aircraft).
    - k) Press the "N (2)" key to select North Latitude coordinates field of Waypoint 1
    - l) Press "43392" on the keypad, then press the "INSERT" key to enter Latitude coordinates of Waypoint 1.
    - m) Press the "W (4)" key to select the West Longitude coordinates field of Waypoint 1
    - n) Press "079209", then press the "INSERT" key to enter Longitude coordinates of Waypoint 1.
    - o) Repeat steps j) through n) for Waypoints 2 (HANKK), 3 (PONCT) and 4 (KBOS).
    - p) Set Mode Selector Knob to NAV when you are done.

INPUT TO CIVA		Degrees, Minutes, Tenths of Minutes	
Waypoint	Reference	NORTH	WEST
0	CYYZ	43414	079372
1	SIKBO	43392	079209
2	HANKK	42537	077092
3	PONCT	42448	073488
4	KBOS	42218	071004





VHF NAV SETUP – DEPARTURE

19. The departure procedure (SID) we intend to take dictates that we depart from runway 05 and follow a heading of 057, then turn to 047 once we reach 1000 ft. We will use the YTP (PEARSON) VOR as a reference.
    a) Set VHF-1 NAV frequency to the frequency of the YTP VOR (116.55 as shown on the Jeppesen chart).
    b) Verify that the TFR switch is set properly, showing that the active frequency is 116.55.
    c) We can see on the HSI (Horizontal Situation Indicator) that we are 1 nm from the VOR (which is right next to the airport).
    d) Set the HSI VOR Course to 057.
    e) Set the RMI (Radio Magnetic Indicator) VOR/ADF 1 knob to VOR

JEPPESEN 16 DEC 05 (10-3B) Eff 22 Dec

SID

TORONTO, ONT
TORONTO/PEARSON INTL

TORONTO Departure 127.57 128.8

LESTER SEVEN DEPARTURE (LEST7.) (VECTOR)

UNLESS OTHERWISE ASSIGNED BY ATC:
JET ACFT MAINTAIN 5000′, NON-JET ACFT MAINTAIN 3000′
DO NOT EXCEED 250 KT UNTIL ABOVE 10000′
(REFER TO NOISE ABATEMENT PROCEDURES FOR ADDITIONAL REQUIREMENTS)

CAUTION: Rwys 05, 06L, 06R, 23, 24L, 24R departures: Simultaneous parallel departures in use.

TURBOJET/FAN AIRCRAFT ONLY

RWY	VNAP
ALL RWYS	A or B

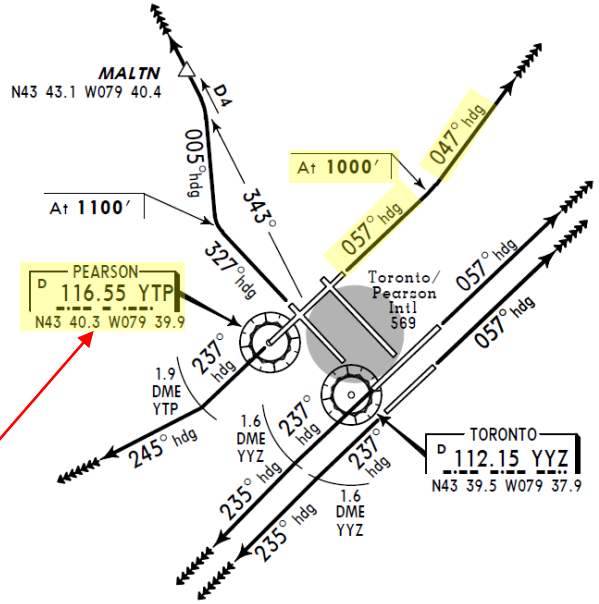
NOISE ABATEMENT
RWYS 05, 06L, 06R, 23, 24L, 24R DEPARTURES: FOR NOISE ABATEMENT NO UNAUTHORIZED TURNS BELOW 3600′ EXCEPT AS DESCRIBED IN NOISE ABATEMENT PROCEDURES (See Chart 10-4A).
RWY 33L DEPARTURE: FOR NOISE ABATEMENT NO UNAUTHORIZED TURNS BELOW 3600′ NOR PRIOR TO MALTN INT. NON-JET AIRCRAFT COMMENCE TURN ASSIGNED AT TAKE-OFF AT 1100′ (0700-2300 LOCAL TIME).

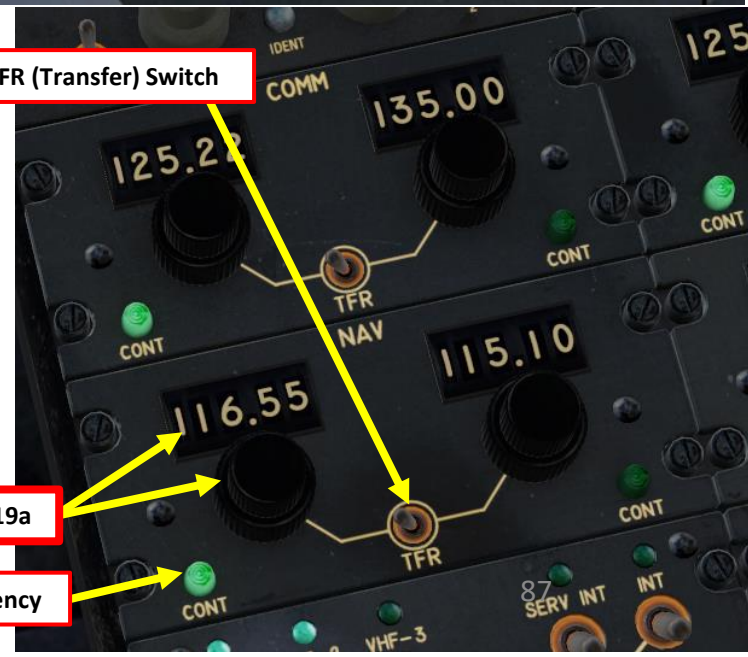
DEPARTURE
Unless otherwise assigned by ATC:
Rwy 05: Climb heading 057°. At 1000′ turn LEFT heading 047° or assigned heading for vectors to assigned route. **MAINTAIN** 5000′ jet acft, 3000′ non-jet acft.
Rwys 06L, 06R: Climb heading 057° or assigned heading for vectors to assigned route. **MAINTAIN** 5000′ jet acft, 3000′ non-jet acft.
Rwy 23: Climb heading 237°. At YTP 1.9 DME turn RIGHT heading 245° or assigned heading for vectors to assigned route. **MAINTAIN** 5000′ jet acft, 3000′ non-jet acft.
Rwys 24L, 24R: Climb heading 237°, at YYZ 1.6 DME turn LEFT heading 235° or assigned heading for vectors to assigned route. **MAINTAIN** 5000′ jet acft, 3000′ non-jet acft.
Rwy 33L: Climb heading 327° to 1100′. Turn RIGHT heading 005° to intercept YYZ R-343 outbound. Track YYZ R-343 outbound for vectors to assigned route. **MAINTAIN** 5000′ jet acft, 3000′ non-jet acft.

COMMUNICATION FAILURE
On recognition of a failure 20 minutes or less after take-off and in IFR weather conditions, proceed as follows:
1. Transponder Mode A/3 7600;
2. Beyond 10 DME YYZ proceed directly on course;
3. Do not climb above last assigned altitude for 5 minutes after recognition of failure, then;
4. Climb to flight plan altitude.

SID towards next waypoint

N
NOT TO SCALE



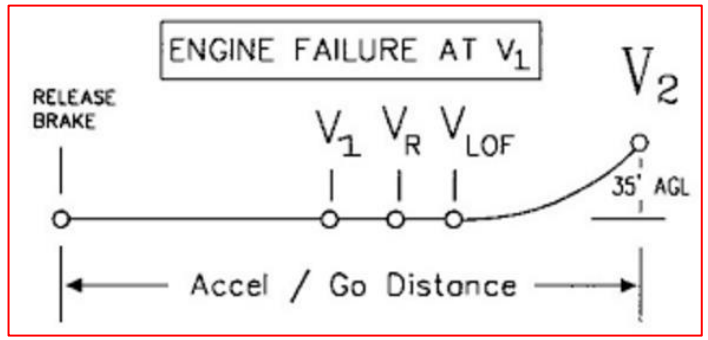


TAKEOFF REF V-SPEEDS

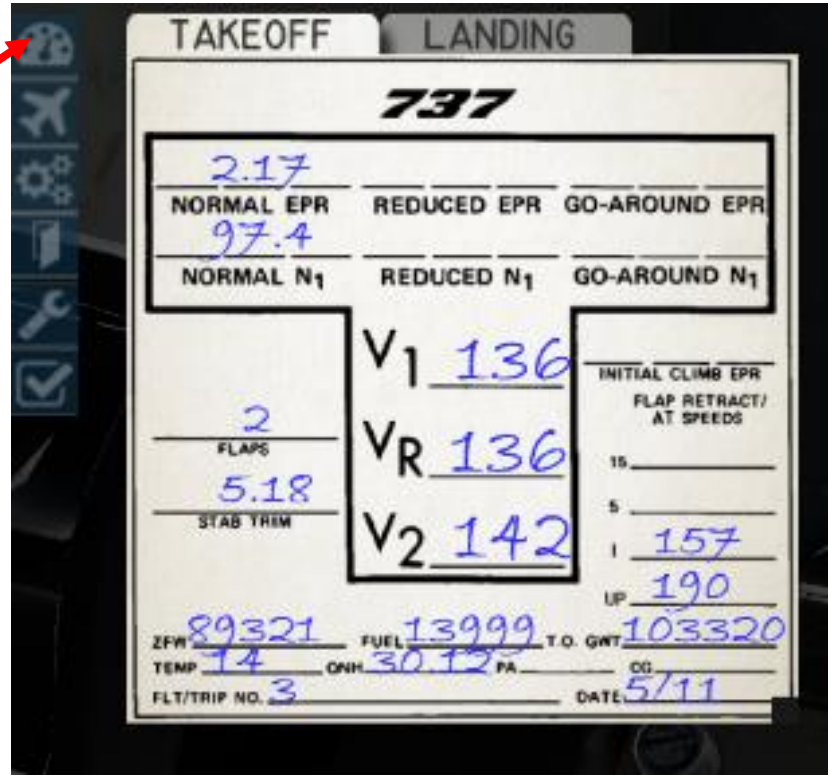
20. If you click on the "V card" sub-menu button, you will get your takeoff & landing reference V-Speeds. You will notice that the airspeed bugs are automatically set on your airspeed indicator.

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).

All these V-speeds are computed by FlyJSim for you. In real life, pilots had to figure out the V-speeds themselves by using charts and a bit of math. Modern-day FMCs (Flight Management Computers) compute these speeds in a similar fashion, taking the aircraft's weight, takeoff flap setting and other parameters.

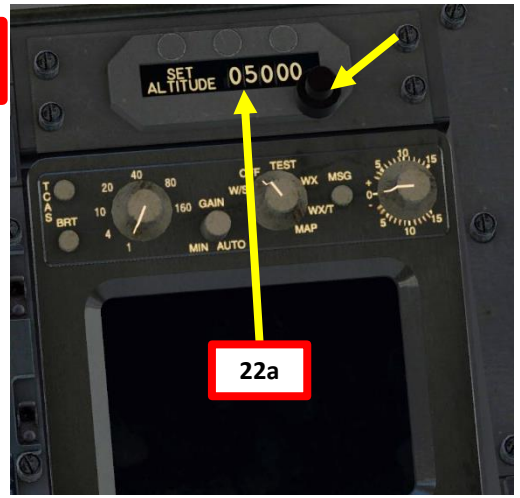


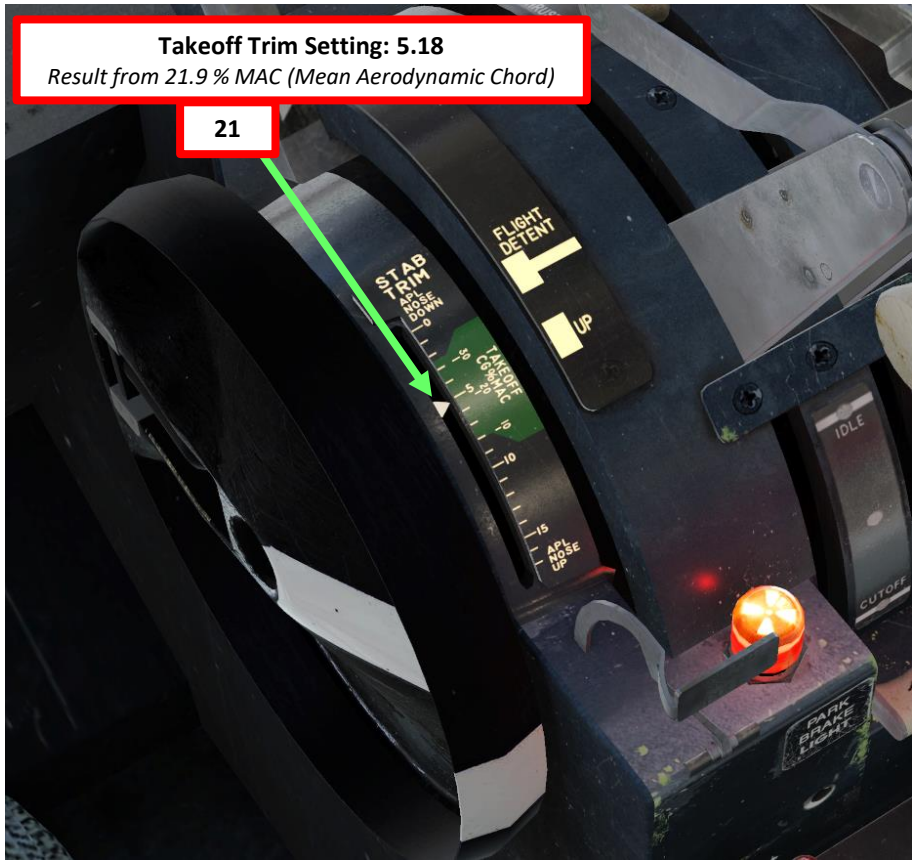
20

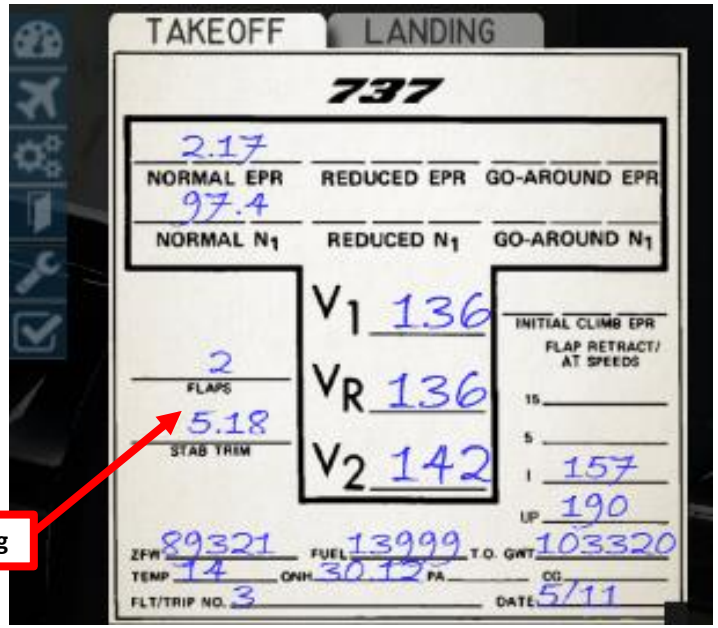


TAKEOFF TRIM & AUTOPILOT SETUP

21. Set Stabilizer (Elevator) trim to the Takeoff Stabilizer Trim setting obtained on the V-Card (5.18). This value is automatically computed.
22. Set up Autopilot for departure
    a) Set ALTITUDE SELECT to 5000 ft with the black knob, which will be our first altitude target for the initial climb segment
    b) Set Airspeed Bug to the Initial Climb Speed, which will be V2+20 (136 + 20 = 156 kts)
    c) Set the Heading Bug to the Runway Heading (057)
    d) Set Autopilot COURSE and HEADING to 057

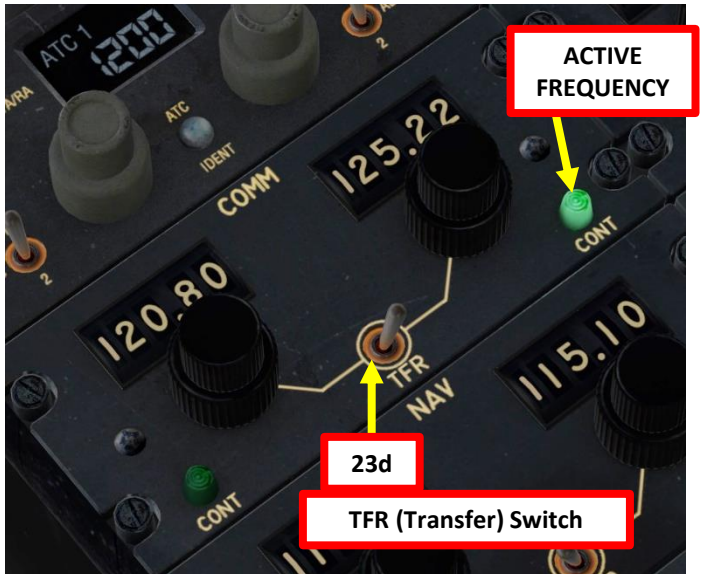






ALTIMETER SETTING

23. Consult the CYYZ (Toronto) ATIS system via the radio to get the altimeter setting.
    a) Consult the CYYZ chart and find the Toronto Pearson ATIS Frequency (120.825).
    b) Set VHF-1 COMM ACTIVE radio frequency ATIS frequency (120.825). Active frequency is indicated with a small blue light. Due to some minor X-Plane quirk, in our case we had to set the frequency to 120.80 instead of 120.825 to hear the ATIS properly.
    c) You should receive the ATIS automated report on the radio for Niagara Falls. The reported altimeter setting is 30.12 inches of Hg.
    d) You can click on the TFR (Transfer) button to set the ATIS frequency to the STANDBY frequency once you have the information you need. You will then stop hearing the ATIS broadcast.
24. Set altimeter setting to 3012 (30.12 inches of mercury) by rotating the altimeter and standby altimeter knob. You will see that the altimeter will indicate the airport's elevation, which is approximately 570 ft.

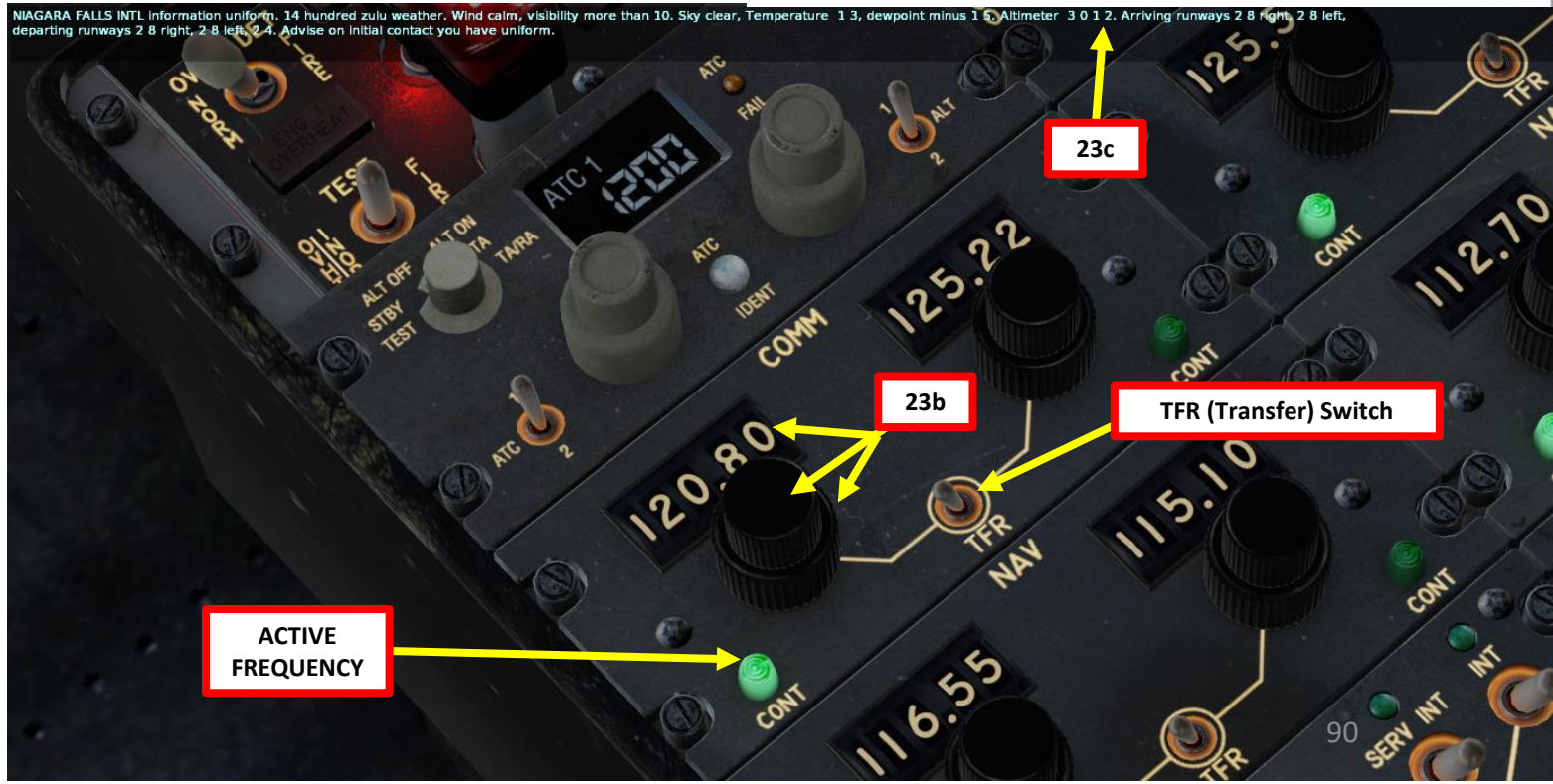


Airport Information
CYYZ (Toronto/Pearson Intl)
JEPPESEN JeppView 3.5.2.0

Communications Info
ATIS **120.825**
Toronto Tower Tower **118.7**
Toronto Tower Tower **118.35**
Toronto Ground Ground Control **121.9**
Toronto Ground Ground Control **121.65**
Toronto Ground Ground Control **119.1**
Toronto Ground Ground Control **118.0**
Terminal 3 Ramp/Taxi Control **122.875**
South Apron Ramp/Taxi Control **122.075**
North Apron Ramp/Taxi Control **122.275**
Toronto Clearance Delivry Clearance Delivery **121.3**
Toronto Arrival Arrival Control **132.8** Arrival Service
Toronto Arrival Arrival Control **125.4** Arrival Service
Toronto Arrival Arrival Control **124.475** Arrival Service
Toronto Departure Departure Control **128.8** Departure Service
Toronto Departure Departure Control **127.575** Departure Service
Toronto Terminal Unknown **133.4**
Toronto Terminal Unknown **119.3**
London Radio Radio **123.275** Flight Info Service RCO
Skyservice/Esso Avitat Operations **128.95**
Skycharter Ltd Operations **129.75**
Shell Aerecentre Operations **122.95**

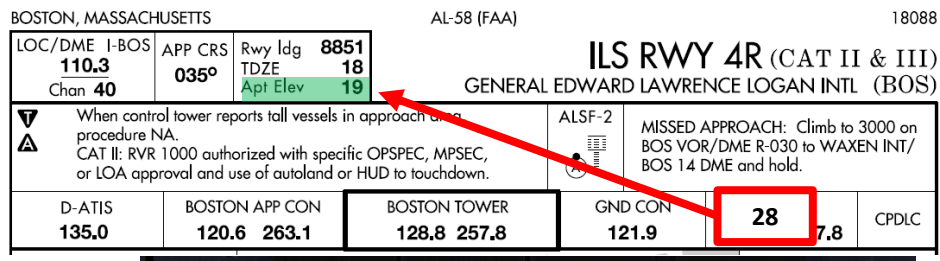
General Info
0 NM W of Toronto ON, CAN
N 43° 40.6' W 79° 37.8' Mag Var: 10.4°W
Elevation: 569'
Detroit Sectional

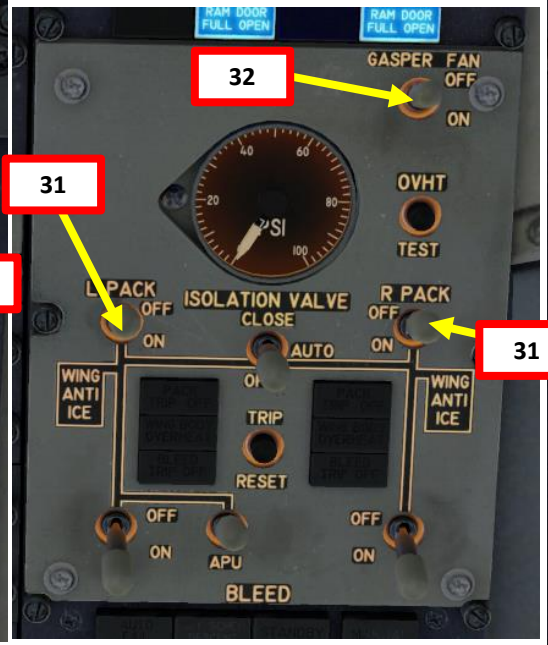
24

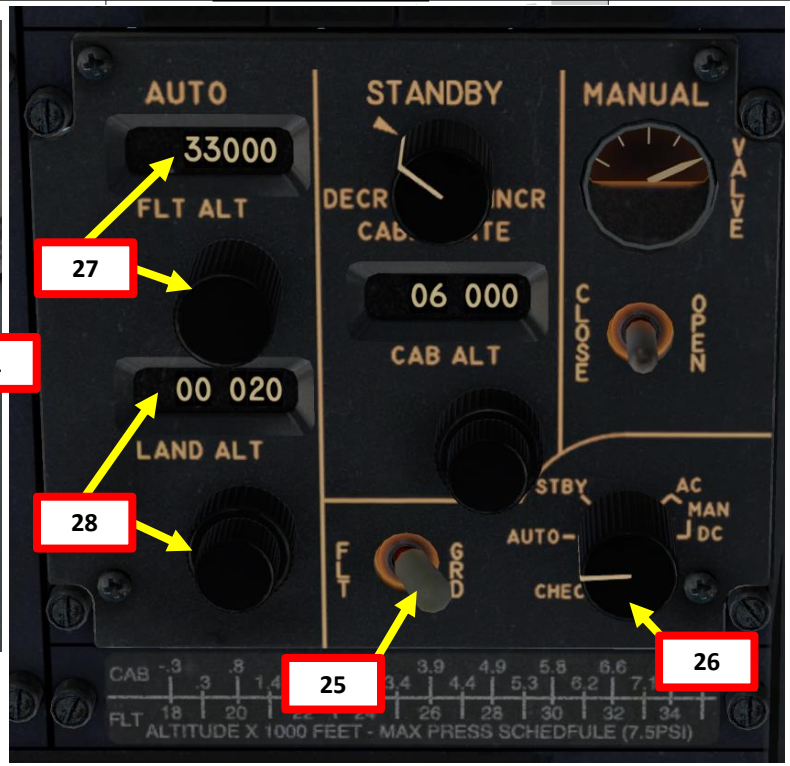


CABIN PRESSURE

25. On the Overhead Panel, set Cabin Pressure Switch to GROUND
26. Set Cabin Pressurization Mode Selector to AUTO
27. Set FLT ALT (Flight Altitude) to our cruising altitude of 33000 ft
28. Set LAND ALT (Landing Altitude) to the Boston Logan Airport's elevation (19 ft, or close to 20 ft)
29. Set Control Cabin Temperature Selector knob to AUTO
30. Set Passenger Cabin Temperature Selector to AUTO
31. Set Left and Right A/C PACK (Pneumatic Air Conditioning Kit) switches to OFF
32. Set Gasper Fan switch to OFF





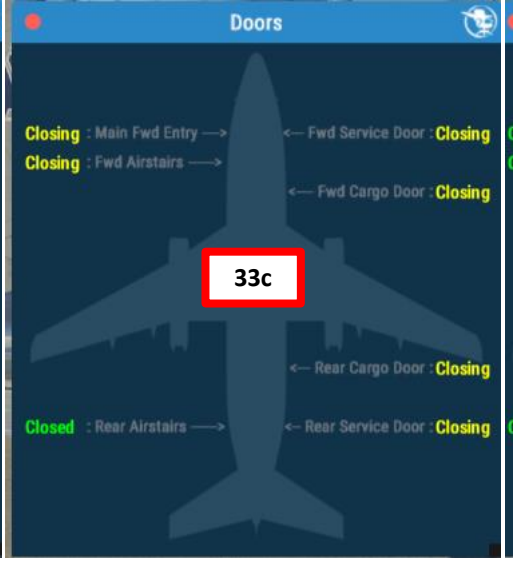


Note:

The PACKs regulate cabin temperature through the mixing of hot bleed air with bleed air that has been cooled. The cooling is done by two heat exchanges and a device called an Air Cycle Machine (ACM). Hot and cold bleed air is mixed by an air mix valve. Immediately downstream of the turbine wheel in the ACM is a water separator. This removes the condensed moisture that is a by-product of the ACM's cooling of the air. This air can be used by the Gasper Fans, which are an adjustable air outlet situated above each passenger seat, which is also a part of the air conditioning and cabin air recirculation system.

DOORS

33. Close the doors by clicking on the DOORS menu

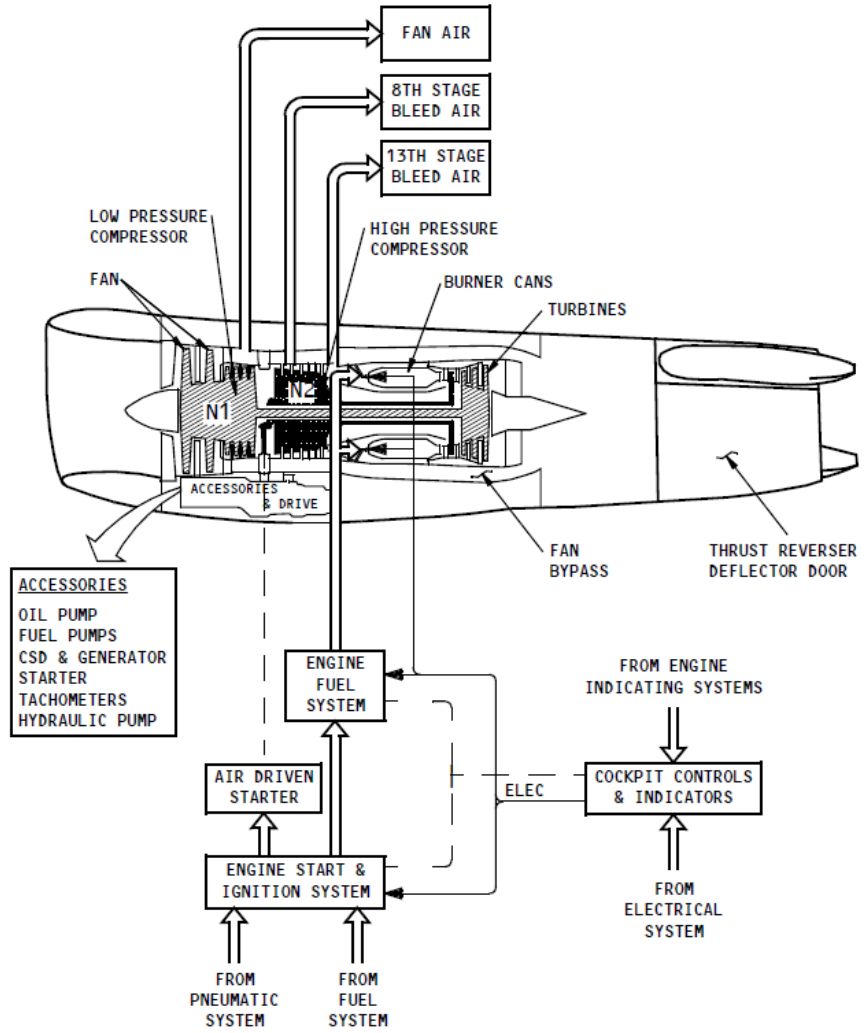


TRANSPONDER, TCAS, WEATHER RADAR & BUILT-IN TESTS

34. Set up the Transponder
    - Set Transponder frequency to 1200 (VFR standard squawk code for most of North American airspace, or as specified by ATC)
35. Press the TCAS (Traffic & Collision Avoidance System) button to power up TCAS system.
36. Set TCAS (Traffic Collision and Avoidance System) selector to TA/RA (Traffic Advisory/Resolution Advisory)
37. If desired, test the Weather Radar by setting the WX Selector switch to TEST. A short built-in test will begin.
38. Power up the Weather Radar by setting the Weather Radar Selector to WX/T, which is a combined Weather Radar and TCAS mode.
39. Set desired weather radar range (20 nm in our case).

ENGINE START-UP

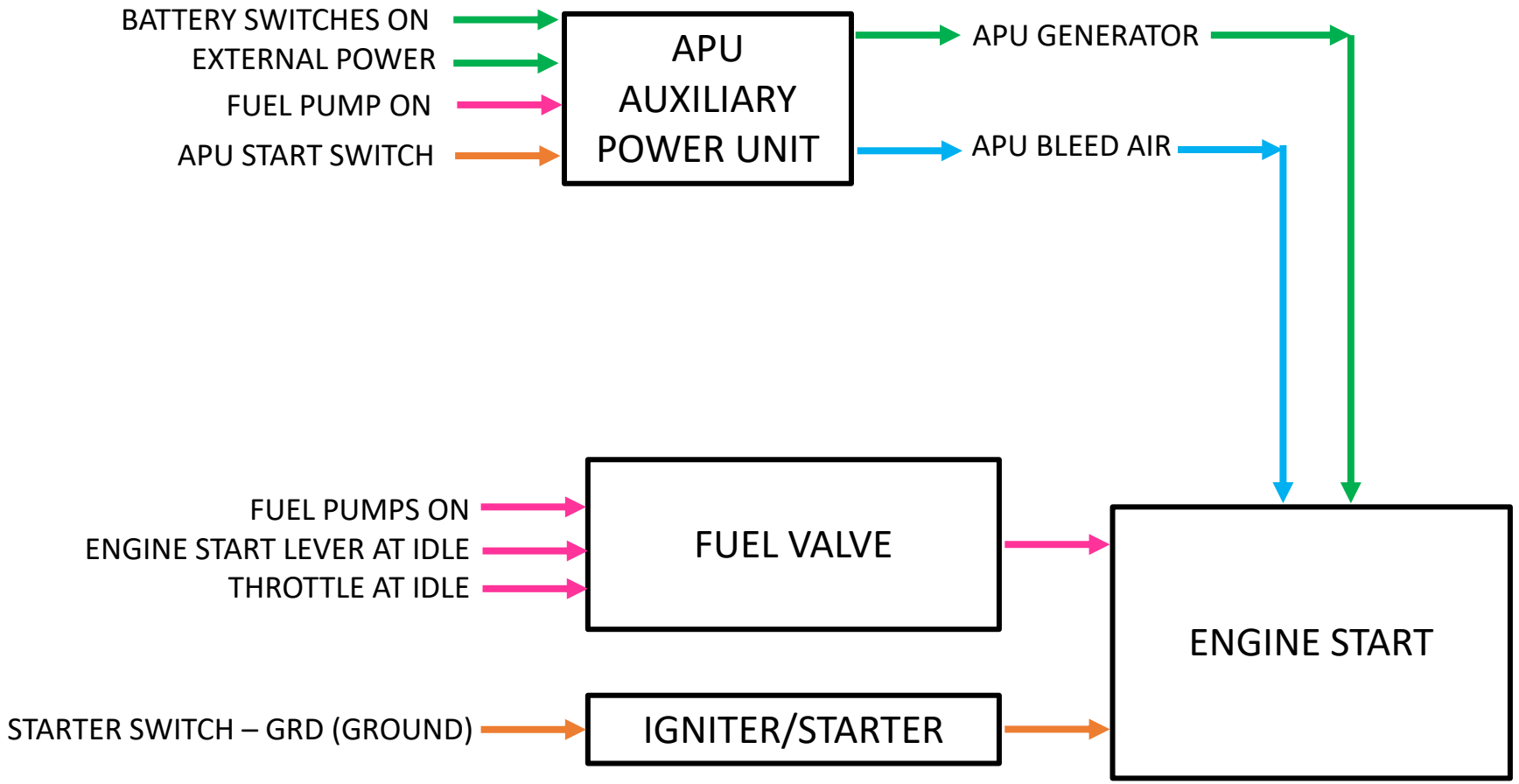
APU AUXILIARY POWER UNIT	APU GENERATOR
	APU BLEED AIR
GROUND POWER CART	EXTERNAL POWER
AIR PRESSURE CART	EXTERNAL AIR
ENGINE (RUNNING)	ENGINE GENERATOR (ENGINE CROSS-START)
	ENGINE BLEED (ENGINE CROSS-START)
FUEL PUMPS	FUEL PUMPS ON
THROTTLE POSITION	THROTTLE AT IDLE
ENGINE START LEVER	ENGINE START LEVER AT IDLE (UP)
STARTER SWITCH	STARTER SWITCH – GRD (GROUND)



FUEL	ENGINE START
IGNITION/STARTER	
ELECTRICAL POWER	
AIR PRESSURE	

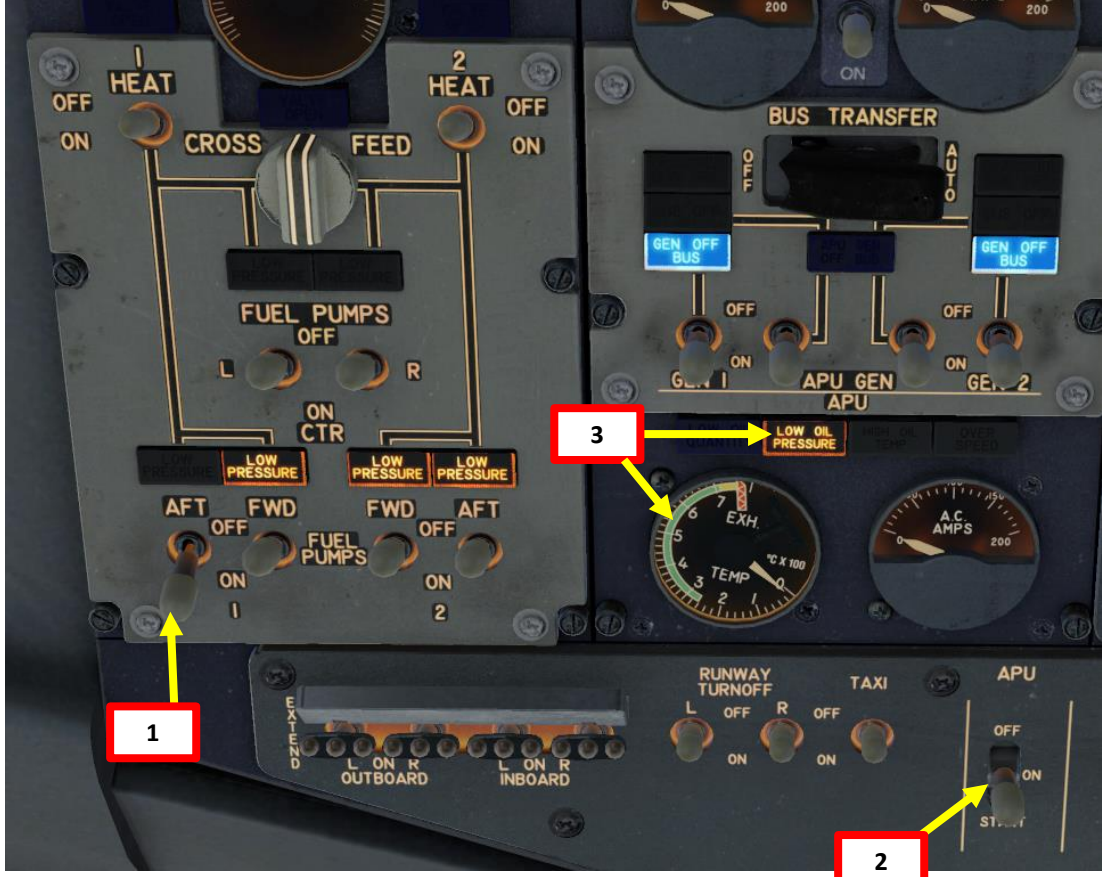
ENGINE START-UP

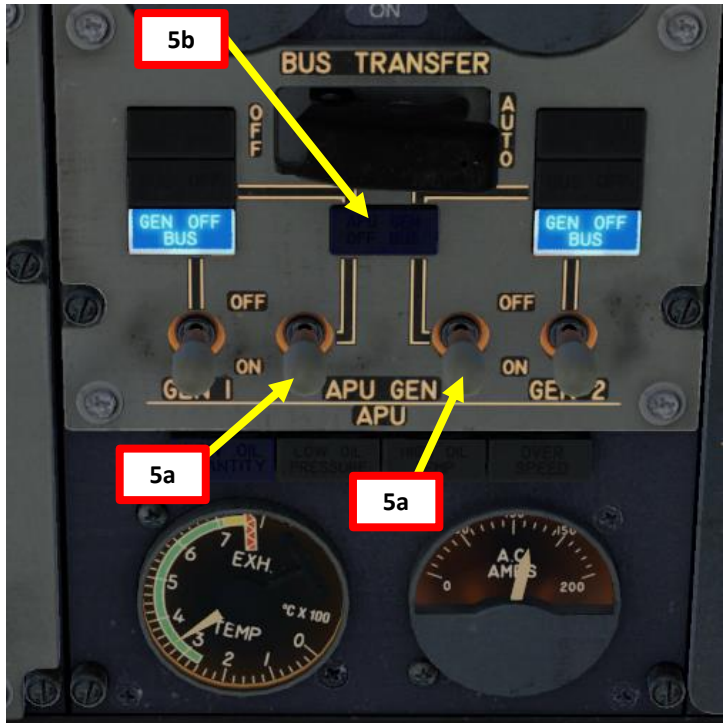
NOTE: It is usually common practice to start your engines during pushback. We will start our engines before that for simplicity.



APU (AUXILIARY POWER UNIT) START

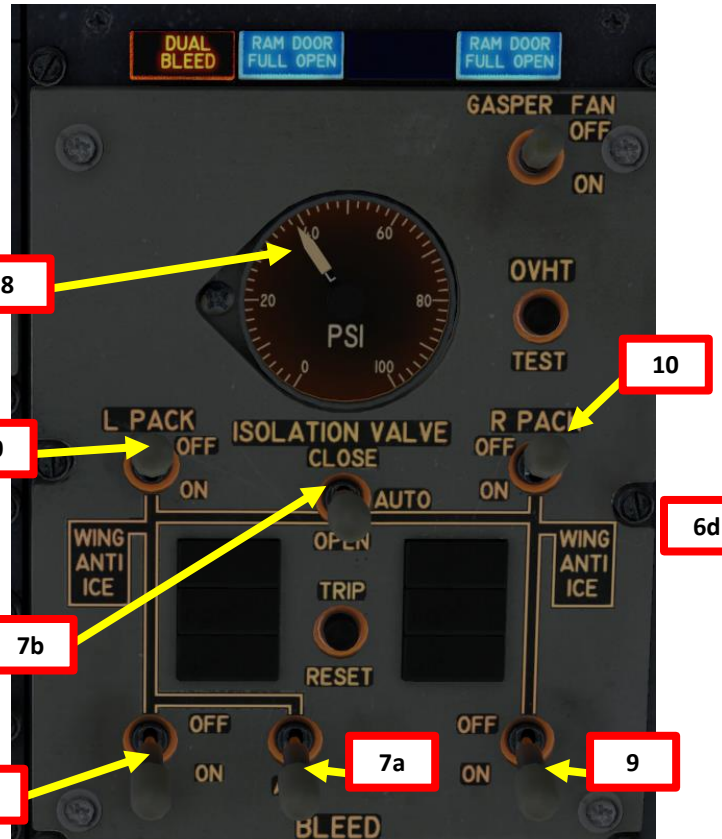
1. On Overhead Panel, turn ON AFT LEFT fuel pump
2. Set APU switch to START to initiate start, wait for EXH (also known as EGT, Exhaust Gas Temperature) to rise, then set switch to ON.
3. LOW OIL PRESSURE caution should illuminate, and EXH/EGT (Exhaust Gas Temperature) should increase within 30 seconds.
4. Monitor APU temperature (EXH) during start sequence to make sure no overheating occurs. The temperature will first rise in the 500-600 deg C range, then stabilize in the 300-340 deg C range. When APU reaches IDLE RPM, the LOW OIL PRESSURE caution will extinguish and the APU GEN OFF caution light will illuminate.
5. Set APU GEN switches #1 and #2 to ON to let the aircraft use the electrical power generated by the APU instead of Ground Power. The APU GEN OFF BUS caution will extinguish, meaning that the aircraft now runs on APU power. Take note that the External Ground Power switch will automatically reset itself to OFF.

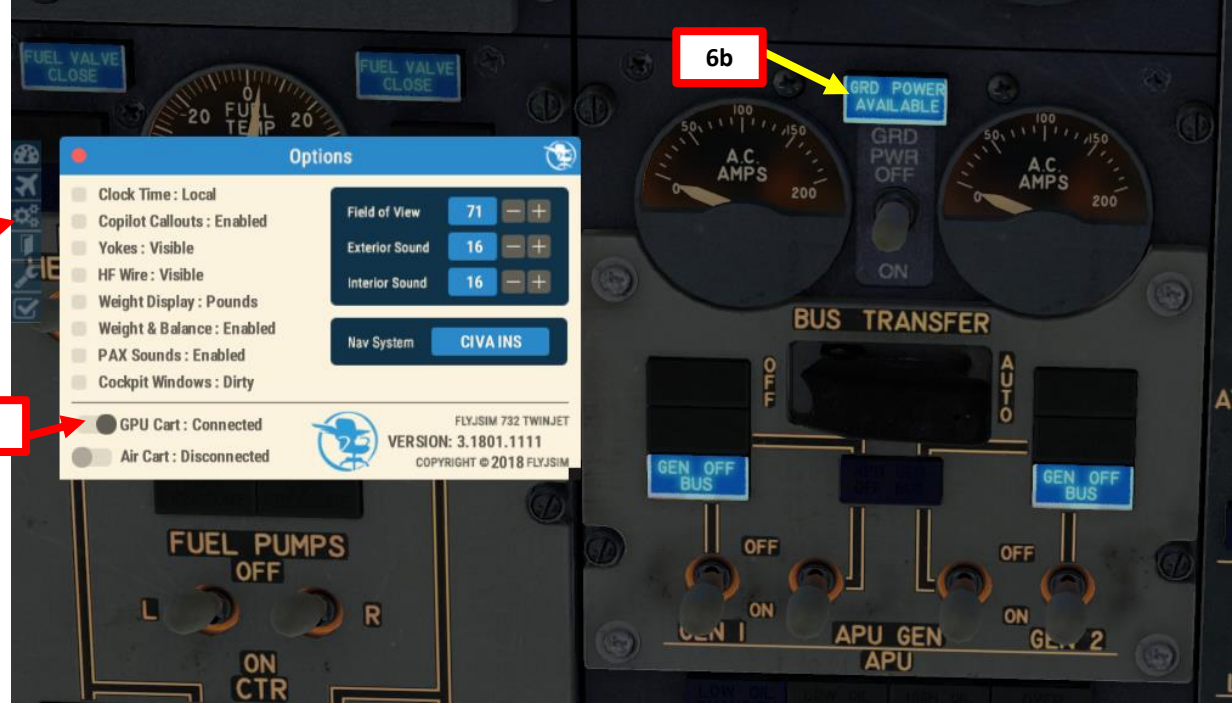




APU (AUXILIARY POWER UNIT) START

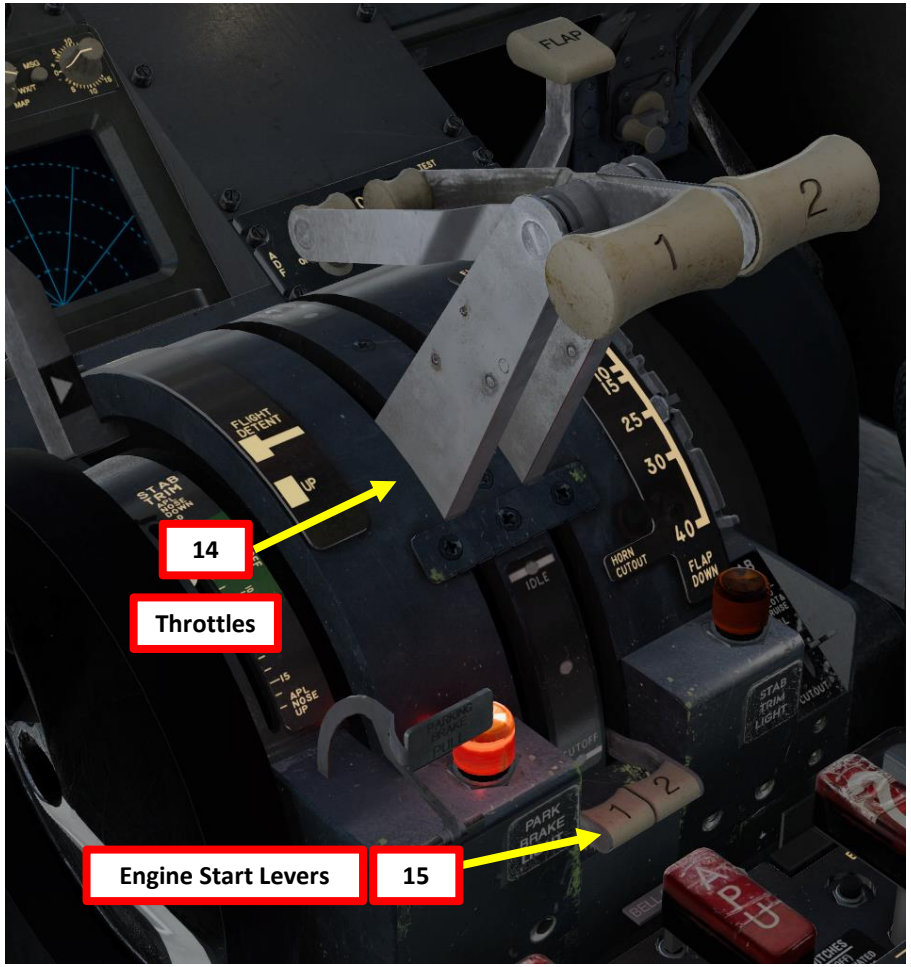
6. Disconnect ground power
   a) Click on the Options Sub-Menu button
   b) Click on the GPU Cart button
   c) Ground crew will now disconnect ground power to the aircraft. The “GRD PWR AVAILABLE” light will extinguish when the GPU (Ground Power Unit) is disconnected.
7. Set APU BLEED switch ON and ISOLATION VALVE switch to AUTO
8. Confirm that both Manifold Pressure needles stabilize above 30 PSI.
9. Set Engine 1 and Engine 2 Bleed Switches – ON
10. Make sure the Left and Right PACK (Pneumatic Air Conditioning Kit) switches are set to OFF. This is to make sure maximum APU bleed air pressure is available for engine start since the engine has a pneumatic starter.

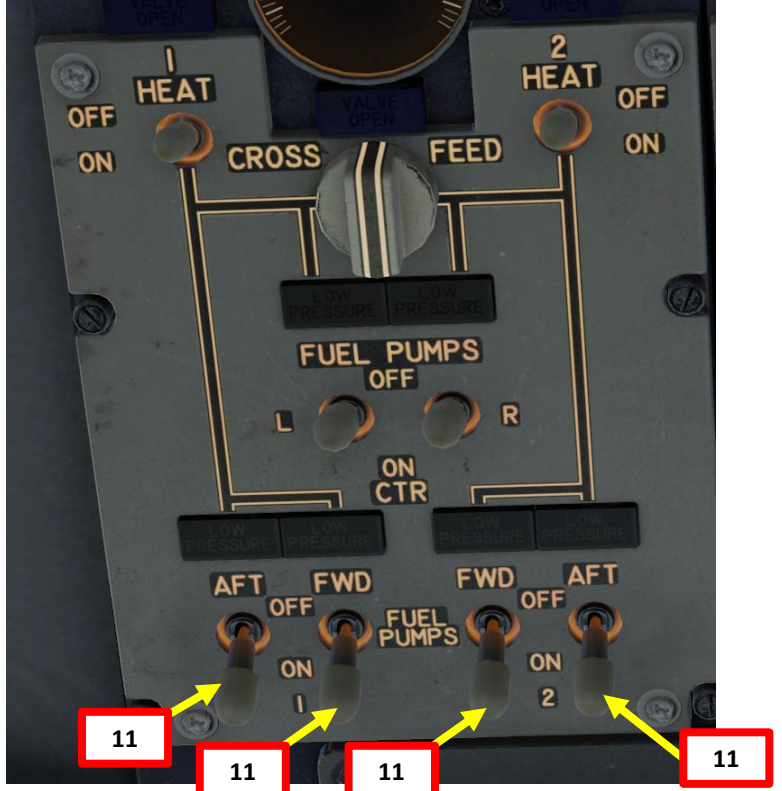


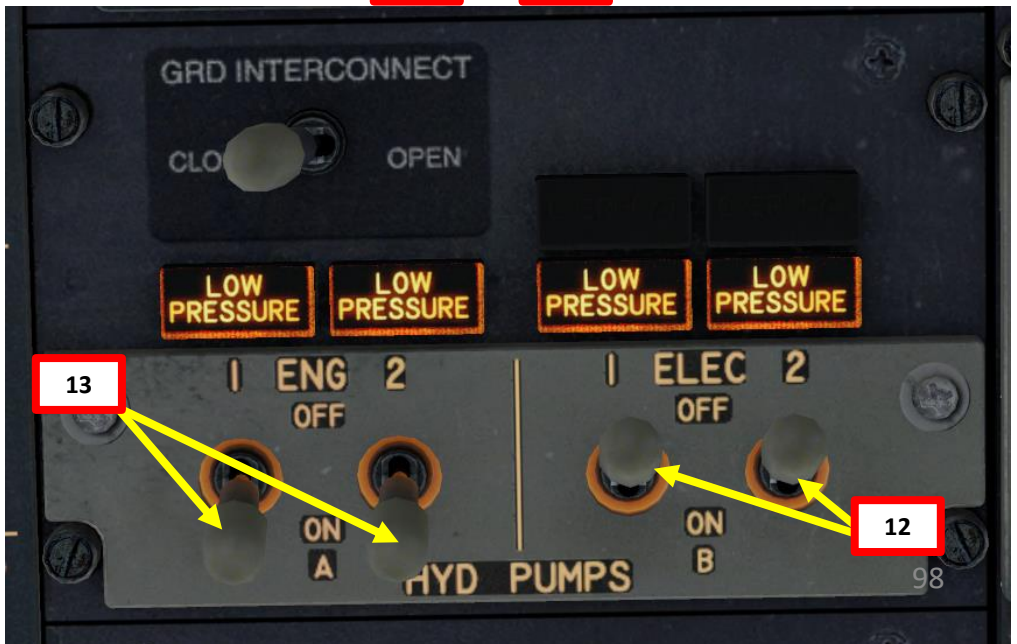


ENGINE START-UP

11. On overhead panel, set remaining fuel pump switches (FWD LEFT, FWD RIGHT, AFT RIGHT) – ON. The LOW PRESS lights should extinguish once the pumps are running.
12. Set ELEC 1 & 2 HYDRAULIC PUMP (System B) switches – OFF
13. Set ENG 1 & 2 HYDRAULIC PUMP (System A) switches – ON
14. Set all throttles to IDLE (fully aft)
15. Make sure all Engine Start Levers are at CUTOFF (DOWN).

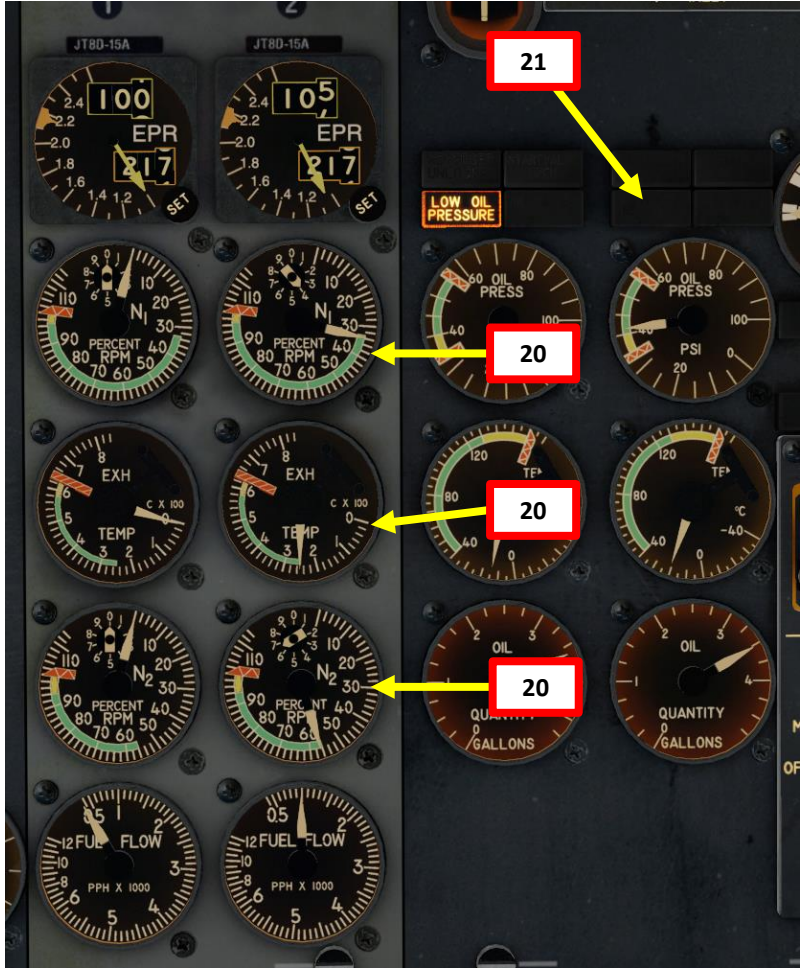


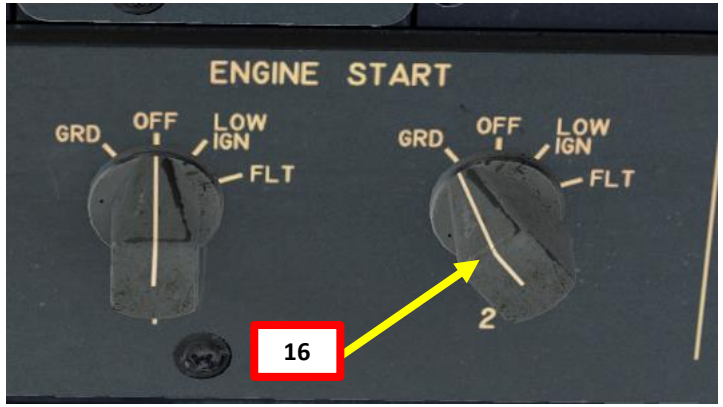


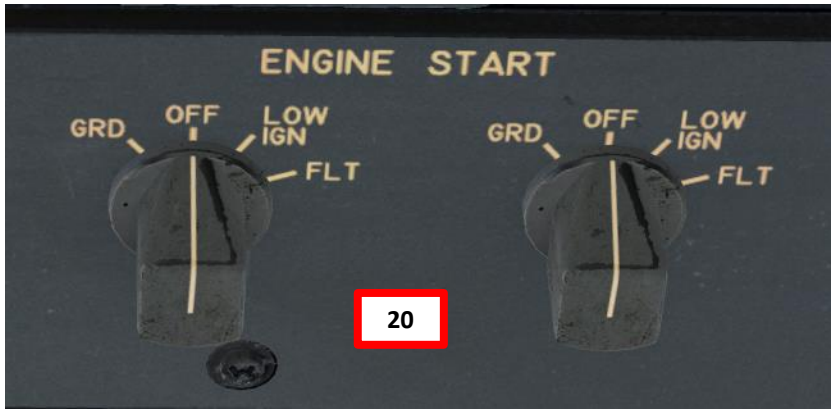


ENGINE START-UP

16. Set RIGHT STARTER selector knob to GRD (Ground Start) to crank up the starter.
17. Make sure the START VALVE OPEN light for the No. 2 engine illuminates on the Flight Engineer Panel.
18. When No. 2 Engine N2 indication (High Pressure Compressor Rotation Speed) reaches 20 %, set No. 2 Engine Start Lever to IDLE (UP). This will energize the ignition system and lightoff the engine.
19. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), Fuel Flow and EXH (Exhaust Gas Temperature) for No. 2 Engine should increase.
20. When No. 2 Engine parameters stabilize at about 35 % N1 and 60 % N2, the RIGHT STARTER selector will automatically reset itself from GROUND to OFF.
21. No. 2 Engine is considered stabilized when the LOW OIL PRESSURE light is extinguished.

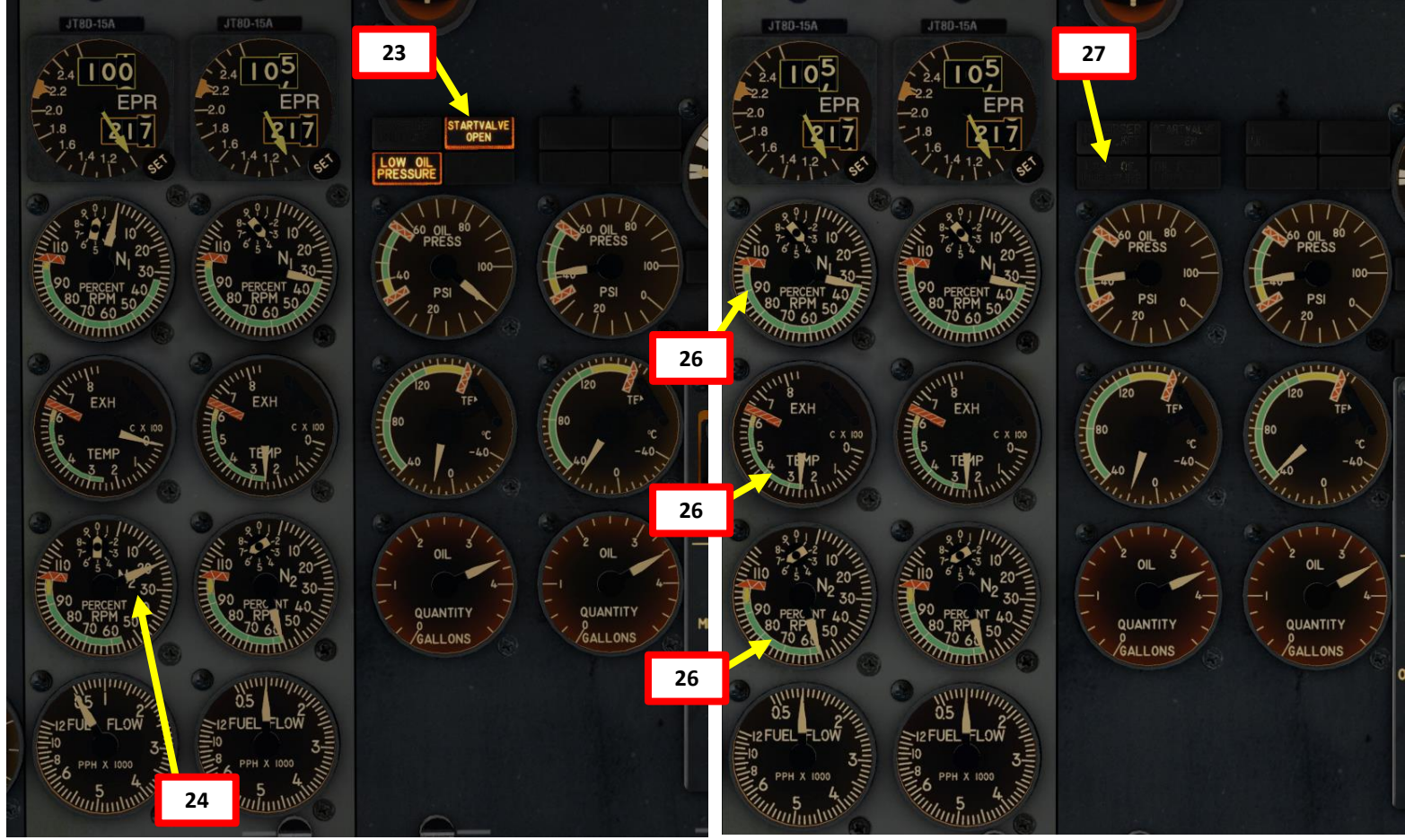


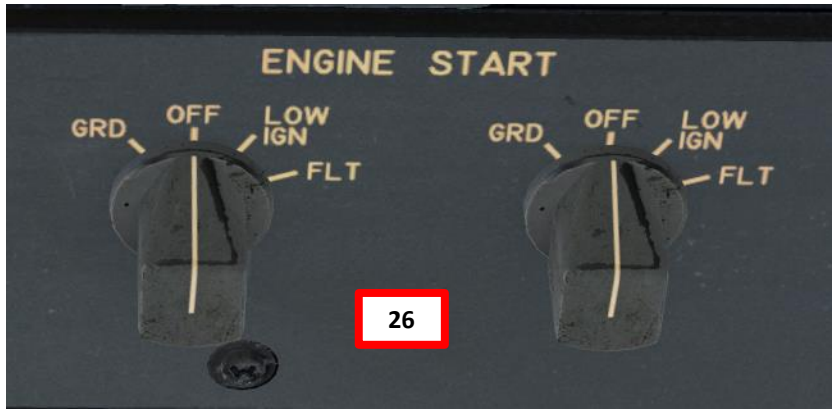




ENGINE START-UP

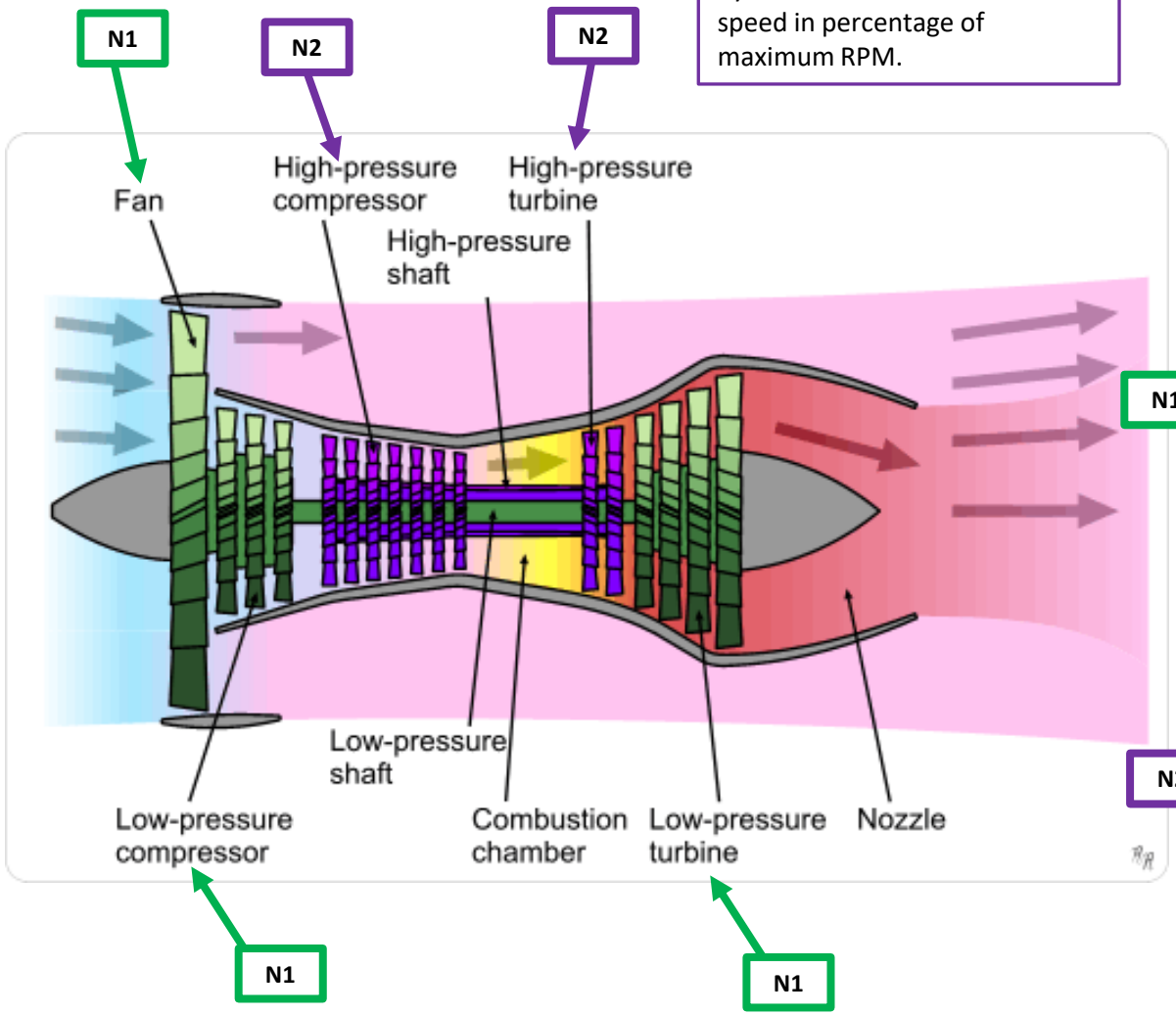
22. Set LEFT STARTER selector knob to GRD (Ground Start) to crank up the starter.
23. Make sure the START VALVE OPEN light for the No. 1 engine illuminates on the Flight Engineer Panel.
24. When No. 1 Engine N2 indication (High Pressure Compressor Rotation Speed) reaches 20 %, set No. 1 Engine Start Lever to IDLE (UP). This will energize the ignition system and lightoff the engine.
25. N1 indication (Fan Speed / Low Pressure Compressor Rotation Speed), Fuel Flow and EXH (Exhaust Gas Temperature) for No. 1 Engine should increase.
26. When No. 1 Engine parameters stabilize at about 35 % N1 and 60 % N2, the LEFT STARTER selector will automatically reset itself from GROUND to OFF.
27. No. 1 Engine is considered stabilized when the LOW OIL PRESSURE light is extinguished.





ENGINE START-UP

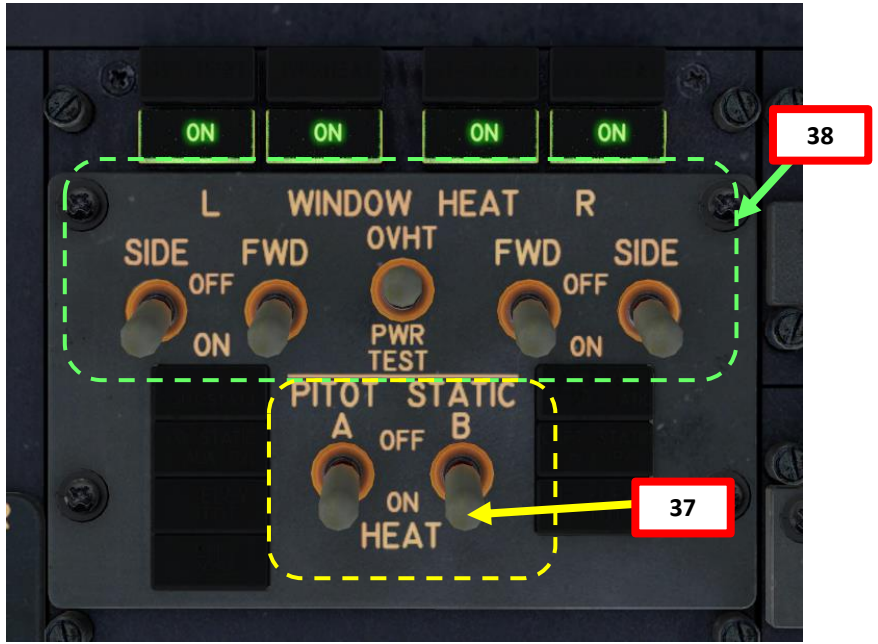
High-pressure compressor and high-pressure turbine are driven by the same shaft. This is N2 speed in percentage of maximum RPM.

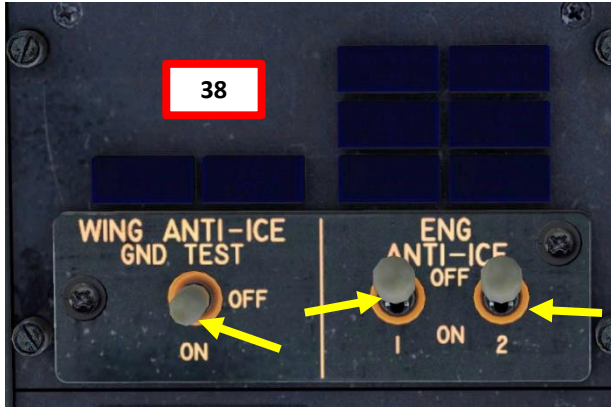


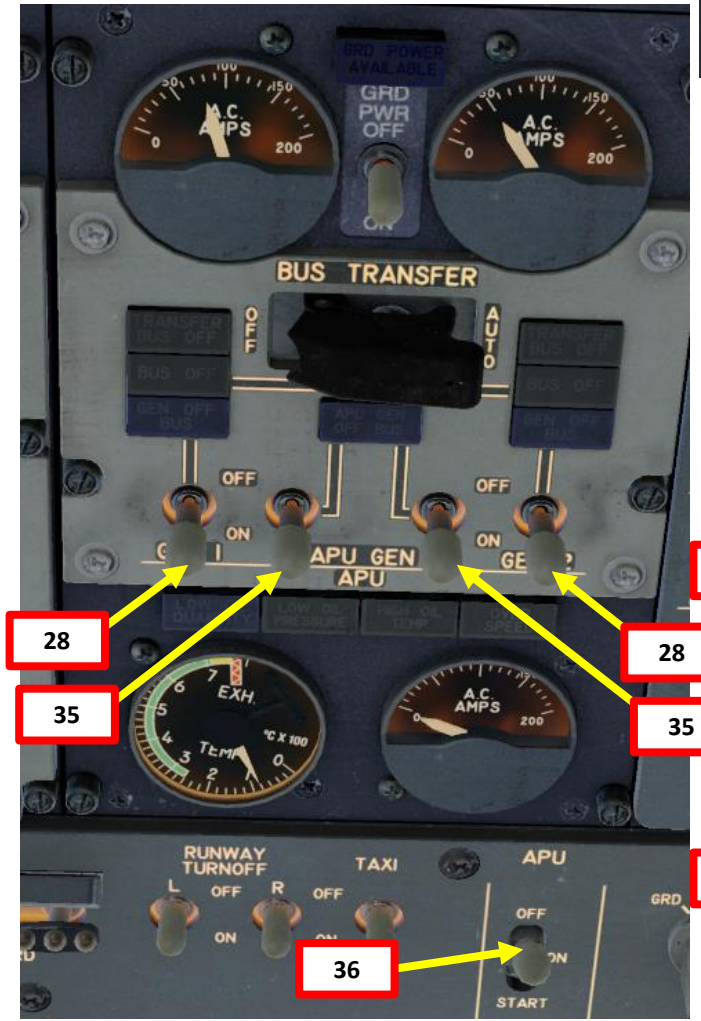
Fan, low-pressure compressor and low-pressure turbine are driven by the same shaft. This is N1 speed in percentage of maximum RPM.

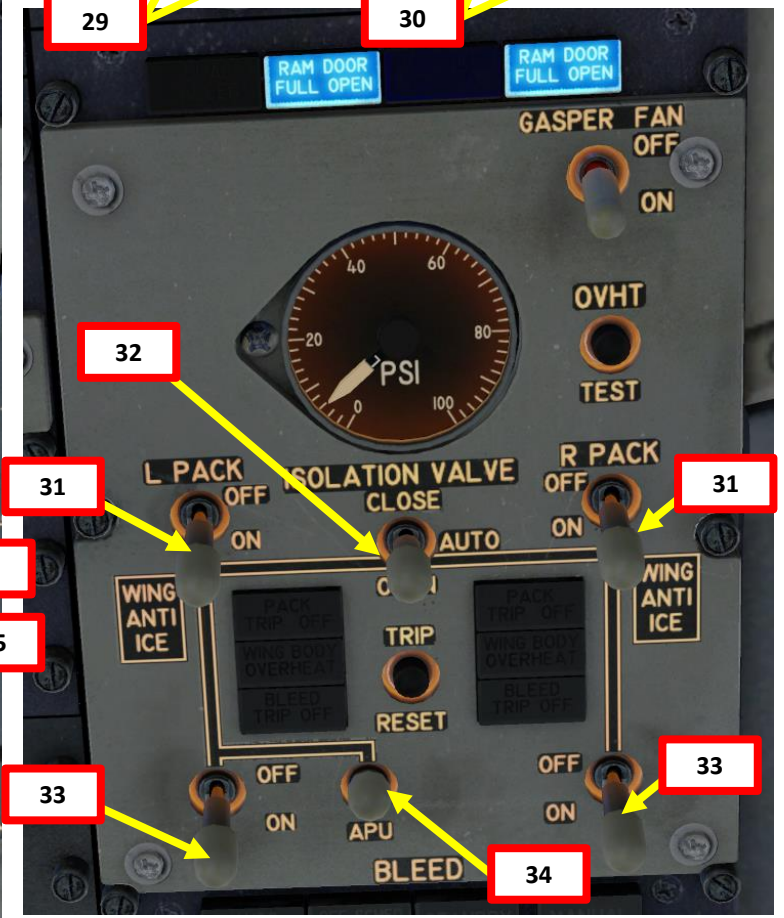
ENGINE START-UP

28. Set both Engine GEN 1 and GEN 2 switches to ON. Once engine generator power kicks in, the APU generators will be automatically disconnected.
29. Verify that ENG 1 & 2 HYDRAULIC PUMP switches are ON. Verify that you have positive hydraulic pressure in System A.
30. Set ELEC 1 & 2 HYDRAULIC PUMP switches – ON. Verify that you have positive hydraulic pressure in System B.
31. LEFT and RIGHT AIR CONDITIONING PACK (Pneumatic Air Conditioning Kit) switches – ON
32. Verify Isolation Valve is set to AUTO
33. Verify ENG 1 and 2 BLEED switches are ON
34. APU BLEED switch – OFF
35. APU GEN #1 and #2 switches – OFF
36. APU switch – OFF
37. Pitot Probe Heat switches – ON
38. Engine Anti-Ice / Wing Anti-Ice / Window Heat switches – As Required







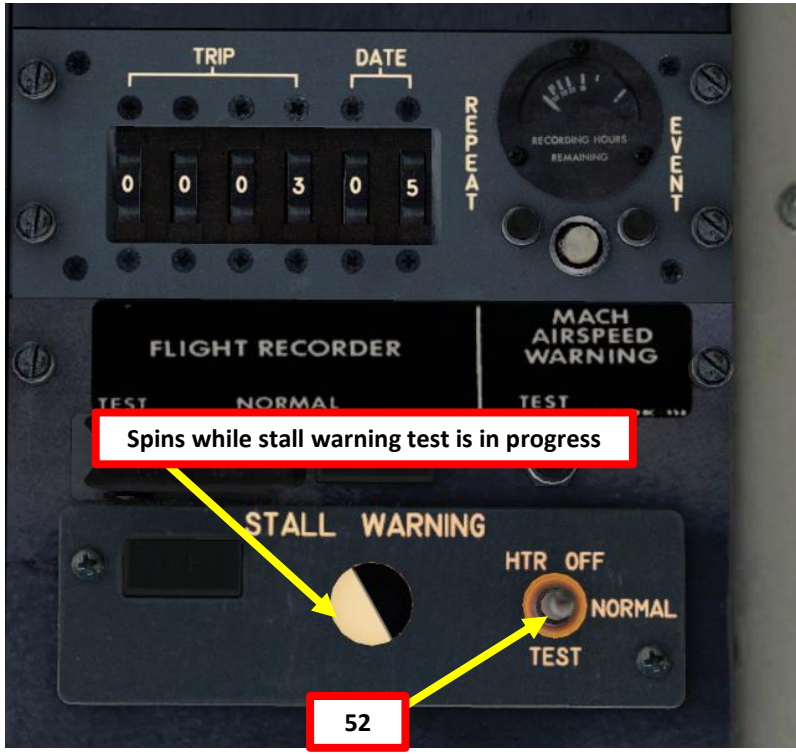


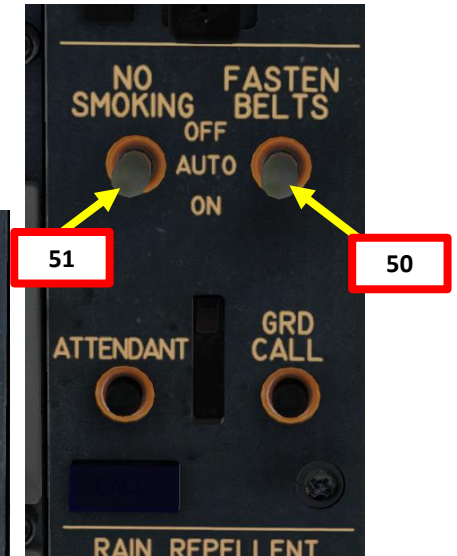
COMPLETE PRE-FLIGHT

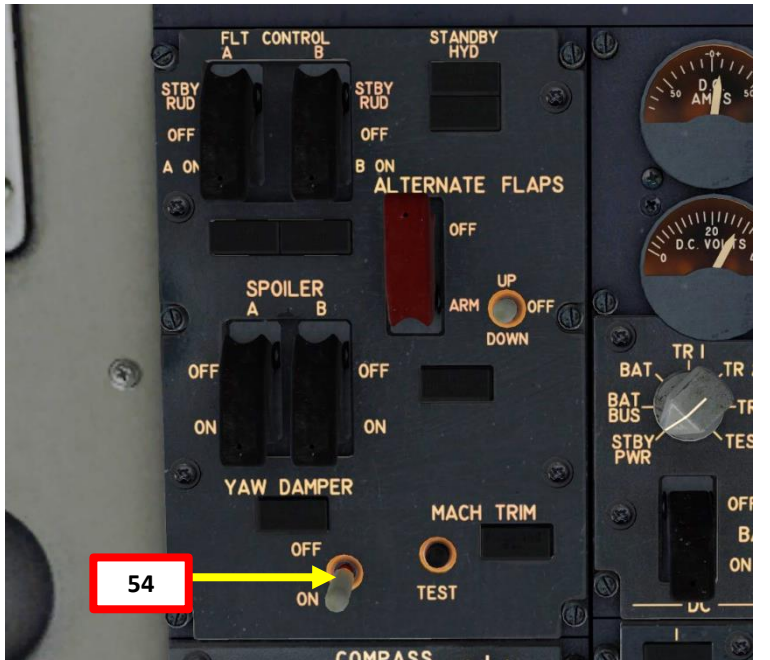
39. Set the Gasper Fan switch – ON
40. Set Cabin Pressure switch – FLIGHT
41. Landing Lights switch – ON
42. Runway Turnoff Lights switches – ON
43. Taxi Light switch – ON
44. Strobe Light switch – ON
45. Position Lights switch – ON
46. Anti-Collision Lights switch – ON
47. Wing Light – ON
48. Logo Light – ON

COMPLETE PRE-FLIGHT

49. Emergency Lights – set switch to ARMED and close cover
50. Set FASTEN BELTS light to AUTO
51. NO SMOKING (CHIME) light to ON
52. On the overhead panel, hold the STALL WARNING switch to TEST and make sure that you hear the stall warning sound (annoying rattle). Reset switch back to NORMAL.
53. Press the GROUND PROXIMITY SYS TEST to start a series of automated tests. You should hear a series of aural warnings like « Glide Slope » or « Pull up! » « Windshear! » « Terrain! » « Airspeed Low! » « Sink Rate! » « Don't sink! » « Too low, Terrain! » « Too low, flaps! », etc.
54. Set Yaw Damper Switch – ON

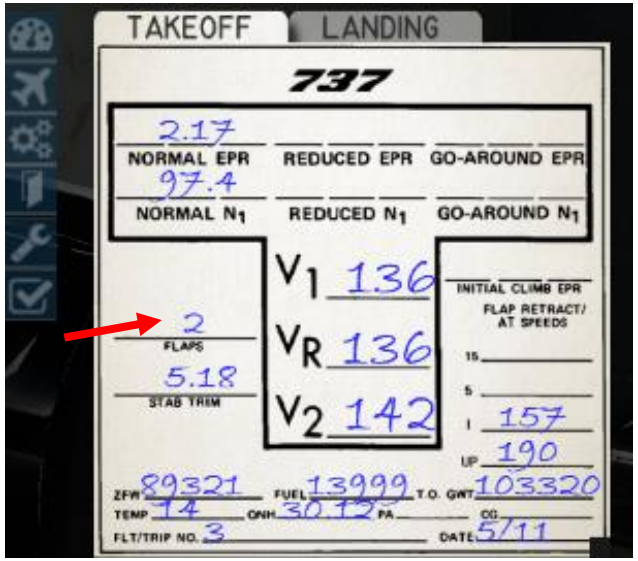


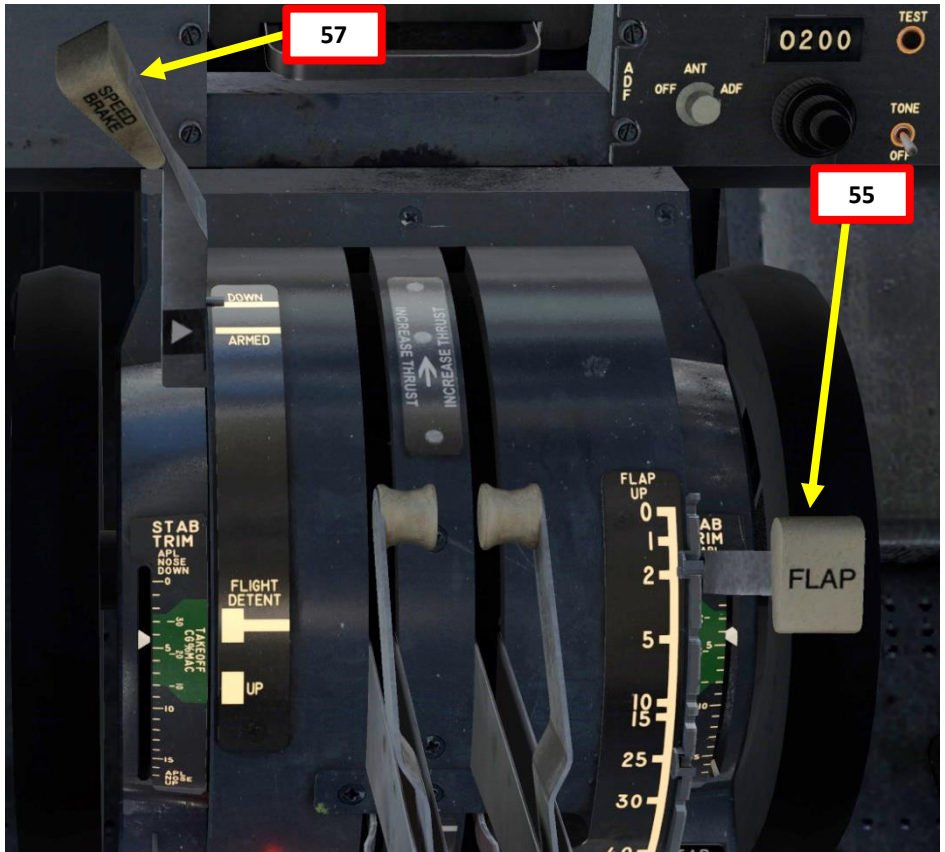




COMPLETE PRE-FLIGHT

55. As per the V-speed card, we intend to takeoff with flaps at 2 degrees. Set flaps lever to 2 degrees
56. Verify that flaps are deployed at 2 deg and that the Leading Edge Flaps Extended light is illuminated.
57. Make sure Speed Brake is OFF/DOWN (NOT ARMED) by checking that lever position is down and forward
58. Verify that no warnings are displayed on the Master Recall panel

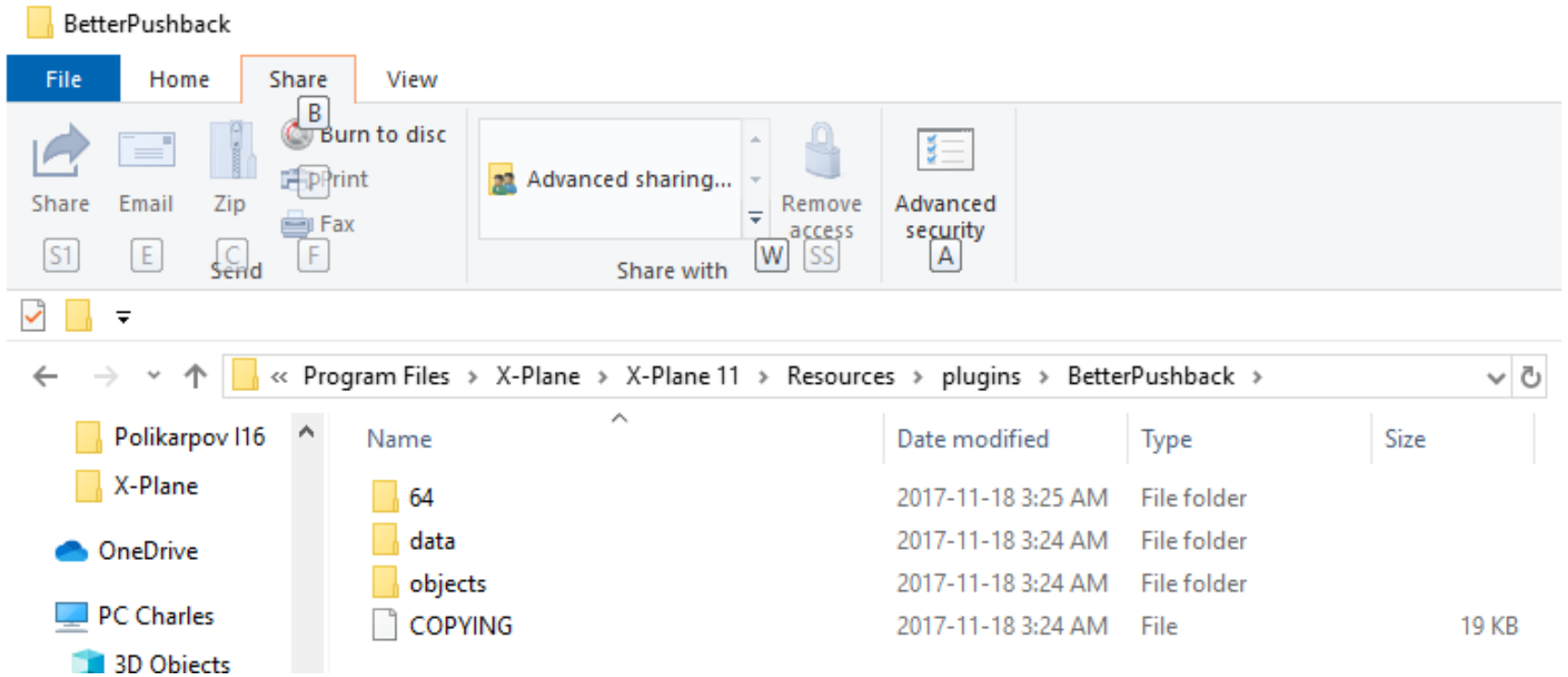




PUSHBACK

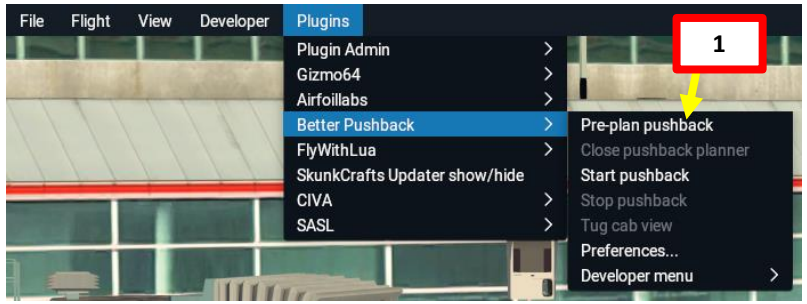
- The FlyJSim 737-200 requires the free external plugin BetterPushback to be installed in order to use pushback functionalities. You can find it here:
  https://github.com/skiselkov/BetterPushbackC/releases/download/v0.46/BetterPushback.zip

- The BetterPushback files need to be installed in the following folder:
  C:\Program Files\X-Plane\X-Plane 11\Resources\plugins\BetterPushback



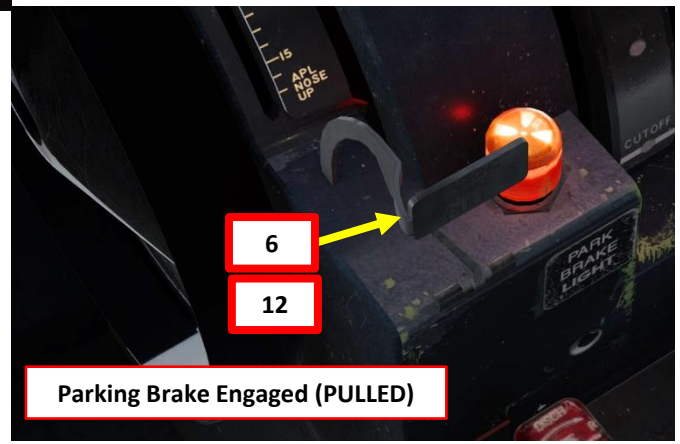
PUSHBACK

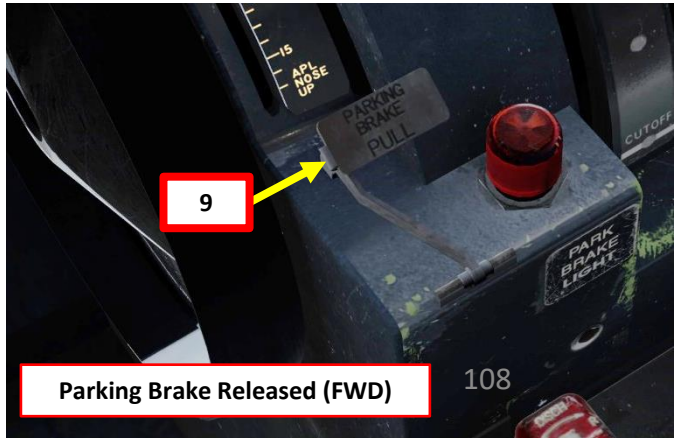
1. First, you need to pre-plan the pushback trajectory. In your Plugins menu, select “Better Pushback” sub-menu, then click “Pre-plan pushback”.
2. You will automatically see a top-down view of your aircraft. You can drag your mouse to your desired aircraft position and rotate the aircraft by scrolling the middle mousewheel button.
3. Once the yellow aircraft silhouette is to your liking, left click (silhouette will turn green) and press “ENTER” to save the pushback trajectory.



PUSHBACK

4. Verify that Anti-Skid Inboard and Outboard switches are ON
5. Before beginning pushback, make sure your landing lights and taxi lights are off to avoid blinding the ground crew.
6. Engage Parking Brake (PULLED). Verify that BRAKE LIGHT is illuminated.
7. Press and hold the GROUND CREW CALL button for about 4 to 5 seconds to contact ground crew personnel.
8. The ground crew will connect the Pushback Tug and ask you to release the parking brake when ready
9. Disengage Parking Brake (FWD). Verify that BRAKE LIGHT is extinguished
10. The pushback tug will start moving the aircraft
11. When the pushback procedure is finished, the ground crew will ask you to set the parking brake to disconnect the tug
12. Engage Parking Brake (PULLED). Verify that BRAKE LIGHT is illuminated.






PUSHBACK
WESTJET
WESTJET
American
HSBC
HSBC
HSBC

PUSHBACK

13. Give the ground crew the thumbs up to disconnect the tug

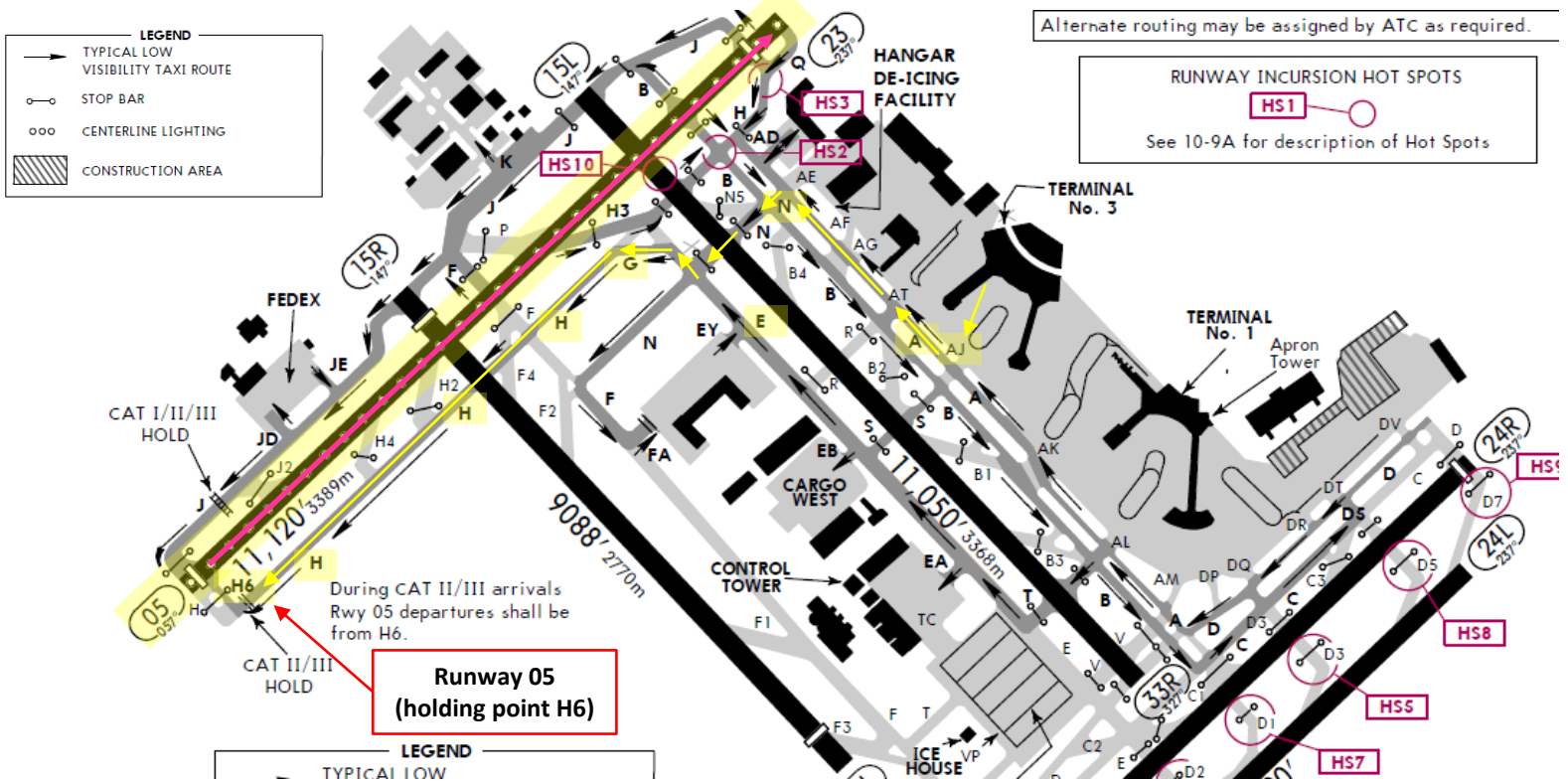
TAXI

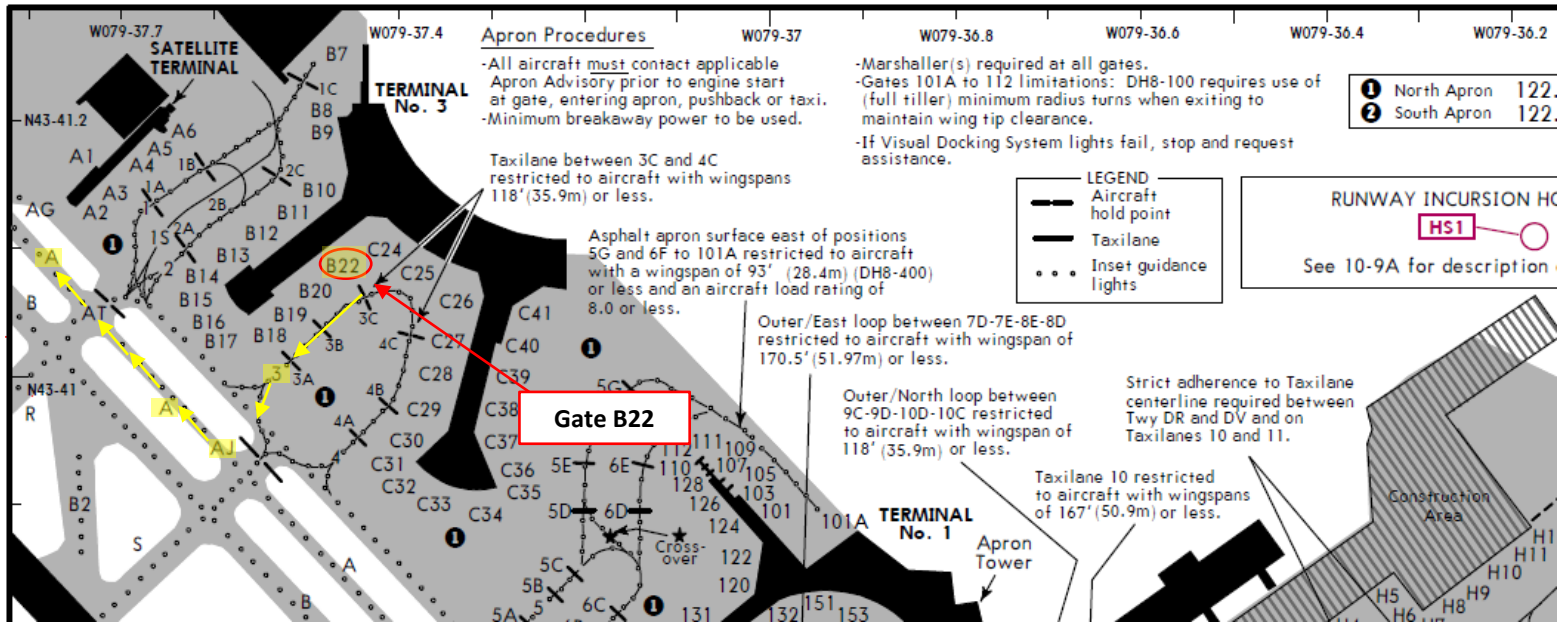
The 737 is steered on the ground by using a tiller. X-Plane allows you to map an axis to the tiller.

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

TAXI

- Our Flight Number for today will be AAL119 and we spawned at gate B22.
- After we performed pushback from gate B22, we would typically contact the tower for guidance by saying « AAL119, requesting taxi. »
- The tower would then grant you taxi clearance by saying « AAL119, 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.





TAXI

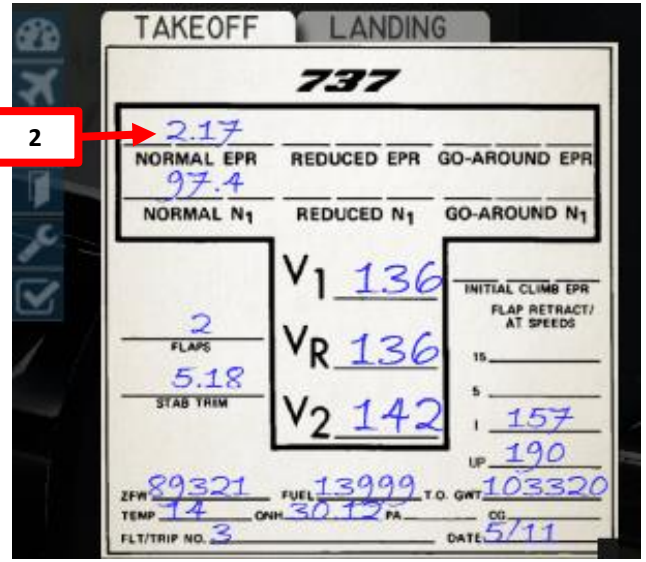

Check signs to follow the taxi route towards the holding point (H6)

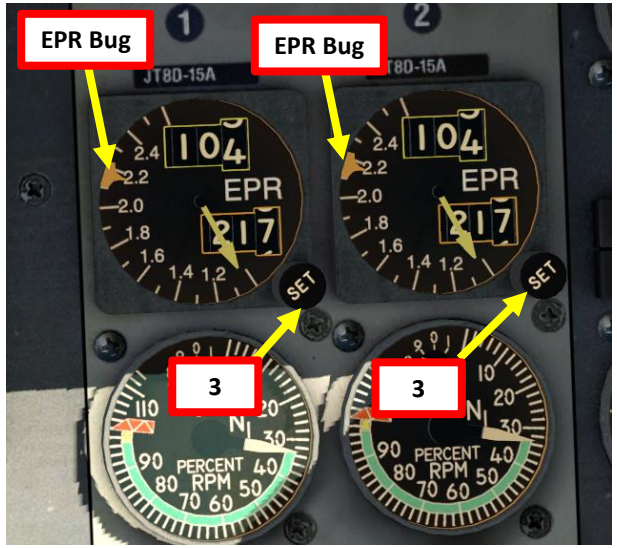
TAXI

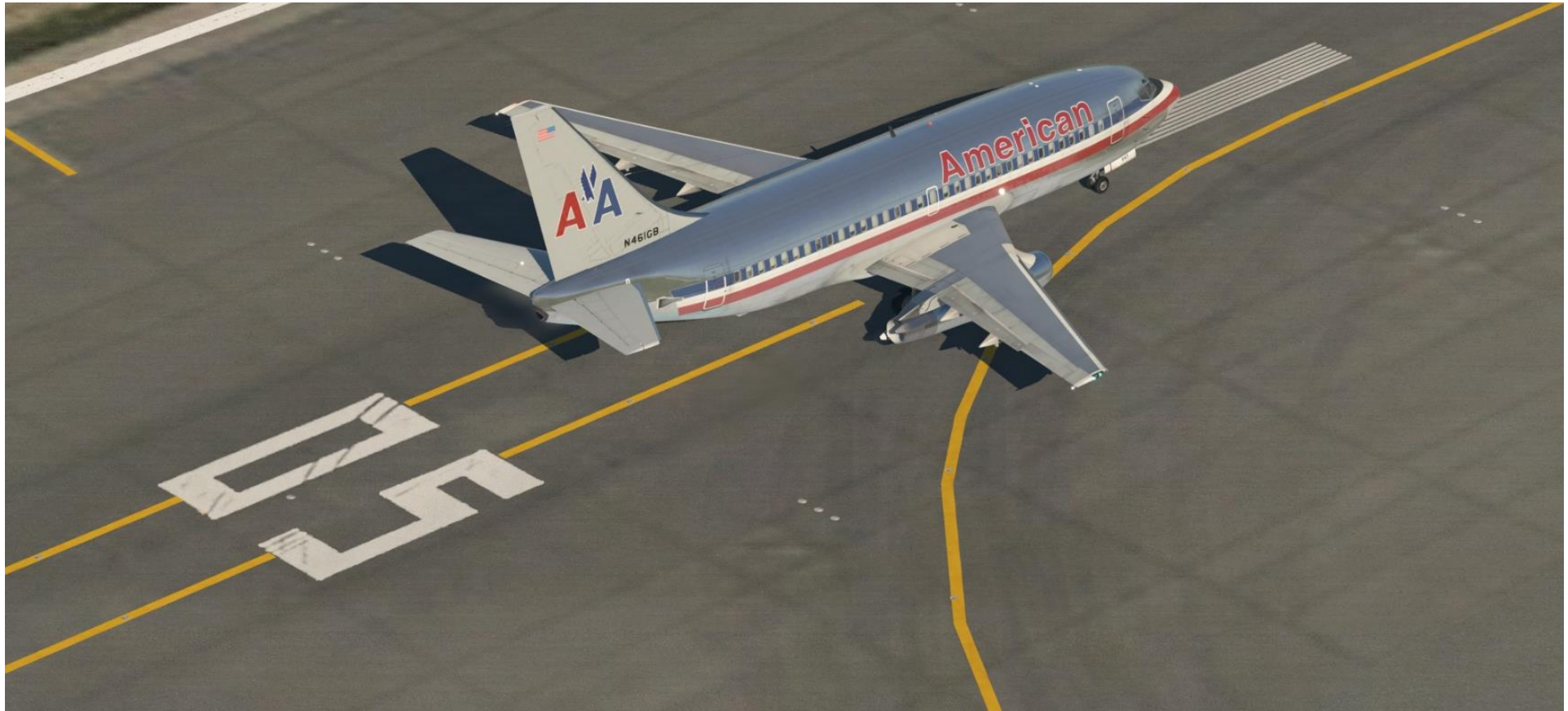

H6 05-23
AFT FWD FUEL PUMPS FWD AFT
OFF ON
RUNWAY TURNOFF TAXI APU
ENGINE START
FIRE WARN
MASTER CAUTION
HDG VOR LOC AUTO APP MAN GS
057 COURSE
057 HEADING
057 COURSE
ALT HOLD
FLT DIR
PITCH CMD
ENGAGE
HDG SEL
DISENGAGE
F/D A/P
IVSI
RADIO ALT
EPR
YAW DAMPER TEST
LANDING GEAR
AUTOBRAKE

TAKEOFF

1. Line up on the runway
2. Verify that your flaps are set to 2 as per the V-speed card
3. Set your EPR (Engine Pressure Ratio) bugs to the NORMAL EPR written on the V-speed card.
4. Release parking brake and hold wheel brakes

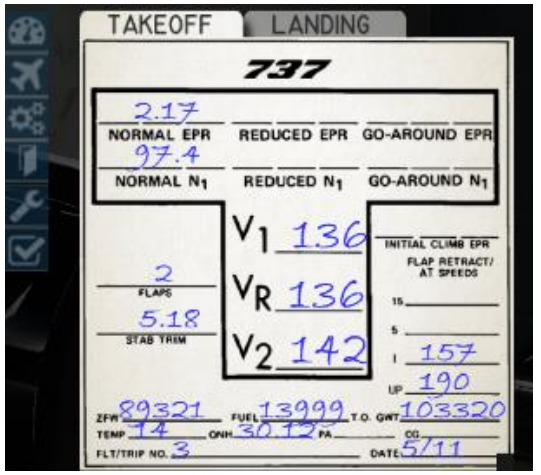


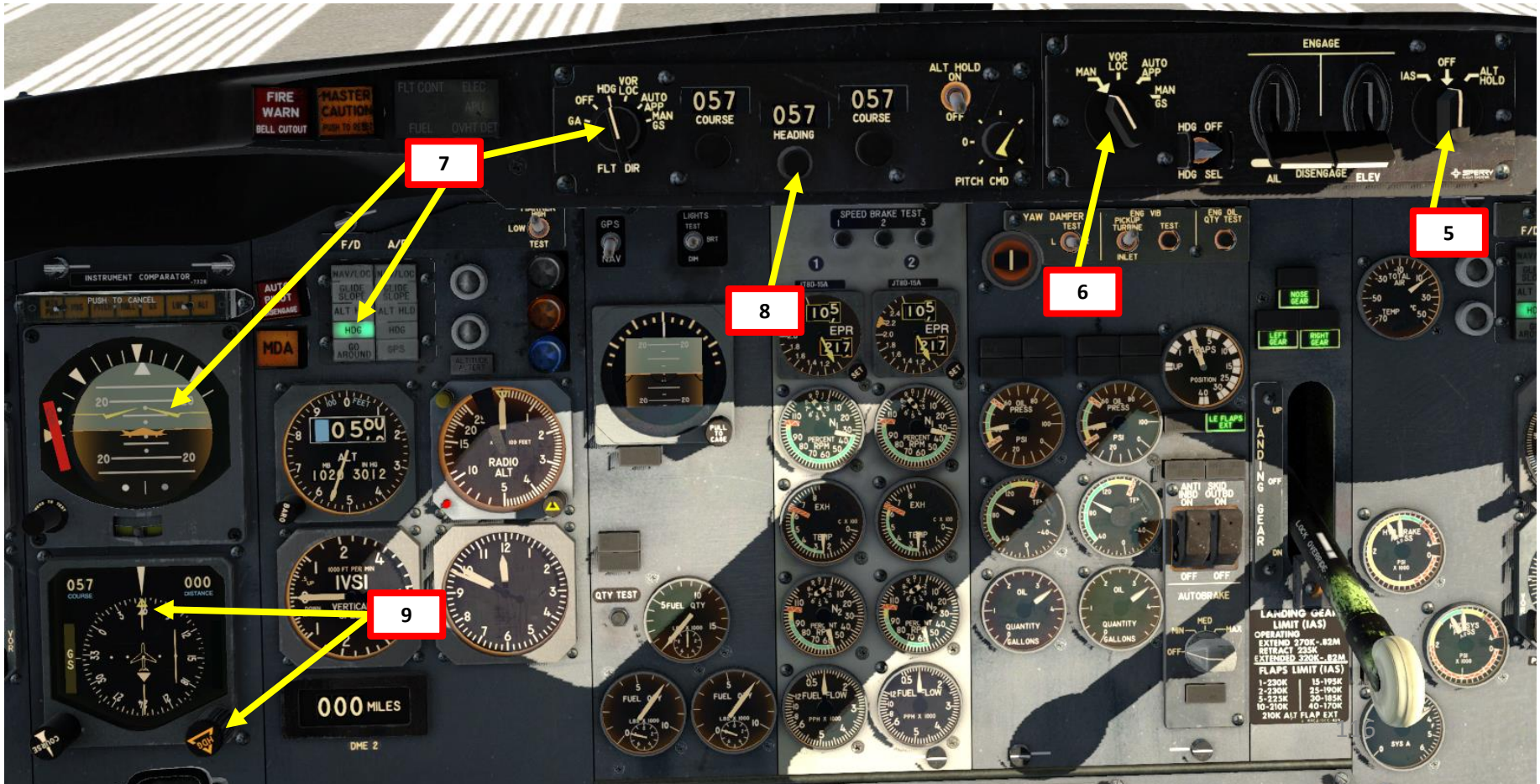




TAKEOFF

5. Set Autopilot Pitch Mode Selector to OFF
6. Set Autopilot Roll Mode Selector to MAN
7. Set Flight Director Mode Selector to HDG (Heading). The 15-degree Pitch line will appear on your ADI (Attitude Director Indicator)
8. Verify that your Autopilot Selected Heading Indicator is set to the runway heading (057)
9. Verify that your Heading Select Bug is set to the runway heading (057)
10. Hold brakes and throttle up to an EPR of maximum 2.17 EPR (Normal Engine Pressure Ratio as per V-speed card). You can also use a maximum N1 of 97.4 % as a reference.
11. Release brakes and accelerate

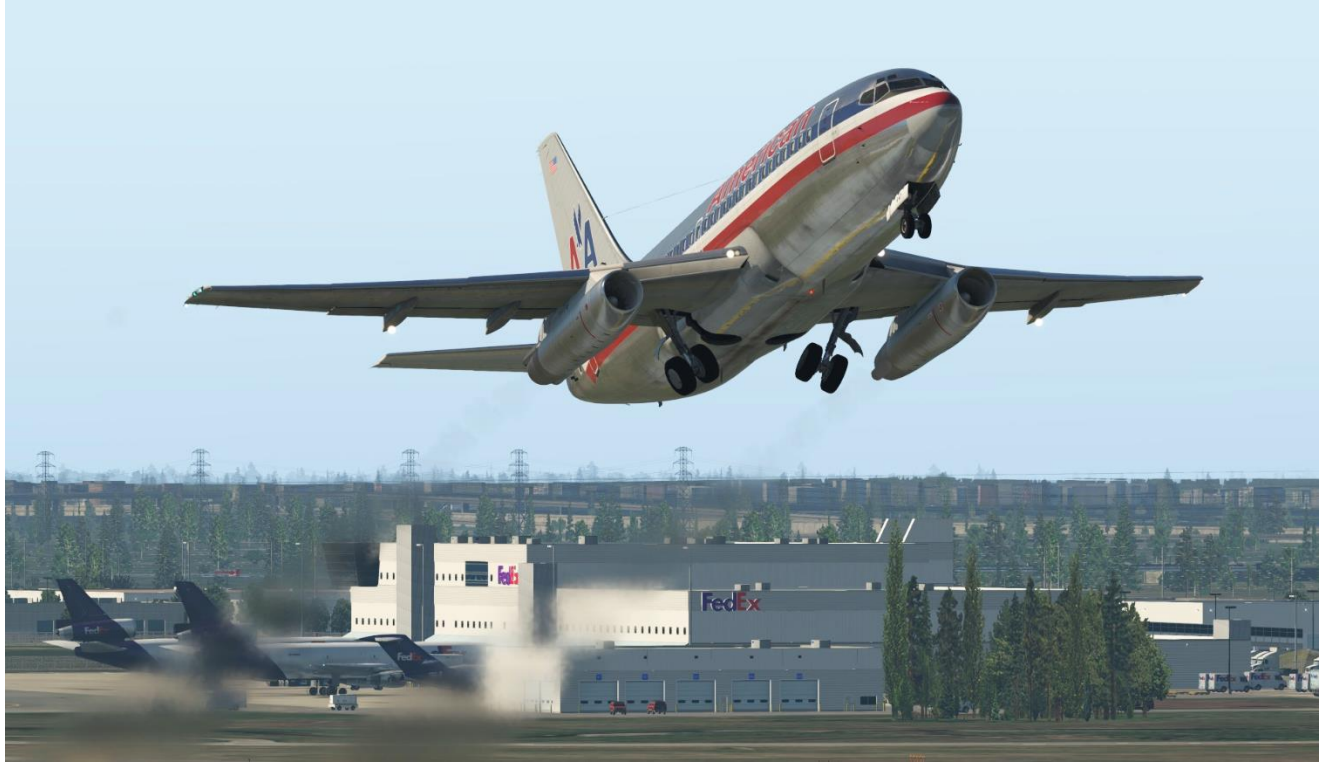


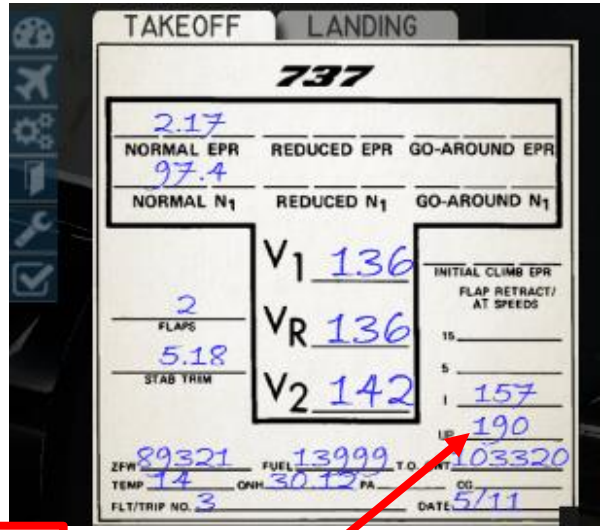


TAKEOFF

TAKEOFF

12. As you speed up to 80 kts, the First Officer will call out « 80 knots ». The airspeed indicator comes alive at that speed.
13. Once you reach V1 (Decision Speed, 136 kts), start a gentle rotation.
14. Once you confirm a « Positive Rate », retract landing gear by setting the Landing Gear Lever UP, waiting for the landing gear to retract, and then setting the gear lever to the OFF (Middle) position to lock it.





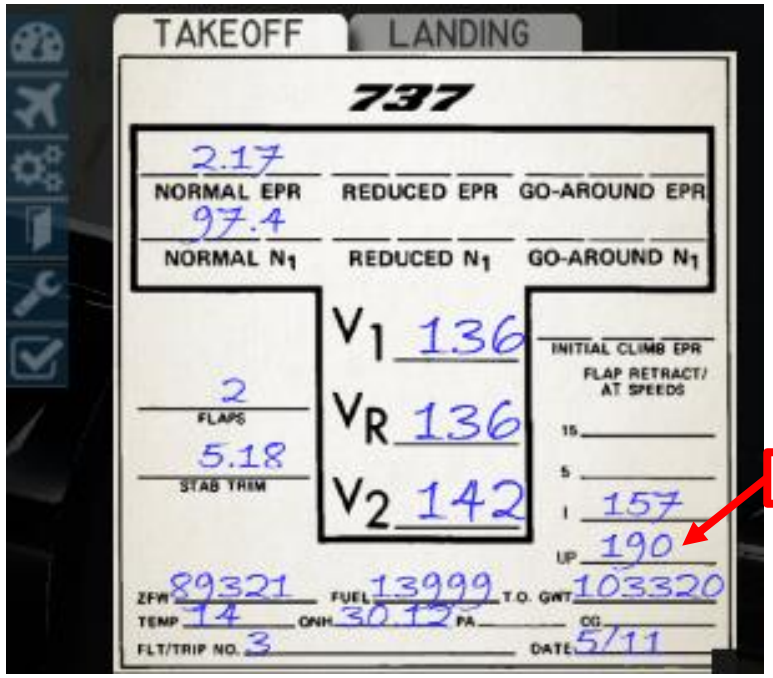
TAKEOFF

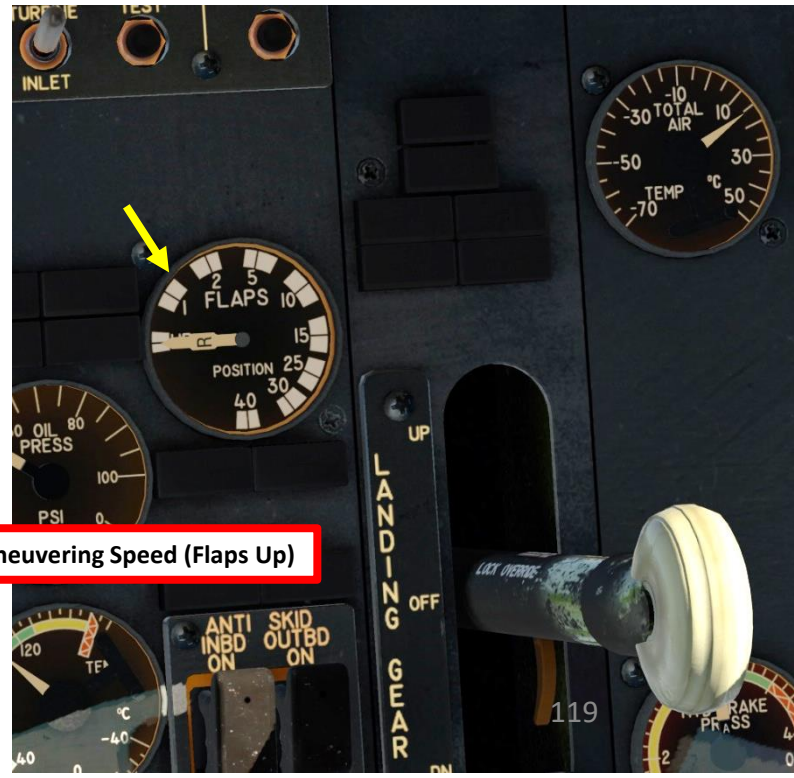
15. Rise flaps as per flaps schedule.
    a) Set flaps to 1 at 157 kts (V_2 + 15)
    b) Set flaps to 0 at 190 kts (Maneuvering speed)

FLAP RETRACTION SPEED SCHEDULE

ACTION	FLAP SETTING FOR TAKEOFF		
	15/10	5/2	1
Select Flap 5 at	V2 + 15	-	-
Select Flap 1 at	Maneuv. Speed	V2 + 15	-
Select flap 0 at	Maneuvering Speed (190 kts as per our Takeoff Chart)		

NOTE: Flap retraction speeds (minimum maneuver speeds) may be led by 10 kts when accelerating. Limit bank angle to 15 until reaching maneuvering speed. As flaps are retracted from 1 to 0 deg, power may be reduced to 1.7 EPR for noise abatement and continued climb to 3000 ft AGL.





Maneuvering Speed (Flaps Up)

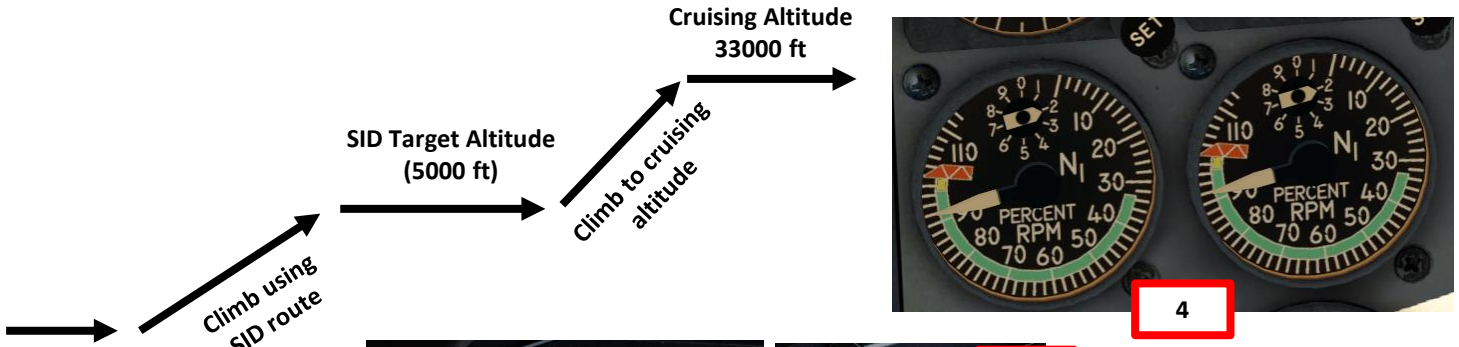
TAKEOFF

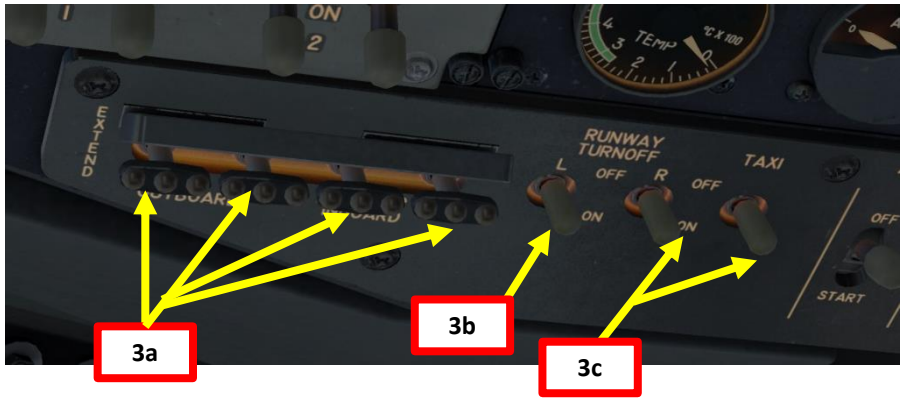
16. Verify that the GPS/NAV Selector Switch is set to NAV.
17. Engage Autopilot Aileron (Roll) and Elevator Channel switches
18. Set Heading Bug to 047 deg for the first turn and verify that selected altitude is 5000 ft.
19. Set Autopilot Speed Bug to 250 kts
20. Set Autopilot Pitch Mode Selector to IAS. The elevator will attempt to maintain the selected target speed (250 kts).
21. The IAS mode automatically engages the ALTITUDE SELECT mode to the selected target altitude (5000 ft). The amber ALT HLD indication shows that the ALTITUDE HOLD mode is armed but not yet active; it will automatically activate once the target altitude is reached.
22. When climbing above 1000 ft, set Autopilot Roll Sub-Mode to HDG SEL and verify that the Flight Director Mode Selector is set to HDG.
23. Aircraft will now steer to 047 as set by the Heading Select bug.

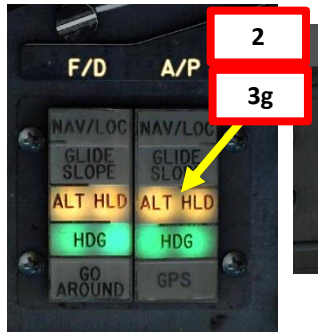
TAKEOFF

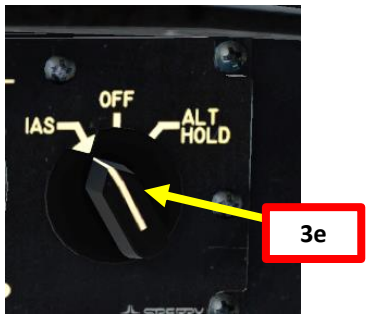
CLIMB

1. Verify that the Selected Airspeed Bug is set to 250 kts
2. Verify that the Autopilot Pitch Mode Selector is set to IAS. This means the ALTITUDE SELECT mode is active as well. The aircraft should be climbing to the target altitude (5000 ft) while maintaining the selected target speed of 250 kts.
3. When reaching 5,000 ft (the end of the first climb segment):
   a) Landing Lights switches – OFF
   b) Taxi Light switch – OFF
   c) Runway Turnoff Lights switches – OFF
   d) The ALTITUDE ALERT indication will illuminate once you are 1000 ft from the target altitude.
   e) Once the target altitude has been reached, the ALT HOLD mode will automatically engage and the ALT HLD light will turn green. This means that the IAS mode is no longer active; the aircraft will maintain its current altitude and you will control the aircraft speed with the throttle.
   f) Set Selected Altitude to cruising altitude of 33000 ft
   g) Set Autopilot Pitch Mode Selector to IAS. It will automatically re-engage the ALTITUDE SELECT mode and continue your climb.
4. Throttle back to a cruise setting of 92 % N1.



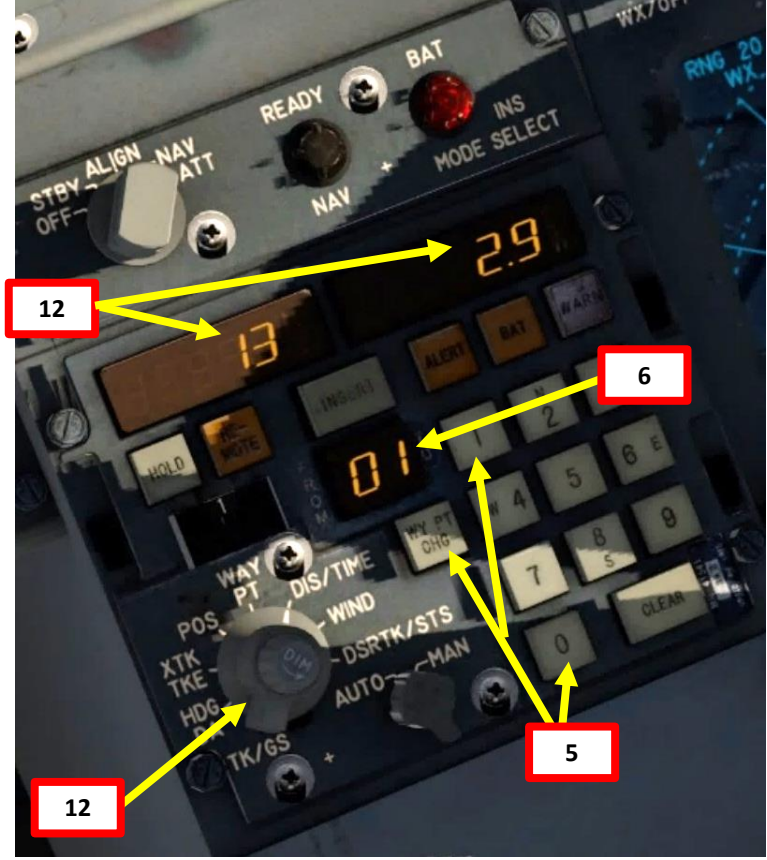


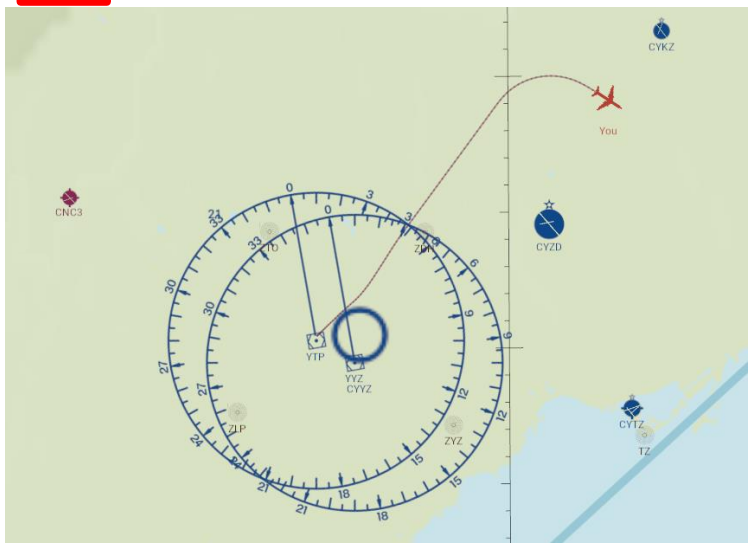


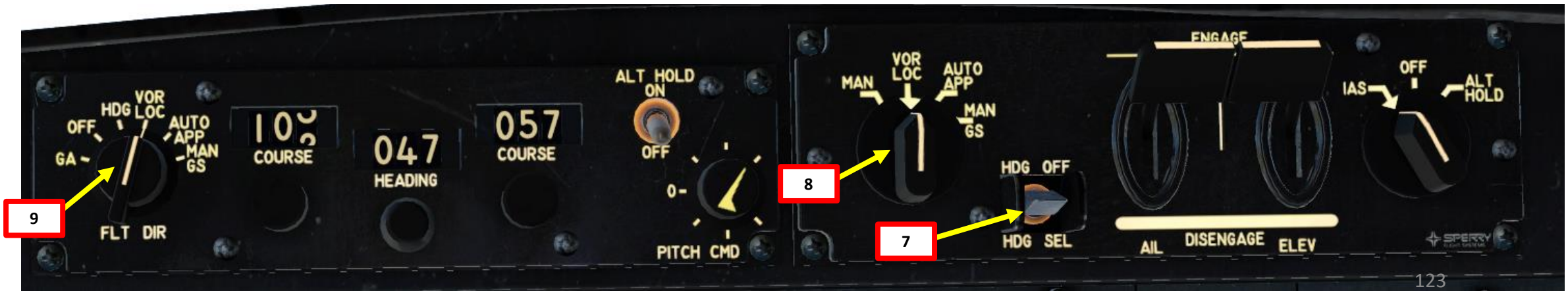


CLIMB

5. To track the waypoints we entered in our CIVA, we will choose what waypoint we want to track first. Press the WY PT CHG (Waypoint Change) button and press “01”.
6. The FROM-TO display will now show 01, meaning that we are flying FROM waypoint 0 (which is the position of the aircraft) TO waypoint 1 (SIKBO).
7. Set Autopilot Roll Sub-Mode switch to HDG OFF
8. Set the Autopilot Roll Mode switch to VOR/LOC
9. Set the Flight Director Mode Selector switch to VOR/LOC
10. Set the GPS/NAV Selector Switch set to GPS. This will set the CIVA as the data source that drives the autopilot, as shown by the “GPS” light on the APD panel.
11. The aircraft will now steer from your current position (waypoint 0) towards waypoint 1 (SIKBO).
12. Set the CIVA Data Selector Switch to DIS/TIME to display the distance from tracked waypoint (in nautical miles) and the time to waypoint (in minutes). The picture shows that we are 13 nm from waypoint 1 and that we will cross it in 2.9 minutes.

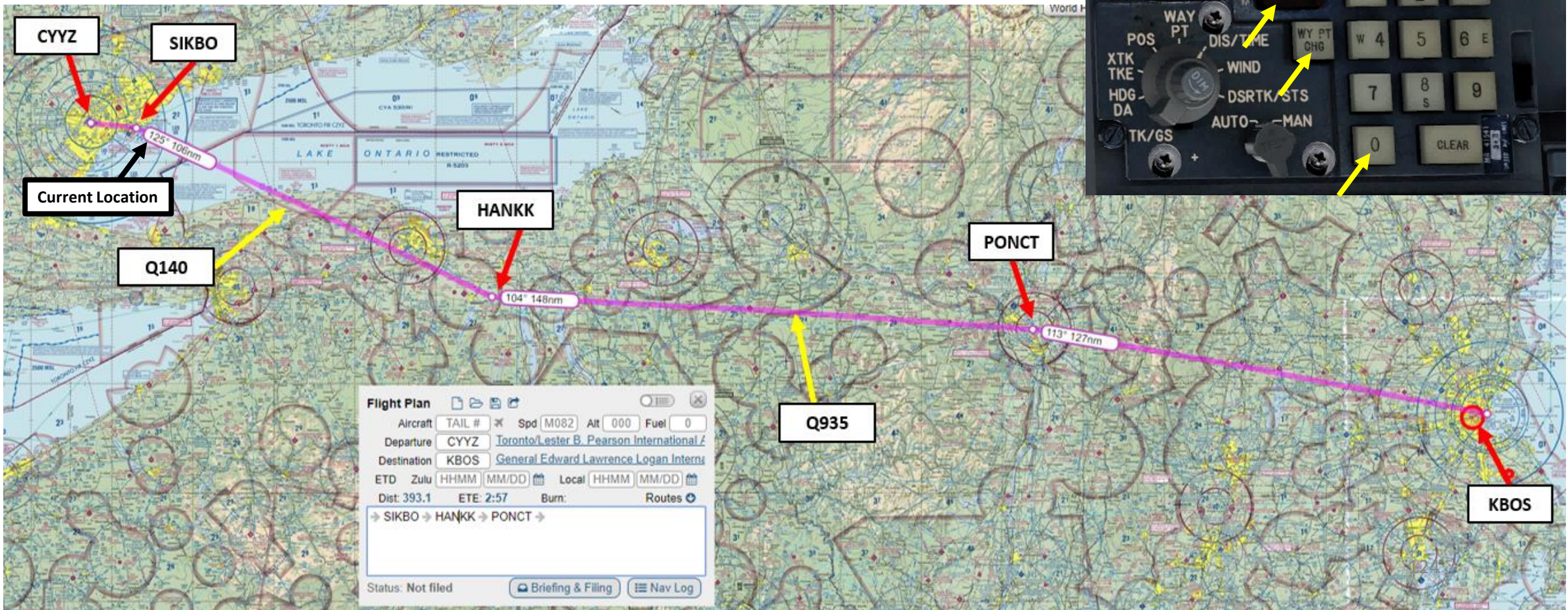






CLIMB

13. Once you have reached waypoint 1 (SIKBO), press WY PT CHG button, then type “02” on the CIVA keypad. The aircraft will then track from your current location to Waypoint 2 (HANKK).
14. As we can see, the estimated distance is quite similar to what SkyVector gave us. Repeat those steps to track Waypoint 3 (PONCT) and finally Waypoint 4 (KBOS).



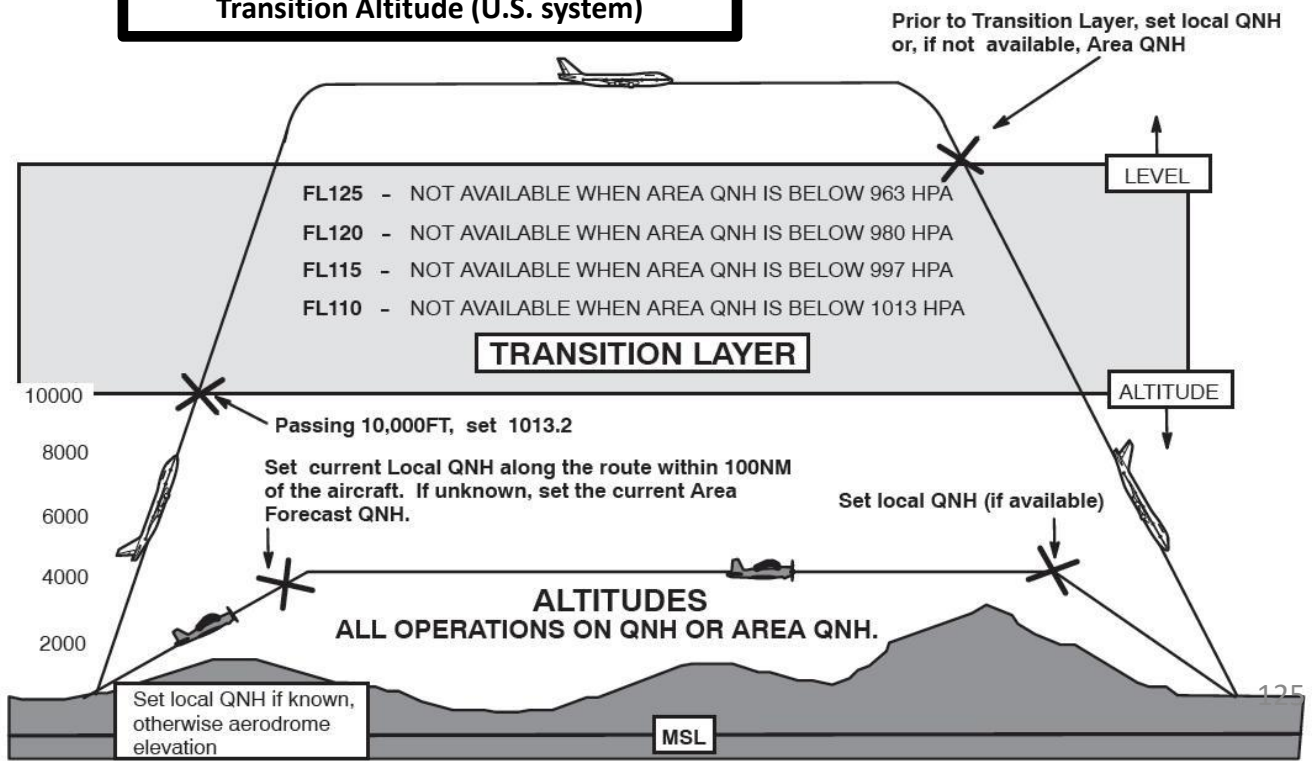
CLIMB

15. 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. FL330 would be 33000 ft).
16. The ALTITUDE ALERT indication will illuminate once you are 1000 ft from the target altitude (1000 ft). When you reach your cruising ceiling (33,000 ft), the ALT HOLD mode will automatically engage and the ALT HLD light will turn green. This means that the IAS mode is no longer active; the aircraft will maintain its current altitude and you will control the aircraft speed with the throttle.

Altitude (33000 ft) not captured

Altitude (33000 ft) captured

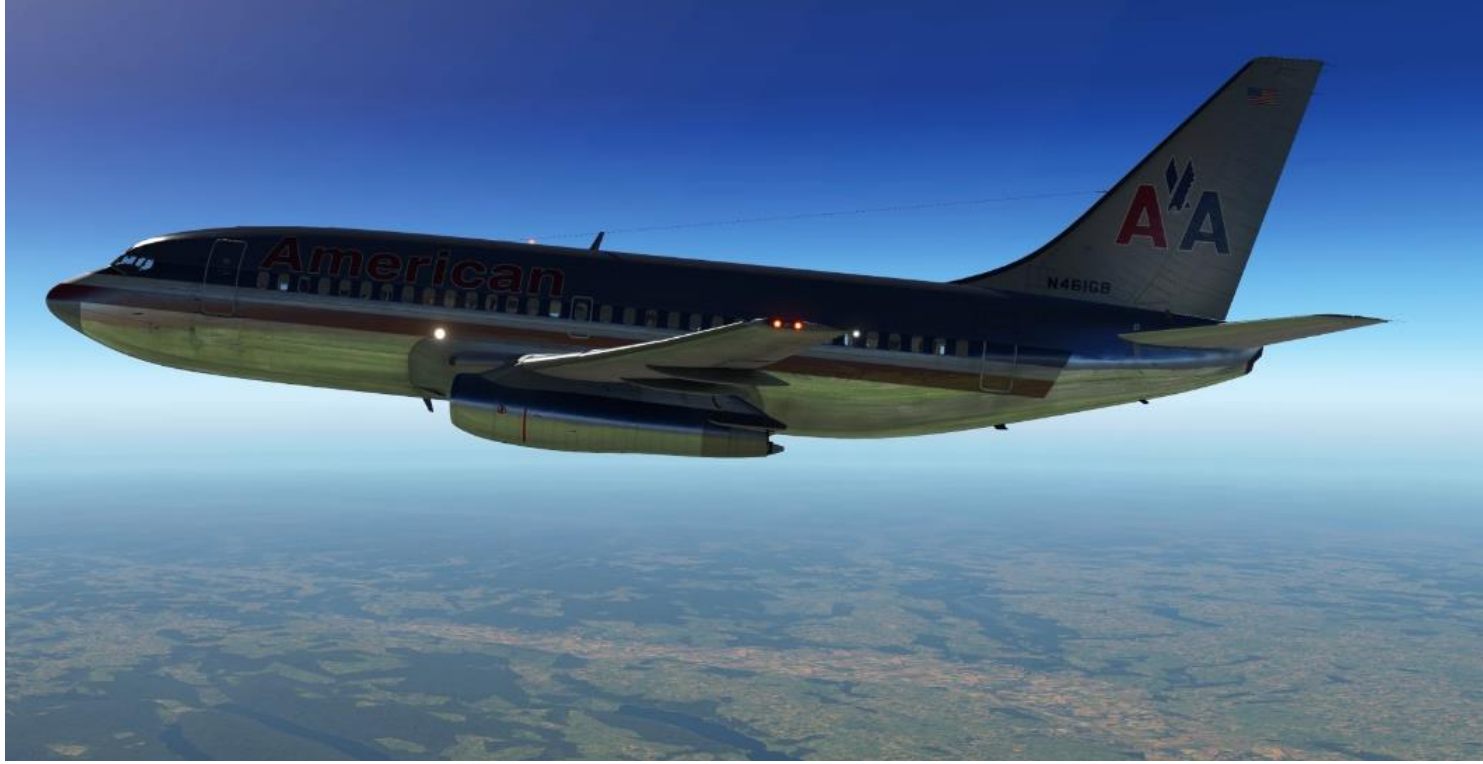
Transition Altitude (U.S. system)



CLIMB

CRUISE

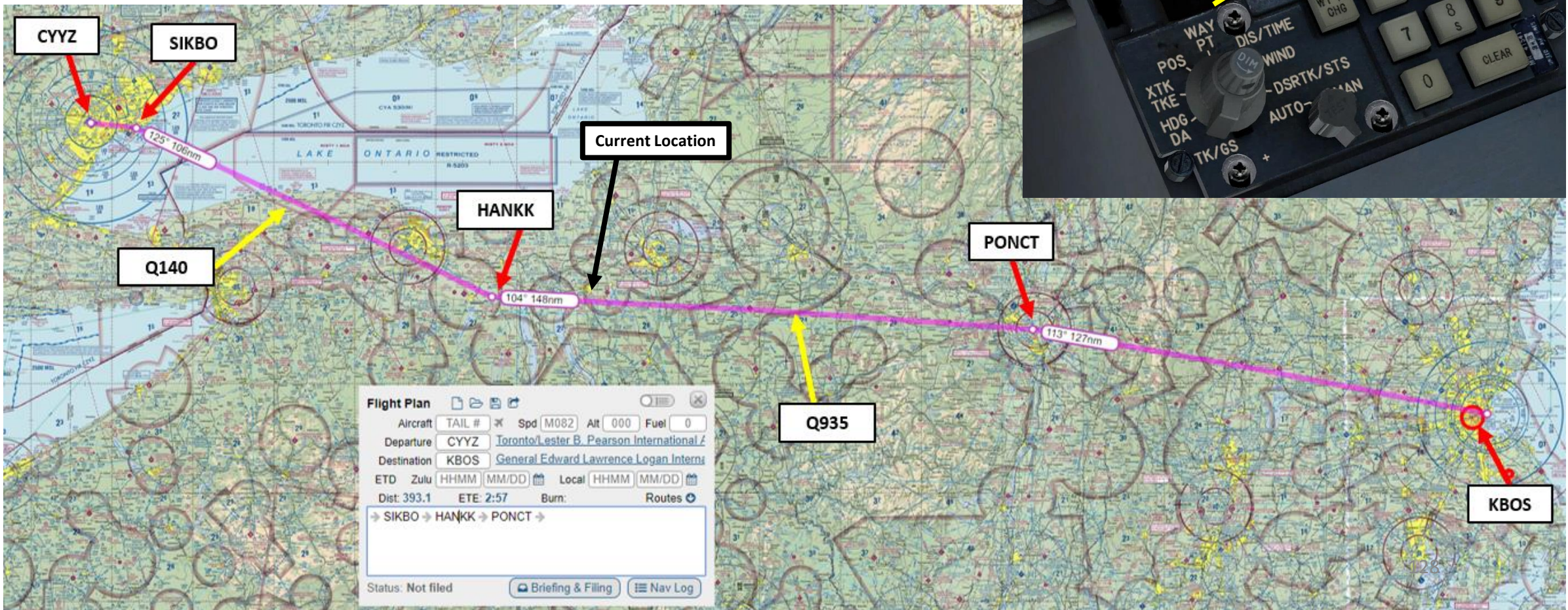
1. When reaching cruising altitude, the autopilot will start levelling off and automatically switch to ALT HOLD.
2. Once levelled off to 33000 ft, you can control your cruising speed with your throttle (Yep, there is no autothrottle on this bad boy). A cruising speed between Mach 0.7 and Mach 0.74 is recommended.
    - Alternatively, you can switch to IAS mode and control your altitude with your throttle.



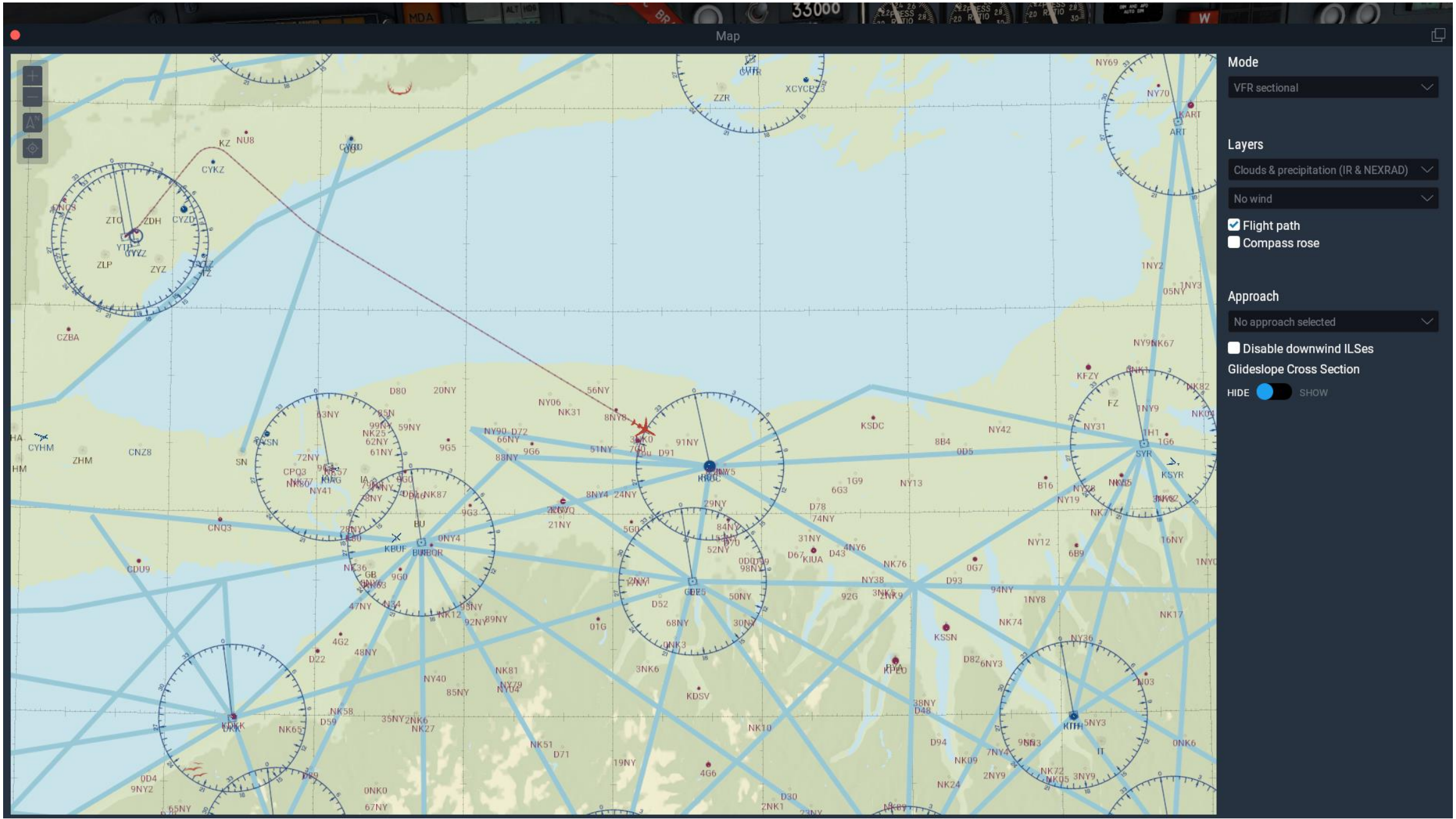
CRUISE

3. When you fly over a waypoint, the CIVA will automatically follow the next one. The FROM-TO menu will indicate which leg you are currently following. As an example, the CIVA in the picture to the right shows that we are following the leg **from** Waypoint 2 (HANKK) **to** Waypoint 3 (PONCT).

   Alternatively, you can use the WY PT CHG technique by typing 0 (your current location) followed by the waypoint number you want to track, as shown before. This method is like a DIRECT TO since it will direct the autopilot directly from your position to the waypoint you want to track.



CRUISE


Map
Mode
VFR sectional
Layers
Clouds & precipitation (IR & NEXRAD)
No wind
Flight path
Compass rose
Approach
No approach selected
Disable downwind ILSes
Glideslope Cross Section
HIDE
SHOW

CRUISE

CRUISE


RUNWAY TURNOFF
TAXI
APU
FIRE WARN
MASTER CAUTION
FLT DIR
107 COURSE
047 HEADING
057 COURSE
ALT HOLD
PITCH CMD
HDG SEL
ENGAGE
AIL
DISENGAGE
ELEV
F/D
A/P
MDA
IVSI
RADIO ALT
000 MILES
DME 2
YAW DAMPER
AUTOBRAKE
LANDING GEAR
LANDING GEAR LIMIT (IAS)

Introduction to Autopilot

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

Now, why am I saying this? Because *some* people's knowledge of modern autopilot systems is summed up in "hit LNAV and VNAV, then go watch an episode of Mayday while the aircraft does all the work". **Beware!** The Boeing 737 has no ordinary autopilot: it is equipped with the Sperry SP-77. This is old school. Basically, the Sperry will let you control the aircraft laterally and vertically in a number of ways. Keep in mind that there is no auto-throttle system, which means that the aircraft can start abruptly pitching up to increase its angle of attack in order to increase lift if you are asking for a flight parameter (like altitude) to be maintained while not enough power is available to maintain said parameter.

There are three main components to the Autopilot

- The Sperry Autopilot Panel
- The Flight Director
- The APD (Approach Progress Display), which is basically the ancestor of the FMA (Flight Mode Annunciator) installed on modern the Boeing 737 and 747.

APD (Approach Progress Display) for Autopilot (A/P) and Flight Director (F/D)

Sperry SP-77 Autopilot Control Panel

Sperry SP-77 Control Panel

Autopilot Altitude Select Indicator (ft) & Setting Knob

Autopilot Course 1 Selected Indicator & Setting Knob

Autopilot Selected Heading Indicator & Setting Knob

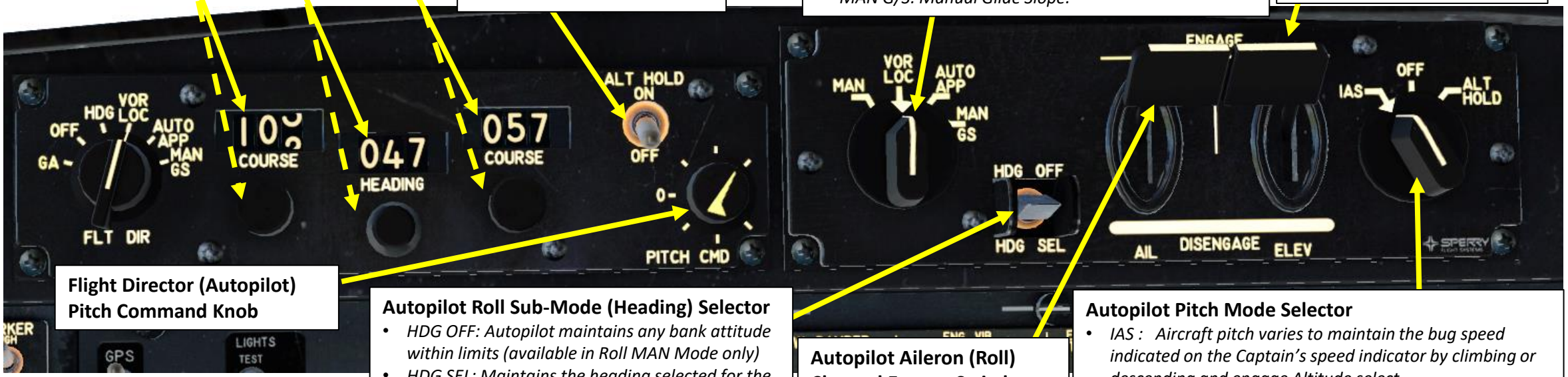
Autopilot Course 2 Selected Indicator & Setting Knob

Flight Director (Autopilot) Altitude Hold Switch

Autopilot Roll Mode Selector

- *MAN: Manual Mode, or Control Wheel Steering. ALT HOLD, HDG SEL or HDG OFF modes are selectable.*
- *VOR LOC: VOR Navigation / Localizer Mode. Used to automatically intercept selected radio course.*
- *AUTO APP: Automatic Approach. Used to automatically capture ILS localizer and glide slope.*
- *MAN G/S: Manual Glide Slope.*

Autopilot Elevator (Pitch) Channel Engage Switch



Flight Director (Autopilot) Pitch Command Knob

Autopilot Roll Sub-Mode (Heading) Selector

- *HDG OFF: Autopilot maintains any bank attitude within limits (available in Roll MAN Mode only)*
- *HDG SEL: Maintains the heading selected for the captains Horizontal Situation Indicator (HIS)*

Autopilot Aileron (Roll) Channel Engage Switch

Autopilot Pitch Mode Selector

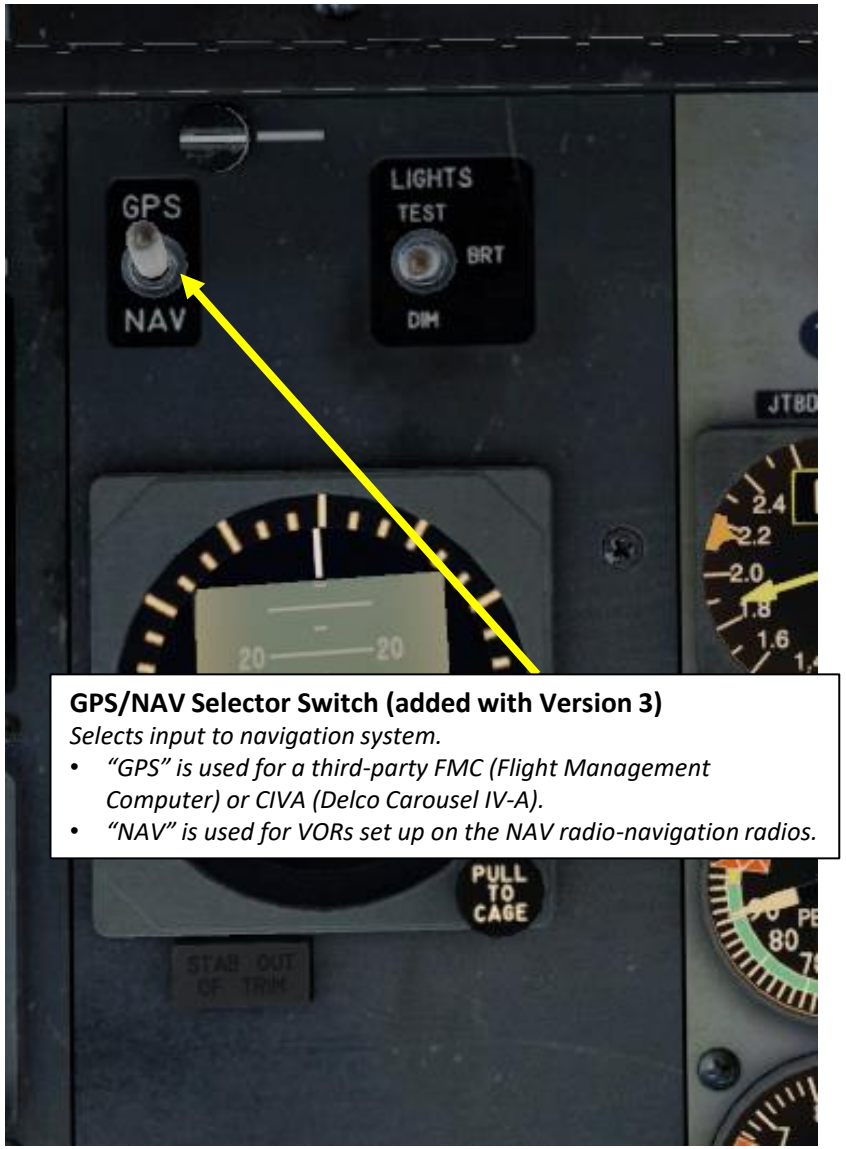
- *IAS : Aircraft pitch varies to maintain the bug speed indicated on the Captain's speed indicator by climbing or descending and engage Altitude select*
- *OFF: Pitch Attitude Hold or Glide Slope engaged.*
- *ALT HOLD: Aircraft varies pitch & airspeed to maintain a constant altitude. Pitch reference is to pressure altitude.*

Airspeed Bug (IAS HOLD)

Heading Bug (HEADING SELECT)

Flight Director Control Panel

Flight Director (Autopilot) Mode Selector
GA: Go-Around
OFF: Autopilot Off
HDG: Heading
VOR/LOC: VOR Navigation/Localizer
AUTO APP: Automatic Approach
MAN APP: Manual Approach



GPS/NAV Selector Switch (added with Version 3)
Selects input to navigation system.
- *"GPS" is used for a third-party FMC (Flight Management Computer) or CIVA (Delco Carousel IV-A).*
- *"NAV" is used for VORs set up on the NAV radio-navigation radios.*

APD (Approach Progress Display)

Autopilot Mode	Description
IAS HOLD	Vertical autopilot changes aircraft attitude to maintain the bug speed indicated on the Captain's speed indicator by climbing or descending. The IAS HOLD mode automatically select the ALT SELECT mode and will try to reach the target altitude set on the Altitude Select Indicator panel.
PITCH HOLD	Vertical autopilot maintains aircraft attitude by varying airspeed and altitude
ALT HOLD	Vertical autopilot changes aircraft attitude to maintain current altitude. The ALT HOLD mode is armed when IAS HOLD and ALT SELECT are active.
ALT SELECT	Vertical autopilot changes aircraft attitude to fly to target altitude. This mode is automatically selected when IAS HOLD is selected, and it is not displayed on the APD; the amber ALT HLD indication means that the ALT SELECT mode is active.
GLIDE SLOPE	Vertical autopilot changes aircraft attitude maintain an adequate glide slope on approach (requires an ILS)
HDG	Lateral autopilot tracks selected heading
GPS	Lateral autopilot tracks auxiliary navigation systems like CIVA or FMS waypoints
NAV/LOC	Lateral autopilot arms autopilot to capture and track a selected VOR or LOC course if NAV mode is selected. If GPS is selected, the autopilot tracks the selected waypoint from the CIVA or FMS.

VERTICAL MODE
LATERAL MODE

APD (Approach Progress Display) for Autopilot (A/P) and Flight Director (F/D)

- *GO AROUND*
- *ALT HLD (Hold)*
- *HDG*
- *NAV/LOC (VOR)*
- *GLIDE SLOPE*
- *GPS*

Note: Amber means ARMED, Green Means CAPTURED.

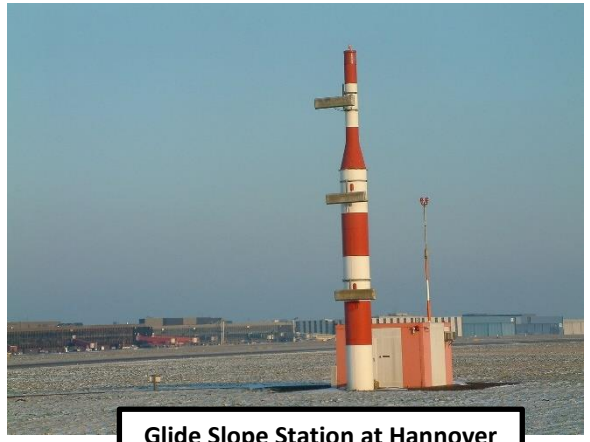
PLANNING DESCENT

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.

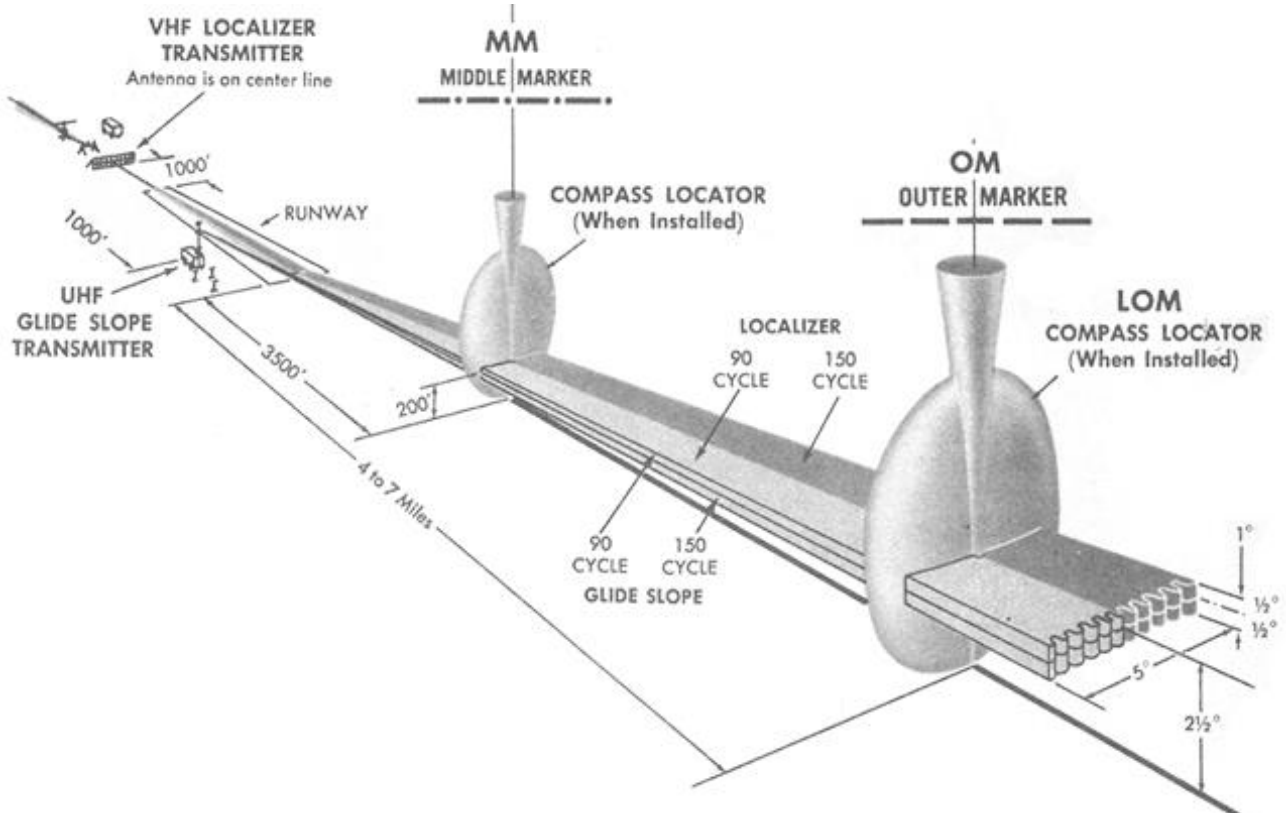
- The Localizer is generally an array of antennas that will give you a lateral reference to the center of the runway.
- The Glide Slope station will help you determine the descent speed you need in order to not smack the runway in a smoldering ball of fire.

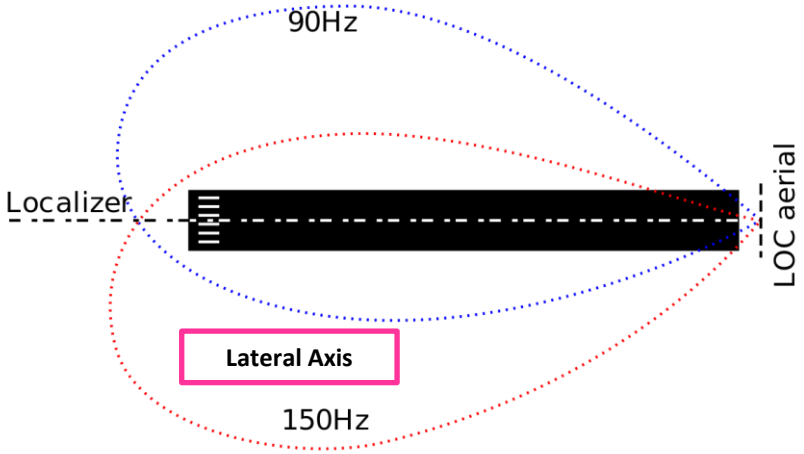
Localizer Array Station at Hannover

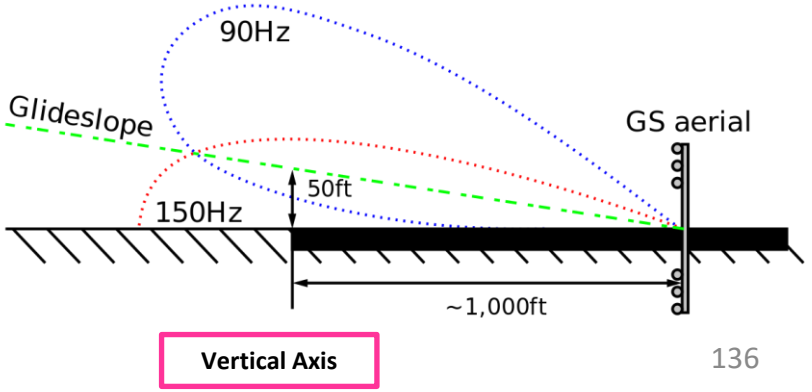


Glide Slope Station at Hannover

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



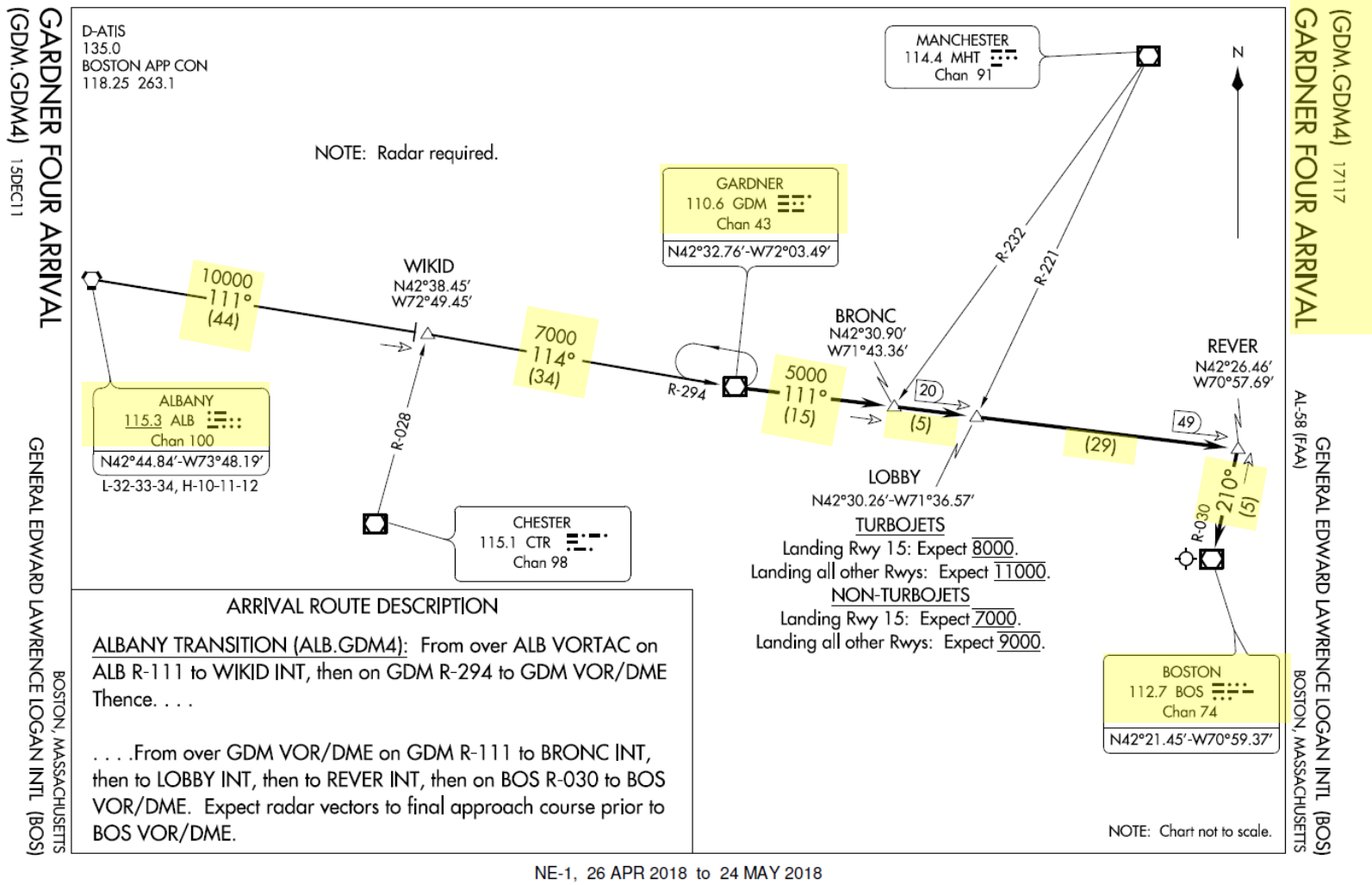


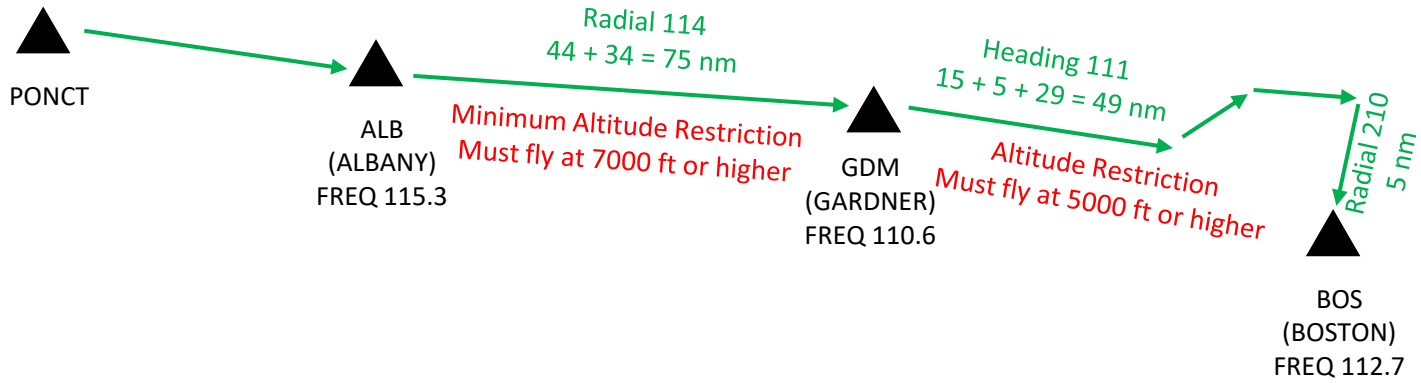


PLANNING THE APPROACH - STAR

These charts are for the STAR (Standard Terminal Arrival Route) from PONCT to Boston Logan International Airport (KBOS). This STAR is a little complicated for those not used to land by tracking VORs, so we will simplify it a little. We intend to:

1. Come from PONCT waypoint
2. Fly from PONCT towards the GARDNER FOUR arrival route via PONCT -> ALB.
3. Follow the STAR (ALB -> GDM -> BOS)
4. Follow the approach towards the runway, guided by the KBOS airport's ILS (Instrument Landing System).
5. Land at Boston (KBOS) on **runway 22L** (orientation: 215 Left)





PLANNING DESCENT

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

Final Approach Course: 215
This is the heading you will take when approaching for final landing.

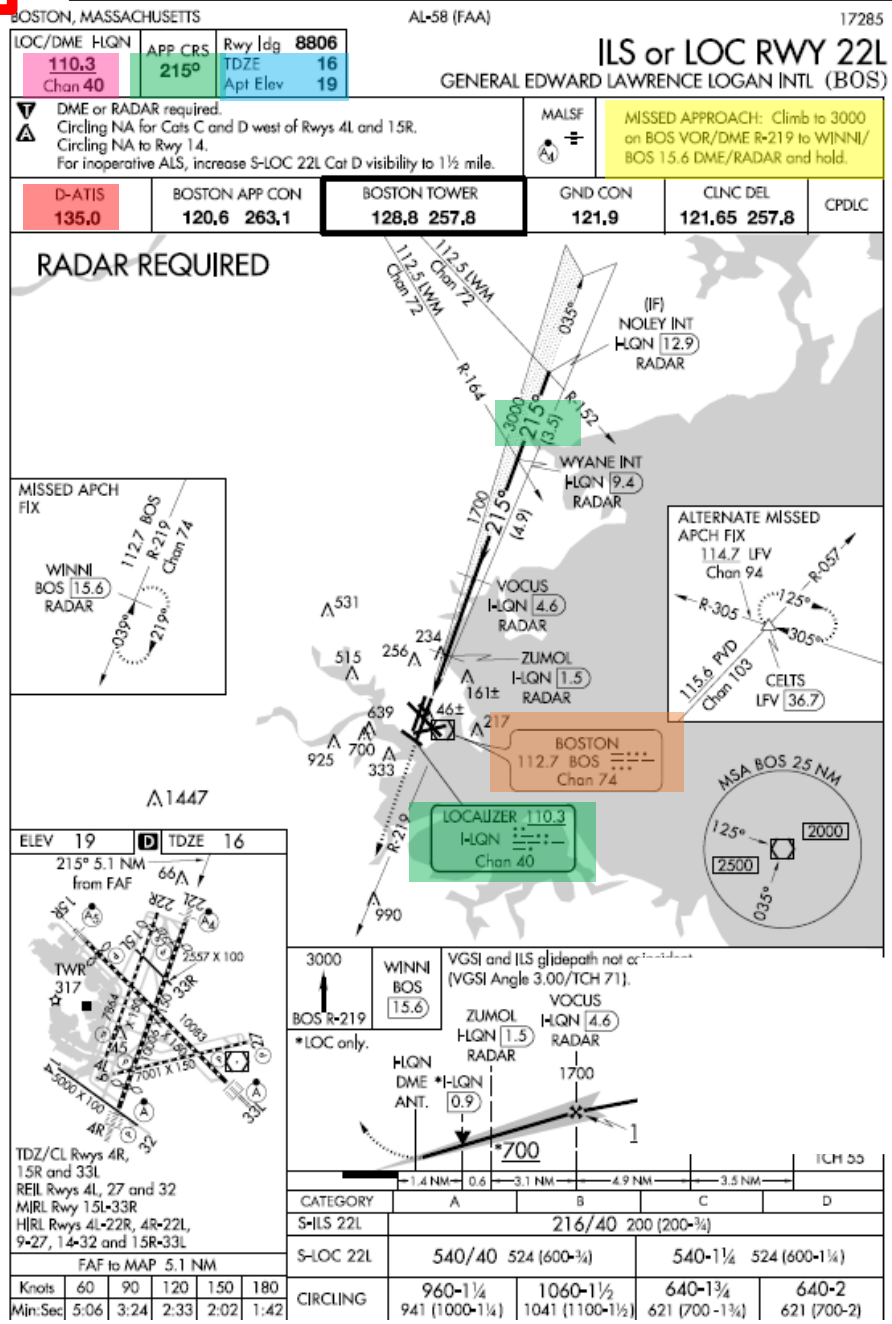
Minimums Decision Height: 200 ft
This is the minimum "decision height" (DH) during landing. If you go lower than 200 ft above ground level, you are committed to land no matter what happens. Above 200 ft, you can still miss your approach and go around. Take note of the Airport Elevation (19) and the TDZE (Touchdown Zone Elevation) of 16 ft.

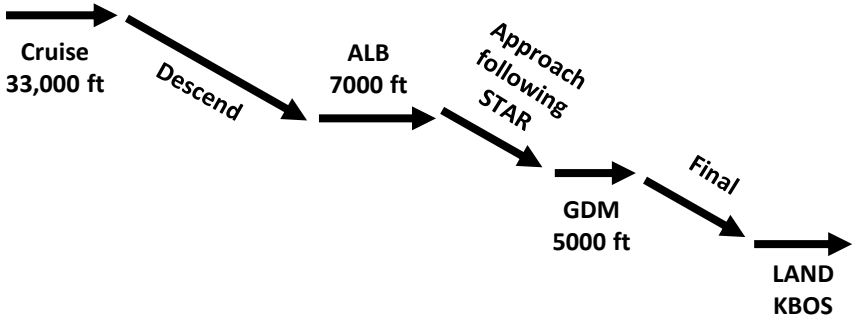
ILS Frequency: 110.3 MHz
This is the ILS system frequency you will track to guide your aircraft for landing.

ATIS Frequency: 135.0
The ATIS (Automatic Terminal Information Service) will provide you valuable information including wind direction and speed, and the altimeter setting required for landing.

Missed Approach Standby Frequency: 112.7 MHz
VOR BOS will be the beacon we will track in case we miss our approach and have to go around.

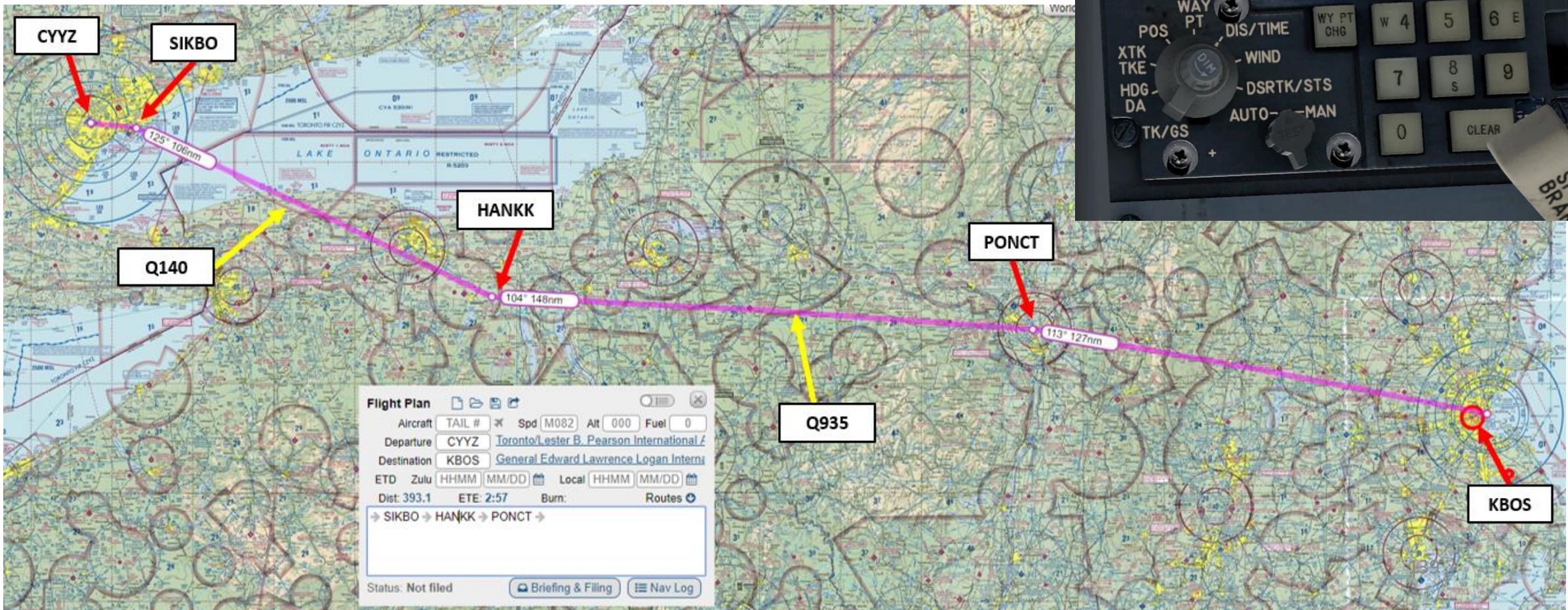
Missed Approach Procedure
In case we miss our approach, the procedure is to climb to 3000 ft then follow the BOS VOR and hold.





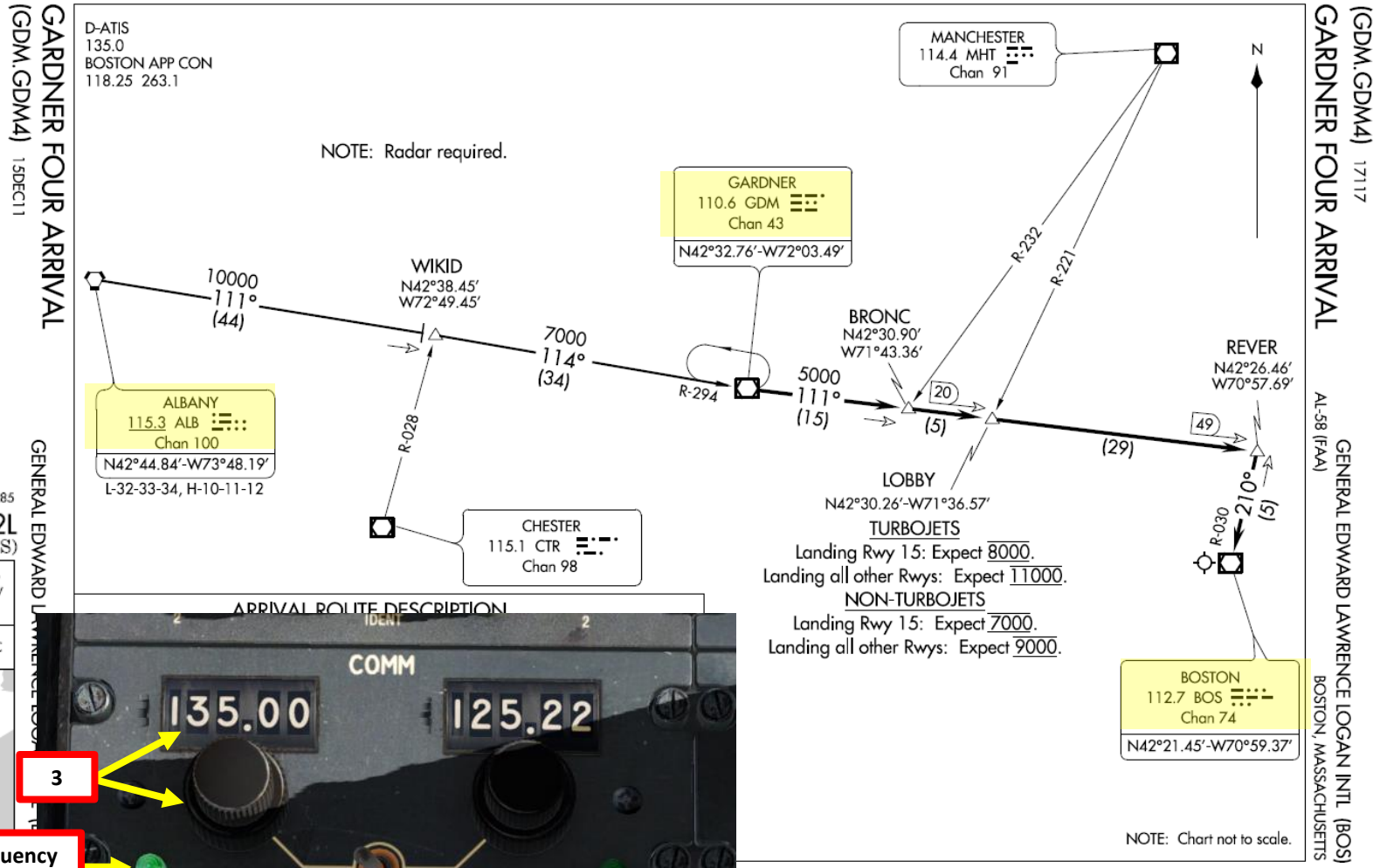
PLANNING DESCENT

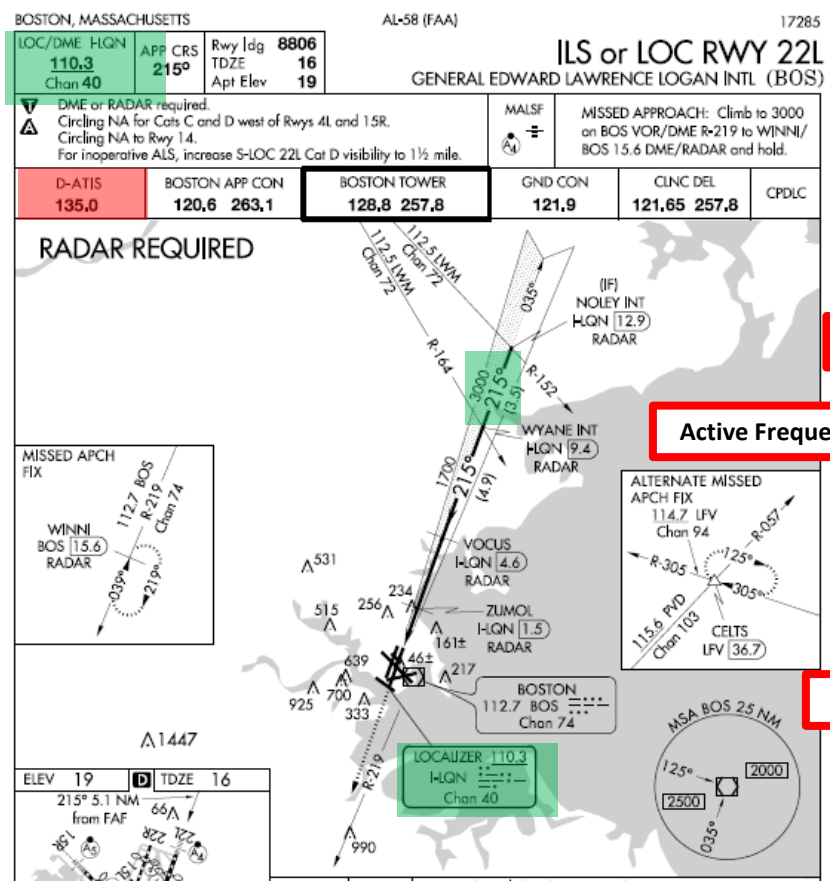
1. So we are finally approaching Boston by following leg 34 on the CIVA (PONCT-KBOS). For descent, we will track VORs instead of CIVA waypoints since they are easier to track and the CIVA has accumulated drift during the flight, which will make the approach more difficult than it needs to be.

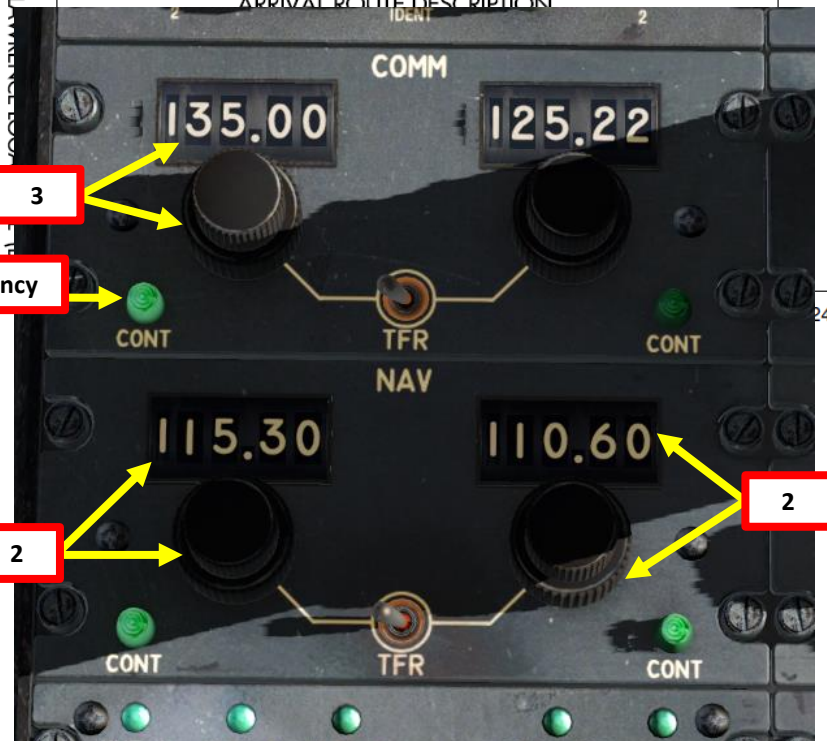


PLANNING DESCENT

2. Set VHF-1 NAV Active frequency to 115.3 (ALBANY VOR) and set the VHF-1 NAV Standby frequency to 110.6 (GARDNER VOR).
3. Set VHF-1 COMM Radio Active frequency to 135.0 (Logan International ATIS).

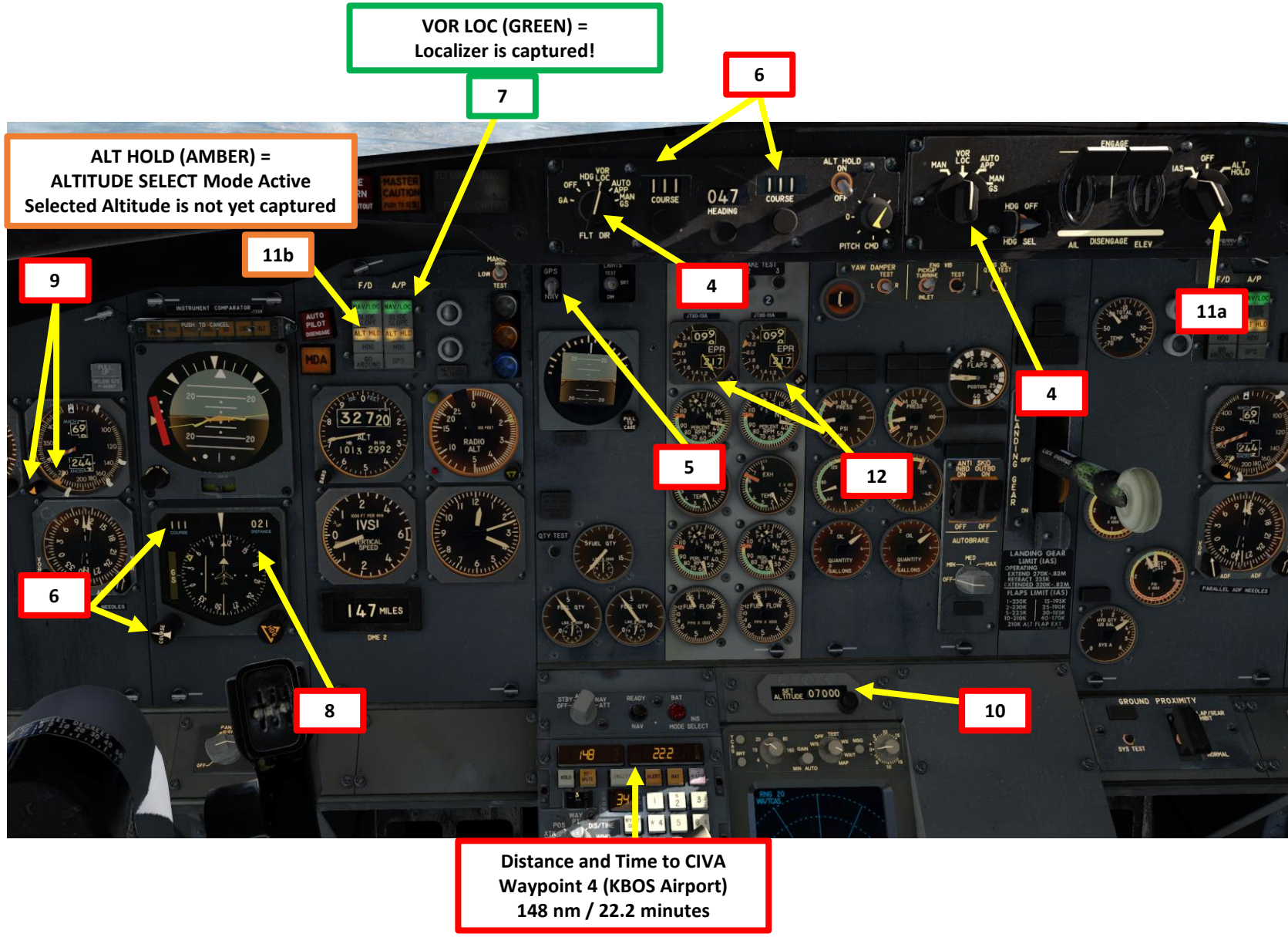






PLANNING DESCENT

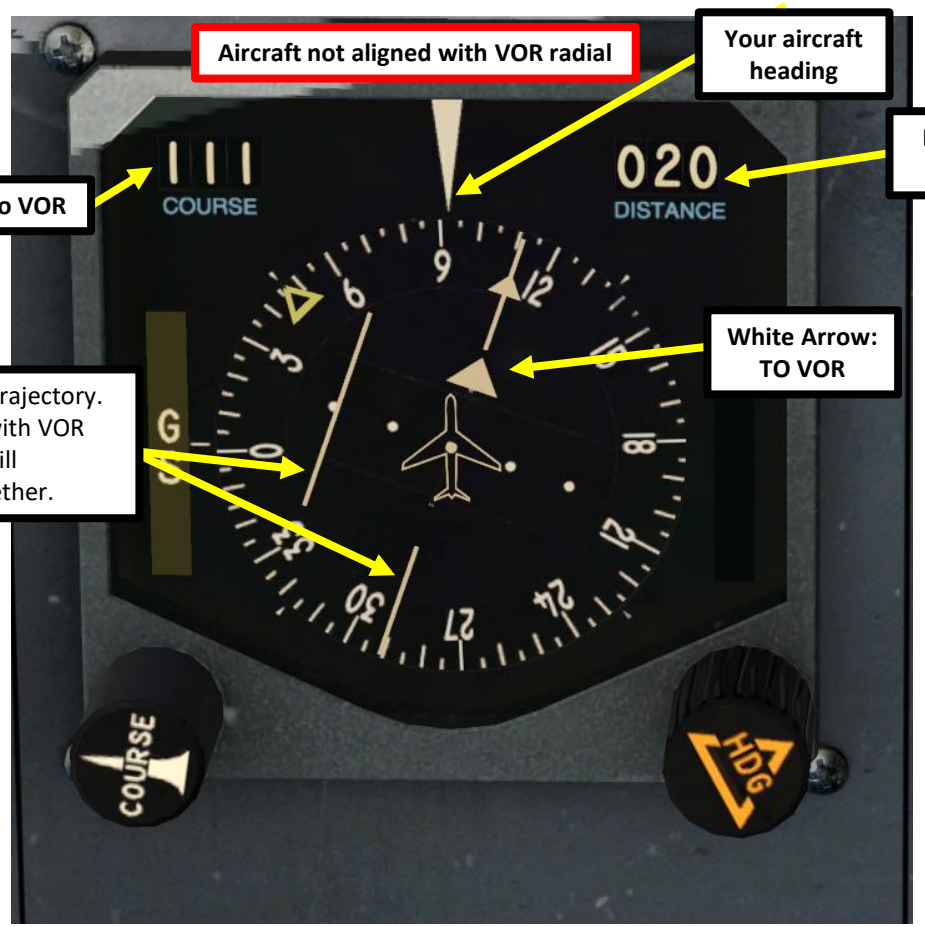
4. Verify that Flight Director Mode Selector and Autopilot Roll Mode Selector switches are set to VOR/LOC.
5. Set the GPS/NAV Selector Switch set to NAV to make the autopilot track the VOR instead of the CIVA waypoints.
6. Set a course of 111 on the HSI (Horizontal Situation Indicator) to approach the ALBANY VOR from a heading of 111 degrees.
7. The VOR LOC will be amber when the localizer is not captured, and it will turn to green when localizer is captured.
8. Distance from VOR ALB (ALBANY) is displayed on the HSI (Horizontal Situation Indicator). On this image, we are about 21 nm from ALB.
9. Set airspeed bug to descent speed of 250 kts.
10. Set ALTITUDE SELECT to 7000 ft (ALB minimum altitude restriction).
11. Set Autopilot Pitch Mode Selector to IAS. The ALTITUDE SELECT mode will automatically engage as well. The aircraft should be descending to the target altitude (7000 ft) while maintaining the selected target speed of 250 kts.
12. Set throttles to IDLE and start descent.



DESCENT

1. As you set your throttle to IDLE and start descending, watch carefully the HSI (Horizontal Situation Indicator) and make sure that you are tracking the ALB VOR in the correct direction. The white arrow points towards the tracked VOR beacon. You can also check if the Distance to VOR is decreasing or increasing.

Aircraft aligned with VOR radial



Aircraft not aligned with VOR radial

Your aircraft heading

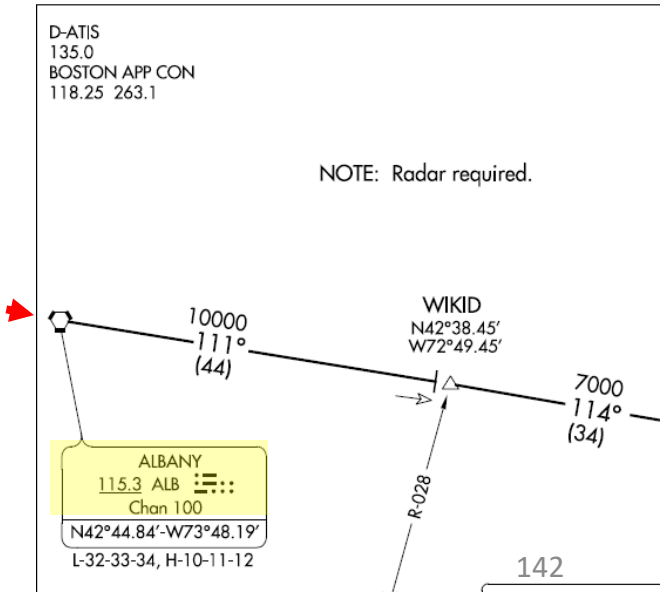
Distance to VOR (nm)

Course (Radial) to VOR

White Arrow: TO VOR

Deviation from radial trajectory. As you align yourself with VOR Radial, the two lines will eventually line up together.

Radial 111 to VOR ALB



DESCENT

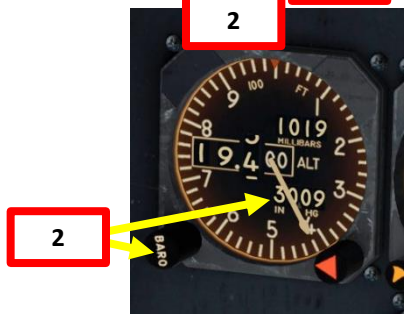
2. When reaching the transition level of 18000 ft, set barometric pressure to the altimeter setting specified by the ATIS (30.09 in Hg). Also set the Radio Altimeter bug to 200 ft (Decision Height).
3. Deploy flaps as per flaps schedule.
   a) Set airspeed bug to 190 kts, then set flaps to 1 at 210 kts
   b) Set airspeed bug to 170 kts, then set flaps to 5 at 190 kts
   c) Set airspeed bug to 160 kts, then set flaps to 10 at 170 kts
   d) Set airspeed bug to 150 kts, then set flaps to 15 at 160 kts
   e) Set airspeed bug to 140 kts, then set flaps to 25 at 150 kts
   f) Set airspeed bug to V_{REF} (130 kts), then set flaps to 30 at 140 kts

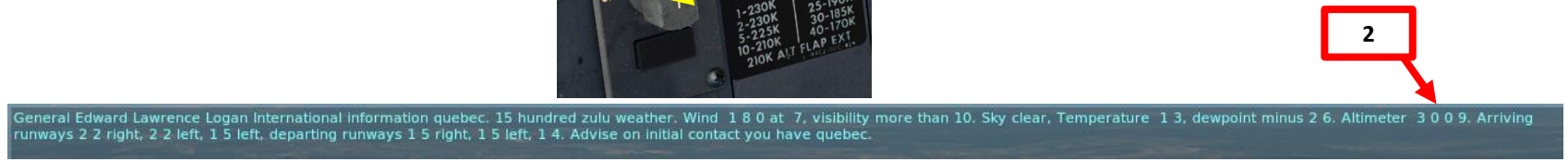
When reaching 10,000 ft:

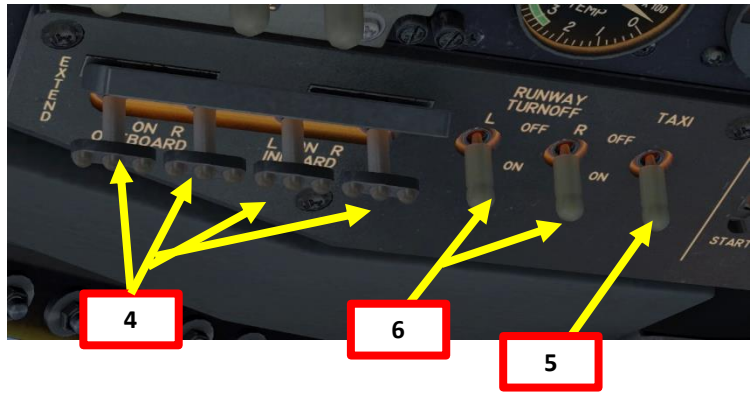
4. Landing Lights switches – ON
5. Taxi Light switch – ON
6. Runway Turnoff Lights switches – ON
7. Auto-Brake Switch - MED

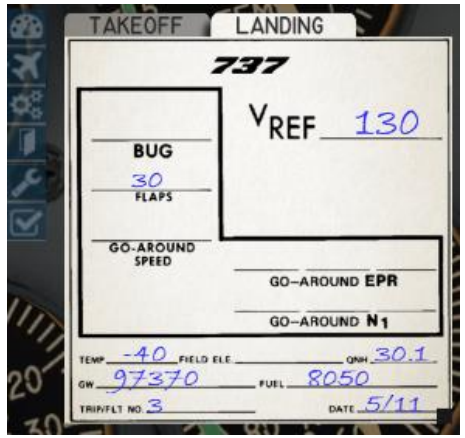
3 FLAPS EXTENSION SCHEDULE KTS IAS

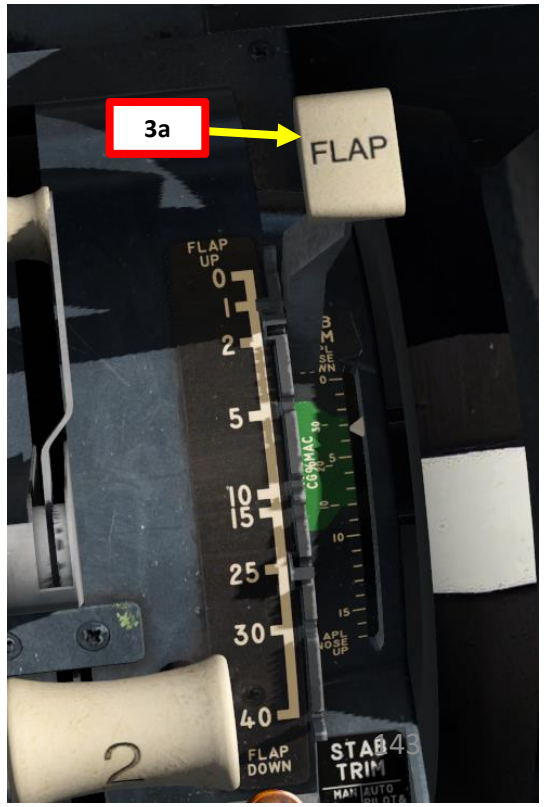
CURRENT FLAP POSITION	AT SPEED (KTS)	SELECT FLAPS	COMMAND SPEED FOR SELECTED FLAPS
UP	210	1	190
1	190	5	170
5	170	10 (as needed)	160
10	160	15	150/V_{REF}
15	150/V_{REF}	25	140
25	140	30 or 40	V_{REF} @ Flaps 30 Or V_{REF} @ Flaps 40 (+Add Wind Speed)







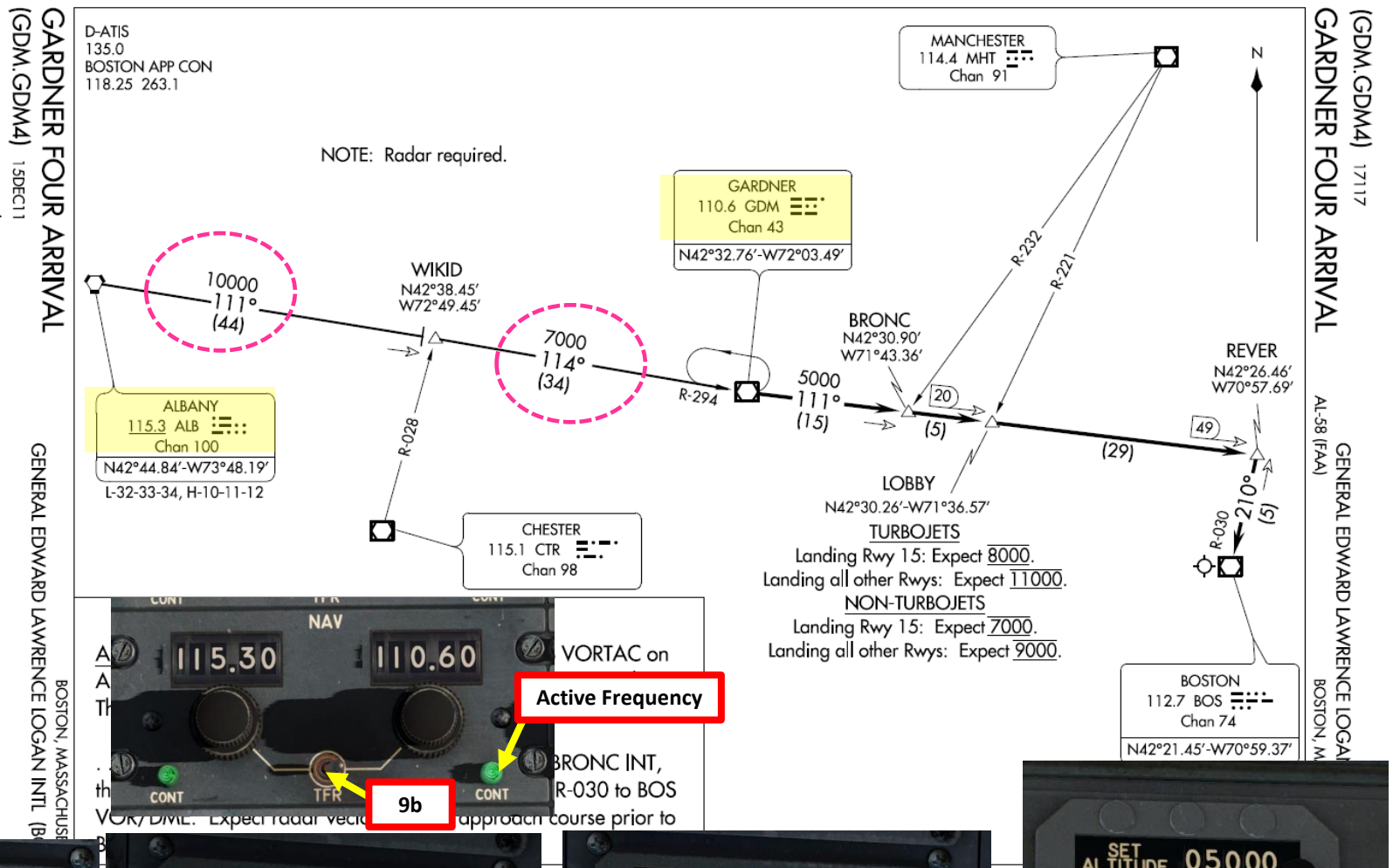




DESCENT

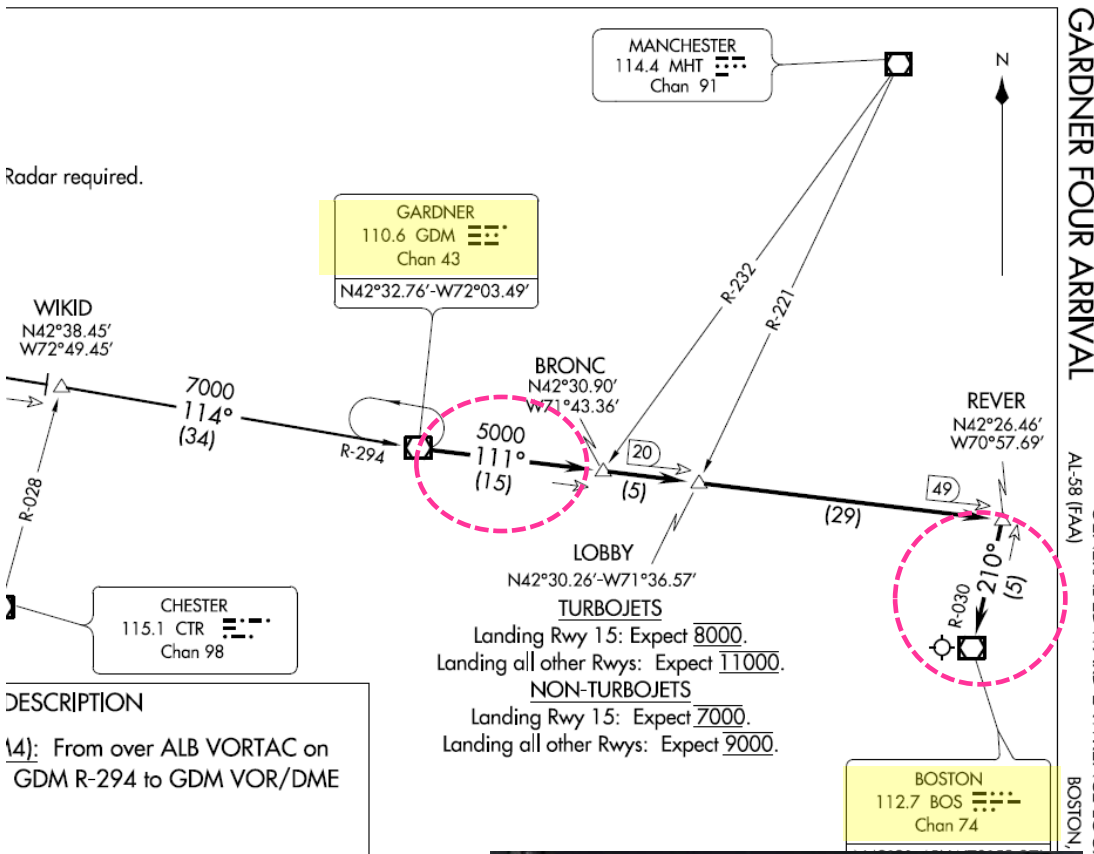
If airspeed is dropping too low, don't be scared to throttle up a little. Once again, the aircraft does not have an auto-throttle… so the aircraft pitch will vary with throttle input and selected autopilot modes, which act on the flight control surfaces. If you're going too fast, using the speed brake lever is also a viable option.

8. When you cross ALB (Albany), don't track the GDM (Gardner) yet. It is too far to be picked up yet. Instead, use the instructions from the chart. We will follow the same heading, overfly ALB, then continue for 44 more miles before switching to GDM.
9. When you are 44 nm FROM Albany with a heading of 111, switch VHF-1 NAV Active Frequency by using the TFR (Transfer) Switch.
10. Set Course to 114 to line up the aircraft with radial 114 to GMD (Gardner) VOR.
11. Set ALTITUDE SELECT to 5000 ft and make sure the IAS HOLD mode is selected to activate the ALTITUDE SELECT autopilot mode.
12. Keep controlling your descent rate and attitude with your throttle.

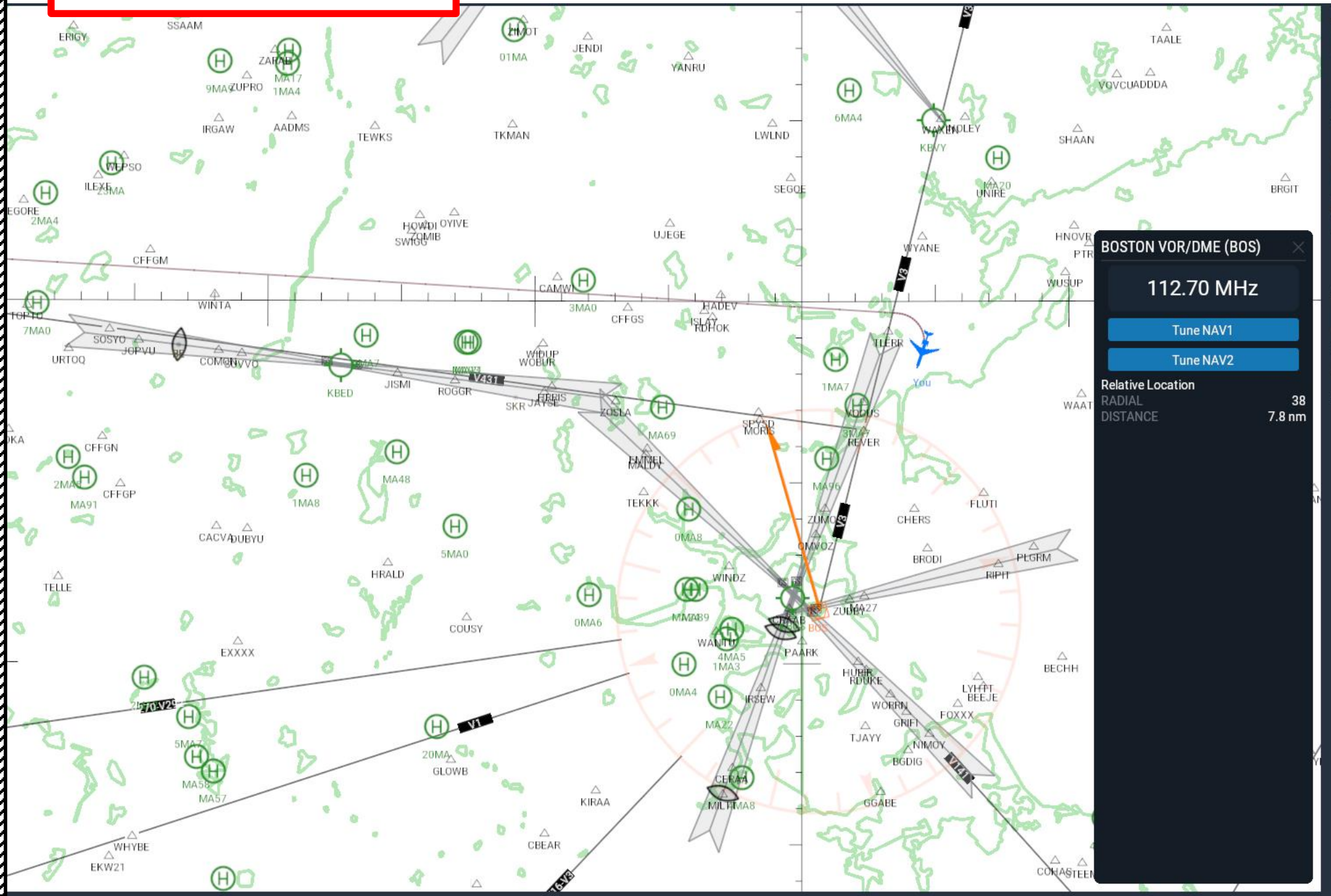


SET UP APPROACH

13. Once you crossed the GDM (Gardner) VOR, set VHF-1 Standby Frequency to 112.7 (BOS, Boston VOR), then use the TFR (Transfer) switch to set it as the active frequency
14. Set Course to 210 to line up the aircraft with radial 210 to GMD (Gardner) VOR.
15. The aircraft will keep its current heading until the aircraft intercepts the BOS radial 210. When the radial is intercepted, the autopilot will steer the aircraft and line it up with the runway.
16. Keep controlling your altitude and attitude with your throttle.

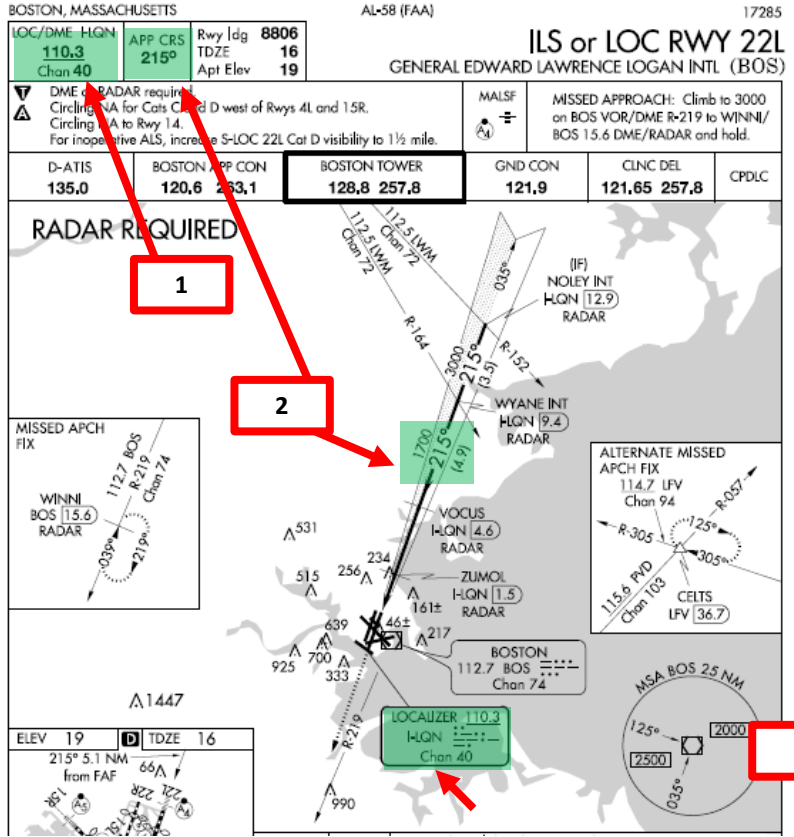


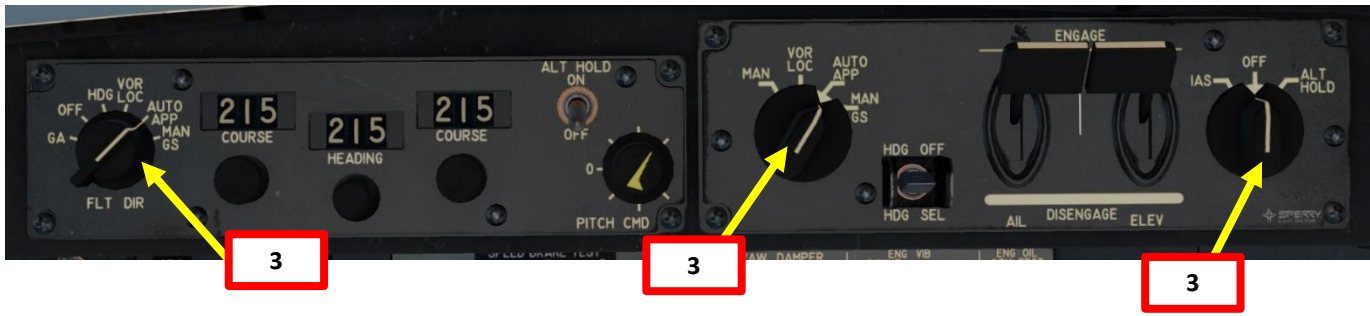
SET UP APPROACH



FINAL APPROACH

1. When the BOS VOR is tracked (NAV/LOC in green), set up the VHF-1 Radio Navigation active frequency to the ILS Localizer frequency (110.3)
2. Set the Localizer Course to 215 as per the ILS chart
3. Set the Autopilot Roll Mode Selector switch to AUTO APP (Approach) and make sure the Flight Director Mode Selector is set to AUTO APP as well. Set the Autopilot Pitch Mode to OFF.
4. NAV/LOC light will be amber when attempting to capture the localizer, and will illuminate in green once localizer is captured
5. GLIDE SLOPE light will be amber when attempting to capture the glide slope, and will illuminate in green once glide slope is captured.
6. Set Landing Gear lever DOWN to deploy landing gear

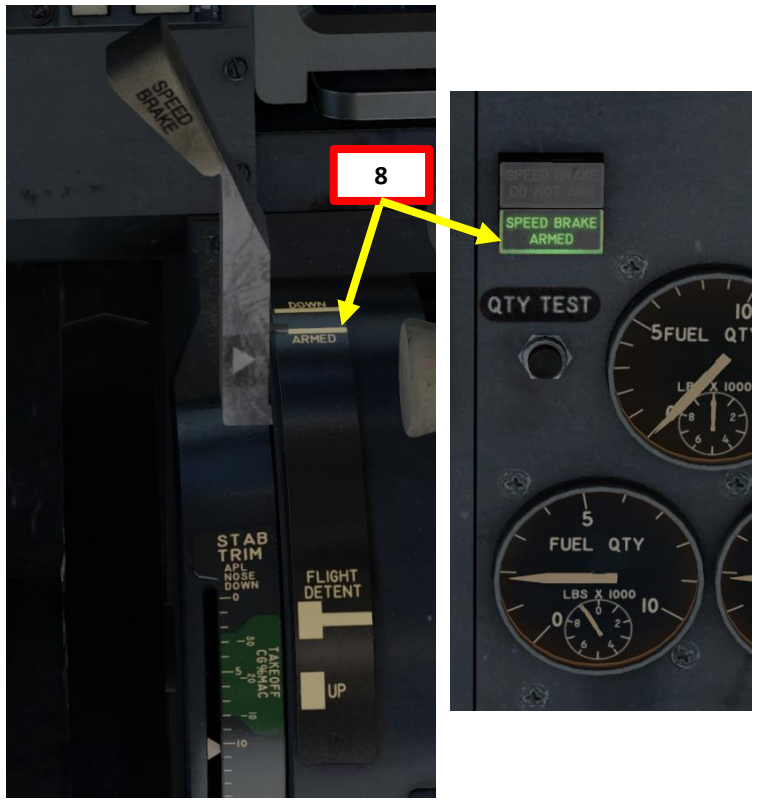


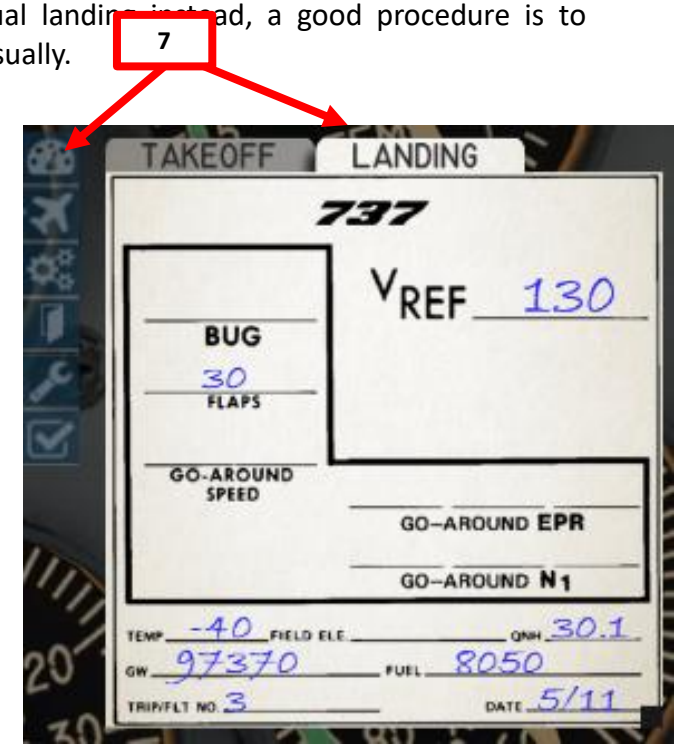


FINAL APPROACH

7. Click on the V CARD option button and select the LANDING tab. A recommended landing flaps setting and reference speed will be calculated for you. In our case, we will do our final approach with flaps 30 with an approach speed of 130 kts.
8. Set flaps to 30 deg when airspeed is stabilized to VREF+5 (135 kts).
9. Once localizer (lateral component) and glide slope (vertical component) of approach path are both captured and tracked by autopilot. However, the aircraft landing speed needs to be controlled with the throttle manually.
10. Move Speed Brake lever to ARMED position. Click next to ARMED clickspot, and the SPEED BRAKE ARMED indication should illuminate.

NOTE: If for some reason you decide to do a manual landing instead, a good procedure is to disconnect the Autopilot switch and land the aircraft visually.





FINAL APPROACH

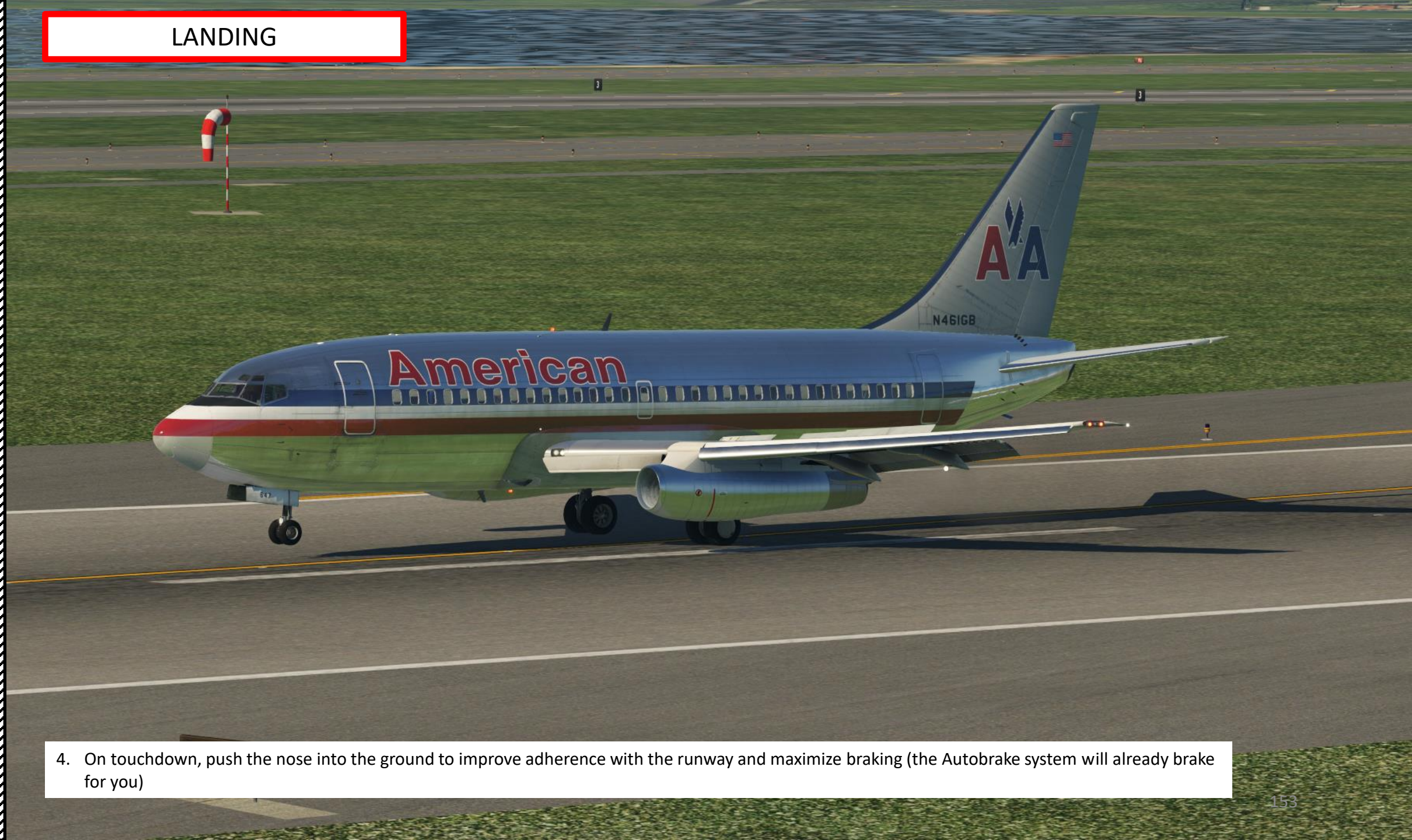
LANDING

1. At your Decision Height (200 ft), you will hear the « Minimums » audio cue. Below this altitude, you are now commited to land.
2. At 200 ft, disengage autopilot and land manually.
3. Throttle back to IDLE and gently flare before touchdown.

LANDING

LANDING

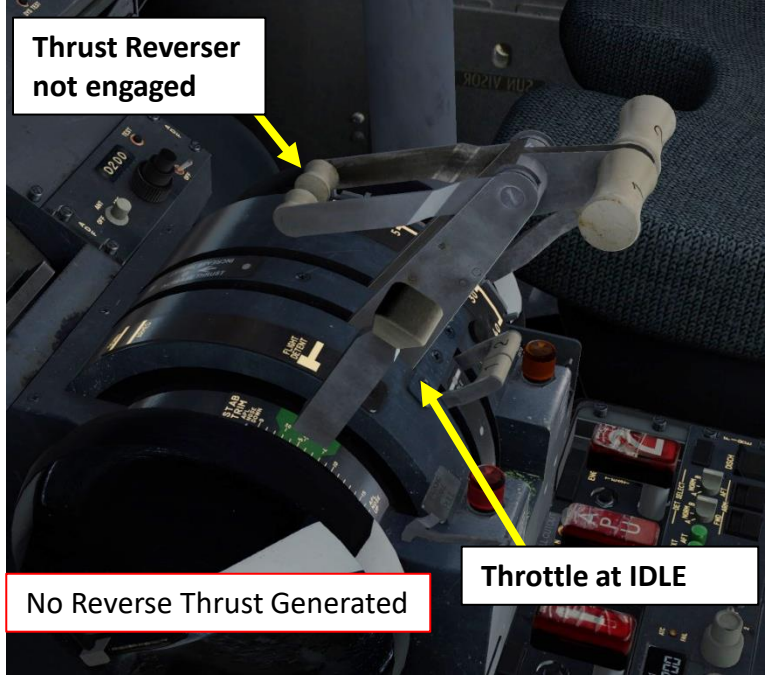
LANDING

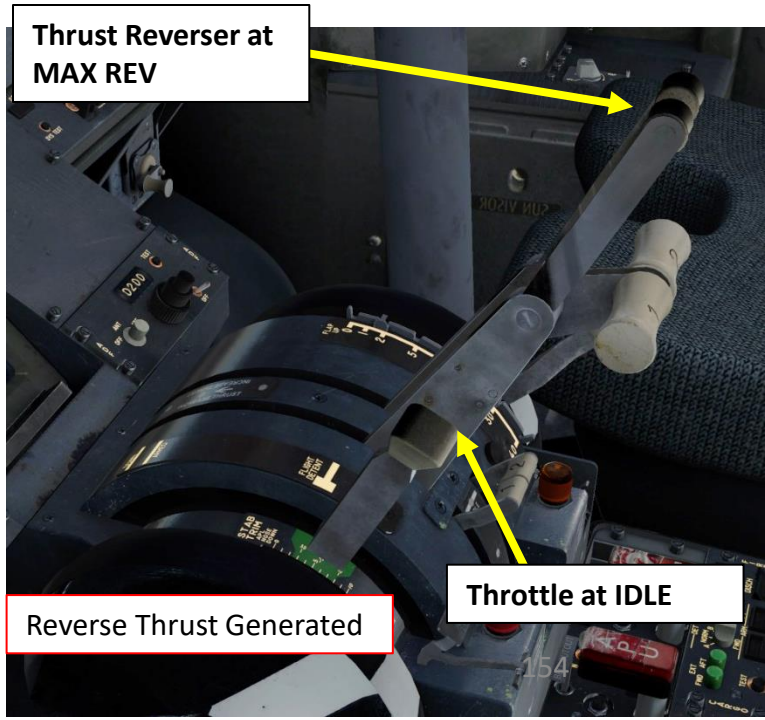


4. On touchdown, push the nose into the ground to improve adherence with the runway and maximize braking (the Autobrake system will already brake for you)

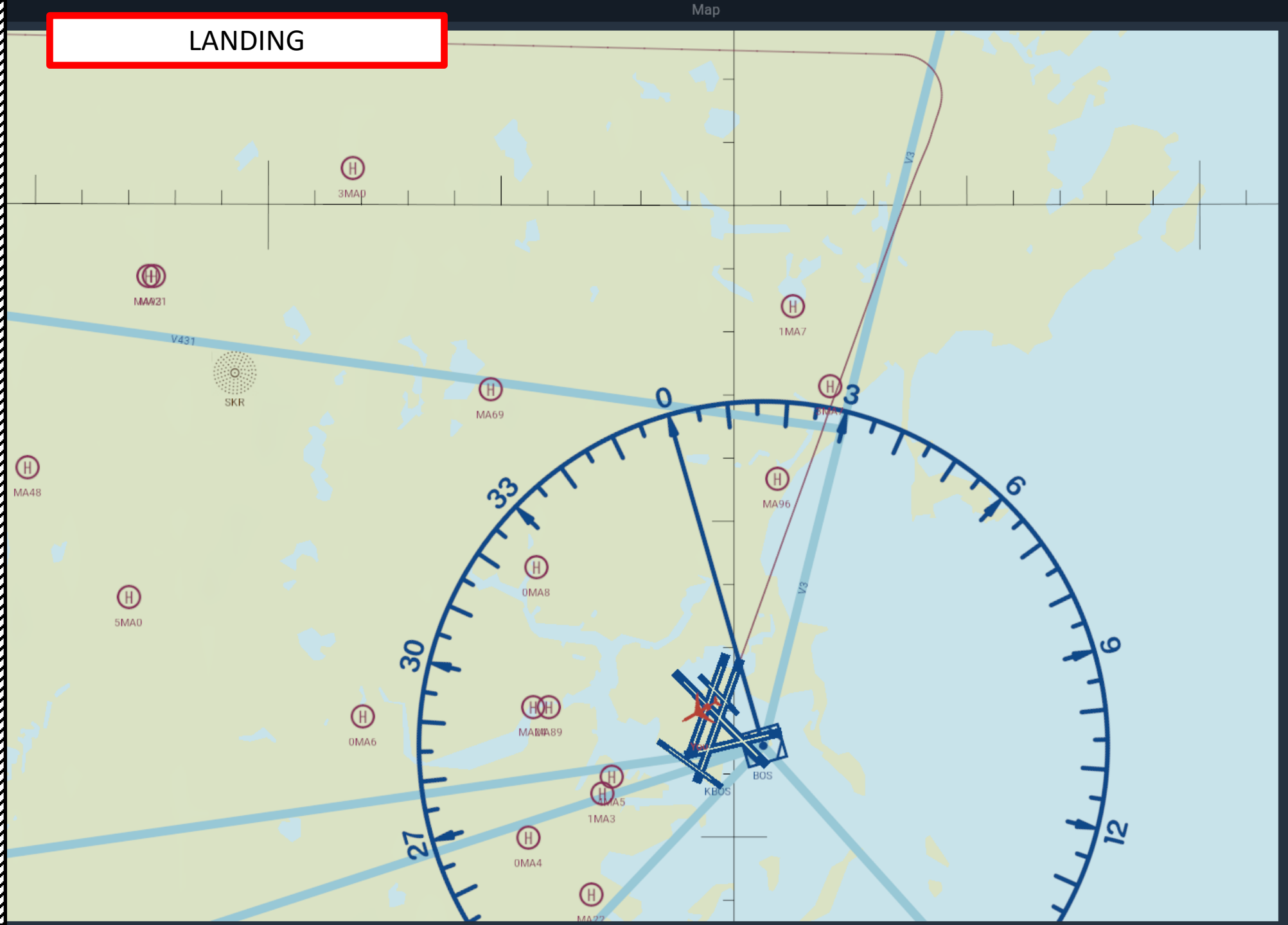
LANDING

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





LANDING


Map
Mode
VFR sectional
Layers
Clouds & precipitation (IR & NEXRAD)
No wind
Flight path
Compass rose
Approach
No approach selected
Disable downwind ILSes
Glideslope Cross Section
HIDE
SHOW
3MA0
MA21
V431
SKR
MA69
1MA7
MA48
MA96
0MA8
5MA0
0MA6
MA89
1MA5
1MA3
0MA4
MA22
KBOS
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