

N2



- PRATT & WHITNEY PUREPOWER PW800 ENGINES

PW815GA - 15,681 pounds of thrust

- High-Bypass Turbo fans - 6:1 Bypass ratio

- FADEC - controlled

- Thrust reverser

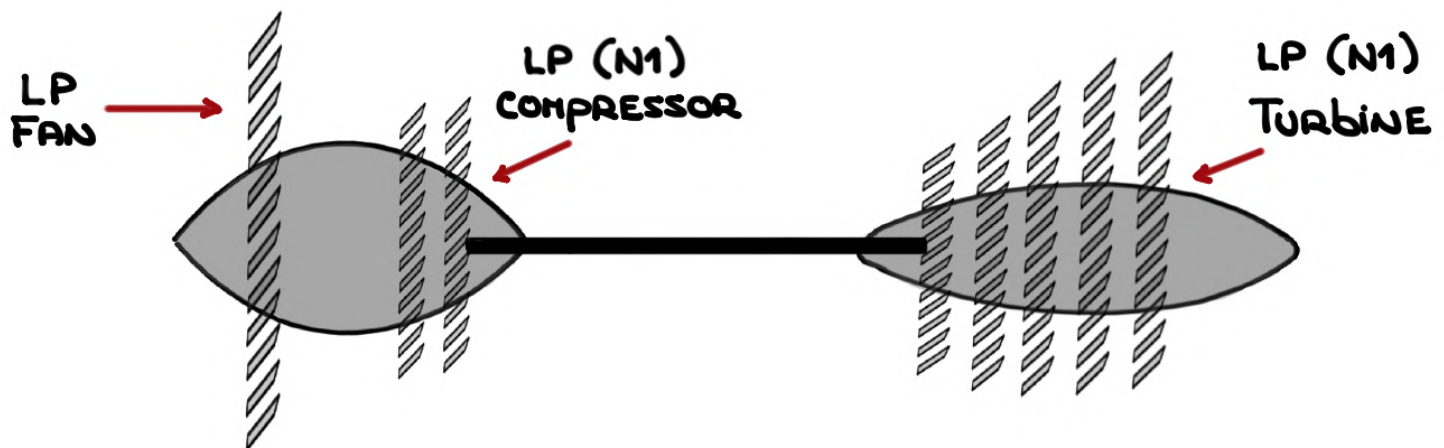
- Single-stage Titanium LP fan (24 blades)

- Twin-spool

• LOW PRESSURE ROTOR (N1):

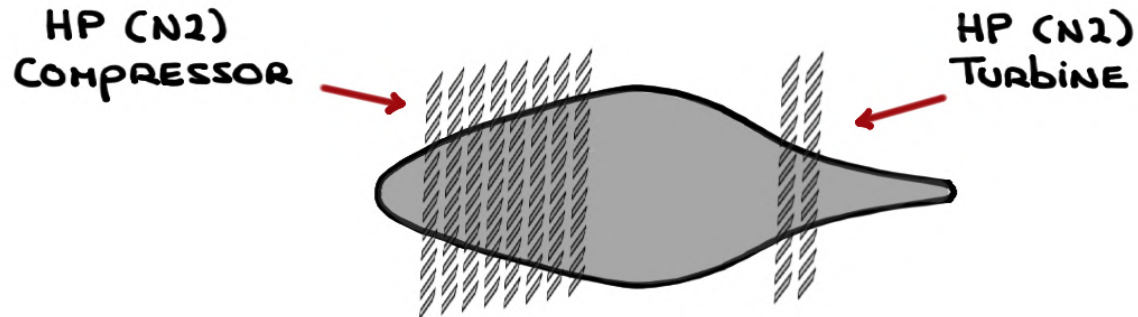
single-stage fan and two (2) stage compressor

driven by five (5) stage turbine

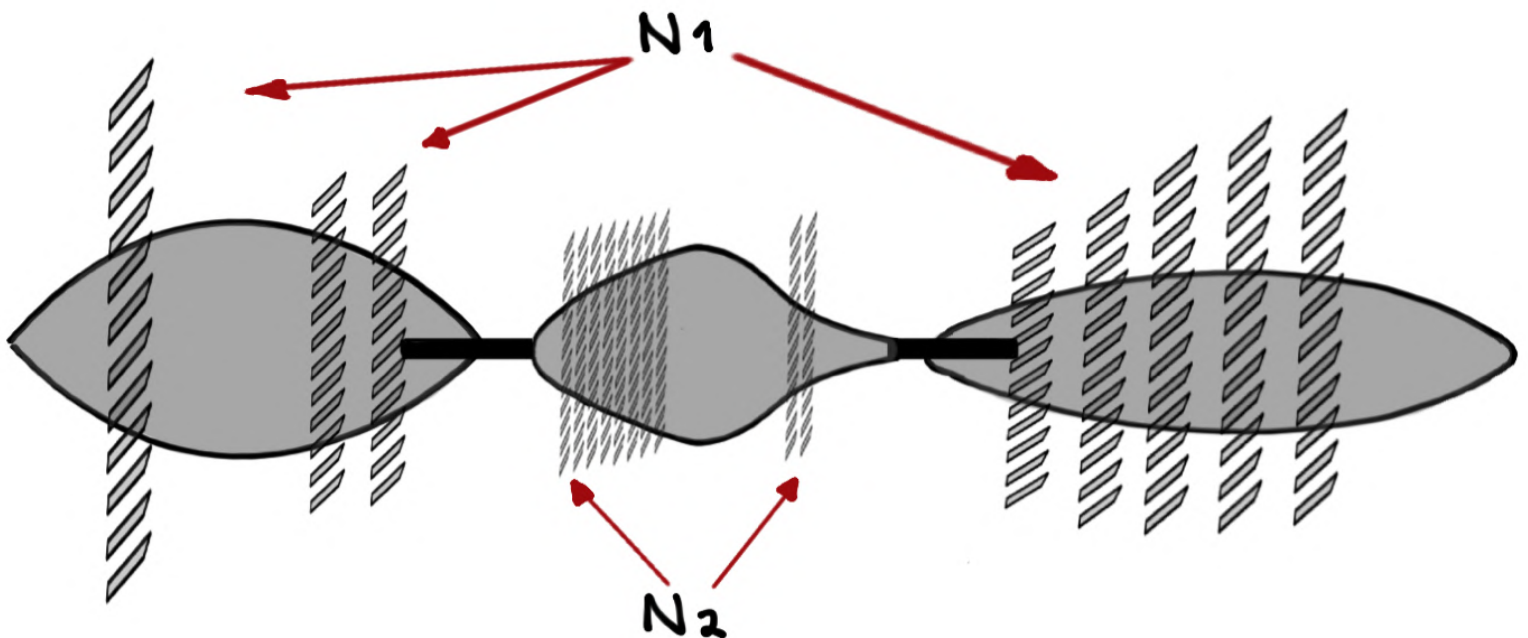


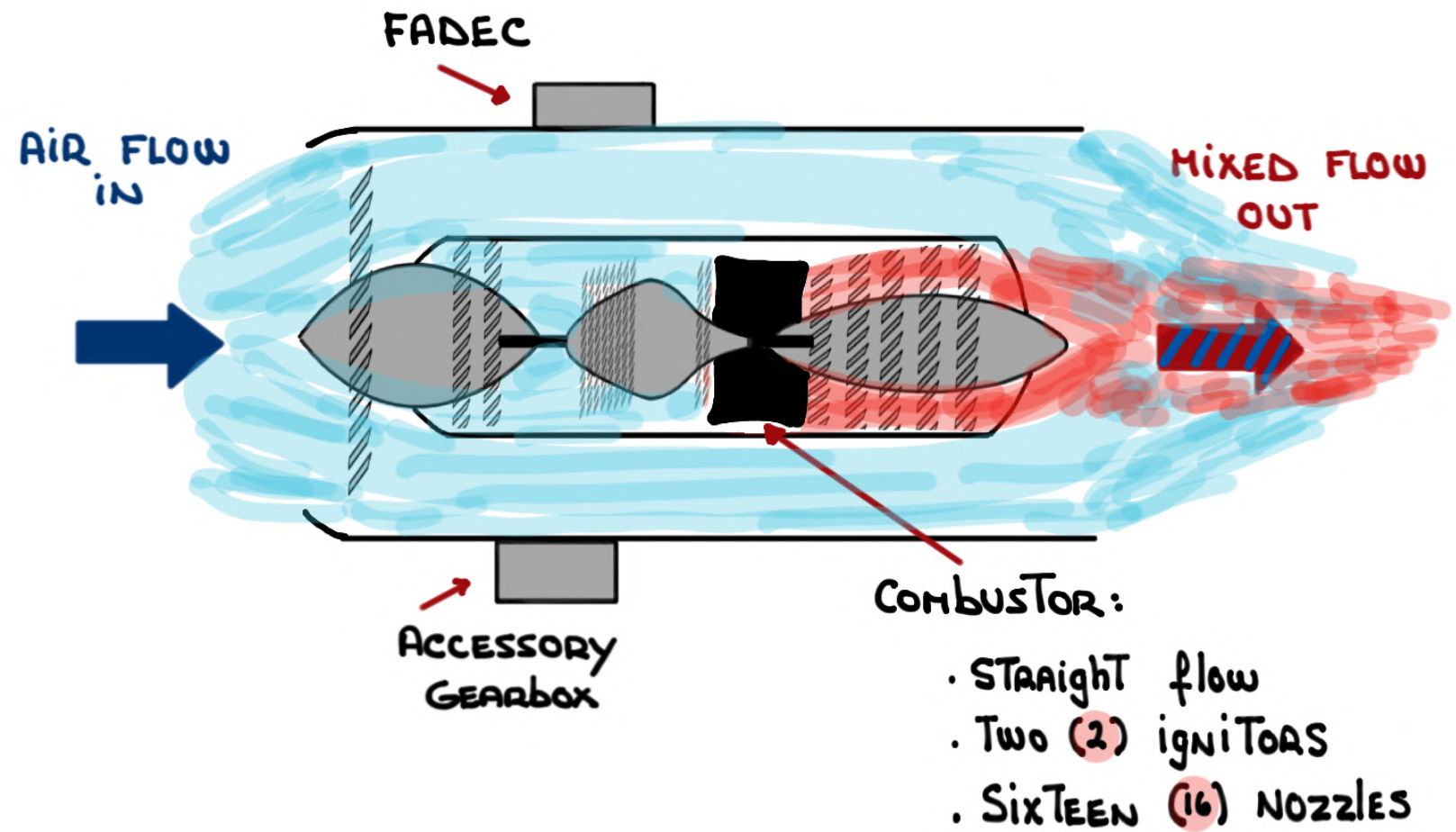
- High pressure rotor (N2):

Eight (8) stage compressor driven by a Two (2) stage turbine



(LP = N1 / HP = N2)





- ACCESSORY GEARBOX:

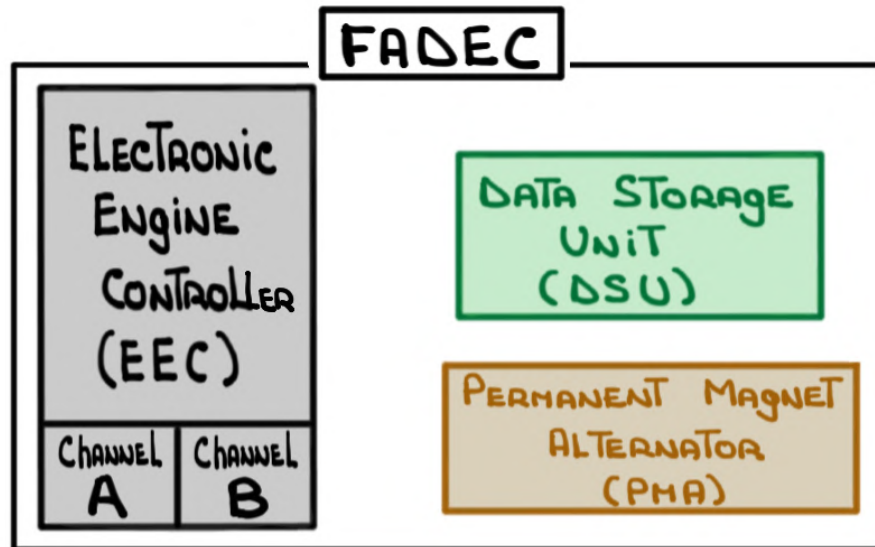
USES POWER EXTRACTED FROM THE N₂ COMPRESSOR shaft
TO DRIVE THE FOLLOWING ACCESSORIES:

- BREATHER
- FUEL METERING UNIT (FMU)
- HYDRAULIC pump
- INTEGRATED DRIVE GENERATOR (IDG)
- OIL TANK AND pump
- PERMANENT MAGNET ALTERNATOR (PMA)

- Full Authority Digital Electronic Control (FADEC):

MOUNTED ON OUTSIDE, UPPER PORTION OF THE ENGINE.

CONSISTS OF THREE (3) MAJOR COMPONENTS:



THE FADEC CONTROLS N1 SPEED/THRUST BASED ON:

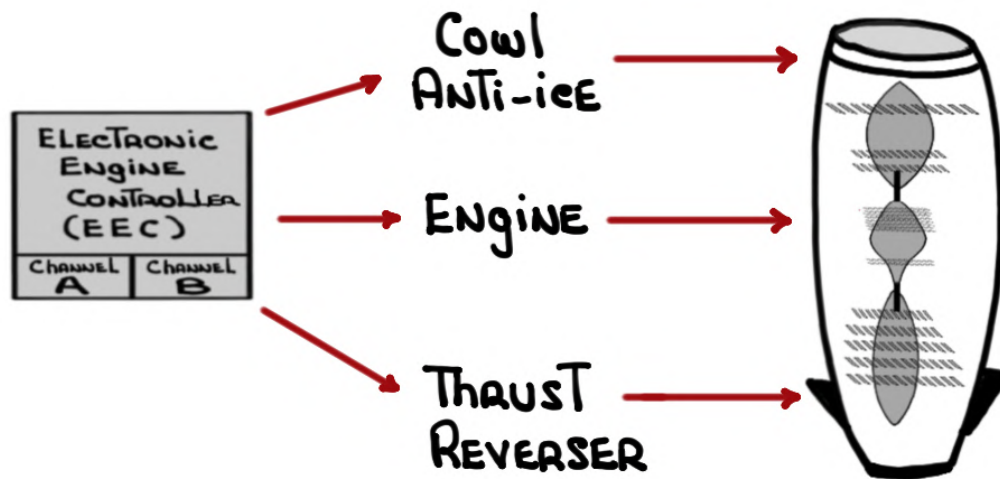
- THRUST LEVER POSITION
- AMBIENT CONDITIONS
- LEVEL OF BLEED AIR EXTRACTION

THE FADEC PROVIDES:

- ENGINE PROTECTION
- IMPROVED HANDLING
- BETTER FUEL EFFICIENCY
- PROLONGED ENGINE LIFE

ELECTRONIC ENGINE CONTROLLER (EEC)

- DUAL CHANNEL - ONE ACTIVE AND ONE STANDBY
- COMMUNICATES WITH VARIOUS SYSTEMS ACROSS THE DCN
- RECEIVES INPUT FROM VARIOUS SENSORS THEN CONTROLS:



- EEC CONTROLS Engine Idle Speed

Idle Speed Control is based on N_1 speed with Thrust Levers at idle. There are four (4) modes:

- ① Flight Idle
- ② WAI Idle
- ③ Approach Idle
- ④ Ground Idle

① Flight Idle:

- GEAR NOT down AND locked, AND
- Flaps < 39°

② WAI Idle:

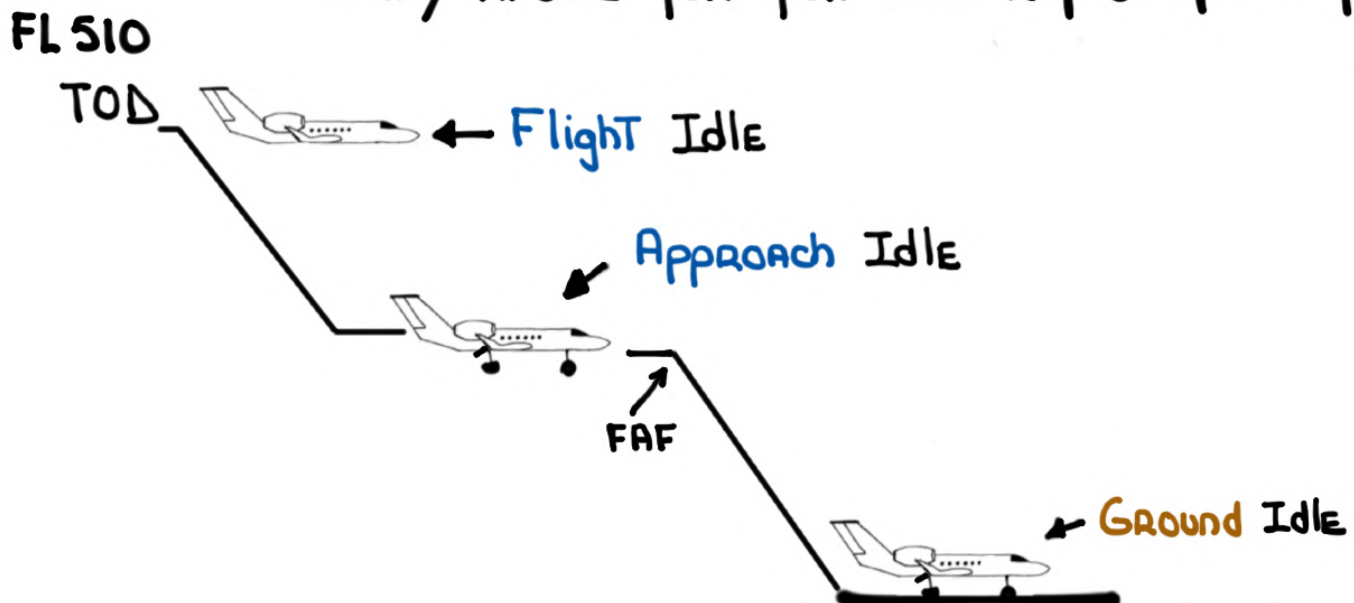
- WAI ON
- GEAR UP
- TAT $\leq +2^{\circ}\text{C}$

③ Approach Idle:

- GEAR down AND locked, OR
- Flaps 39°

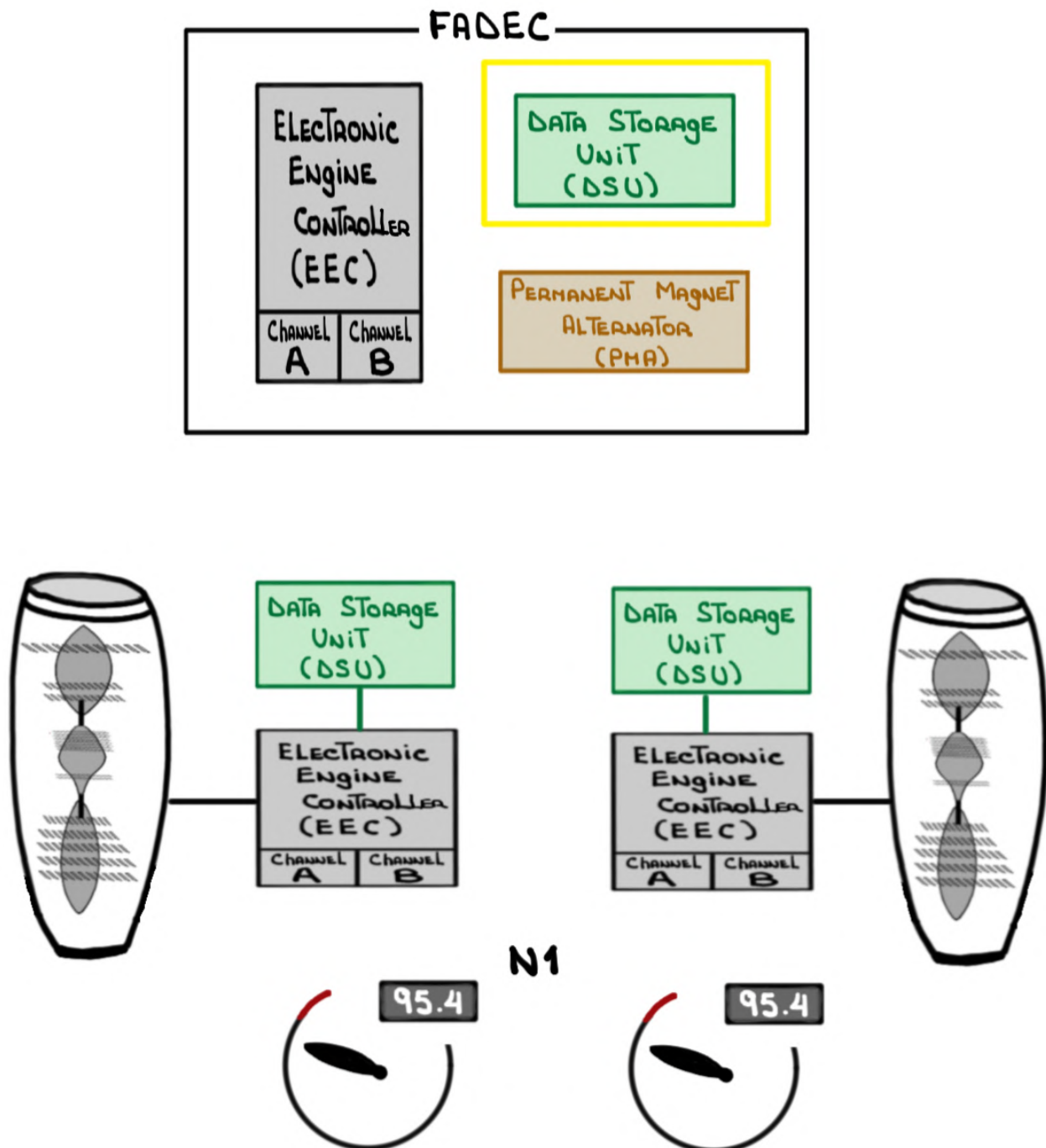
④ Ground Idle:

- AIRCRAFT WOW (GROUND)
- Touchdown + five (5) SECONDS
- Delay allows for full AND RAPID spool up



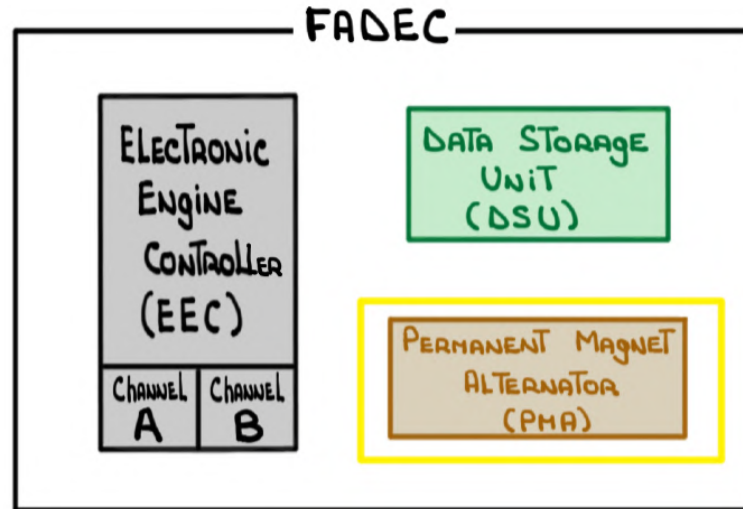
DATA STORAGE UNIT (DSU)

The DSU CONTAINS ENGINE TRIM data. This TRIM data is utilized by THE EEC TO MAKE ALL ENGINES PRODUCE THE SAME THRUST

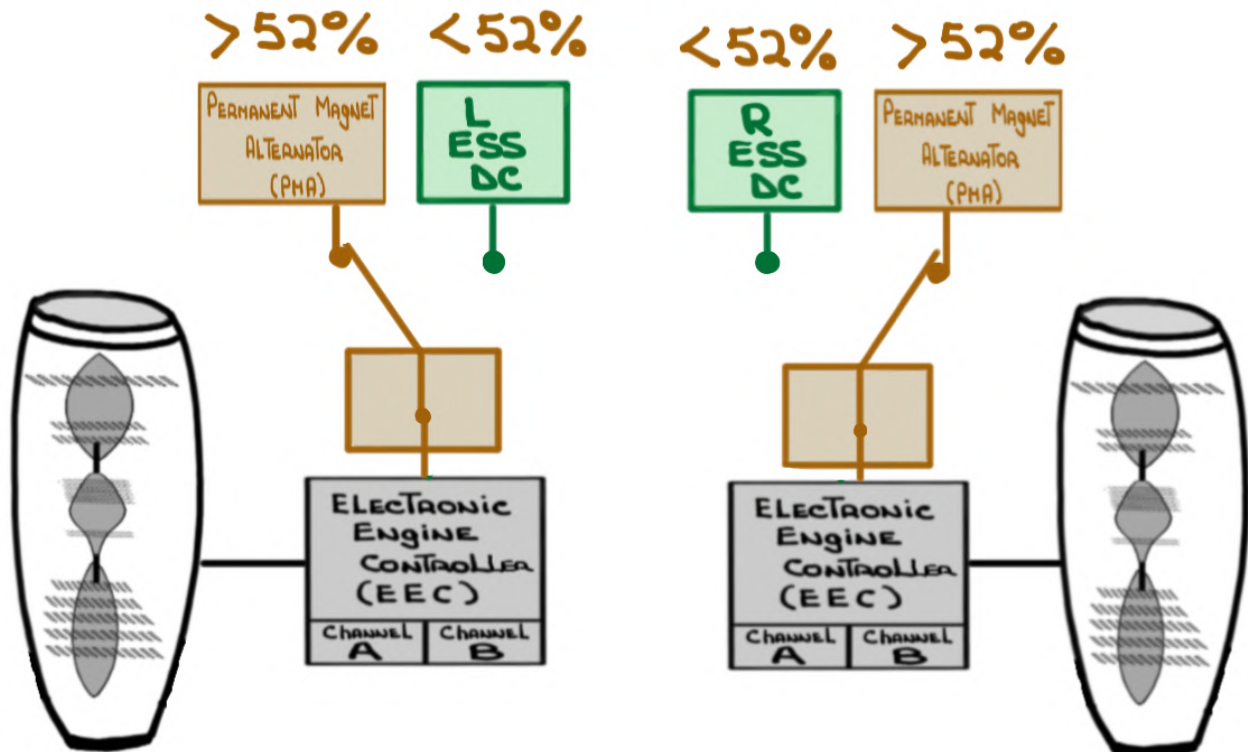


PERMANENT MAGNET ALTERNATOR (PMA)

PRIMARY SOURCE OF EEC POWER ONCE THE ENGINE ACCELERATES $> 52\%$ N2

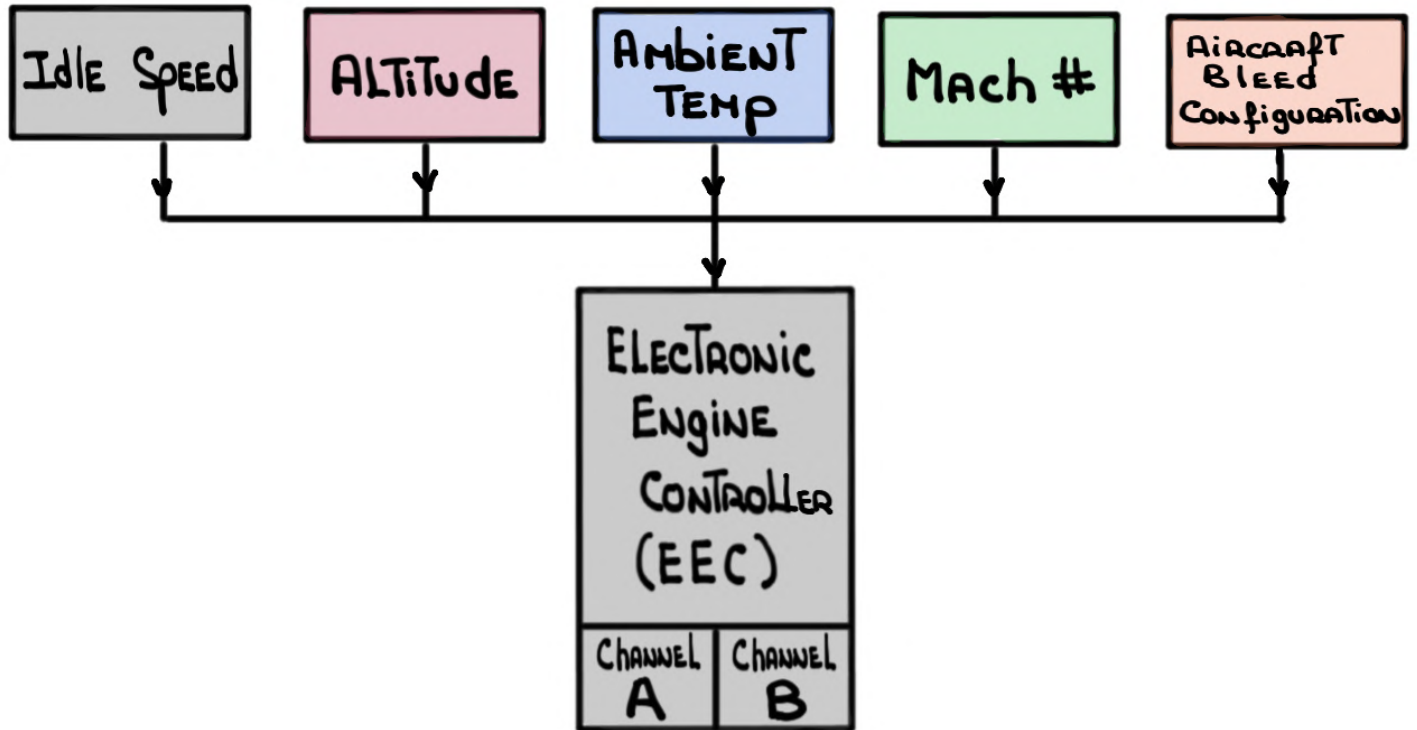


N2



- Thrust Control Modes:

① Normal mode: EEC generates N1 speed based on:

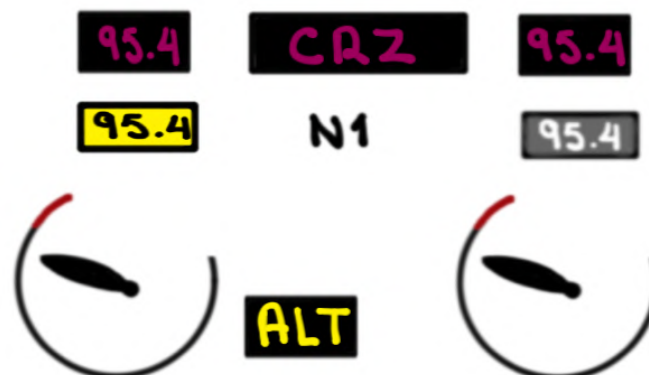


② ALTERNATE Mode (Backup): Thrust lever directly sets N1 speed. Downside:

- Overboost potential
- Auto Throttles inop
- No dispatch (Takeoff prohibited)
- Ops in icing conditions - prohibited

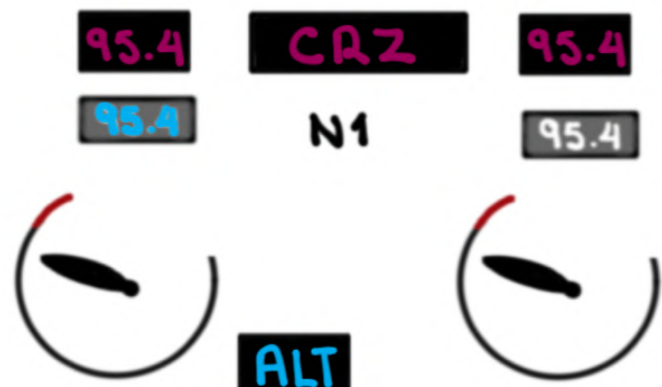
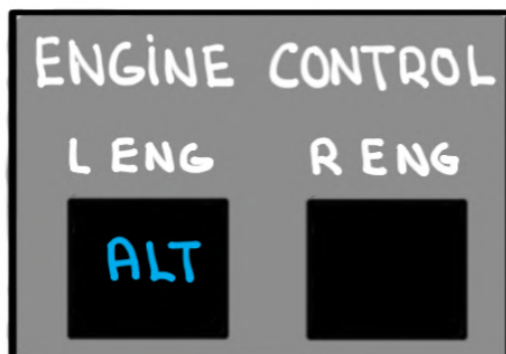
• Auto (soft) REVERSION

Eng ALT CTRL (0)



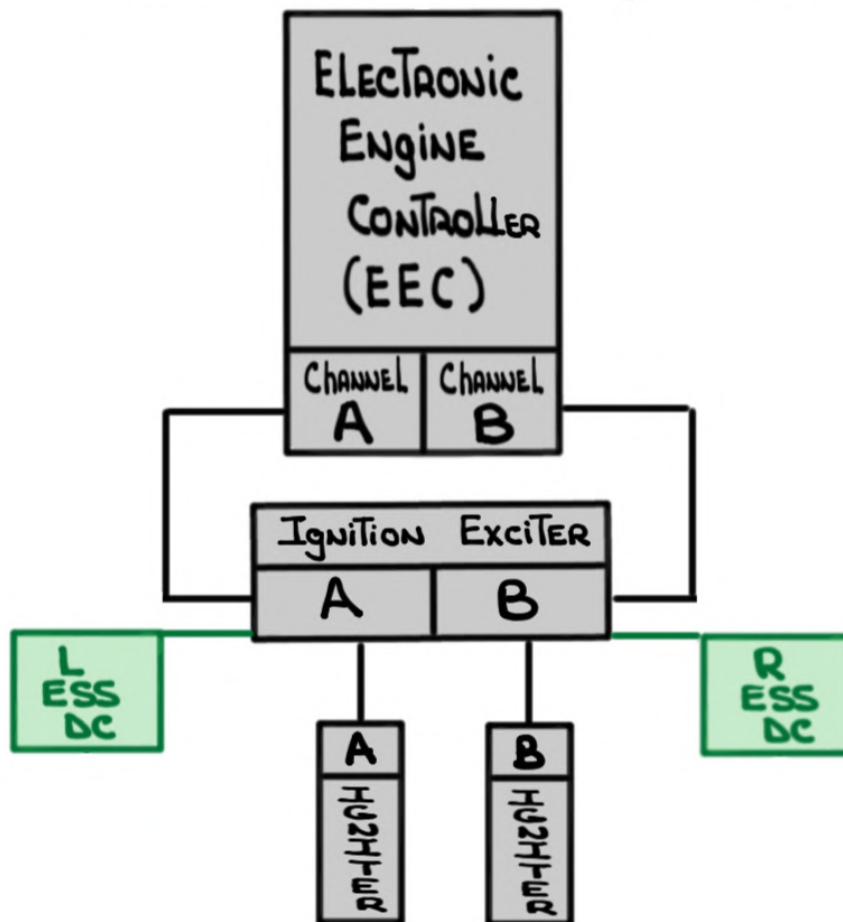
• MANUAL (hard) REVERSION

Eng ALT CTRL (0)



ENGINE Ignition System

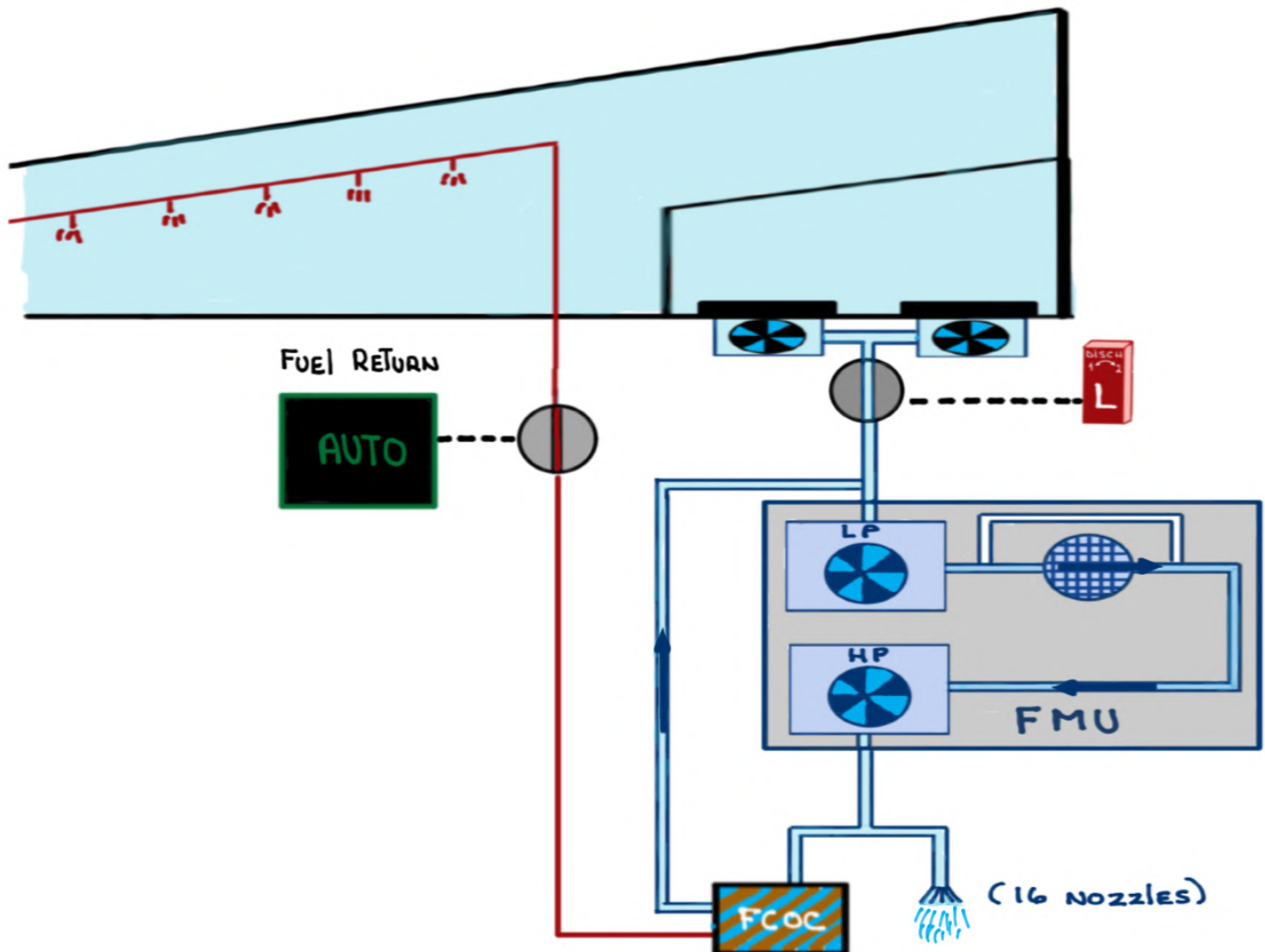
- DUAL channel Ignition Exciter (A and B) ON EACH ENGINE
- CONTROLLED by dual channel EEC AND POWERED by 28 VDC
- GENERATES high voltage pulse TRANSMITTED THROUGH ignition LEADS TO ignition plugs in combustor



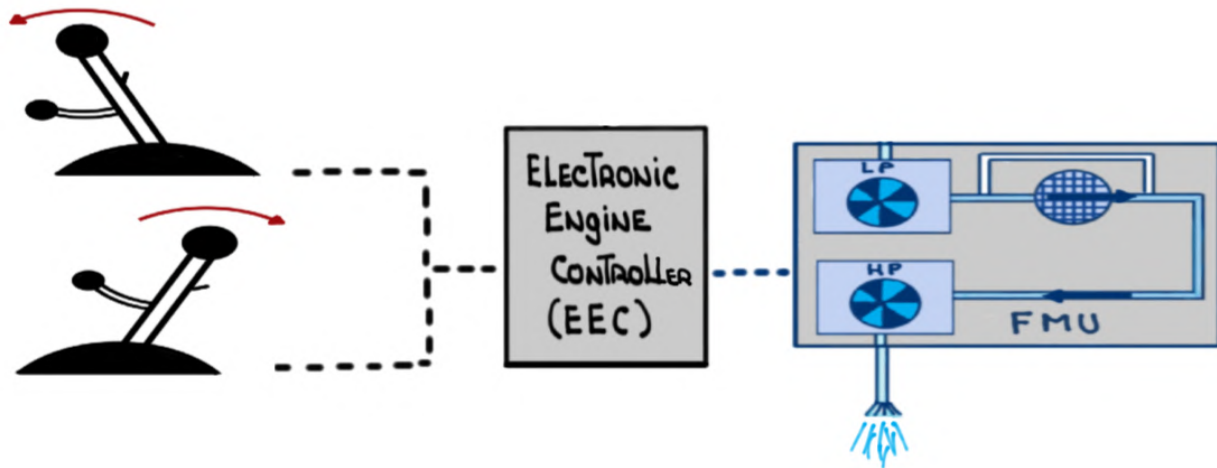
- GROUND STARTS → ONE (1) ignITER
- AIRSTARTS → Two (2) ignITERS (high SPARKING RATE)

ENGINE FUEL SYSTEM

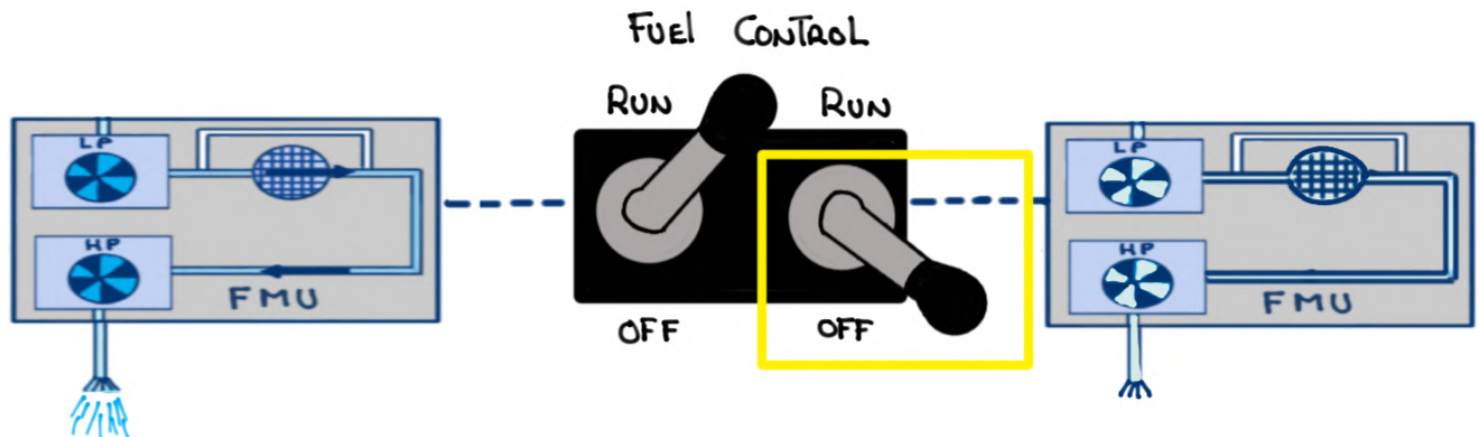
- METERED fuel from TANKS' boost pumps To NOZZLES
- INTRODUCTION of fuel is CONTROLLED by THE EEC
- Low PRESSURE fuel coming from THE wings
- High PRESSURE fuel coming from THE FUEL METERING UNIT (FMU)



- As Thrust Levers are Advanced or Retarded The EEC Commands The FMU To Modulate fuel To nozzles

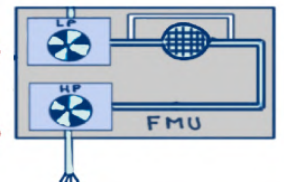


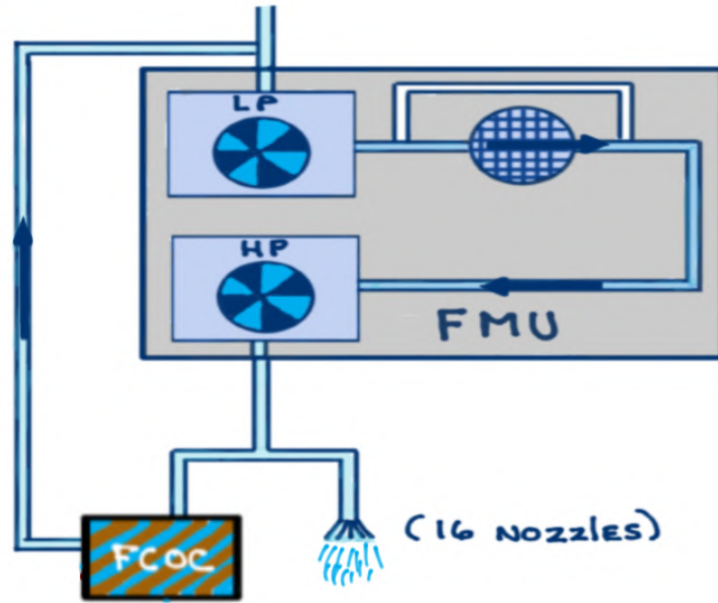
- Placing a fuel control switch To OFF closes FMU
All fuel is cutoff To The fuel nozzles AND The Engine shuts down




- The FMU contains Two (2) internal pumps:

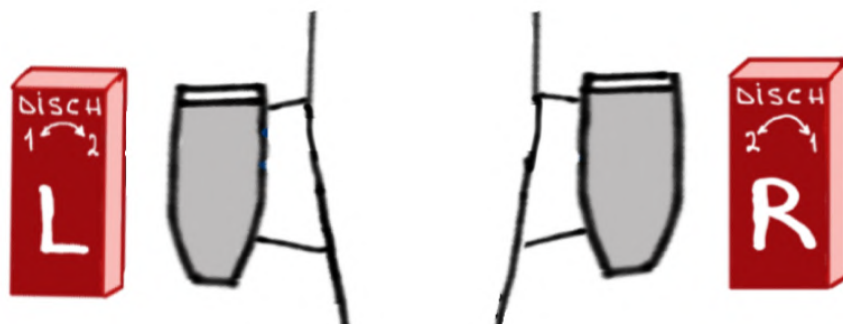
- Low pressure (LP) 1st stage →
- High pressure (HP) 2nd stage →



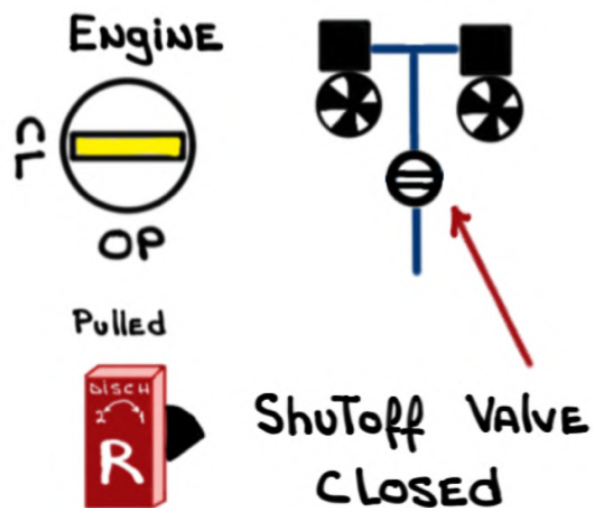
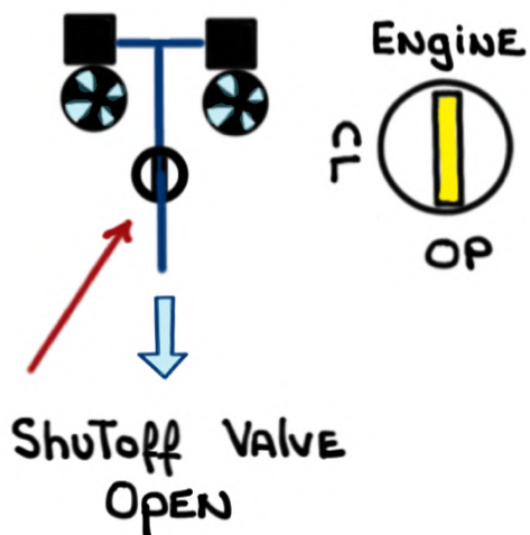
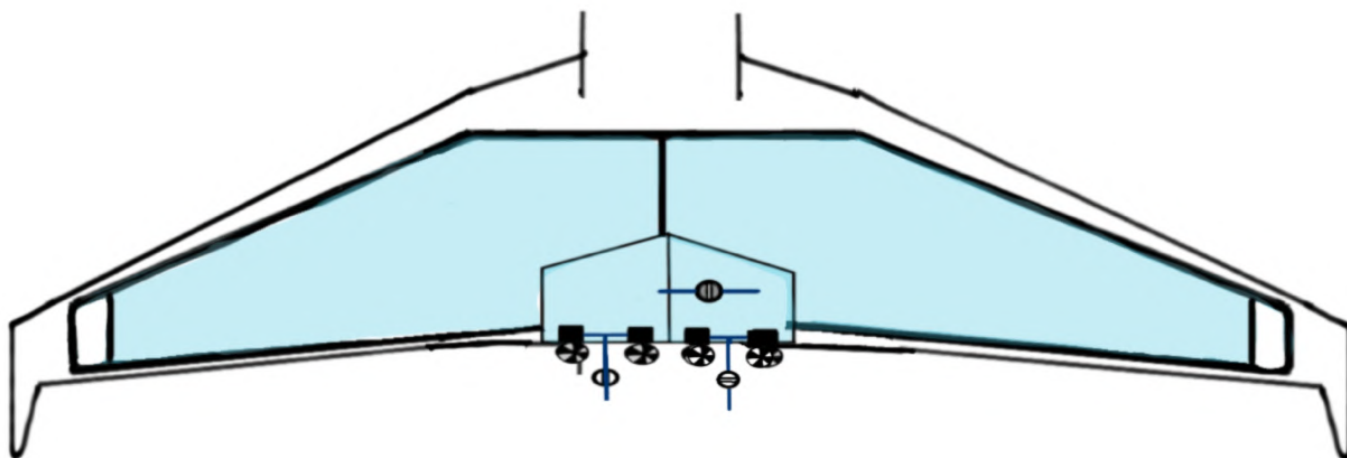


- THE LP AND HP PUMPS ARE DRIVEN BY THE ENGINE ACCESSORY GEARBOX
- A fuel filter RECEIVES fuel from the 1st stage LP pump and REMOVES debris and contaminants
- A filter bypass valve ensures CONTINUAL fuel flow to the engine if filter is blocked
- EXCESS fuel is RECIRCULATED THROUGH THE FUEL/OIL HEAT EXCHANGER 

- Each ENGINE has its own **FIRE HANDLE**

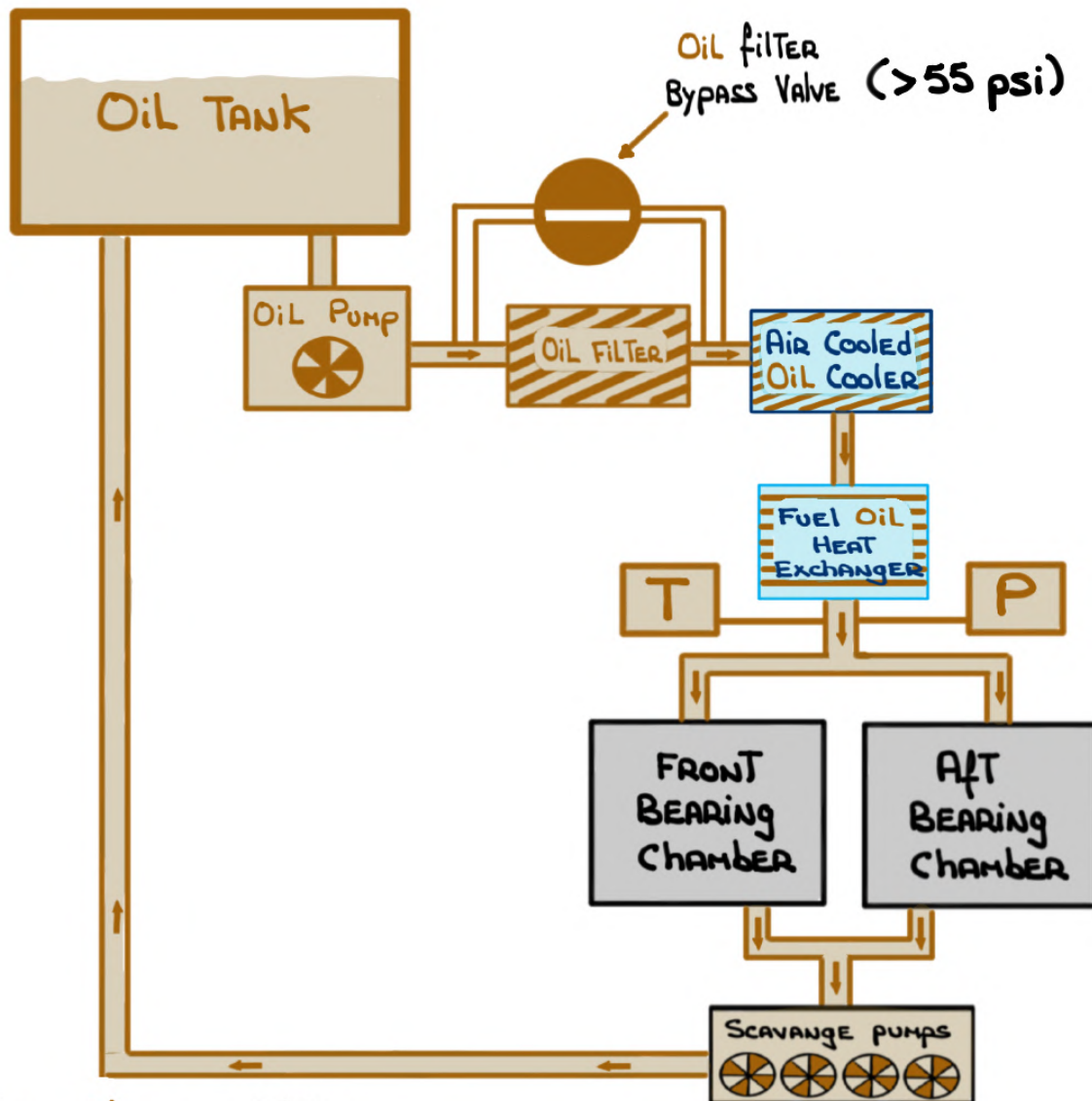


- Pulling a **FIRE HANDLE** shuts off fuel AT THE TANK



ENGINE OIL SYSTEM

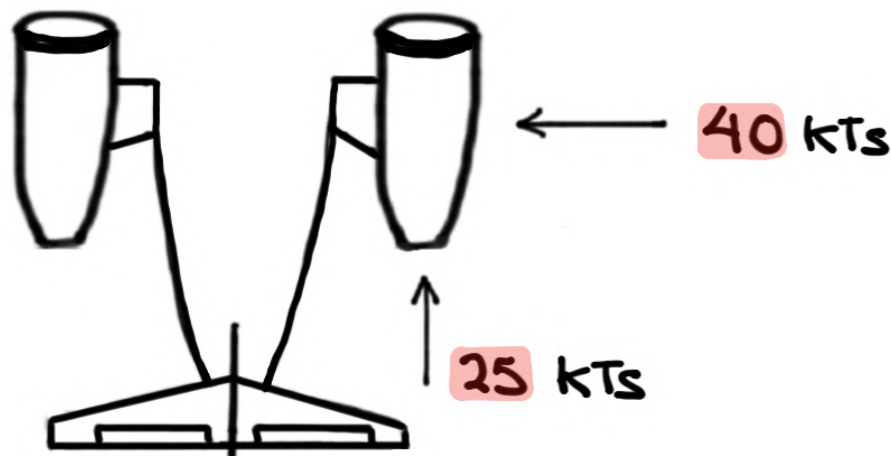
- Provides lubrication during engine operation
- Oil Tank and pump are located in the engine's accessory gearbox



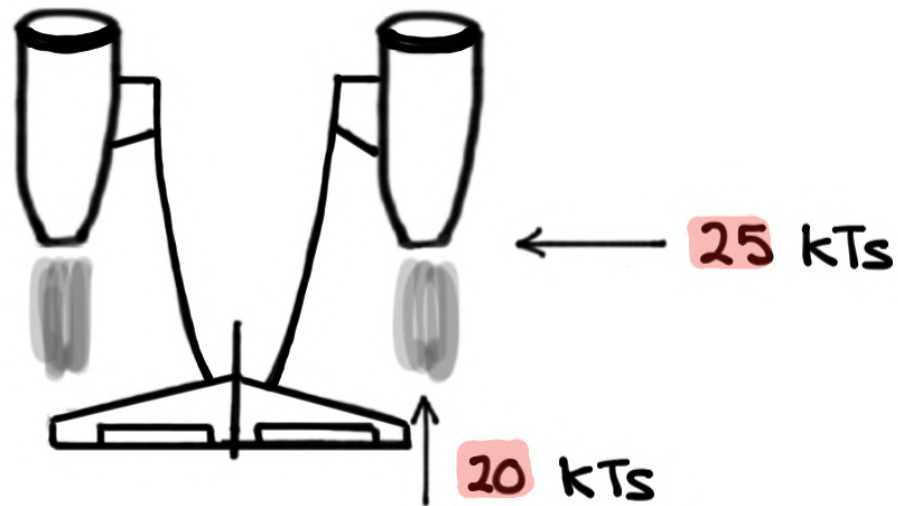
- Check oil quantity:
 - LAST flight of the day, or
 - INTERVAL NOT > 24 CUMULATIVE flight TIME
 - 10-30 MINUTES AFTER shutdown

ENGINE LIMITATIONS - START

- MINIMUM OAT: -40°C
- MINIMUM BLEED AIR: 22 PSI
- MAXIMUM TGT PRIOR TO START: 120°C
- MAXIMUM TGT: 975°C (ground 875°C)
- ROTORBOW PROTECTION: if ENGINE shutdown < 8 hours
- STARTER duty cycle
 - MAXIMUM of THREE (3) MINUTES PER START cycle
 - DELAY FIFTEEN (15) SECONDS BETWEEN cycles
 - TEN (10) MINUTE COOLING PERIOD REQUIRED if START ATTEMPT EXCEEDS THREE (3) MINUTES
 - AFTER THREE (3) START cycles delay USE of THE STARTER TEN (10) MINUTES OR MORE
- MAXIMUM Tailwind AND CROSSWIND:

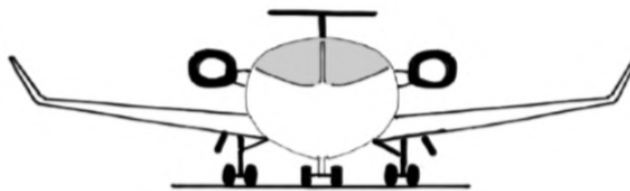


ENGINE LIMITATIONS - High POWER Ground Ops



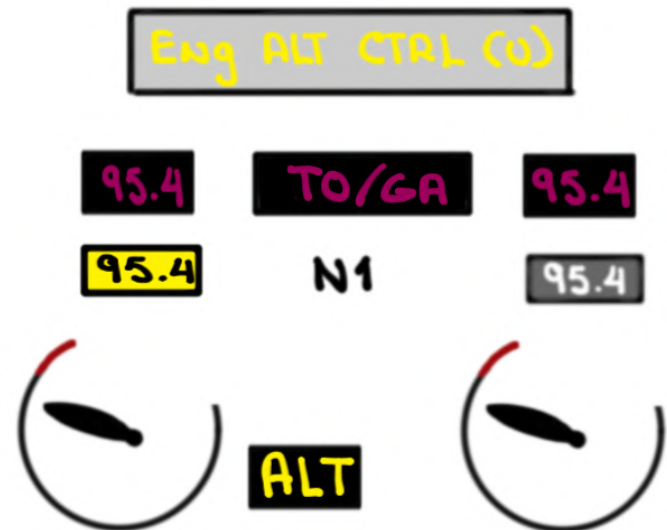
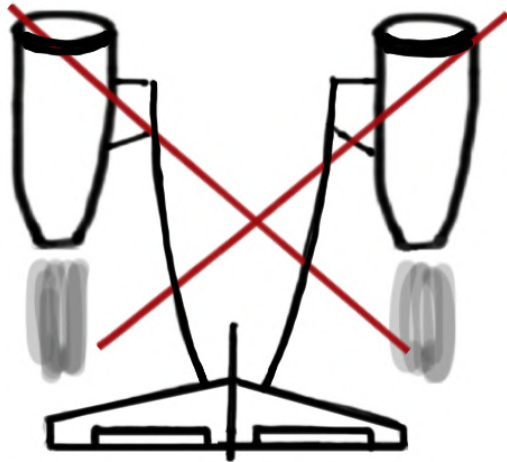
ENGINE LIMITATIONS - Taxi

Taxi operation with ENGINE OIL TEMPERATURE BETWEEN -30°C TO $+10^{\circ}\text{C}$: ONLY THRUST REQUIRED FOR TAXI shall be USED

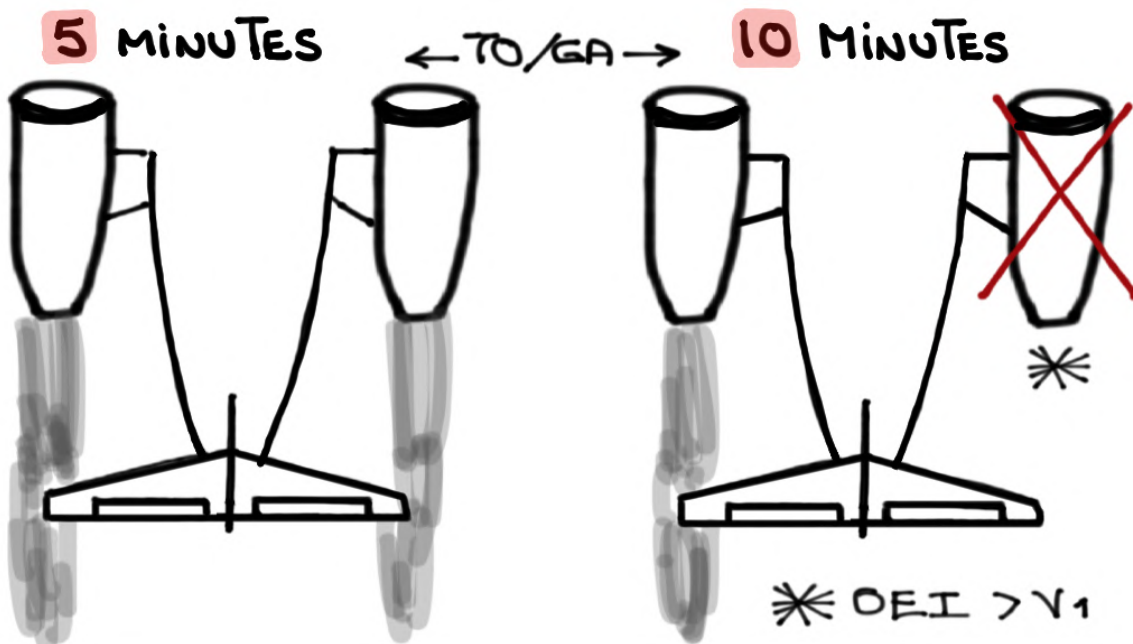


ENGINE LIMITATIONS - TAKEOFF

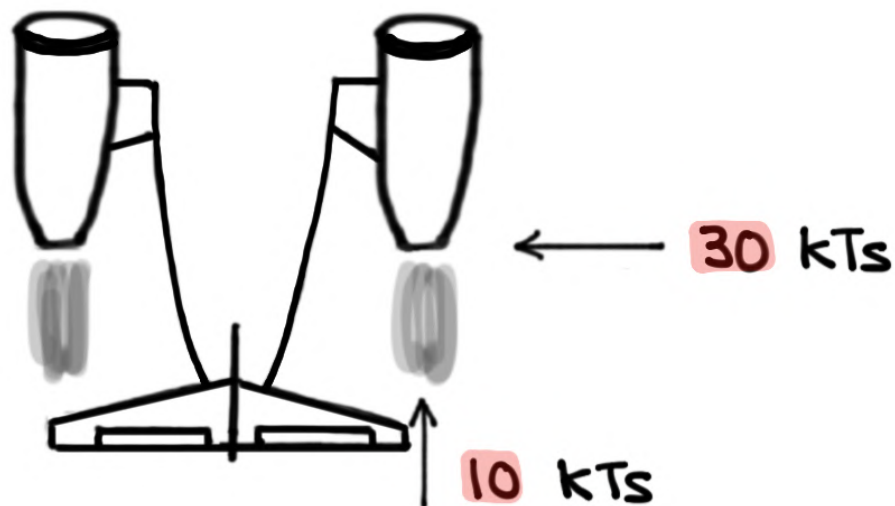
- TAKEOFF in **ALT** mode is prohibited



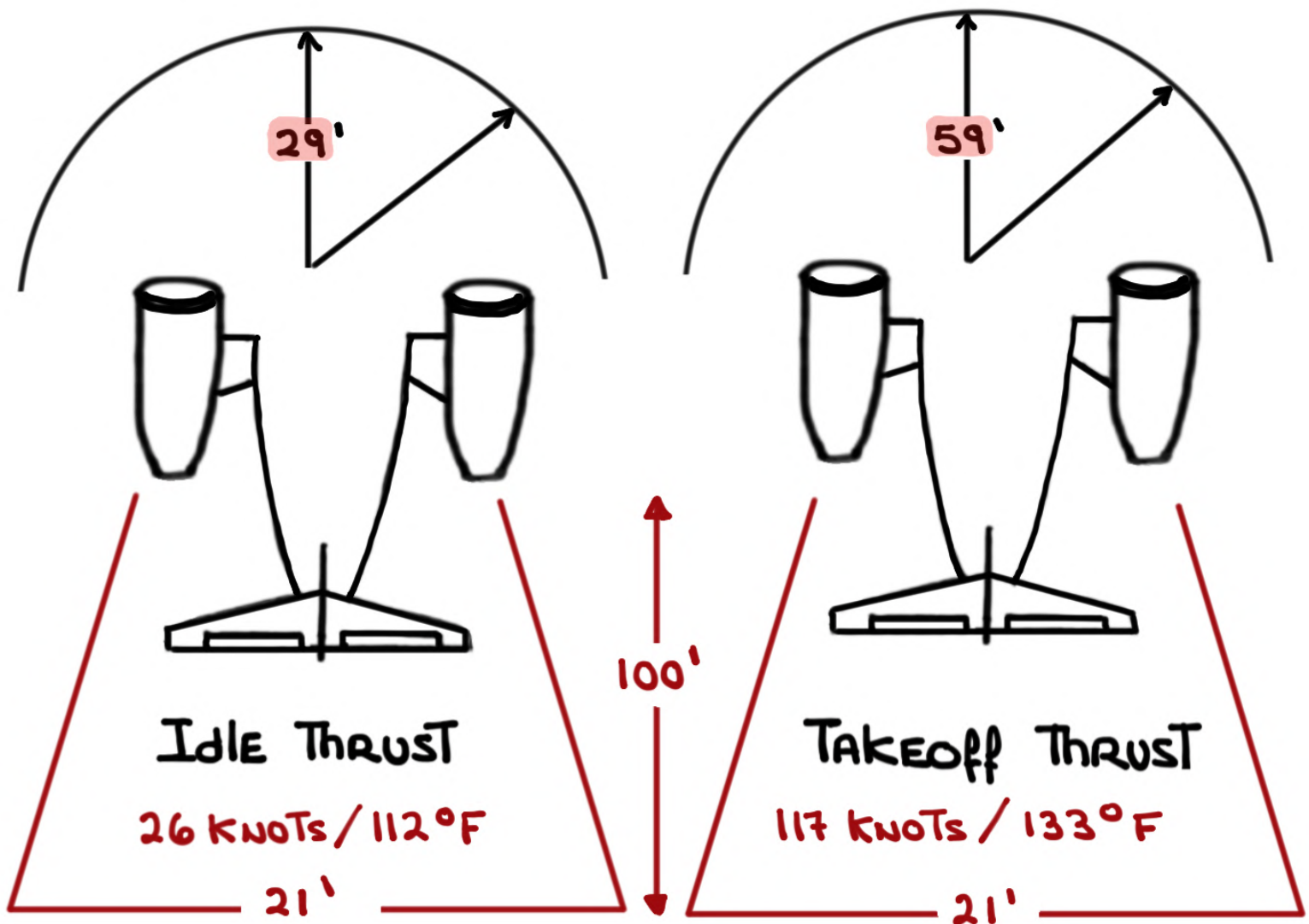
- MINIMUM OIL TEMPERATURE: + 10°C
- MINIMUM FUEL TEMPERATURE: + 9°C
- MAXIMUM TGT: 965°C



- MAXIMUM Tailwind AND crosswind for TAKEoff:



EXHAUST DANGER AREA



ENGINE LIMITATIONS - Inflight

- MAXIMUM CONTINUOUS THRUST (MCT): **956** °C
- ENGINE OPERATIONS < 0 Gs limited to less than SEVEN (7) SECONDS

AIRSTART

PRIORITY: ① CROSSBLEED
② APU ASSISTED
③ Windmill

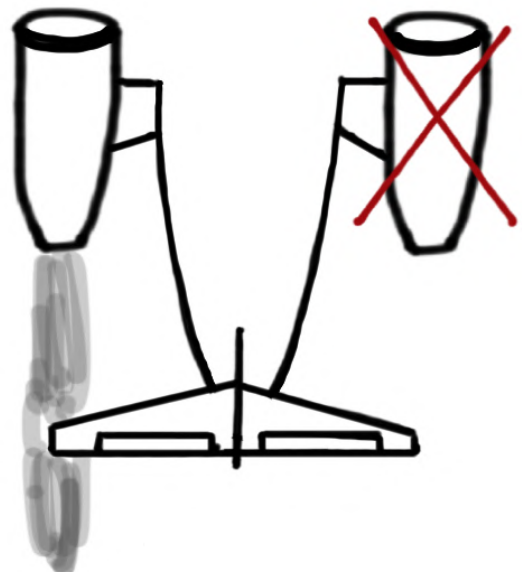
<u>AIRSTART Type</u>	<u>Altitude</u>	<u>Speed</u>	<u>Minimum N₂</u>
• STARTER ASSIST	≤ 30,000	V _{REF} - V _{MO}	N/A
• Windmill	≤ 16,500'	250 KCAS - V _{MO}	9%

NOTE: NO FADEC PROTECTION

MAXIMUM TGT: **975** %

DO NOT ATTEMPT AIRSTART if:

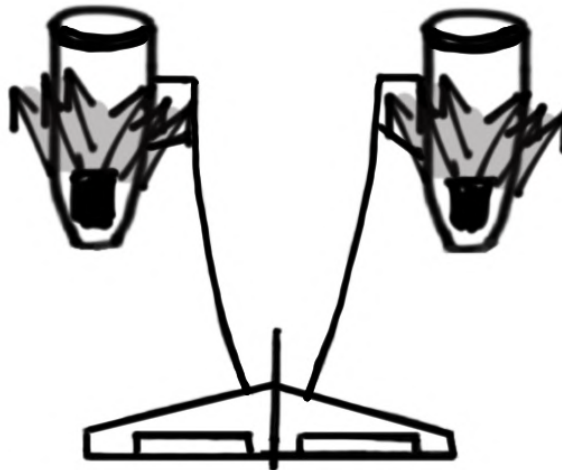
- FIRE
- FOD
- FROZEN



ENGINE LIMITATIONS - LANDING

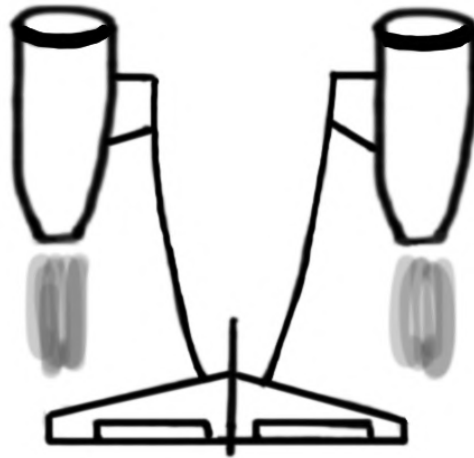
THRUST REVERSERS:

- REVERSE idle by sixty (60) knots
- USE for power back NOT approved
- If USED in AN EMERGENCY to bring the AIRCRAFT to a COMPLETE STOP MUST REPORT TO MAINTENANCE
- THRUST REVERSEER MUST be deployed and STOWED AT LEAST ONCE EVERY ONE hundred (100) hours
- USE of both THRUST REVERSEERS below TEN (10) knots is prohibited



ENGINE LIMITATIONS - TAXI IN / SHUTDOWN

00:00 IDLE POWER 00:03



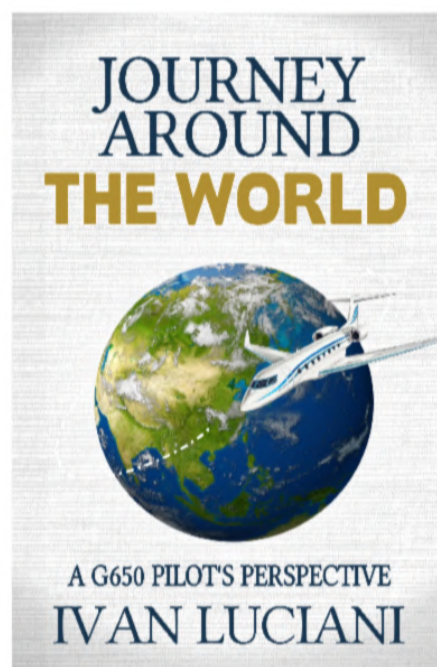
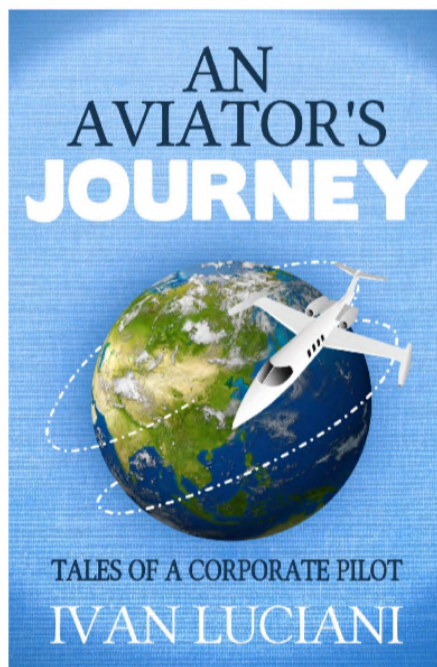
A THREE (3) MINUTE POST-LANDING AT IDLE POWER NEEDS TO BE OBSERVED PRIOR TO ENGINE SHUTDOWN

CONDUCTING MANUAL ICE SHEDDING DURING TAXI IN DOES NOT RESET THE POST-LANDING THREE (3) MINUTE ENGINE IDLE TIME REQUIREMENT PRIOR TO ENGINE SHUTDOWN (PAW ENGINE MAINTENANCE MANUAL 71.00.03)

REMINDER: these system notes are intended for study purposes only. Always refer to official Gulfstream manuals and other approved references when operating your aircraft.

NOTE: these system notes are updated from time to time and what is posted on Code450.com will always be the most recent version.

Questions, comments or errors...please do send me an email:
ivan@code7700.com



Thank you!