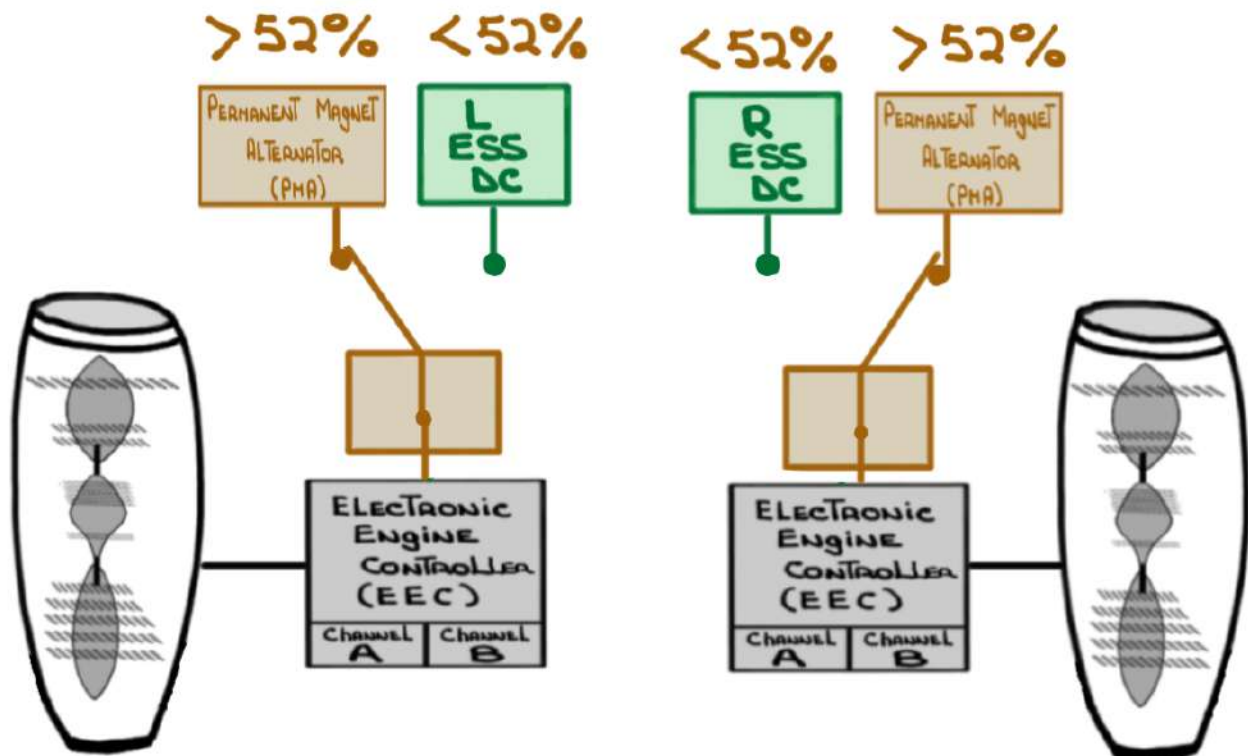


# G500 POWERPLANT

N2



For study purposes only

- PRATT & WHITNEY PUREPOWER PW800 ENGINES

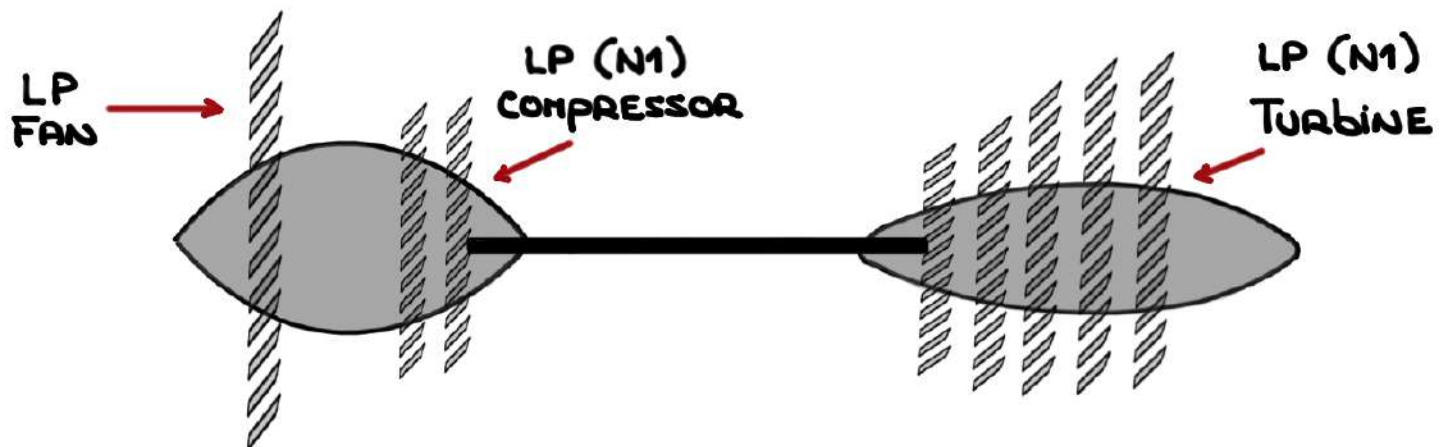
PW814GA - 15,144 pounds of thrust

- High-Bypass Turbo fan - 6:1 Bypass ratio
- FADEC - controlled
- Thrust reverser
- Single-stage Titanium LP fan (24 blades) referred as Integrally Bladed Rotor (IBR) or Blisk
- Stage 5 (FAA) / Chapter 14 (ICAO)
- Twin-spool

• LOW PRESSURE ROTOR (N1):

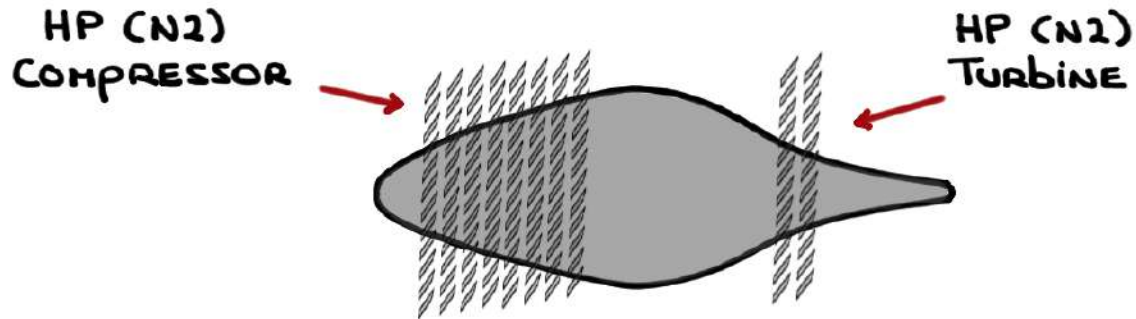
single-stage fan and two (2) stage compressor

driven by five (5) stage turbine

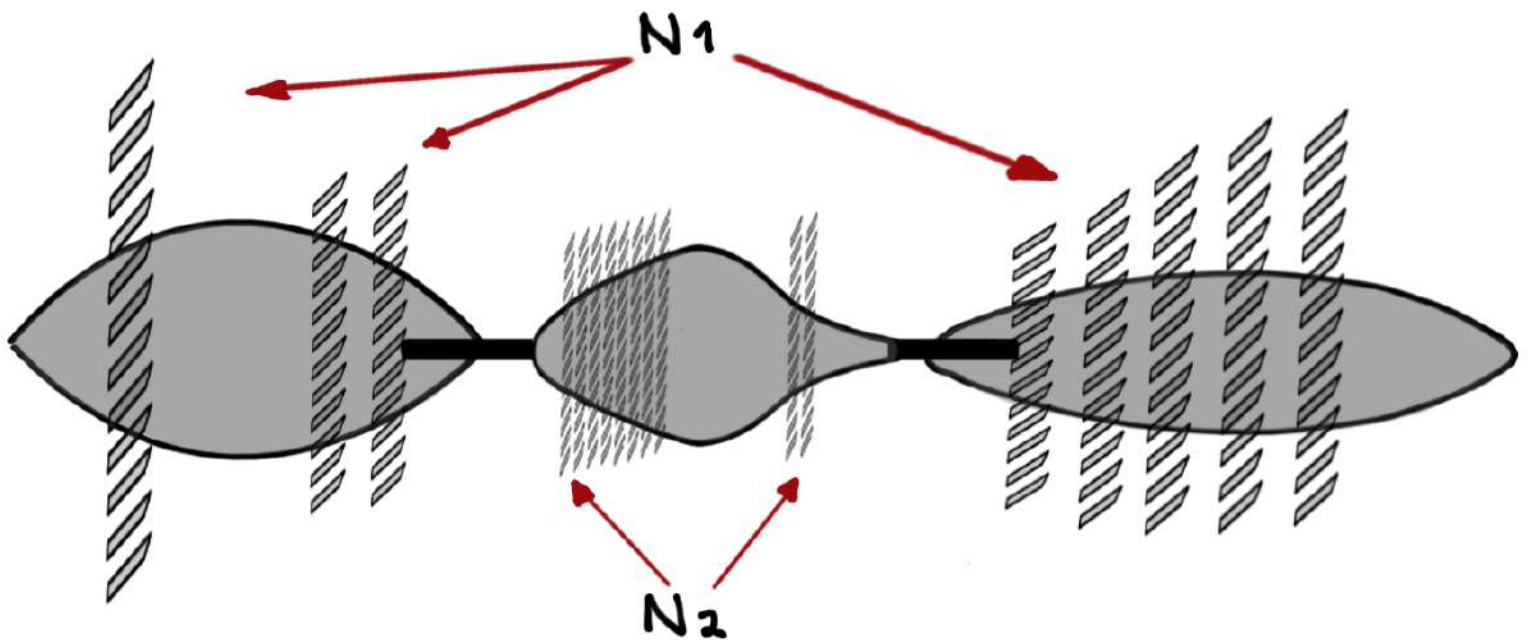


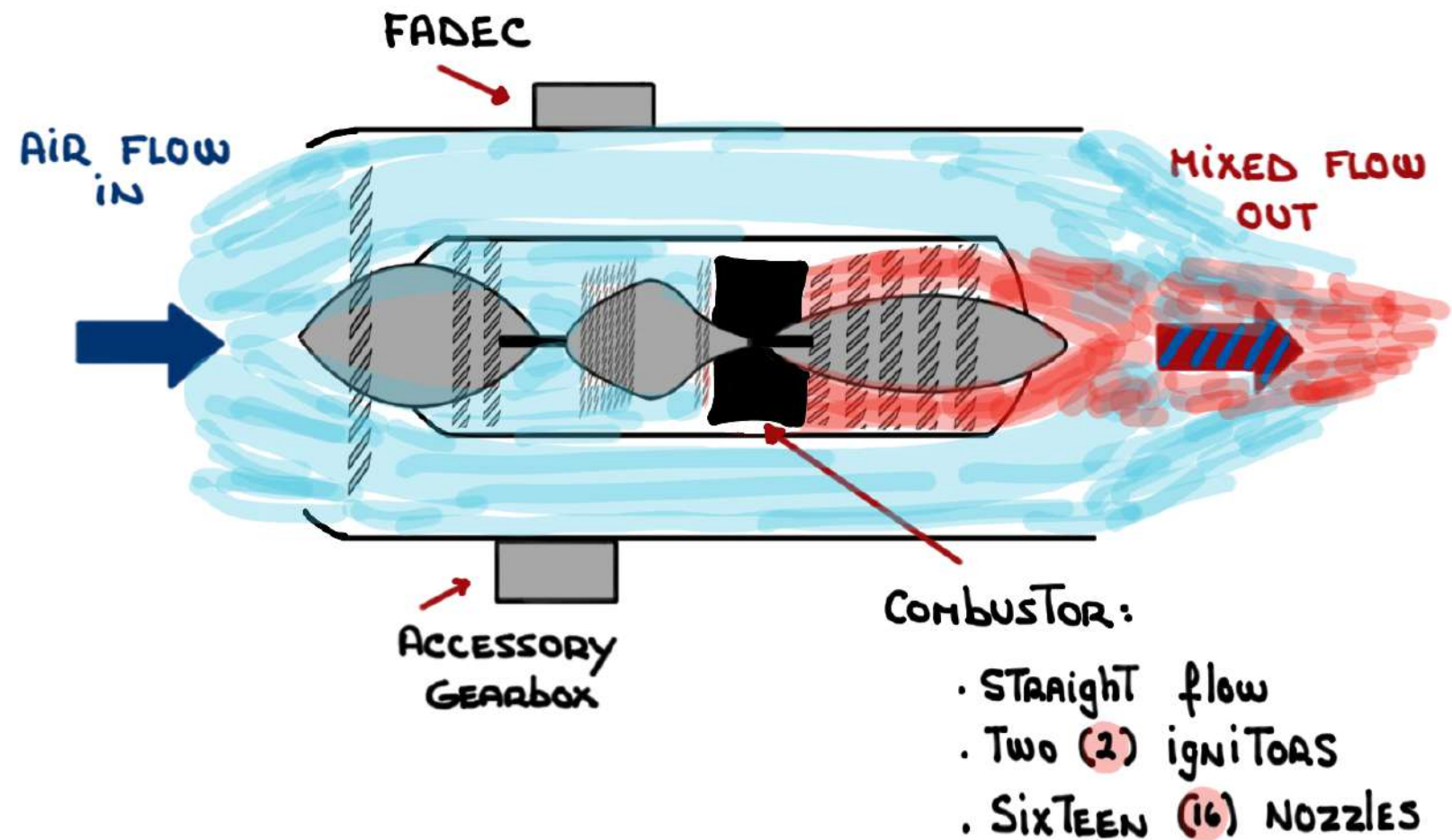
• High pressure ROTOR (N2):

Eight (8) STAGE COMPRESSOR DRIVEN by a Two (2) STAGE TURBINE



(LP = N1    HP = N2)





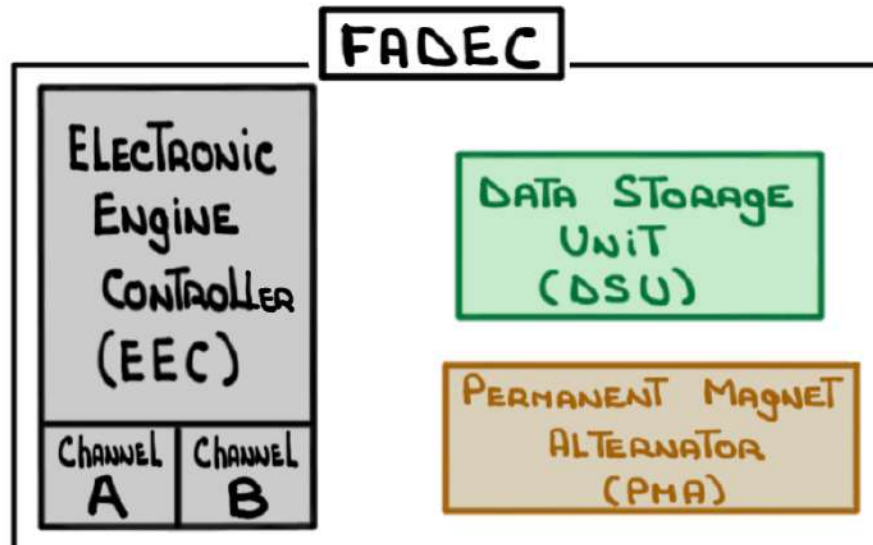
## - ACCESSORY GEARBOX (AGB):

USES POWER EXTRACTED FROM THE N<sub>2</sub> 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):

The FADEC consists of THREE (3) MAJOR COMPONENTS:



The FADEC CONTROLS N1 speed/THRUST based on:

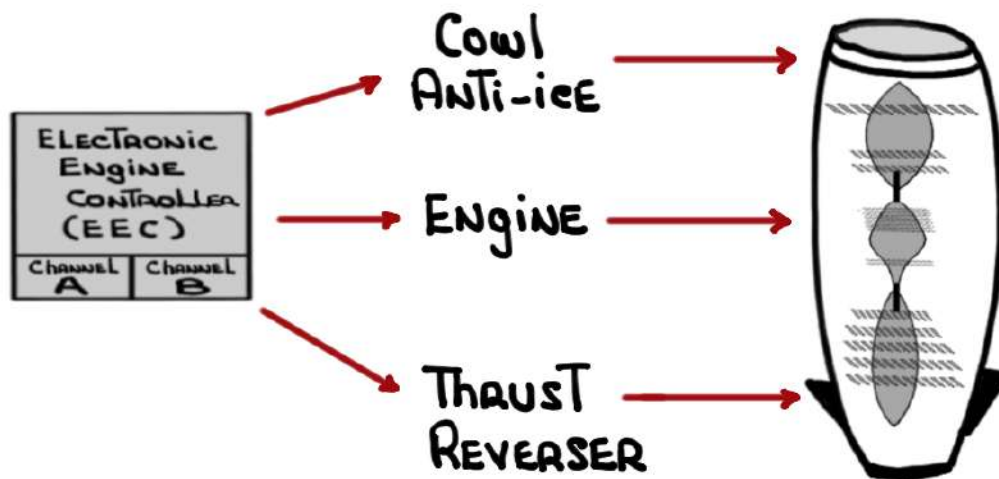
- THRUST LEVER POSITION
- AMBIENT CONDITIONS
- LEVEL OF BLEED AIR EXTRACTION

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 THRAUST 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:

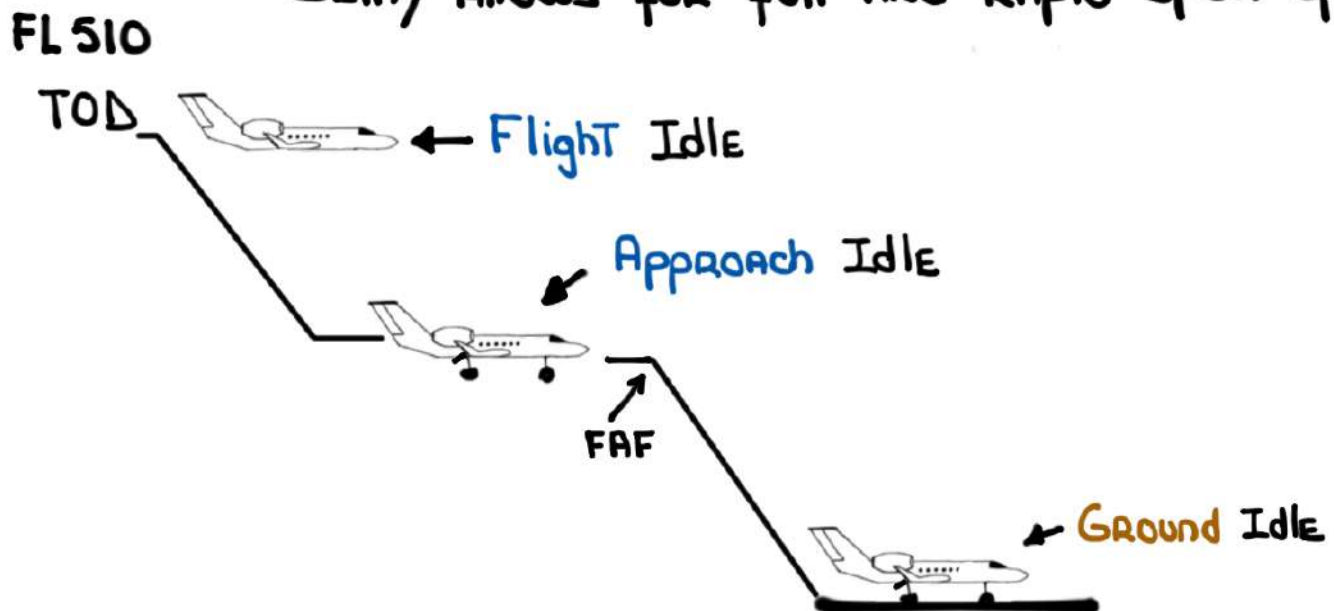
- WAI ON
- GEAR UP
- TAT  $\leq -5^{\circ}\text{C}$  (+2°C with ASC 022)

### 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

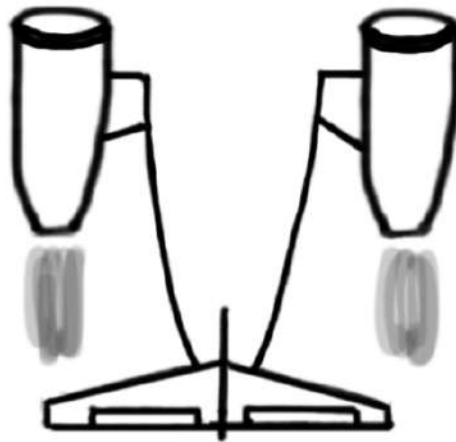


### ⑤ No Dwell Zone (NDZ):

- PREVENTS STEADY-STATE ENGINE OPERATION IN THE N1 RESONANCE ZONE ( $41\% < N1 < 46\%$ )
- WHEN THE COMMANDED N1 (THROTTLE ANGLE) IS WITHIN THE NDZ, IN LIEU OF EITHER ENGINE BEING ALLOWED TO DWELL AT OR NEAR THE RESONANCE ZONE, THE ENGINES N1 ARE SPLIT AS REQUIRED TO ACHIEVE THE TOTAL NET COMMANDED THRUST

LEFT ENGINE  
bias:

$\leq 41\%$  N1  
DURING NDZ  
Split



Right ENGINE  
bias:

$\geq 46\%$  N1  
DURING NDZ  
Split

- Cockpit indication limited to displayed N1 %
- ACTIVE WHEN THE FOLLOWING CONDITIONS EXIST:
  - WAI - ON
  - GEAR DOWN OR FLAPS  $> 22^\circ$  OR AIRSPEED  $< 160$  KCAS
  - TAT  $< 0^\circ\text{C}$

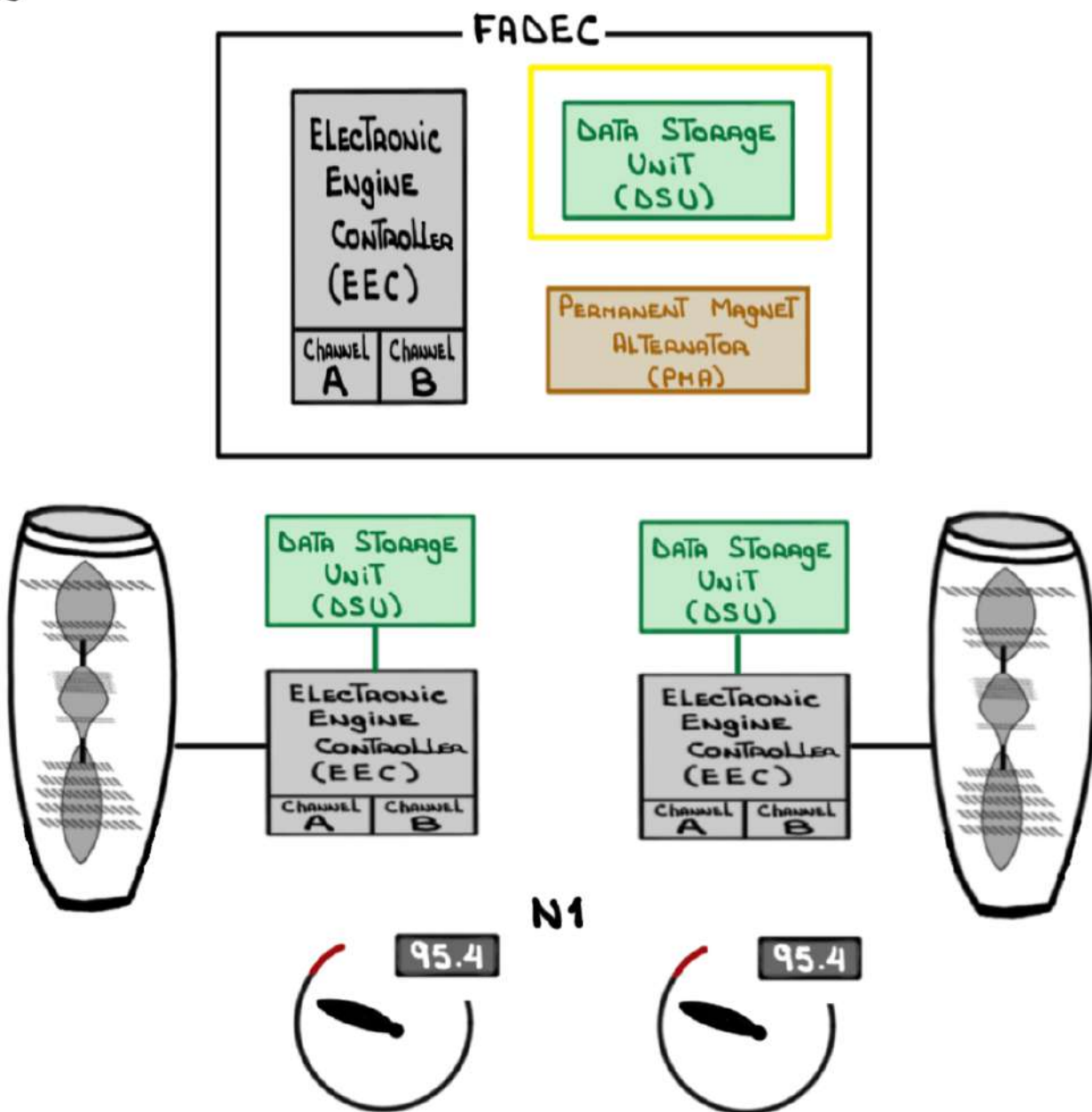


## ⑥ NDZ with ELEVATED EVM logic:

- ACTIVE ANY TIME NDZ logic ENABLED AND EVM > 1.0 ips TO LIMIT RESONANCE ZONE TRANSITIONS DURING ICE SHEDDING EVENTS WITH ELEVATED EVMS
- FADEC LIMITS N1 TRANSITIONS FROM POWER SETTINGS > 46% N1 INTO NDZ
- N1 idle floor REMAINS fixed 46% N1 UNTIL ONE OF THE FOLLOWING OCCURS:
  - \* EVM REMAINS < 1.0 ips FOR TEN (10) SECONDS
  - \* THROTTLE MANUALLY SET TO idle
  - \* SAT < 0°C

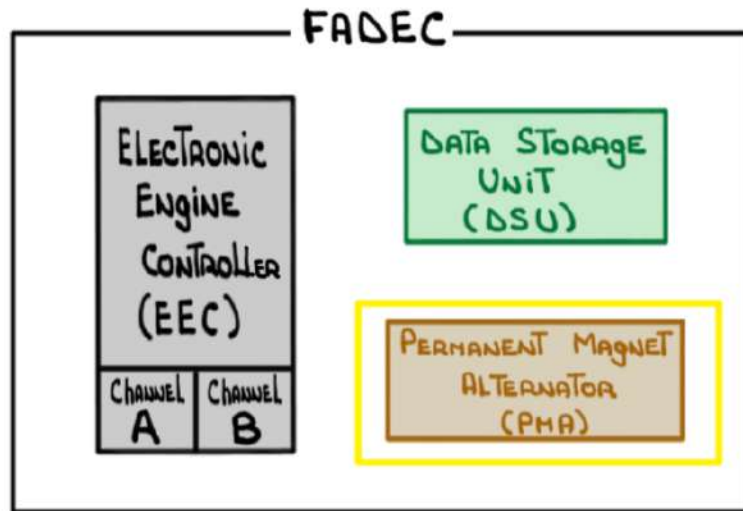
# DATA STORAGE UNIT (DSU)

The DSU CONTAINS ENGINE TRIM DATA. This TRIM DATA is utilized by THE EEC TO MAKE ALL ENGINES PRODUCE THE SAME THRUST. THE DSU IS MOUNTED ON THE EEC WHICH IS MOUNTED ON THE OUTSIDE, UPPER PORTION OF THE ENGINE

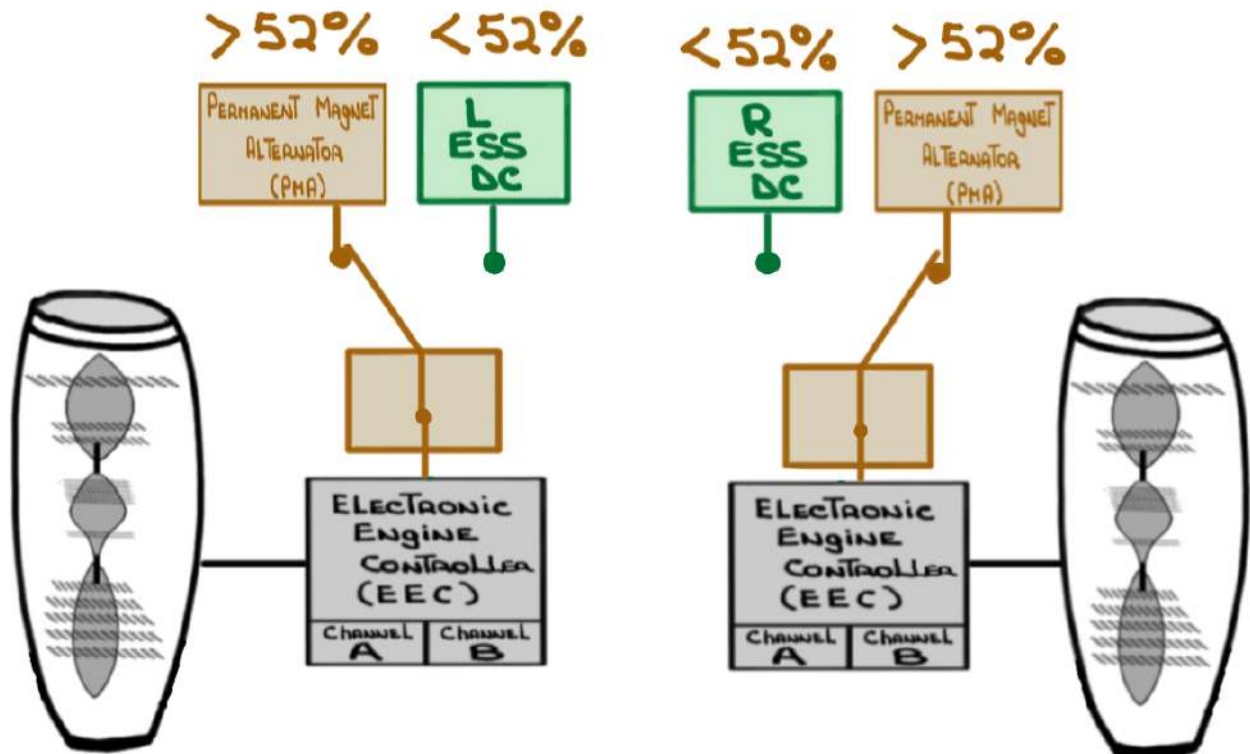


# PERMANENT MAGNET ALTERNATOR (PMA)

PRIMARY SOURCE OF EEC POWER ONCE THE ENGINE ACCELERATES  $> 52\%$  N2. THE PMA, WHILE PART OF FADEC, IS MOUNTED ON THE AGB

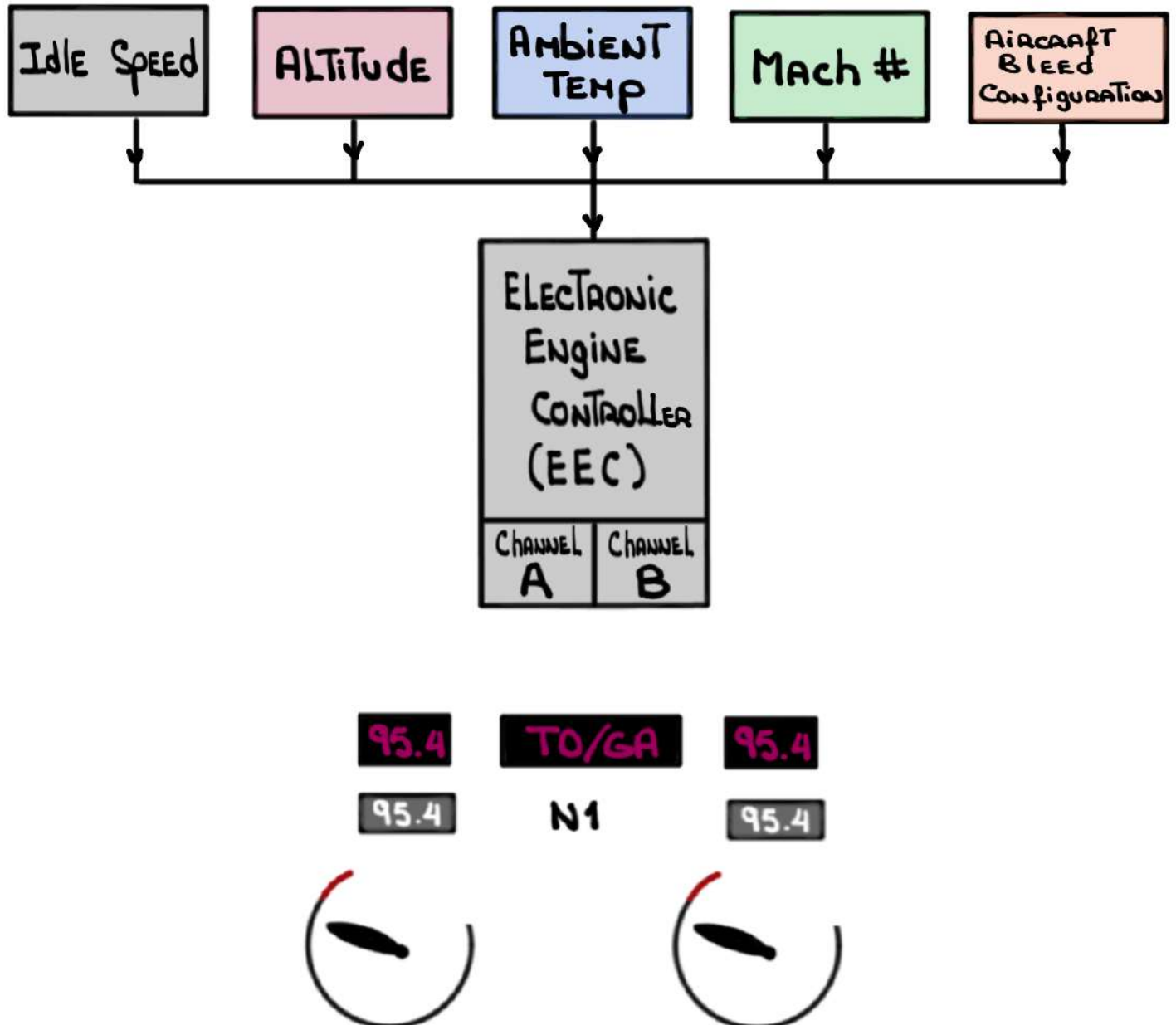


## N2



## - Thrust Control Modes:

① NORMAL MODE: EEC GENERATES N1 SPEED BASED ON:

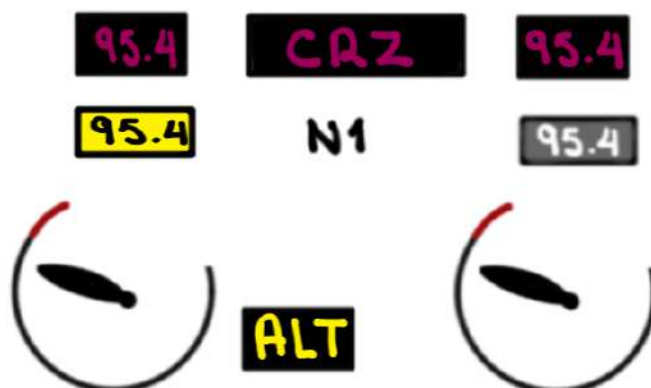


② ALTERNATE MODE (Backup): THRUST LEVER DIRECTLY SETS N1 SPEED. Downside:

- OVERBOOST POTENTIAL
- AUTO THROTTLES INOP
- No dispatch (TAKEOFF PROHIBITED)
- Ops in icing conditions - prohibited

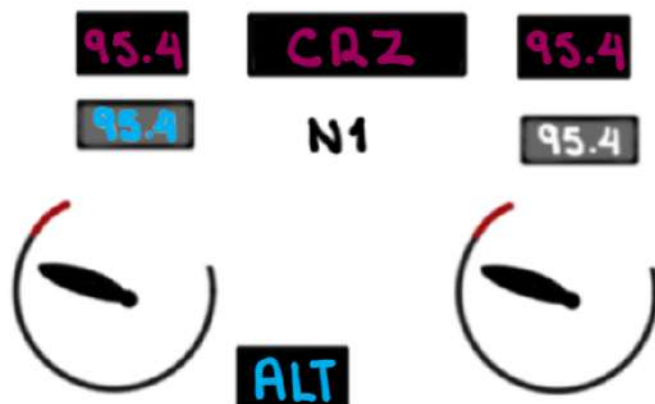
• AUTO (SOFT) REVERSION

Eng ALT CTRL (0)



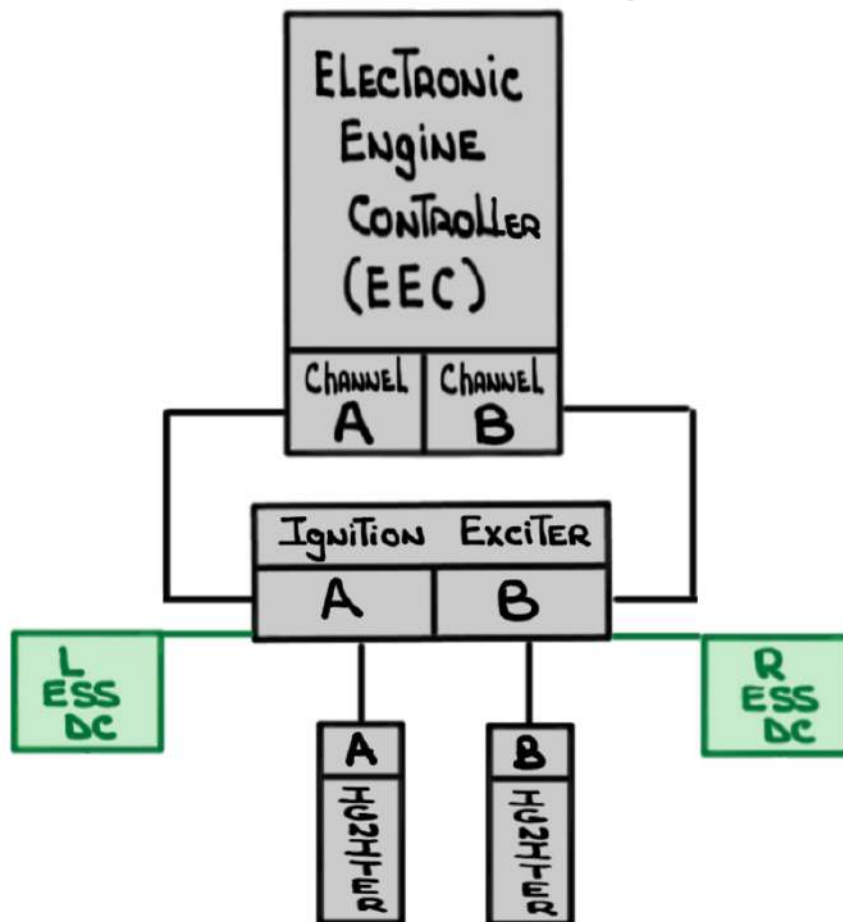
• MANUAL (HARD) REVERSION

Eng ALT CTRL (0)



# ENGINE Ignition SYSTEM

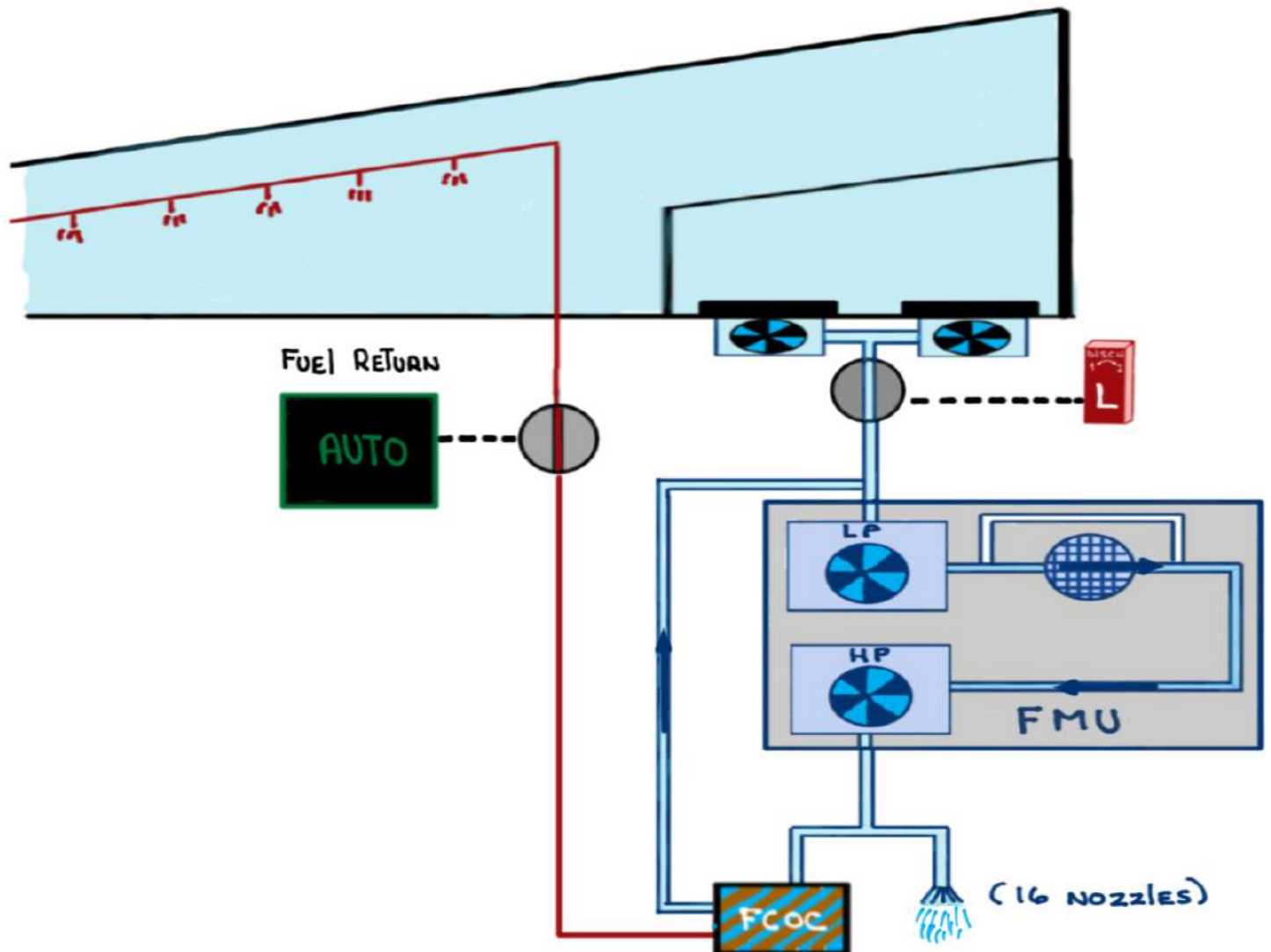
- DUAL channel Ignition Exciter (A and B) ON EACH ENGINE
- CONTROLLED by dual channel EEC AND POWERED by 28 VDC
- GENERATES high voltage pulse TRANSMITTED THROUGH ignition LEADS TO ignition plugs in COMBUSTOR



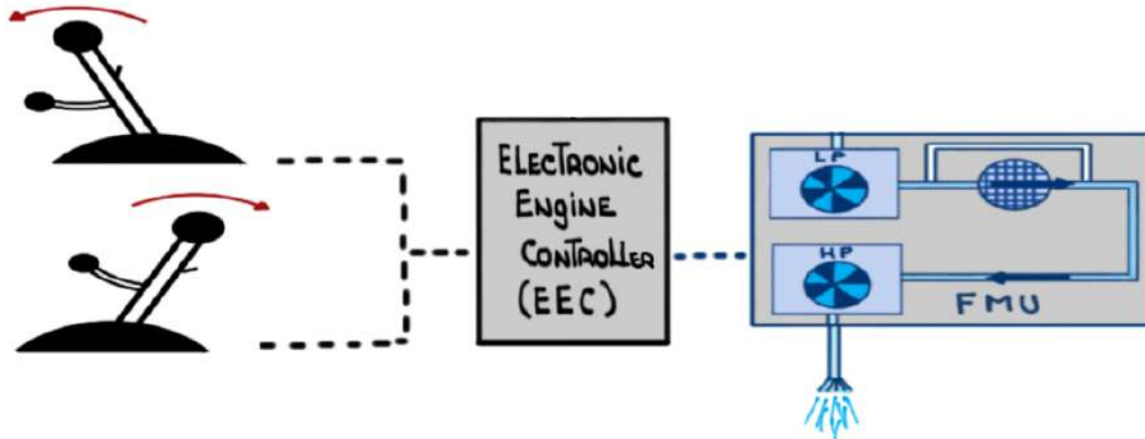
- GROUND STARTS → ONE (1) ignITER
- AIRSTARTS → Two (2) ignITERS (high SPARKING RATE)

# ENGINE FUEL SYSTEM

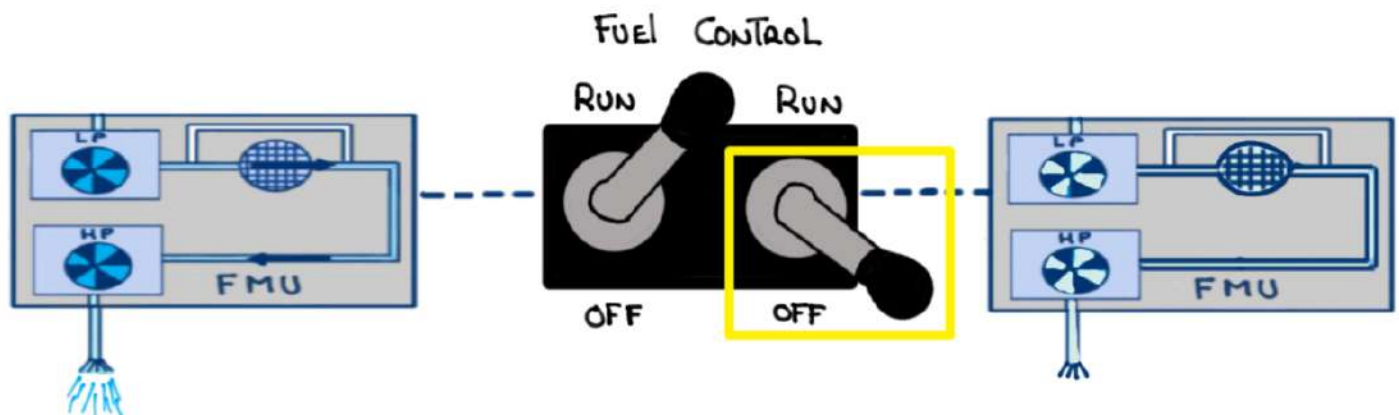
- METERED fuel from TANKS' boost pumps To NOZZLES
- INTRODUCTION of fuel is CONTROLLED by THE EEC
- LOW PRESSURE fuel COMING from THE wings
- High PRESSURE fuel COMING from THE FUEL METERING UNIT (FMU)



- AS THRUST LEVERS ARE ADVANCED OR RETARDED THE EEC COMMANDS THE FMU TO MODULATE FUEL TO NOZZLES



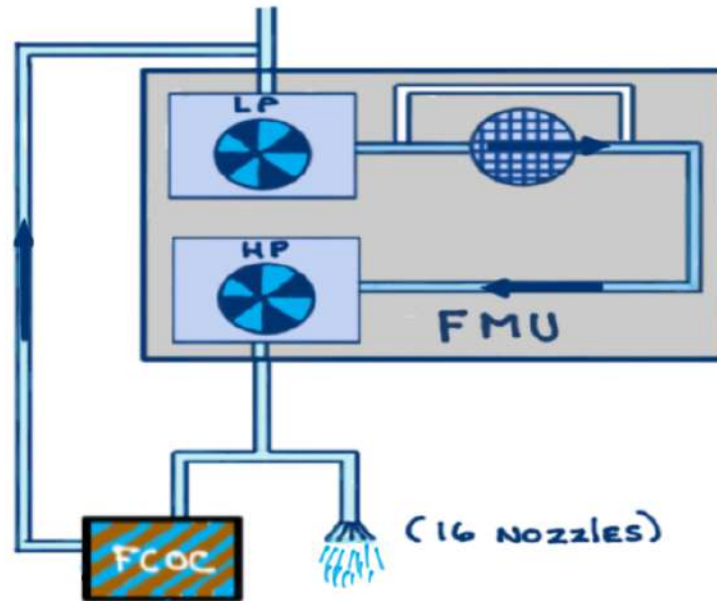
- PLACING A FUEL CONTROL SWITCH TO OFF CLOSSES FMU
- All fuel is cutoff to the fuel nozzles and the engine shuts down




- THE FMU CONTAINS TWO (2) INTERNAL PUMPS :

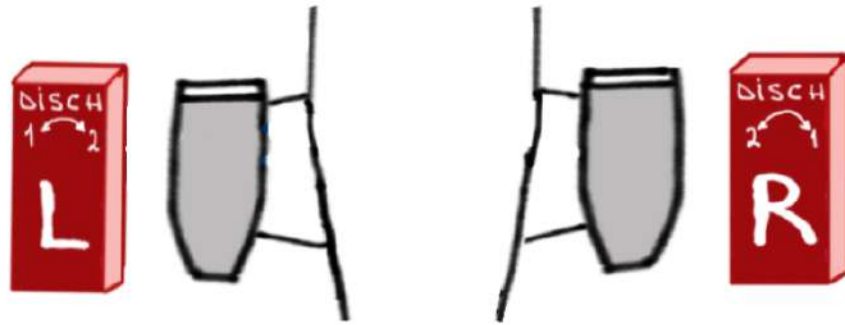
- LOW PRESSURE (LP) 1<sup>ST</sup> STAGE →
  - HIGH PRESSURE (HP) 2<sup>ND</sup> STAGE →
-



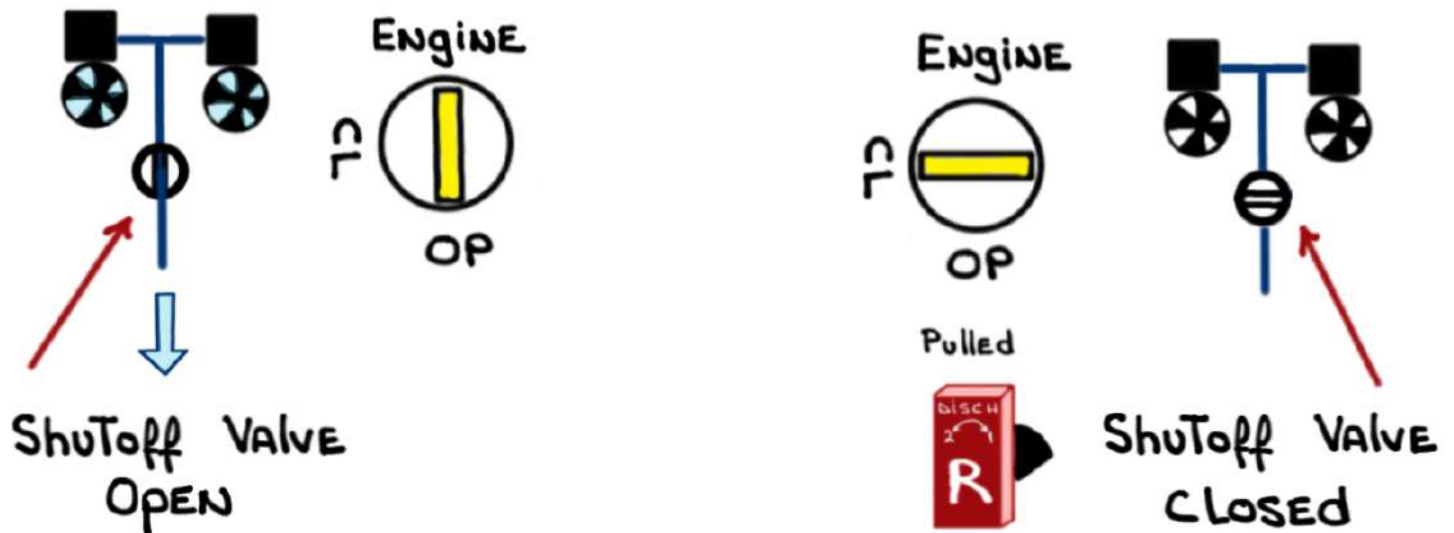
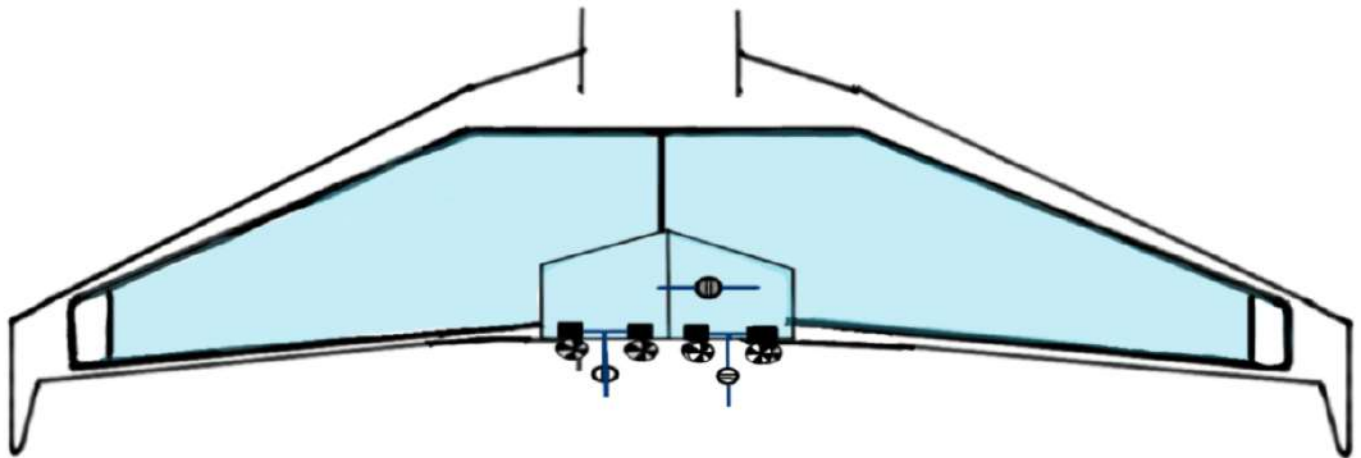


- THE LP AND HP PUMPS ARE DRIVEN BY THE ENGINE ACCESSORY GEARBOX
- A FUEL FILTER RECEIVES FUEL FROM THE 1<sup>ST</sup> STAGE LP PUMP AND REMOVES DEBRIS AND CONTAMINANTS
- A FILTER BYPASS VALVE ENSURES CONTINUAL FUEL FLOW TO THE ENGINE IF FILTER IS BLOCKED
- EXCESS FUEL IS RECIACULATED THROUGH THE FUEL/OIL HEAT EXCHANGER 

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

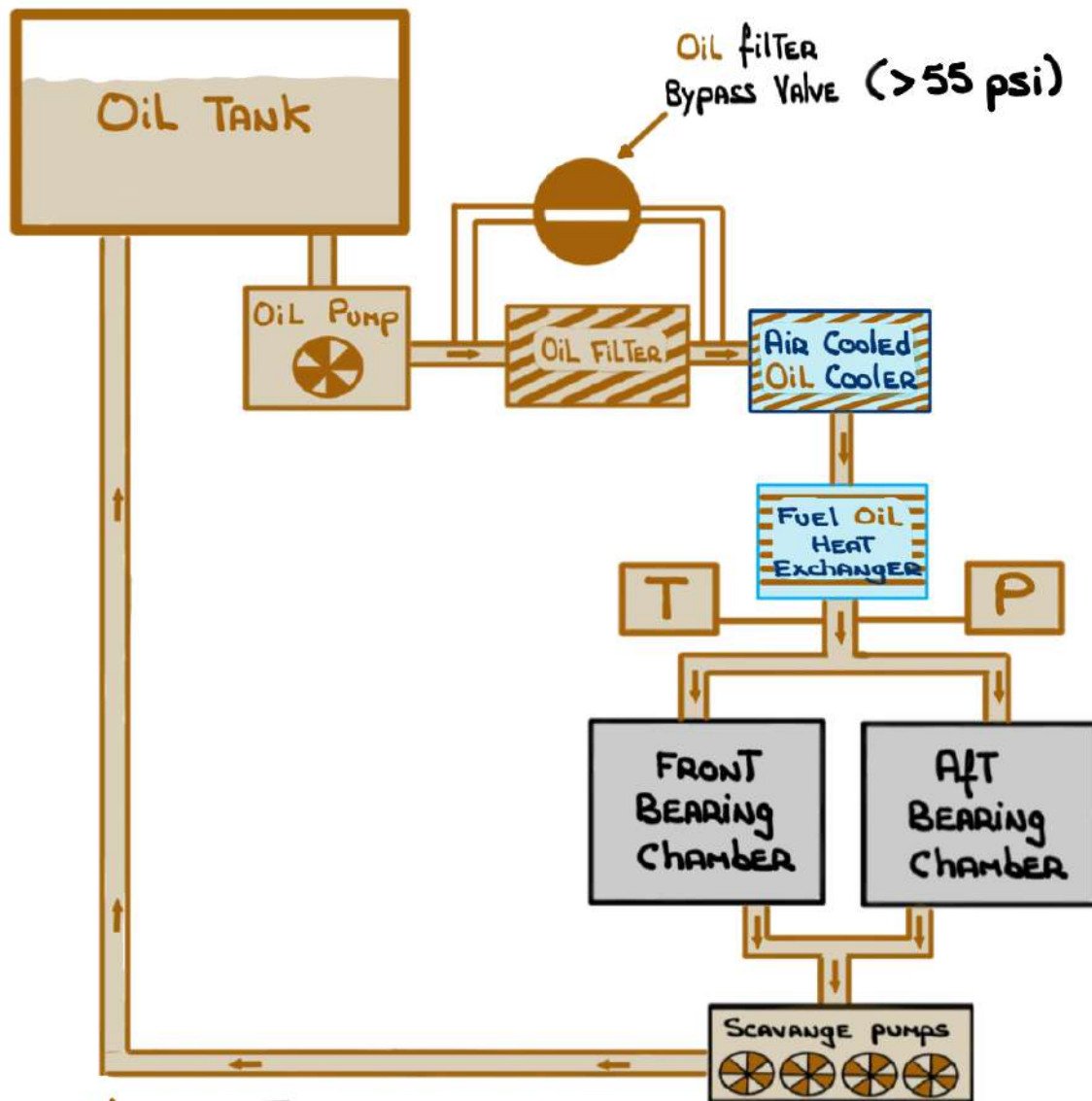


- Pulling a **FiRE HANDLE** shuts off fuel AT THE TANK



# ENGINE OIL SYSTEM

- PROVIDES lubrication DURING ENGINE OPERATION
- OIL TANK AND PUMP ARE LOCATED IN THE ENGINE'S ACCESSORY GEARBOX

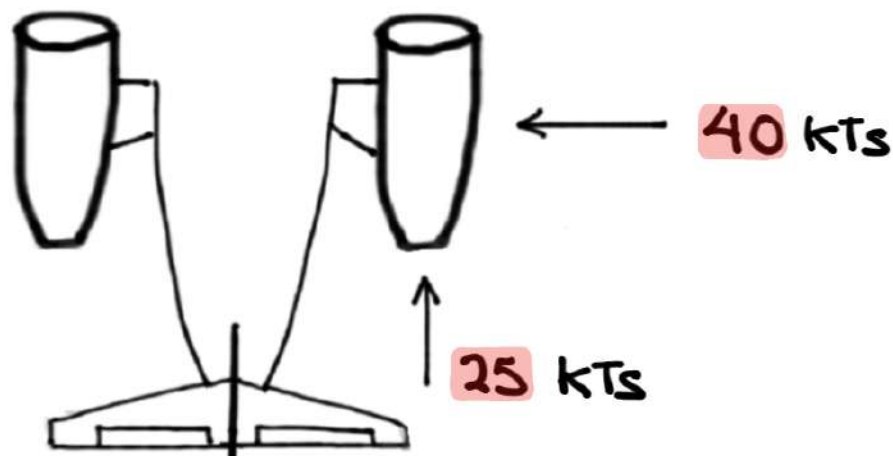


## - Check OIL quantity:

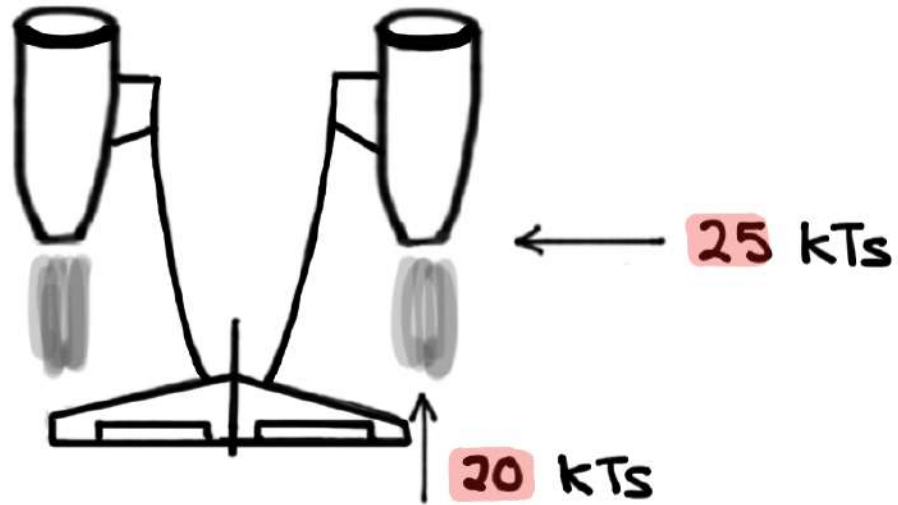
- LAST flight of THE day, OR
- INTERVAL NOT > 24 CUMULATIVE flight TIME
- 10-30 MINUTES AFTER SHUTDOWN

# 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:

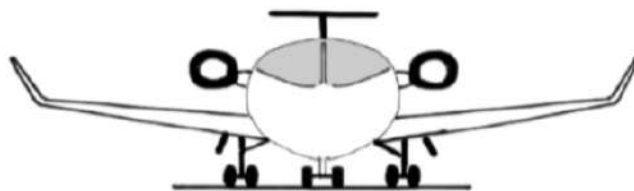


# ENGINE LIMITATIONS - High Power Ground Ops



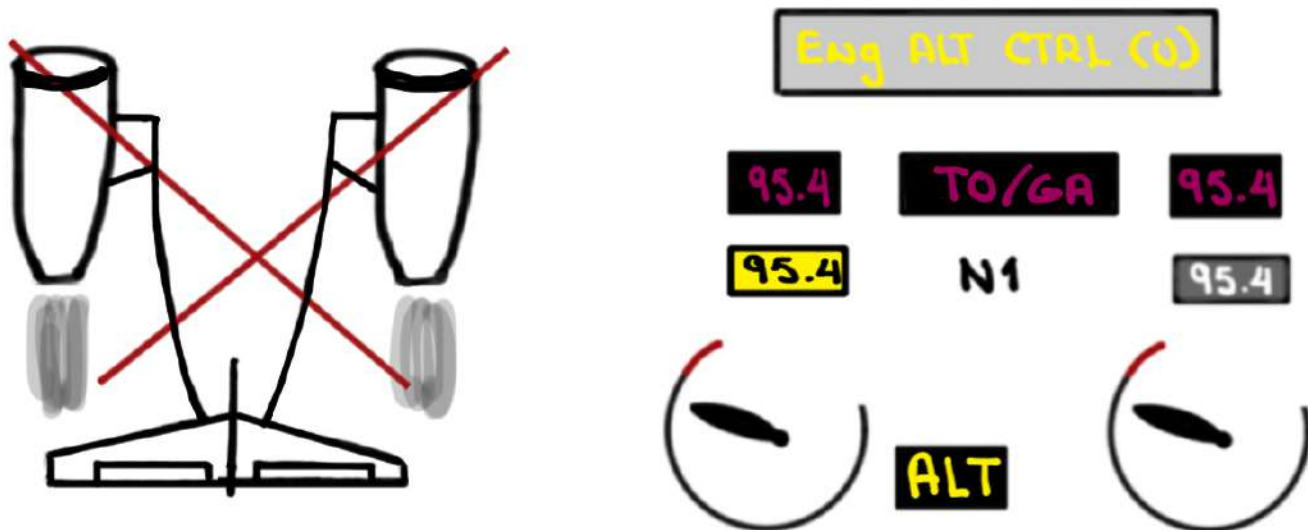
## ENGINE LIMITATIONS - TAXI

TAXI OPERATION WITH ENGINE OIL TEMPERATURE BETWEEN  $-30^{\circ}\text{C}$  TO  $+10^{\circ}\text{C}$ : ONLY THRUST REQUIRED FOR TAXI SHALL BE USED

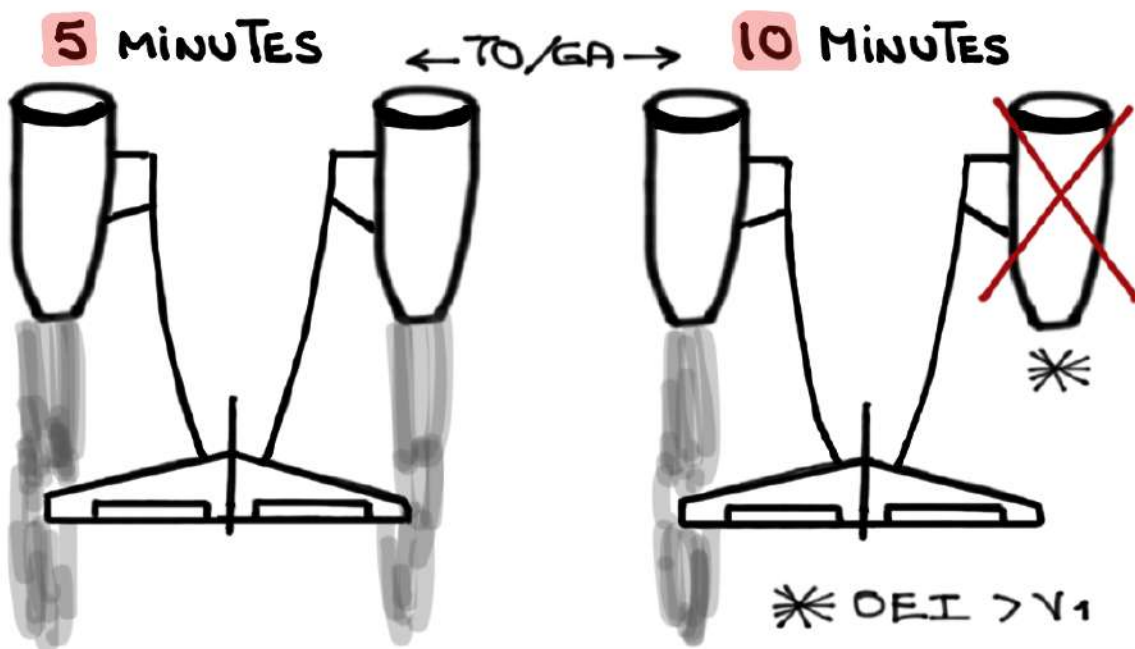


# ENGINE LIMITATIONS - TAKEOFF

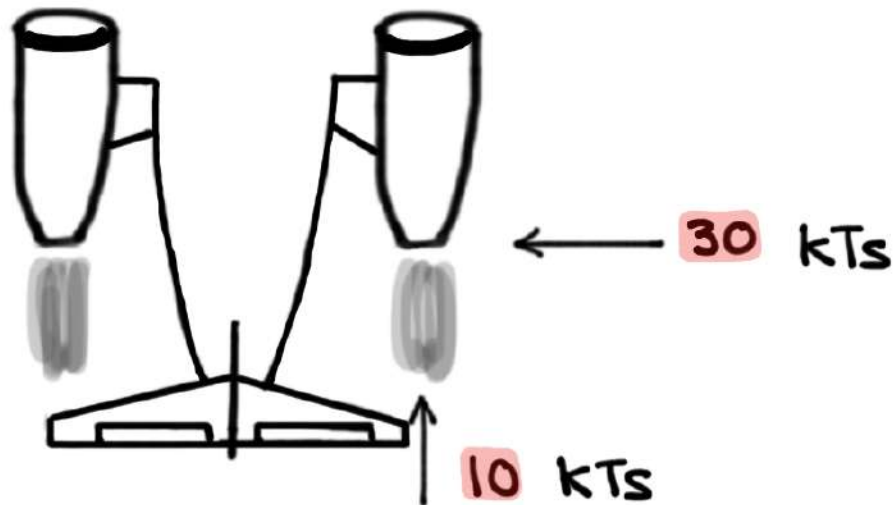
- TAKEOFF in **ALT** mode is prohibited



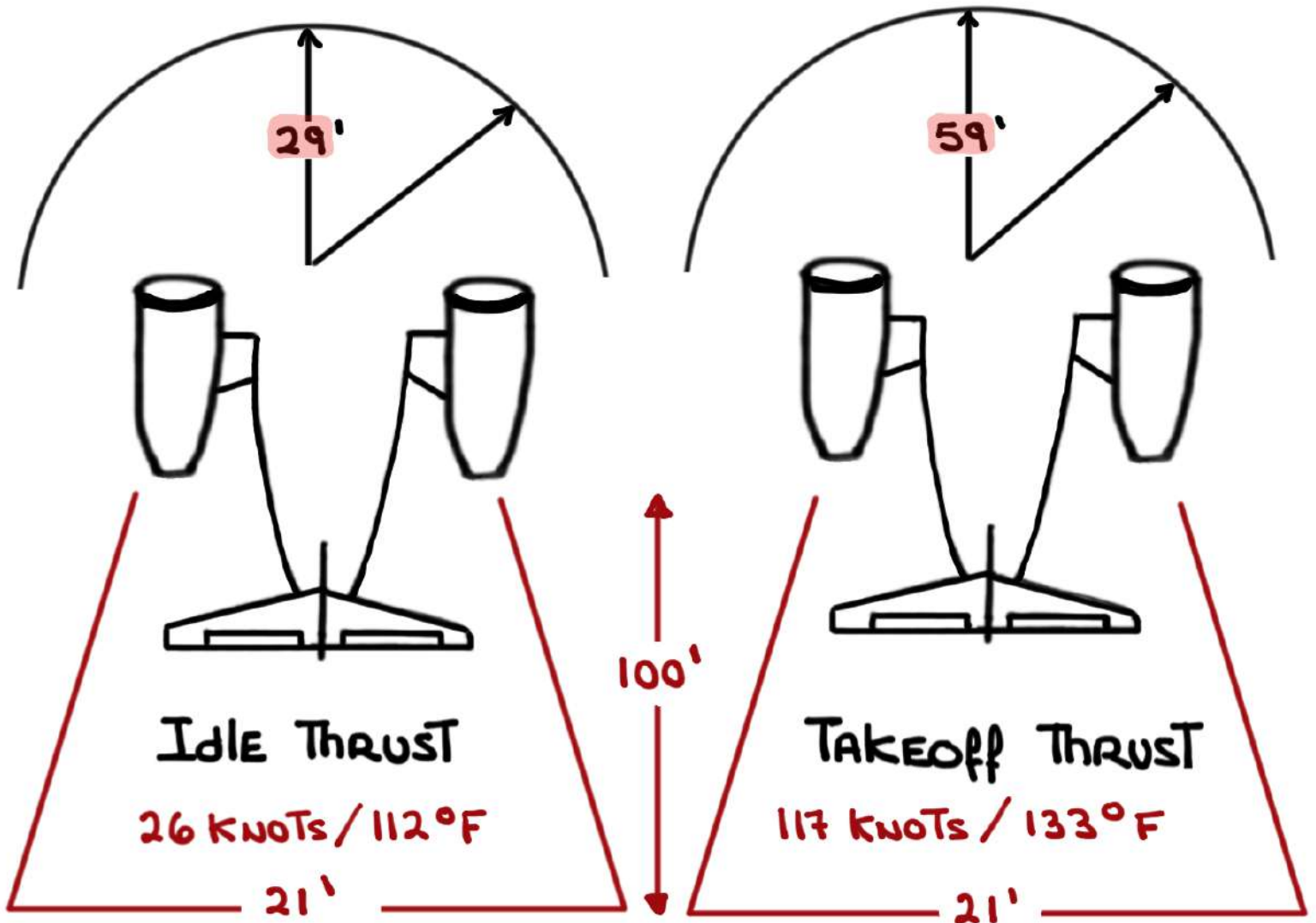
- MINIMUM OIL TEMPERATURE: + 10°C
- MINIMUM FUEL TEMPERATURE: + 9°C
- MAXIMUM TGT: 965°C



- MAXIMUM Tailwind AND CROSSWIND FOR TAKEOFF:



EXHAUST DANGER AREA



# ENGINE LIMITATIONS - Inflight

- MAXIMUM CONTINUOUS THRUST (MCT):

950°C (956°C with ASC 022)

- ENGINE OPERATIONS < 0 Gs LIMITED TO LESS THAN SEVEN (7) SECONDS

**AIRSTART**  
(PRIORITY)

- ① CROSSBLEED
- ② APU ASSISTED
- ③ WINDMILL

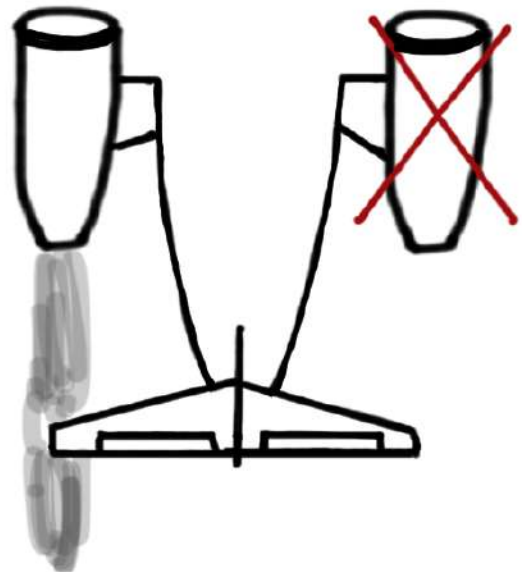
<u>AIRSTART Type</u>	<u>ALTITUDE</u>	<u>SPEED</u>	<u>MINIMUM N<sub>2</sub></u>
• STARTER ASSIST	≤ 30,000	V <sub>REF</sub> - V <sub>MO</sub>	N/A
• Windmill	≤ 16,500'	250 KCAS - V <sub>MO</sub>	9%

NOTE: NO FADEC PROTECTION

MAXIMUM TGT: 975%

DO NOT ATTEMPT AIRSTART IF:

- FIRE
- FOD
- FROZEN

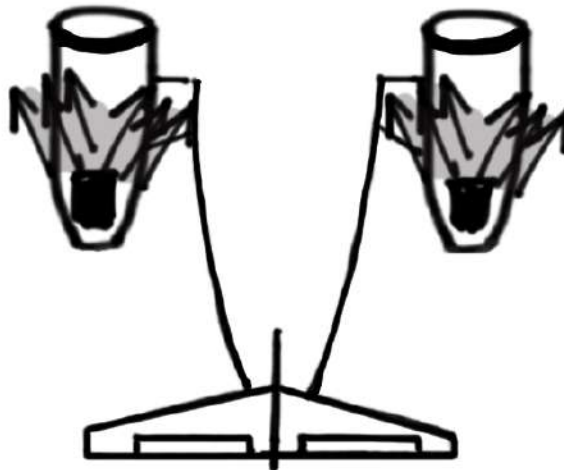




# ENGINE LIMITATIONS - LANDING

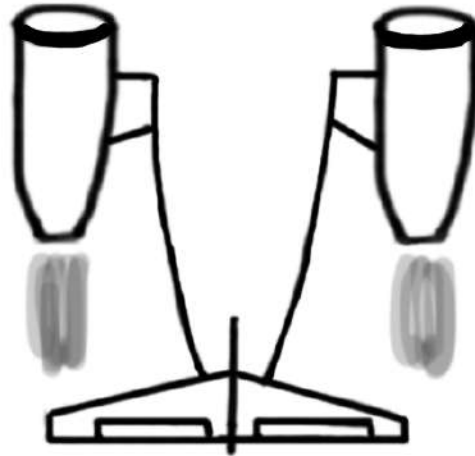
## THRUST REVERSERS:

- 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



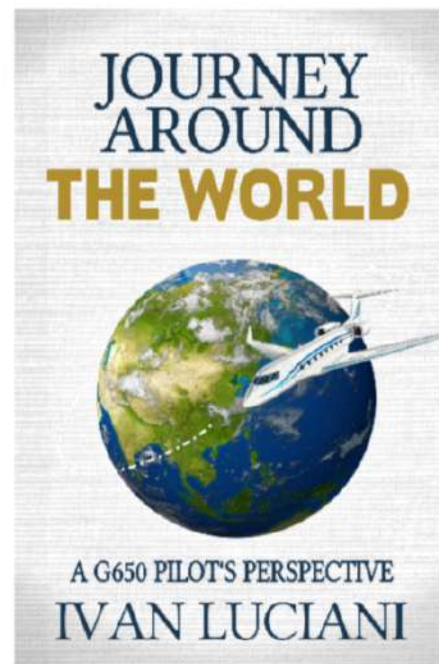
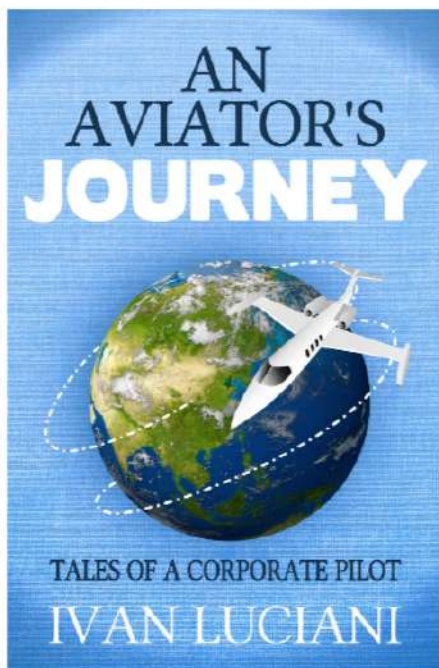
A THREE (3) MINUTE POST-LANDING AT IDLE POWER NEEDS TO BE OBSERVED PRIOR TO ENGINE SHUTDOWN

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.luciani@gmail.com](mailto:ivan.luciani@gmail.com)



Thank you!