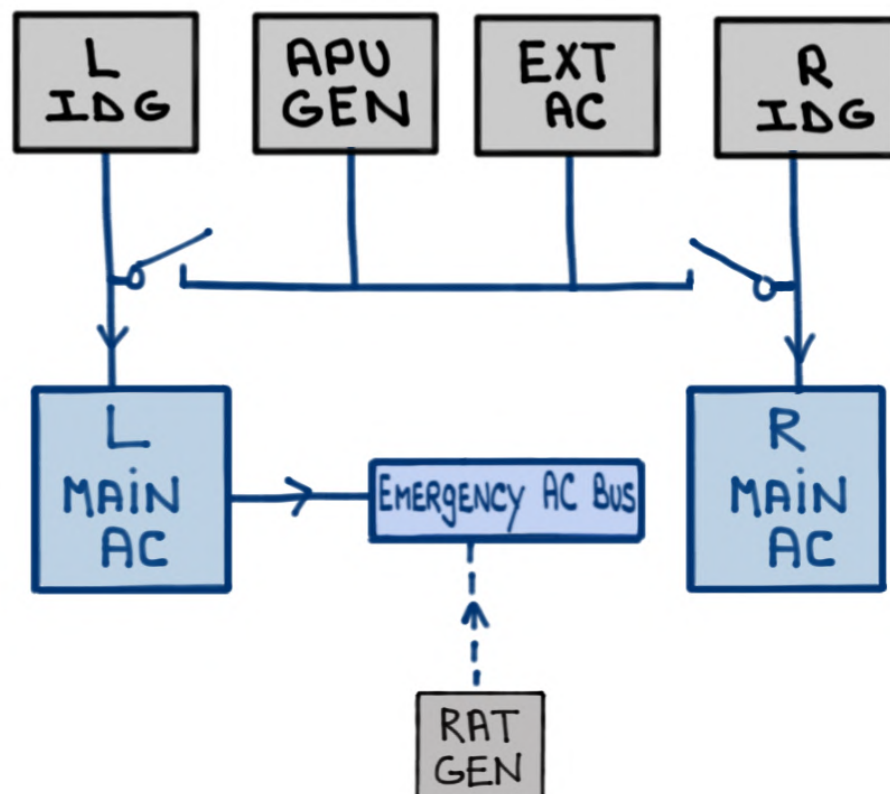


G500 ELECTRICAL System



For study purposes only

- The ELECTRICAL POWER SYSTEM produces:

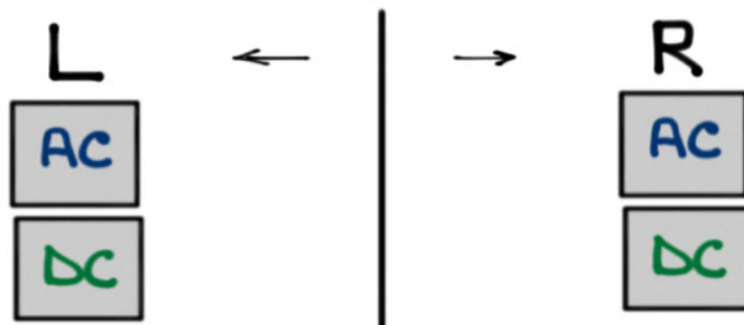


- 115 Volts AC is GENERATED in order to PRODUCE 28 Volts DC via TRANSFORMER RECTIFIER UNITS (TRU)



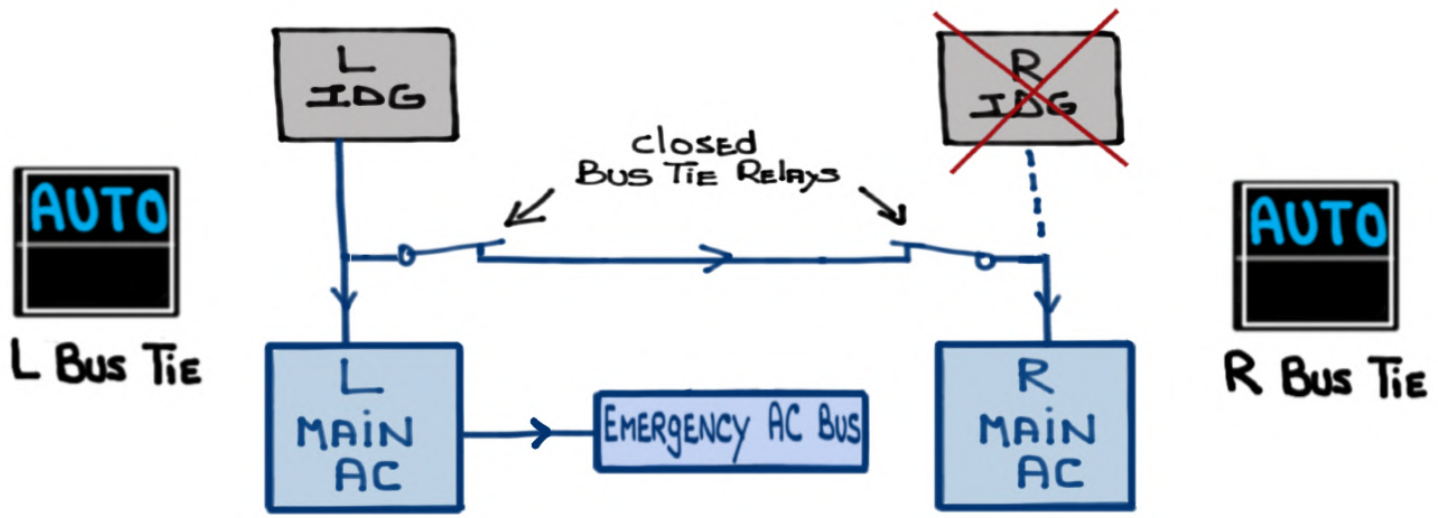
- AC — MOTORS
HEATERS
CHARGERS
- DC — CONTROL functions
OR
STEADY-STATE OPERATIONS

- Two (2) SEPARATE SYSTEMS/NETWORKS



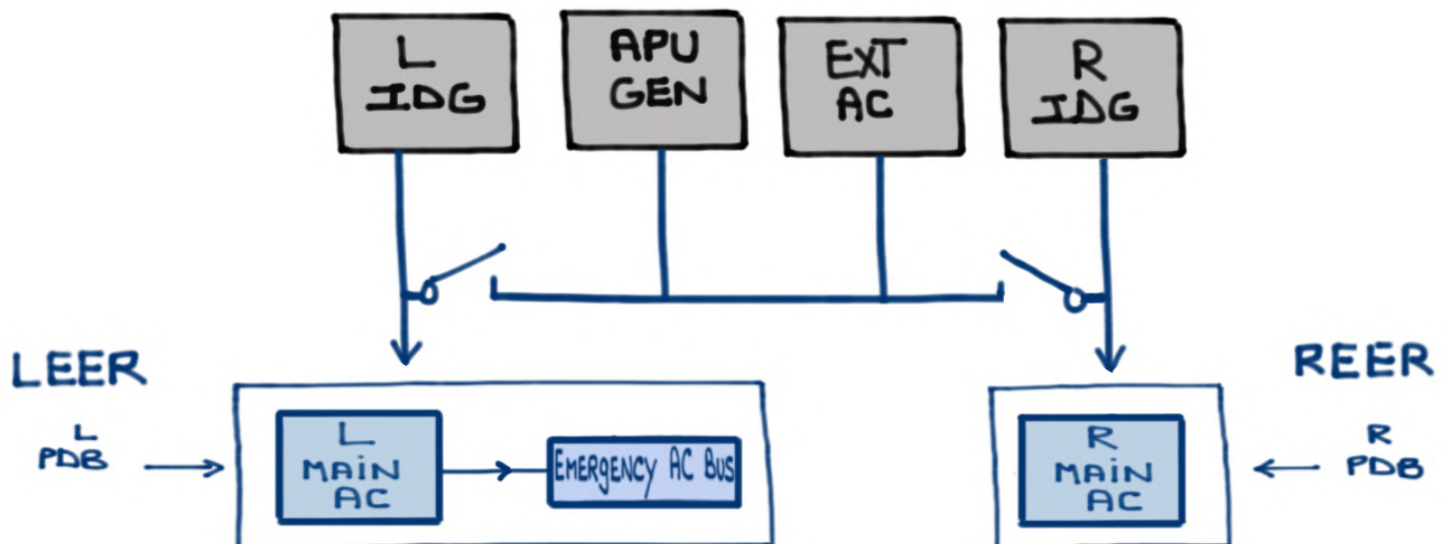
- A split bus system PREVENTS A SHORT ON ONE SIDE FROM AFFECTING THE OTHER SIDE

- OPERATIVE side CAN POWER The inoperative side

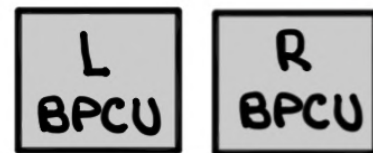


- POWER DISTRIBUTION BOXES (PDB):

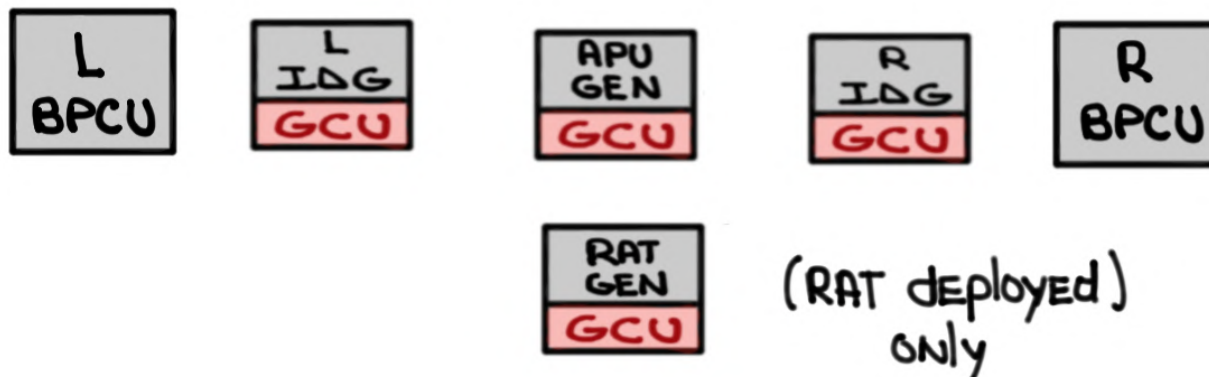
AC POWER is first SENT TO THE PDBs which is WHERE THE MAIN AC BUSES ARE LOCATED



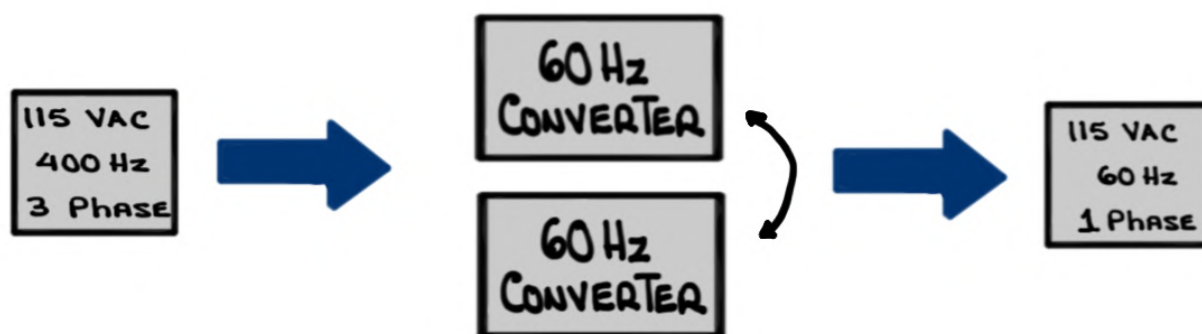
- The ELECTRICAL Power System is controlled by Two (2) BUS POWER CONTROL Units (BPCU)



- There ARE SIX (6) COMPUTERS:



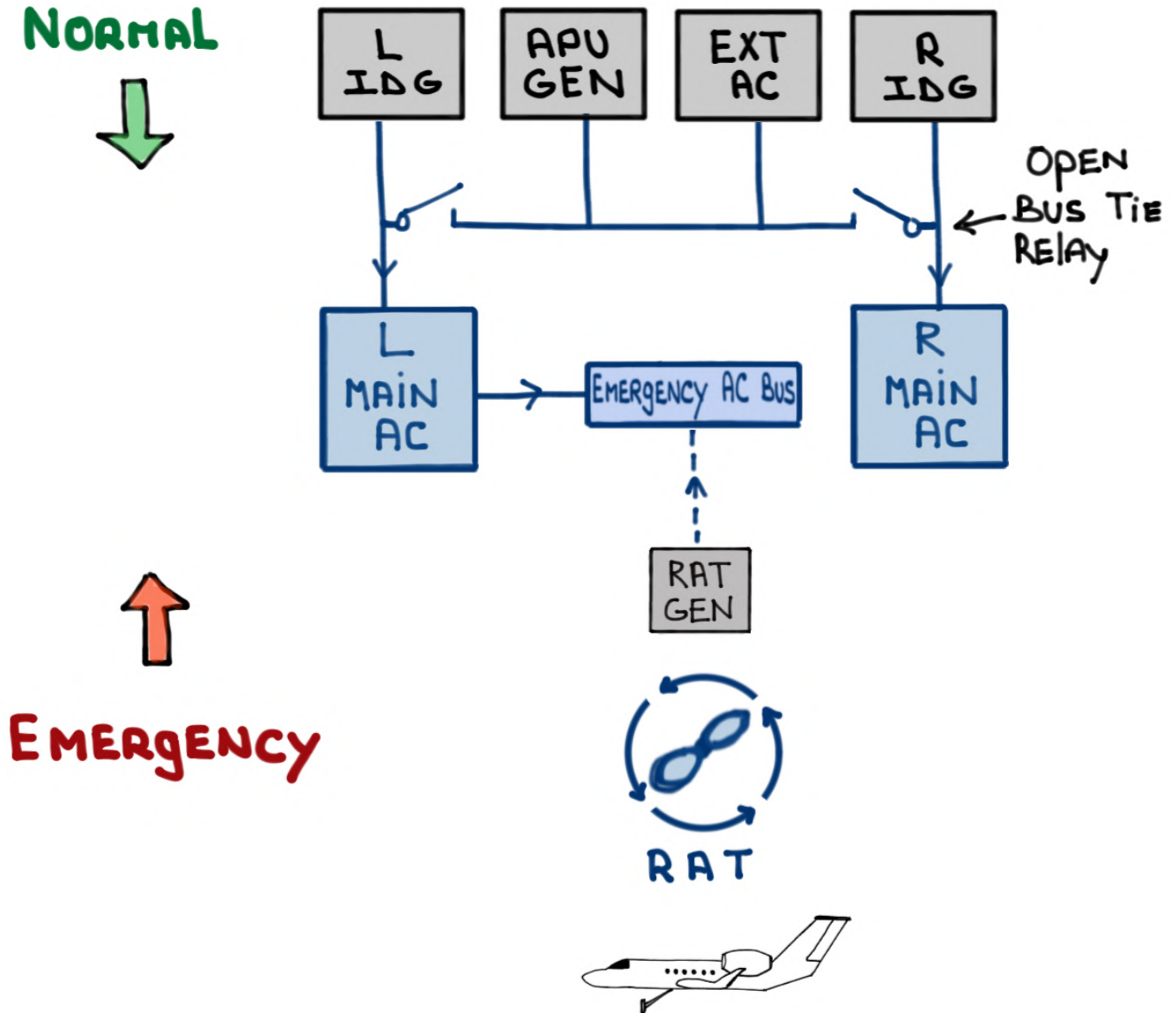
- There ARE Two (2) 60 Hz CONVERTERS located in The Tail COMPARTMENT



- ONE (1) 60 Hz CONVERTER ACTIVE AND THE OTHER ON STANDBY
- 115 VAC 60 Hz 1 Phase = COMMON household power

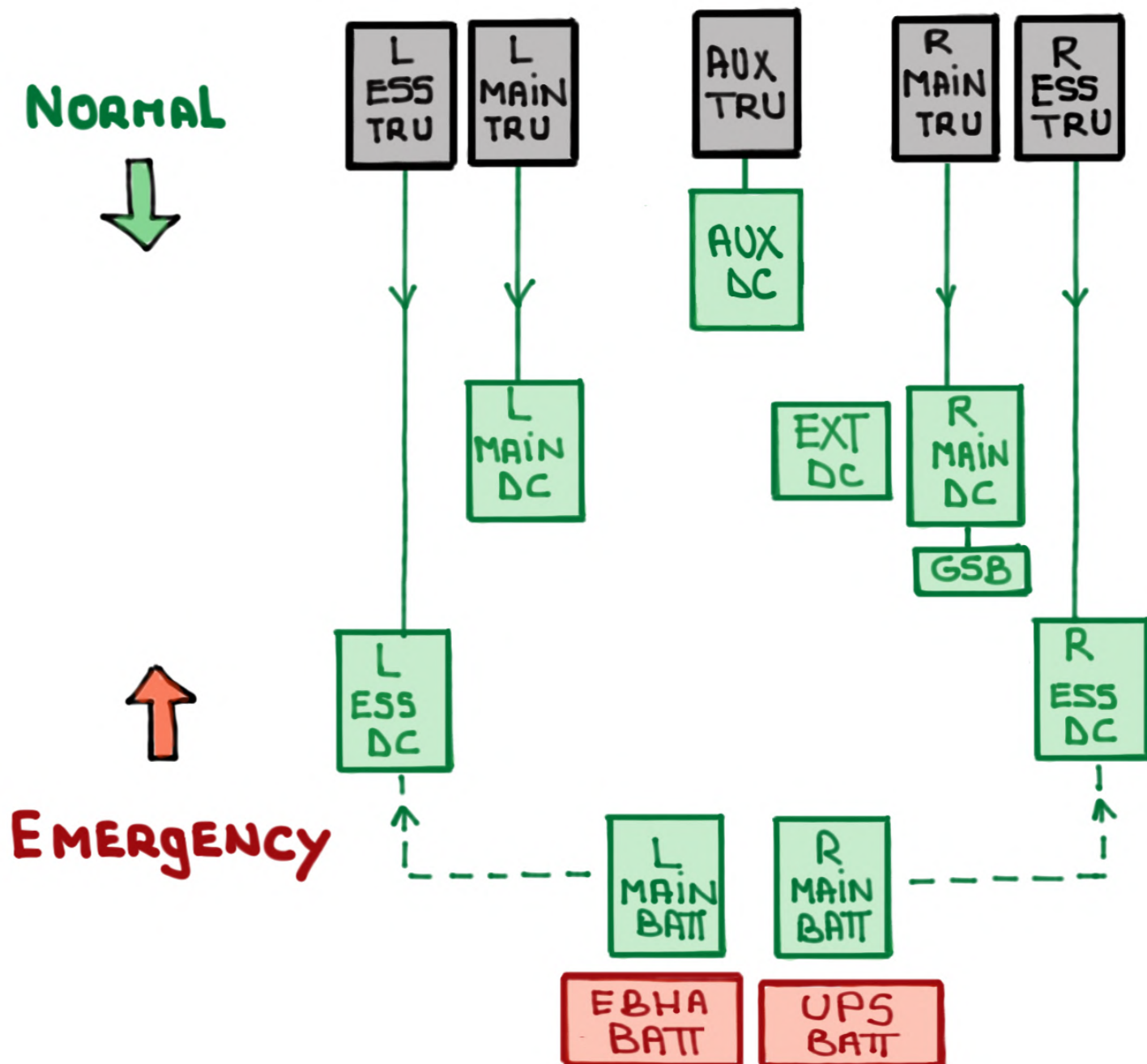
- AC System:

115 VAC is GENERATED by:



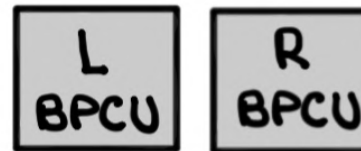

- DC System:






28 VDC is PRODUCED by:



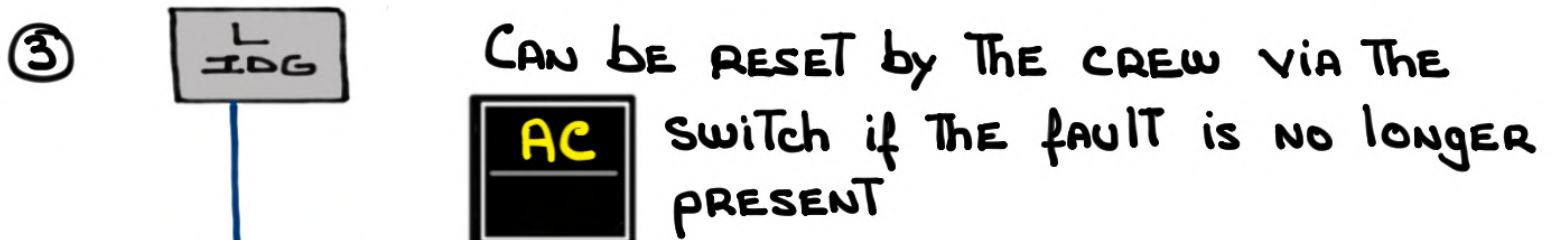
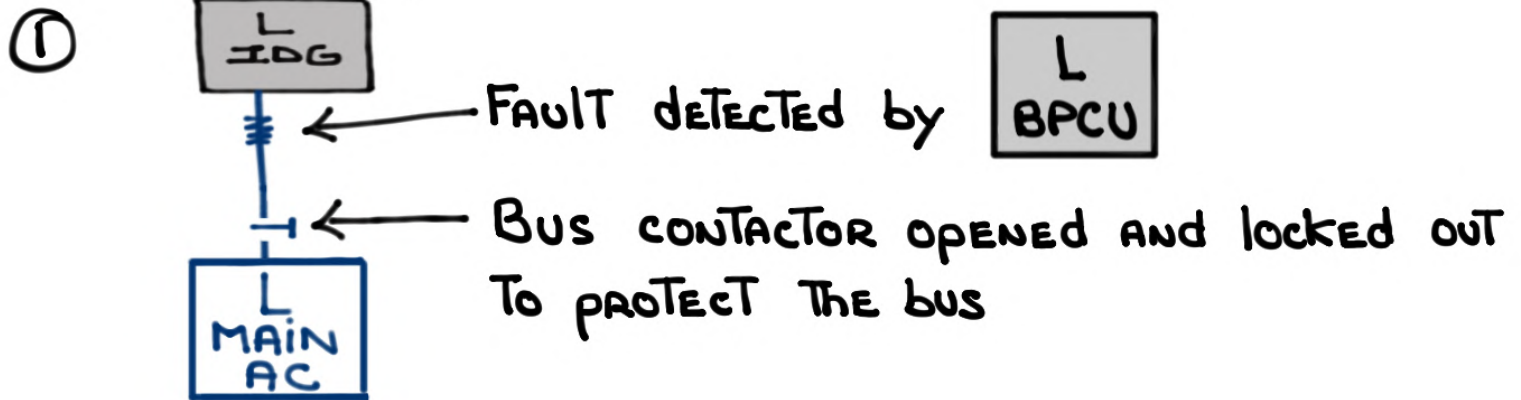
BUS POWER CONTROL UNITS (BPCU)

The ELECTRICAL POWER SYSTEM is controlled by Two (2) identical AND INTERCHANGEABLE MICROPROCESSORS called BPCUs

  = The brains

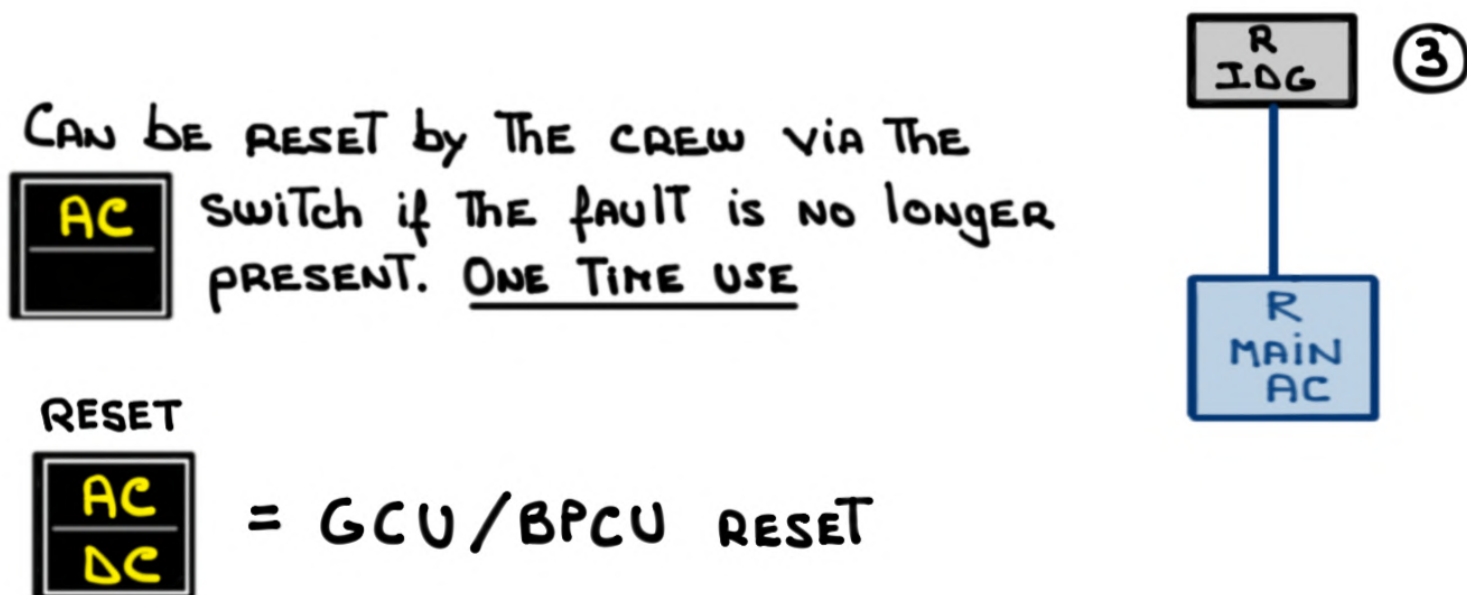
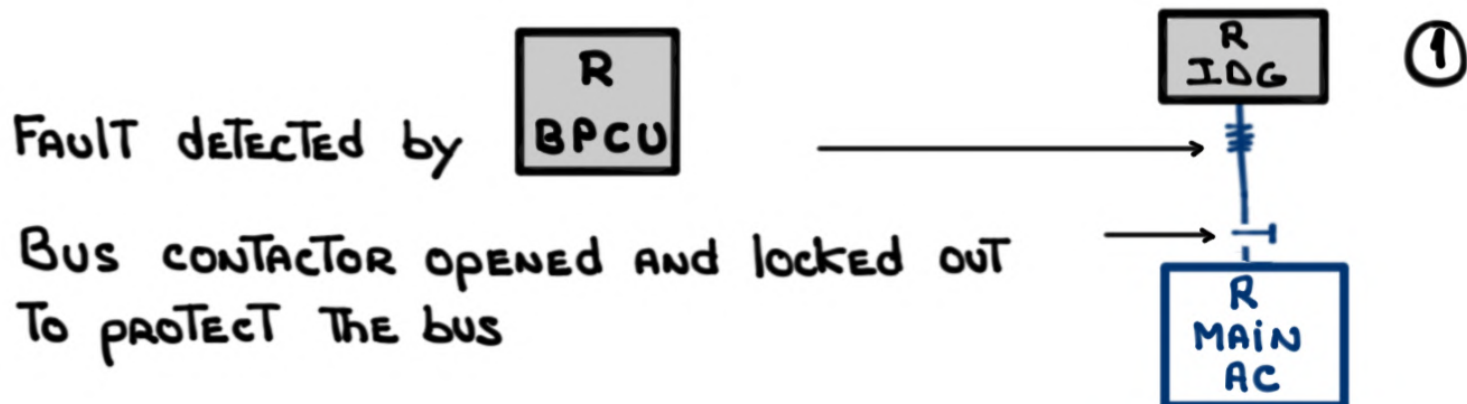
- The   CONTROL AND MAKE ALL LOGICAL DECISIONS FOR ELECTRICAL DISTRIBUTION AND PROTECTION
- Traffic cops - PROTECTORS OF THE BUSES
- CLOSE AND OPEN CONTACTORS AND/OR RELAYS TO:
 - Efficiently supply power to the buses
 - PROTECT AND ISOLATE THE ELECTRICAL SYSTEM FROM FAULTS
- OUTPUT critical findings TO THE CAS
- PROVIDES PROTECTION, POWER AND logic TO  RESET switch
- MONITOR EXTERNAL   power
- CONTROL THE NO BREAK POWER TRANSFER (NBPT)

- FAULT DETECTION, PROTECTION AND NOTIFICATION:



RESET



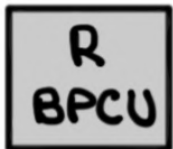


- BPCU logic: **ESS** before **MAIN** / **L** before **R**

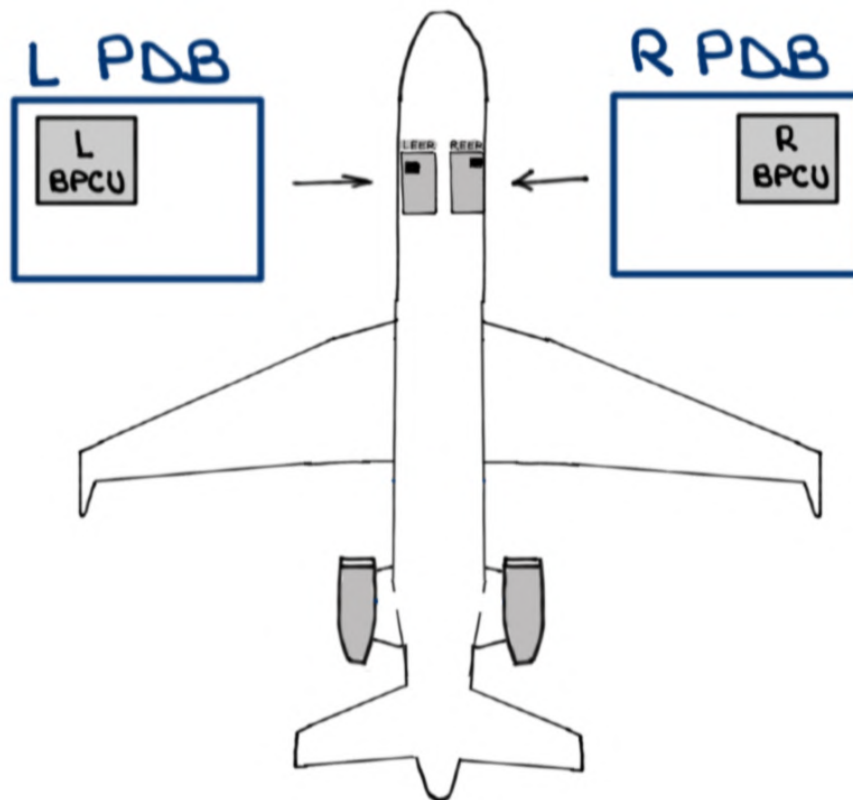
- LOCATED in:



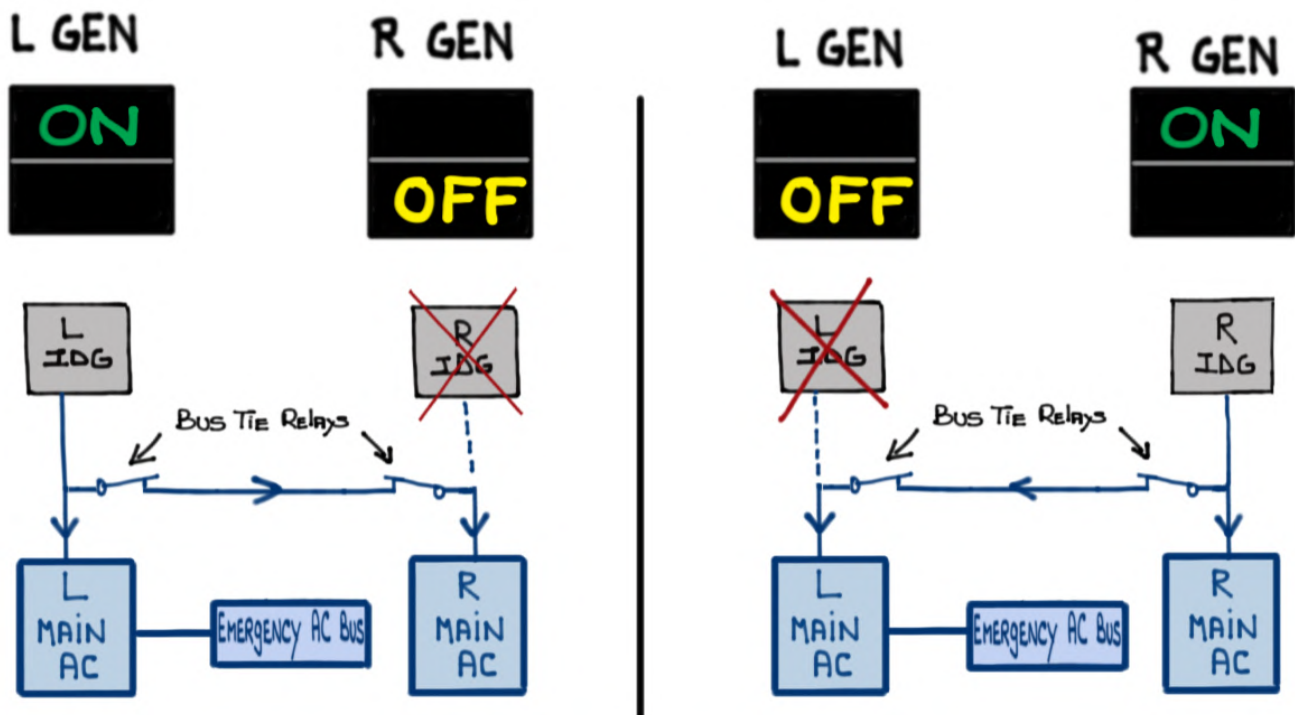
LEFT ELECTRONIC EQUIPMENT RACK (LEER)



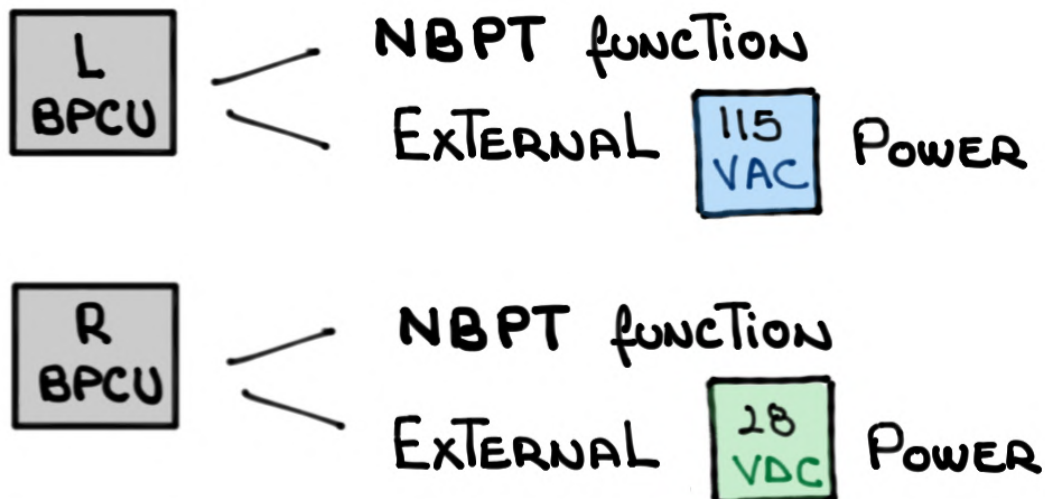
RIGHT ELECTRONIC EQUIPMENT RACK (REER)



- CONTROL THE BUS TIE RELAYS which allow operative side TO POWER THE INOPERATIVE side IN THE EVENT of A SHORT/FAULT ON ONE side



- CONTROL AND MONITOR:

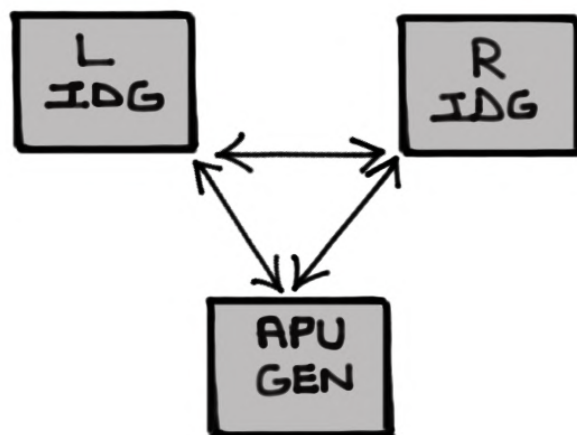


- NO BREAK POWER TRANSFER (NBPT)

- CONTROLLED by L
BPCU R
BPCU
- POWER TRANSFER WITHOUT A MOMENTARY INTERRUPTION
- MATCHES THE PHASES OF THE IDGs AND/OR APU GEN

- NO BREAK

IDG
AND
No FAILURE

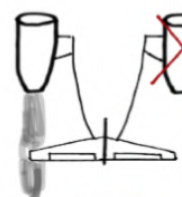


- BREAK

No IDG
AND/OR
FAILURE



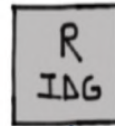
GEN ~~R
IDG~~ FAILURE

ENG  FAILURE

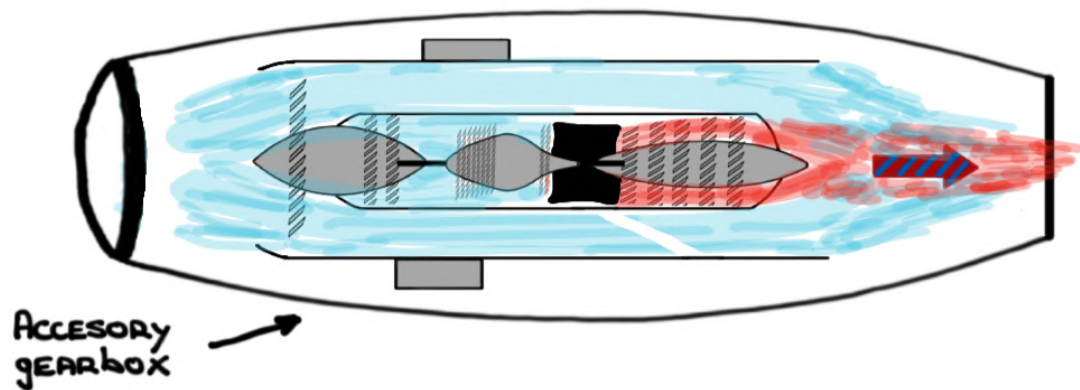
A FIRE  HANDLE pulled

INTEGRATED DRIVE GENERATORS (IDG)

- Two (2) ENGINE-DRIVEN IDGs



- LOCATED ON THE ENGINE'S ACCESSORY gearbox

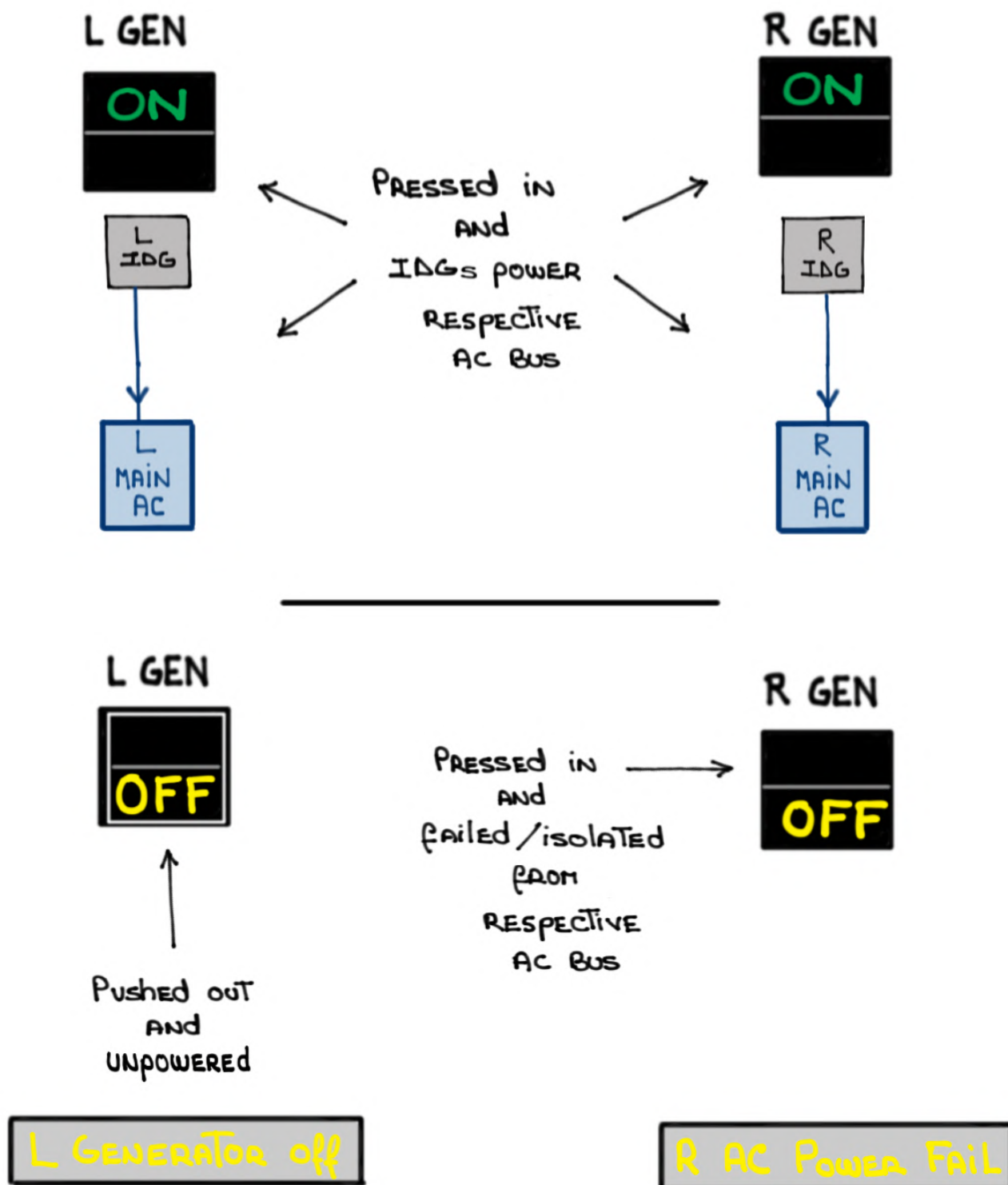


- IDG
 - < CONSTANT SPEED DRIVE (CSD)
 - < Oil-cooled GENERATOR (oil is cooled by fan air)

- IDG
 - < RATED AT 40 KVA
 - < PRODUCES: 115 VAC
 - < 400 HERTZ
 - < 3-phase

- CSD CONVERTS VARIABLE ENGINE SPEED TO A CONSTANT SPEED AT THE GENERATOR (12,000 RPM)

- GENERATOR SWITCHES:



Auxiliary Power Unit (APU) GENERATOR

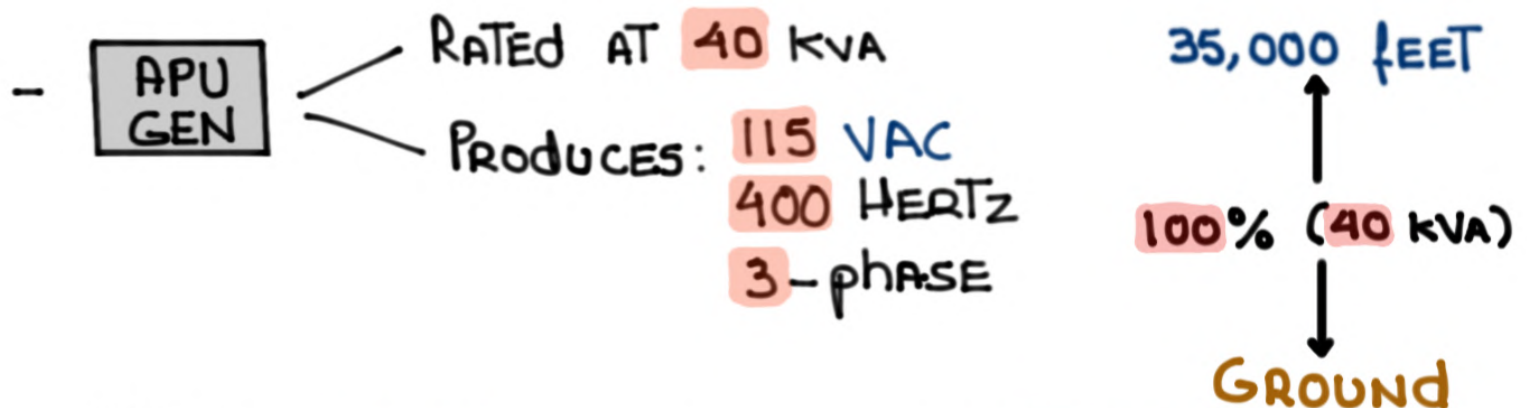
- The APU provides an auxiliary source of:

- ① Electrical AC power - **GROUND**
- ② Backup Electrical AC power - **AIR**

- The APU can be started with L
MAIN
BATT R
MAIN
BATT power

- When the APU reaches **99%** RPM + Two **(2)** seconds
The APU generator comes online and can power
All AC and DC buses

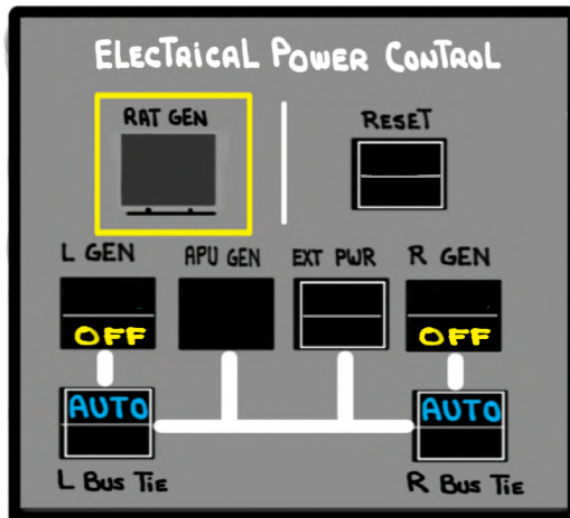
- The APU GEN is constant speed (NOT an IDG)



If load > **55%** → DESCEND ≤ **FL350**

RAM AIR TURBINE (RAT)

- Backup **AC** GENERATOR

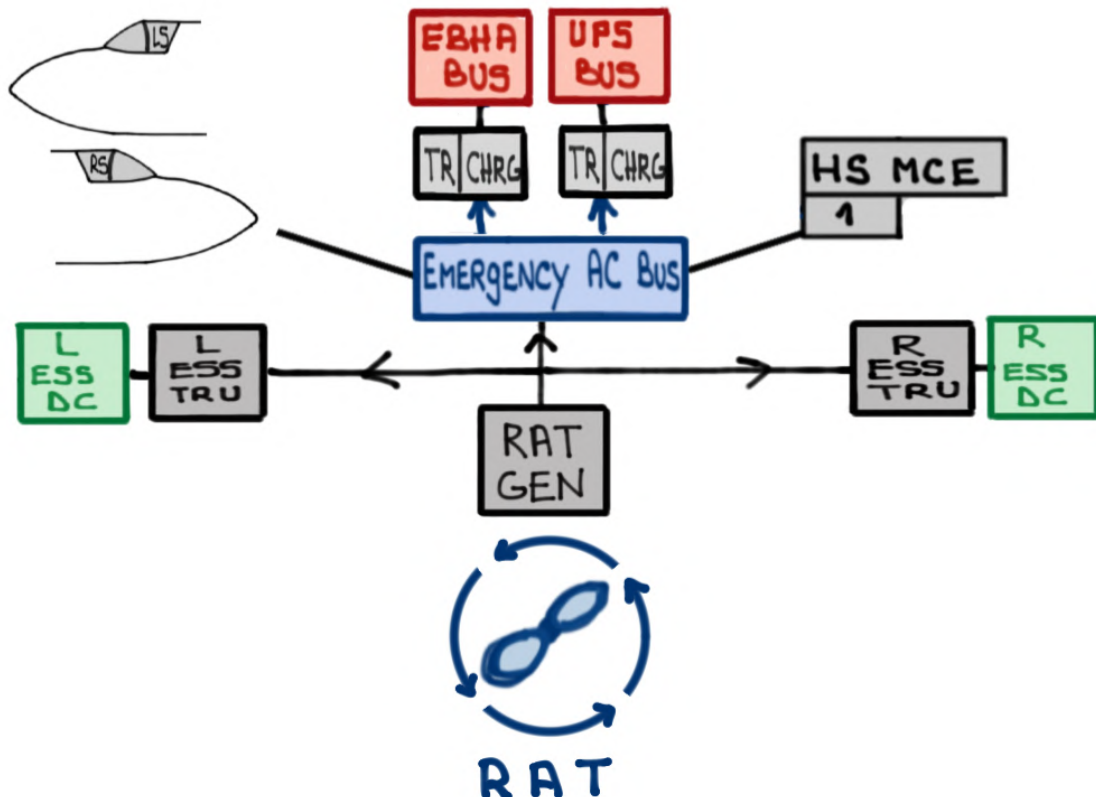


L-R AC POWER FAIL

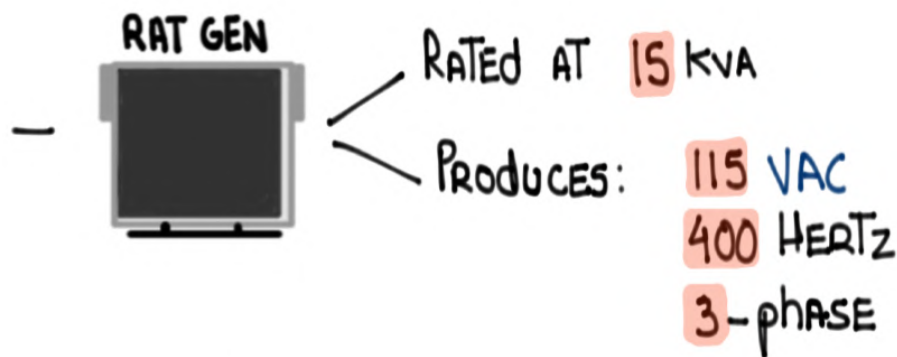
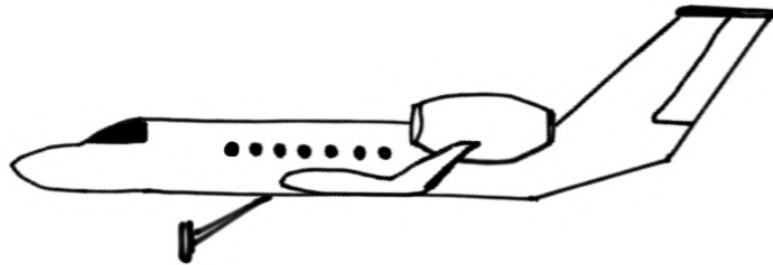
L-R AC POWER FAULT

APU POWER FAIL

RAT GENERATOR ON



- The RAT, once deployed by The CREW, CONVERTS AIRSTREAM ENERGY TO ELECTRICAL ENERGY :



RAT GENERATOR ON

- OPERATING ENVELOPE:

- ≥ 200 KTS — $\leq M0.925$ (Mmo)
- SEA LEVEL \rightarrow FL510

- < 200 KTS The RAT GEN drops offline AND The L MAIN BATT R MAIN BATT power The L ESS DC R ESS DC buses

—  ROTATES COUNTER clockwise

— Six (6) PERCENT FUEL PENALTY

— RAT TEST = MAINTENANCE FUNCTION ONLY 

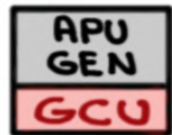
— ONCE DEPLOYED THE RAT CAN'T BE STOWED IN FLIGHT

— GUIDANCE PANEL: NO VERTICAL MODES (ADS 4)

GENERATOR CONTROL UNITS (GCU)

- GCUs ARE MICROPROCESSORS THAT CONTROL GENERATOR OUTPUT (QUALITY ASSURANCE) AND PROVIDE FAULT PROTECTION

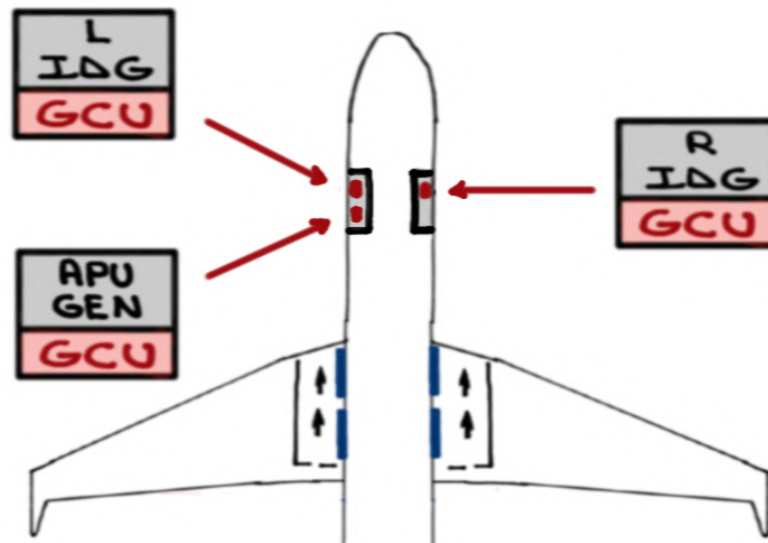
- THERE ARE (4) GCUs:



IDENTICAL
INDEPENDENT
INTERCHANGEABLE

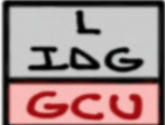
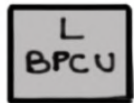
NON-INTERCHANGEABLE

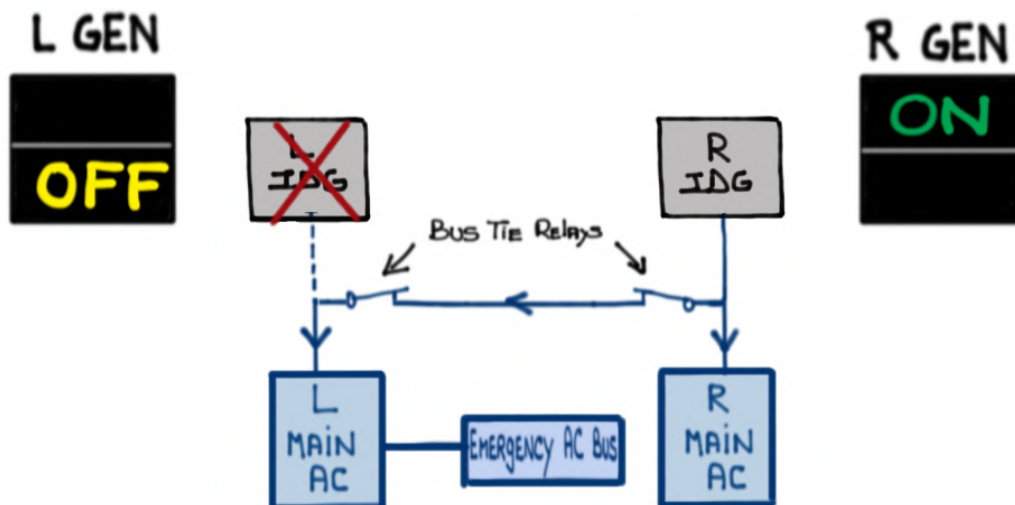
- GCUs ARE LOCATED IN THE LEER AND REER






- If A GENERATOR'S:

- ①
- VOLTAGE
 - FREQUENCY
 - AMPERAGE
- OUTSIDE of PARAMETERS

- ②
-  GCU TAKES THE GENERATOR OFFLINE
GCU NOTIFIES 



- ③  — NOTIFIES THE CREW VIA CAS MESSAGE
- 


 CAN BE RESET BY CYCLING THE  SWITCH

EXTERNAL AC/DC POWER

EXT PWR

– EXTERNAL  power 

- RECEPTABLE is located on the right side of the fuselage
- 30 KVA, 115 VAC, 400 Hz, 3 phase
- CAN power all AC buses and through the TRUs all DC buses are powered
- BPCU checks quality of power before allowing onto aircraft

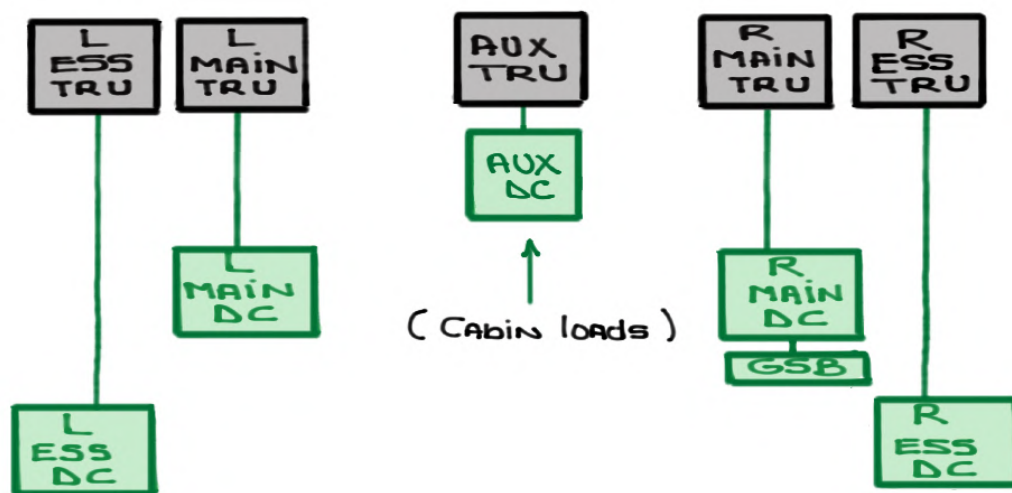
EXT PWR

– EXTERNAL  power 

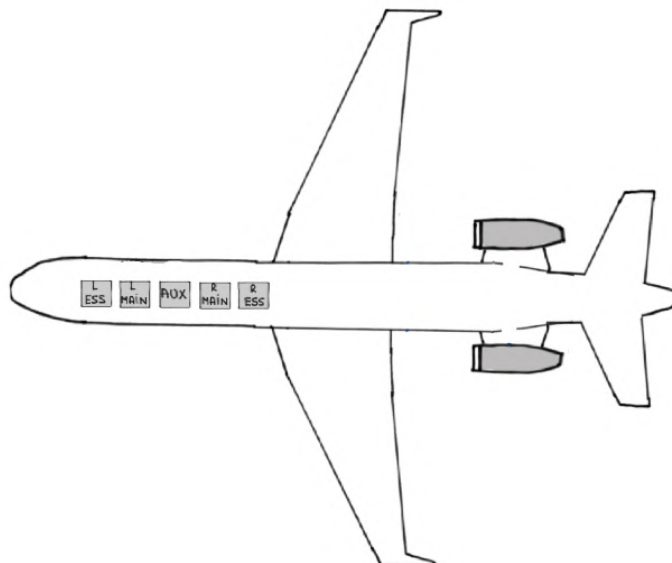
- RECEPTABLE is located on the right side of the fuselage
- Powers all DC buses
- CAN be used to power the GSB
- Use of EXTERNAL DC power to start the APU is prohibited

TRANSFORMER RECTIFIER UNITS (TRU)

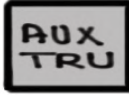



- TRUs ARE POWERED by The L MAIN AC R MAIN AC BUSES
- A TRU CONVERTS 115 VAC TO 28 VDC

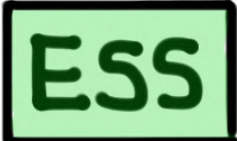



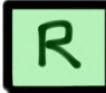
- TRUs ARE LOCATED UNDERNEATH THE FLOOR



-     power Their own buses

-  power The  bus and will Take over The duties of a failed ~~~~ or ~~~~ TRU using The following priority process:

 before 

 before 

① Sheds  bus

② 

③ 

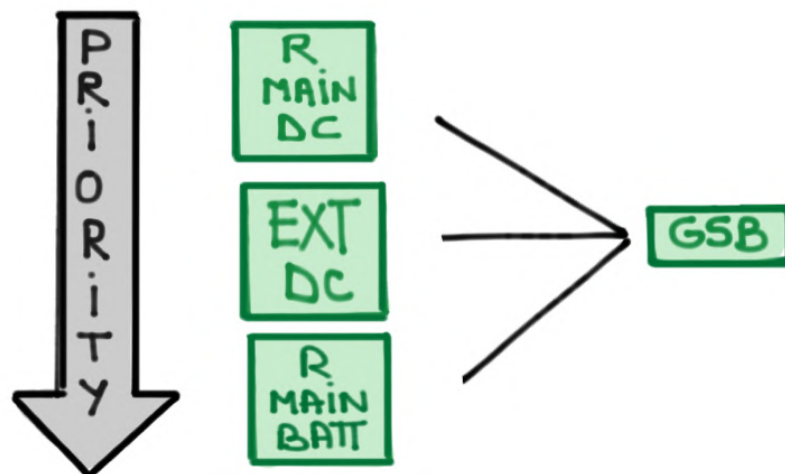
④ 

⑤ 



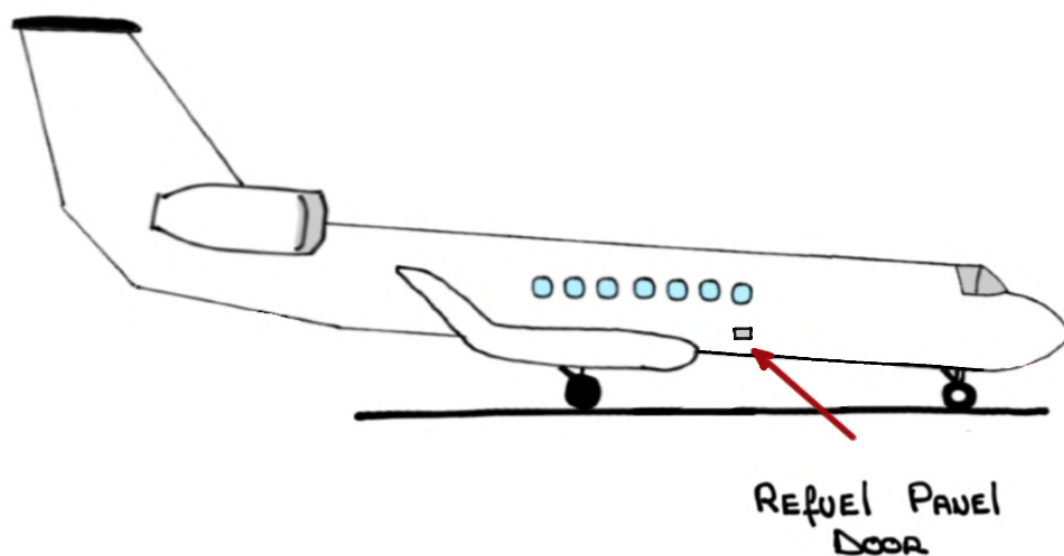
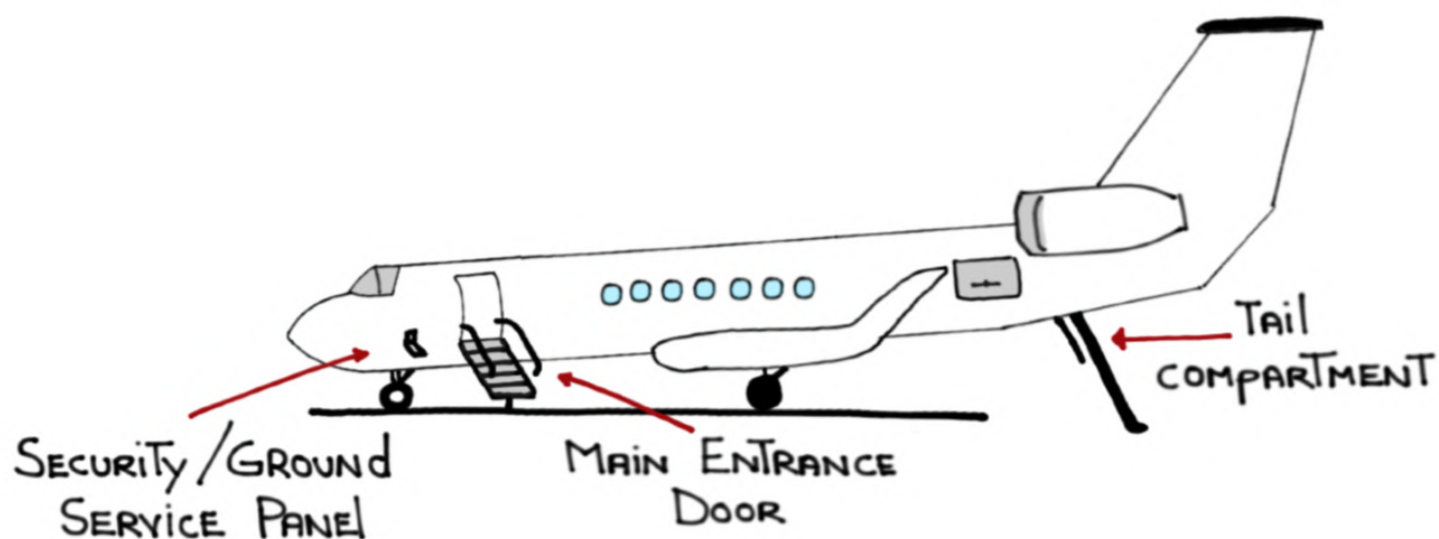
GROUND SERVICE BUS

- WHEN you DON'T WANT TO WAKE UP THE BEAST
- **GROUND OPERATIONS** (APU shutdown)
 - REFUELING
 - ENGINE OIL
 - POTABLE WATER SERVICING
 - HYDRAULIC fluid SERVICING
 - WHEELWELL lights
- FOUR (4) **G5B** switches
 - SECURITY / GROUND SERVICE PANEL
 - REER MAINTENANCE PANEL
 - TAIL COMPARTMENT GROUND SERVICE PANEL
 - REFUEL PANEL
- POWER SOURCES (PRIORITY)

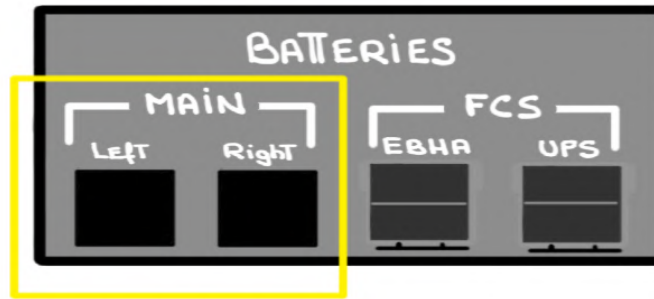


- Rotating beacon light is powered by The **GSB** when The **R MAIN BATT** is The source of power

- AT LEAST ONE (1) of The following MUST be open when using ONE of The four (4) **GSB** switches:



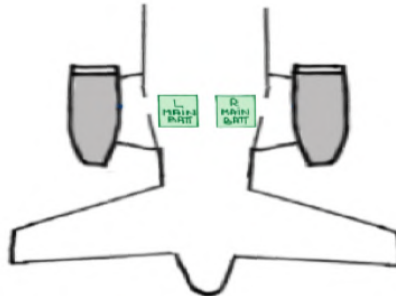
MAIN BATTERIES



- THERE ARE TWO (2) MAIN BATTERIES



- LOCATED in THE TAIL COMPARTMENT



- Nicad, 21 cells, 95 pounds, 25 VDC, 53 AMP/hour

- PURPOSE:

① START THE APU - 

② OPERATE THE AUX HYDRAULIC PUMP -  

③ POWER THE   BUSES IF THERE IS NO OTHER SOURCE

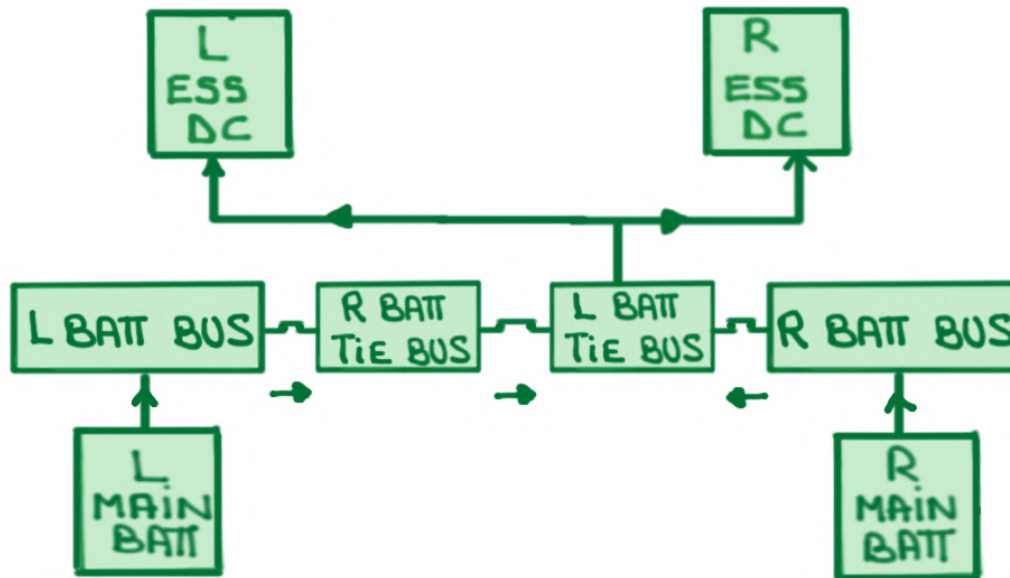
- MAIN
 LEFT

ON

RIGHT

ON

ILLUMINATE ON if THEY POWER THE
 ESS DC BUSES (DISCHARGING)



- MINIMUM of TEN (10) MINUTES of power with Two (2) APU START ATTEMPTS
- MUST BE REMOVED FROM AIRCRAFT IN COLD SOAKED CONDITIONS ($\leq -20^{\circ}\text{C}$) AND STORED IN A LOCATION WARMER $> -20^{\circ}\text{C}$ AND COOLER THAN $+40^{\circ}\text{C}$
- THE

L
MAIN
BATT

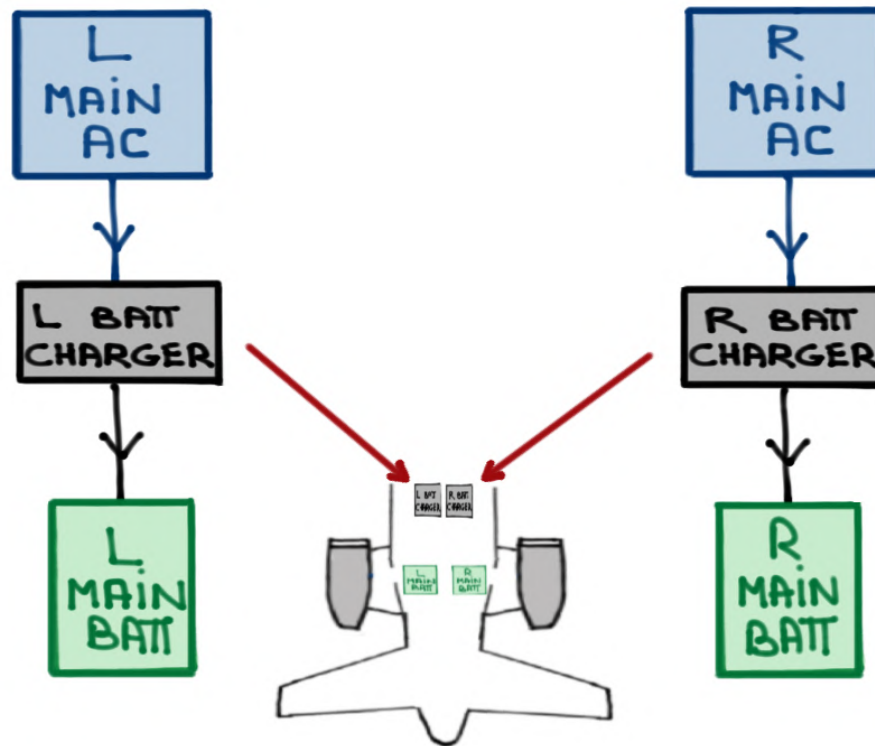
R
MAIN
BATT

 ARE NORMALLY RECHARGED BY THE

MAIN
AC

 BUSES

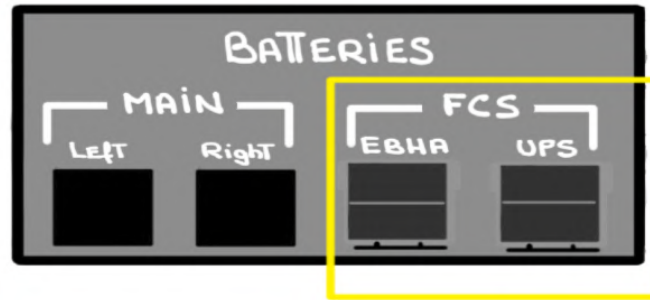
- The EXTERNAL BATTERY chargers ARE located in THE TAIL COMPARTMENT



- Approximately ninety (90) MINUTES To RECHARGE THEM
- BATTERIES should be disconnected if THE AIRCRAFT is shutdown \geq five (5) days
- If ≤ 22 Volts but NOT LESS THAN 7 Volts THE BATTERIES CAN BE RECHARGED AS follows:
 - EXT AC POWER CONNECTED



FLIGHT CONTROL BATTERIES



THERE ARE TWO (2) Flight Control System (FCS) BATTERIES:

① ELECTRICAL BACKUP HYDRAULIC ACTUATOR (EBHA) BATTERY

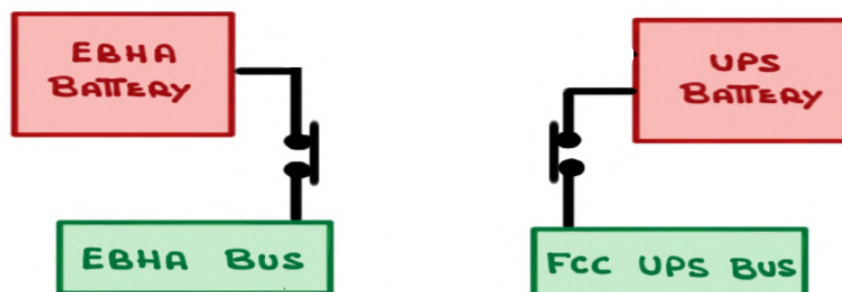


② UNINTERRUPTIBLE POWER SUPPLY (UPS) BATTERY





THE FCS BATTERIES CAN POWER THE FLIGHT CONTROLS FOR THIRTY (30) MINUTES

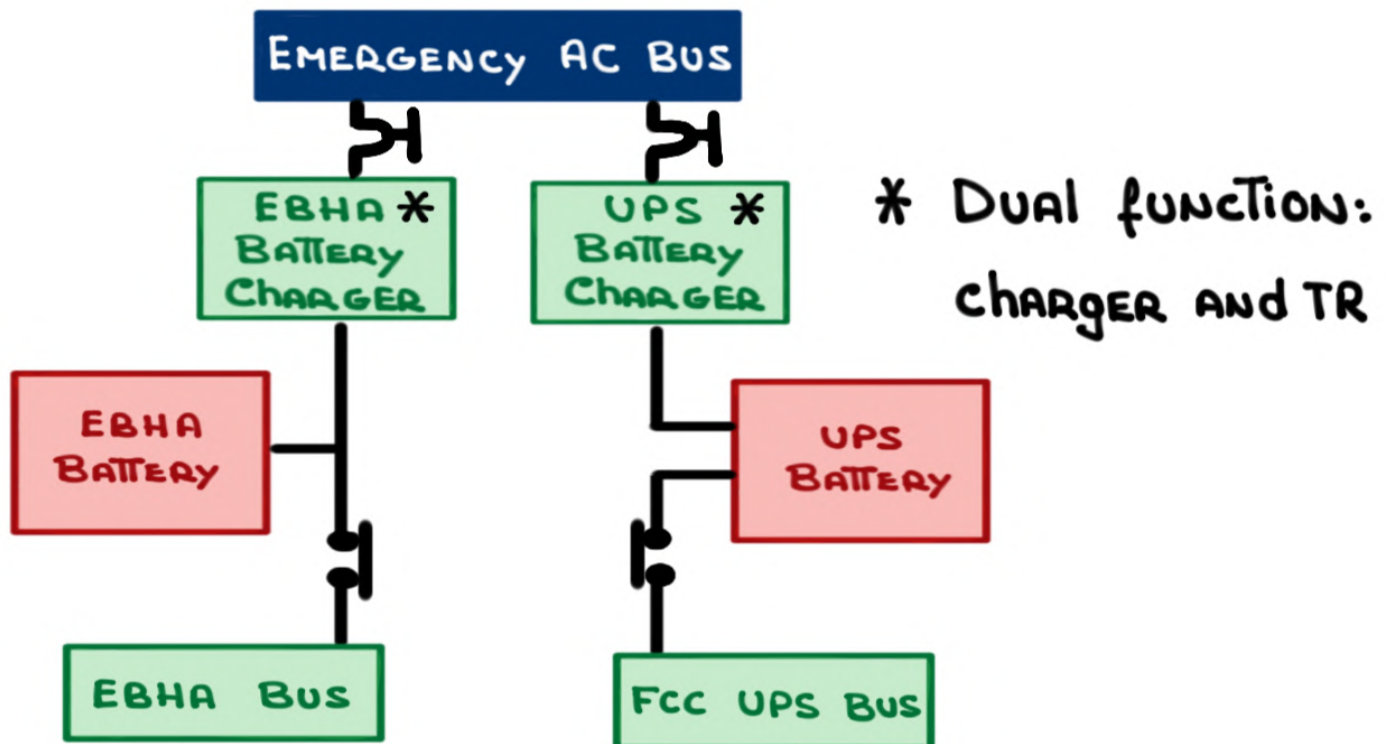
- ILLUMINATED   IF NO  POWER IS BEING PRODUCED AND THEY POWER THEIR OWN BUSES (DISCHARGING)



- SYSTEM POWER ON SELF TEST (SPOST)

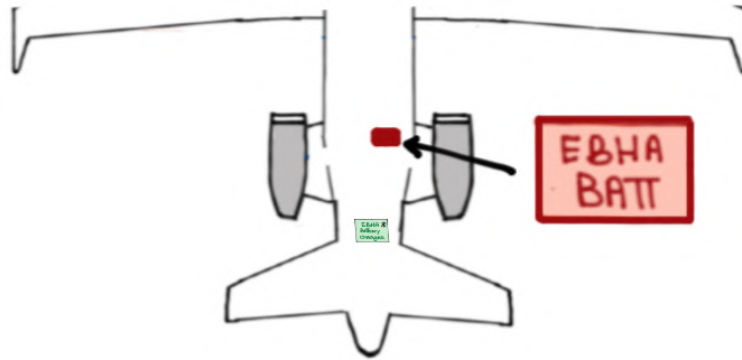
-  SELECTED ON FIRST THEN  SELECTED ON
- FORTY FIVE (45) SECOND TEST
- NO ELECTRICAL INTERRUPTIONS DURING SPOST OR A COMPLETE POWER DOWN IS REQUIRED

- FCS BATTERIES - CHARGER/TRANSFORMER RECTIFIER

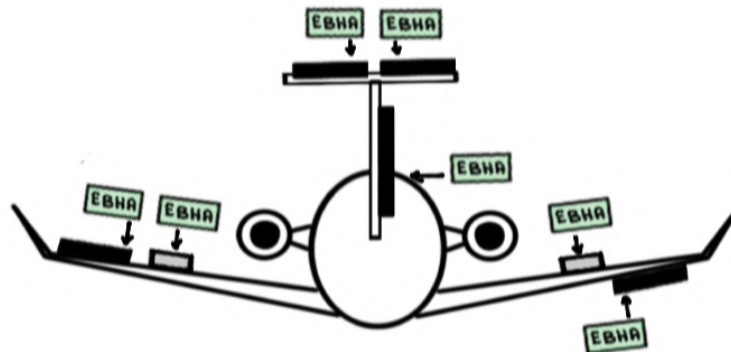


- **EBHA BATT** ELECTRICAL Backup Hydraulic Actuator

- Nicad, **25** Volts, **53** Amp/hour
- LOCATED IN THE TAIL COMPARTMENT



- POWERS SEVEN (7) **EBHA** ACTUATORS



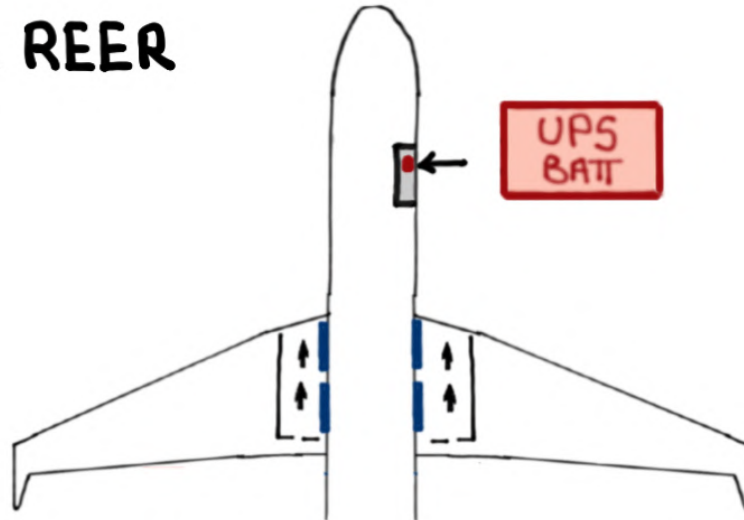
- CAN BE CHARGED BY **RAT GEN**  VIA THE **EMERGENCY AC BUS**

- MUST BE REMOVED FROM AIRCRAFT IN COLD SOAKED CONDITIONS (\leq **-20°C**) AND STORED IN A LOCATION WARMER **> -20°C**

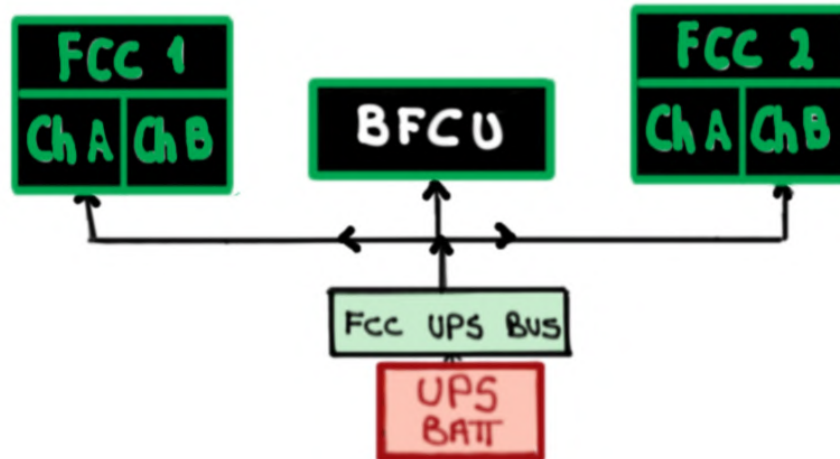
- **UPS BATT** UNINTERRUPTIBLE POWER SUPPLY (UPS)

- LEAD ACID, **24** Volts, **10.5** Amp/hour

- LOCATED IN THE REER



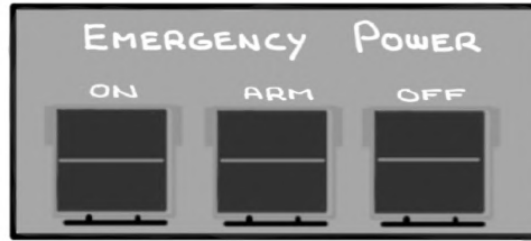
- POWERS FLIGHT CONTROL COMPUTERS channels 1A AND 2B



- SECONDARY power SOURCE TO **REU**

- CAN BE CHARGED by **RAT GEN**  VIA THE **EMERGENCY AC BUS**

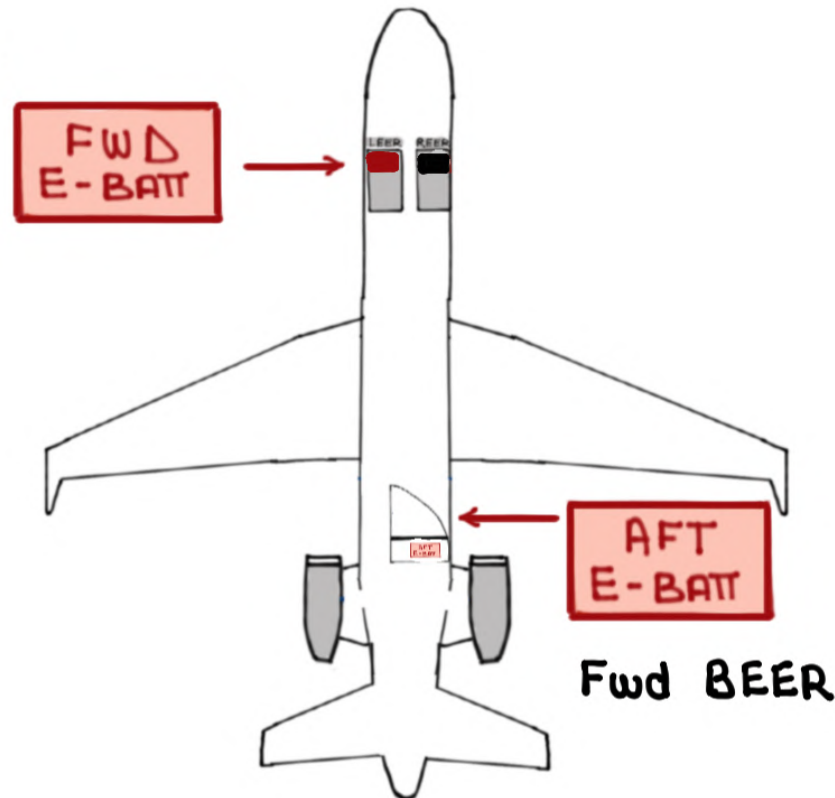
EMERGENCY BATTERIES



- THERE ARE TWO (2) E-BATTs

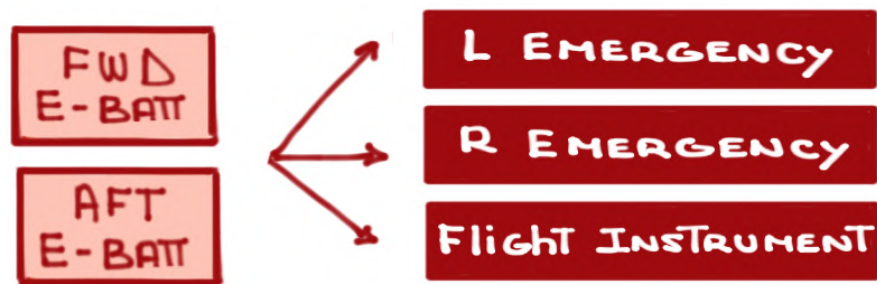
A FORWARD AND AN AFT E-BATT

• LOCATED in:

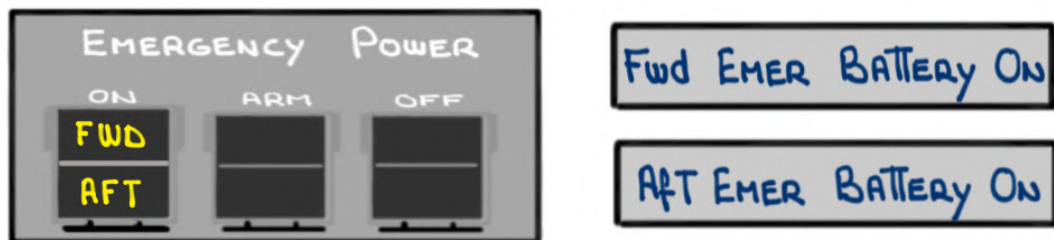


- SEALED, LEAD ACID with its own INTERNAL CHARGER
- 24 Volts, 10.5 amp/hour
- Forty Five (45) MINUTES DURATION, APPROXIMATELY

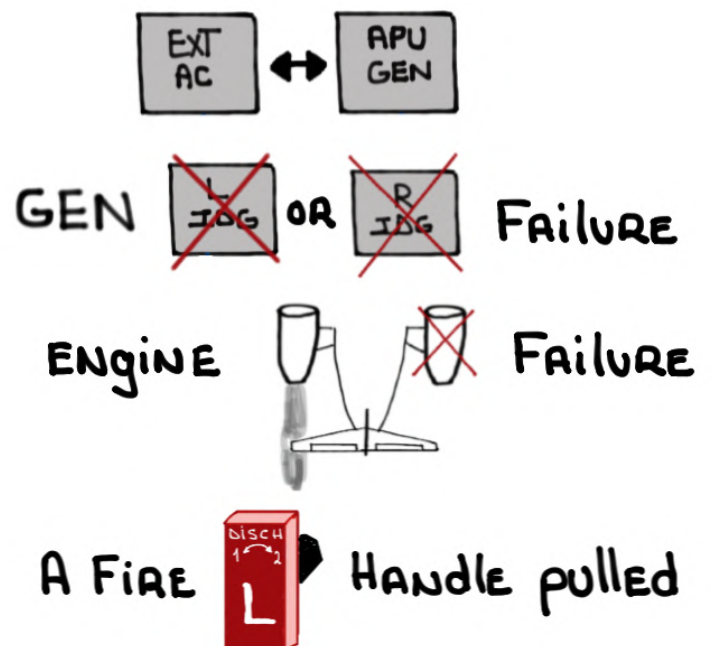
- POWERS The following buses:



- When "ARMED" The E-BATTs come ON automatically when power to the L ESS DC AND/OR R ESS DC drops below 20 Volts, EVEN MOMENTARILY



- AFTER A BREAK POWER TRANSFER The E-BATTs will come ON



- E-BATTs power the following equipment:

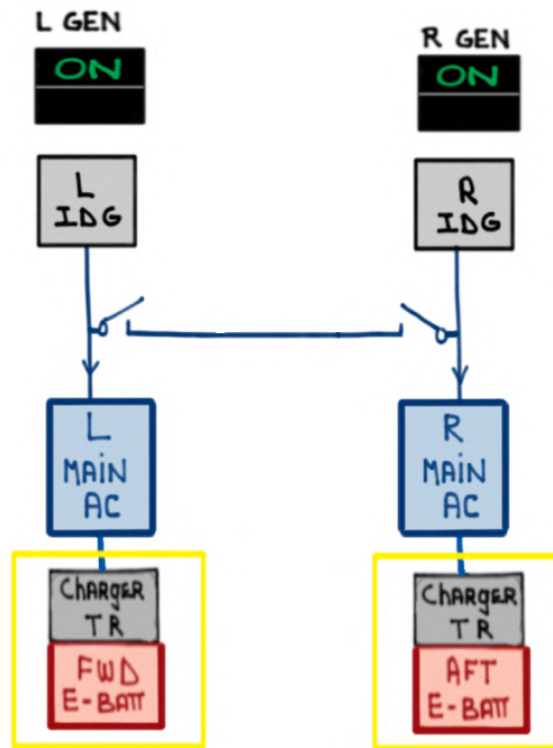
- EMERGENCY Lighting
 - Cabin Emergency Lights
 - Exterior Emergency Lights
- Standby Flight Displays (2)
- Inertial Reference Units (3)
- VHF 1 Radio
- Touch Screen Controllers # 2 and # 3
(No Air Data and Fuel Quantity without ESS DC)

- An Integrated Charger/Transformer Rectifier Recharges the E-BATTs

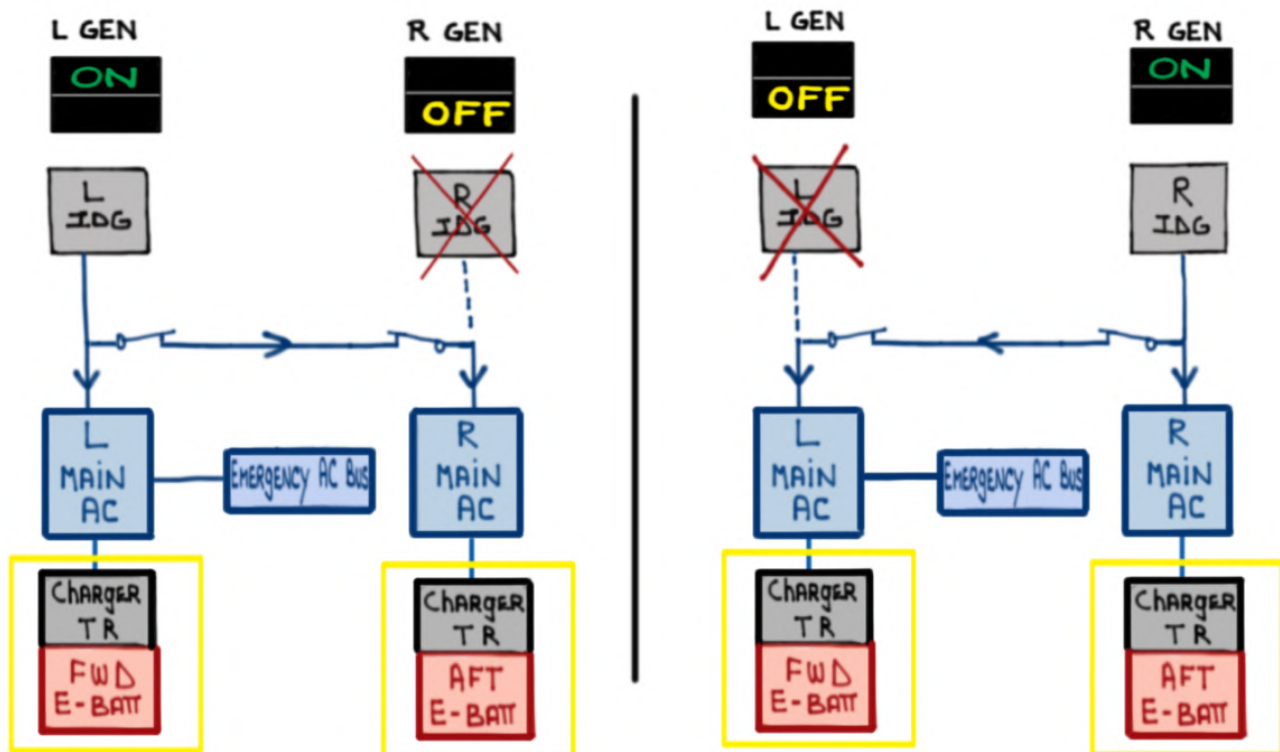


* 1.5 hours To fully charge

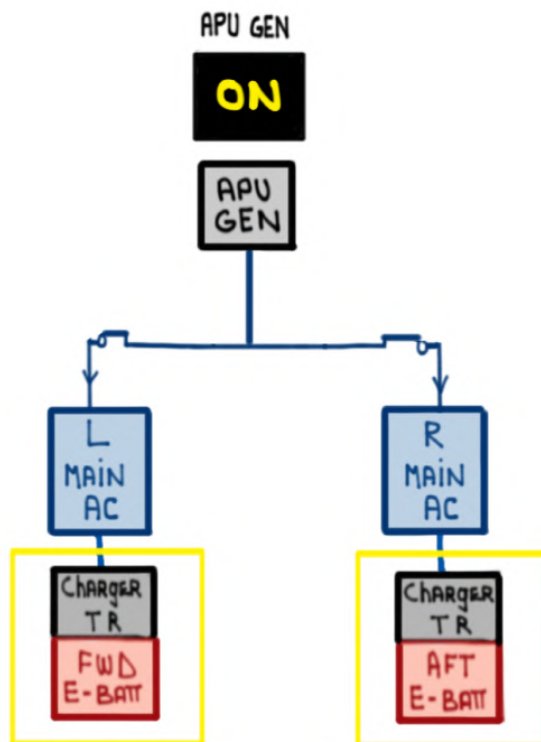
① Both IDGs



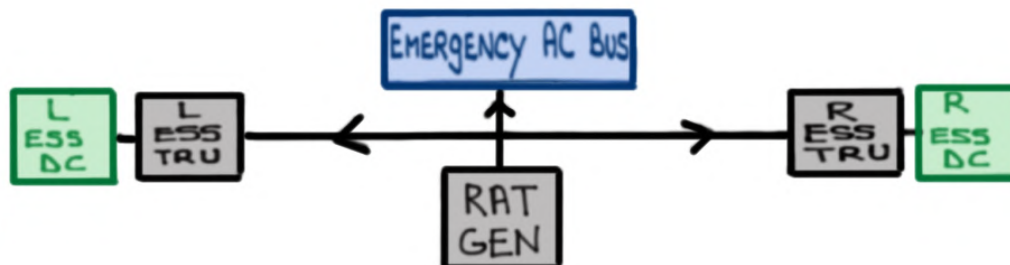
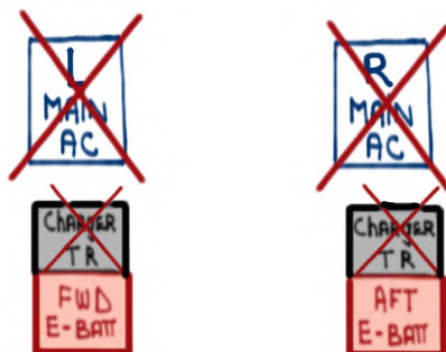
② ONE IDG only



③ APU GEN
only

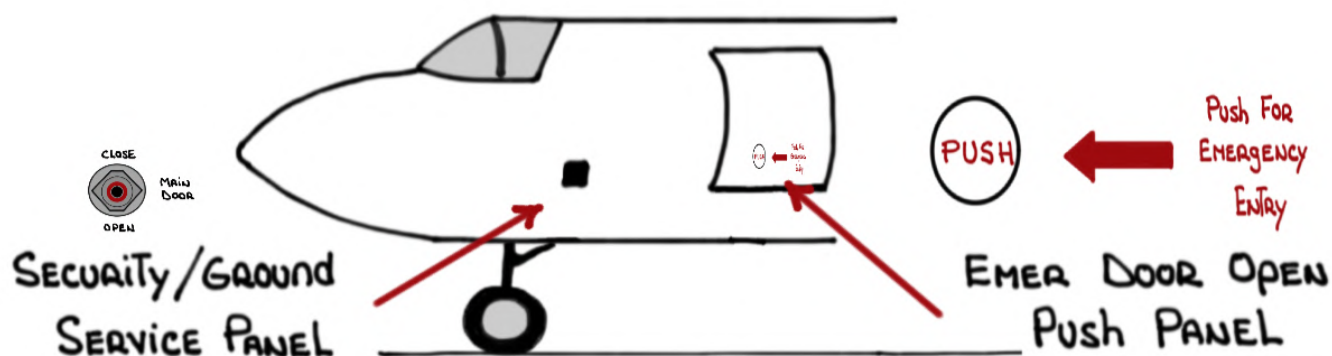


④ RAT GEN
only



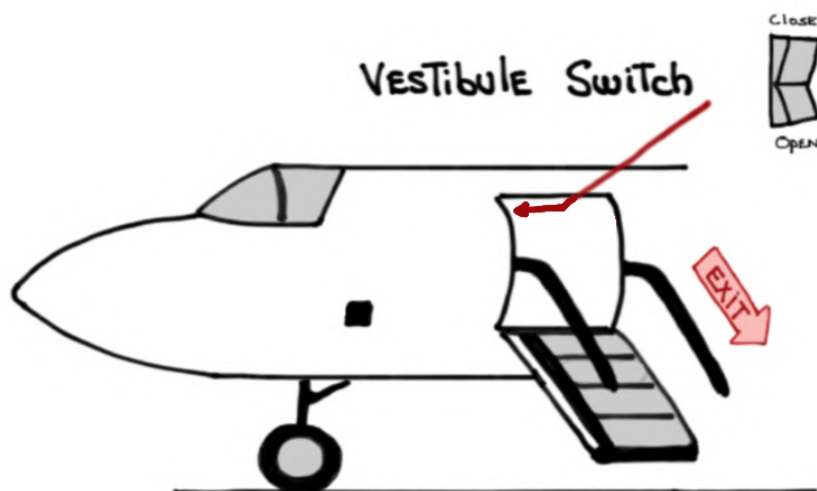
- The **FWD E-BATT** CAN BE USED IN AN EMERGENCY TO OPEN THE ELECTRIC MAIN ENTRANCE DOOR (EMED) VIA THREE (3) SWITCHES. TWO (2) EXTERNAL AND ONE (1) INTERNAL

EXTERNAL switches:



THE EMED IS OPENED VIA EITHER ONE OF THESE ON THE FIRST flight of THE day TO CONFIRM THAT THE **FWD E-BATT** HAS SUFFICIENT BATTERY CHARGE

INTERNAL switch:

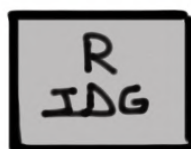


NORMAL - EMERGENCY

NORMAL



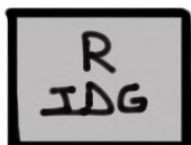
AND



- All AC AND DC buses



OR



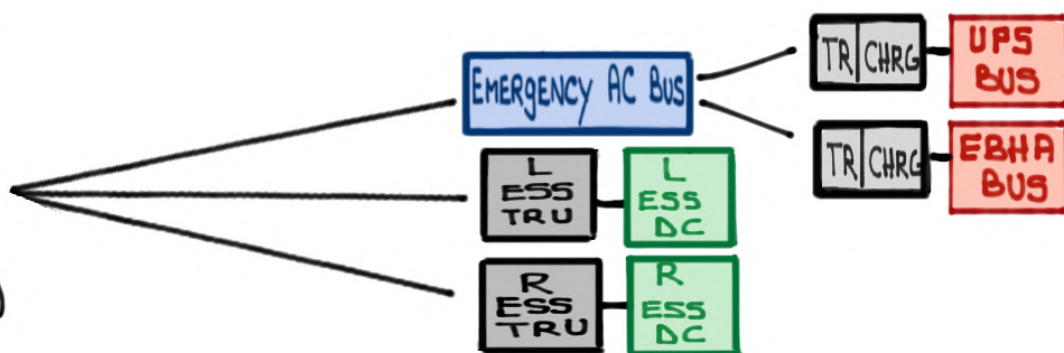
- All AC AND DC buses



- All AC AND DC buses



(≥ 100 KTs)



(2 APU START ATTEMPTS)



$\geq 00:10$ MINUTES



(< 200 KTs)

00:30 MINUTES

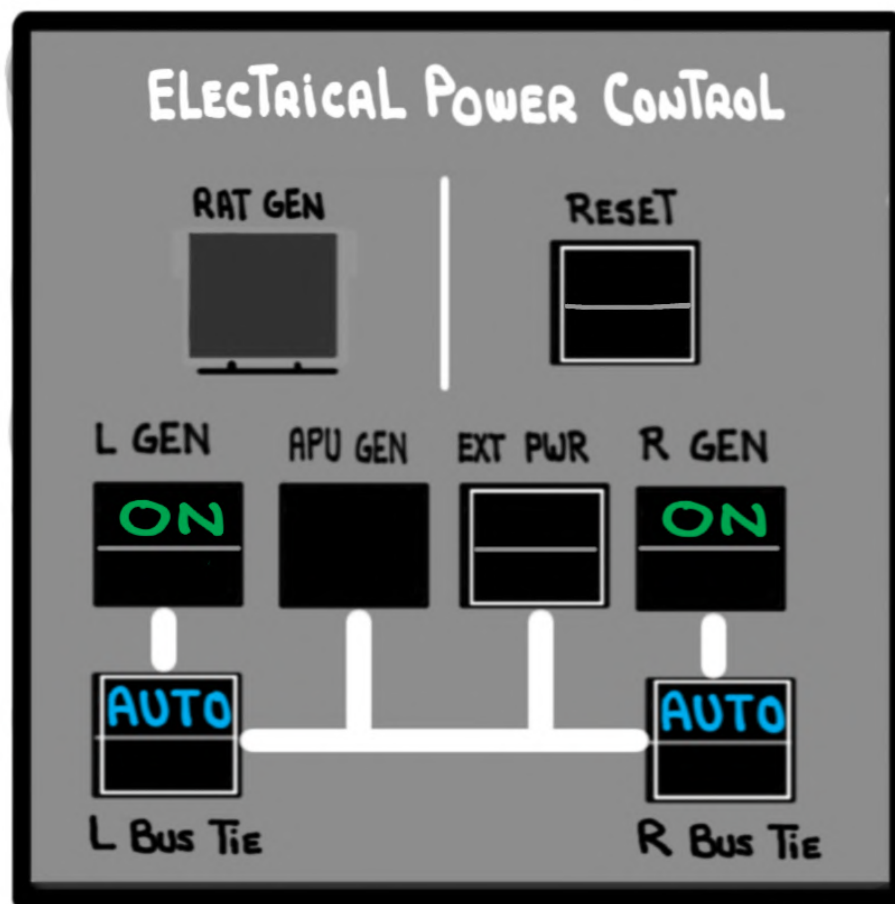


(ESS DC buses < 20 Volts)



00:45 MINUTES
(APPROXIMATELY)

EMERGENCY



Two (2) switchlights GREEN

Two (2) switchlights BLUE

Four (4) switchlights PRESSED IN
including the guarded RAT GEN switchlight



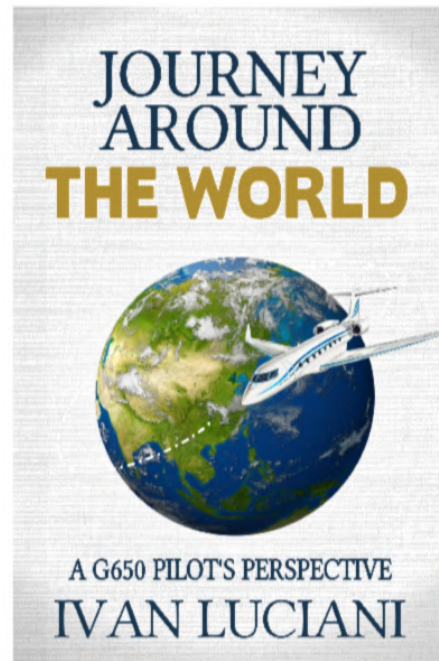
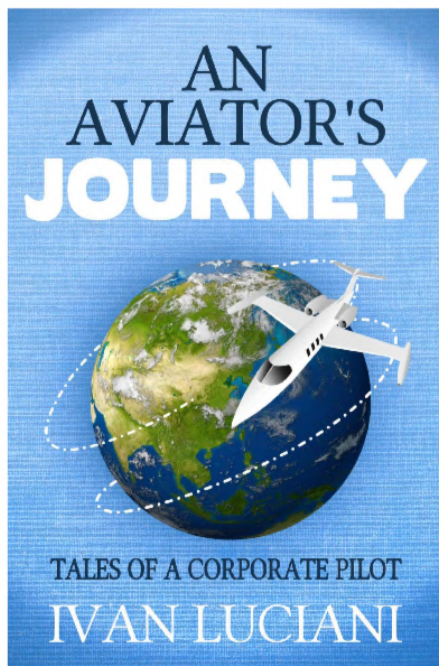
Four (4) switchlights Pushed OUT



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!