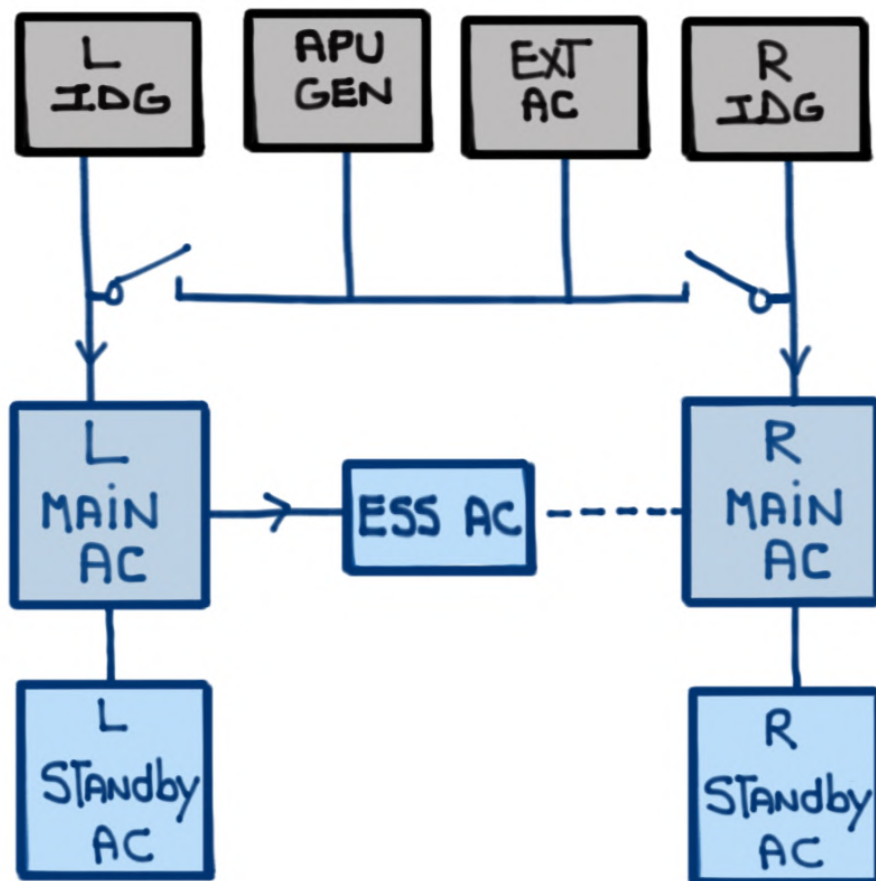


# G450 ELECTRICAL SYSTEM



For study purposes only

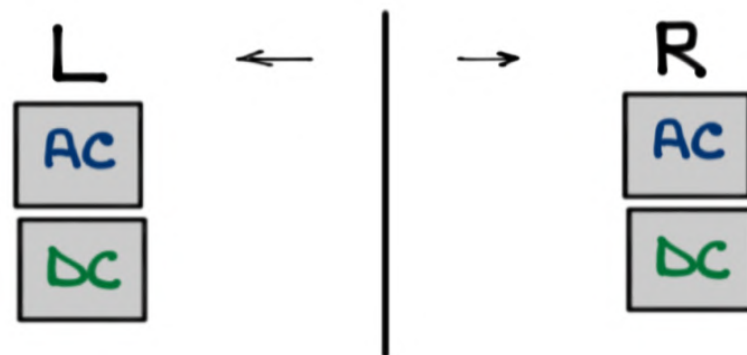
- The ELECTRICAL POWER SYSTEM produces:



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

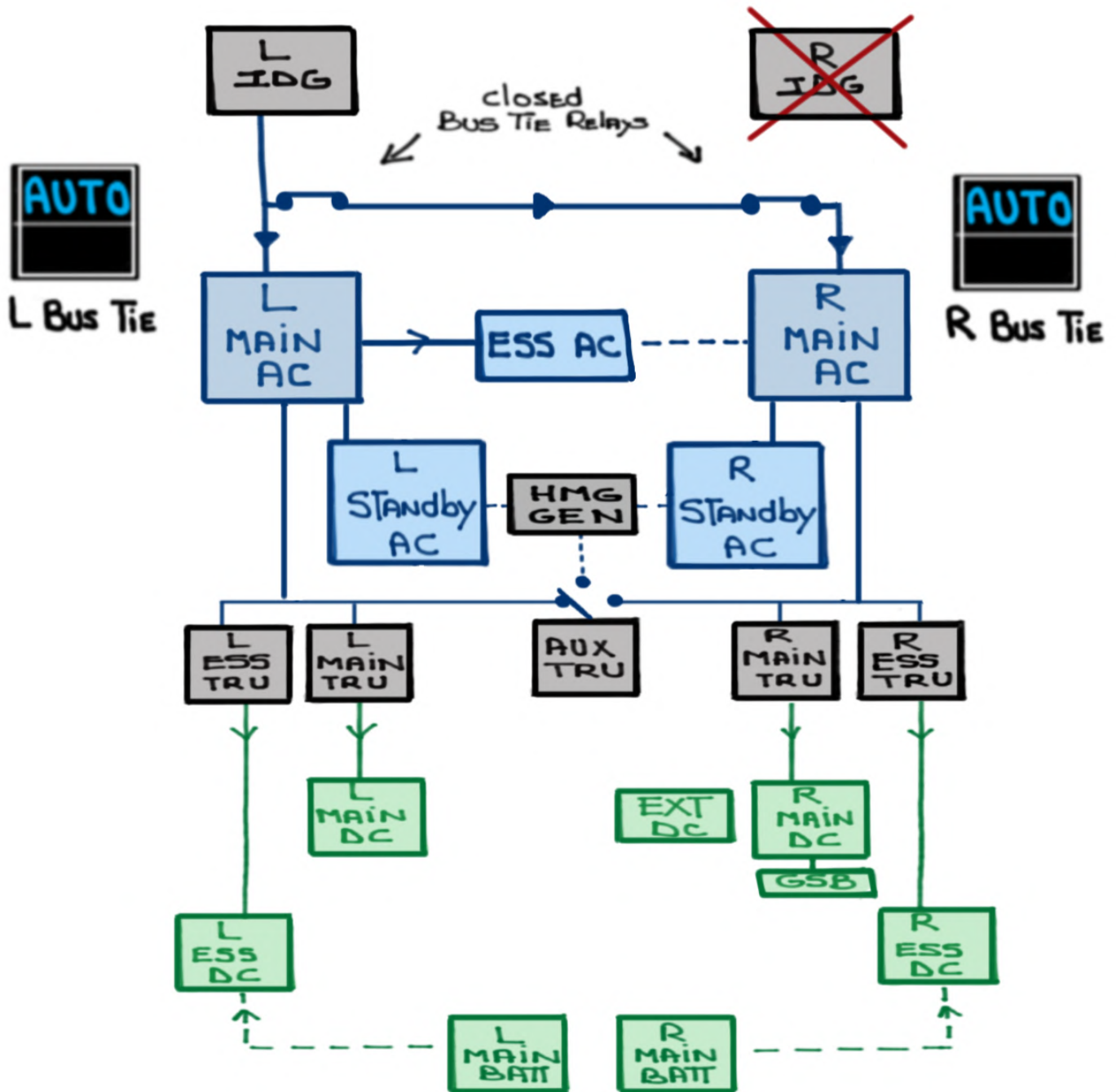


- Two (2) SEPARATE SYSTEMS / NETWORKS



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

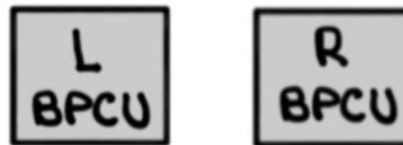
- OPERATIVE SIDE CAN POWER THE INOPERATIVE SIDE



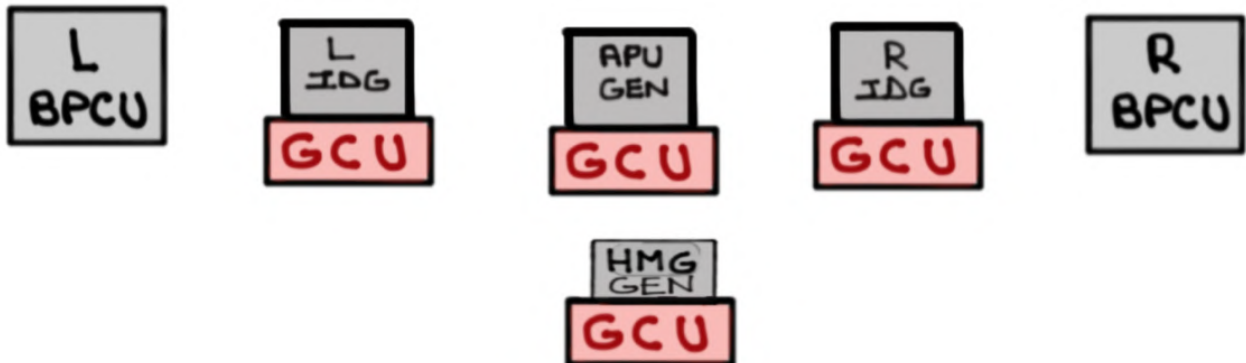
- POWER DISTRIBUTION BOXES (PDB):



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



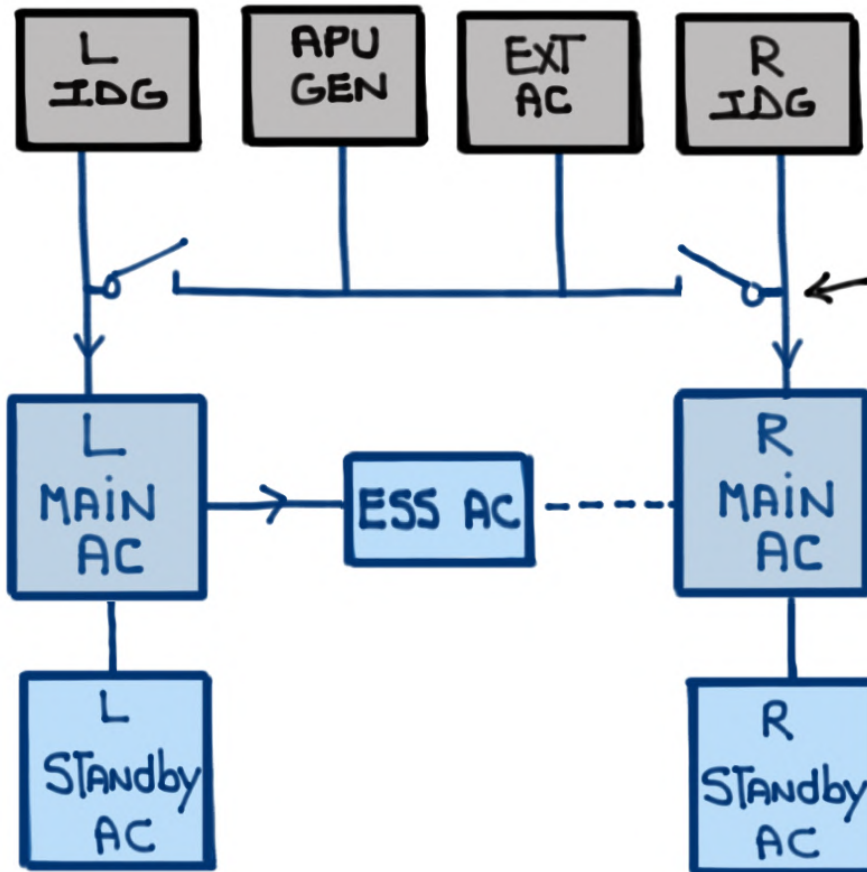
- THERE ARE SIX (6) MICROPROCESSORS (BPCUs AND GCUs):



# - AC SYSTEM:

**115 VAC** is GENERATED by:

**NORMAL**



OPEN  
BUS TIE  
RELAY

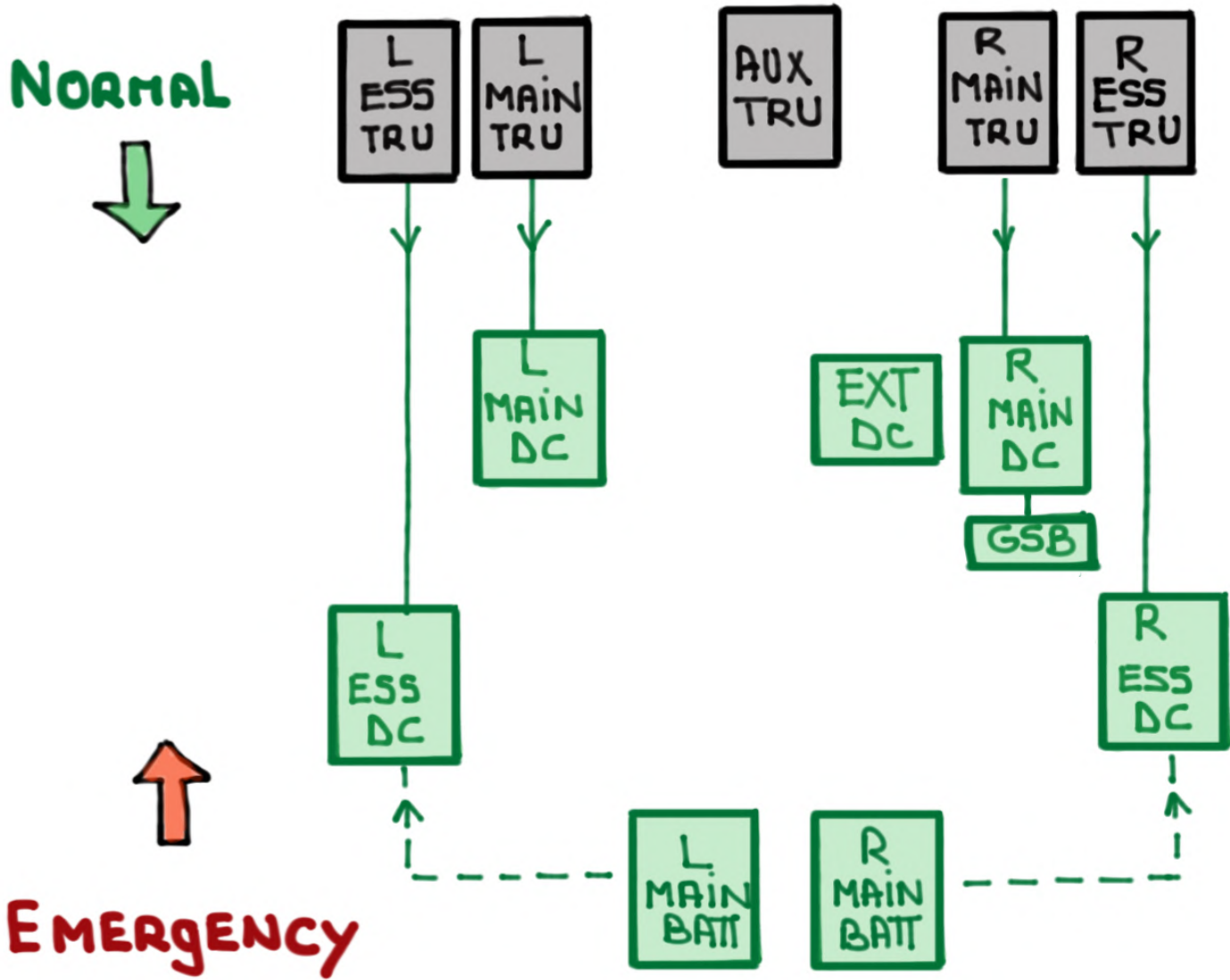


**EMERGENCY**

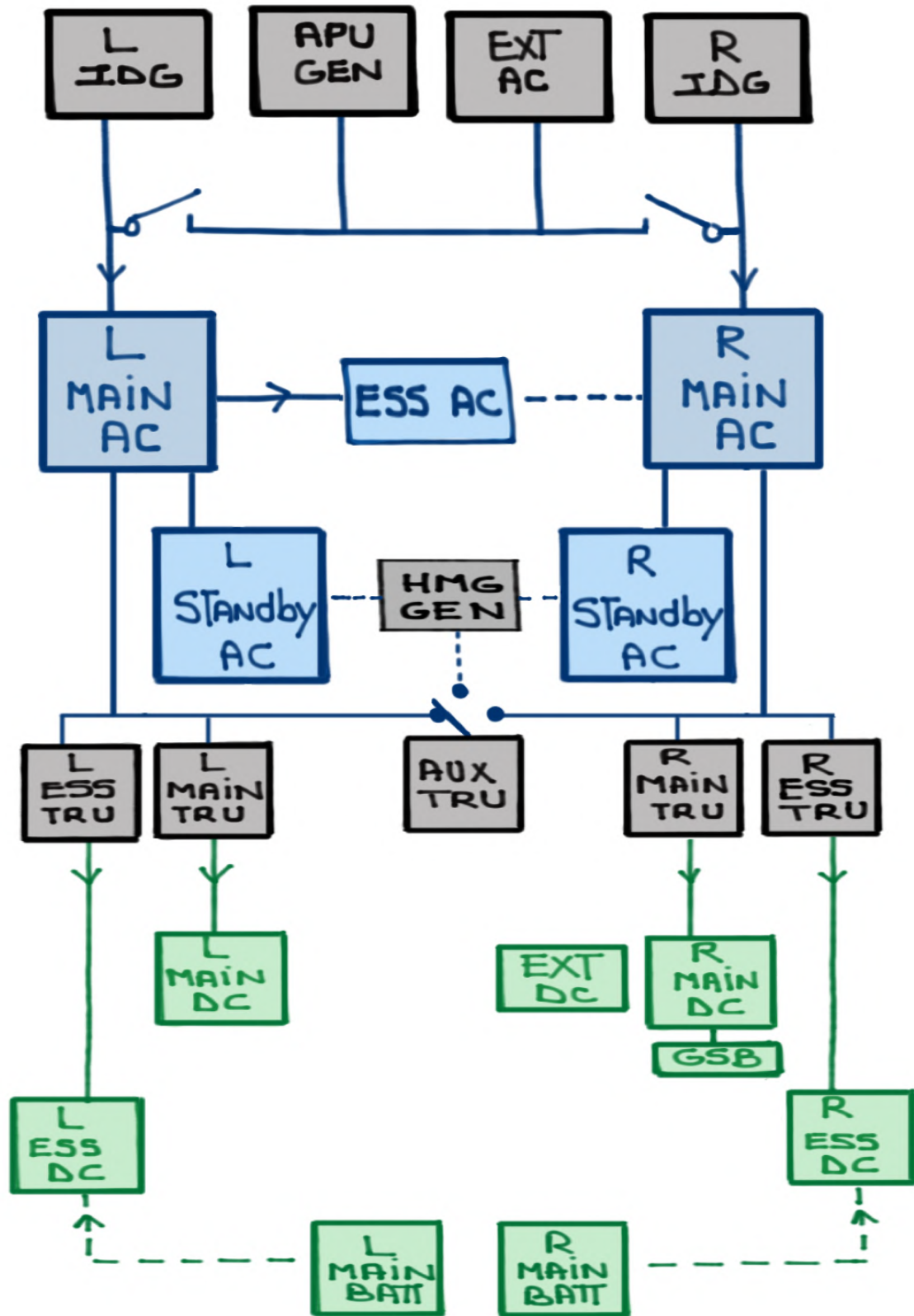


# - DC SYSTEM:

28 VDC is PRODUCED by:

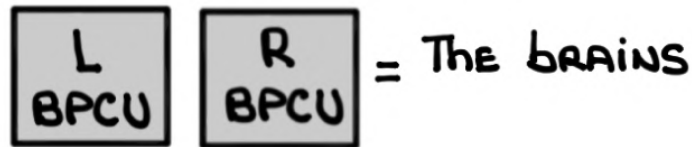


# ELECTRICAL POWER SYSTEM



# BUS POWER CONTROL UNITS (BPCU)

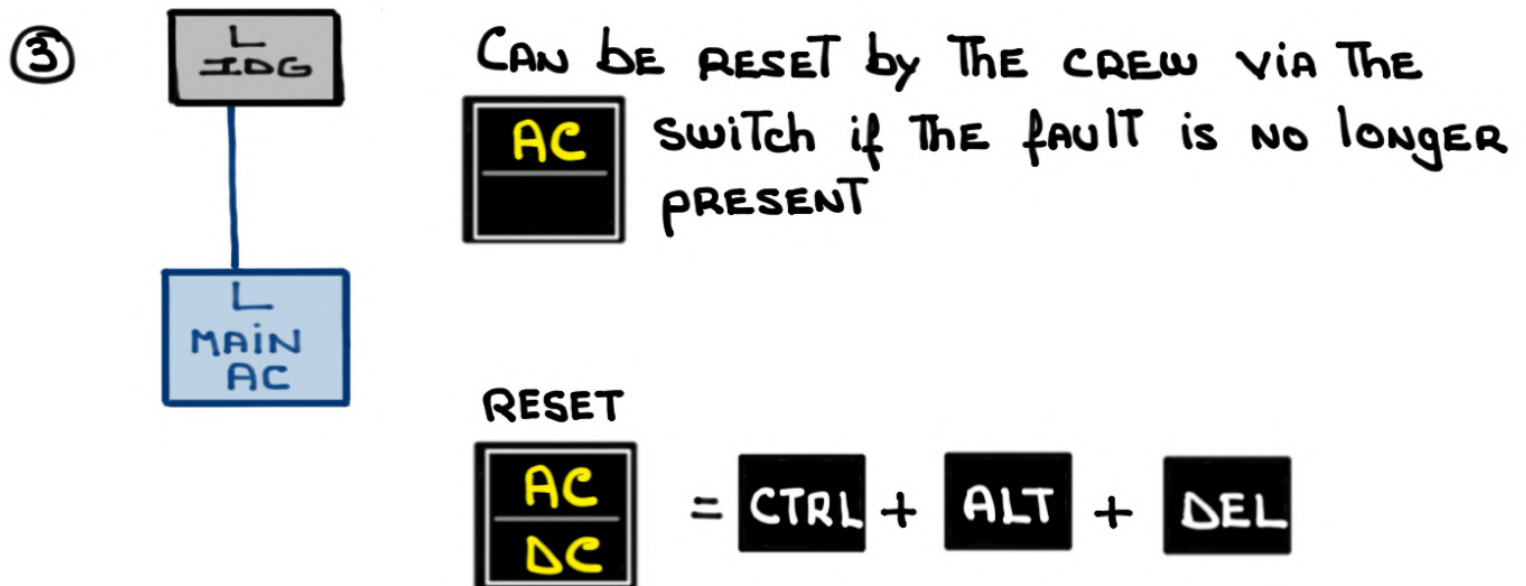
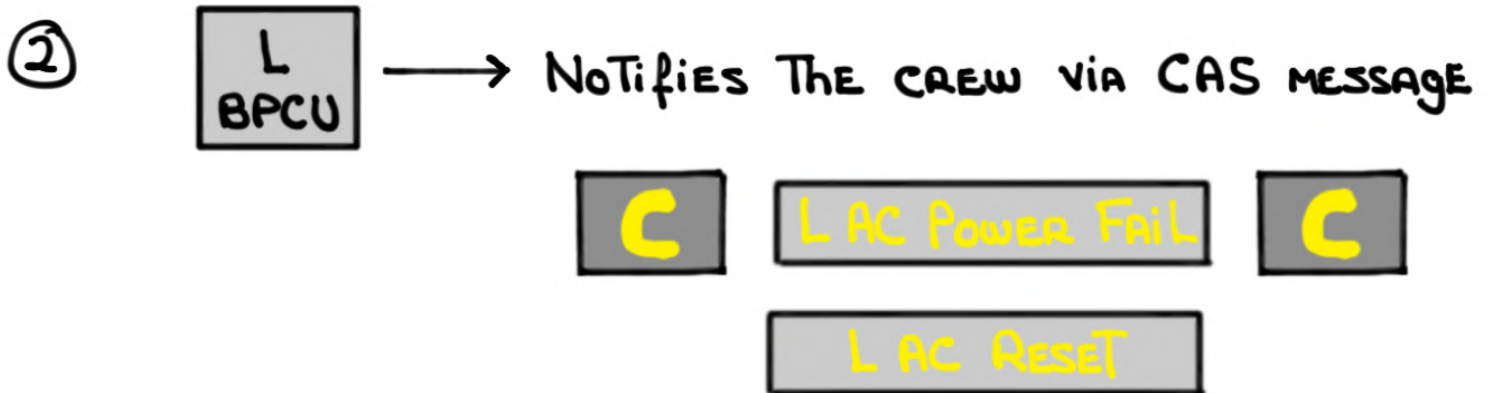
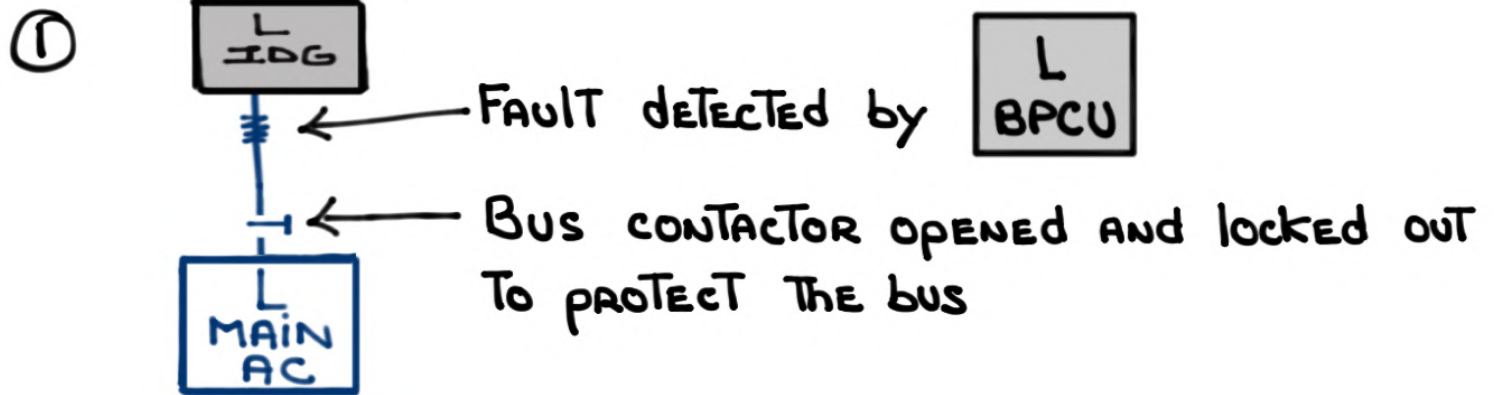
The ELECTRICAL POWER SYSTEM is controlled by Two (2) IDENTICAL AND INTERCHANGEABLE MICROPROCESSORS called BPCUs

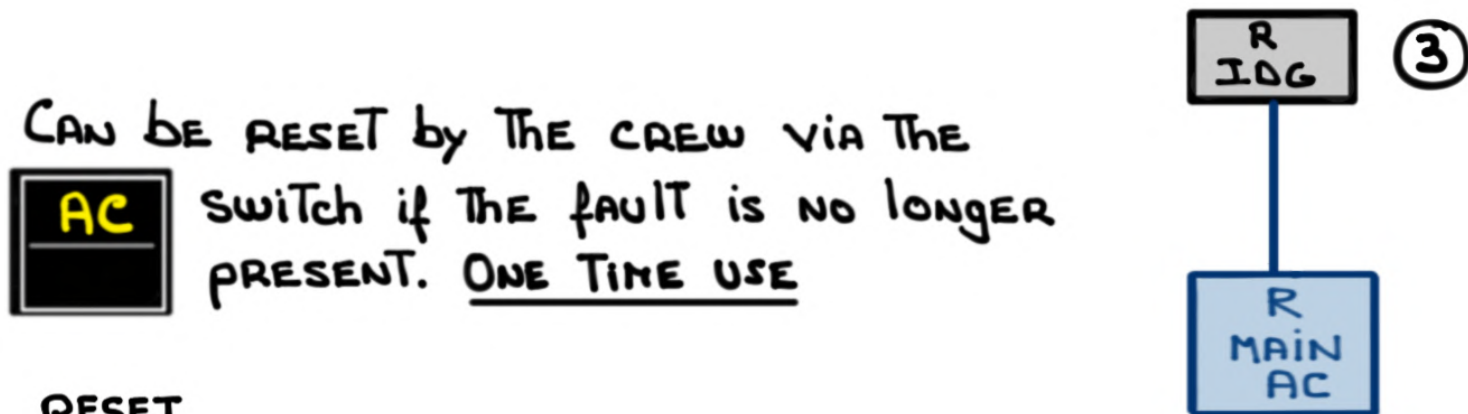
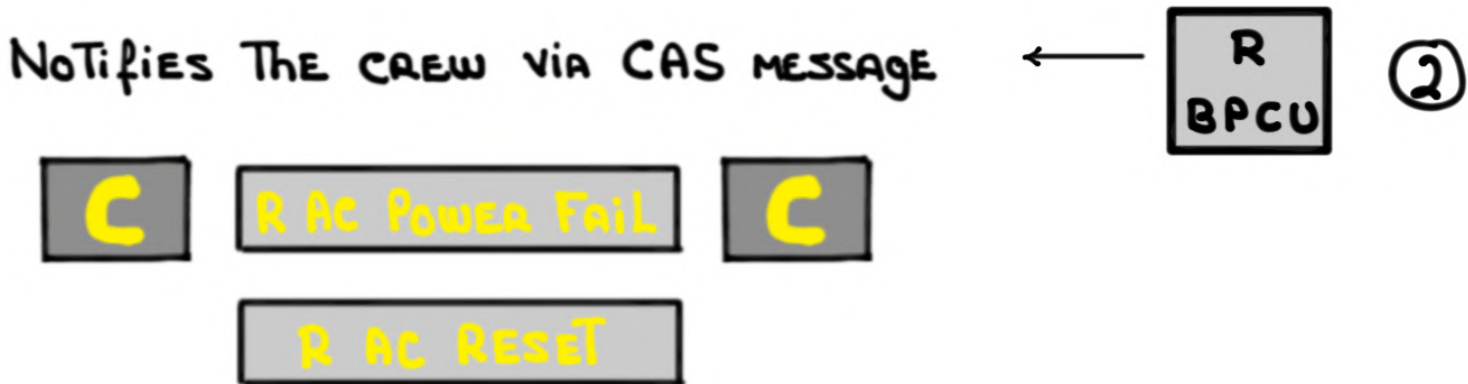
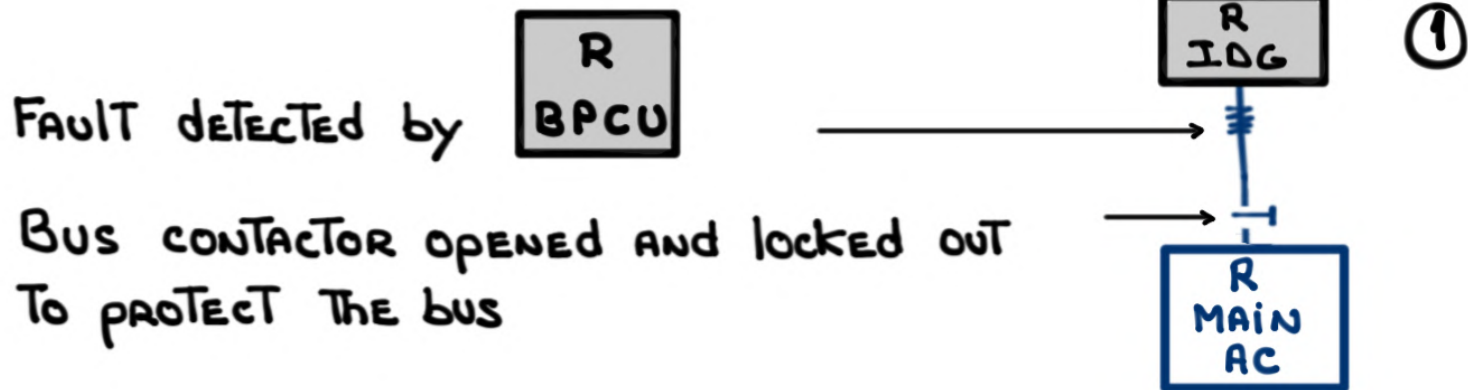


- The L  
BPCU R  
BPCU CONTROL AND MAKE ALL LOGICAL DECISIONS FOR ELECTRICAL distribution AND protection
- Traffic cops - PROTECTORS OF THE BUSES
- CLOSE AND OPEN CONTACTORS AND/OR RELAYS TO:
  - Efficiently supply power to the buses
  - PROTECT AND ISOLATE THE ELECTRICAL SYSTEM FROM FAULTS
- OUTPUT CRITICAL FINDINGS TO THE CAS
- PROVIDES PROTECTION, POWER AND LOGIC TO AC  
DC RESET switch
- MONITOR EXTERNAL AC DC POWER
- CONTROL THE NO BREAK POWER TRANSFER (NBPT)



# - FAULT DETECTION, PROTECTION AND NOTIFICATION:





RESET

**AC**  
**DC** = GCU/BPCU RESET

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

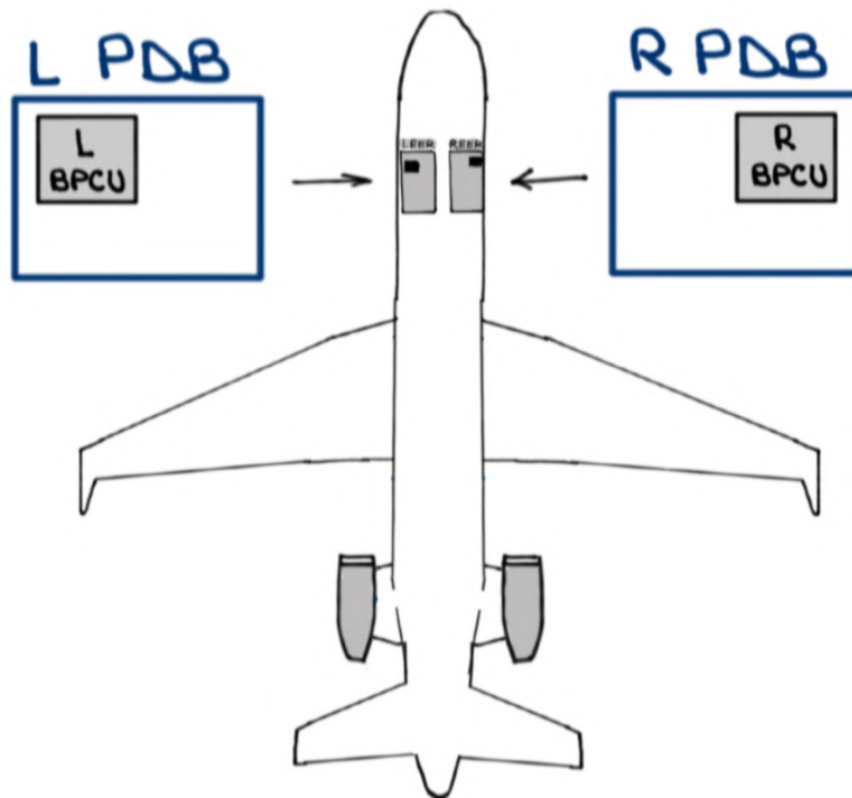
- LOCATED in:

**L**  
BPCU

LEFT ELECTRONIC EQUIPMENT RACK (LEER)

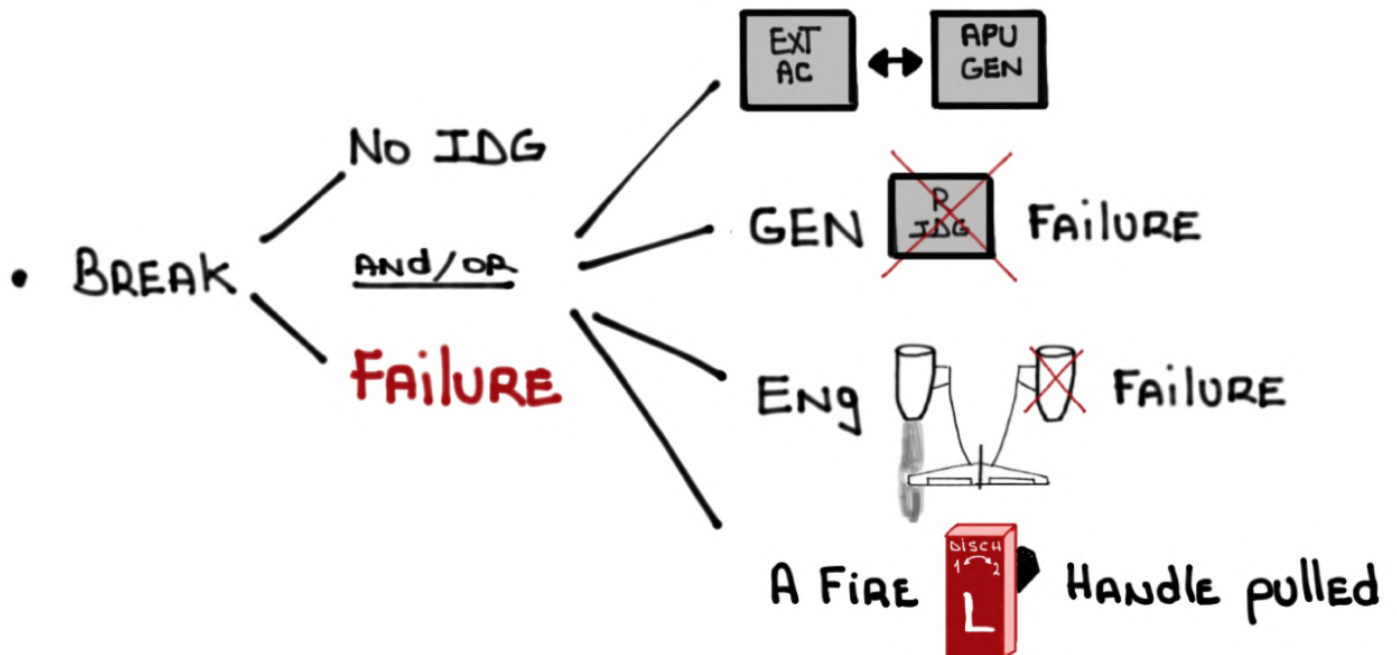
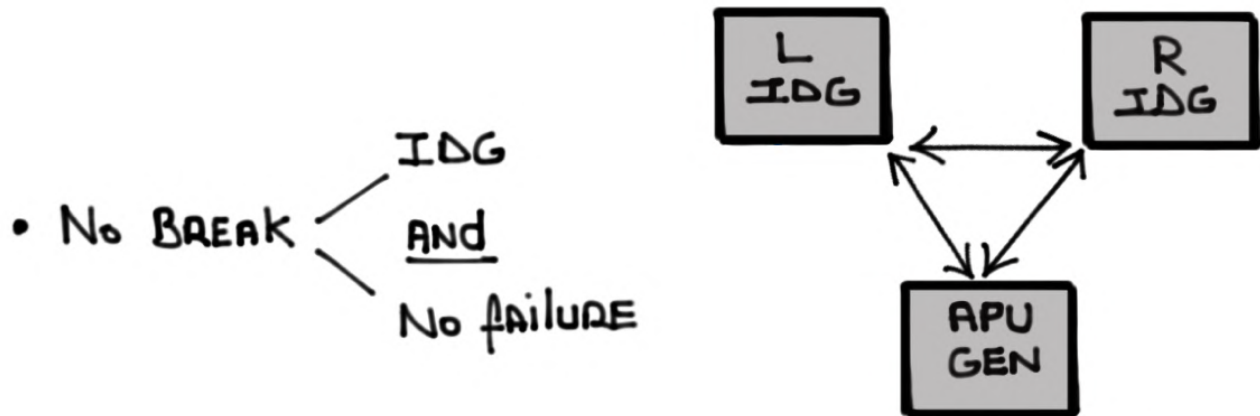
**R**  
BPCU

RIGHT ELECTRONIC EQUIPMENT RACK (REER)



# - NO BREAK POWER TRANSFER (NBPT)

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



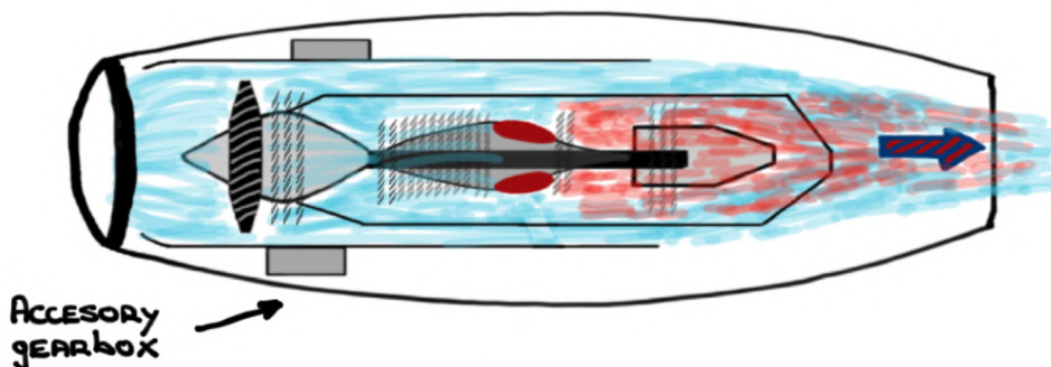
# INTEGRATED DRIVE GENERATORS (IDG)

- Two (2) ENGINE-DRIVEN IDGs

L  
IDG

R  
IDG

- LOCATED ON THE ENGINE'S ACCESSORY GEARBOX



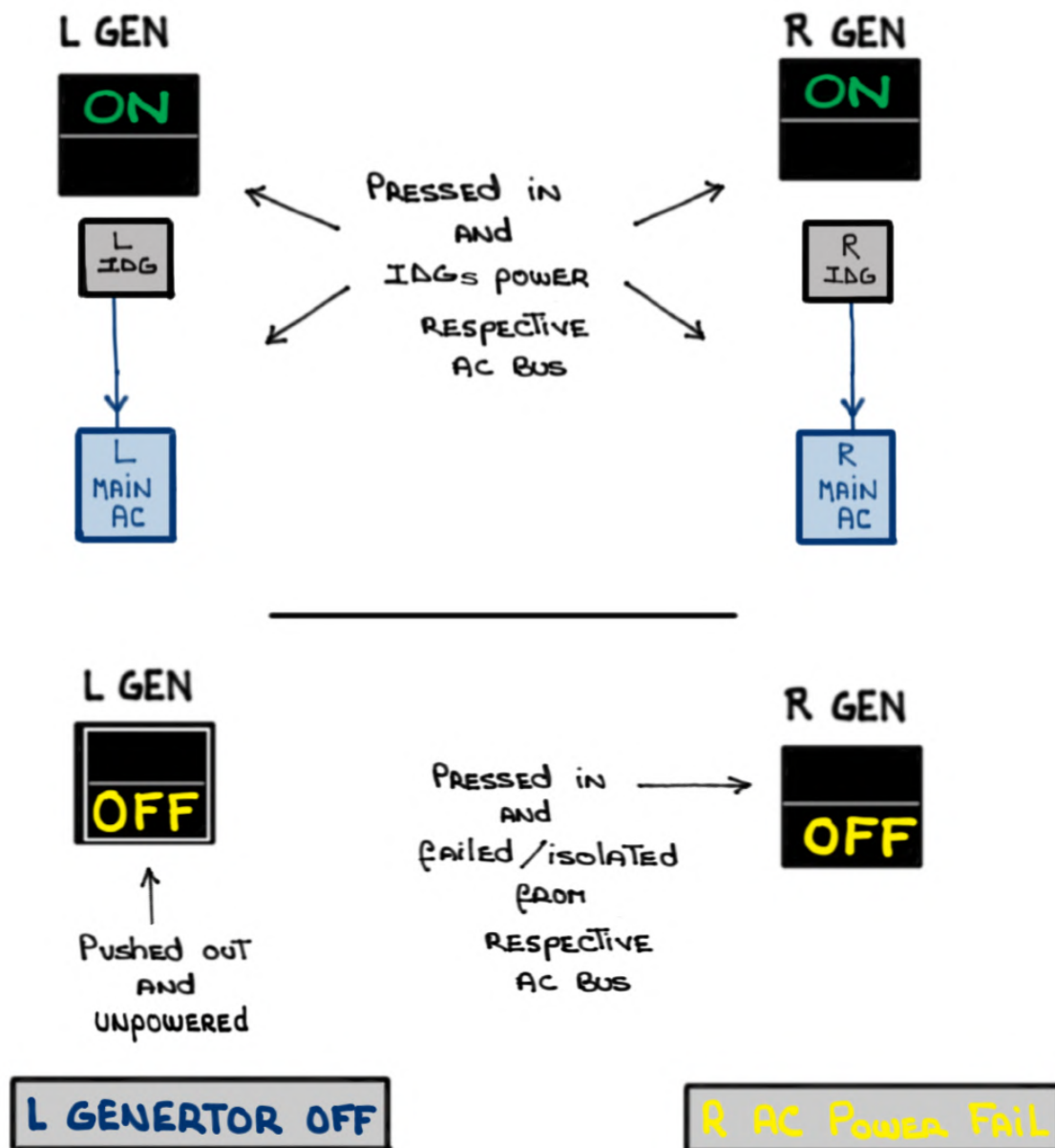
- IDG  $\left\{ \begin{array}{l} \text{CONSTANT SPEED DRIVE (CSD)} \\ \text{Oil-cooled GENERATOR (oil is cooled} \\ \text{by fan air)} \end{array} \right.$

• IDG  $\left\{ \begin{array}{l} \text{RATED AT } 40 \text{ KVA} \\ \text{PRODUCES: } 115 \text{ VAC} \\ 400 \text{ HERTZ} \\ 3\text{-PHASE} \end{array} \right.$

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

- Dispatch with AN IDG U/S is NOT PERMITTED AS PER AFM ois **G450-2016-03** APU SEALANT

- GENERATOR SWITCHES:



- Galley BUSES REQUIRE:

- ONE (1) GEN SOURCE ON THE GROUND
- TWO (2) GEN SOURCES IN THE AIR

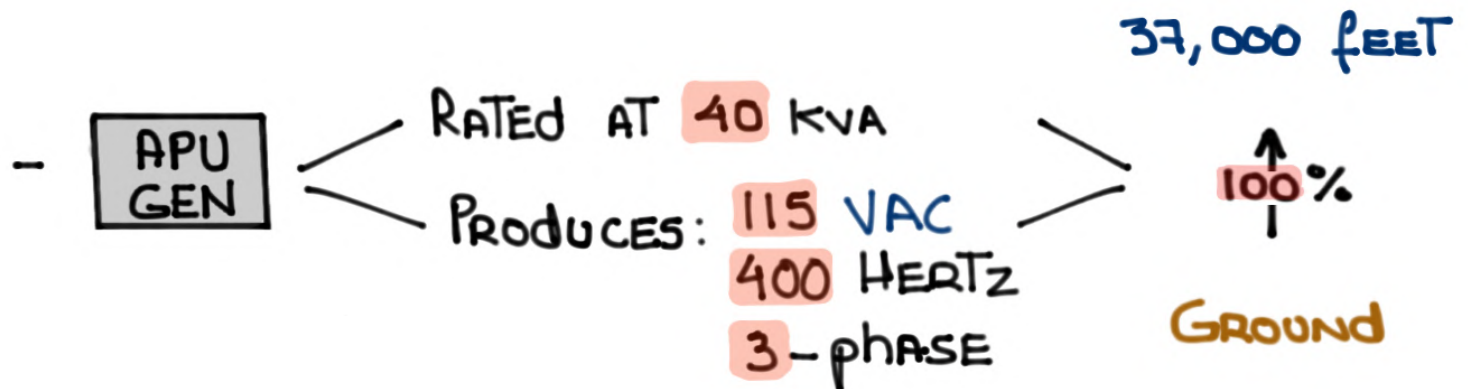
# Auxiliary Power Unit (APU) GENERATOR

- 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 **95%** RPM + **four (4)** seconds  
The APU generator comes online and can power  
All **AC** and **DC** buses



- REFER TO AFM OIS **G450-2016-03** APU SEALANT  
FOR APU INFLIGHT OPERATION LIMITATIONS

# Hydraulic Motor GENERATOR

- The Hydraulic Motor GENERATOR (HMG) is a backup AC GENERATOR

- The HMG is PART of THE Standby ELECTRICAL POWER SYSTEM

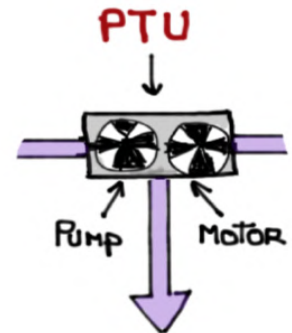
MASTER LESS R ESS



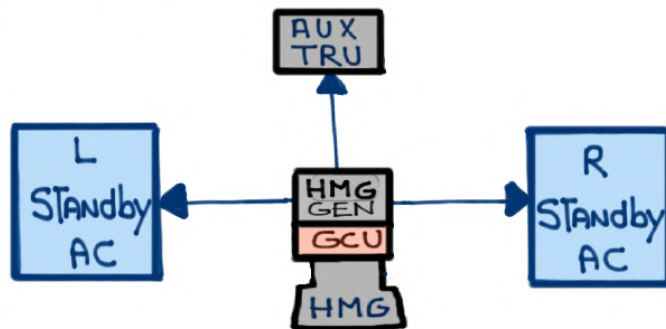
- The HMG is driven by:



OR



- The HMG POWERS:



RATED AT 5 KVA

PRODUCES:

115 VAC

400 HERTZ

3-PHASE

HMG Switch ON



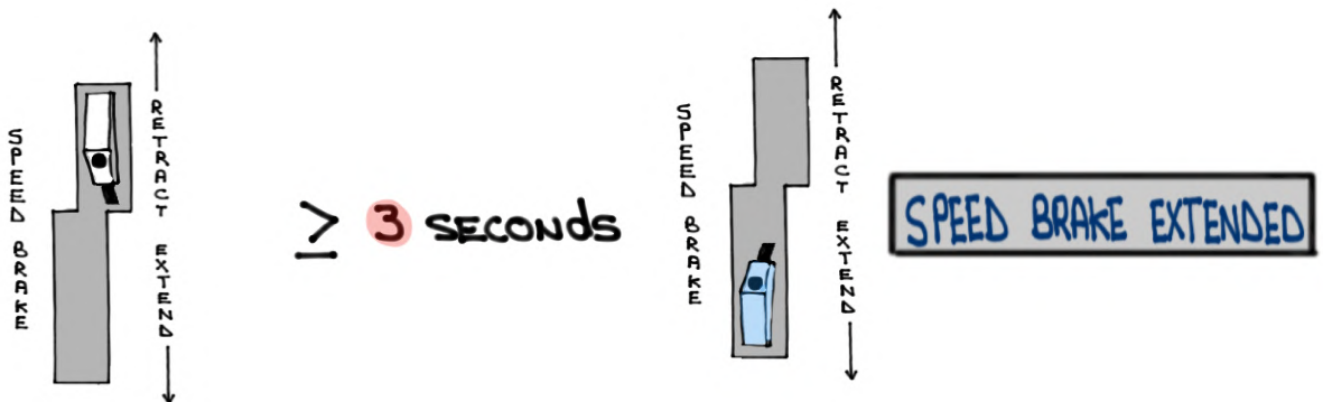
- The HMG produces **AC** power in the event of a dual ~~L IDG~~ ~~R IDG~~ AND ~~APU GEN~~ failure

- The HMG is located in the tail compartment

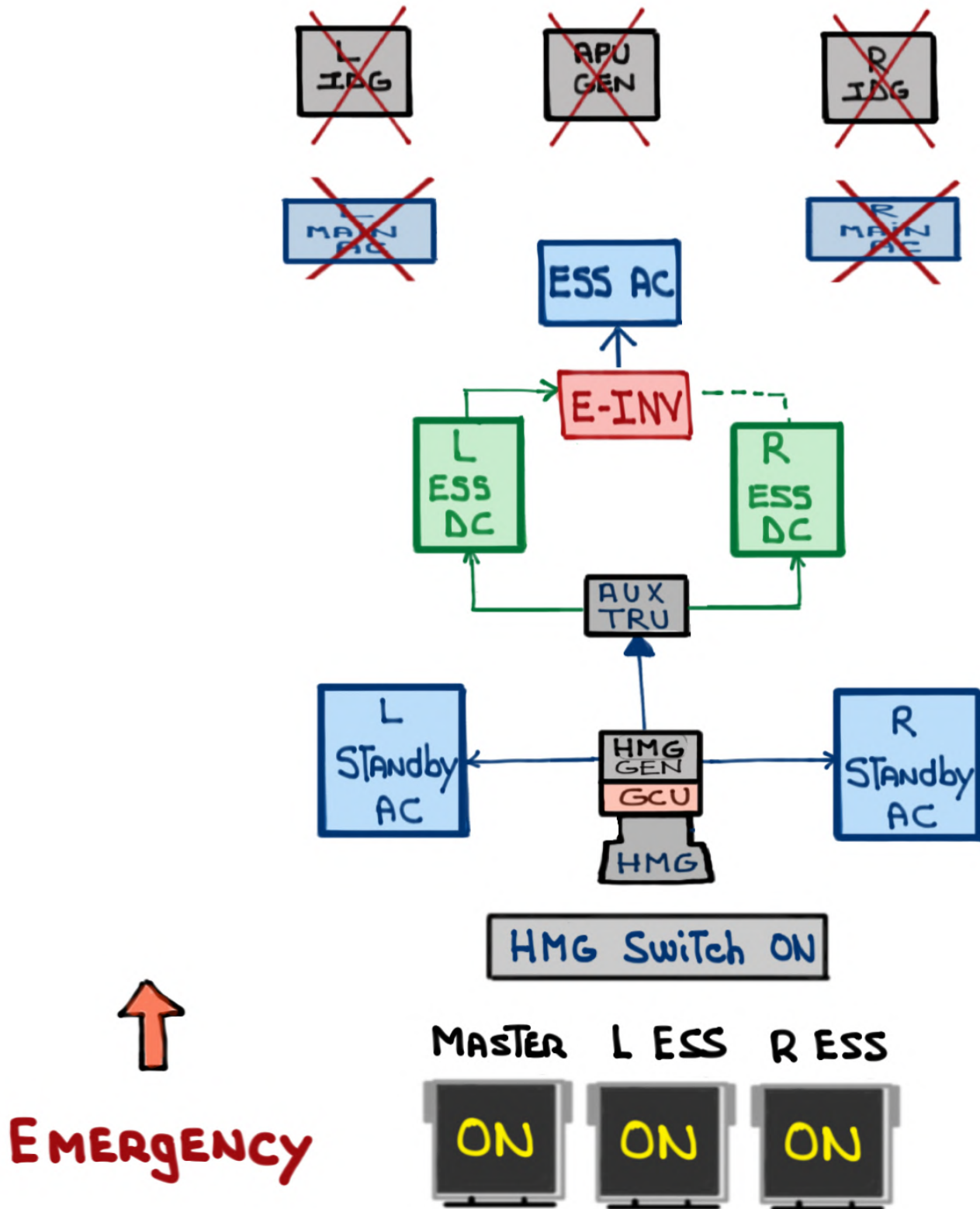
- With the HMG ON the thirty (30) minute limit on the main batteries is no longer a factor

- The **AUX TRU** produces **DC** voltage and will power the **L ESS DC** **R ESS DC** buses when selected by the crew with a ten (10) second interval between selections

- Speed brake deployment is OK as long as the handle is moved from stowed to fully extended in three (3) seconds OR MORE



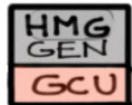
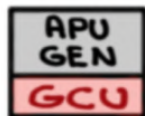
- HMG operation is permitted only when NORMAL AC POWER GENERATION is NOT AVAILABLE



# GENERATOR CONTROL UNITS (GCU)

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

- THERE ARE FOUR (4) GCUs:



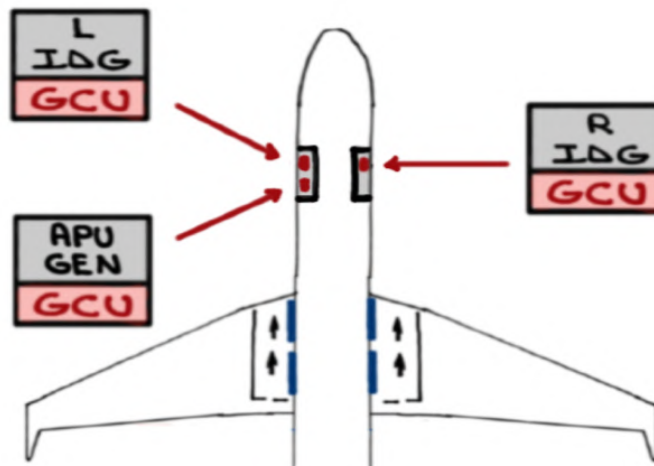
IDENTICAL

INDEPENDENT

INTERCHANGEABLE

NOT INTERCHANGEABLE

- GCUs ARE LOCATED IN THE LEER AND REER



- If GEN

VOLTAGE
FREQUENCY
AMPERAGE

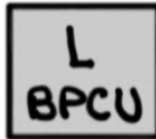
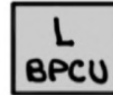


outside  
PARAMETERS =



GCU TAKES GEN offline

GCU NOTifies



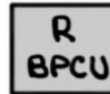
NOTifies CREW VIA CAS:

L AC POWER FAIL

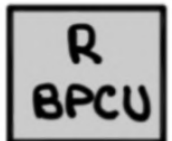
L GENERATOR FAIL

GCU TAKES GEN offline

GCU NOTifies



NOTifies CREW VIA CAS:



R AC POWER FAIL

R GENERATOR FAIL

- **GCU** CAN BE RESET by cycling ASSOCIATED GENERATOR switch

# EXTERNAL AC/DC POWER

- EXTERNAL AC POWER EXT PWR  
ON

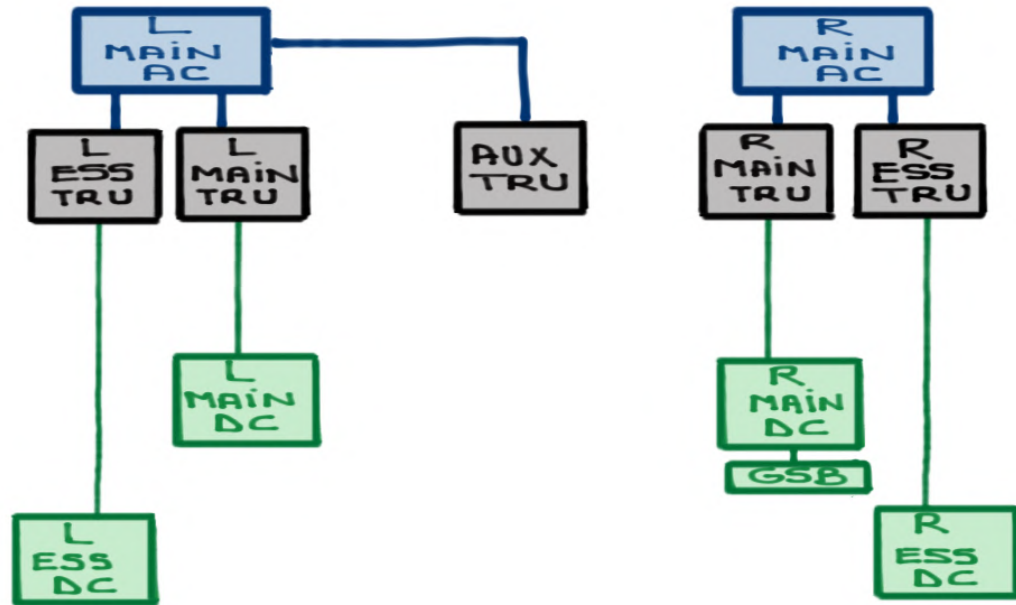
- RECEPTACLE IS LOCATED ON THE RIGHT SIDE OF THE FUSELAGE
- 30 KVA, 115 VAC, 400 Hz, 3 PHASE
- CAN POWER ALL AC BUSES AND THROUGH THE TRUs ALL DC BUSES ARE POWERED
- BPCU CHECKS QUALITY OF POWER BEFORE ALLOWING ONTO AIRCRAFT

- EXTERNAL DC POWER EXT PWR  
AVAIL

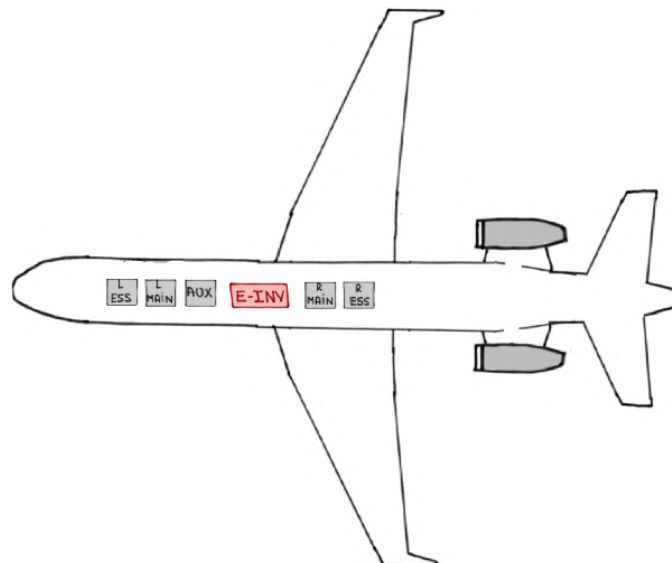
- RECEPTACLE IS LOCATED ON THE RIGHT SIDE OF THE FUSELAGE
- POWERS ALL DC BUSES
- CAN BE USED TO POWER THE GSB

# TRANSFORMER RECTIFIER UNITS (TRU)

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

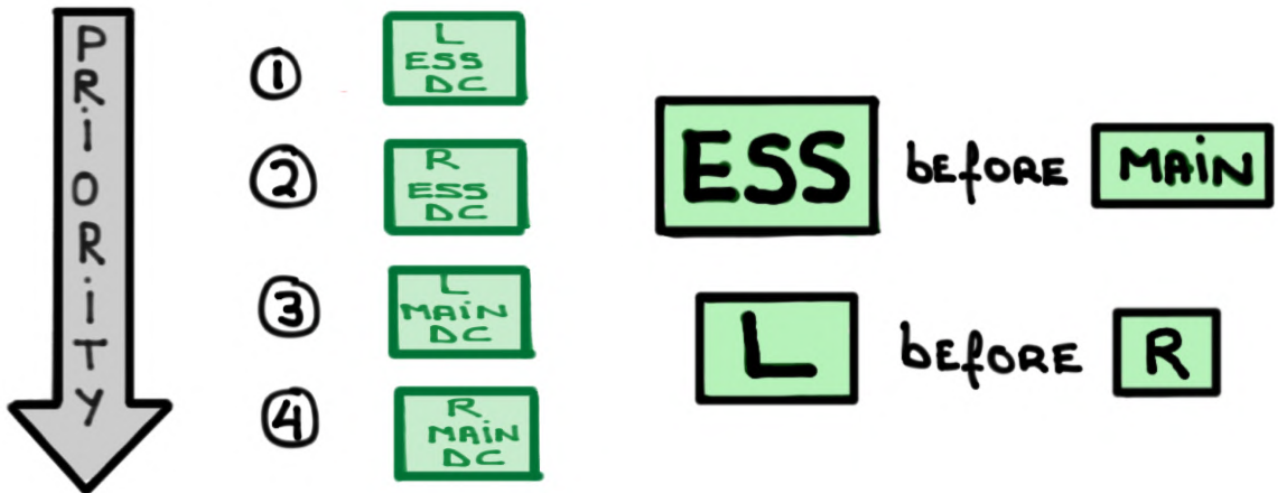


- TRUs ARE LOCATED UNDERNEATH THE FLOOR

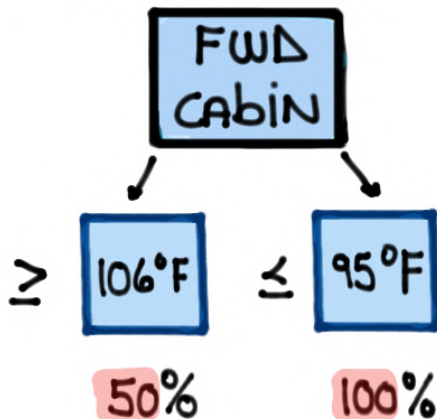


- **L ESS TRU** **L MAIN TRU** **R MAIN TRU** **R ESS TRU** POWER THEIR OWN BUSES

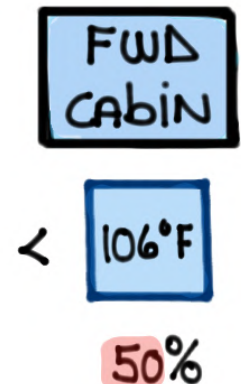
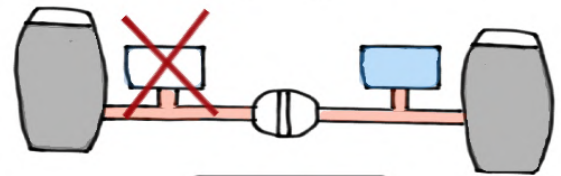
- **AUX TRU** POWERS THE **L AUX DC** **R AUX DC** BUSES AND WILL TAKE OVER THE DUTIES OF A FAILED ~~ESS~~ OR ~~MAIN~~ TRU USING THE FOLLOWING PRIORITY PROCESS:



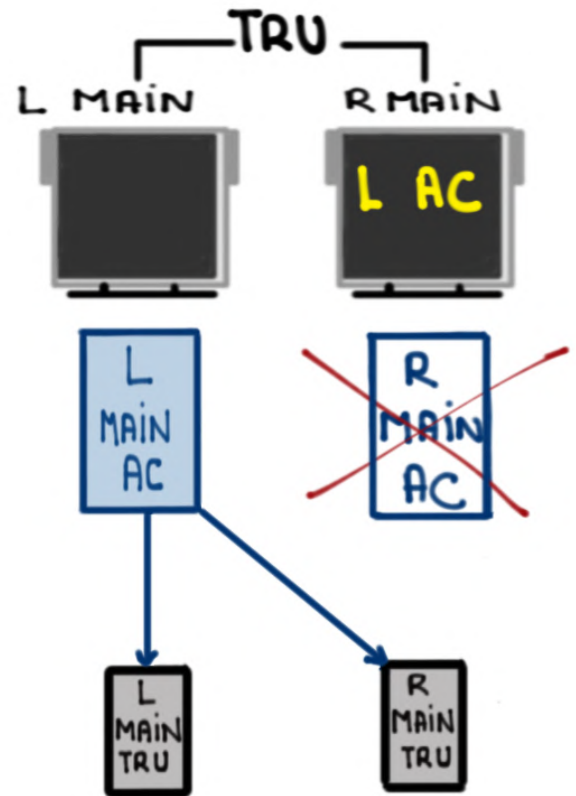
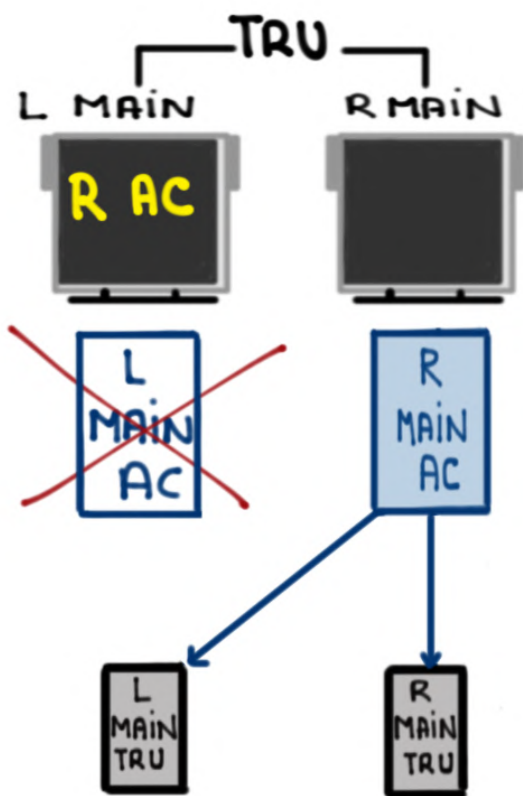
- TRU LOAD LIMITS (ON 03-02-00):



Single pack:



- TRU switches allow opposite **MAIN AC** bus To power A **MAIN TRU** THAT LOST POWER DUE TO THE FAILURE OF ITS OWN ~~MAIN AC~~ bus



- TRUS ARE RATED AT **250** AMPS



# GROUND SERVICE BUS

- WHEN YOU DON'T WANT TO WAKE UP THE BEAST

- **GROUND OPERATIONS** (APU shutdown)

- REFUELING OPERATIONS
- ENGINE OIL SERVICING
- POTABLE WATER SERVICING
- HYDRAULIC FLUID SERVICING
- OPERATION OF WHEEL WELL LIGHTS

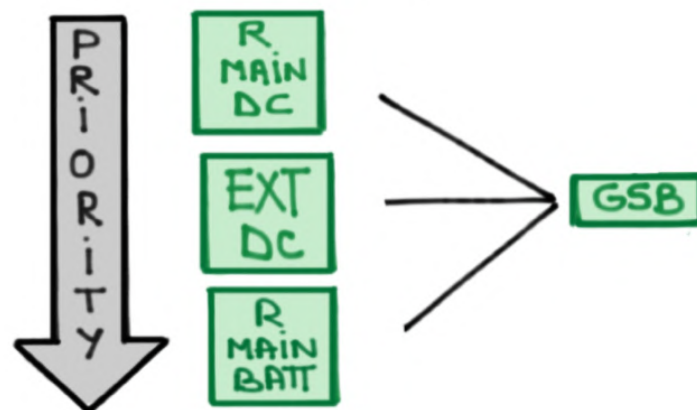
**ON**

GND SYNC BUS

- THREE (3) **GSB** switches:

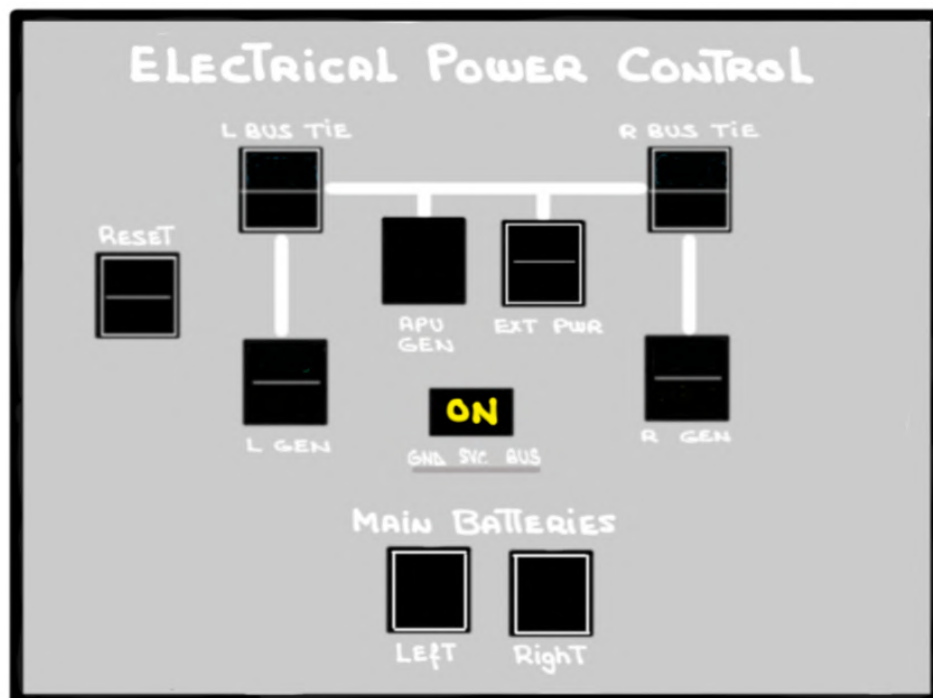
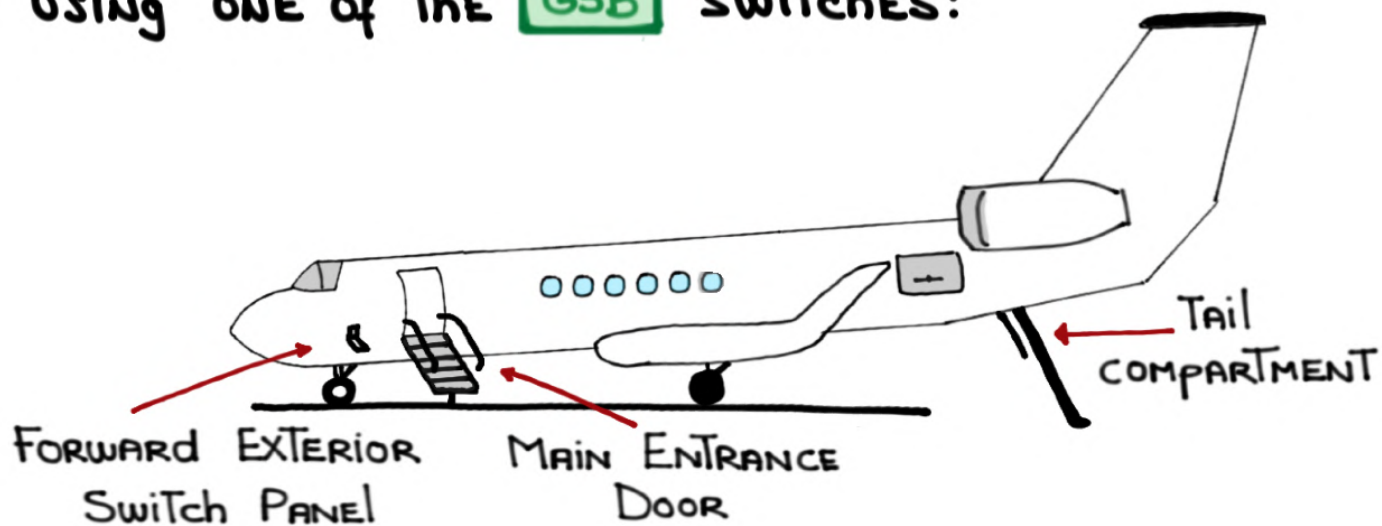
- FORWARD EXTERIOR SWITCH PANEL
- SYSTEM MONITOR/TEST PANEL
- TAIL COMPARTMENT

- POWER SOURCES (PRIORITY):



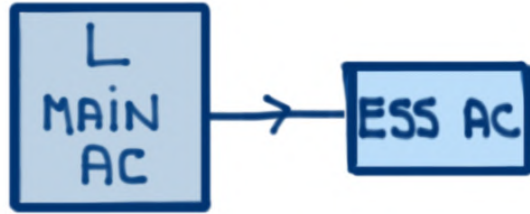
- ROTATING BEACON light is powered by The **GSB** when The **R MAIN BATT** is The SOURCE of power

- AT LEAST ONE of THE following MUST BE OPEN when USING ONE of THE **GSB** switches:



# E-INVERTER

- The **ESS AC** bus is normally powered by The **L MAIN AC** bus

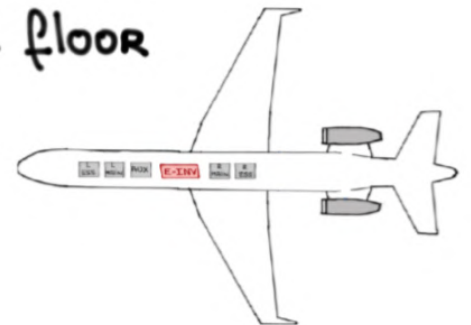


- If **L MAIN AC** bus power is NOT available The **ESS AC** bus can also be powered by The **R MAIN AC** bus



- The **E-INV** is a backup source of **AC** power to The **ESS AC** bus (Phase A only) by converting **28 VDC** to **115 VAC**

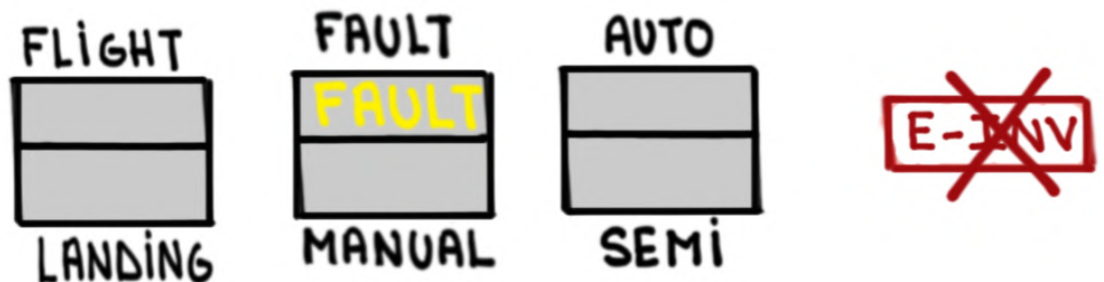
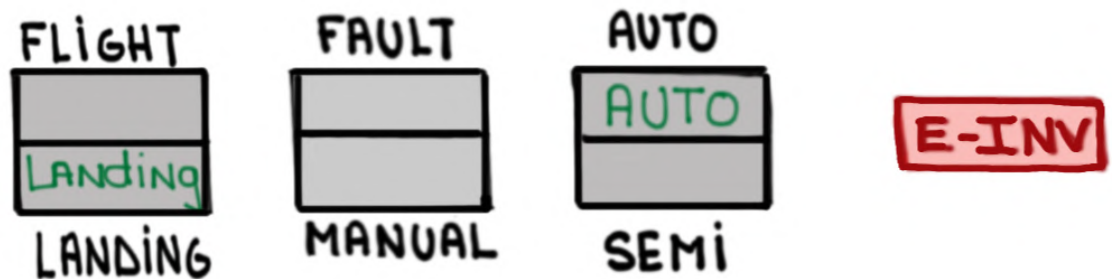
- The **E-INV** is located UNDERNEATH THE FLOOR



- **E-INV** provides:  
115 VAC  
400 hz  
1 KVA

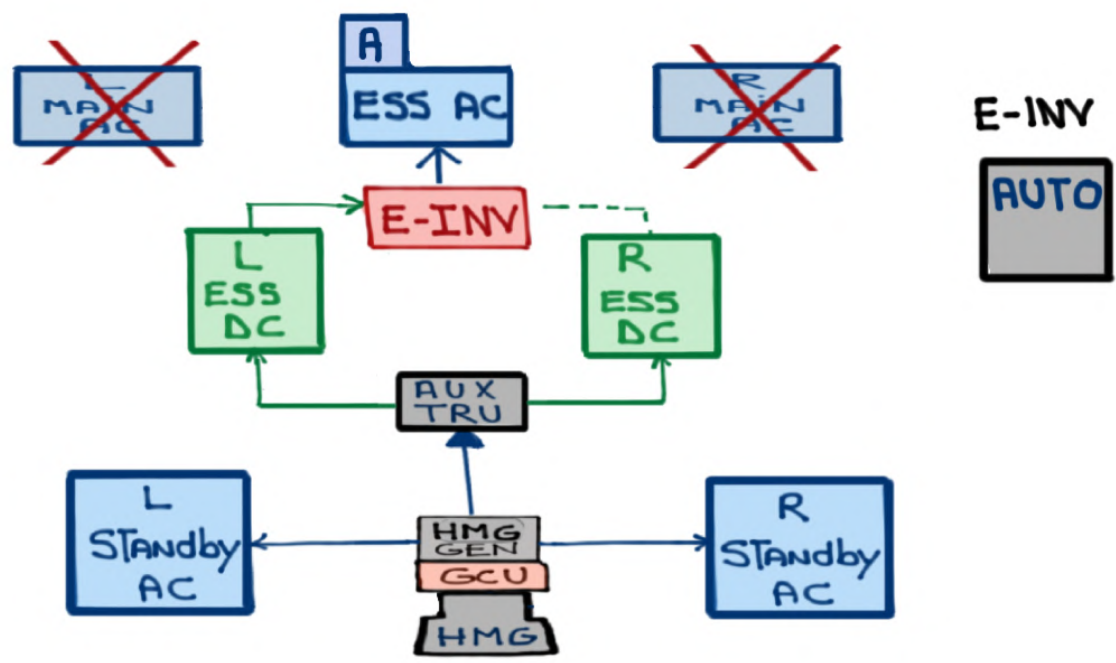
- The **E-INV** has been RENAMED Standby Inverter
- In The EVENT of failure The **E-INV** CAN BE DEFERRED IN ACCORDANCE WITH THE MINIMUM EQUIPMENT LIST (MEL)
- DURING THE PRE-flight inspection with MAIN BATTERY SWITCHES PRESSED IN AND NO **AC** POWER AVAILABLE OPERATION OF THE **E-INV** CAN BE CONFIRMED AS FOLLOWS:

## CABIN PRESSURE CONTROL

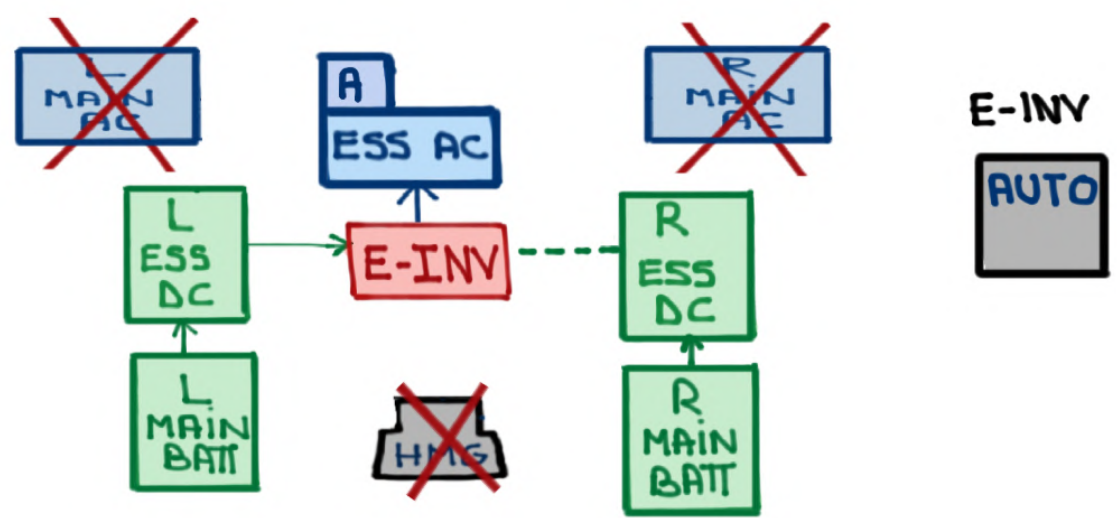


- PHASE A (ØA): CABIN PRESSURE CHANNEL 1, R PITOT HEATER AND STANDBY PITOT HEATER

- In the unlikely event that normal (IDG) or back up AC power (APU GEN) is NOT available the ~~HMG~~ can continue to power the **E-INV**



- In the unlikely event that the ~~HMG~~ is NOT available the MAIN BATTERIES can power the **E-INV**



# MAIN BATTERIES

- Two (2) MAIN BATTERIES



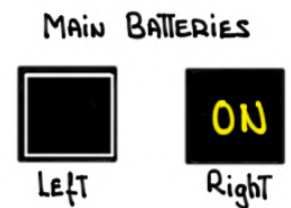
- LOCATED IN THE TAIL COMPARTMENT
- Nicad, 24 cells, 90 pounds EACH
- 24 VDC, 45 AMP/HOUR
- PURPOSE:

① START THE APU





If  < 22 VOLTS AND THE  IS  $\geq$  22 VOLTS

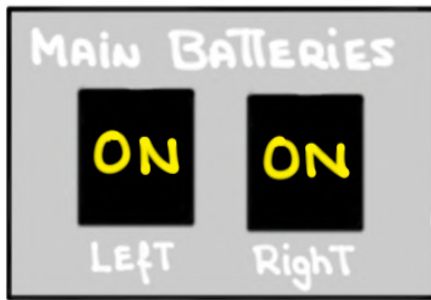
THE  MUST BE SELECTED OFF

TO UTILIZE THE  FOR APU START



② OPERATE AUX HYDRAULIC PUMP - BOTH  

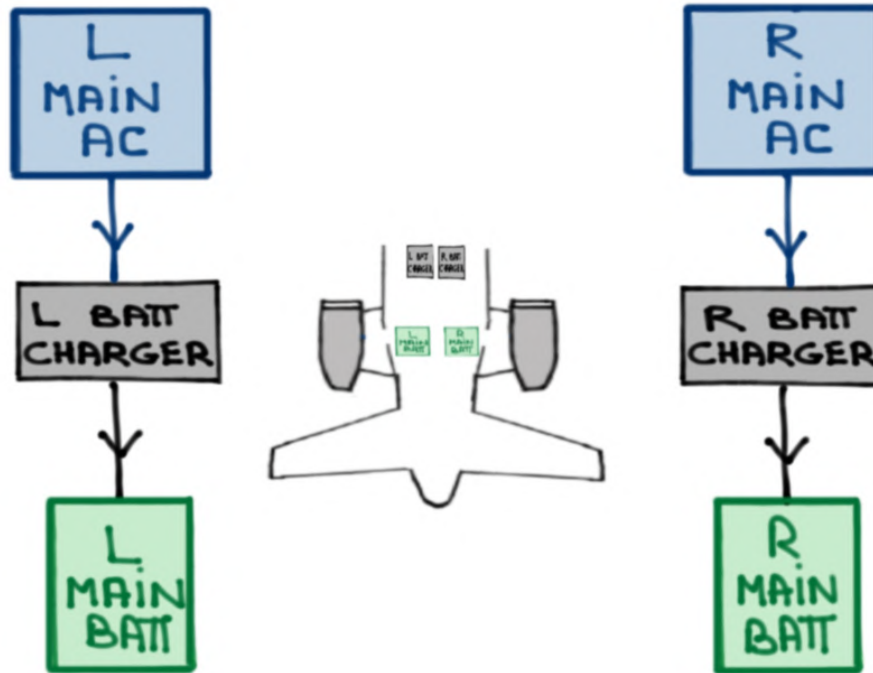
③ POWER   BUSES - BOTH   IF NO OTHER SOURCE OF DC POWER IS AVAILABLE



Switchlights illuminate to indicate that the batteries are discharging

- MAIN BATTERIES CAN POWER THE ESS DC BUSES FOR THIRTY (30) MINUTES AFTER TWO (2) FAILED APU START ATTEMPTS
- MUST BE REMOVED FROM THE AIRCRAFT IN COLD SOAKED CONDITIONS ( $\leq 20^{\circ}\text{C}$ ) AND STORED IN A LOCATION WARMER THAN  $-20^{\circ}\text{C}$  AND COOLER THAN  $+40^{\circ}\text{C}$

- The **L MAIN BATT** **R MAIN BATT** ARE NORMALLY RECHARGED BY THE **MAIN AC** BUSES



- The MAIN BATTERY CHARGERS ARE LOCATED IN THE TAIL COMPARTMENT



# EMERGENCY BATTERIES

## - EMERGENCY POWER SYSTEM



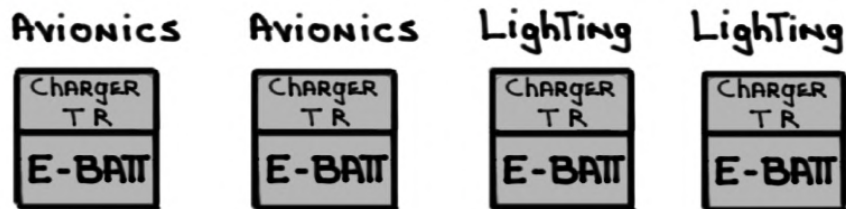
FORWARD E LTG BATTERY ON

L-R EMERGENCY BATTERY ON

AFT E LIGHTING BATTERY ON

- POWER of LAST RESOURCE
- SEALED LEAD ACID. THIRTY (30) APPROXIMATELY
- 24 Volts DC, 9 amp/hour
- ON when L  
ESS  
DC AND/OR R  
ESS  
DC BUSES < 20 Volts, EVEN MOMENTARILY

## - FOUR (4) E-BATTs:



## - POWER THE following BUSES:

L EMERGENCY  
DC BUS

ESSENTIAL Flight  
INSTRUMENTS BUS

R EMERGENCY  
DC BUS

- AFTER A BREAK POWER TRANSFER THE E-BATTs  
will COME ON

- When 

ON
LIGHTS
AV POWER

 The following EQUIPMENT is POWERED:

- EMERGENCY LIGHTING

- CABIN EMERGENCY LIGHTS

- EXTERIOR EMERGENCY LIGHTS

- PILOT'S AUDIO CONTROL PANEL (ACP)

- MCDU 1 - STBY ENGINE INSTRUMENTS

- MCDU 3 - BACKUP RADIOS (VHF1/NAV1)

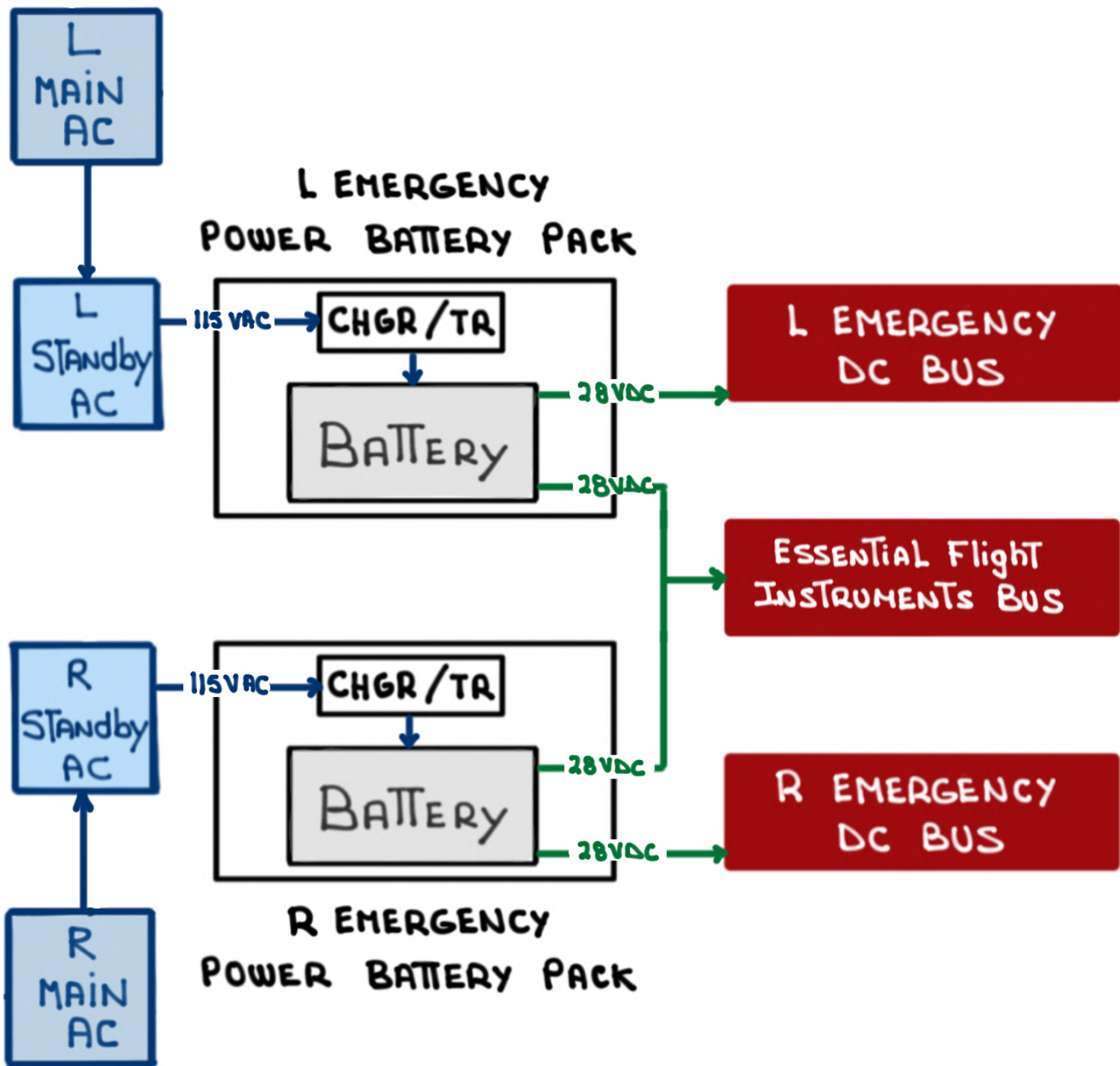
- Two (2) clocks

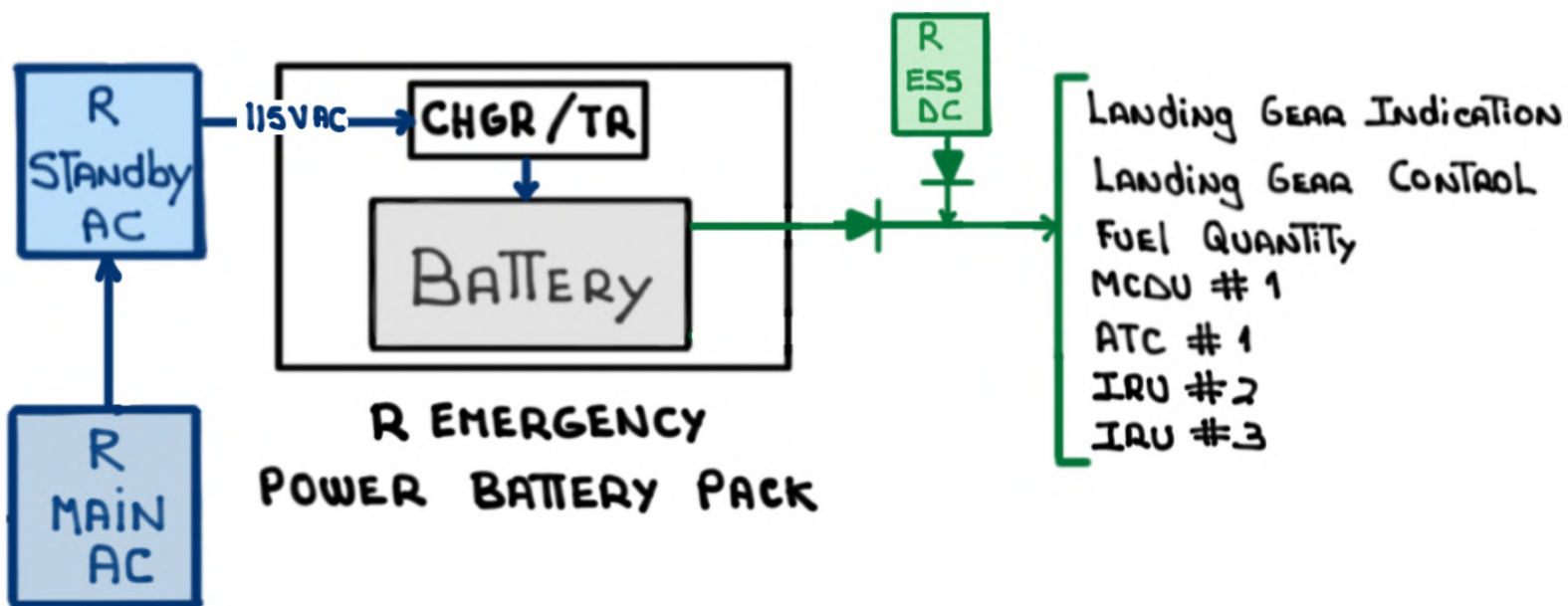
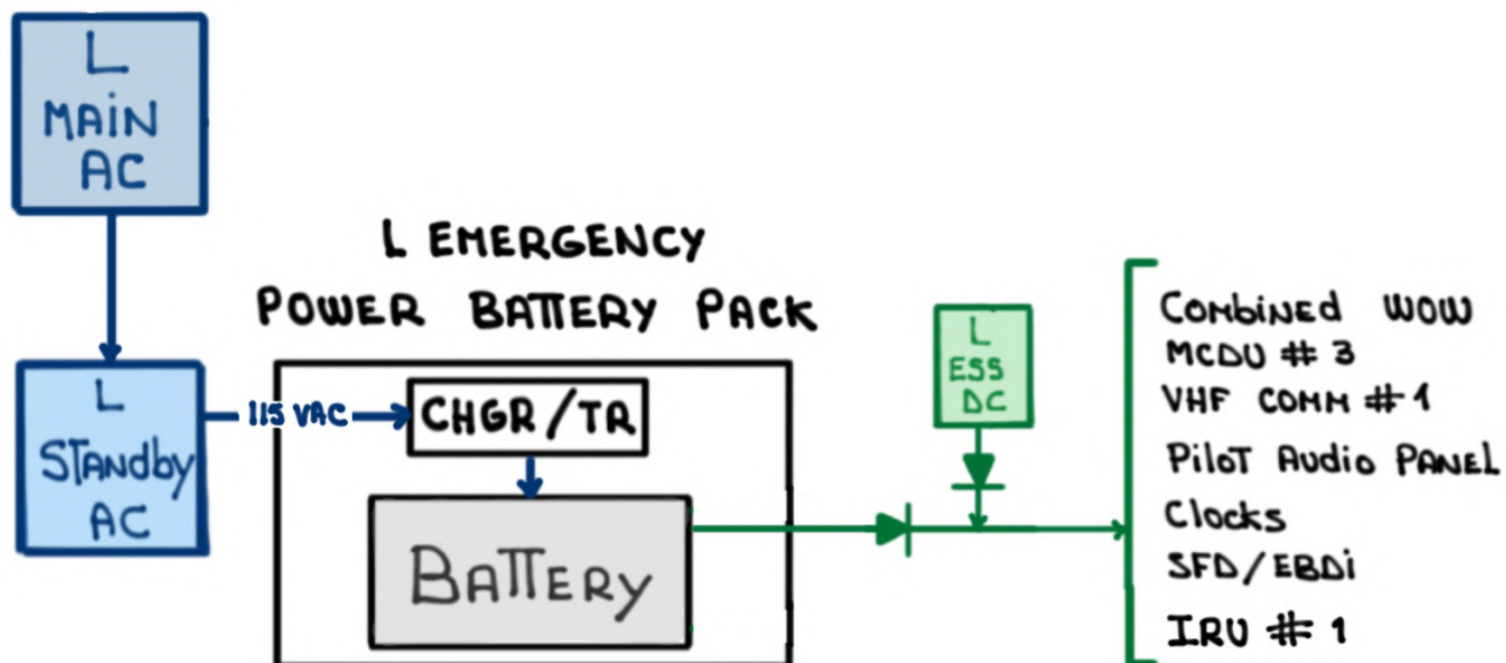
- STANDBY FLIGHT DISPLAY (SFD)

- ELECTRONIC BEARING & DISTANCE INDICATOR (EBDI)

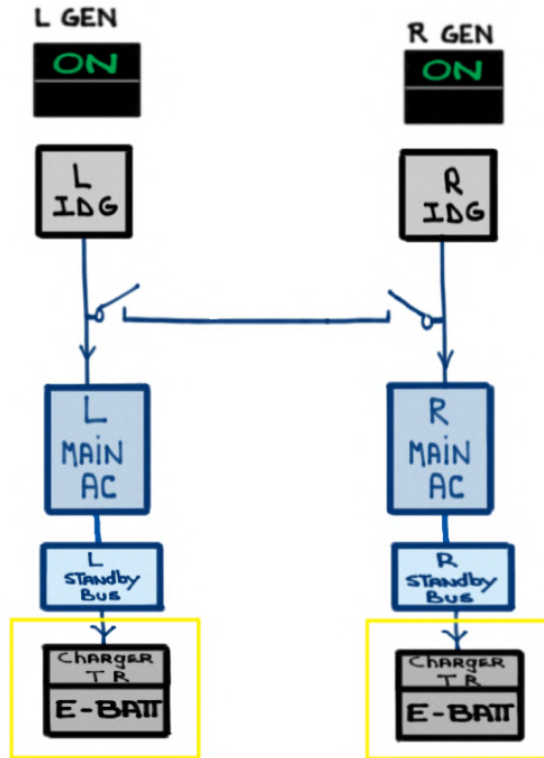
- LANDING GEAR INDICATION

- AN INTEGRATED CHARGER/TRANSFORMER RECTIFIER  
RECHARGES THE E-BATTs

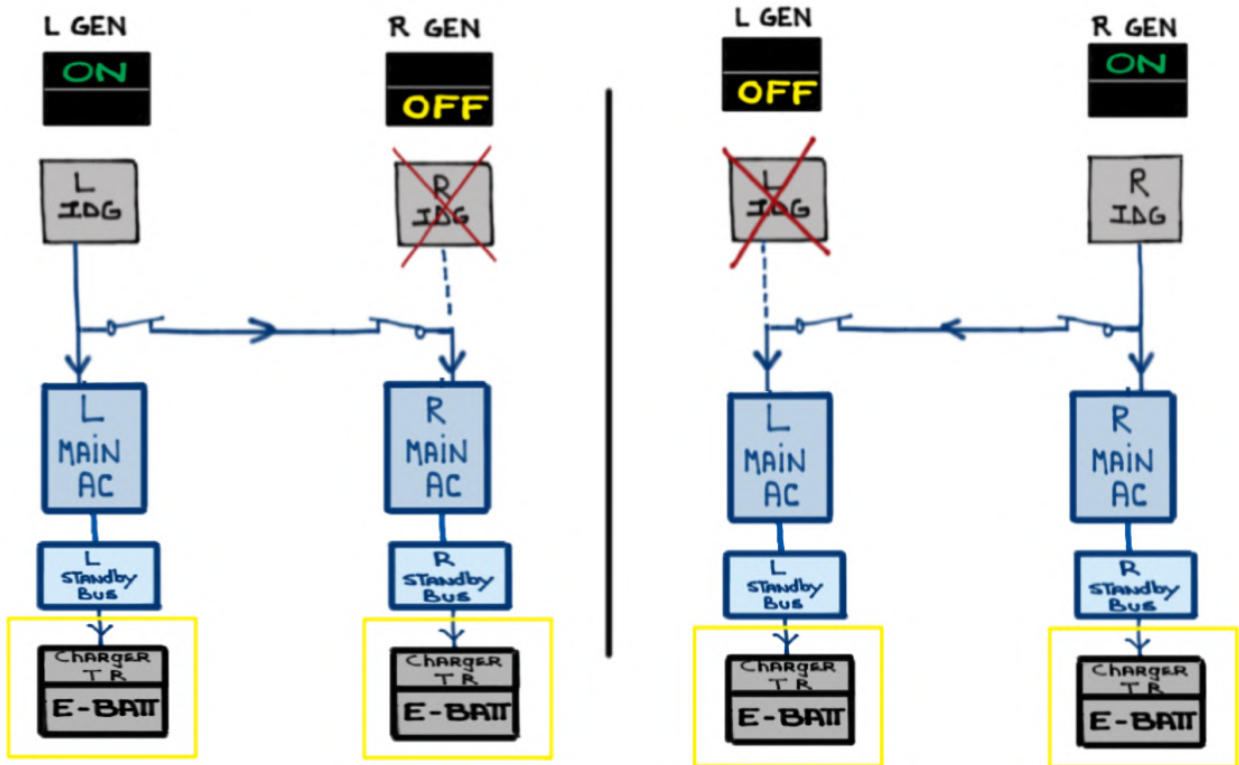




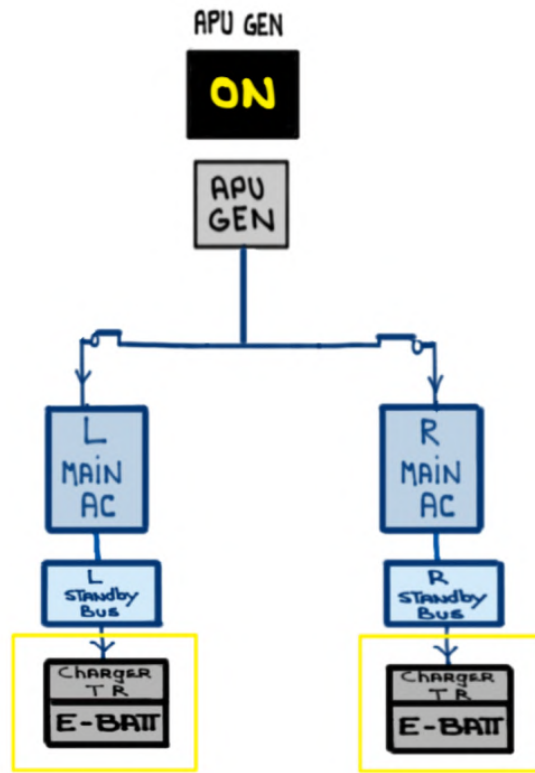
① Both IDGs



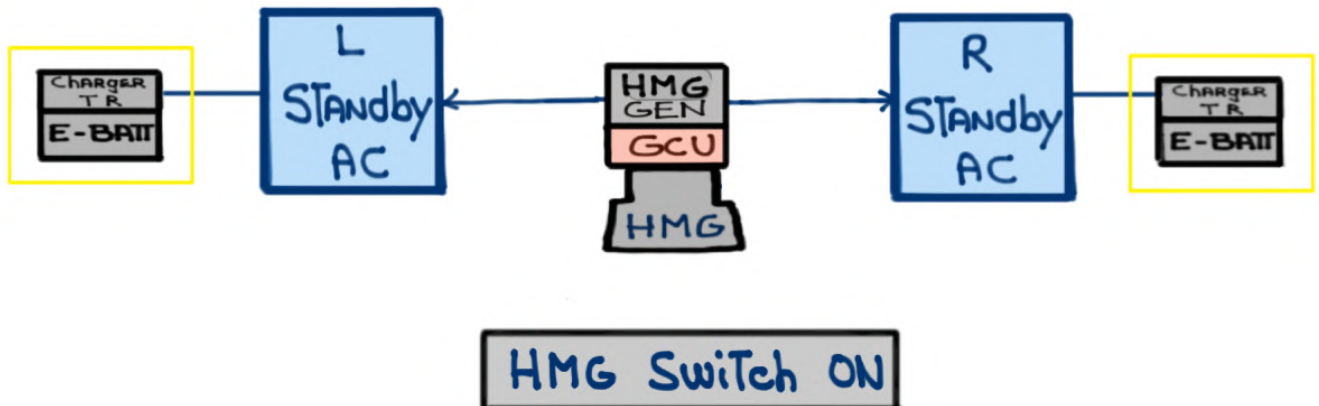
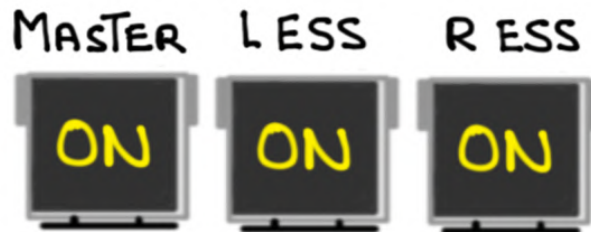
② ONE IDG only

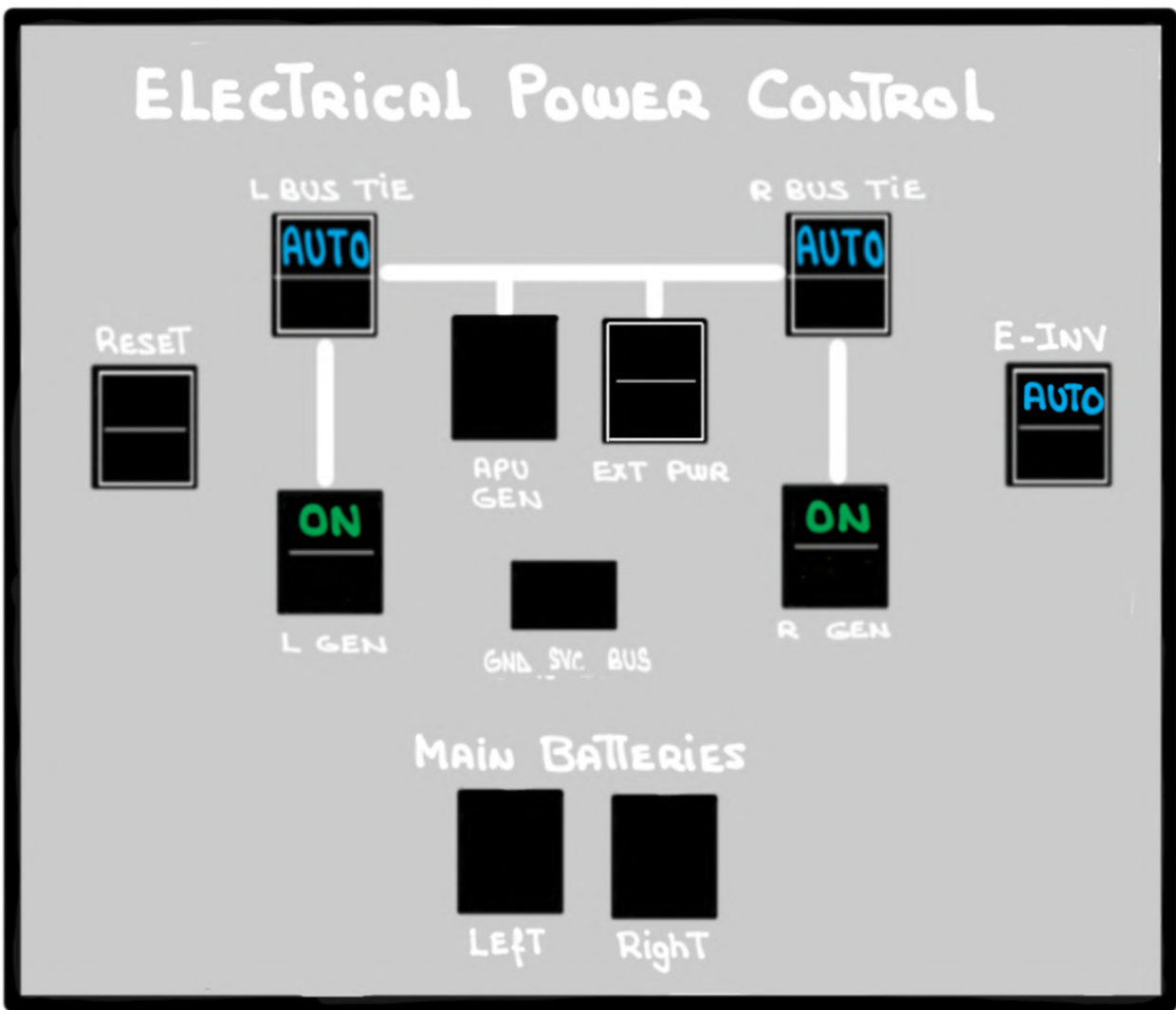


③ APU GEN  
only



④ HMG GEN  
only





THREE (3) BLUE

TWO (2) GREEN

SIX (6) BLACK

FIVE (5) SWITCHLIGHTS PRESSED IN



FIVE (5) SWITCHLIGHTS PUSHED OUT



# NORMAL - EMERGENCY

NORMAL



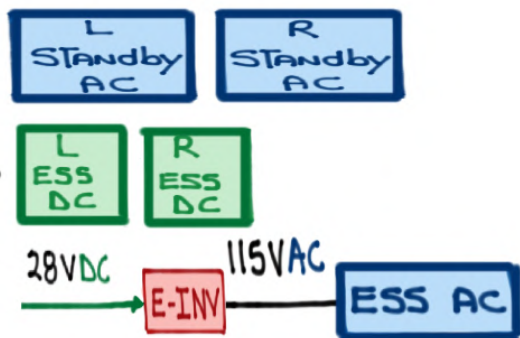
- All AC AND DC BUSES



- All AC AND DC BUSES

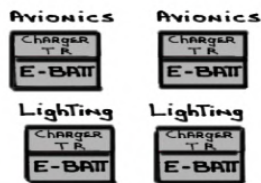


- All AC AND DC BUSES

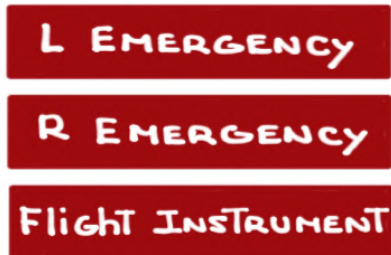


00:30 MINUTES

(2 APU START ATTEMPTS)



(ESS DC BUSES < 20 Volts)



00:30 MINUTES (APPROXIMATELY)

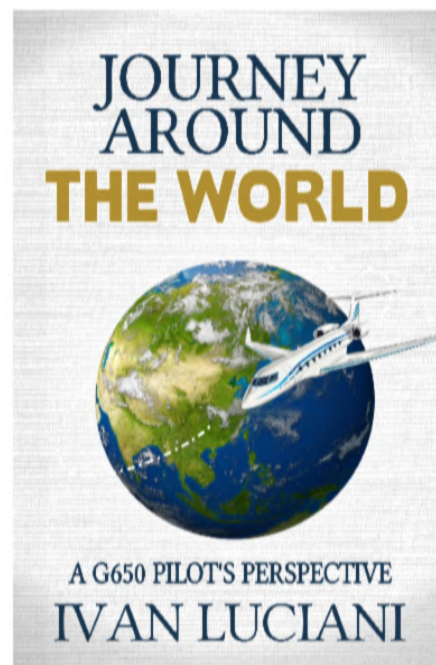
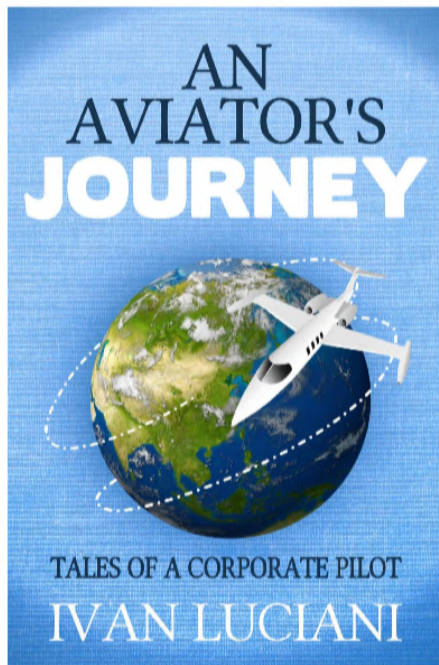
EMERGENCY



**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:  
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Thank you!