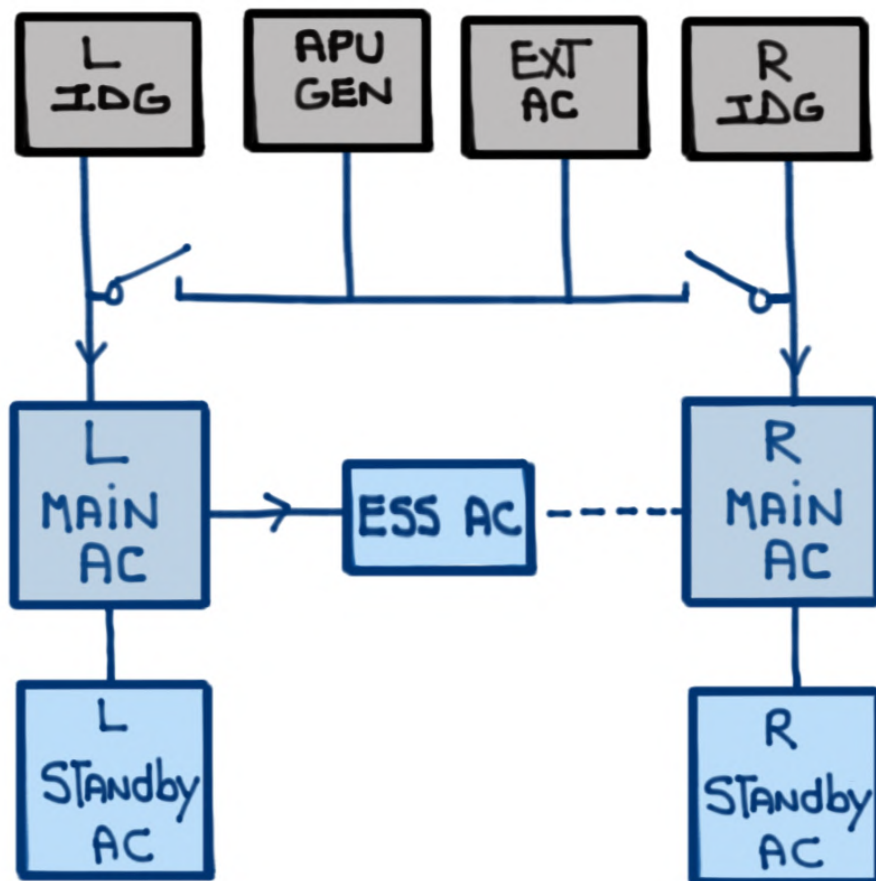


G450 ELECTRICAL System



For study purposes only

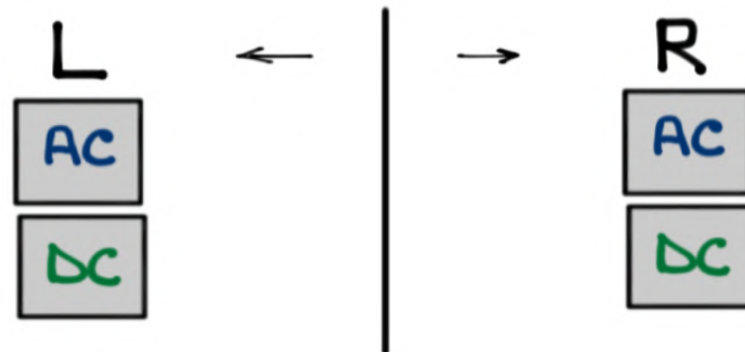
- The ELECTRICAL Power System produces:



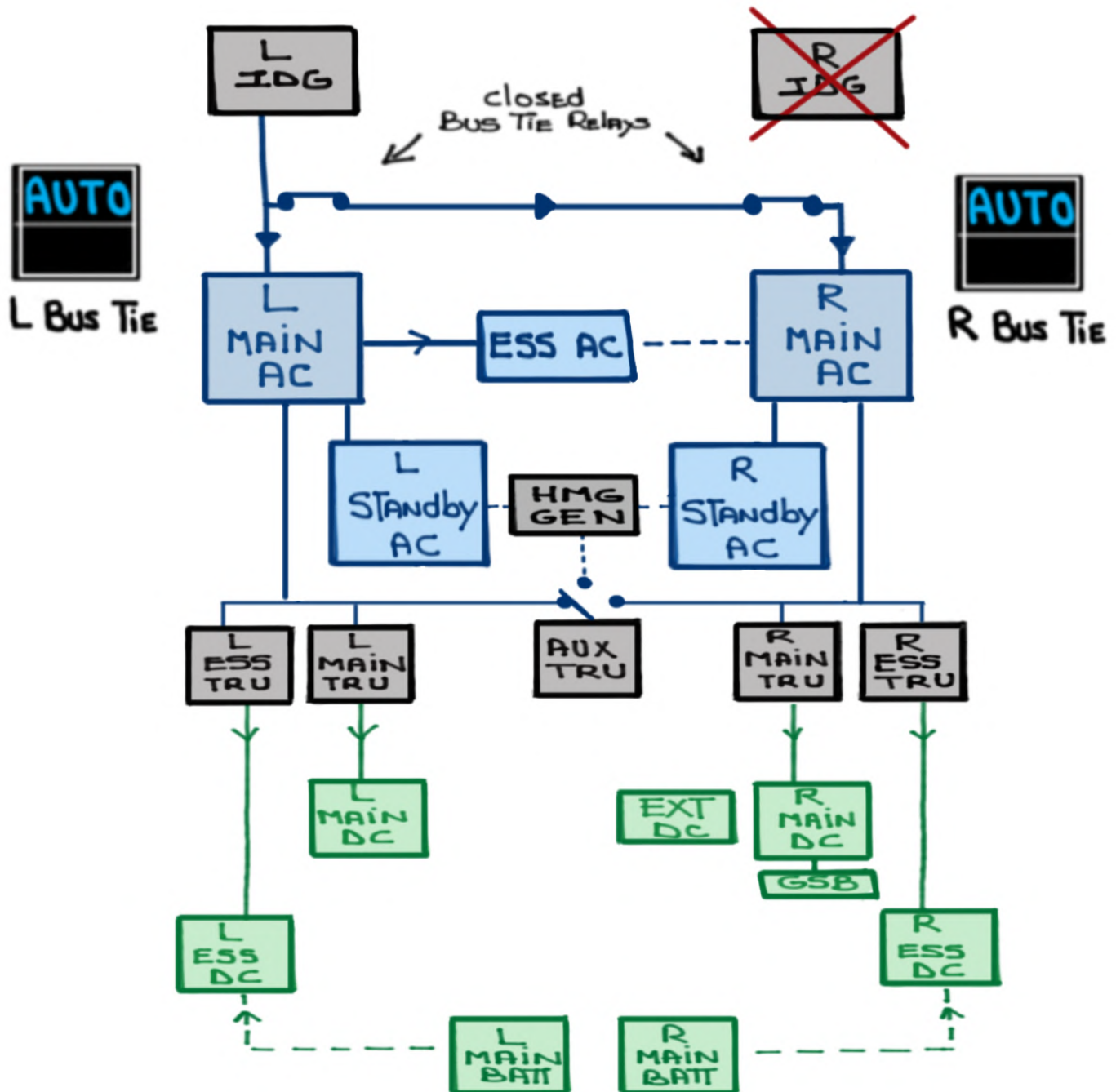
- 115 Volts AC is GENERATED in order To PRODUCE 28 Volts DC via TRANSFORMER RECTIFIER UNITS (TRU)



- Two (2) SEPARATE SYSTEMS/NETWORKS



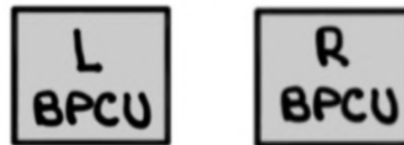
- A split bus system prevents a short on one side from affecting the other side
- Operative side can power the inoperative side



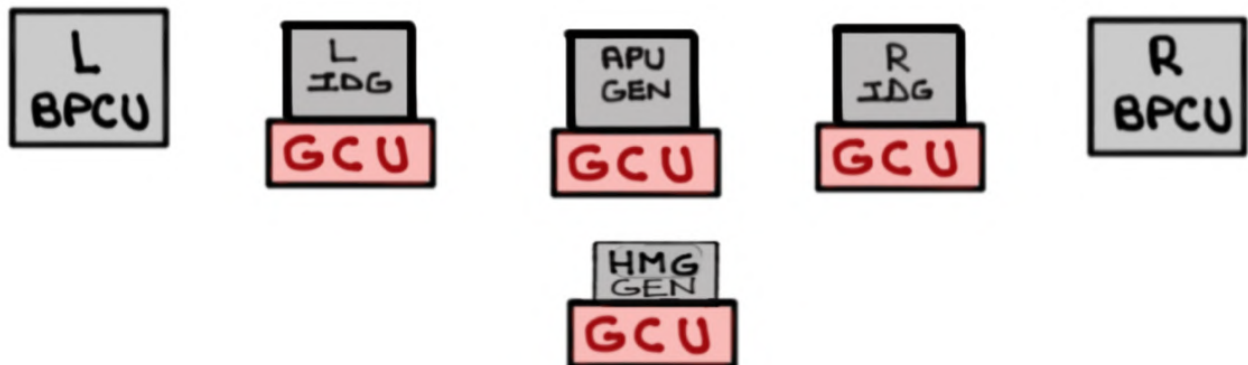
- POWER DISTRIBUTION BOXES (PDB):



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

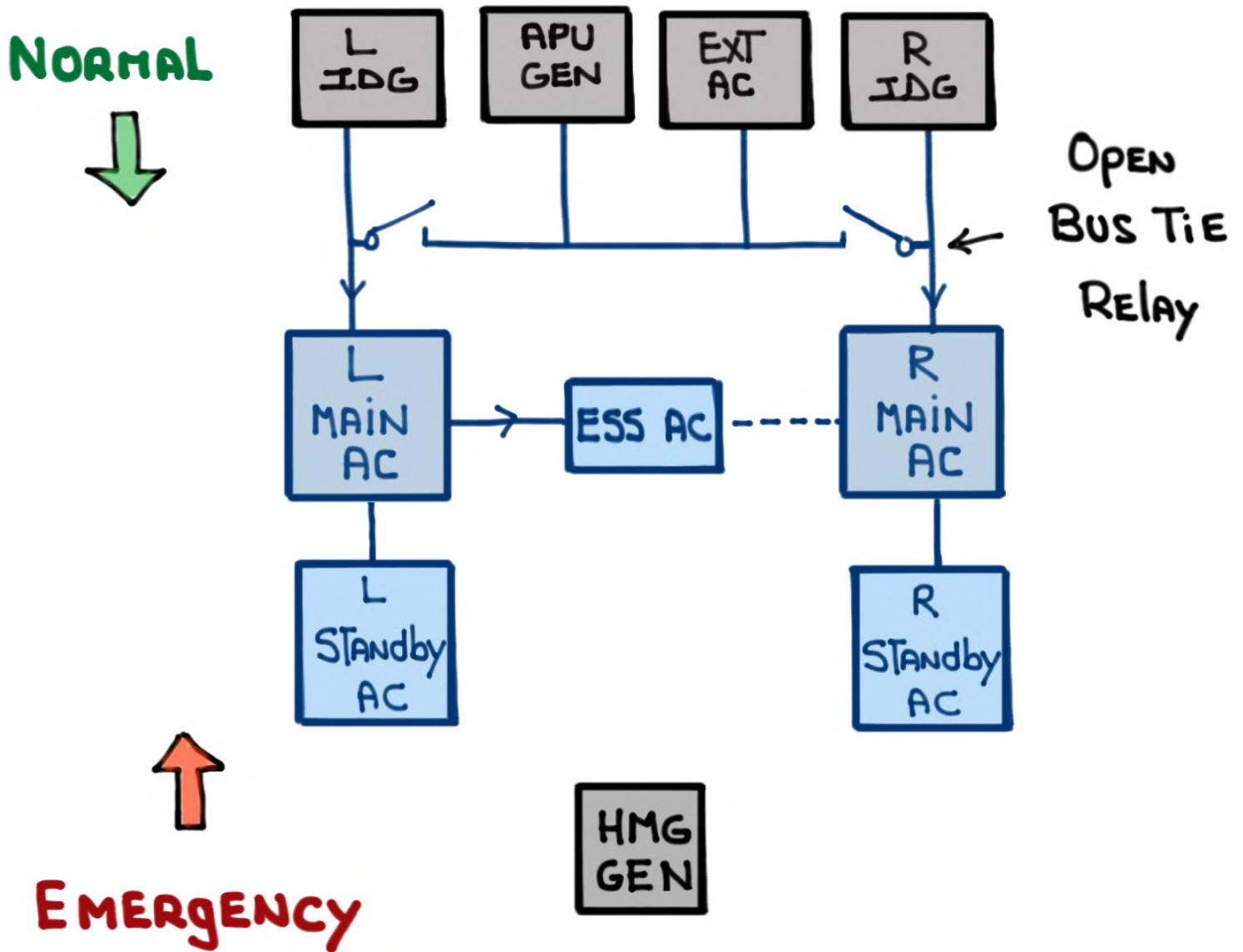


- THERE ARE SIX (6) MICROPROCESSORS (BPCUs AND GCUs):



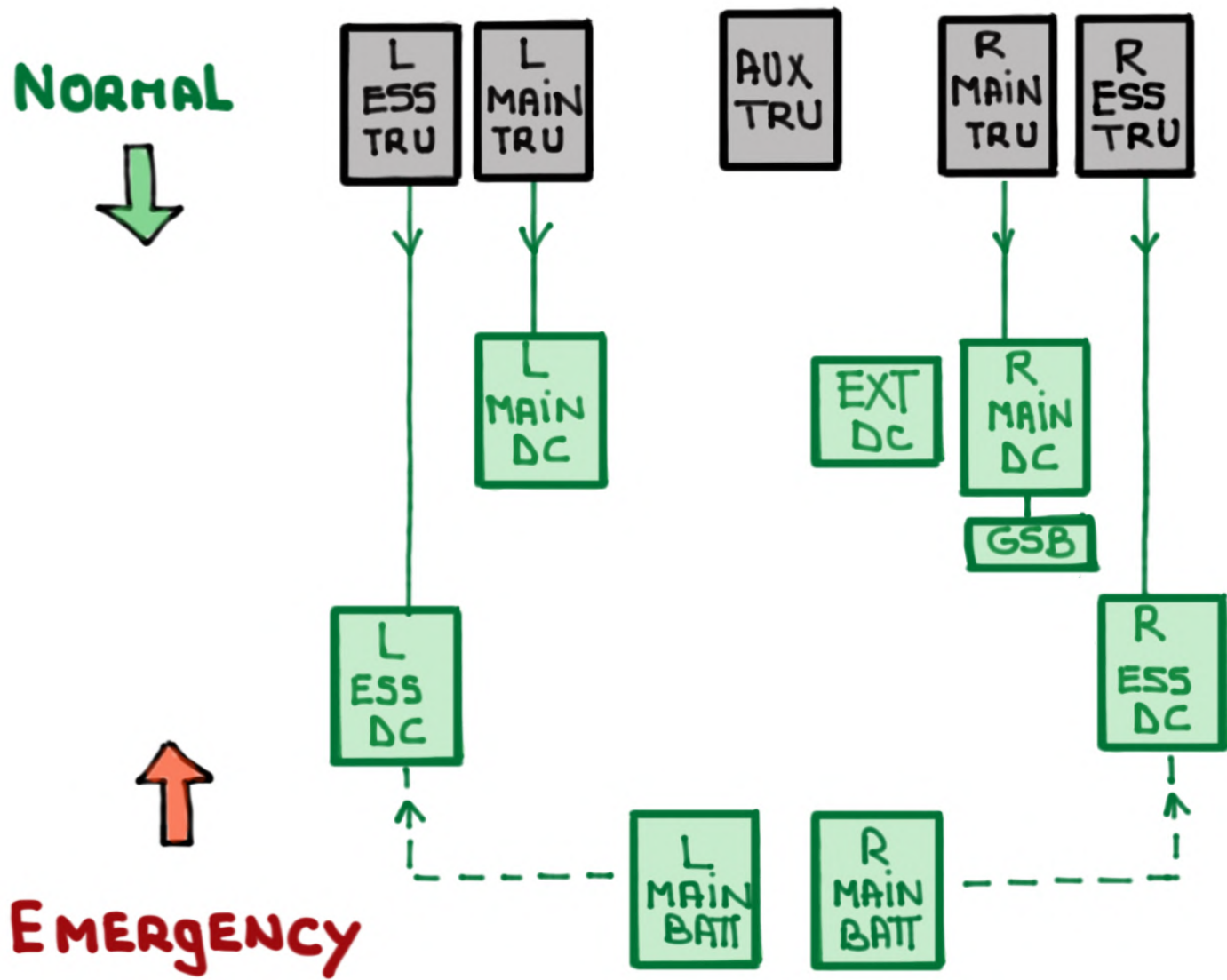
- AC SYSTEM:

115 VAC is GENERATED by:

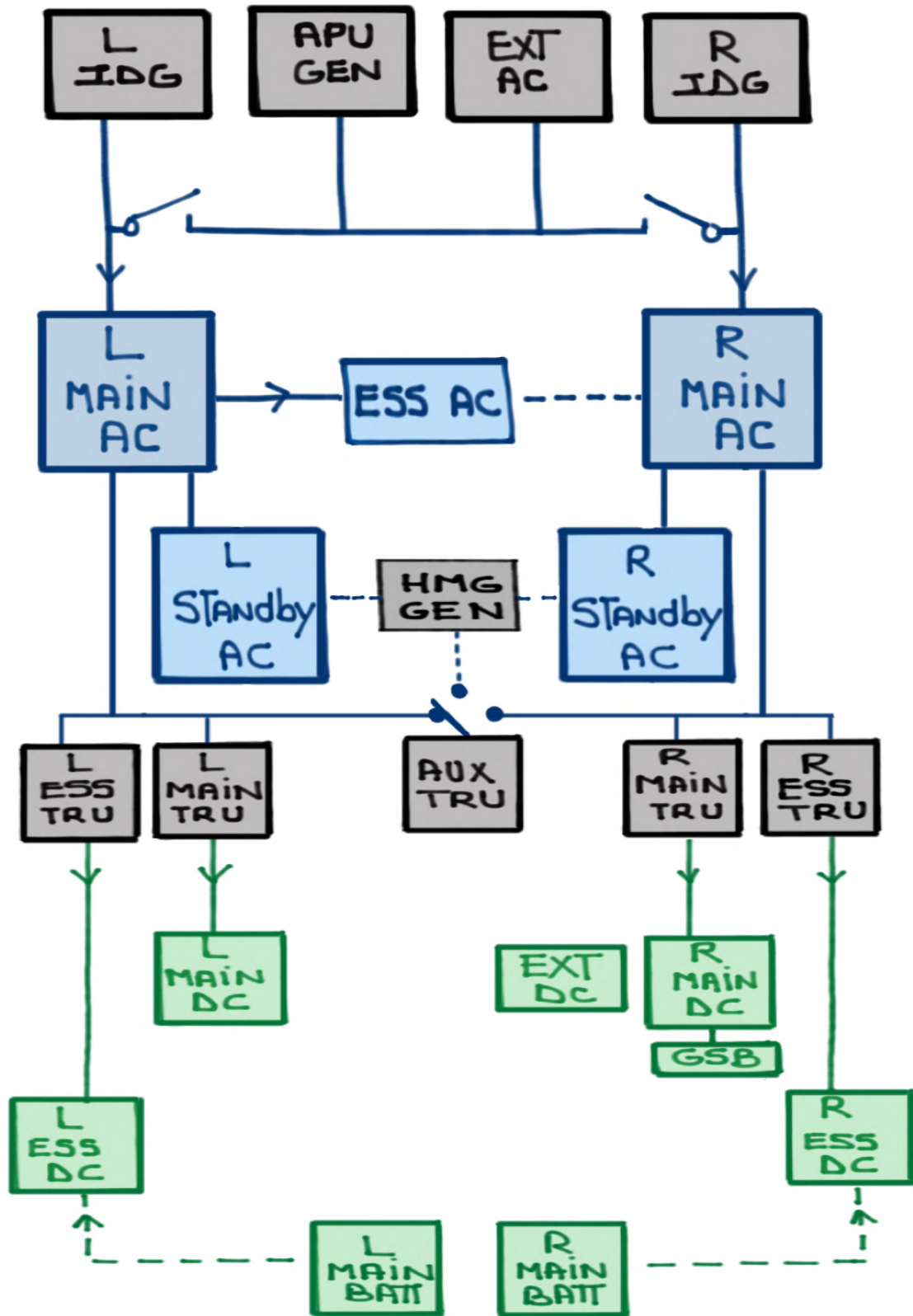


- DC System:

28 VDC is produced by:

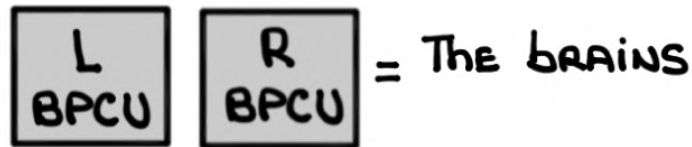







ELECTRICAL POWER SYSTEM



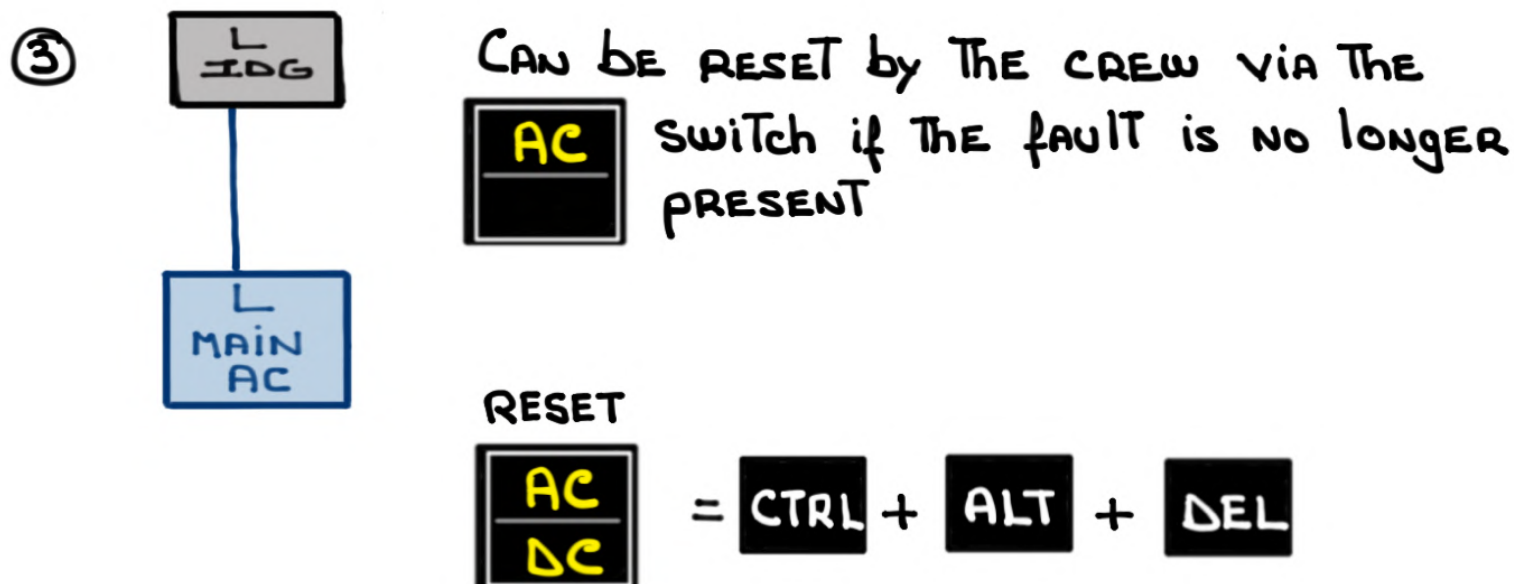
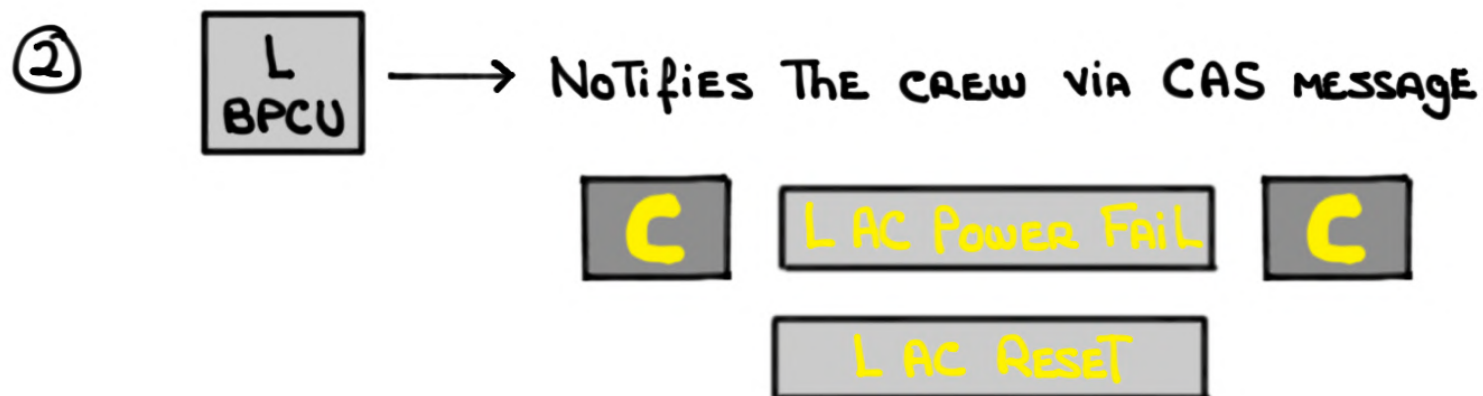
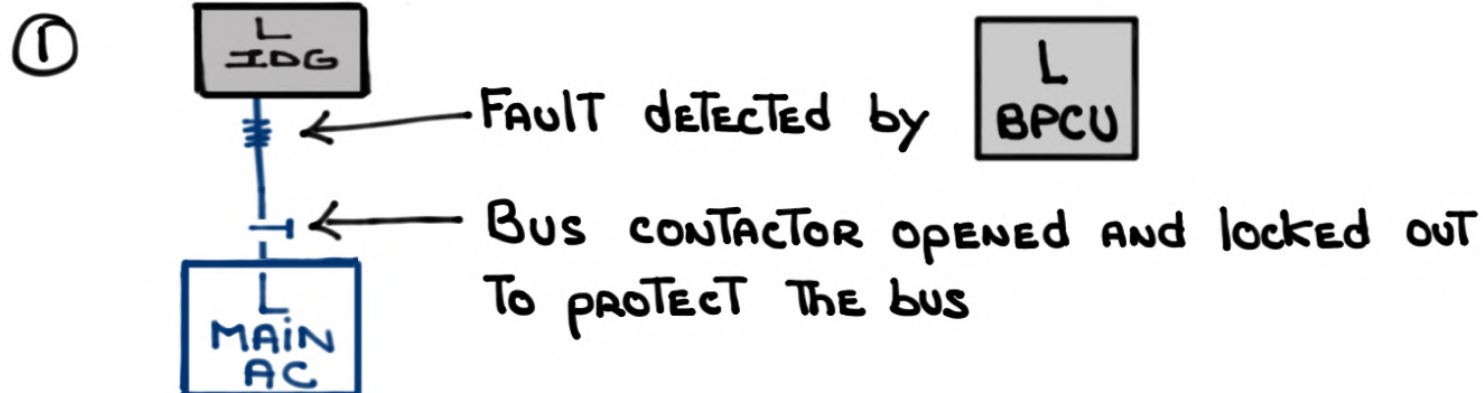
BUS POWER CONTROL UNITS (BPCU)

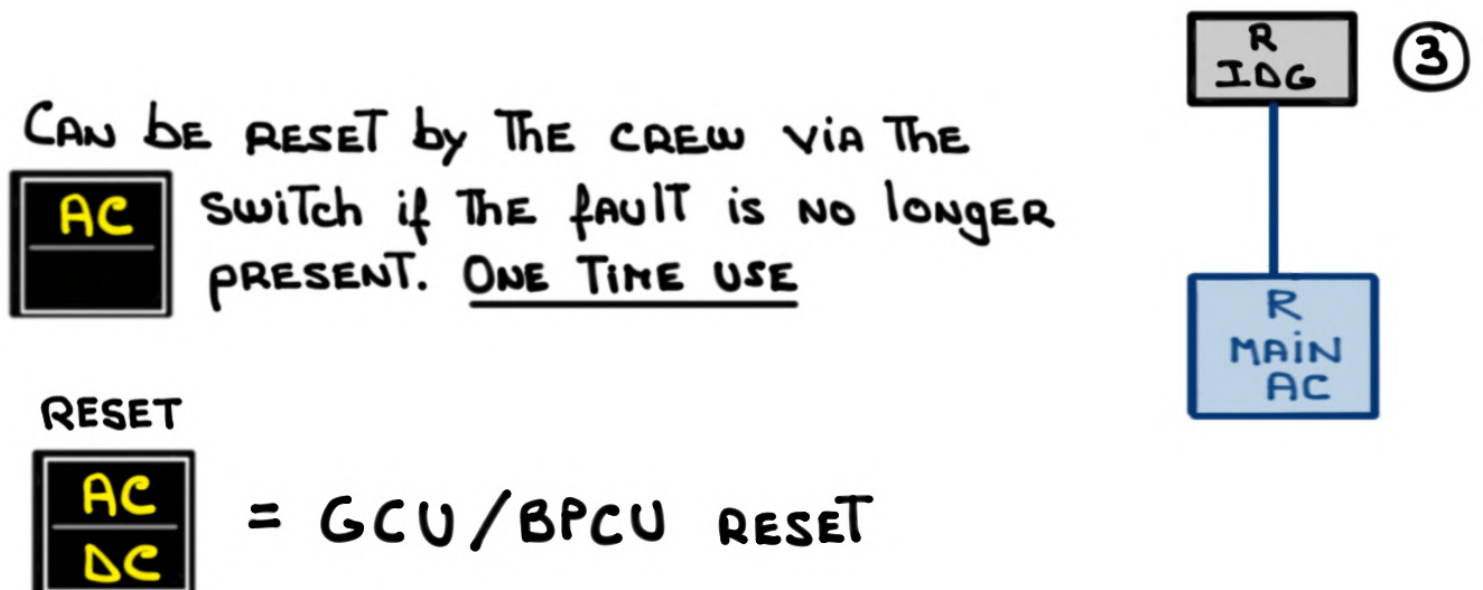
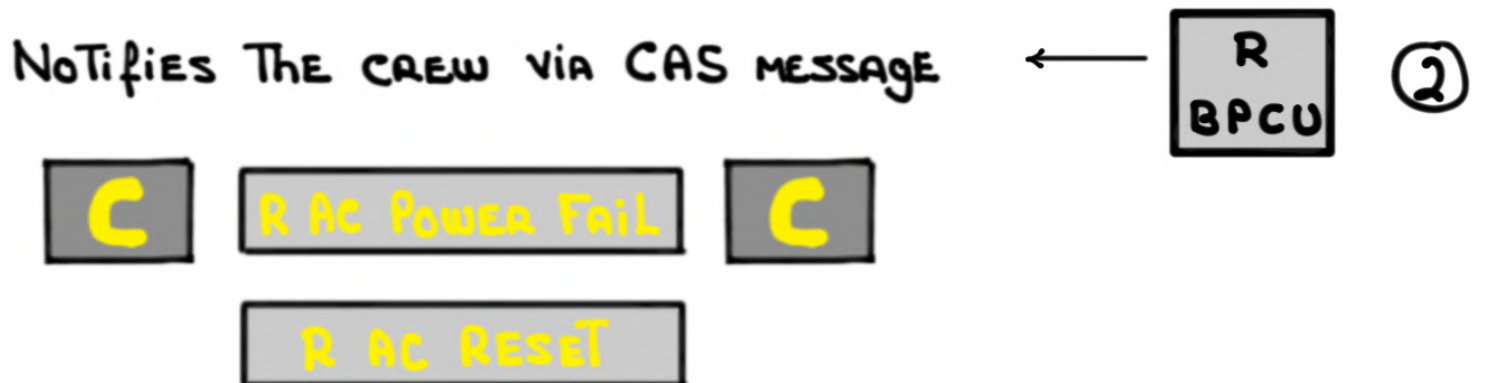
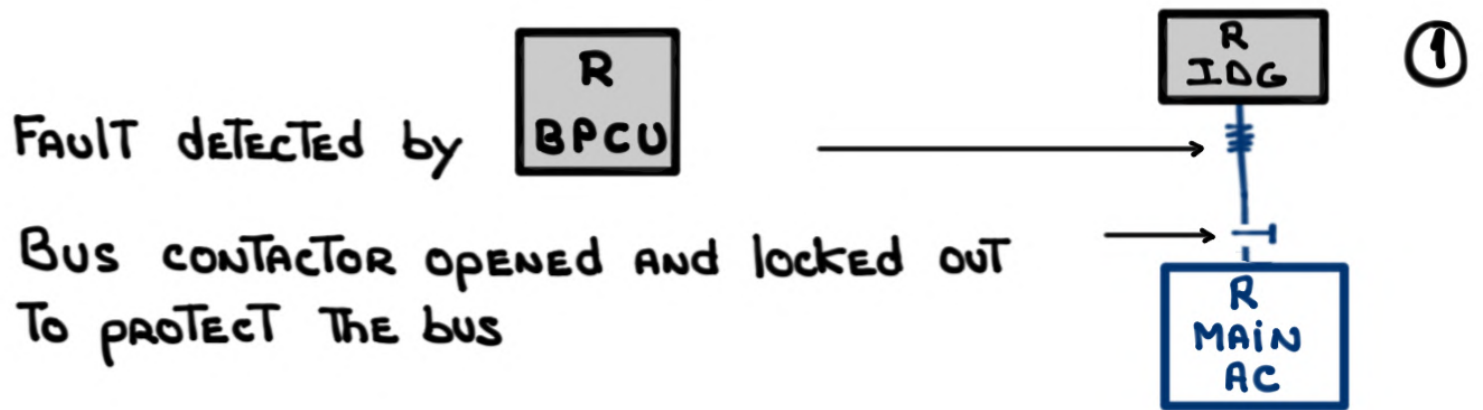
The ELECTRICAL Power System is controlled by Two (2) identical and interchangeable microprocessors called BPCUs



- The   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:



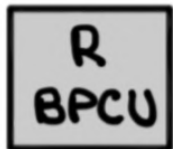


- BPCU logic: **ESS** before **MAIN** / **L** before **R**

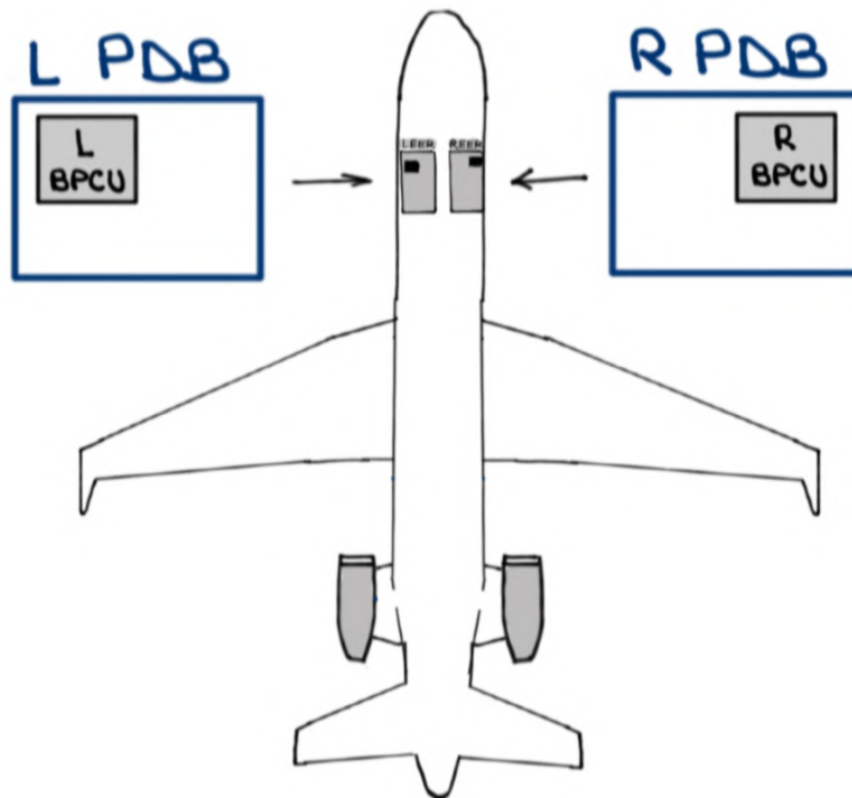
- LOCATED in:



LEFT ELECTRONIC EQUIPMENT RACK (LEER)



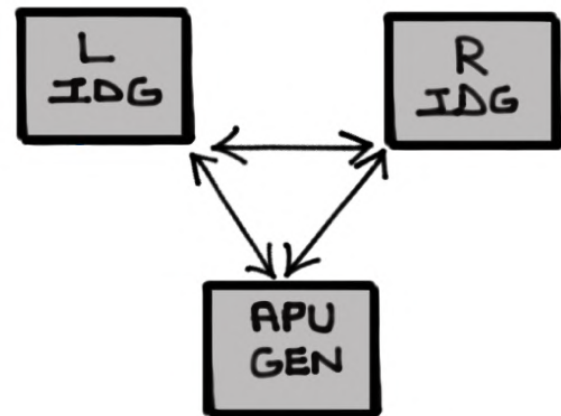
RIGHT ELECTRONIC EQUIPMENT RACK (REER)



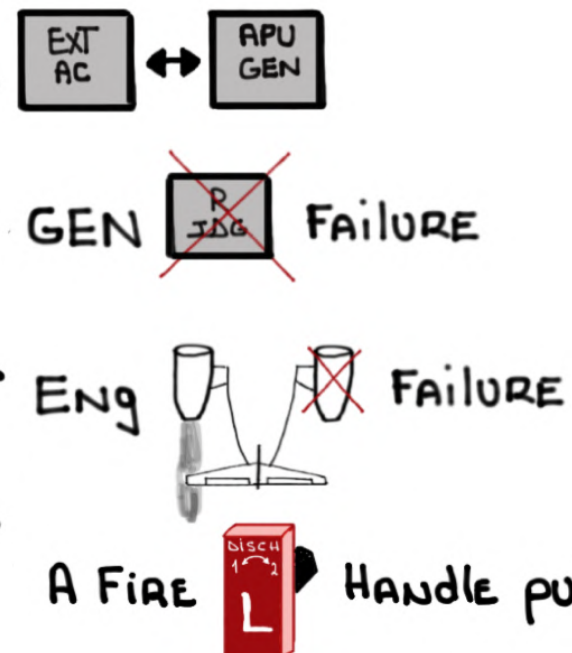
- NO BREAK POWER TRANSFER (NBPT)

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

- NO BREAK
 - IDG
 - AND
 - No FAILURE



- BREAK
 - No IDG
 - AND/OR
 - **FAILURE**

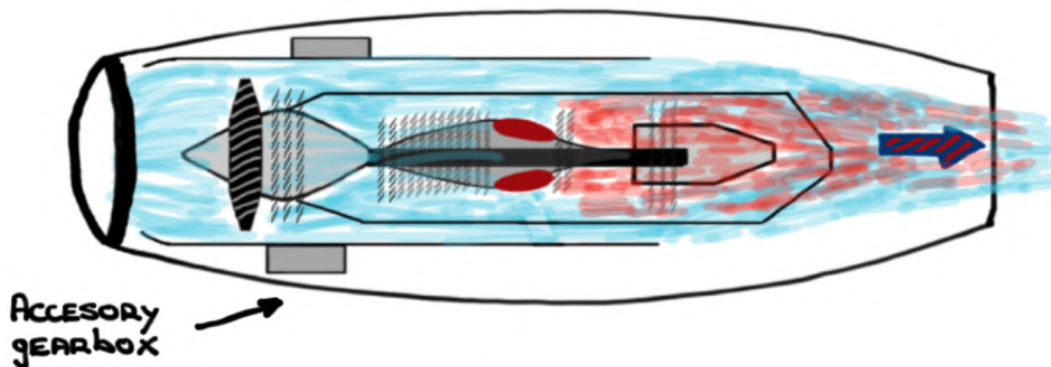


INTEGRATED DRIVE GENERATORS (IDG)

- Two (2) ENGINE-driven IDGs



- LOCATED ON THE ENGINE'S ACCESSORY GEARBOX



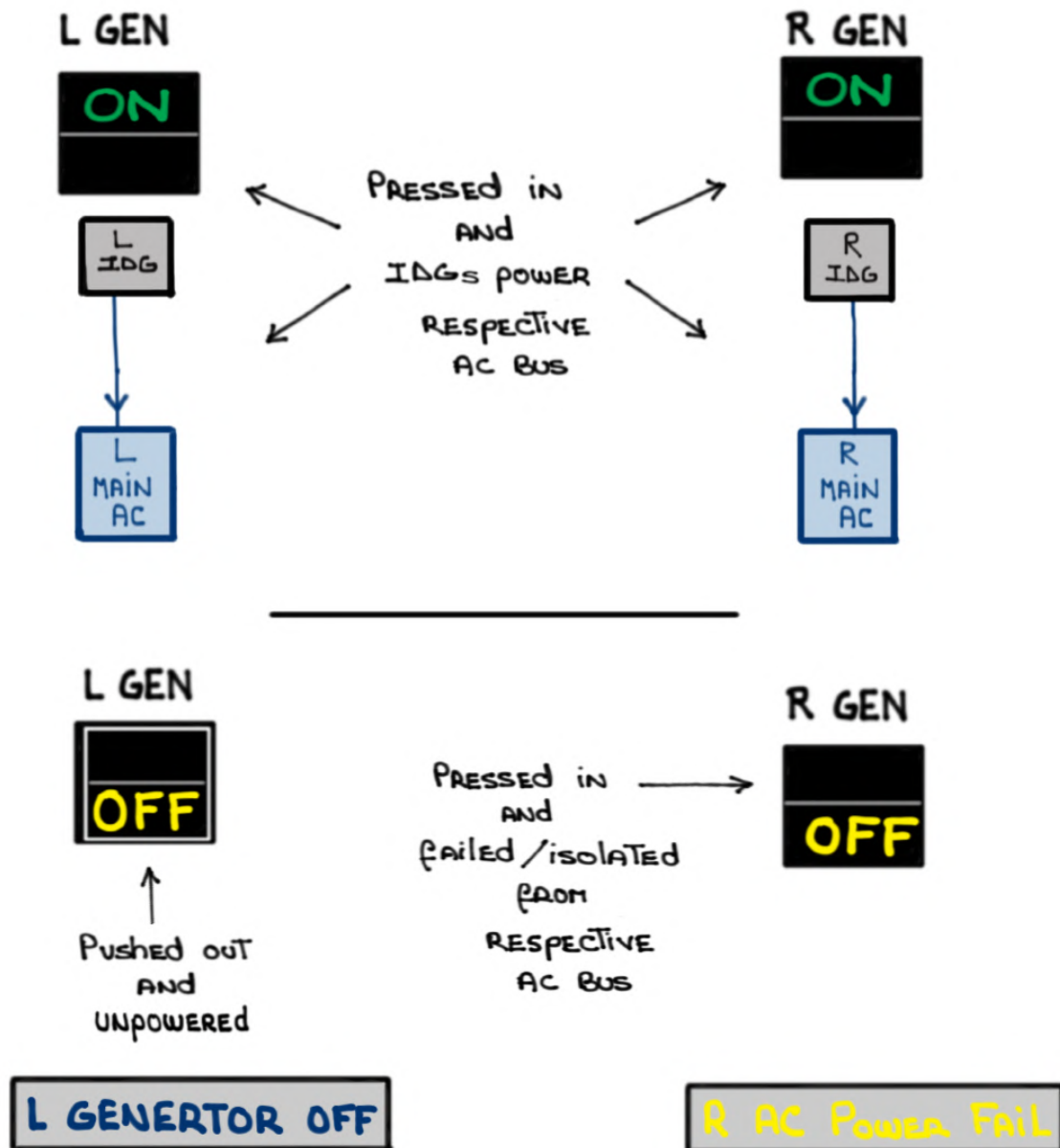
- IDG < CONSTANT SPEED DRIVE (CSD)
Oil-cooled GENERATOR (oil is cooled by fan air)

- 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)

- 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**

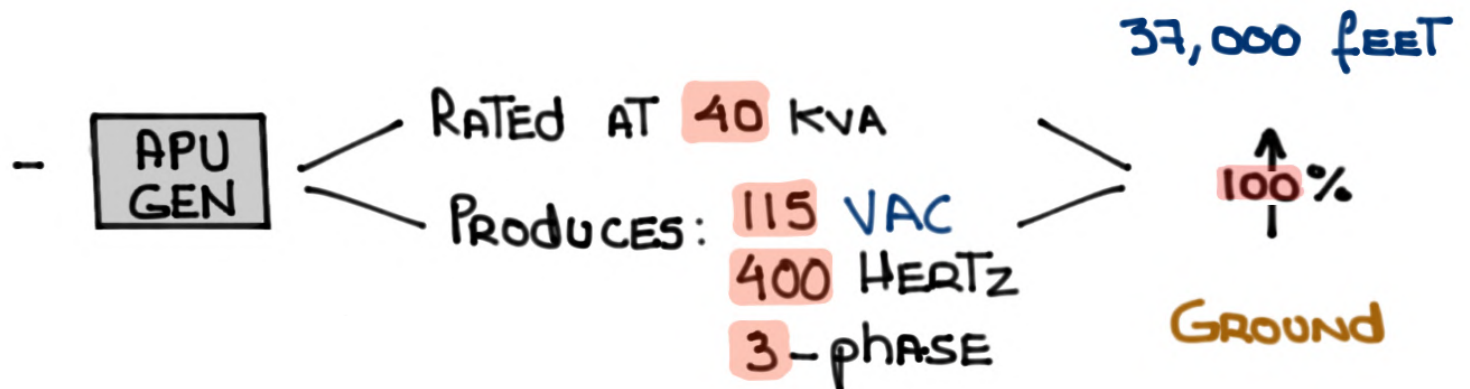
Auxiliary Power Unit (APU) GENERATOR

- 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

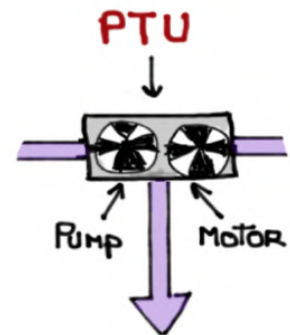
MASTER L ESS R ESS



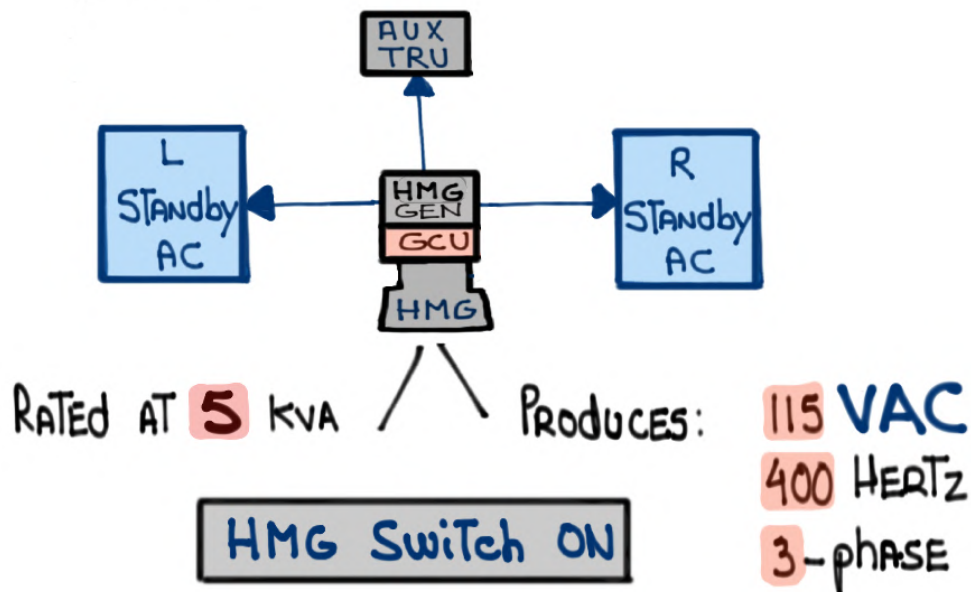
- The HMG is driven by:



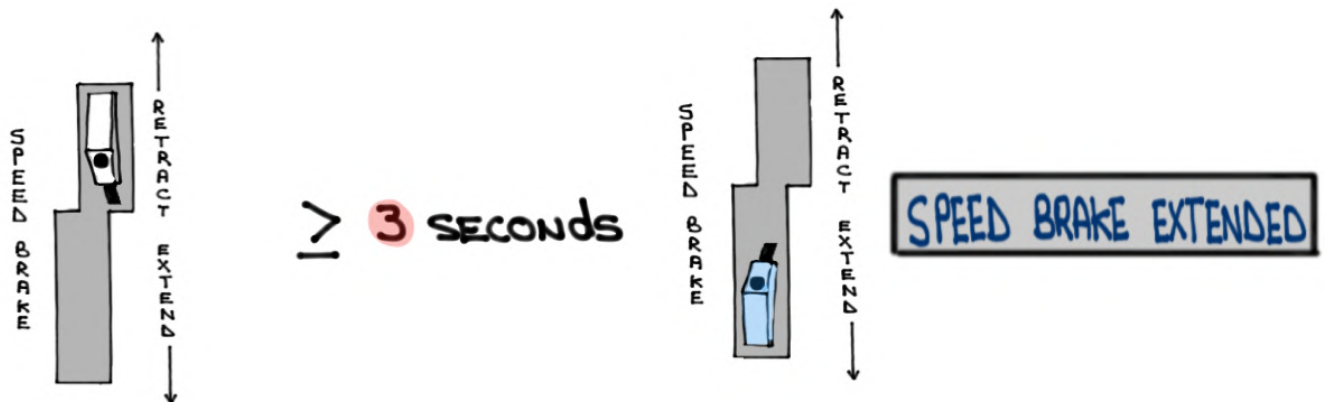
OR



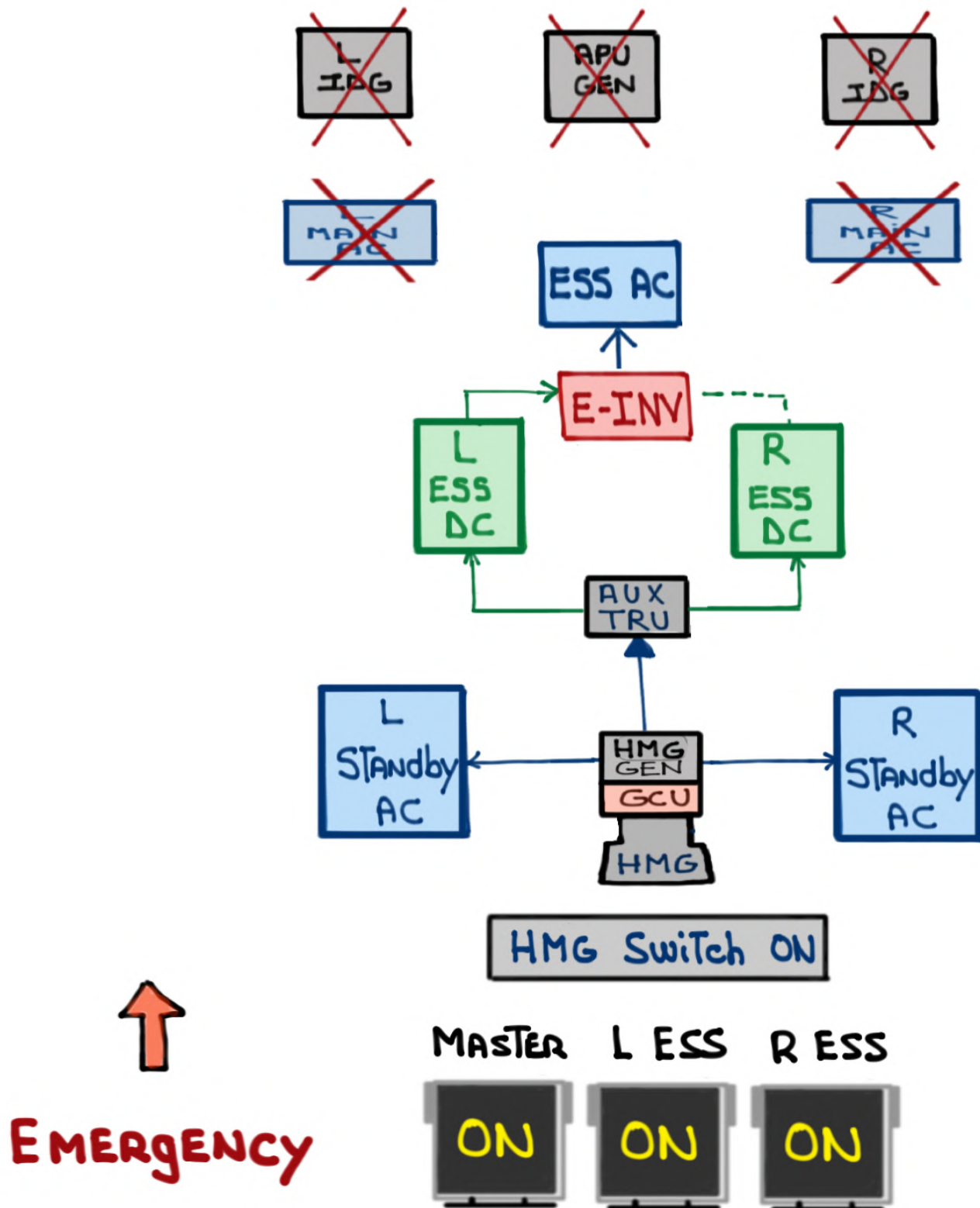
- The HMG powers:



- Speed brake deployment is OK as long as the handle is moved from stowed to fully extended in THREE (3) seconds or more



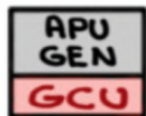
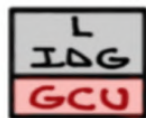
- HMG operation is permitted only when NORMAL **AC** POWER GENERATION is NOT AVAILABLE



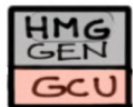
GENERATOR CONTROL UNITS (GCU)

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

- THERE ARE FOUR (4) GCUs:

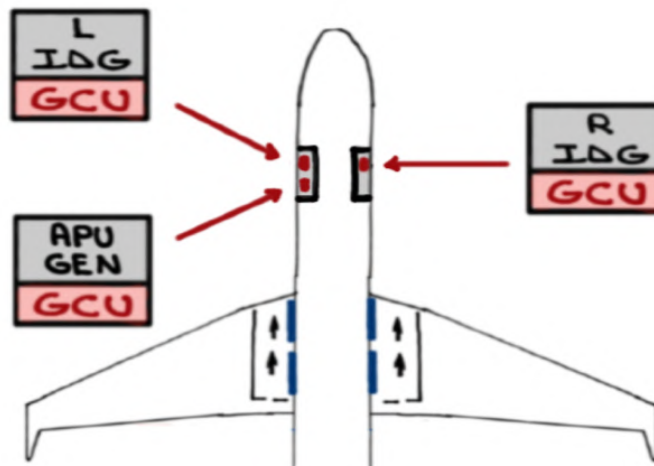


IDENTICAL
INDEPENDENT
INTERCHANGEABLE



NOT INTERCHANGEABLE

- GCUs ARE LOCATED IN THE LEER AND REER



- If GEN

VOLTAGE
FREQUENCY
AMPERAGE

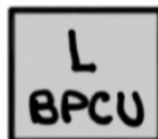
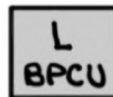


outside
PARAMETERS =



GCU TAKES GEN offline

GCU NOTifies



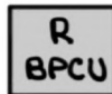
NOTifies CREW via CAS:

L AC POWER FAIL

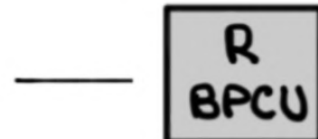
L GENERATOR FAIL

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  POWER

EXT PWR

 ON

- 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

— EXTERNAL  POWER

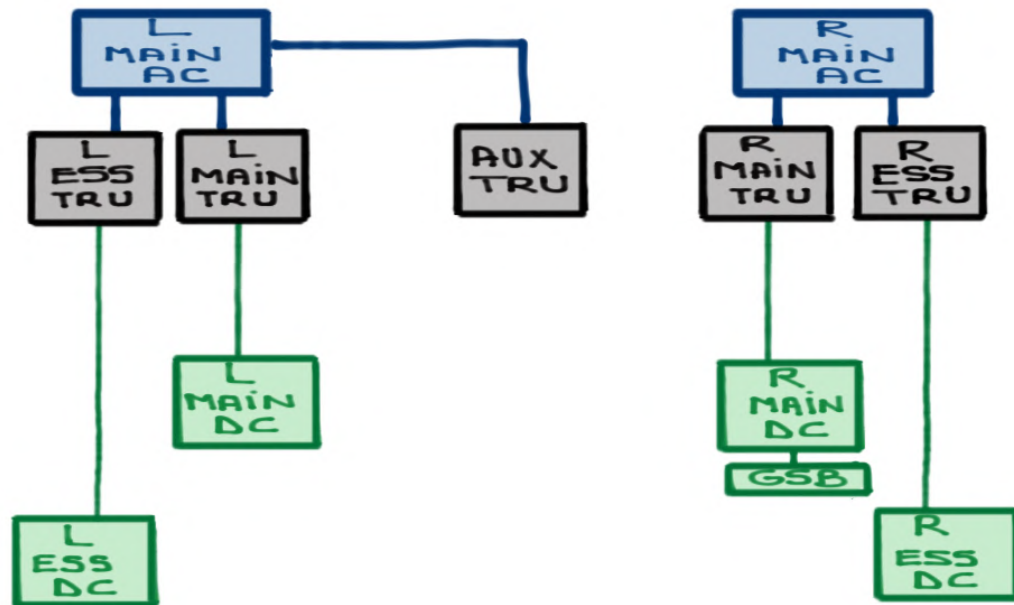
EXT PWR

 AVAIL

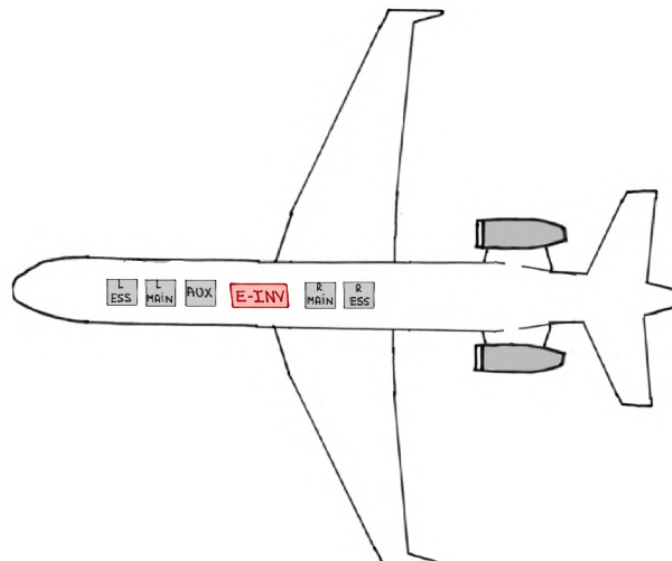
- RECEPTABLE is located on the right side of the fuselage
- POWERS ALL DC BUSES
- CAN BE USED TO POWER THE GSB

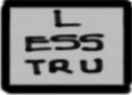

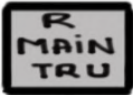




TRANSFORMER RECTIFIER UNITS (TRU)

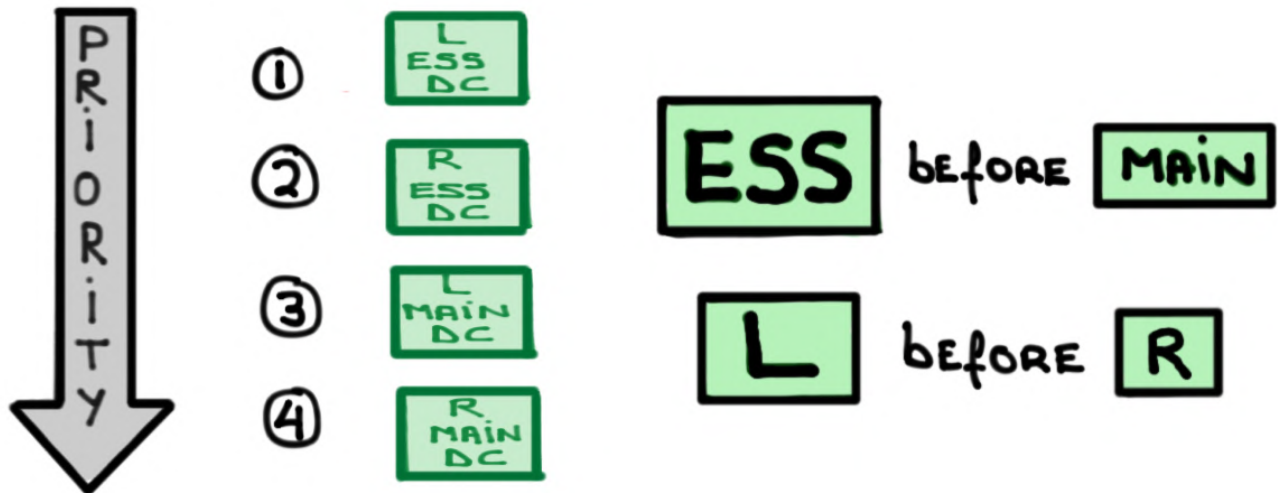
- TRUs ARE POWERED by The L MAIN AC R MAIN AC BUSES
- A TRU CONVERTS 115 VAC To 28 VDC



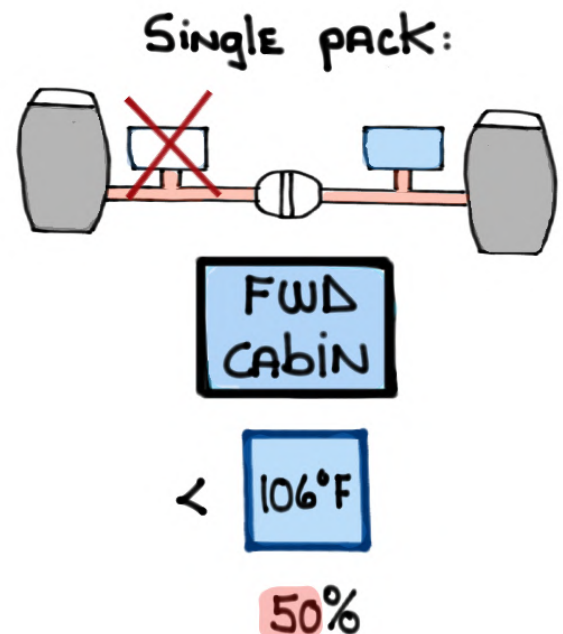
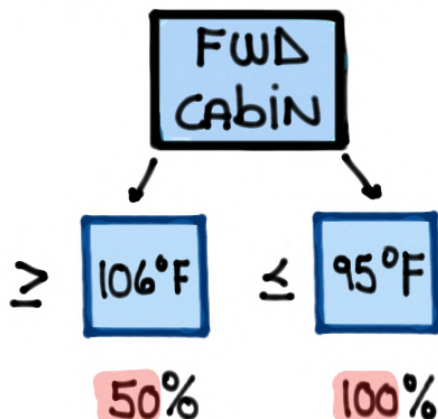
- TRUs ARE LOCATED UNDERNEATH THE FLOOR



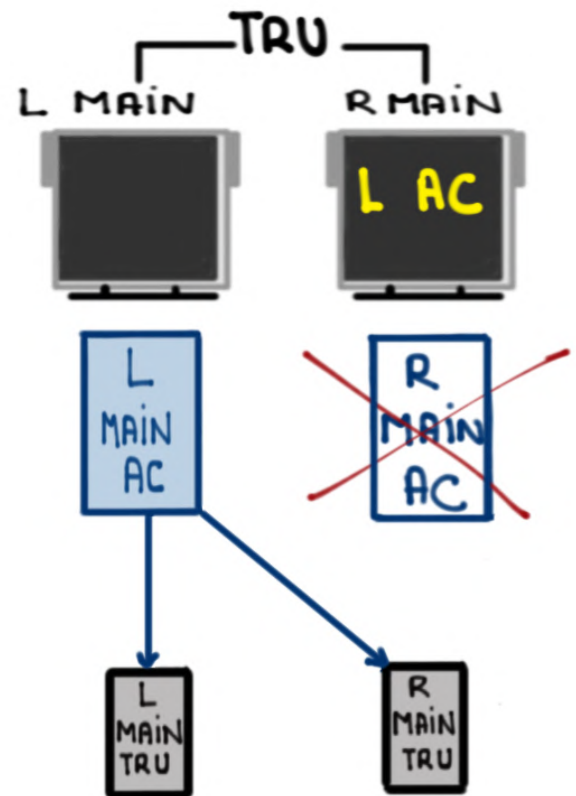
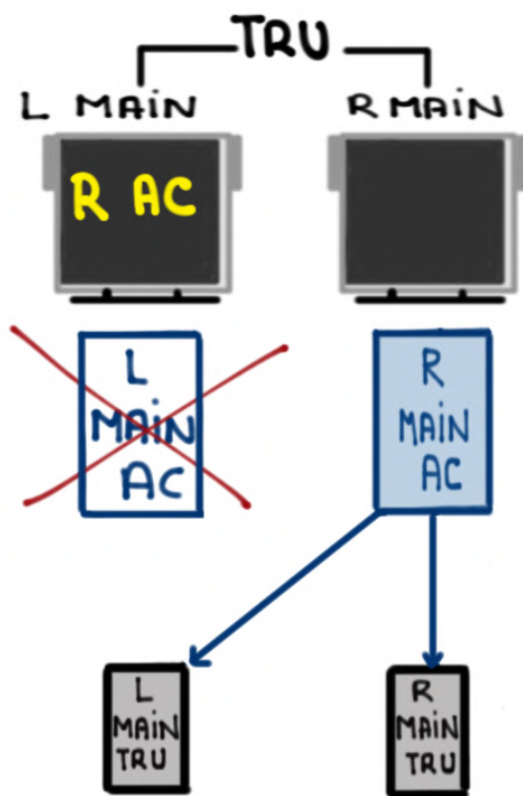
-     POWER THEIR OWN BUSES
-  POWERS THE   BUSES AND WILL TAKE OVER THE DUTIES OF A FAILED ~~ESS~~ OR ~~MAIN~~ TRU USING THE FOLLOWING PRIORITY PROCESS:



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



- 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

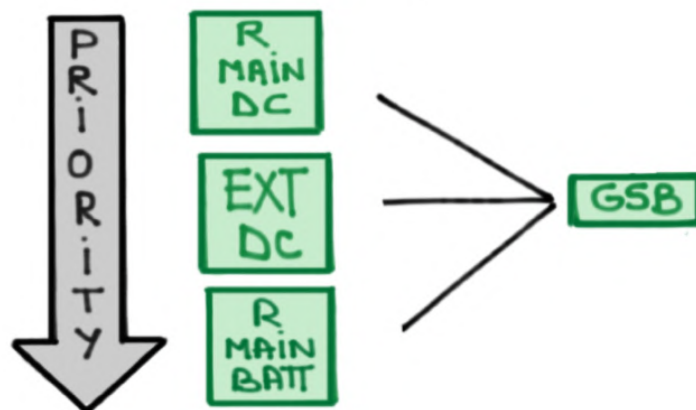
ON

GND SYC BUS

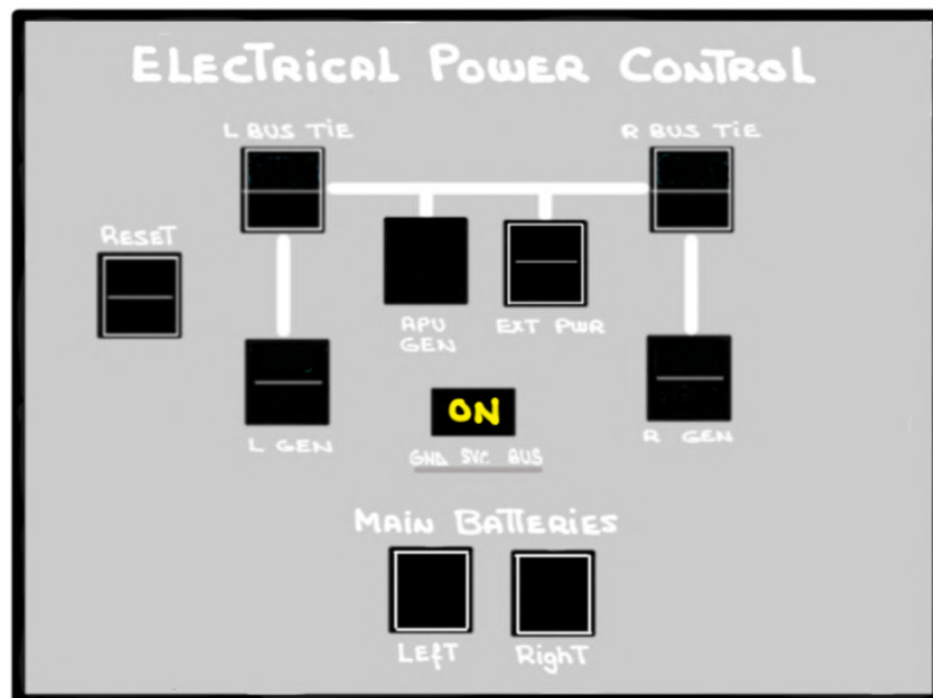
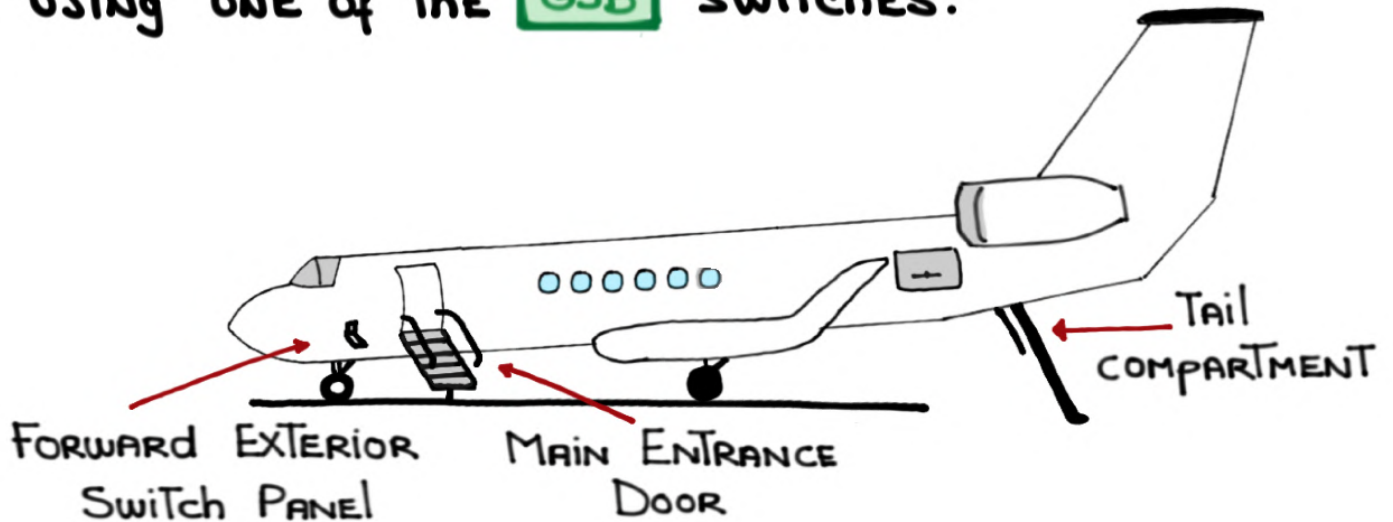
- THREE (3) **GSB** switches:

- FORWARD EXTERIOR Switch PANEL
- SYSTEM MONITOR/TEST PANEL
- Tail compartment

- POWER SOURCES (Priority):

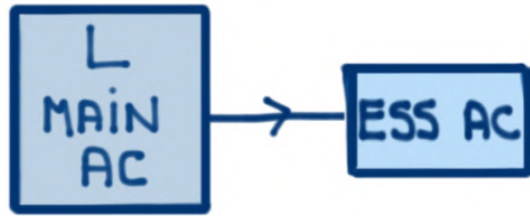


- ROTATING BEACON light is powered by The **GSB** when The **R MAIN BATT** is The SOURCE of power
- AT LEAST ONE of The following MUST BE OPEN when using ONE of The **GSB** switches:



E-INVERTER

- The **ESS AC** bus is NORMALLY POWERED by The **L MAIN AC** bus



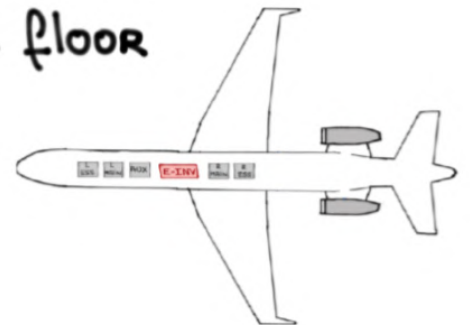
- If **L MAIN AC** bus power is NOT AVAILABLE The **ESS AC** bus CAN ALSO BE POWERED by The **R MAIN AC** bus



- 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**

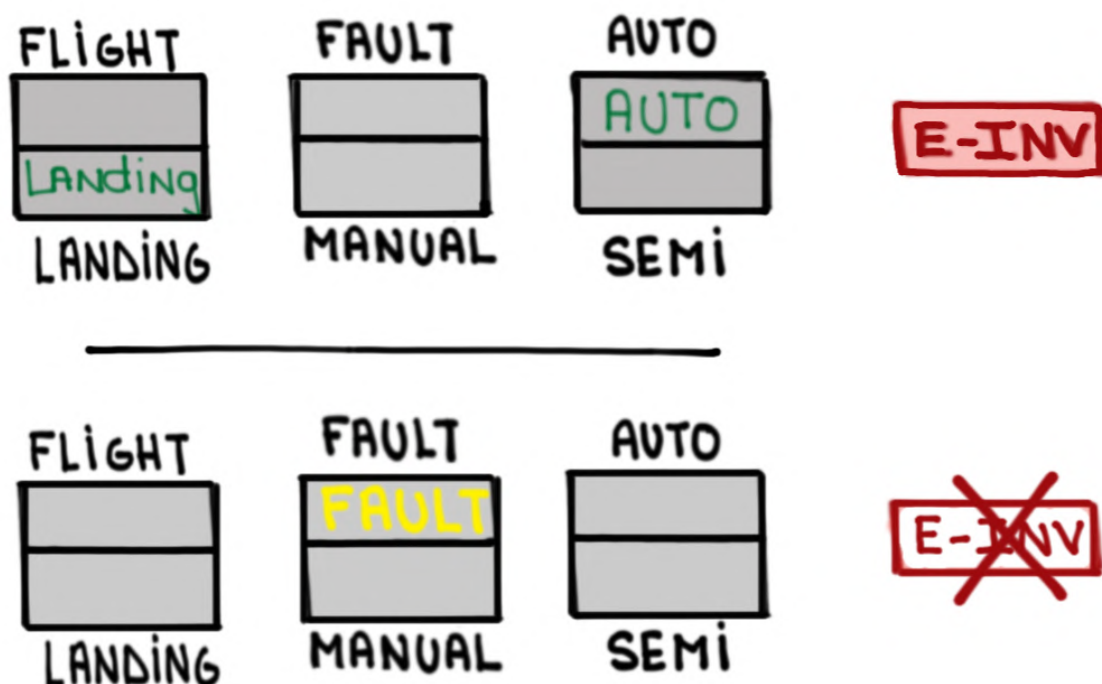
- The **E-INV** is located UNDERNEATH The floor

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




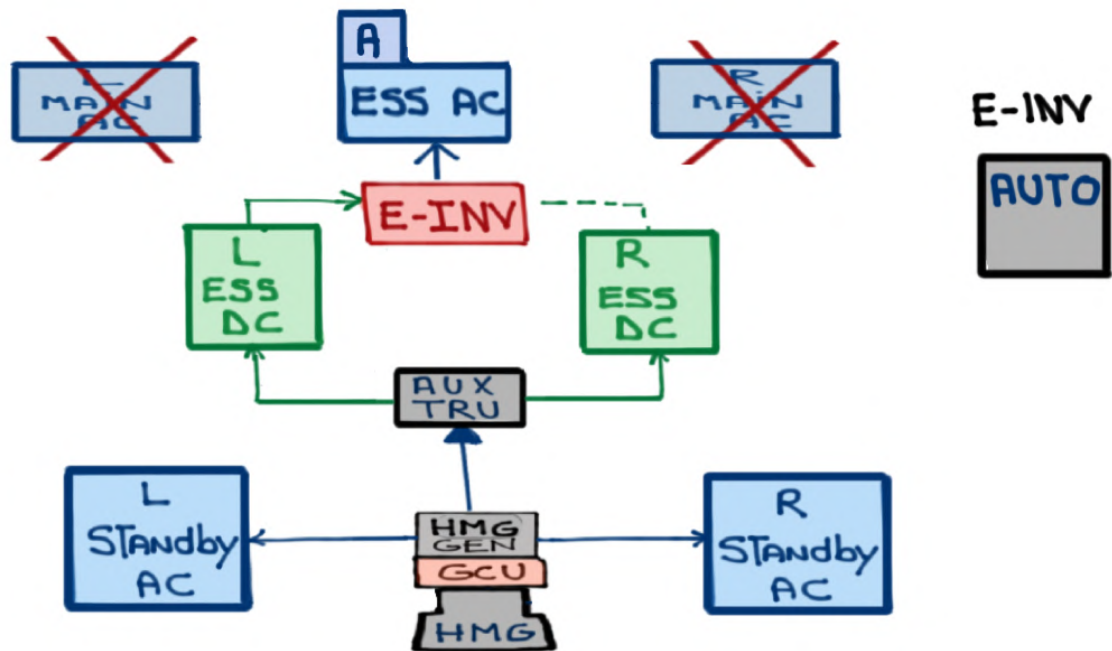
- The **E-INV** has been RENAMED Standby Inverter
- In The EVENT of failure The **E-INV** can be deferred in accordance with The Minimum Equipment List (MEL)
- During The pre-flight inspection with main battery switches pressed IN and no **AC** power available operation of The **E-INV** can be confirmed 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  can continue to power the **E-INV**



- In the unlikely event that the  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

MAIN BATTERIES



Left

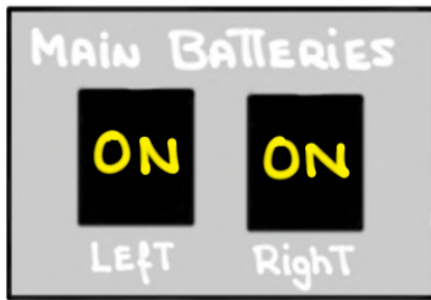


Right

② OPERATE AUX HYDRAULIC PUMP - BOTH

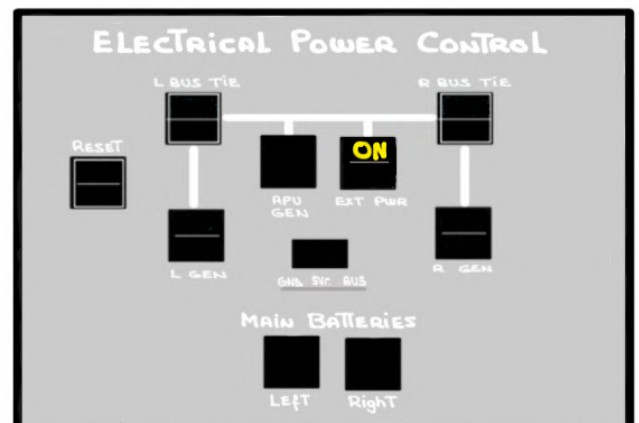


③ POWER BUSES - BOTH IF NO OTHER SOURCE OF DC POWER IS AVAILABLE

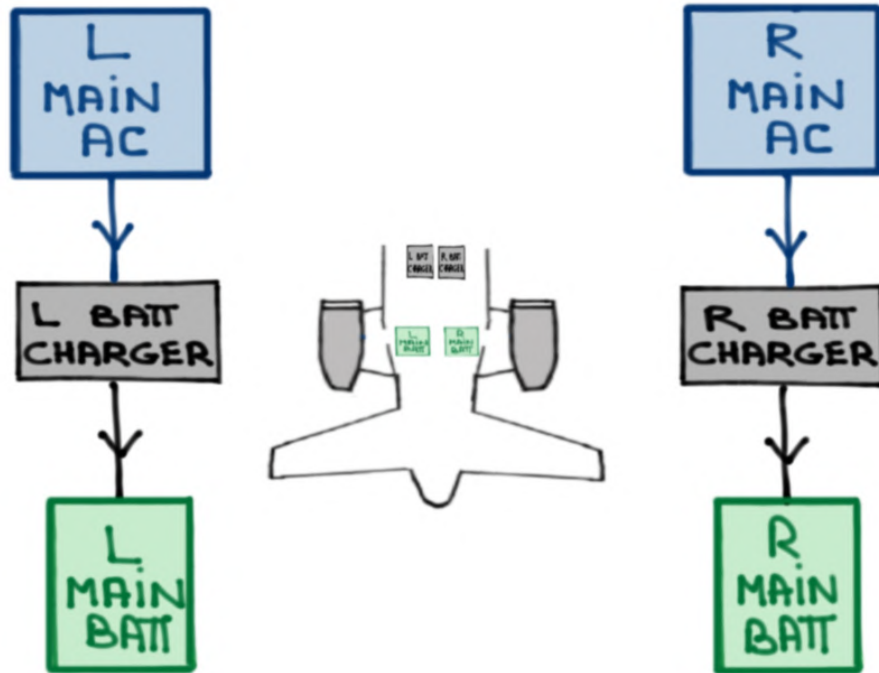


Switchlights illuminate to indicate that the batteries are discharging

- 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°C AND COOLER THAN $+40^{\circ}\text{C}$
- If ≤ 22 VOLTS BUT NOT LESS THAN 7 VOLTS THE BATTERIES CAN BE CHARGED AS FOLLOWS:
 - EXT DC POWER CONNECTED
 - BATTERY switches ON



- 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 AC, 9 amp/hour
- ON when L
ESS
DC AND/OR R
ESS
DC BUSES < 20 Volts, EVEN MOMENTARILY

- FOUR (4) E-BATTS:

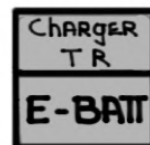
AVIONICS



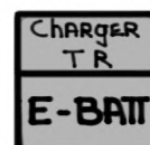
AVIONICS



LIGHTING



LIGHTING




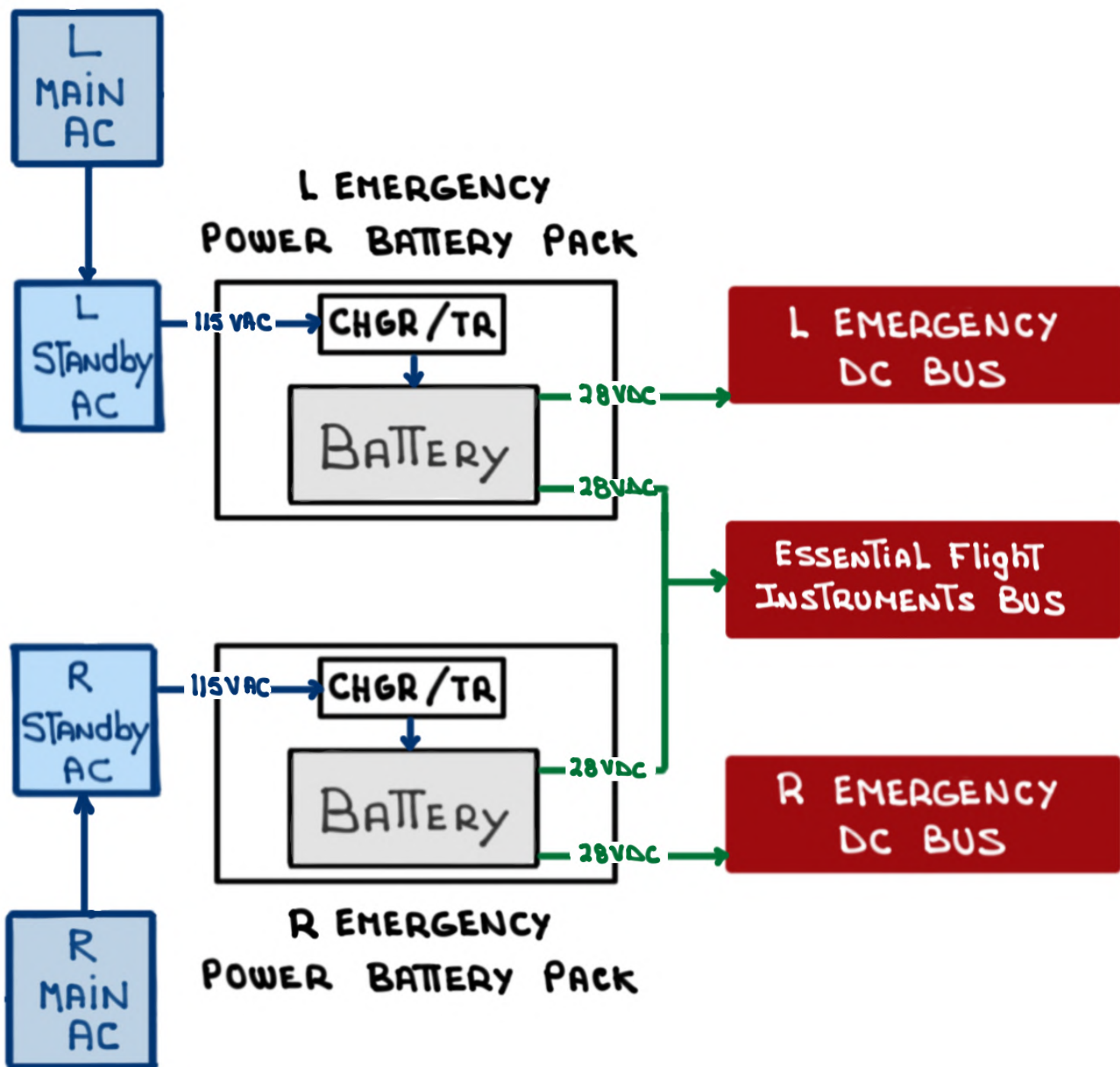
- POWER THE following BUSES:

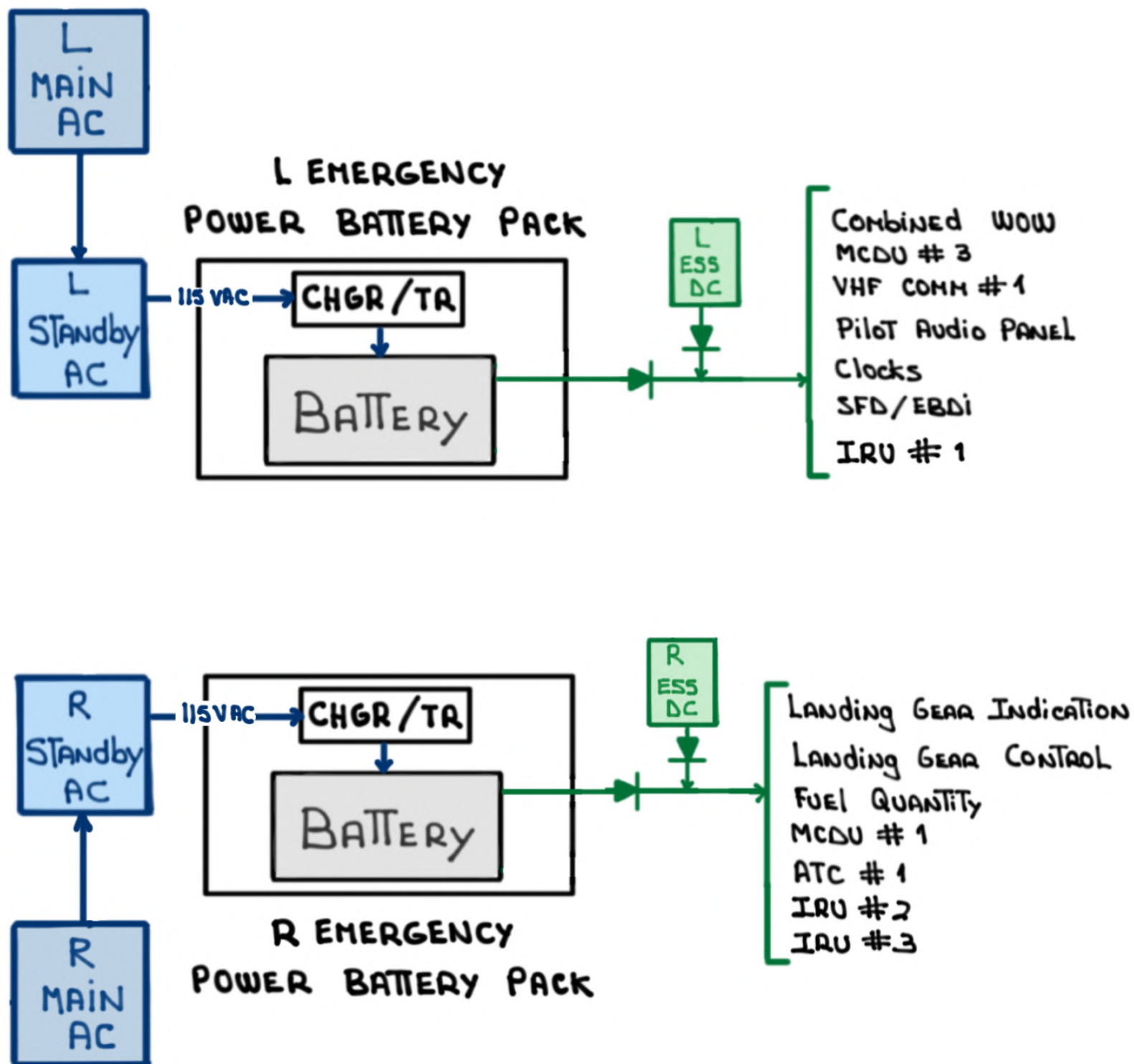
L EMERGENCY
DC BUS

ESSENTIAL FLIGHT
INSTRUMENTS BUS

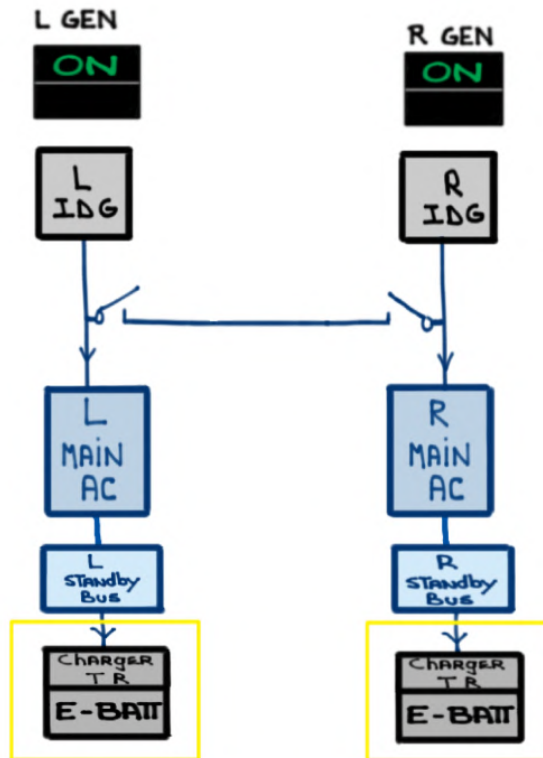
R EMERGENCY
DC BUS

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

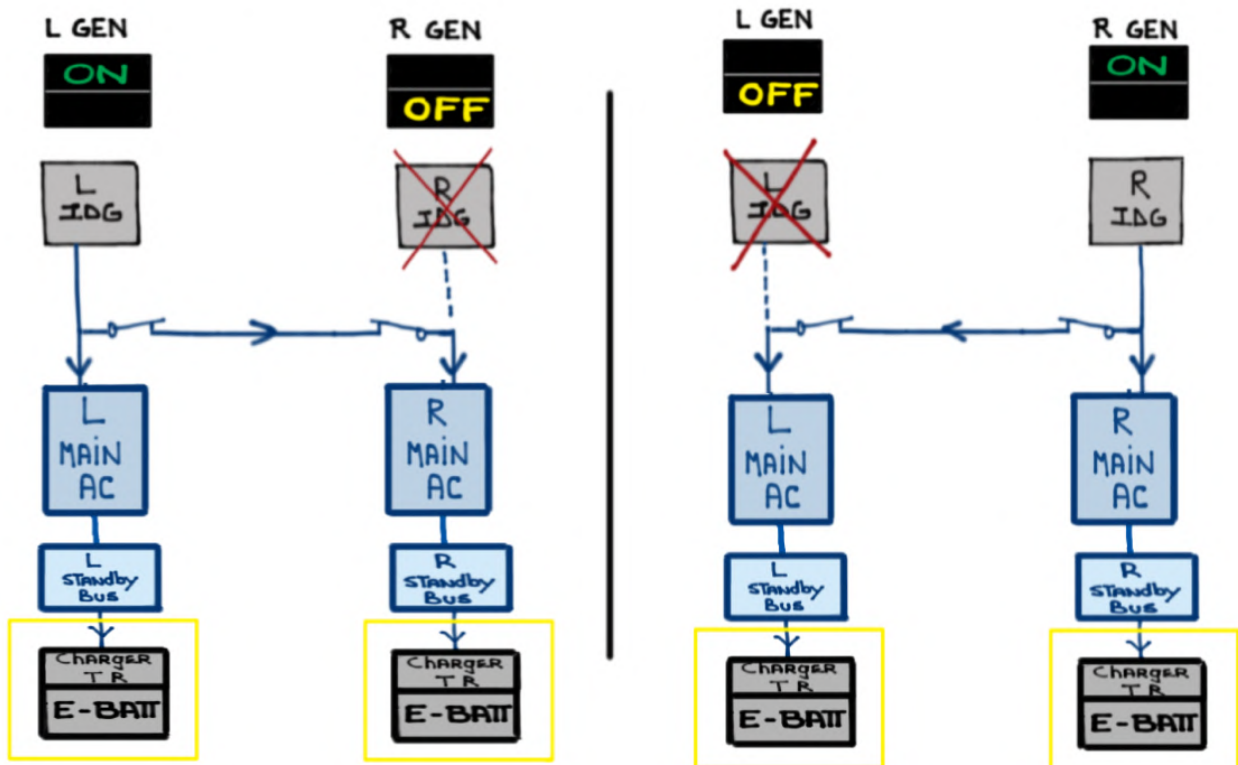




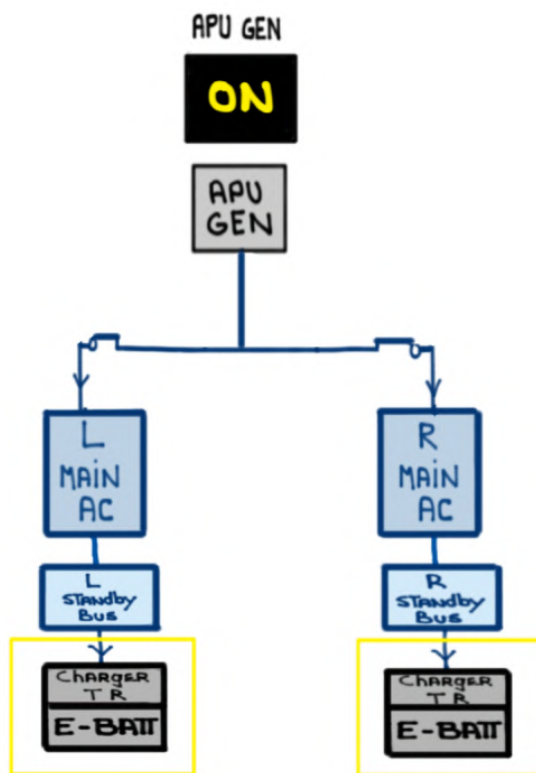
① Both IDGs



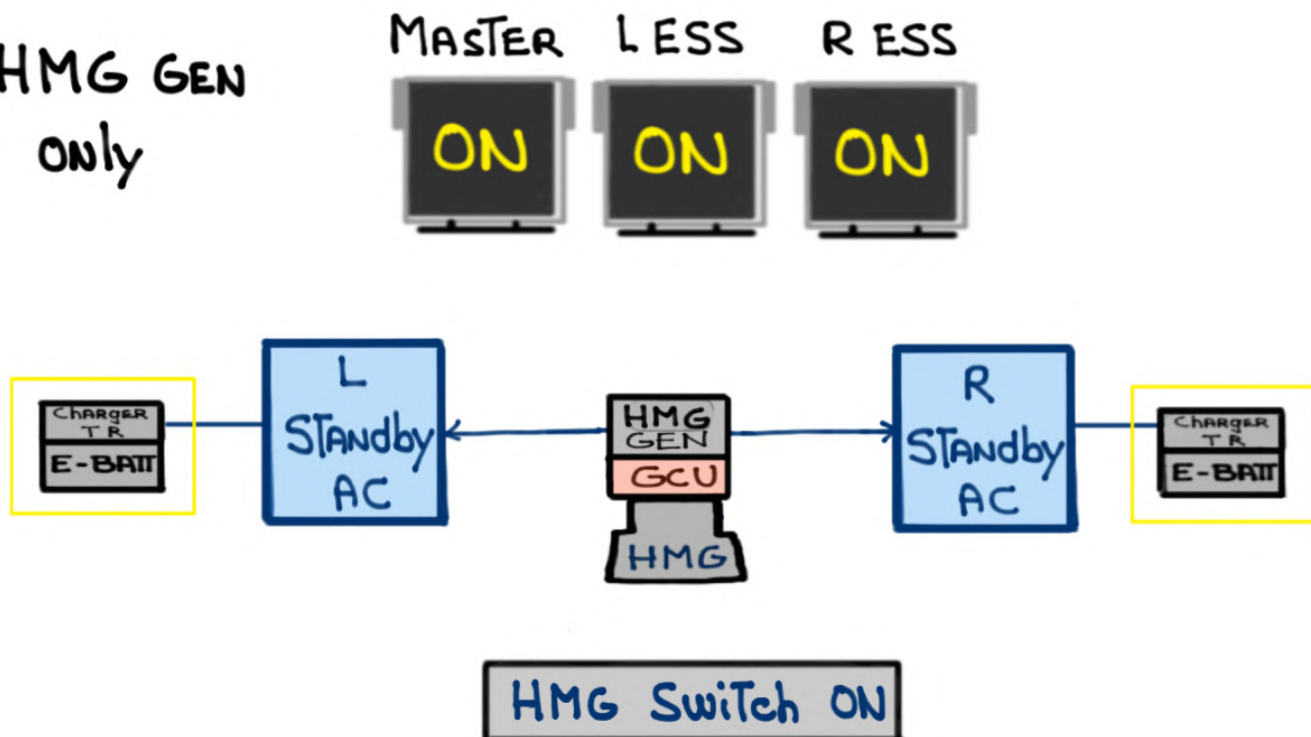
② ONE IDG only

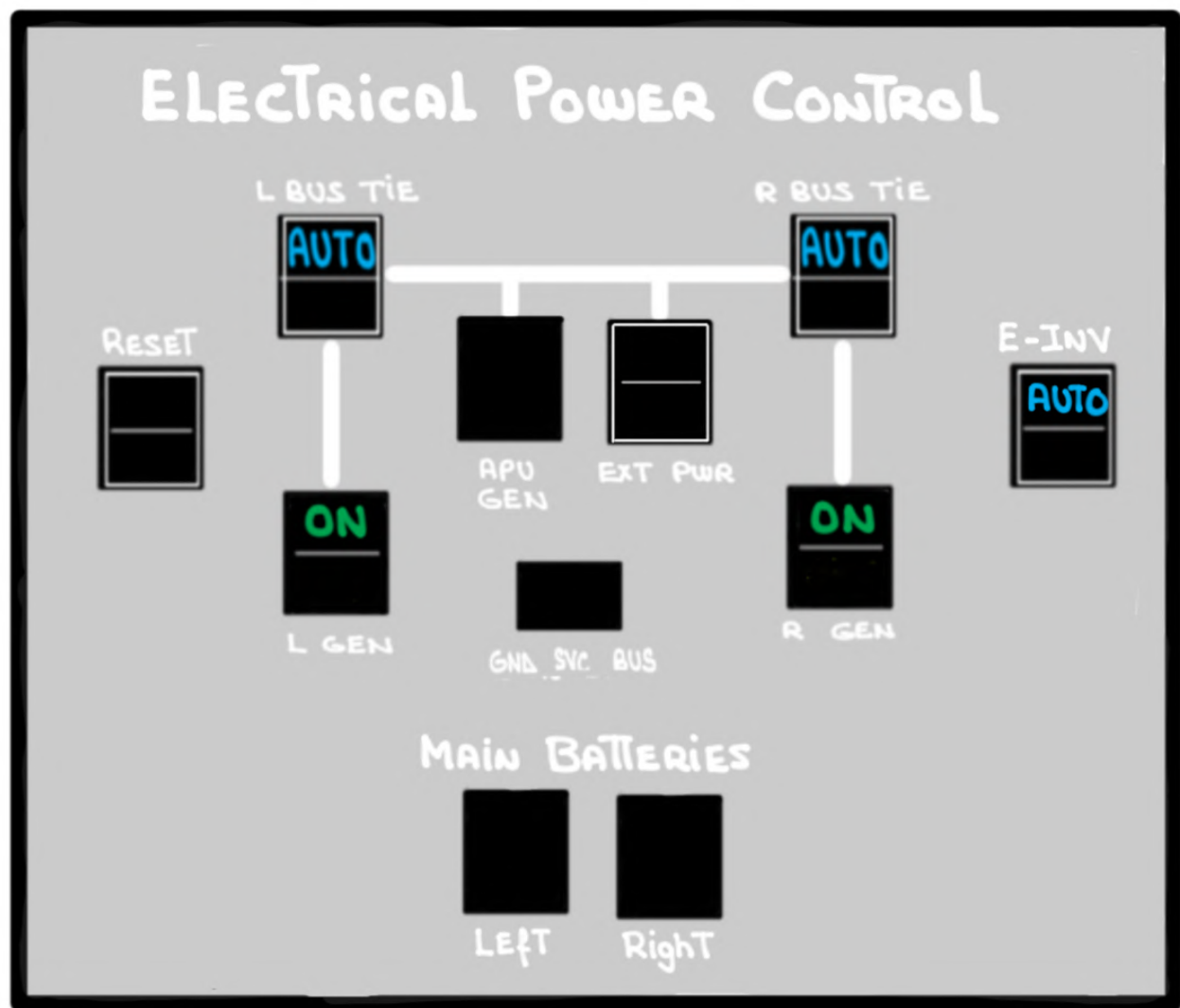


③ APU GEN
only



④ HMG GEN
only



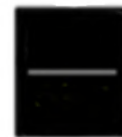


THREE (3) BLUE

TWO (2) GREEN

SIX (6) BLACK

FIVE (5) switchlights PRESSED IN



FIVE (5) switchlights PUSHED OUT

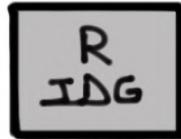


NORMAL - EMERGENCY

NORMAL



AND



- All AC AND DC buses



OR



- All AC AND DC buses

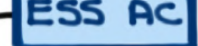


- All AC AND DC buses



28VDC

115VAC

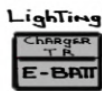
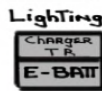
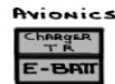
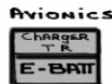


00:30 MINUTES

(2 APU START ATTEMPTS)



EMERGENCY



(ESS DC buses < 20 Volts)

L EMERGENCY

R EMERGENCY

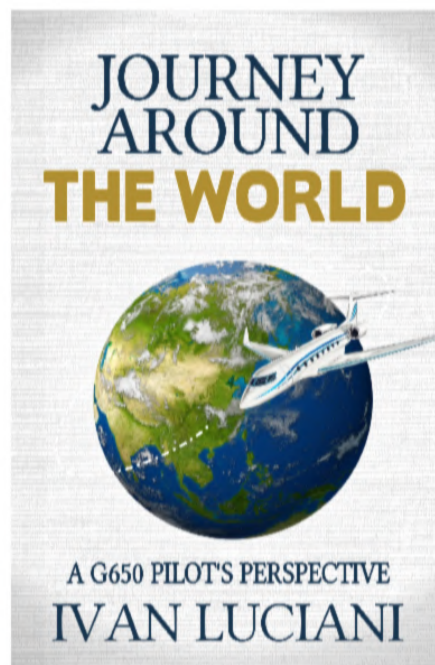
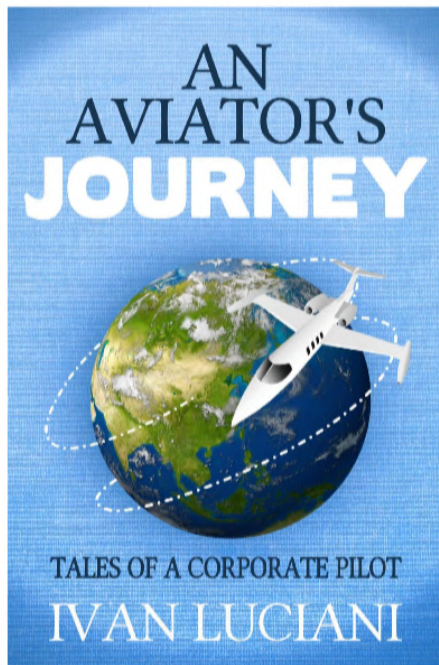
Flight Instrument

00:30 MINUTES
(Approximately)

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!