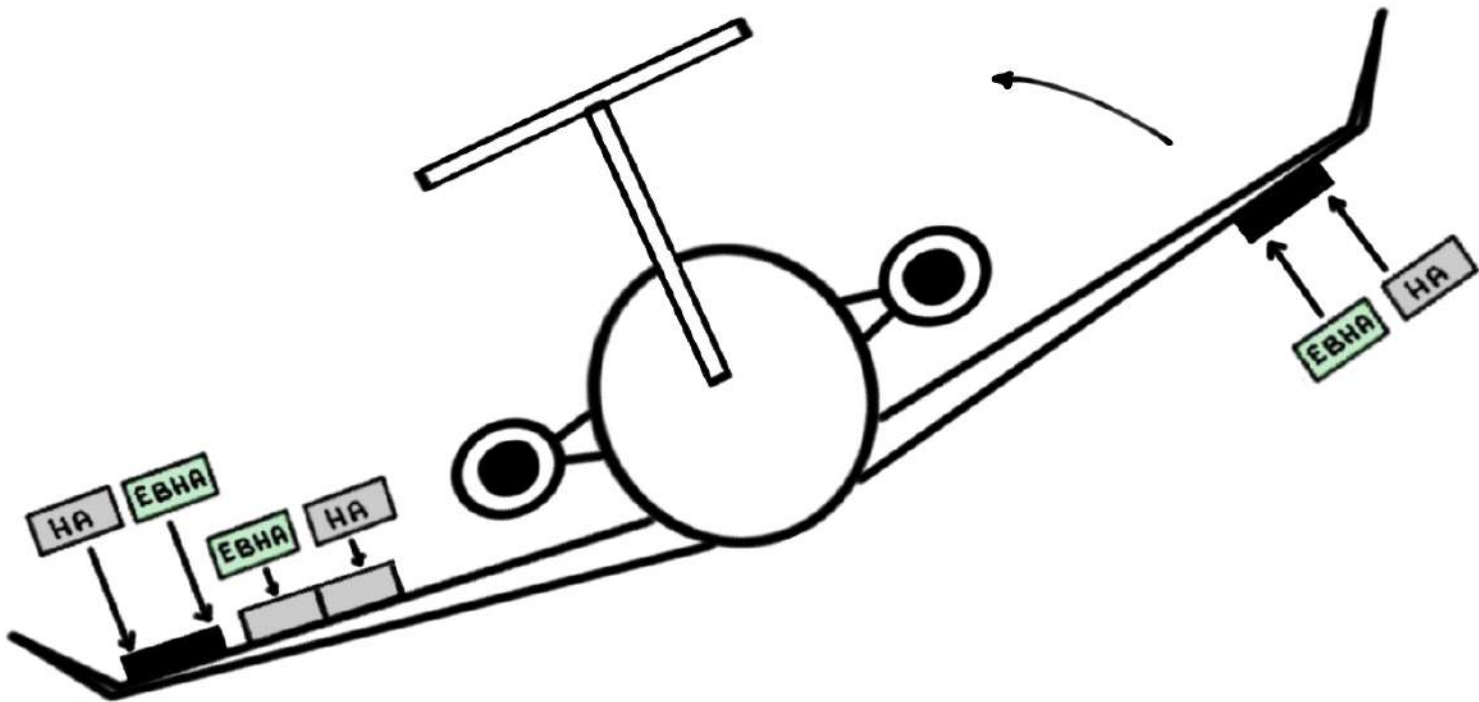
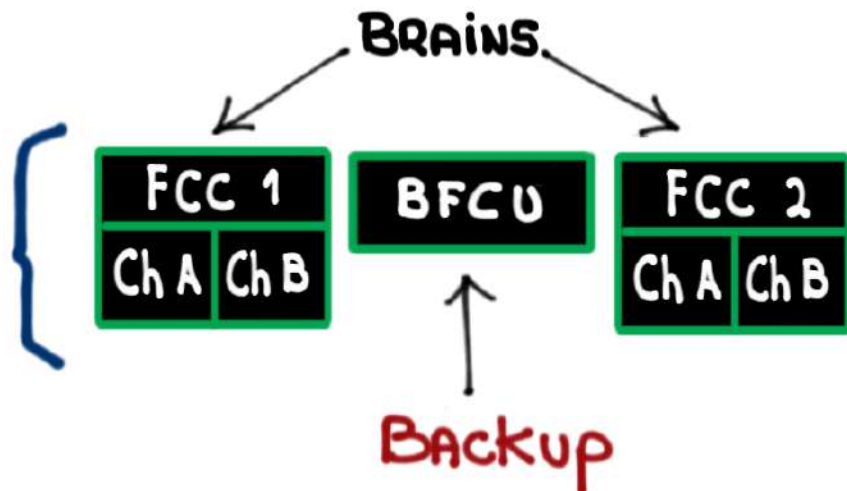


G650 FLIGHT CONTROL SYSTEM



For study purposes only

ELECTRICALLY - CONTROLLED

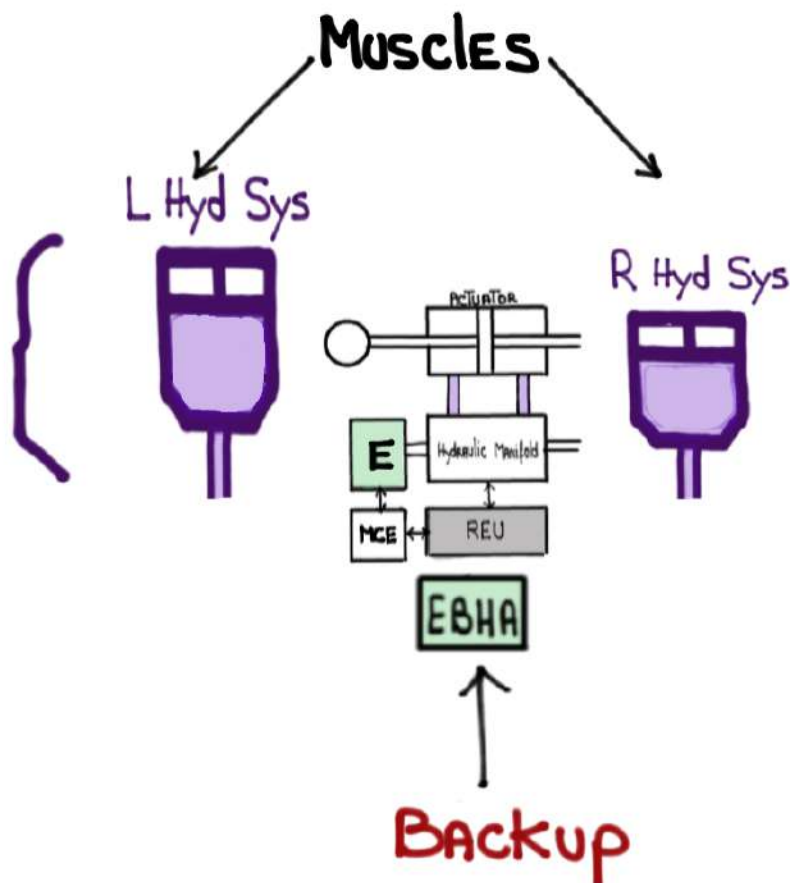


THREE (3) AXIS

Fly-by-wire

FLIGHT CONTROL SYSTEM
(FCS)

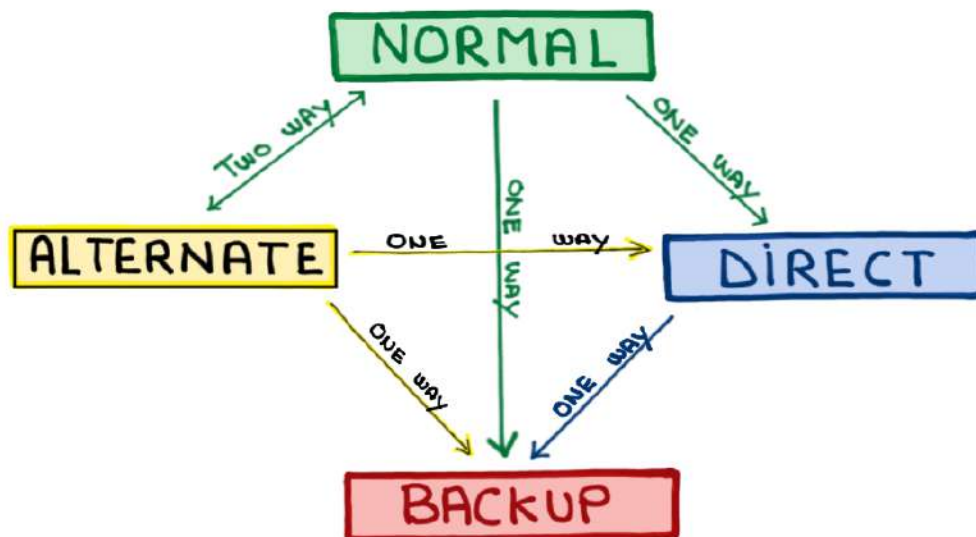
HYDRAULICALLY - ACTUATED



ELECTRICALLY - CONTROLLED

SOFTWARE:

- FLIGHT CONTROL LAW MODES



HARDWARE:

- FLIGHT CONTROL COMPUTERS



- FLIGHT CONTROL BATTERIES



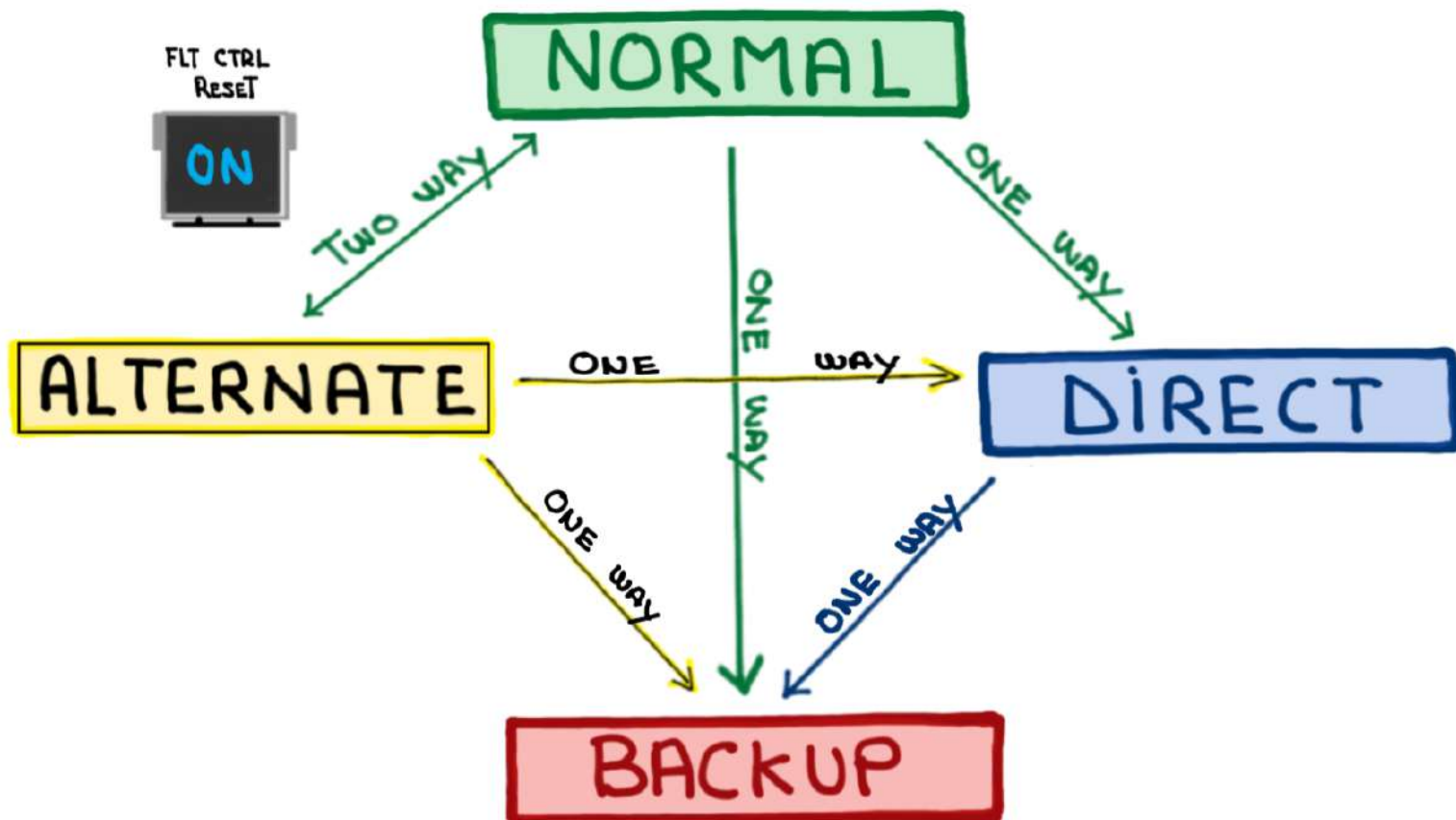
- BACKUP FLIGHT CONTROL UNIT



- REMOTE ELECTRONIC UNITS



FLIGHT CONTROL LAW (CLAWS) MODES



NORMAL

MINIMUM REQUIREMENTS:

- ① ONE ① IRU
- ② ONE ① FCC CHANNEL
- ③ TWO ② AIR DATA PROBES (HEATED AND DATA)
- ④ HSCU NOT REPORTING BACKUP MODE

- GAIN AND CONTROL DEFLECTION SCHEDULED WITH AIRSPEED:

- AMPLIFICATION OF SIGNAL TO ACHIEVE DESIRED AIRCRAFT RESPONSE

- LOWER GAIN - LESS CONTROL DEFLECTION AND VICE VERSA

- HIGH AUTHORITY YAW DAMPER

- SUB-MODES: ON GROUND, TAKEOFF & LANDING, CRUISE, AOA LIMITING, AND HIGH SPEED PROTECTION

NORMAL sub-modes:

CRUISE

(GEAR/FLAPS UP OR AP ON)



Pitch Trim

NU

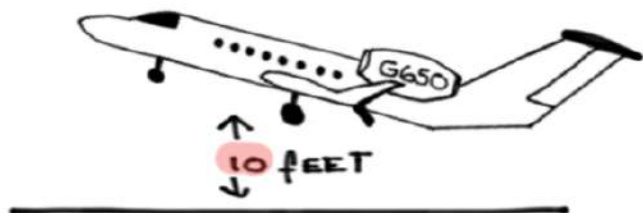
ND



- SURFACE deflection BASED ON ALTITUDE AND AIRSPEED
- PITCH TRIM MOVES ELEVATOR THEN STABILIZER off-loads ELEVATOR

TAKEOFF AND LANDING

(GEAR/FLAPS DOWN AND AP OFF)



Pitch Trim

NU

ND



- 10' AGL
- SURFACE deflection BASED ON ALTITUDE AND AIRSPEED
- PITCH TRIM MOVES STABILIZER

ON GROUND



Pitch Trim

NU

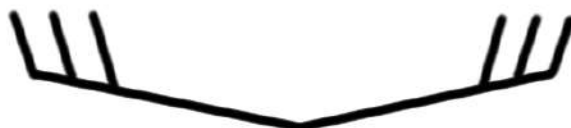
ND



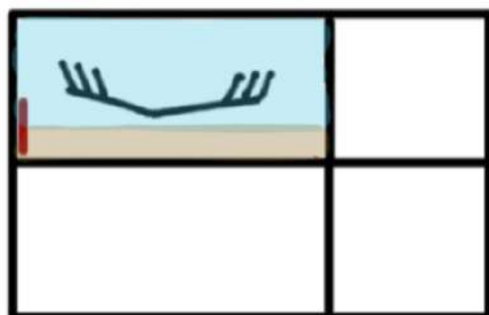
- PILOT input DIRECT
- PITCH TRIM MOVES STABILIZER
- > 60 KTS YD FUNCTIONS

AOA Limiting:

Pitch Limit Indicator (PLI) shows the RELATION OF MARGIN BETWEEN THE AIRCRAFT AOA AND THE STICK SHAKER

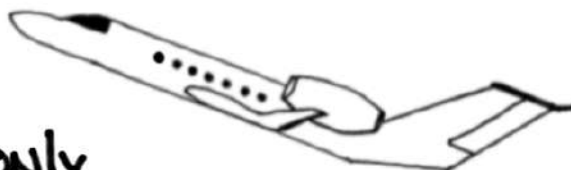


- 0.75 AOA - Pitch Limit Indicator (PLI) APPEARS



- 0.87 - 0.93 AOA Limiting (BASED ON CLOSURE RATE)

FCC AOA Limiting



- NOSE DOWN TRIM ONLY
- AUTOPILOT DISENGAGES
- INHIBITED WITH EITHER MLG WOW - GROUND

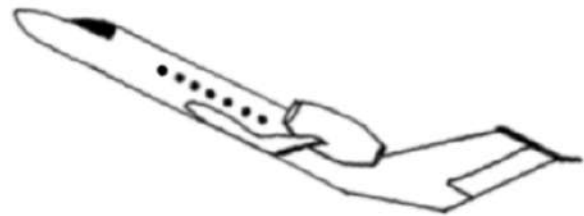
- 0.94 AOA - STICK SHAKER ACTIVATES



NOTE: STICK SHAKER ACTIVATES AT 0.85 if AOA
LIMITING NOT AVAILABLE OR if FCC ALTERNATE Mode
is ACTIVE WITH AIR DATA INFORMATION AVAILABLE

- 0.96 MAX AOA LIMIT (Alpha Limit) *

STALL PROTECTION ACTIVE

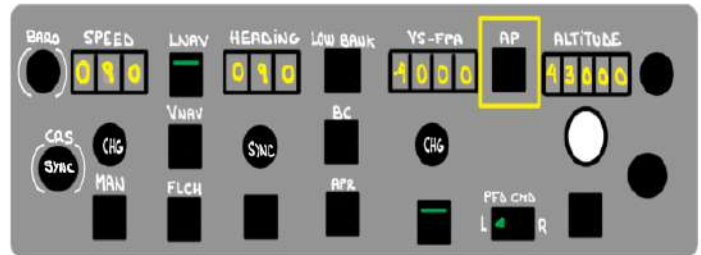


* EVEN WITH CONTROL COLUMN FULL AFT THE AIRCRAFT
WILL NOT ENTER A FULL STALL

High Speed Protection:

- Available when:

- AUTOPILOT is OFF

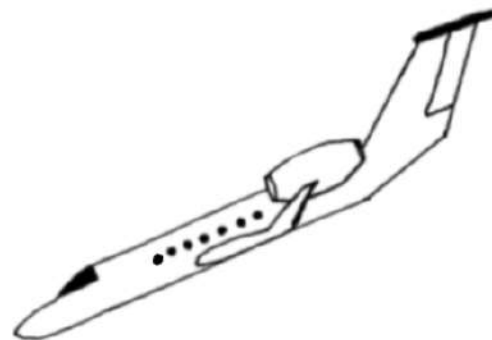


- $V_{MO} / M_{MO} + 5$ (depending on acceleration rate)

- Pitch control restricted by the FCS

- Helps prevent an overspeed condition by decreasing pitch nose down authority **75%**

High Speed PROTECT Active



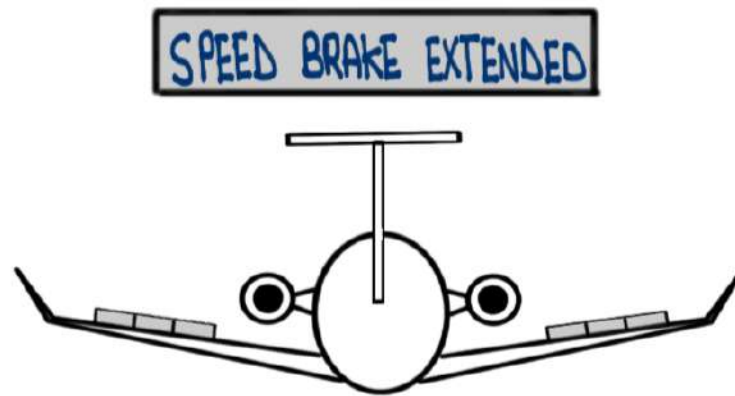
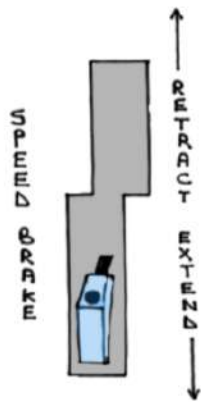
- PROTECTION inhibited with AUTOPILOT ON or at a high bank angle (protection fades out $> 60^\circ$ bank)

- DOES NOT PREVENT EXCEEDING V_{MO} / M_{MO}

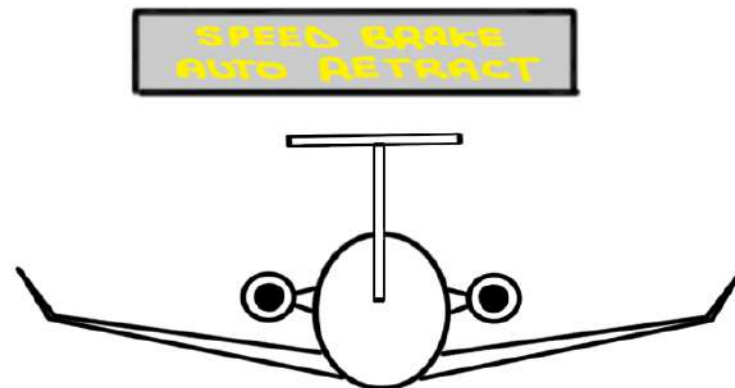
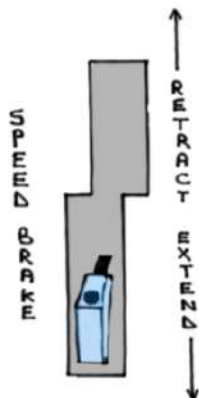
- Additional functions and features:

SPEEDBRAKE - AUTO RETRACT:

STUCK OR JAMMED SPEED BRAKE HANDLE



95% THROTTLE
RESOLVER ANGLE
(TRA)



SPEED BRAKE PANELS RETRACT BUT HANDLE DOES NOT

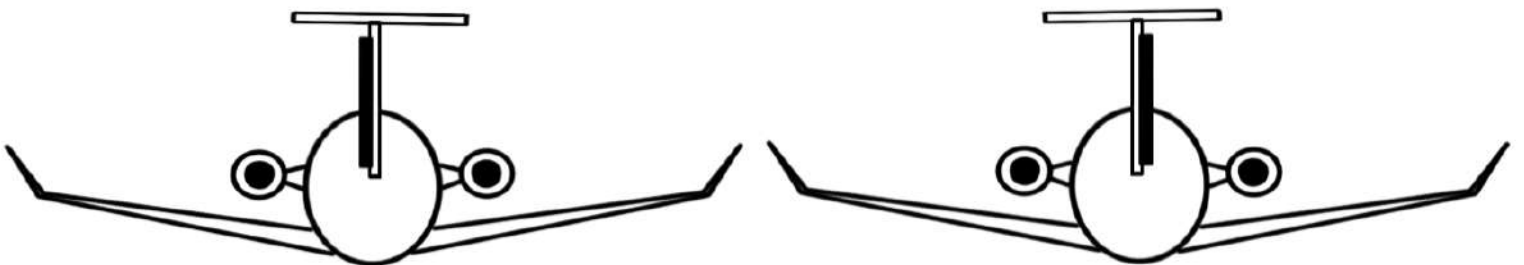
Dynamic Rudder Limiting:

Helps PREVENT A PILOT FROM OVERSTRESSING
THE RUDDER

Low speed: High deflection (26°)

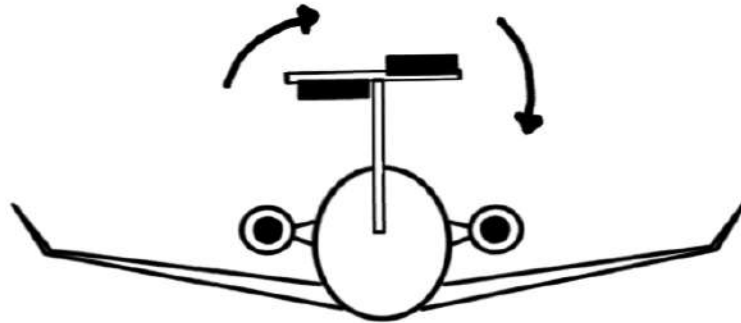


High speed: Low deflection (5°)



ELEVATOR Split Load Limiting:

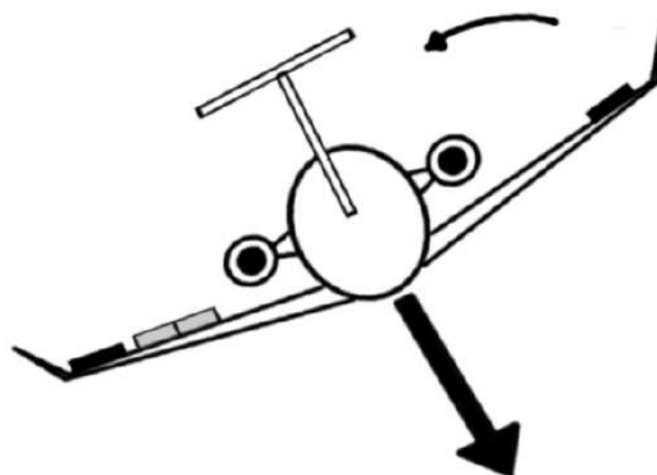
PROTECTS AGAINST LARGE TORQUE ASSOCIATED WITH A SPLIT ELEVATOR (I.E., JAMMED ELEVATOR)



MANEUVER Load Alleviation:

Ailerons SYMMETRICALLY deflect upwards TO REDUCE loads when the pilot commands > 1.5 Gs

REACHES MAXIMUM 3° deflection ≥ 2.5 Gs



ALTERNATE

① < Two ② ADS PROBES

② IRU $\begin{cases} \text{INVALID DATA} \\ \text{CONFLICT} \\ \text{AHRS CONFLICT} \end{cases}$

③

HSCU	
1	2

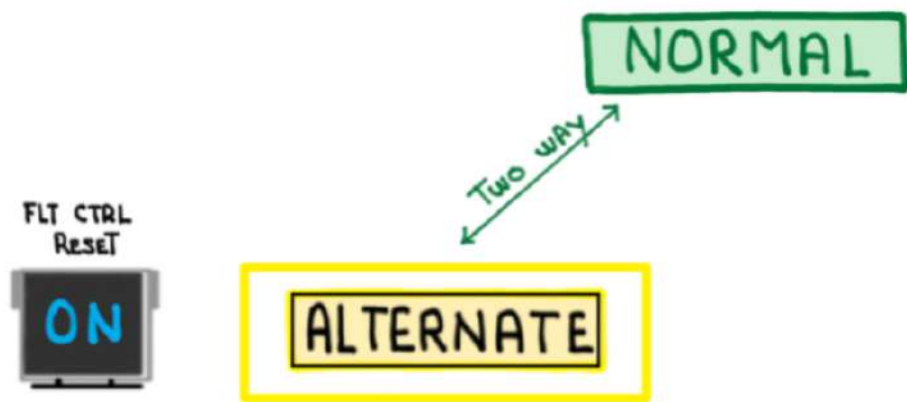
 REPORTING BACKUP CONTROL

• HARDWARE MALFUNCTION

• CAS MESSAGE: FCC ALTERNATE Mode

• Probability of OCCURRENCE: < 1 PER 10 million flight hours

• FLT CTRL RESET switch MAY ALLOW RETURN TO NORMAL if THE REASON FOR THE DEGRADE IS RESOLVED



DIRECT

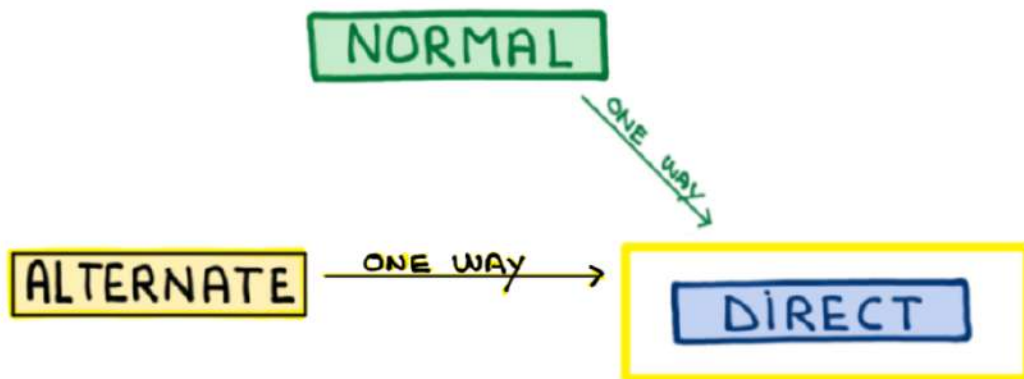
- All

FCC 1			
C	A	C	B
C	M	C	M

FCC 2			
C	A	C	B
C	M	C	M

 channels ARE INVALID

- COMMAND **C** AND MONITOR **M** LANES do NOT AGREE



- TRANSITION TO **DIRECT** MODE CAN ALSO OCCUR if all FOUR (4) LANES of the FCCs CALCULATE different AIRSPEED OR ALTITUDE
- SOFTWARE MALFUNCTION
- RETURN TO **NORMAL** OR **ALTERNATE** NOT possible
- Flying qualities ARE IDENTICAL TO **FCC ALTERNATE Mode**

AFTER SELECTING ANTI-ICE HEATERS TO ON WAIT FIVE (5) SECONDS BEFORE MOVING THE flight CONTROL SURFACES

TO PREVENT

FCC 1	
Ch A	Ch B

FCC 2	
Ch A	Ch B

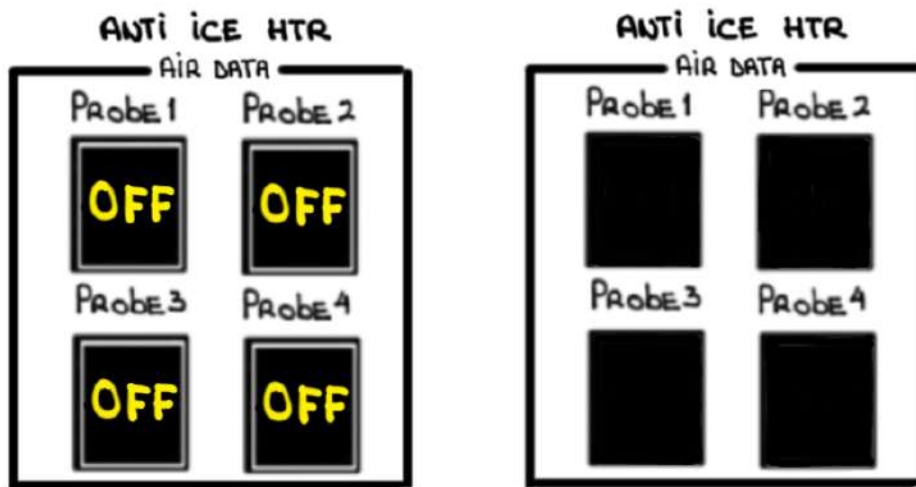
 FROM REVERTING TO

DIRECT

FCC ALTERNATE Mode

 →

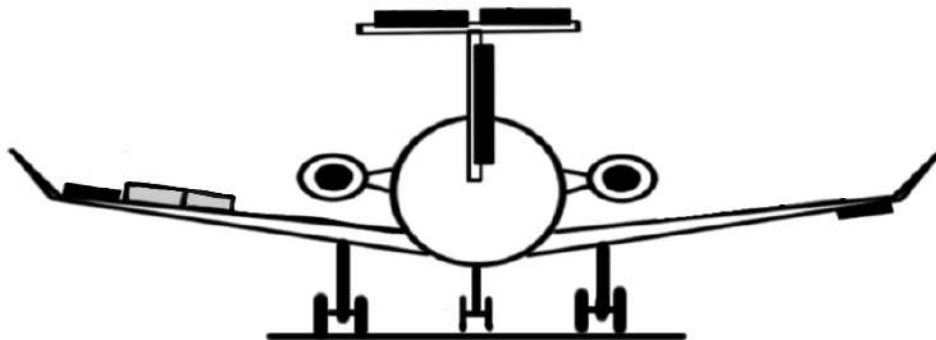
NORMAL



+ 5 SECONDS

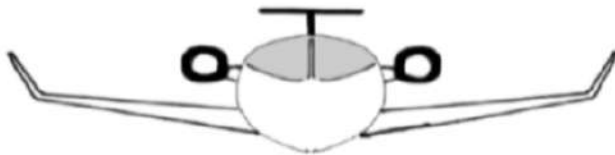
=

OK TO MOVE flight CONTROLS

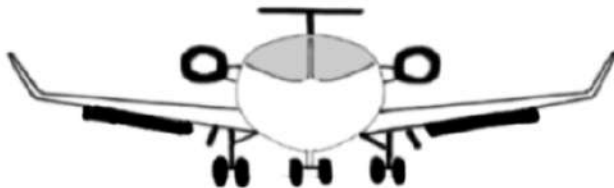


- CLAWS ARE IDENTICAL AND ARE BASED ON TWO (2) SPEED (GAINS) SCHEDULES:
 - High speed: 340 KTS (Low gain)
 - Low speed: 250 KTS (High gain)

THE SPEEDS ARE DEPENDENT ON FLAP OR LANDING GEAR POSITION



High Speed schedule



Low Speed schedule

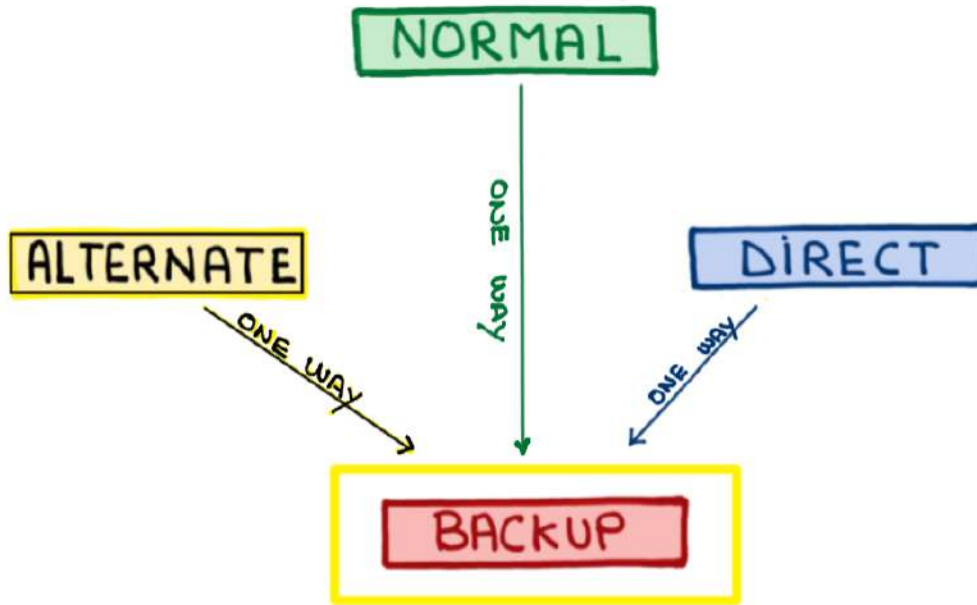
- AUTOPILOT AND ANGLE OF ATTACK (AOA) PROTECTION ARE NOT AVAILABLE
- HORIZONTAL STABILIZER IS CONTROLLED BY THE PEDESTAL TRIM SWITCH ONLY
- GROUND SPOILER NOT AVAILABLE IN FCC DIRECT Mode



BACKUP



CHANNELS CANNOT COMPUTE CONTROL LAW

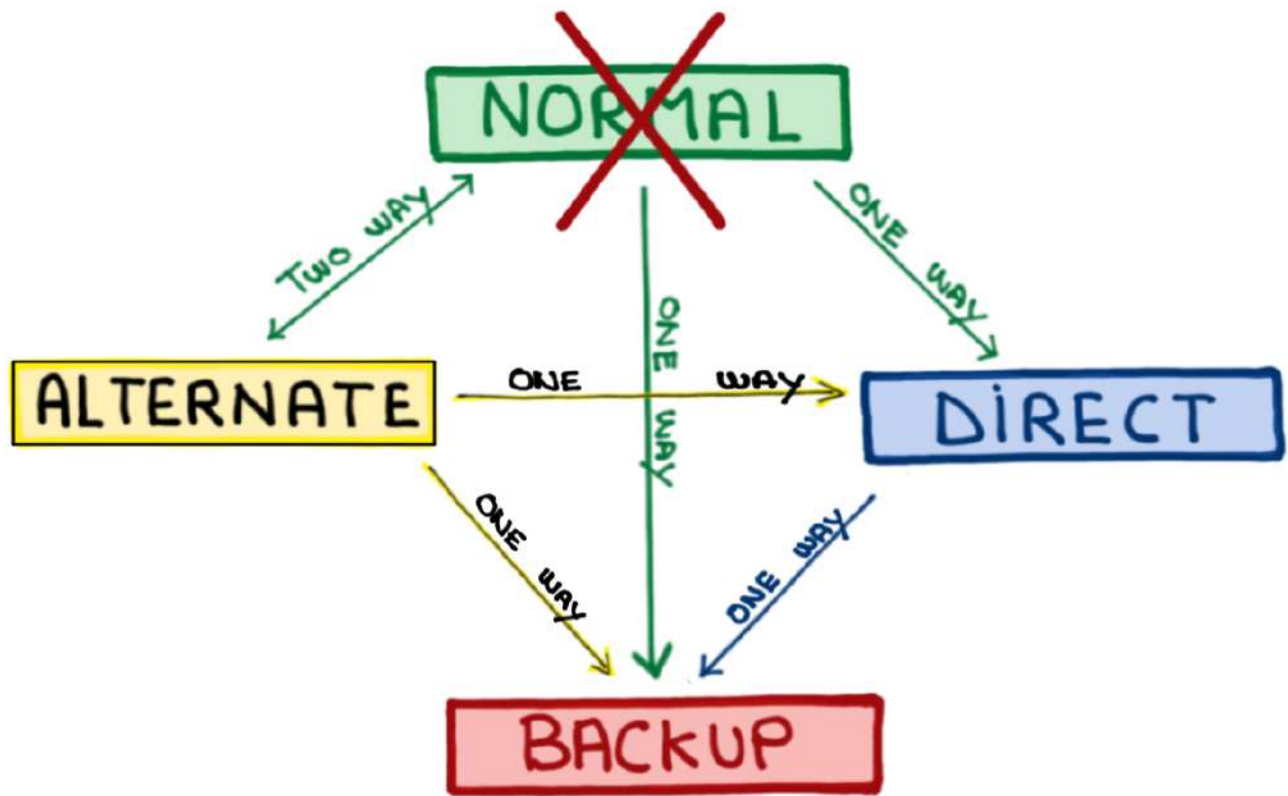


CAS MESSAGE: BFCU ACTIVE

HORIZONTAL STABILIZER IS CONTROLLED BY THE PEDESTAL TRIM SWITCH ONLY



PROBABILITY OF OCCURRENCE < 1 IN A BILLION FLIGHT HOURS



Any FLIGHT CONTROL LAW OTHER THAN **NORMAL**:

FCC ALTERNATE Mode

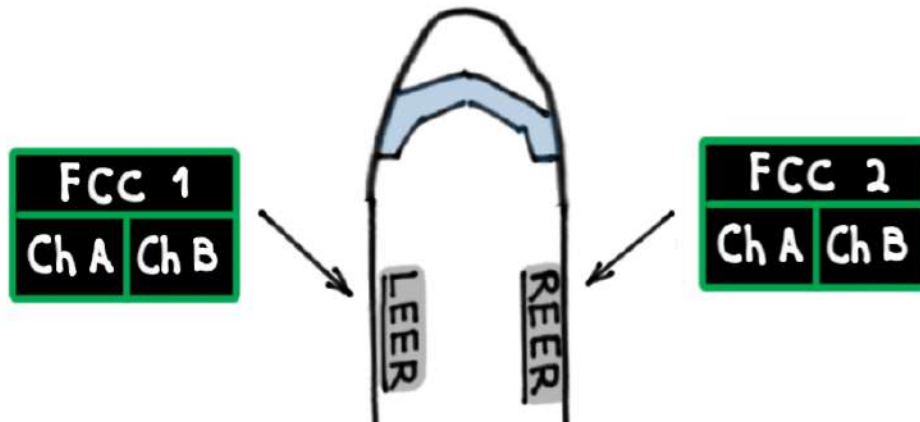
FCC DIRECT Mode

BFCU ACTIVE

- ① TAKEOFF is prohibited
- ② MAXIMUM LANDING CROSSWIND: 10 KNOTS
- ③ MAXIMUM SPEED: 285 KCAS/M0.90
- ④ FLIGHT INTO KNOWN icing conditions prohibited. If in icing conditions EXIT icing conditions
- ⑤ $V_{REF} + 10$ MINIMUM

FLIGHT CONTROL COMPUTERS (FCCs)

- BRAINS of the FCS
- LOCATED in the LEER and REER



- CONVERT input from the CREW/AUTOPILOT TO AN ELECTRICAL OUTPUT
- PROVIDE A COMMAND TO THE HYDRAULIC ACTUATORS which MOVE THE FLIGHT CONTROL SURFACES TO THE REQUESTED POSITION
- Each FCC HAS TWO (2) CHANNELS FOR A TOTAL OF FOUR (4) CHANNELS
- This configuration provides FOUR (4) REDUNDANT, DISSIMILAR, AND INDEPENDENT CHANNELS OF OPERATION

- A single FCC channel can operate the flight controls



- Each FCC channel has two (2) lanes:

① A COMMAND  lane, AND

② A MONITOR  lane

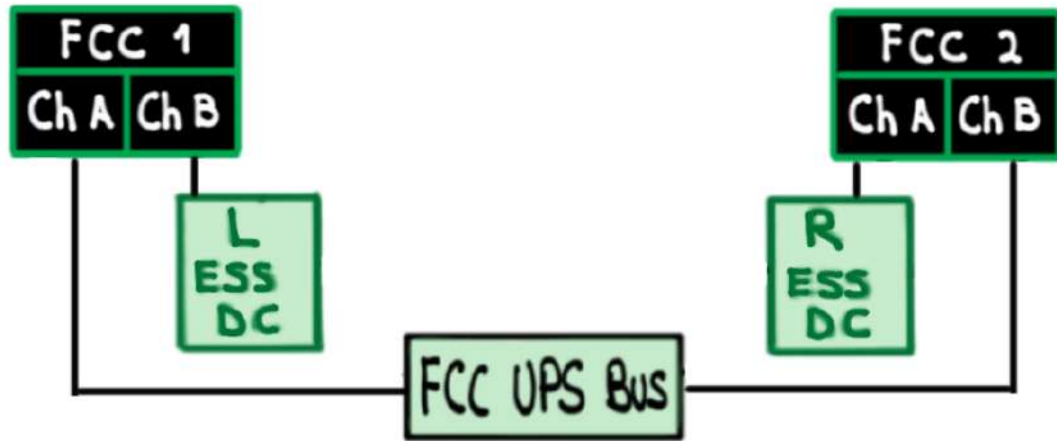


• Their purpose is to provide SYSTEM INTEGRITY by computing input using different software and having to come up with the same output result

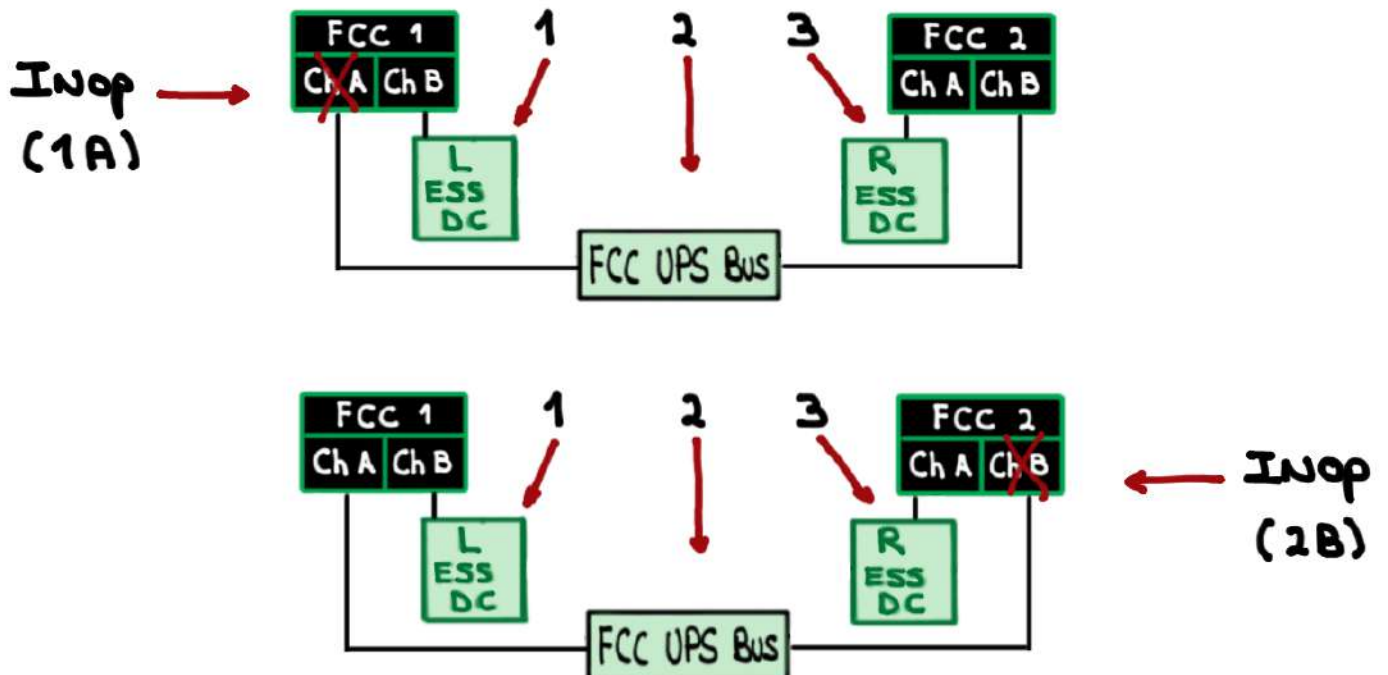
• Any significant difference between a  AND a  lane causes that channel to fail



- POWER SOURCES:



- THREE (3) SEPARATE POWER SOURCES REQUIRED.
- Dispatch with ONE (1) FCC channel inoperative is possible under the MMEL provided the remaining THREE (3) channels are powered by THREE (3) SEPARATE POWER SOURCES



- FLIGHT CONTROL RESET switch

- LOCATED ON THE CENTER PEDESTAL



- UPON ACTIVATION OF THIS SWITCH THE FCCs WILL ATTEMPT TO CLEAR ANY FCS FAULTS THAT ARE RESETTABLE. THIS EXTENDS TO THE REUS AS WELL
- USED WHEN DIRECTED BY AFM
- ADDITIONAL ATTEMPTS ARE PERMITTED WITH A TEN (10) SECOND INTERVAL
- DOES NOT WORK IN THE FOLLOWING CLAWS MODES:

FCC DIRECT MODE BFCU ACTIVE



Flight CONTROL LAWS (CLAWS)

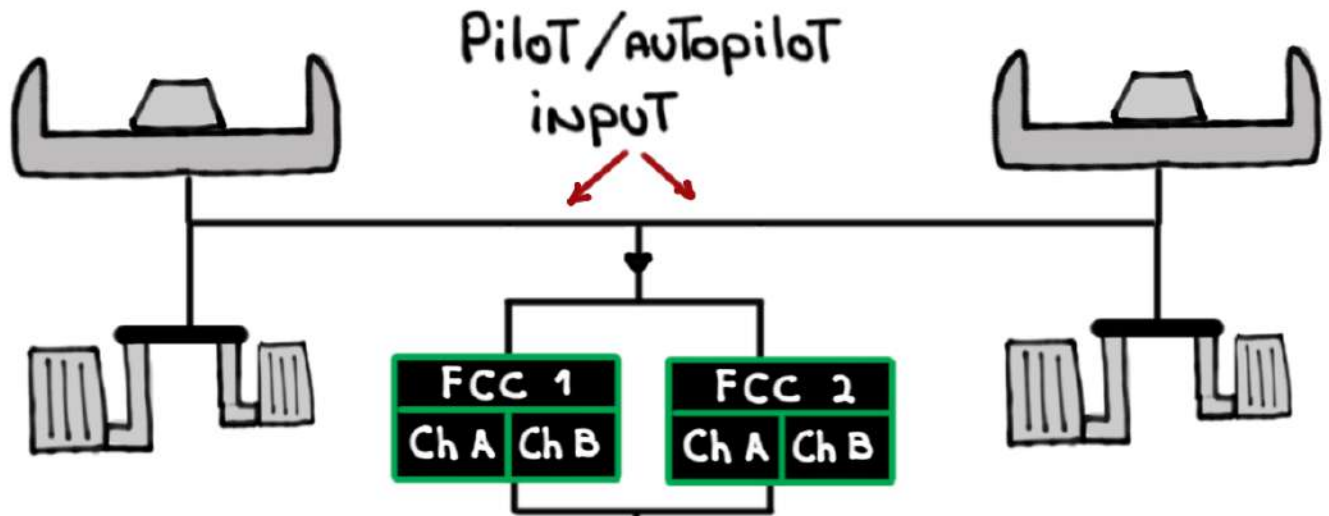
PROTECTIVE FEATURES

FCC 1
Ch A Ch B

FCC 2
Ch A Ch B

 CONTAIN SOFTWARE CALLED CONTROL LAWS OR CLAWS. ITS PURPOSE IS TO:

- MAKE THE AIRCRAFT fly like A GULFSTREAM
- DAMPEN UNDESIRABLE AIRCRAFT MOTIONS SUCH AS DUTCH ROLL
- IMPLEMENT SEVERAL PROTECTIVE FEATURES



CONTROL LAWS

ELECTRICALLY-CONTROLLED

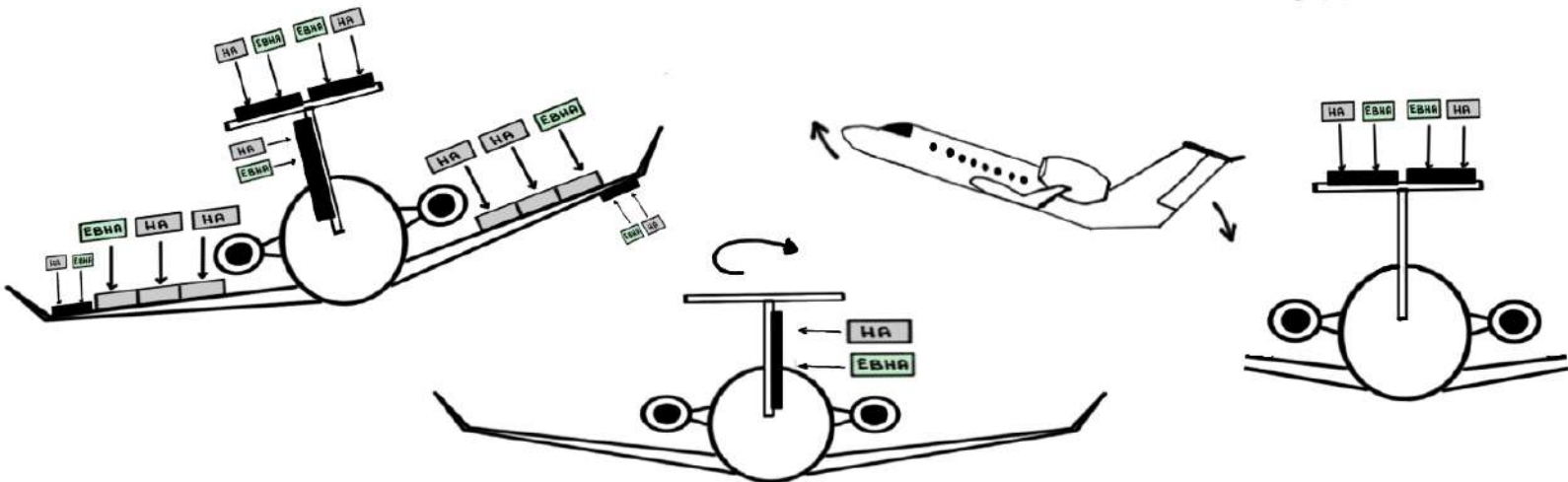
OUTPUT

REU (16) (REMOTE ELECTRONIC UNITS)

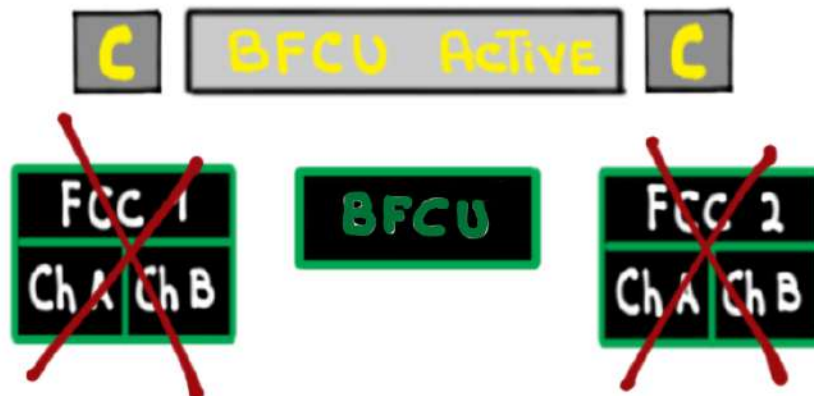
(9) HA EBHA (7)

HYDRAULICALLY-ACTUATED

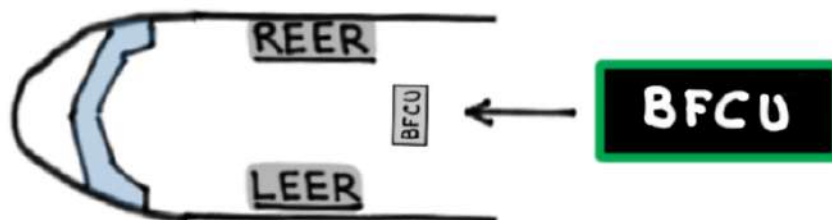
Spoilers ← Flight CONTROL Actuation → Roll
Pitch
YAW



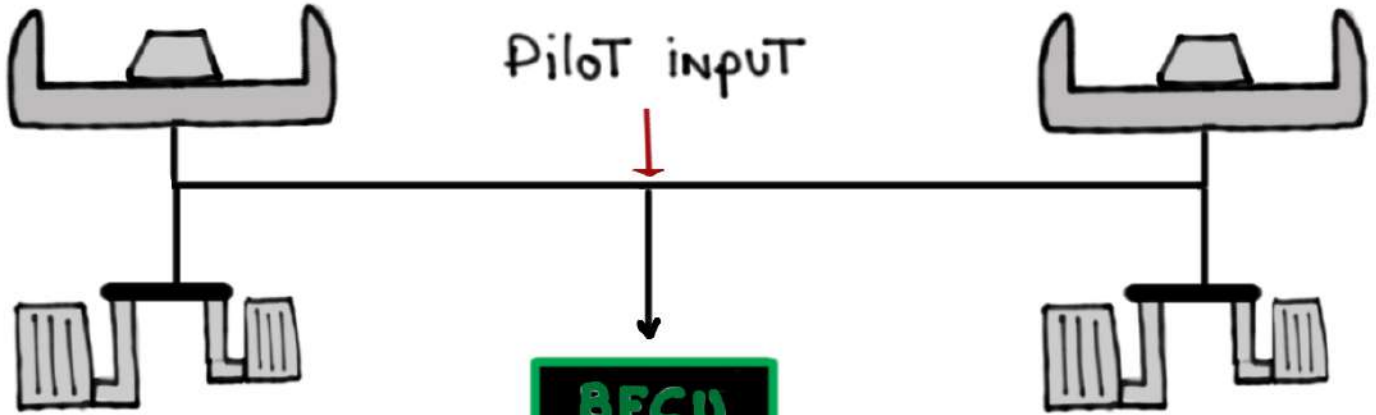
Backup FLIGHT CONTROL UNIT (BFCU)



- **BFCU** MONITORS all four (4) FCC CHANNELS AND ASSUMES CONTROL OF THE FCS if all four (4) CHANNELS BECOME UNAVAILABLE
- **BFCU** ASSUMES CONTROL WITHIN 120 MILLISECONDS. PROVIDES GET HOME capability with its own CONTROL LAWS
- THE **BFCU** IS LOCATED UNDER THE FLOOR JUST AFT OF THE LEER AND REER



C BFCU Active C



ELECTRICALLY - CONTROLLED

output

REU (7)

HYDRAULICALLY - ACTUATED

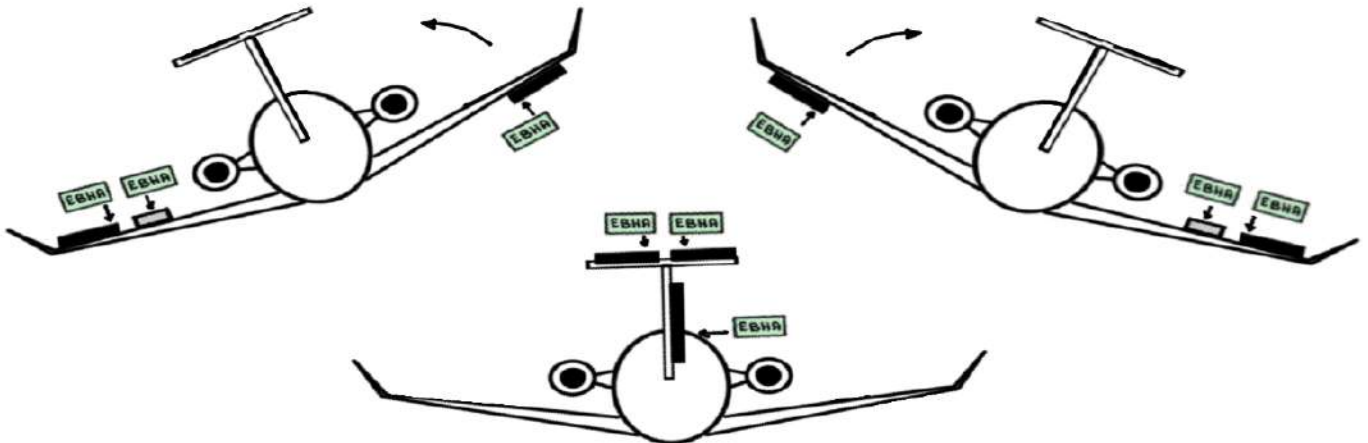
EBHA (7)

Spoilers (OUTBOARD only)

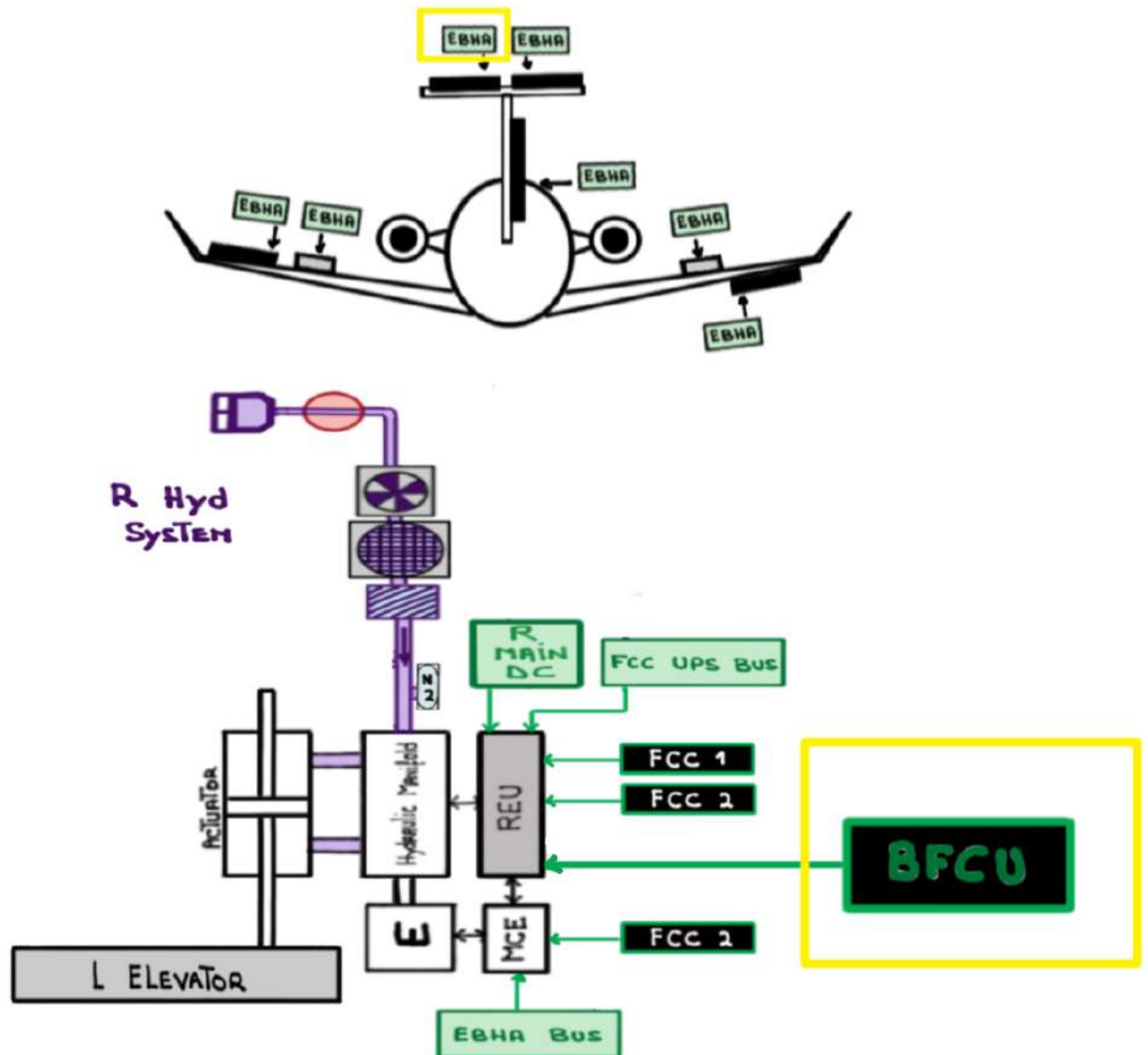
Flight CONTROL Actuation

Roll
Pitch
YAW

GET HOME capability



- **BFCU** COMMUNICATES DIRECTLY WITH **EBHA** ACTUATORS

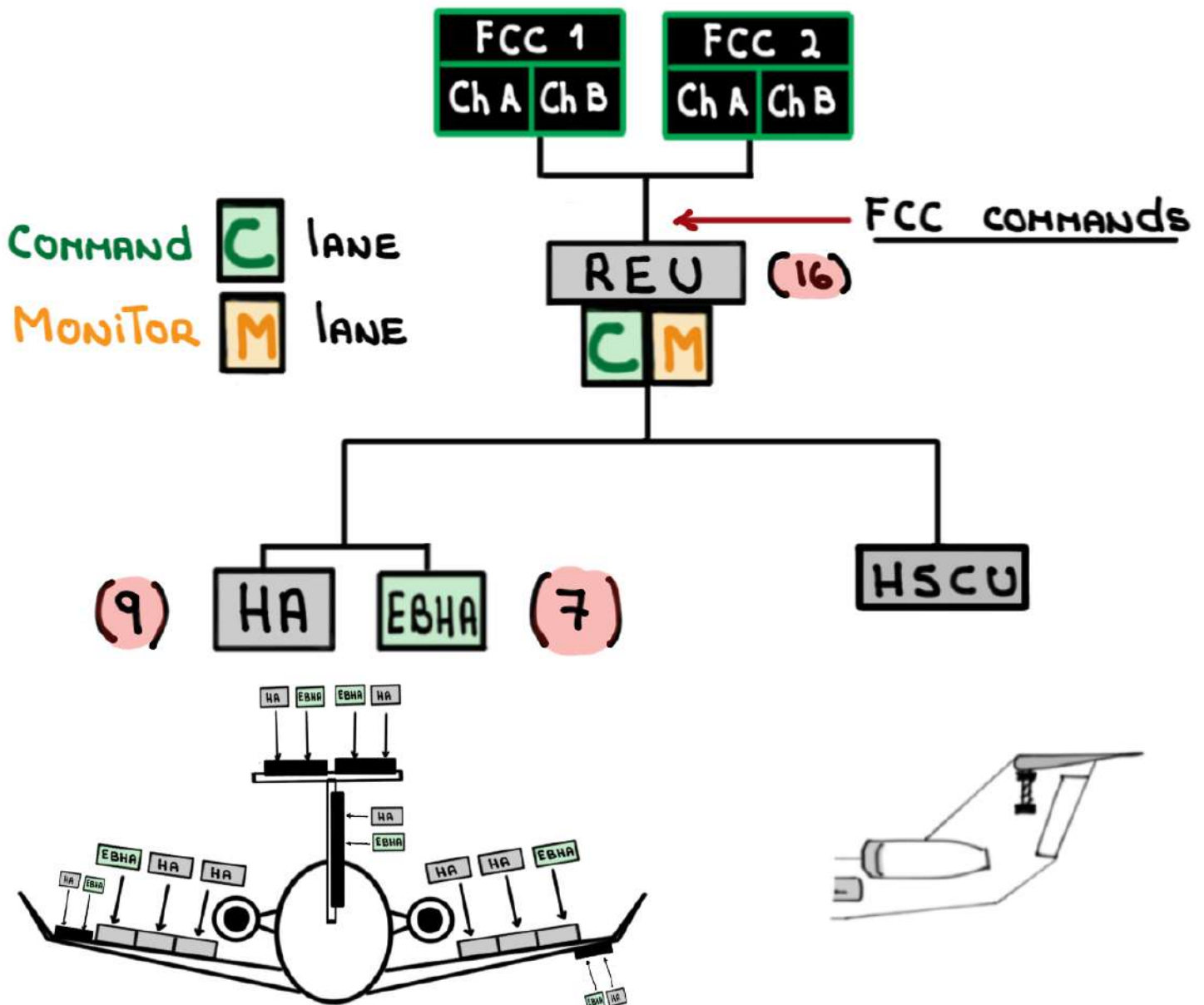
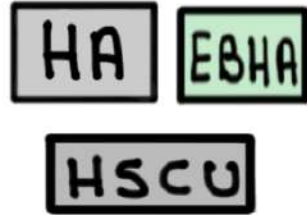


- ONCE ACTIVE IT CANNOT BE RESET in flight
- Inop < 47 KNOTS
- POWERED by **FCC UPS BUS**
- CAN BE DEFERRED IN ACCORDANCE WITH MMEL

REMOTE ELECTRONIC UNITS (REU)

- THERE ARE SIXTEEN (16) REUs

- THE REUs CONTROL THE HYDRAULIC ACTUATORS AND HORIZONTAL STABILIZER CONTROL UNIT BASED ON FCC COMMANDS

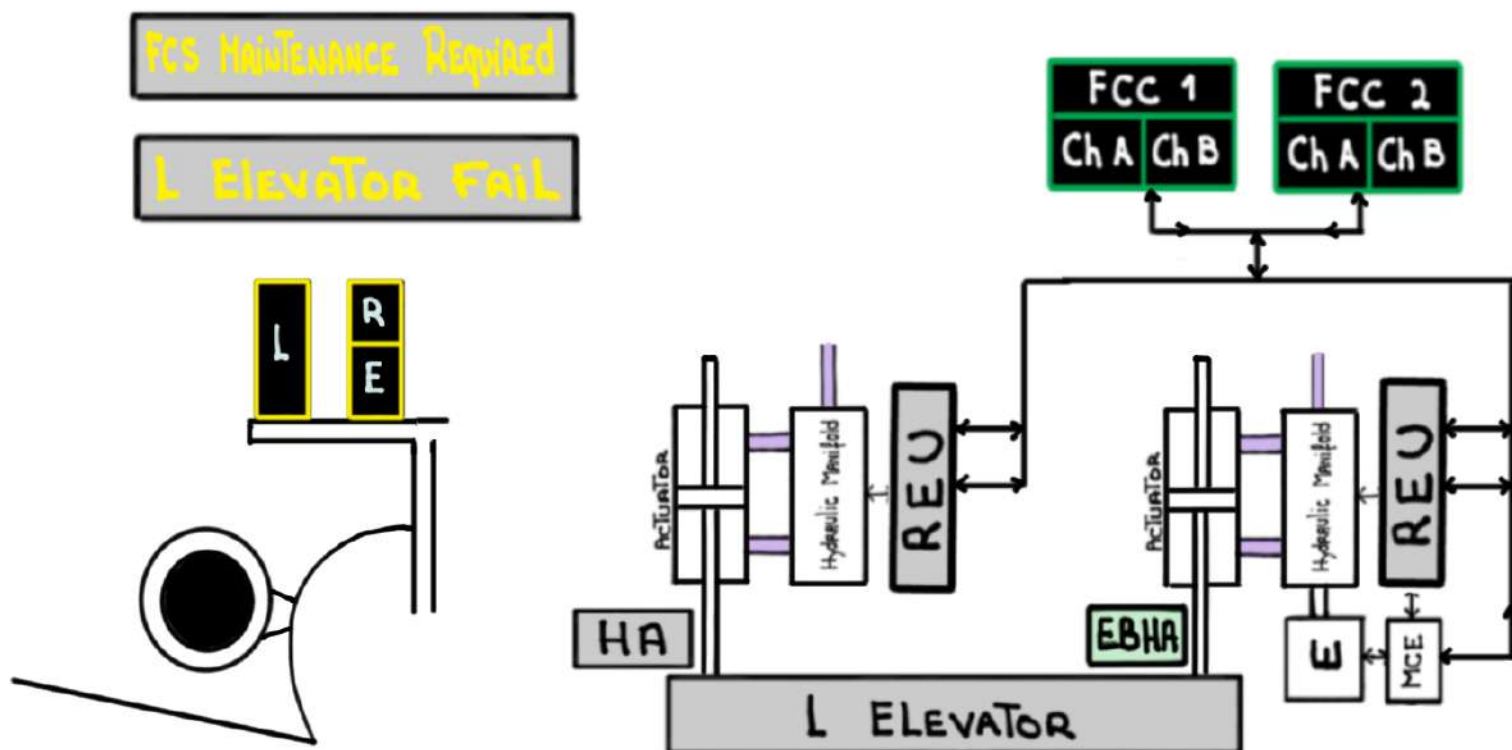


- MONITOR TRIP:

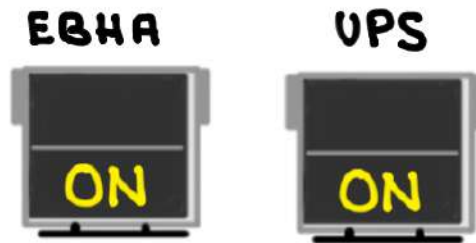
AN INTENTIONAL SHUTDOWN OF THE CONTROL SURFACE WHICH OCCURS WHEN THE FCC'S ARE UNABLE TO DETERMINE WHICH REU, ON THAT CONTROL SURFACE, IS CAUSING A DISAGREEMENT

SURFACE MONITOR TRIPS HAVE BEEN CAUSED BY CORRUPTED POSITION OR PRESSURE SIGNALS DUE TO:

- MOISTURE ENTERING LOOSE CONNECTORS, OR
- DAMAGED/DEFECTIVE COMPONENTS



FCS 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)

The text describes the state of the batteries. It says they are illuminated (shown as 'ON' indicators) if there is no AC power. In this state, they power their own buses, which is a discharging state.







- SYSTEM POWER ON SELF TEST (SPOST)

TURNING ON THE FCS BATTERIES INITIATES A COMPREHENSIVE AND EXTENSIVE FLIGHT CONTROL COMPUTER (FCC) POWER UP TEST

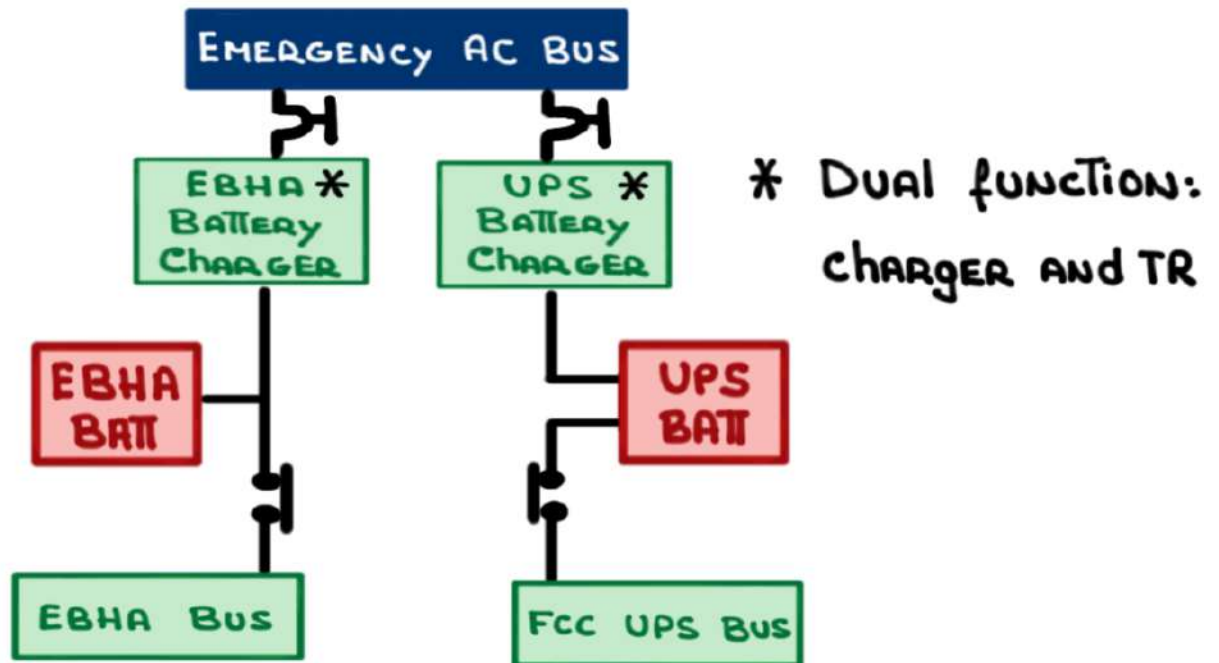
DURING THESE TESTS THE FCS CHECKS ALL SAFETY MONITORS, COMMUNICATION PATHS, AND REVERSIONARY MODES OF OPERATION

IN THE EVENT OF A DISCREPANCY AN AMBER **FCS MAINTENANCE REQUIRED** CAS MESSAGE IS GENERATED

-  SELECTED ON FIRST , THEN  SELECTED ON 

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

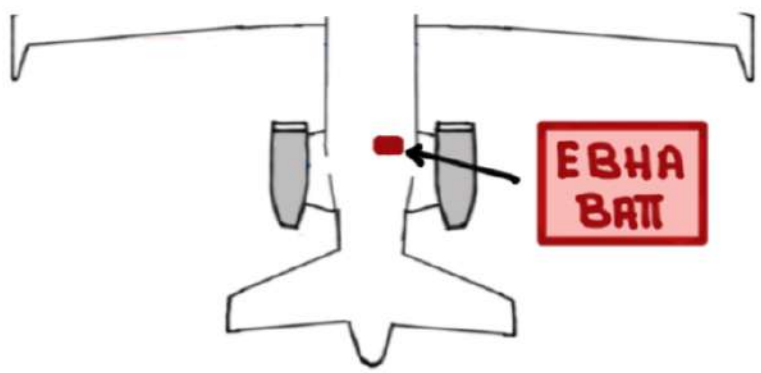
- FCS BATTERIES - CHARGER/TRANSFORMER RECTIFIER



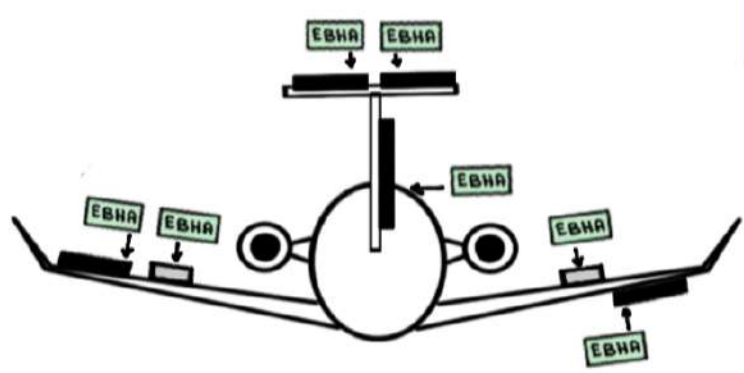
**EBHA
BAT**

ELECTRICAL Backup Hydraulic Actuator

- Nicad battery
- LOCATED IN THE TAIL COMPARTMENT



- POWERS SEVEN (7) MCE



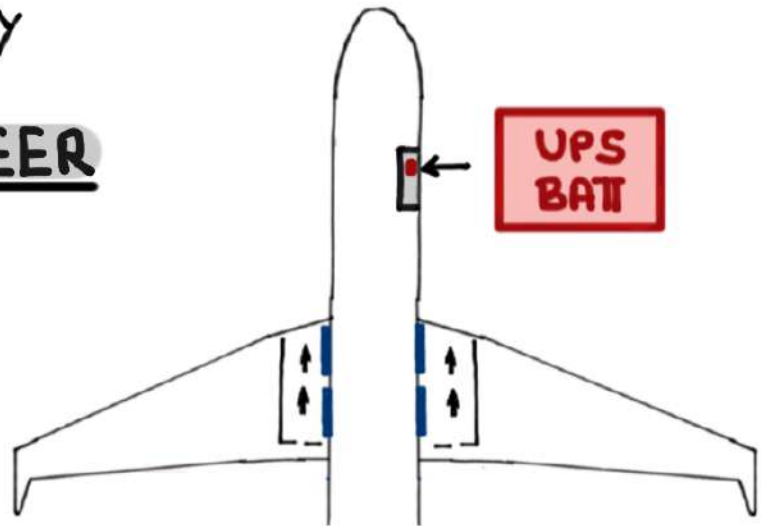
- CAN BE CHARGED BY RAT GEN VIA THE EMERGENCY AC BUS



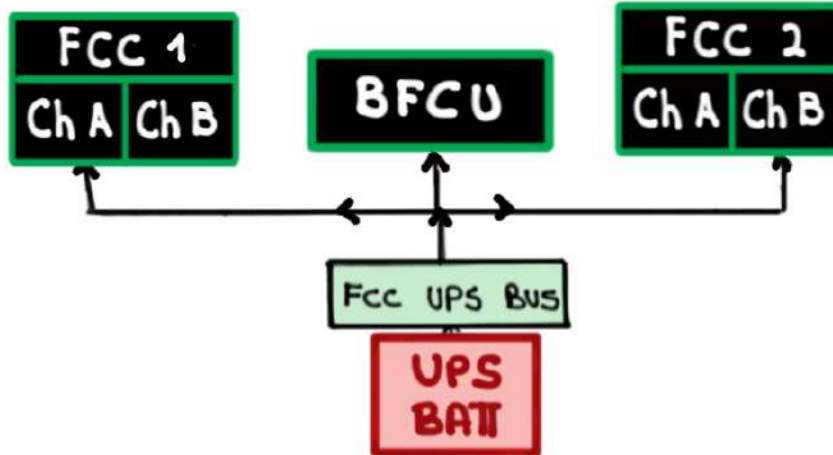
- MUST BE REMOVED FROM THE AIRCRAFT IN COLD SOAKED CONDITIONS ($\leq 20^{\circ}\text{C}$) AND STORED IN A LOCATION WARMER THAN -20°C AND COOLER THAN $+40^{\circ}\text{C}$

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

- LEAD ACID BATTERY
- LOCATED IN THE REER



- POWERS FLIGHT CONTROL COMPUTERS CHANNELS 1A AND 2B



- PRIMARY AND SECONDARY POWER FOR RUDDER EBHA

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

1

L GEN

ON

L
IDG

R
IDG

R GEN

ON



2

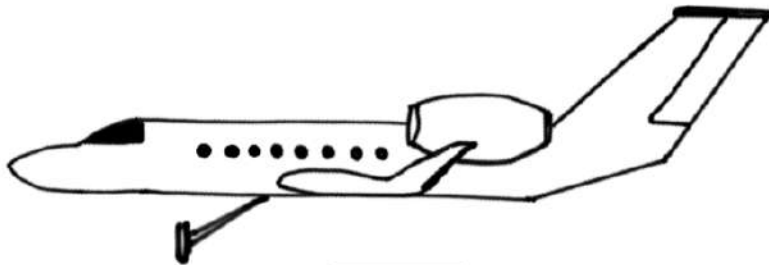
APU GEN

ON

APU
GEN



3



RAT
GEN

(> 180 kts)

RAT GEN



4

MAIN BATTERIES

ON

ON

Left

Right

EBHA



UPS



5

EBHA



UPS



1

Flight CONTROL LAW Mode

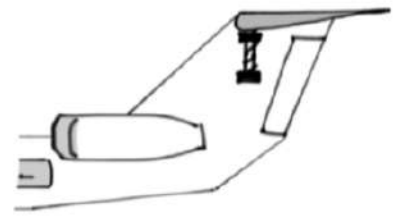
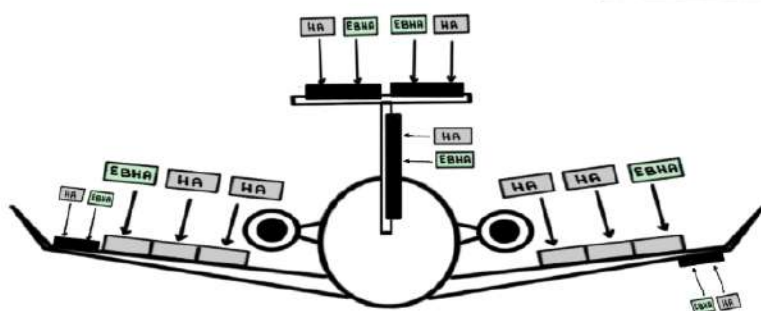
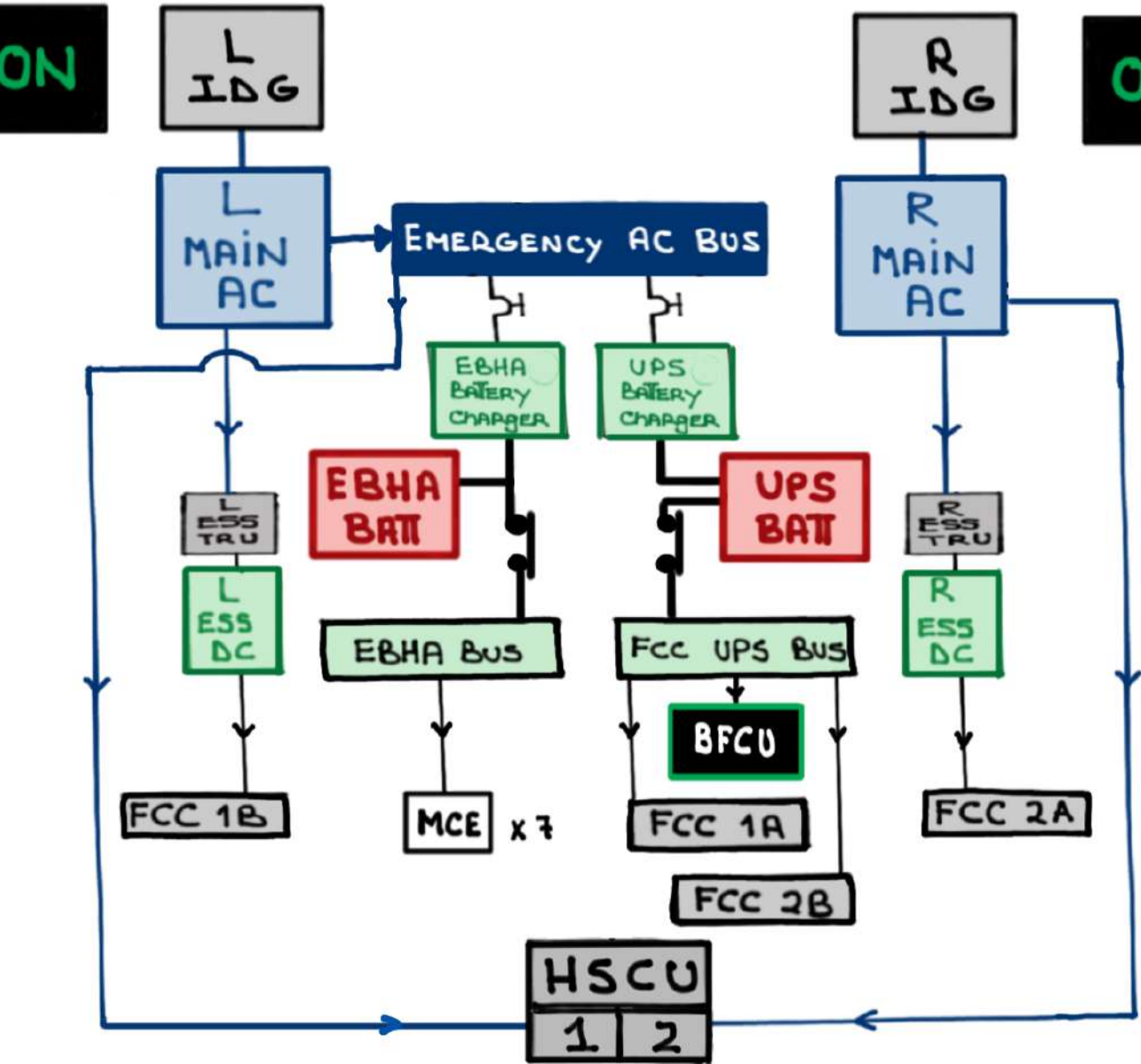
NORMAL

L GEN

ON

R GEN

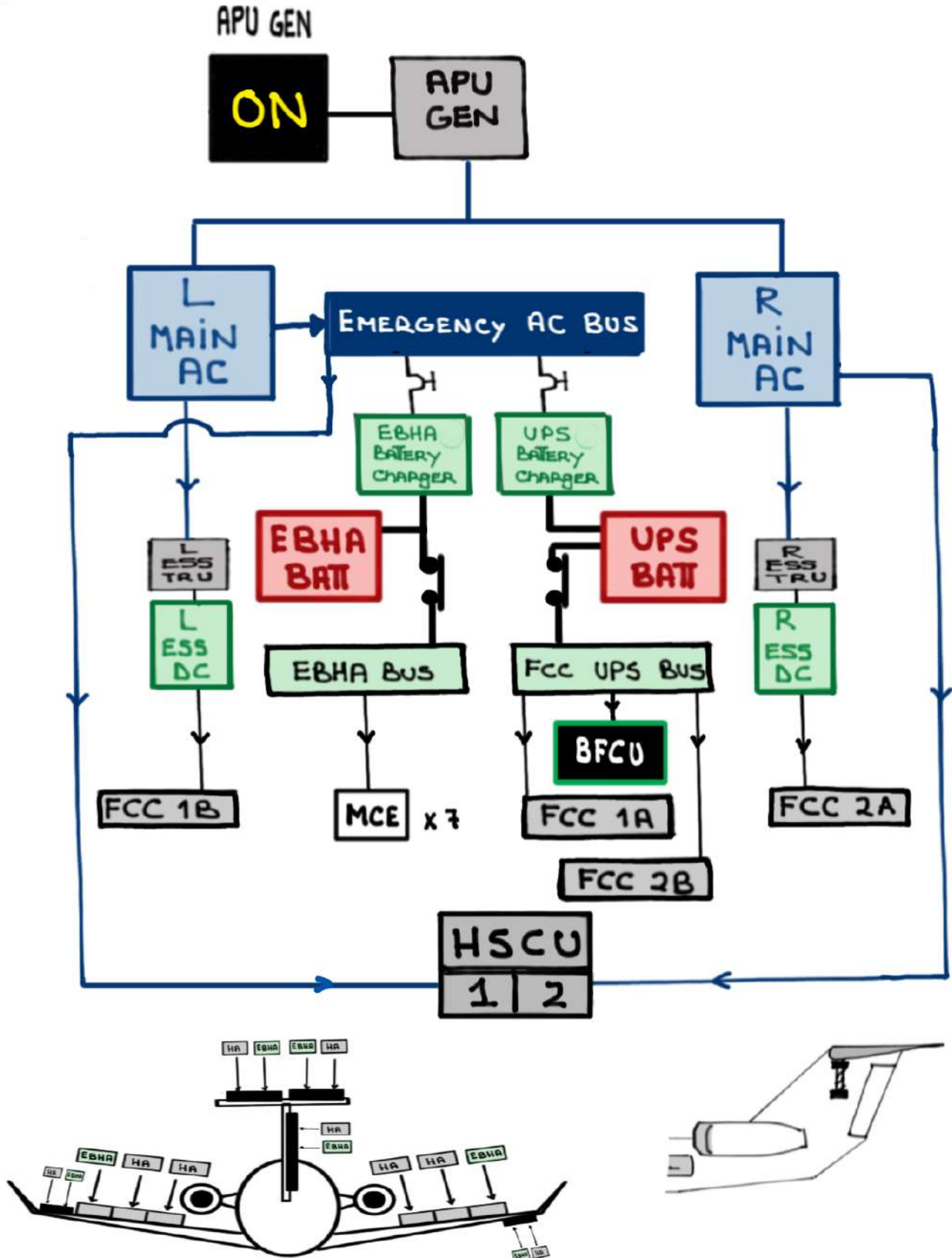
ON



2

Flight CONTROL LAW Mode

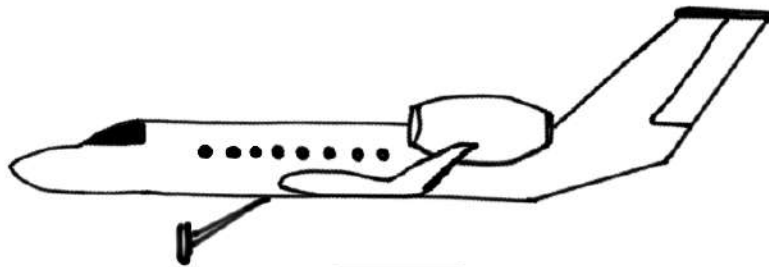
NORMAL



FLIGHT CONTROL LAW MODE

NORMAL

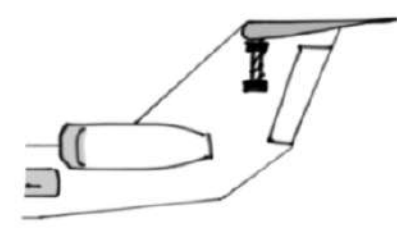
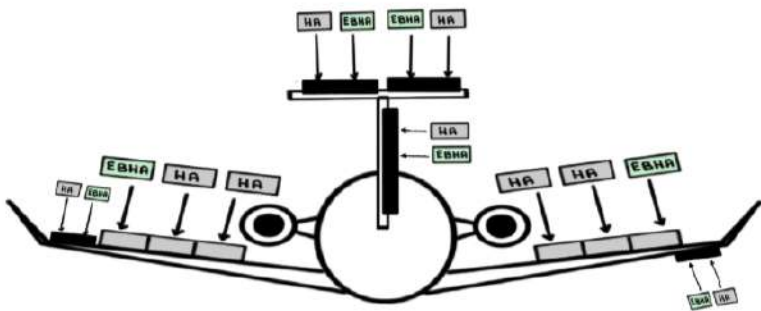
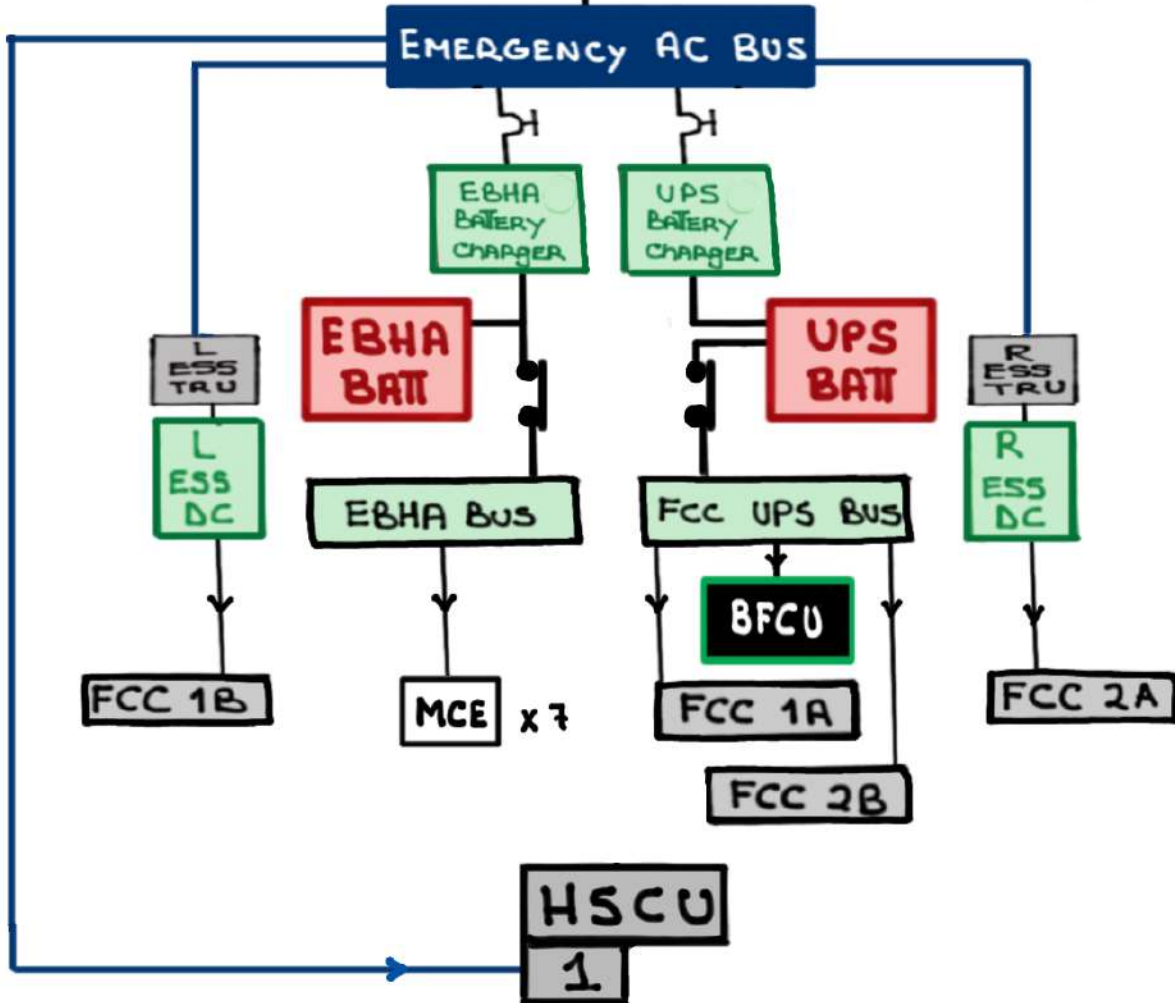
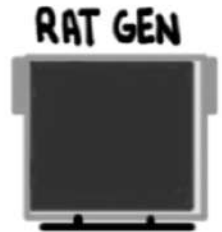
3



RAT GENERATOR ON

RAT GEN

(> 180 kts)



4

FLIGHT CONTROL LAW Mode

NORMAL

MAIN BATTERIES

ON

LEFT

ON

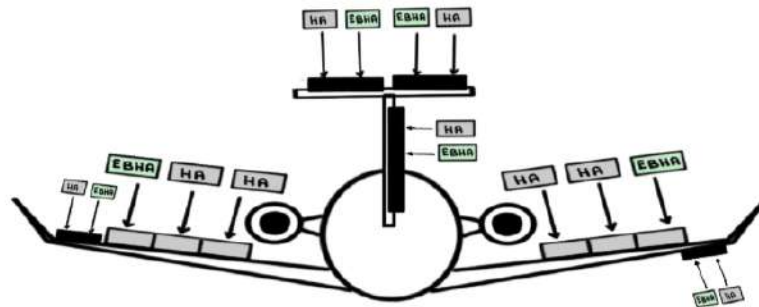
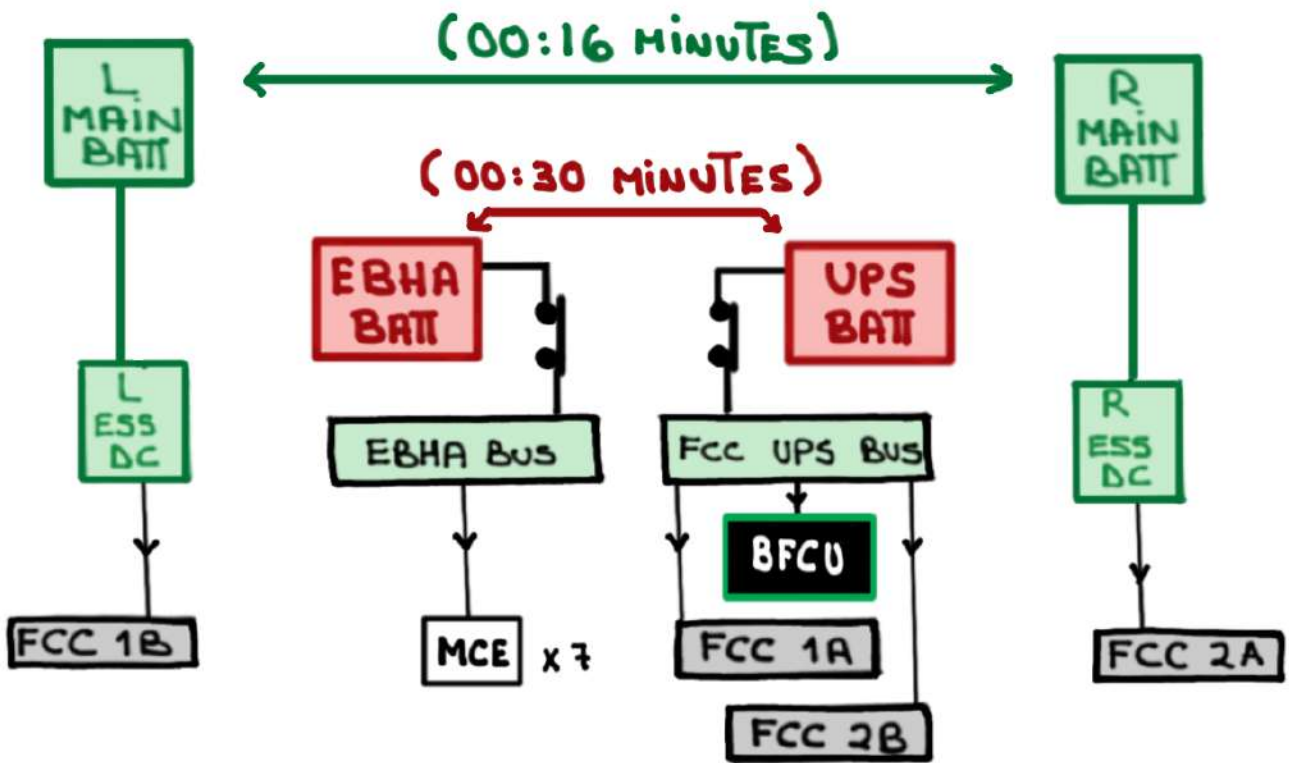
RIGHT

EBHA

ON

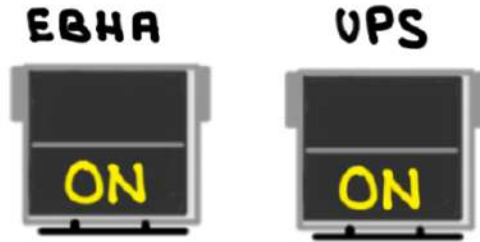
UPS

ON

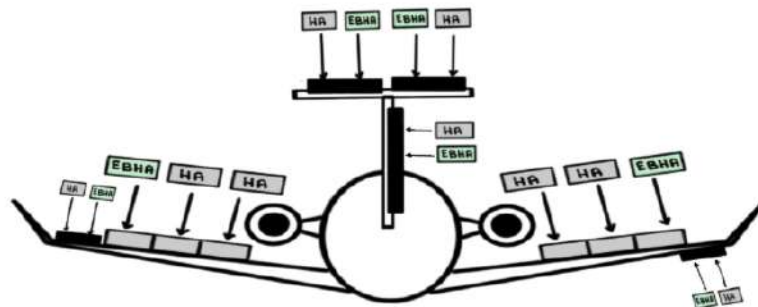
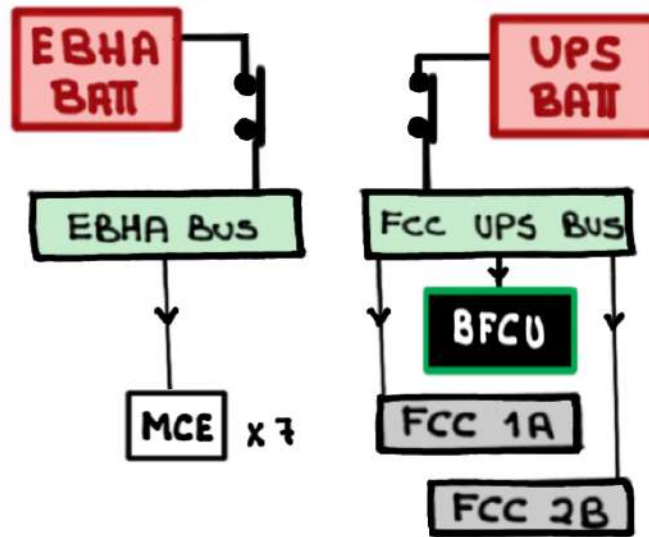


5

FLIGHT CONTROL LAW Mode NORMAL

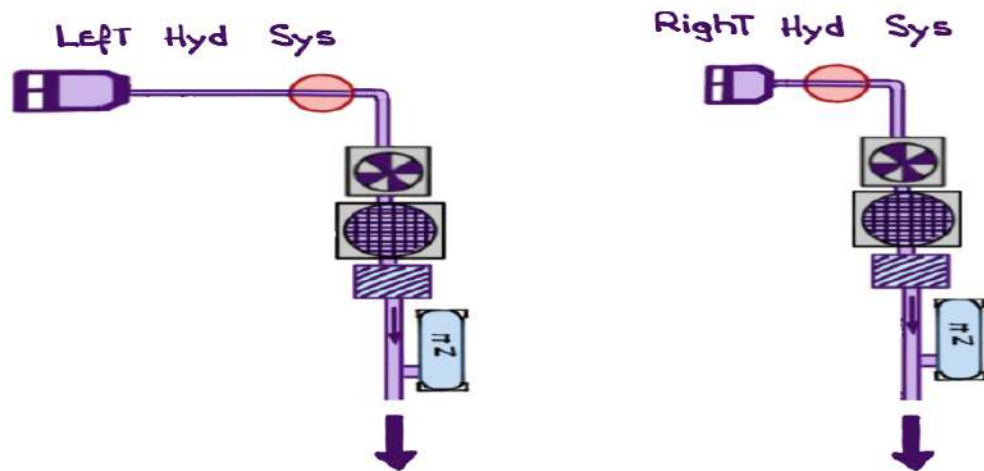


(00:30 MINUTES)



Hydraulically - Actuated

- Hydraulic fluid and pressure provided by:



- THERE ARE SIXTEEN (16) HYDRAULIC ACTUATORS

- TWO (2) ACTUATORS FOR EACH PRIMARY FLIGHT CONTROL SURFACE:

- L/R Ailerons (4)
 - L/R Elevators (4)
 - Rudder (2)
- > TEN (10)

- THERE IS ONE (1) ACTUATOR FOR EACH SPOILER PANEL

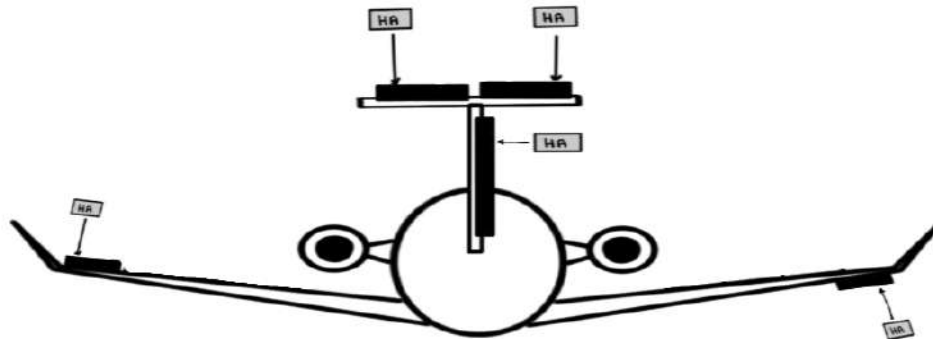
- L/R Inboard (2)
 - L/R Midboard (2)
 - L/R Outboard (2)
- > Six (6)

- THERE ARE TWO (2) TYPES OF ACTUATORS:

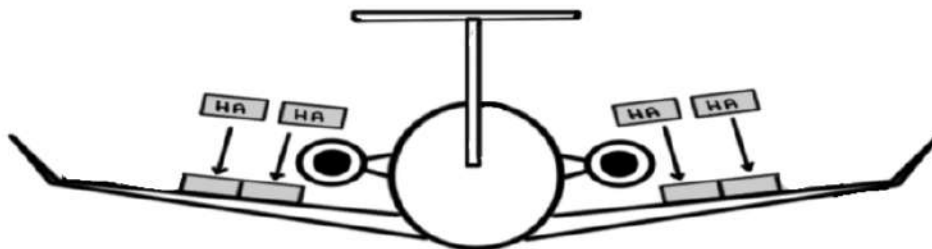
- HYDRAULIC ACTUATOR HA X (9)

(ELECTRO-HYDRAULIC SERVO ACTUATOR)

- ONE (1) FOR EACH PRIMARY FLIGHT SURFACE



- ONE (1) FOR EACH INBOARD AND MIDBOARD SPOILER



- USES LEFT AND RIGHT HYDRAULIC SYSTEMS

- COMMANDED BY AN REU → HA

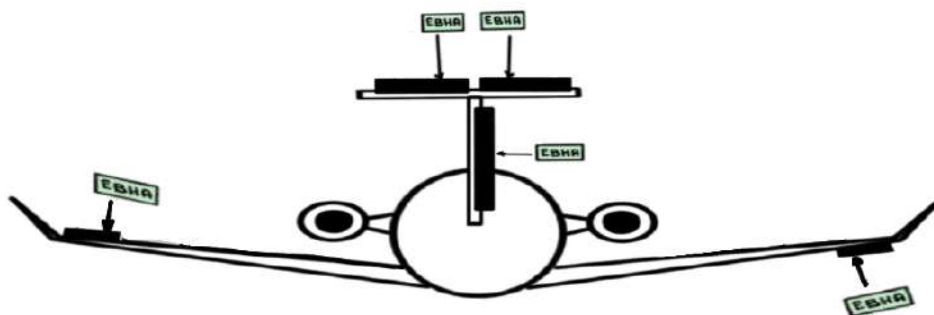
- TWO (2) MODES:

- ① HYDRAULICALLY ACTIVE: NORMAL STATE OF OPERATION

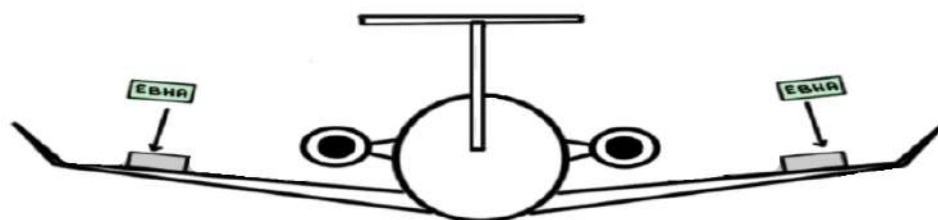
- ② DAMPED BYPASS MODE: PASSIVELY FOLLOWS THE WORKING ACTUATOR

• ELECTRICAL Backup Hydraulic Actuator **EBHA** X (7)

- ONE (1) FOR EACH PRIMARY flight SURFACE



- ONE (1) FOR EACH OUTBOARD spoiler PANEL



- NORMALLY USES LEFT AND RIGHT HYDRAULIC SYSTEMS

- NORMALLY COMMANDED BY AN **REU** → **EBHA**

- If NORMAL HYDRAULIC PRESSURE IS NOT AVAILABLE IT REVERTS TO ELECTRIC Backup (EB) MODE

- THREE (3) MODES:

① Hydraulically Active: NORMAL STATE OF OPERATION

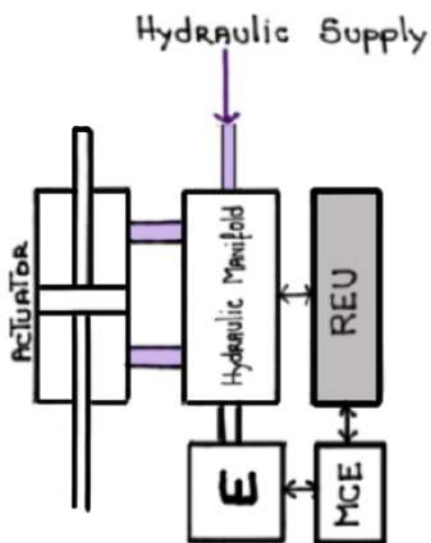
② DAMPED BYPASS MODE: PASSIVELY FOLLOWS THE WORKING ACTUATOR

③ EB MODE **E**

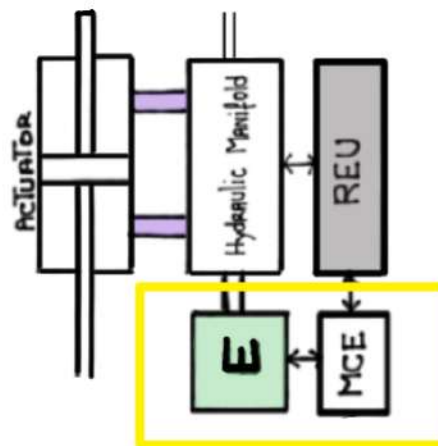
ELECTRIC BACKUP (EB) MODE:

- ELECTRIC POWER TO DRIVE A PUMP AT THE ACTUATOR
- PRESSURIZES TRAPPED hydraulic fluid
- ACTS AS A THIRD HYDRAULIC SYSTEM
- A MOTOR CONTROL ELECTRONICS (MCE) IS USED TO CONTROL THE EBHA MOTOR-PUMP WHEN THE ACTUATOR IS IN THE ELECTRIC BACKUP **E** STATE DUE TO HYDRAULIC OR REU FAILURES

HYDRAULICALLY ACTIVE:

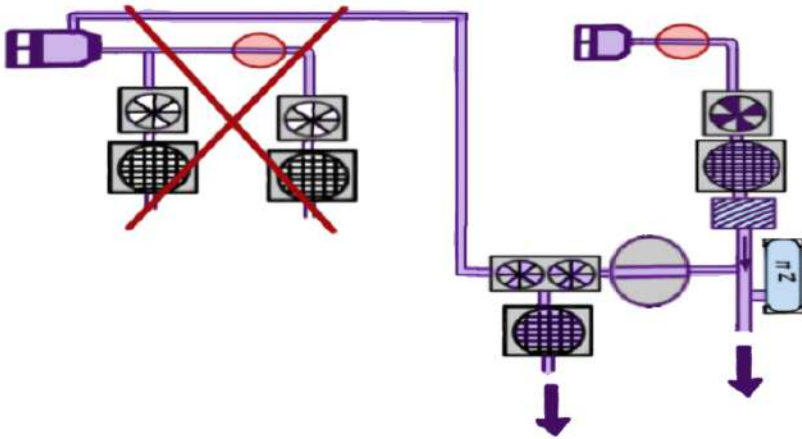


ELECTRIC BACKUP (EB) MODE:

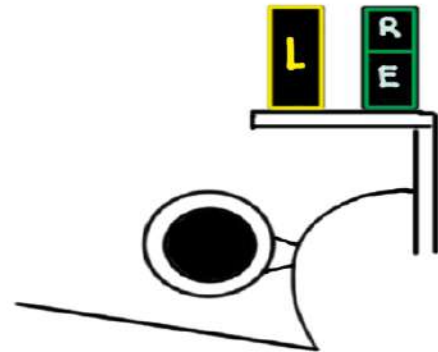


CTAL S/C ACTUATOR EB MODE

L Hyd System Fail



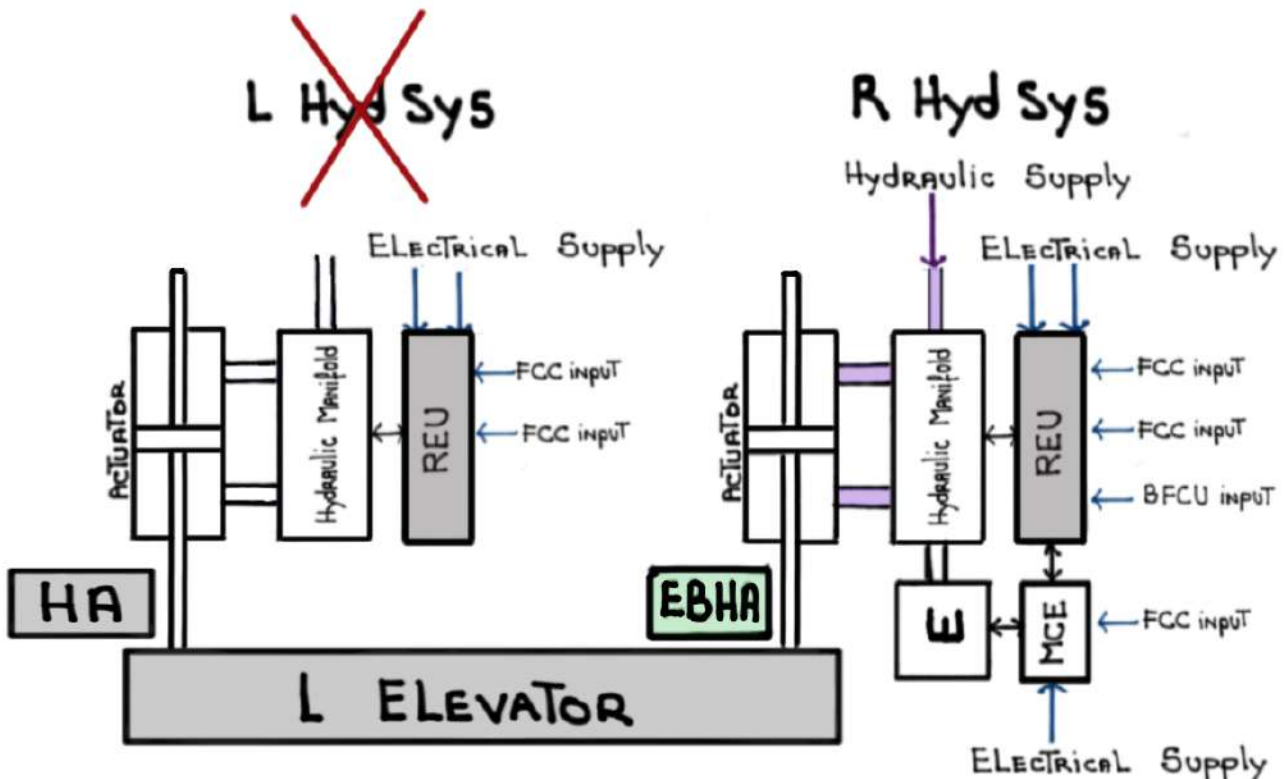
NORMAL

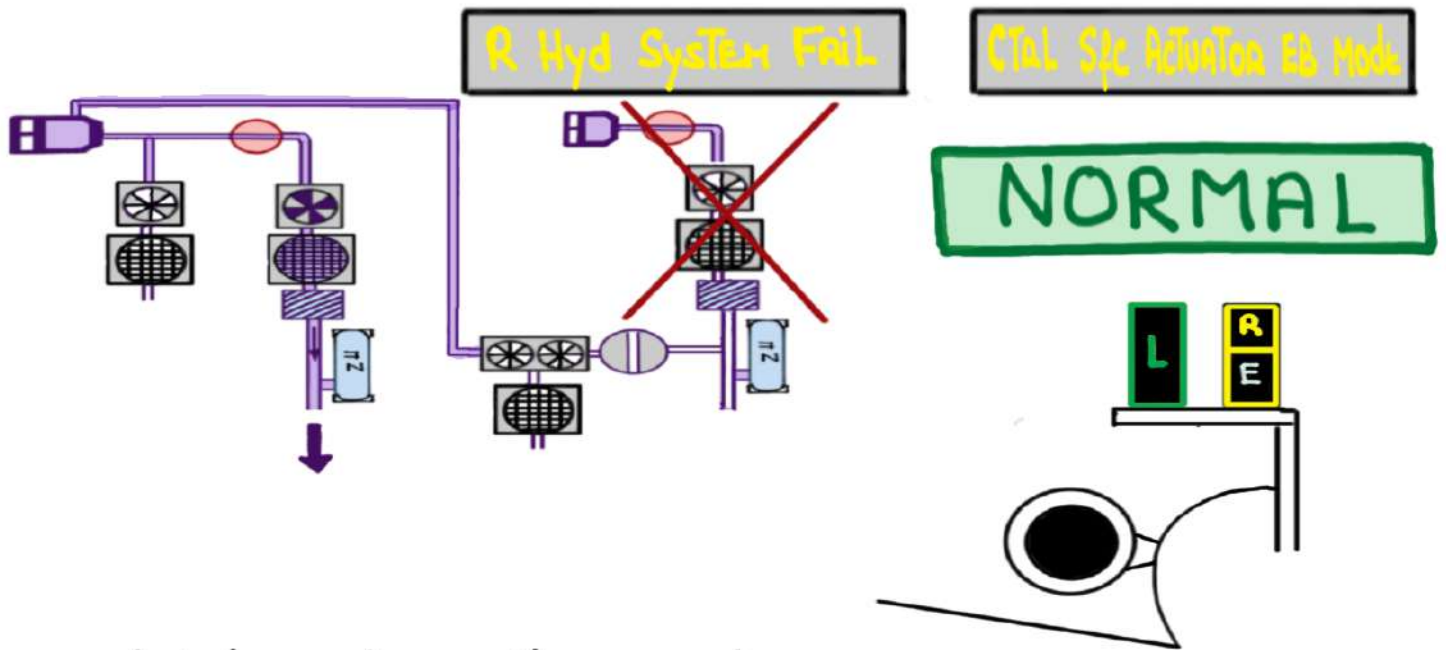


- Loss of midboard spoilers only
- All ACTUATORS powered by THE LEFT HYDRAULIC SYSTEM OPERATE IN DAMPED BYPASS MODE
- MAXIMUM SPEED: 285 KCAS/M0.90

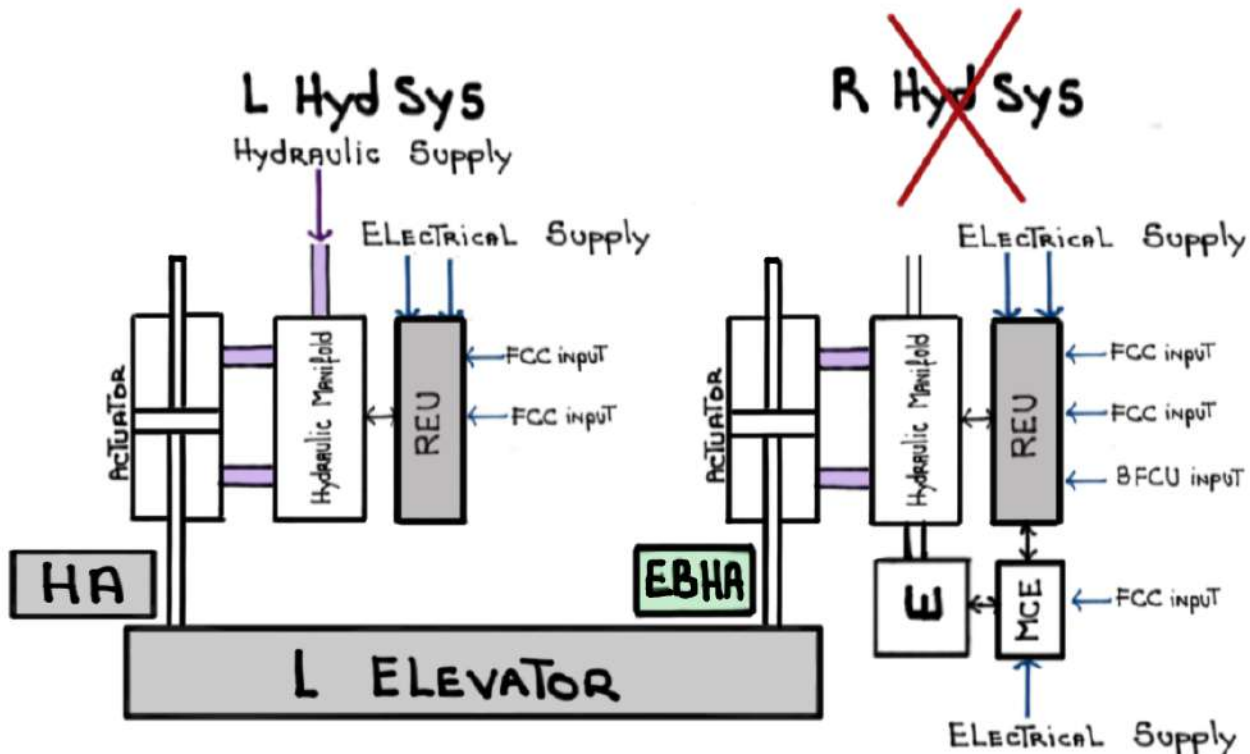
~~L Hyd Sys~~

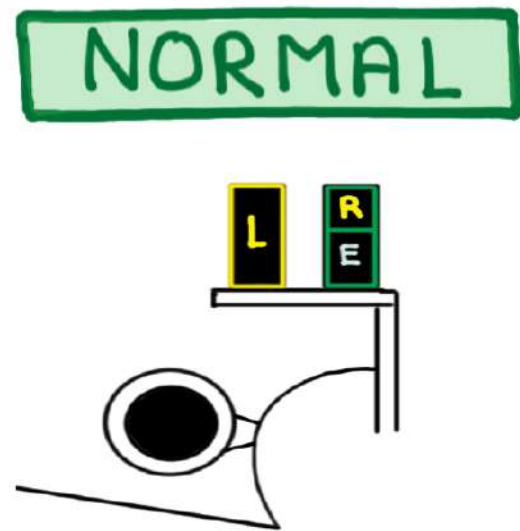
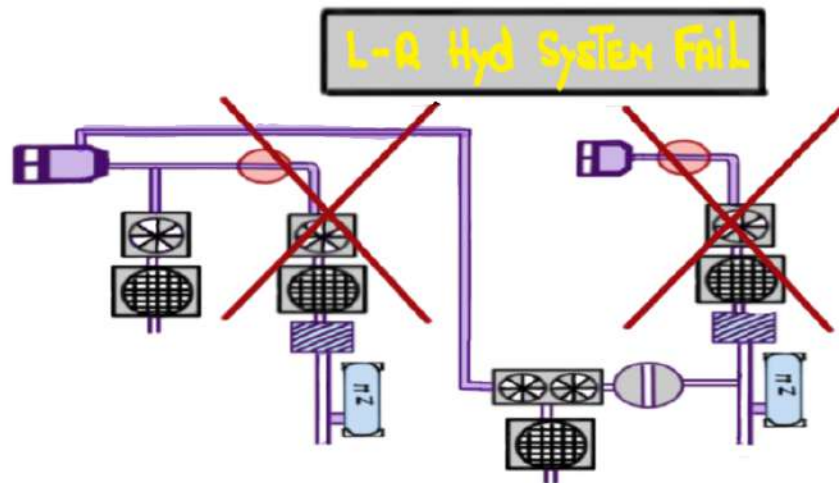
R Hyd Sys



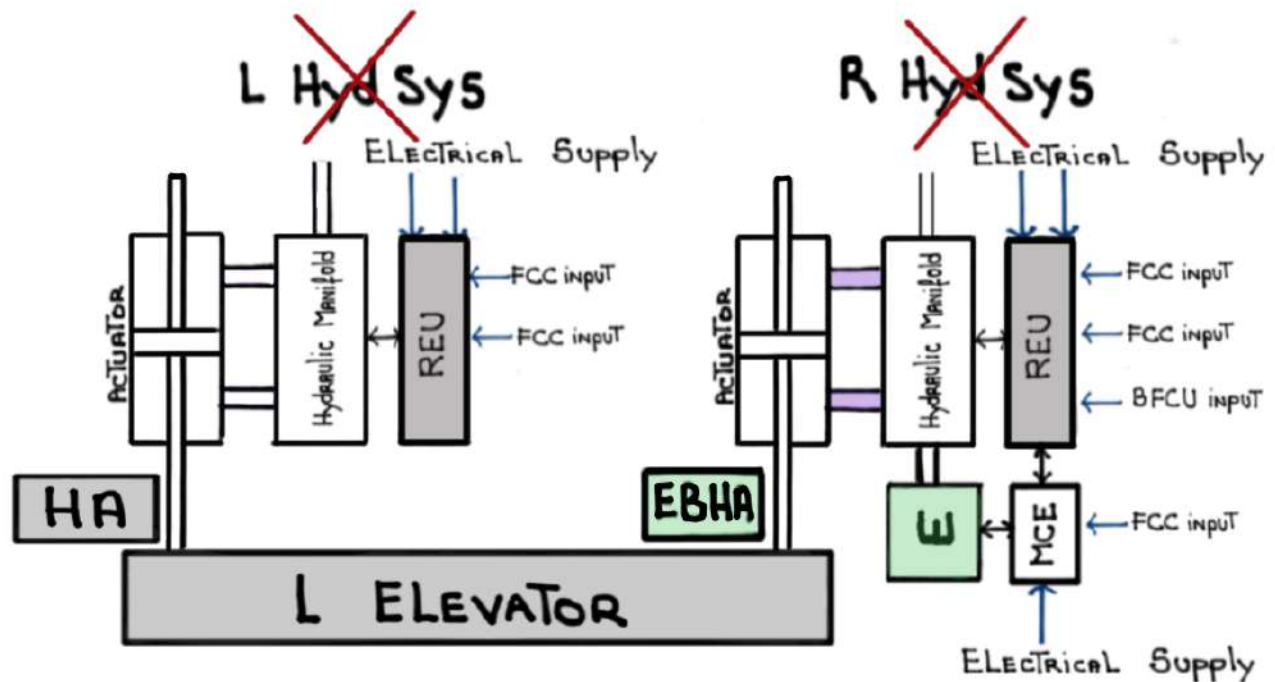


- Loss of inboard spoilers only
- Outboard spoiler actuators ELECTRIC BACKUP (EB) MODE
- All other actuators powered by The Right Hydraulic System operate in DAMPED BYPASS MODE
- MAXIMUM SPEED: 285 KCAS/M0.90



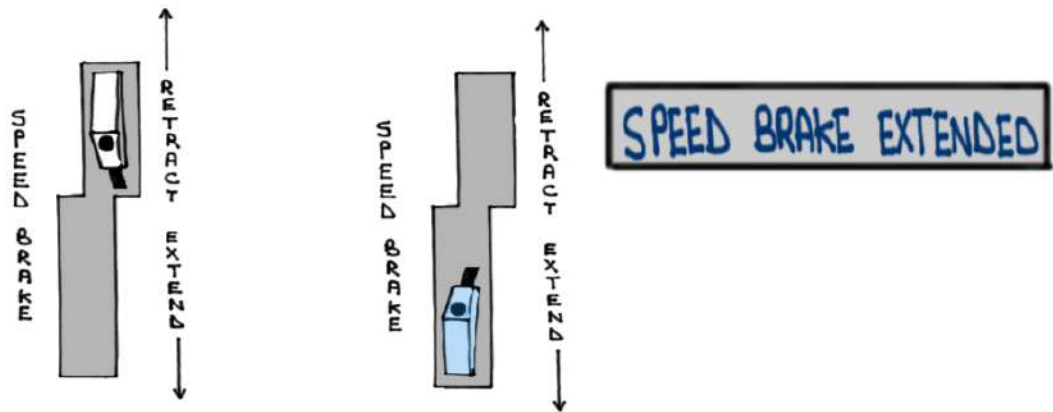


- Loss of midboard and inboard spoilers
- All **EBHA** actuators ELECTRIC BACKUP (EB) MODE
- All other actuators operate in DAMPED BYPASS MODE
- Each flight CONTROL SURFACE POWERED by a SINGLE ACTUATOR
- MAXIMUM SPEED: **285 KCAS/M0.90**

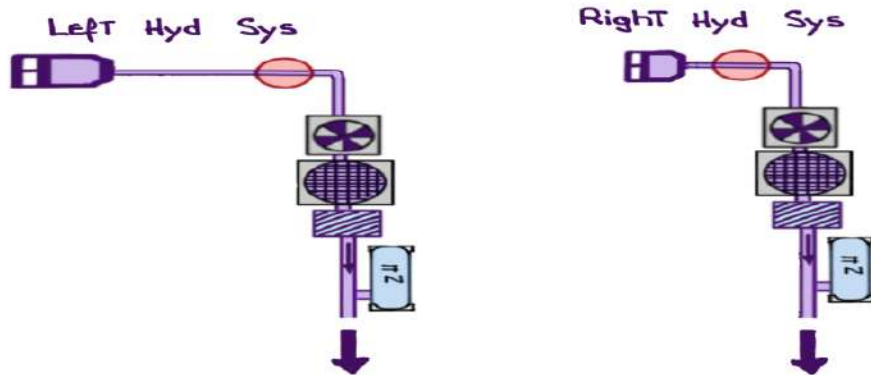


Spoilers

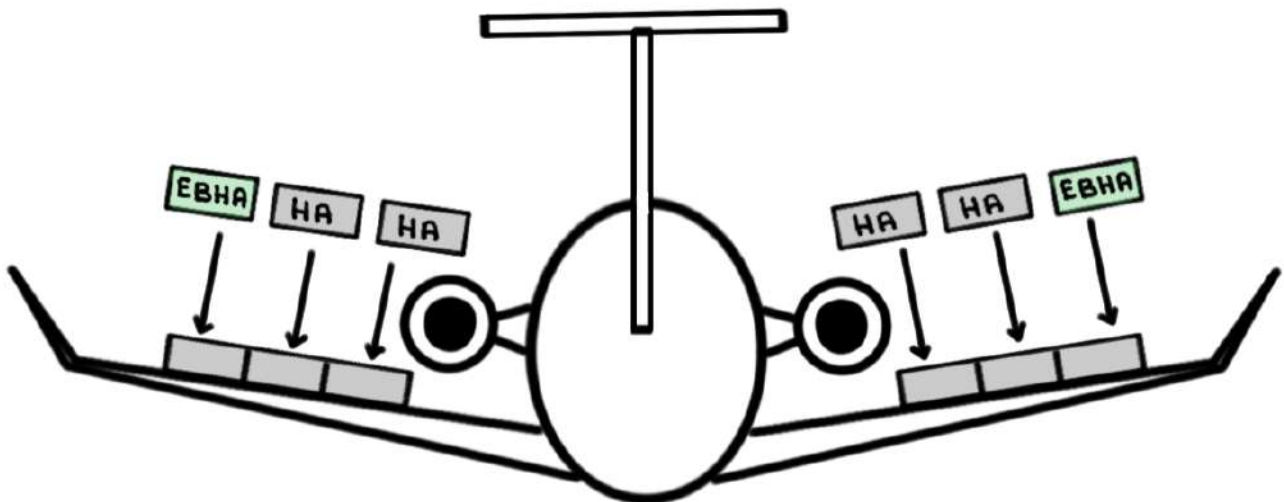
- **ELECTRICALLY** - CONTROLLED VIA SPEED BRAKE HANDLE:



- **HYDRAULICALLY** - POWERED by:

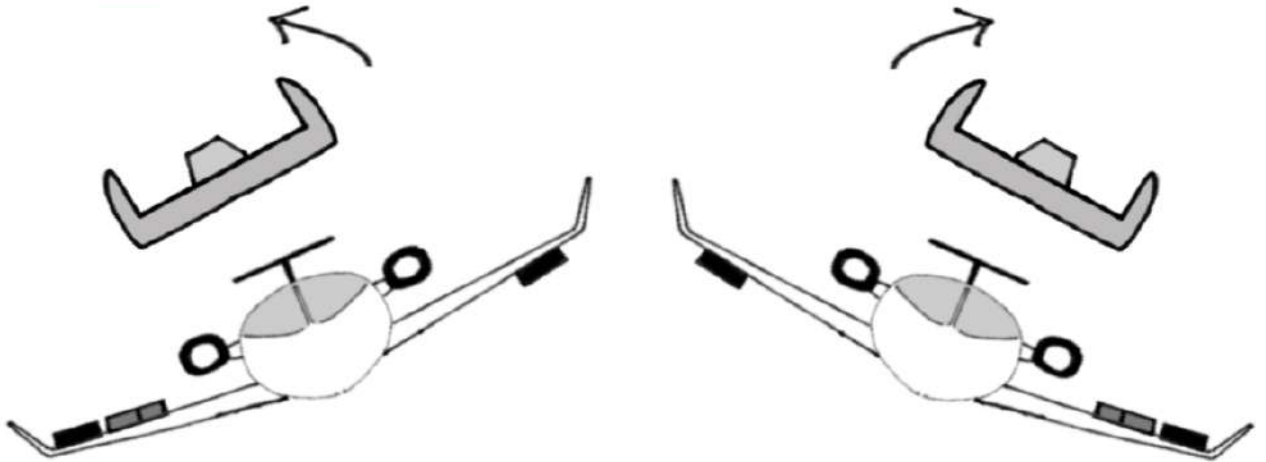


Six (6) spoiler panels - ONE (1) actuator each



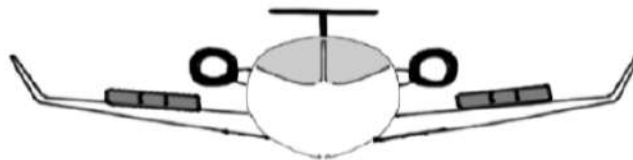
① Roll AUGMENTATION: mid AND OUTBOARD PANELS

Up To **55°**

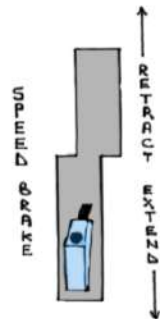


② SPEED BRAKES (IN flight)

Up To **30°**

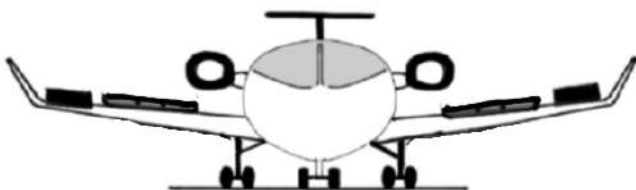


SPEED BRAKE EXTENDED



③ GROUND SPOILERS (ON ground)

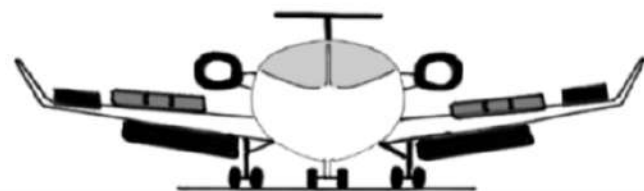
Flaps UP: **30°**



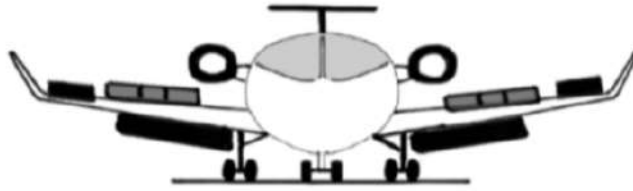
GROUND SPOILER




Flaps \geq **10°** = **55°**



- Ground Spoilers automatically extend when:



① **BFCU ACTIVE** mode NOT ACTIVE

② Ground Spoiler switch 

③ Both Thrust levers - idle on landing

④ ONE OR MORE of the following:

1. Left MLG WOW AND wheel speed > 47 KTS
2. Right MLG WOW AND wheel speed > 47 KTS
3. Both MLG WOW AND RADALT < 10' OR invalid
4. Both MLG wheel speed > 47 KTS AND RADALT < 10' OR invalid AND flaps > 22° OR

EGPWS Flap Override 

GPWS/
GND SPLR
Flap ORIDE



=

① If landing is ATTEMPTED AT
FLAPS 22° OR LESS, Inhibits
GPWS AURAL WARNING

"Too Low Flaps"

② If landing is ATTEMPTED AT
FLAPS 22° OR LESS, AUTOMATIC
EXTENSION of ground spoilers
will occur during wheel spin
up (>47 kts) ON LANDING

GND SPOILER



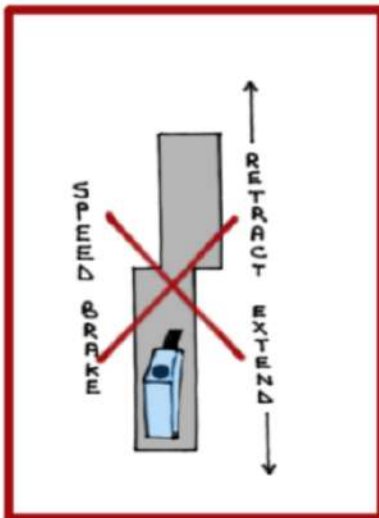
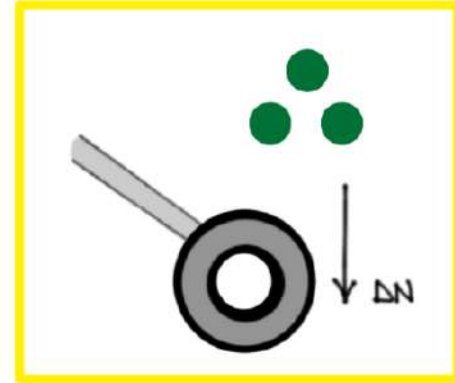
① Touch AND go landings, OR

② INOP :

- DRY AND WET (≤ 3 mm) RUNWAY
- FLAPS 20° only

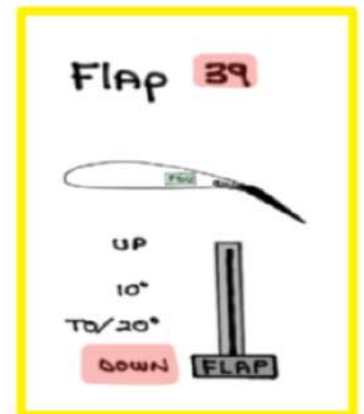
DO NOT EXTEND SPOILERS in flight with GEAR DOWN OR flaps 39°

W AIRCRAFT CONFIGURATION **W**



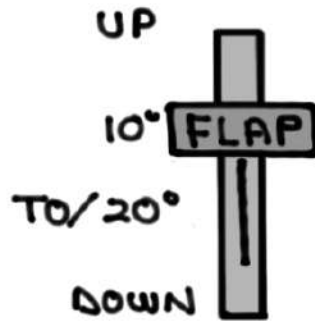
Prohibited

W AIRCRAFT CONFIGURATION **W**

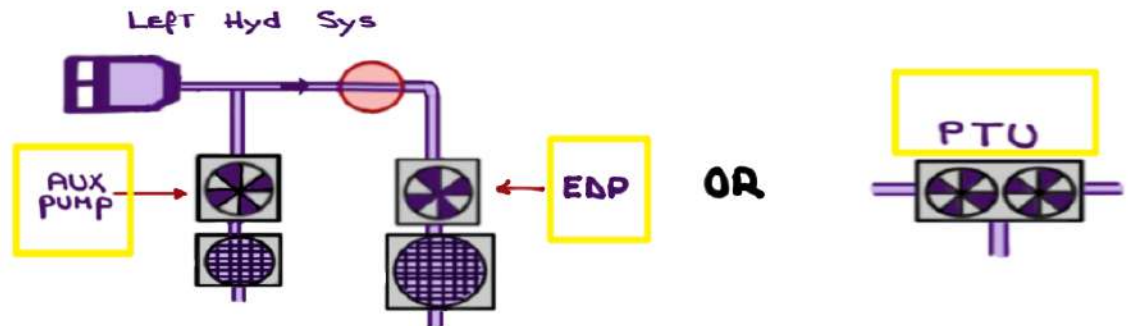


FLAPS

- **ELECTRICALLY** - CONTROLLED by flap handle:



- **HYDRAULICALLY** - POWERED by:



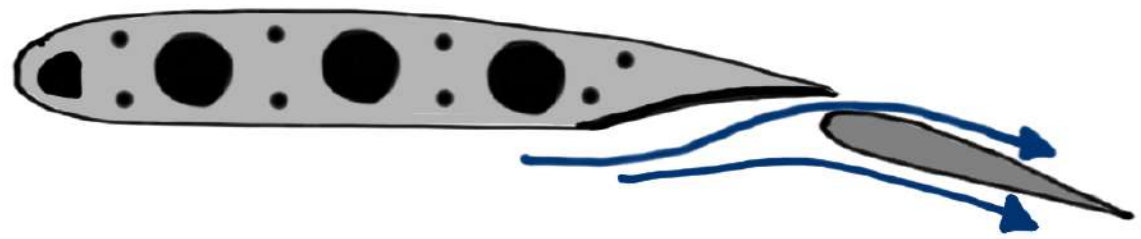
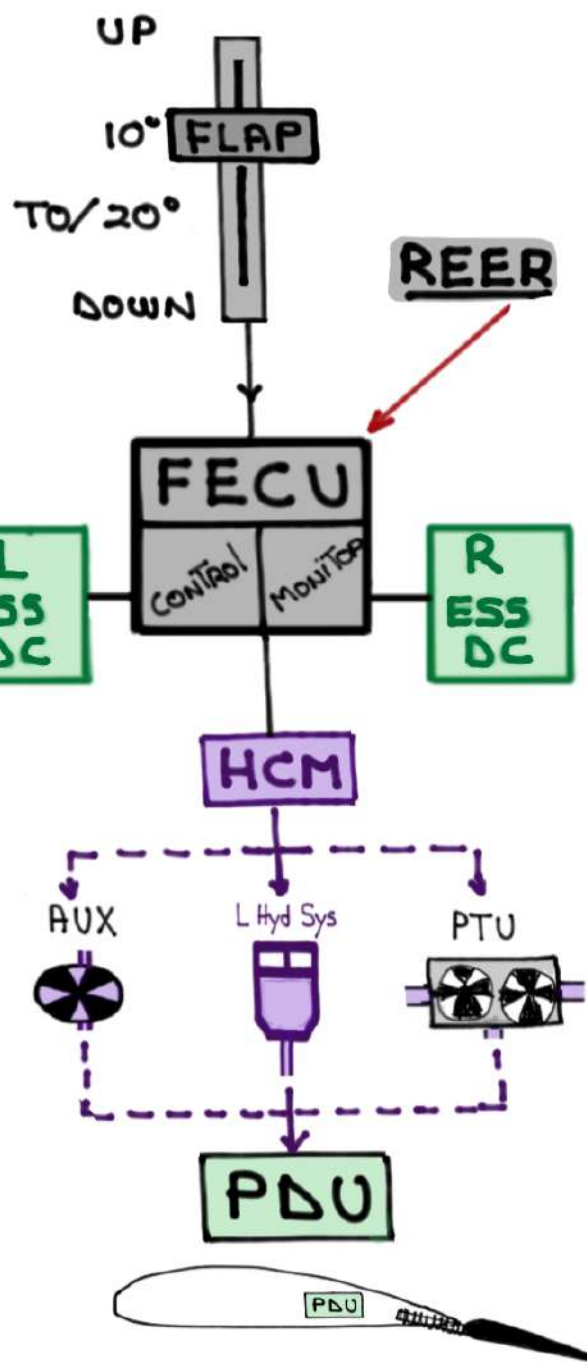
- **MECHANICALLY** - ACTUATED by:

- Flap ELECTRONIC CONTROL UNIT **FECU** (REER)
IT COMMANDS flap MOVEMENT by ELECTRICALLY controlling:
- Hydraulic CONTROL Module **HCM** (MAIN wheel well)
THE HCM CONTROLS HYDRAULIC POWER TO:
- POWER DRIVE UNIT **PDU** (MAIN wheel well)
THE PDU DRIVES THE MECHANICAL ACTUATOR

ELECTRICALLY - CONTROLLED

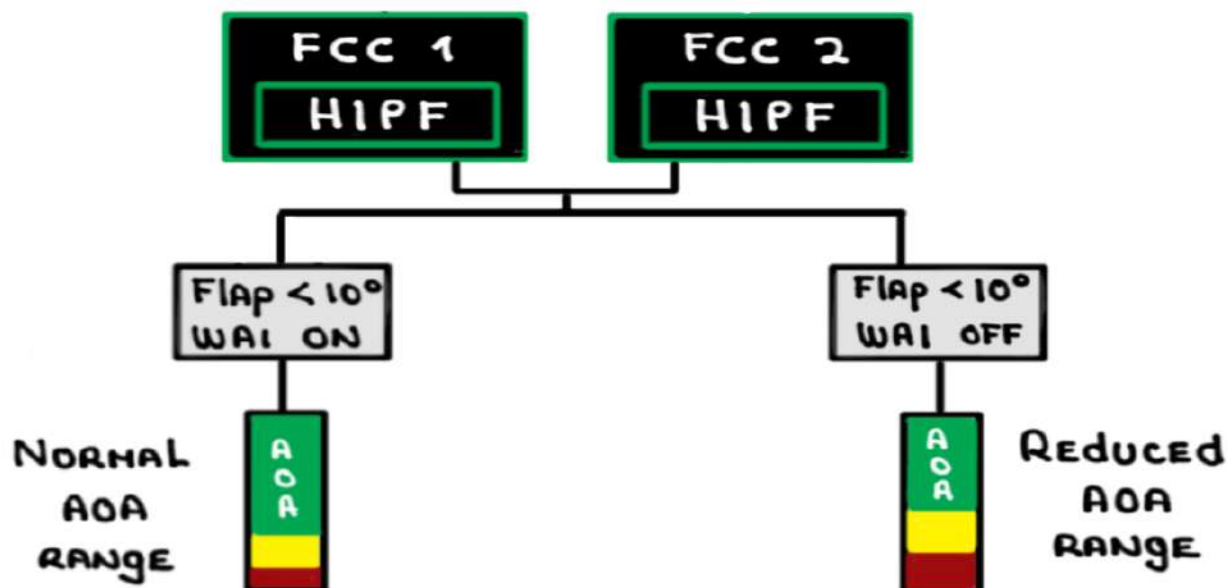
HYDRAULICALLY - POWERED

MECHANICALLY - ACTUATED



FOWLER-TYPE SINGLE FLAP SURFACE
 (GREATEST AMOUNT OF LIFT FOR LEAST AMOUNT OF DRAG)

High Incidence Protection Function

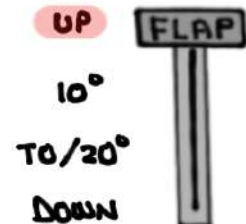
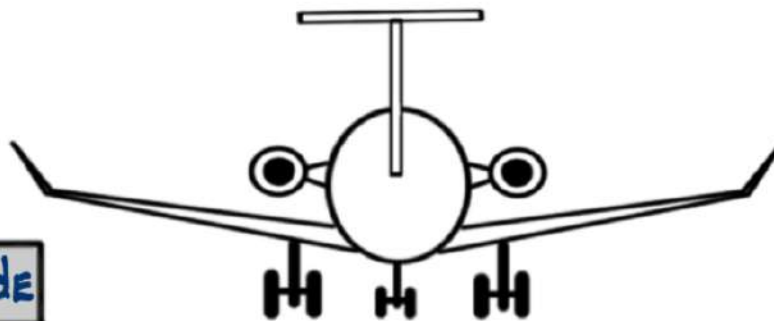


- FCC STALL PROTECTION SOFTWARE
- If landing with $< 10^\circ$ of flaps (ZERO flaps) it ASSUMES THE WING IS CONTAMINATED AND ARTIFICIALLY INCREASES THE FLAPS 0° V_{REF}
- IT ALSO LIMITS THE AVAILABLE AOA SO THAT EVEN WITH full AFT CONTROL COLUMN THE MINIMUM STEADY SPEED IS NOT LESS THAN THE REFERENCE STALL SPEED (V_{SR})

GPWS/
GND SPLR
Flap ORIDE



Flaps Failed

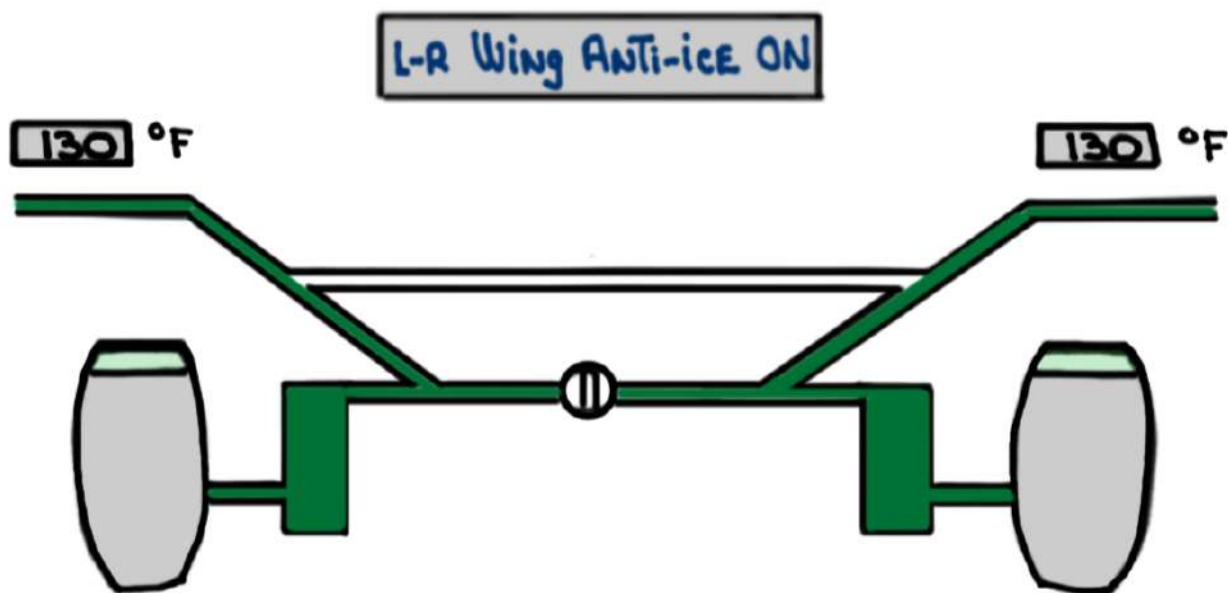
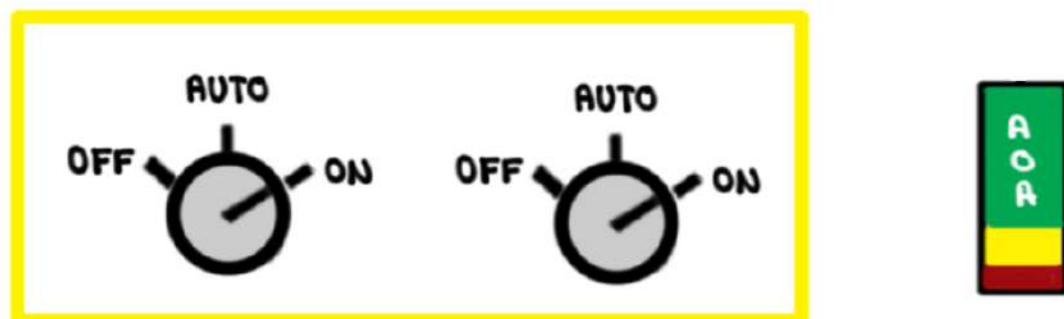


EGPWS Flap Override

- Reduced usable AOA
 - PLI appears at a lower AOA
 - Stick Shaker activates at a lower AOA
 - Red Speed Awareness Tape appears at higher speeds
- Higher Approach and VREF speeds
- Slower engine response due to lower engine idle speed
- Longer landing distance required
- Hotter brake temperatures

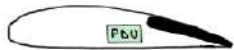


SELECTING Wing ANTI-ICE ON RESETS THE FCS
LAW logic FOR AOA PROTECTION back TO NORMAL



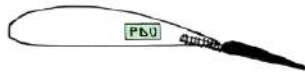
Wing TEMPERATURE MUST be > 100°F AND AIRCRAFT
ALTITUDE > 1,500' AGL FOR THE CONTROL LAW logic
TO CHANGE

Flap 0



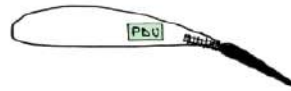
UP
10°
TO/20°
DOWN

Flap 10



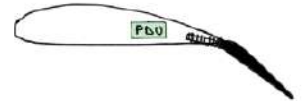
UP
10°
TO/20°
DOWN

Flap 20



UP
10°
TO/20°
DOWN

Flap 39



UP
10°
TO/20°
DOWN

MAXIMUM EXTENSION/EXTENDED SPEED

VFE
250 KCAS

VFE
220 KCAS

VFE
190 KCAS

MAXIMUM G-loads

-1 To +2.5g

0 To +2g

0 To +2g

0 To +2g

0 To +1.5g
(> MLW)

MAXIMUM OPERATING ALTITUDE

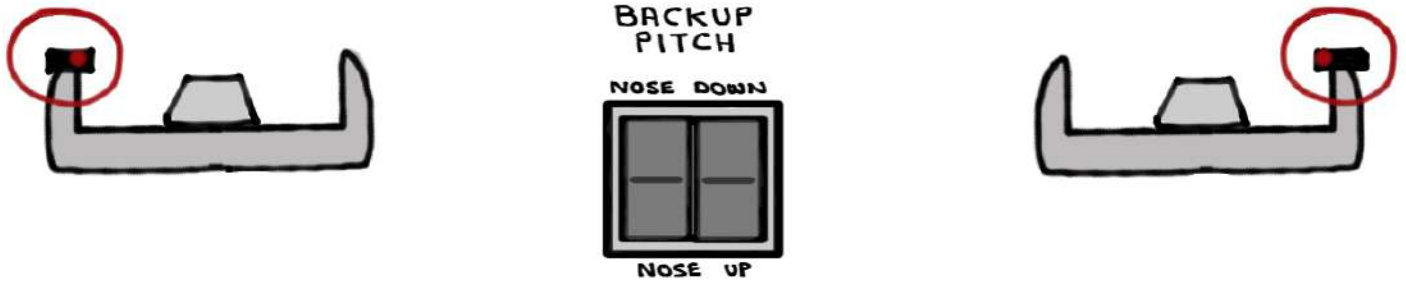
≤ 25,000'

≤ 25,000'

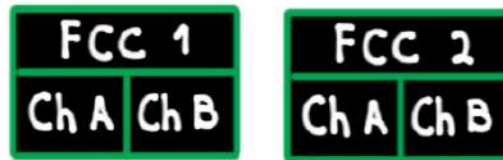
≤ 20,000'

HORIZONTAL STABILIZER TRIM SYSTEM (HSTS)

- Fully TRIMMABLE HORIZONTAL STABILIZER SURFACE
- Pitch trim is controlled by the split-trim switch on EITHER CONTROL WHEEL OR THE BACKUP Pitch trim switch



- Input from these switches is TRANSMITTED TO:

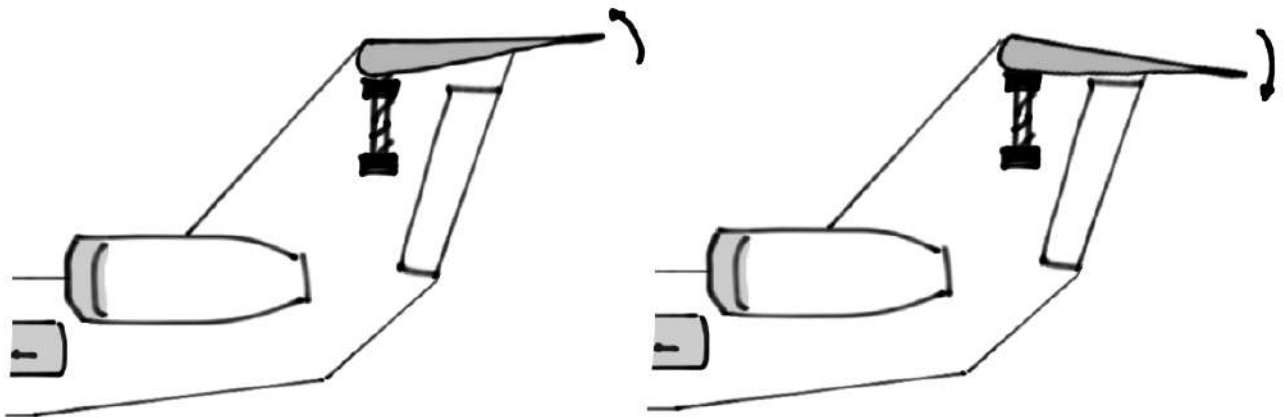
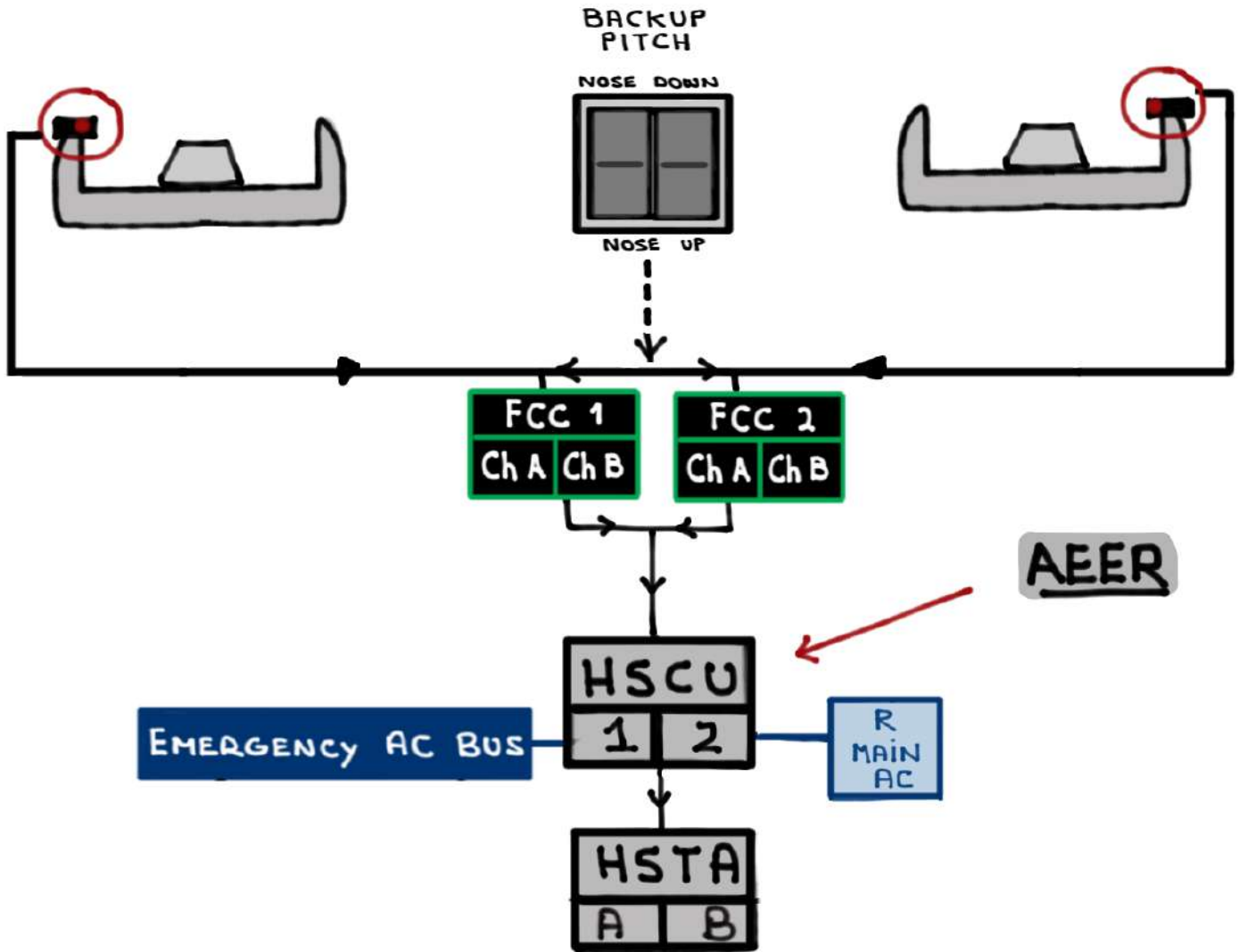


- Stabilizer surface is moved by the dual electric motor HORIZONTAL STABILIZER TRIM ACTUATOR (HSTA)

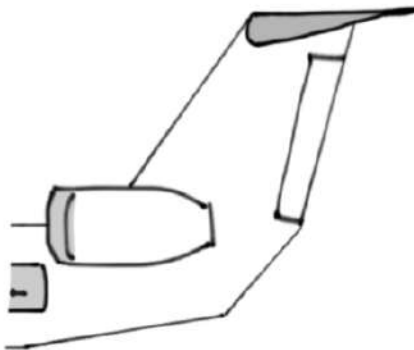
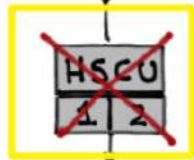
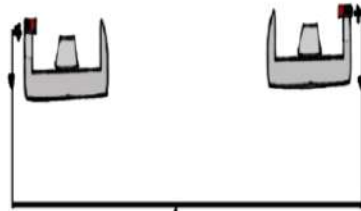


- The HSTA is electrically controlled from the dual channel HORIZONTAL STABILIZER CONTROL UNIT (HSCU)

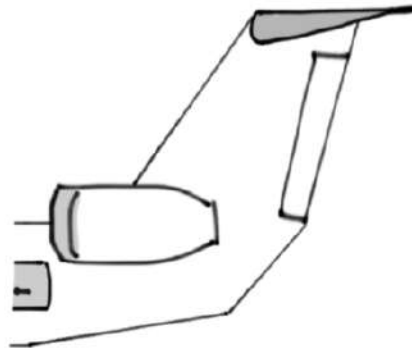
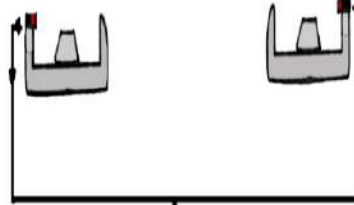




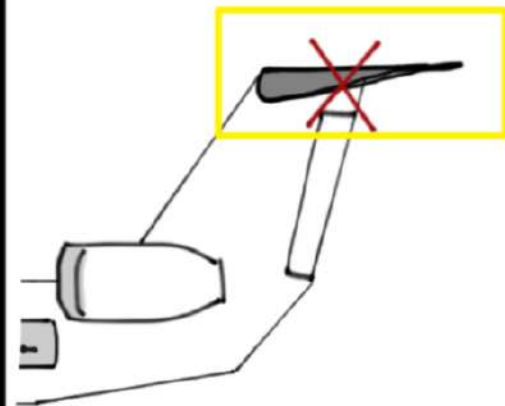
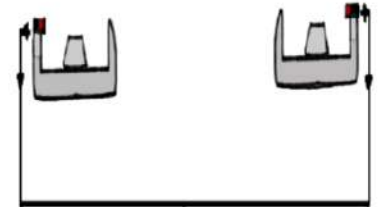
① FAILURE of:





② FAILURE of:



③ JAMMED STABILIZER



- Pitch TRIM switches   CONTROL/TRIM ELEVATORS
- No ELEVATOR off-load FEATURE

- ① If No COMMUNICATION BETWEEN

FCC 1	FCC 2
Ch A	Ch B

 AND

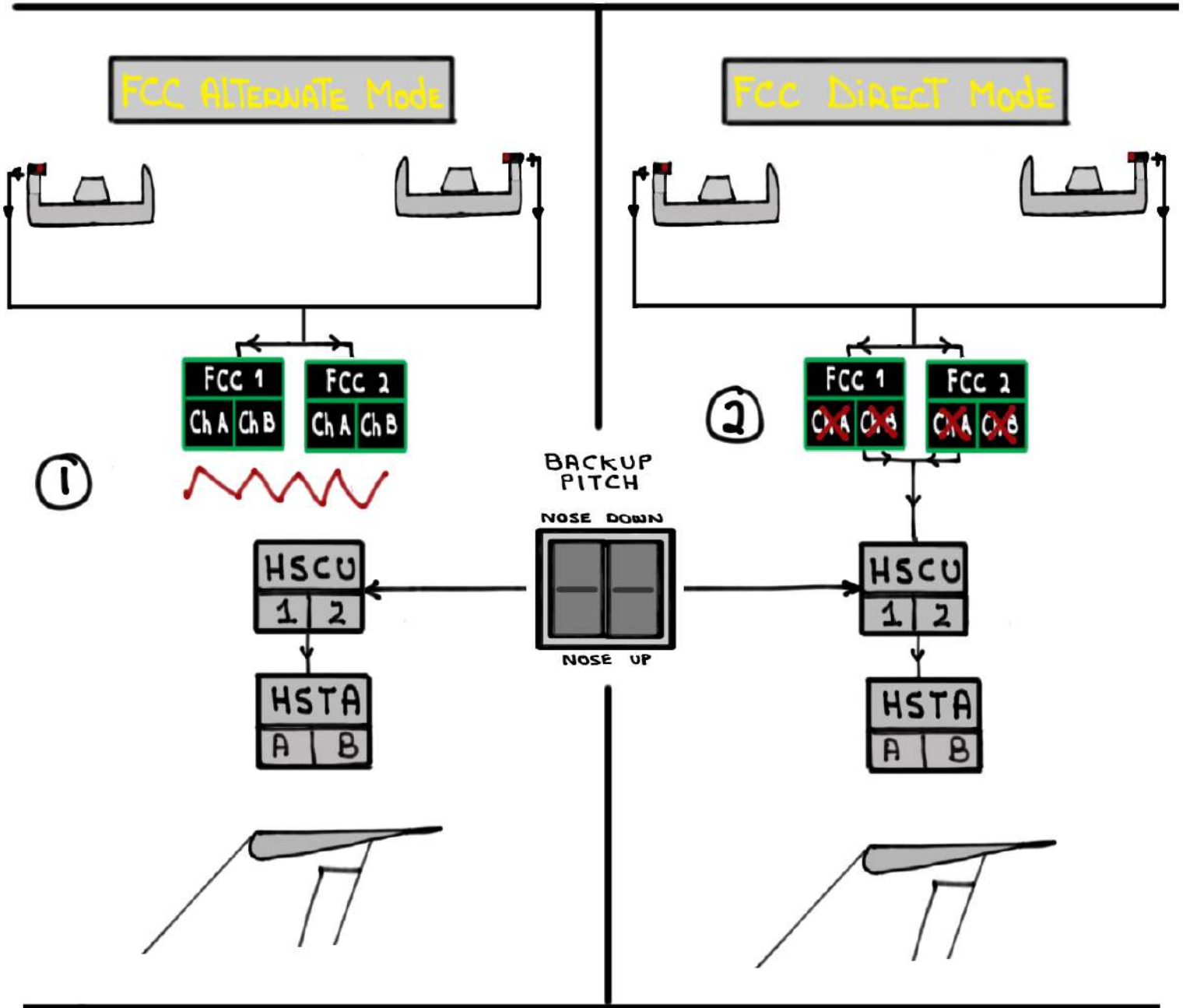
HSCU
1 2

 OR
- ②

FCC 1	FCC 2
Ch A	Ch B

FCC 2	FCC 1
Ch A	Ch B

 channels invalid

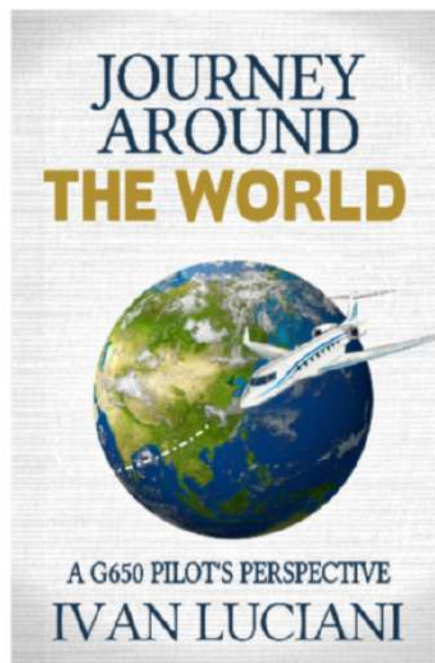
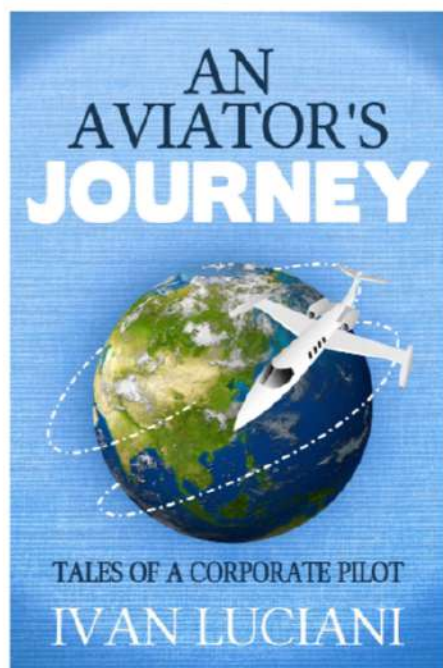


CONTROLS HORIZONTAL STABILIZER AT A REDUCED RATE OF 0.15° / SECOND (NORMAL = 0.4° / s)

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!