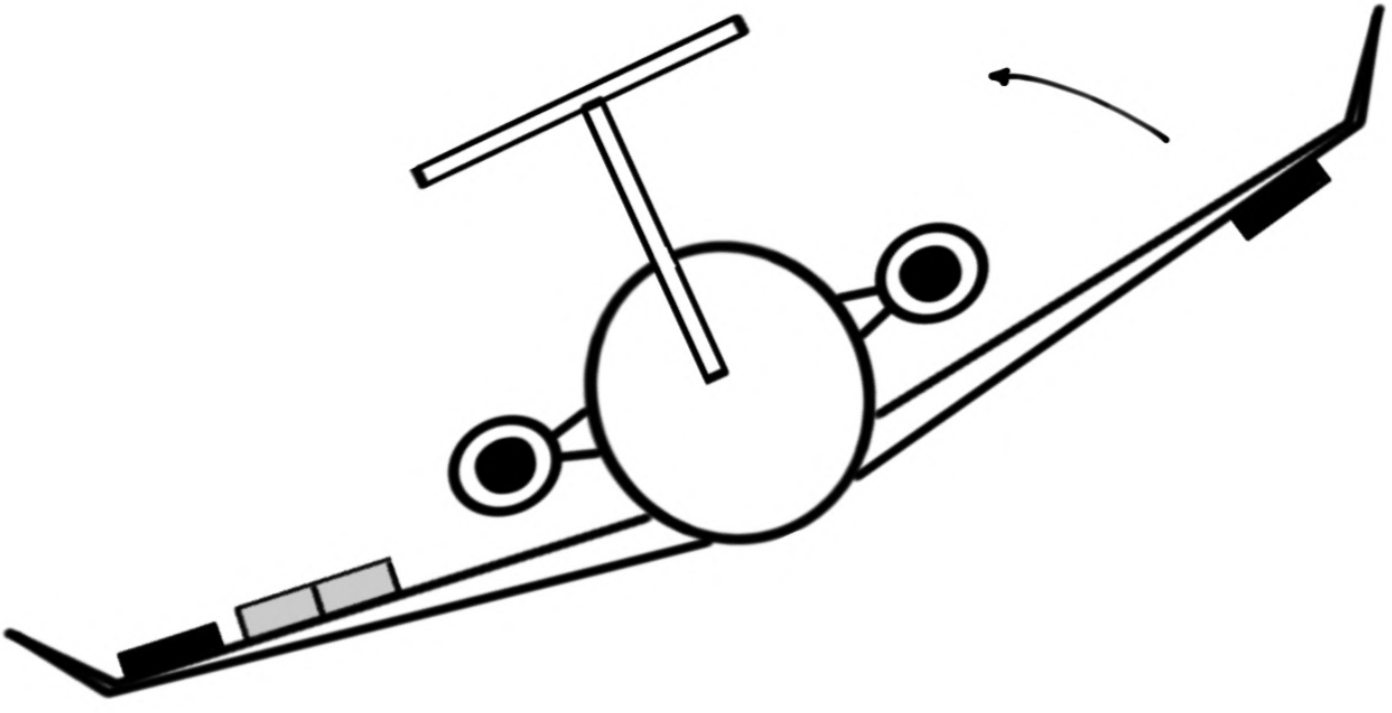
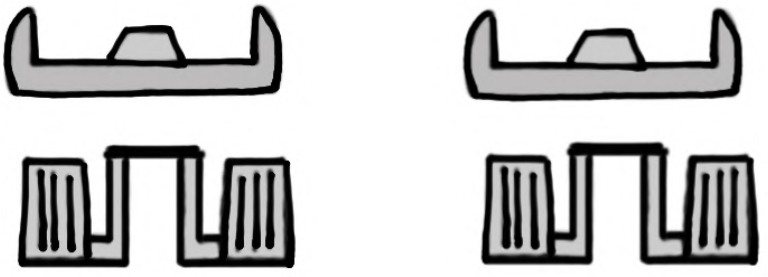
G450 FlighT CONTROL SysTEM



For study purposes only

The G450's Flight controls are Hydraulically-powered but retain manual capability should there be a complete loss of hydraulic fluid

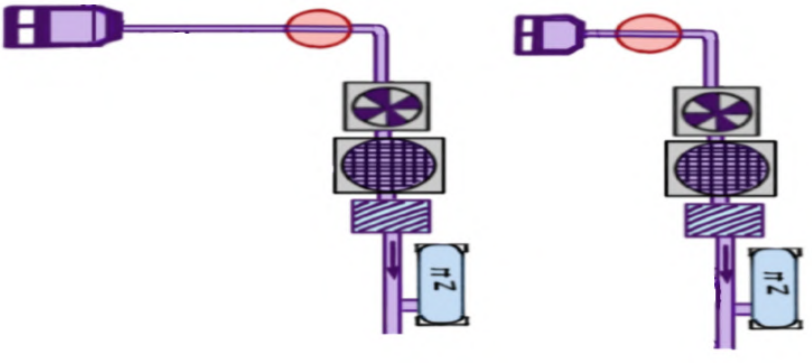
Manually-controlled

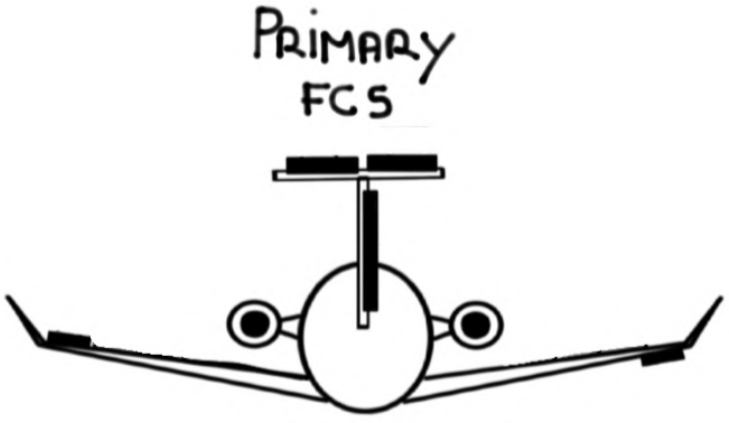


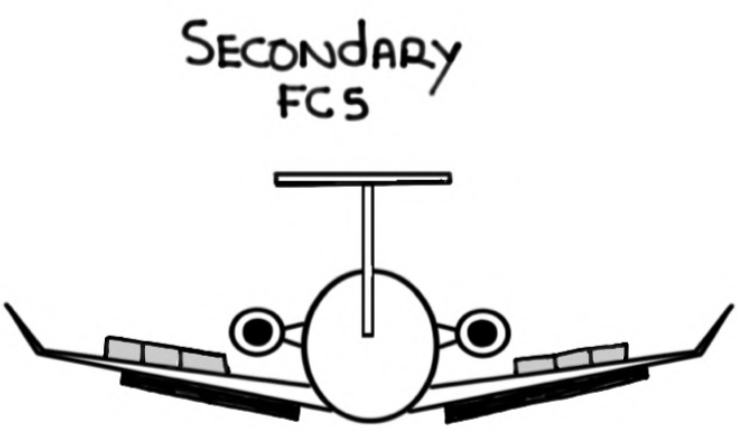
Mechanically-operated

- Pushrods
- Cables
- Bell cranks

Hydraulically-boosted
(6 to 1 boost)

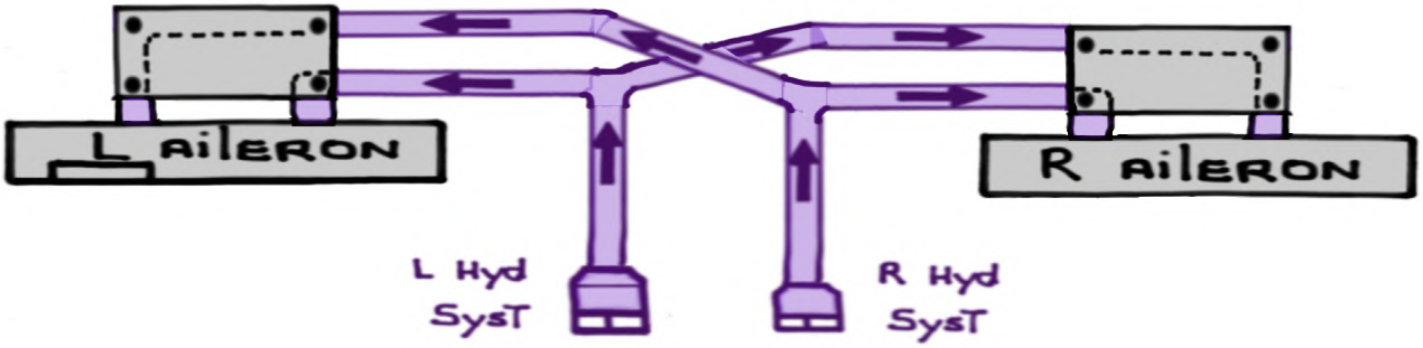




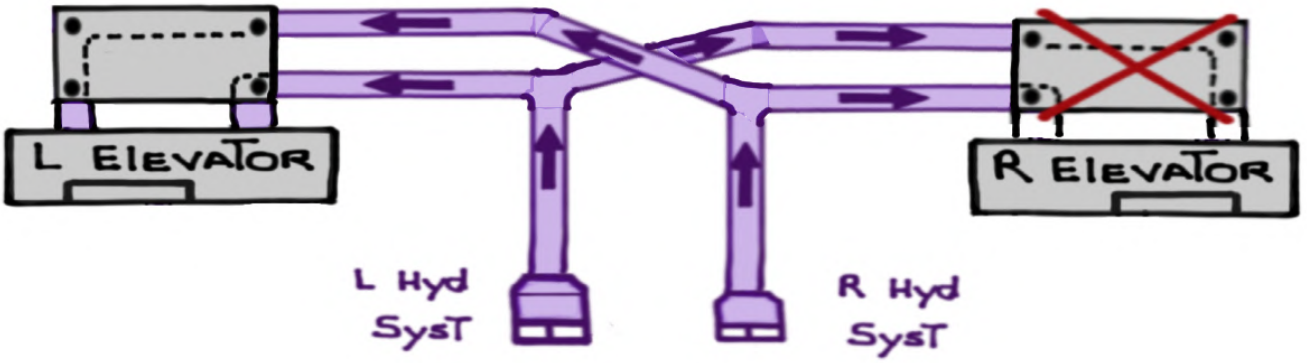


- A **HARD OVER PREVENTION SYSTEM (HOPS)**

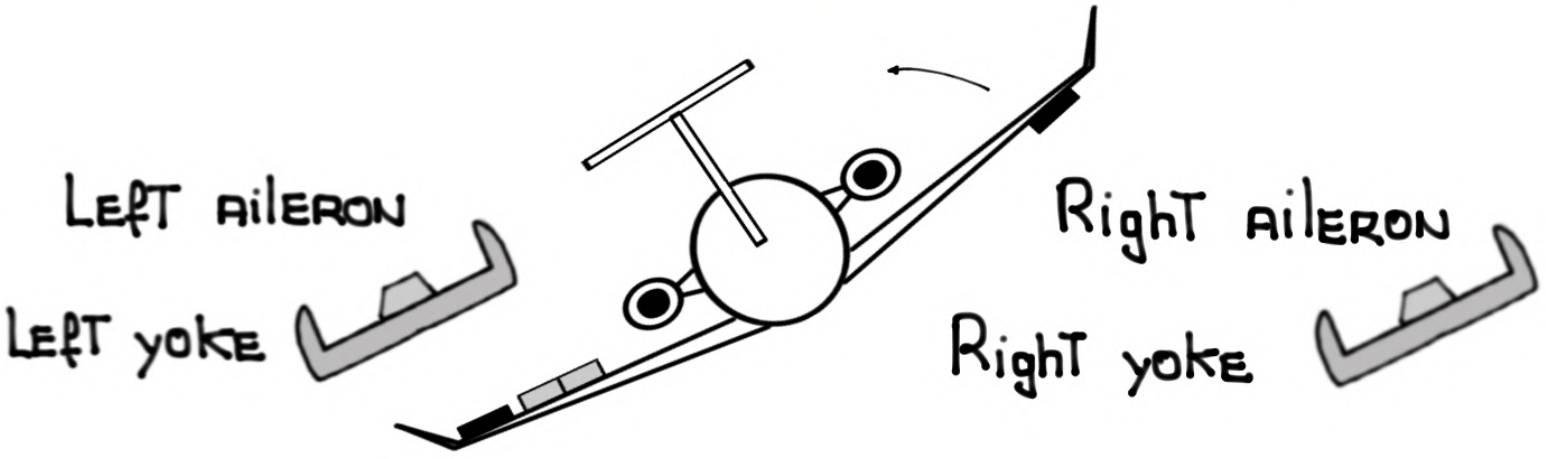
COMPARES PRESSURE SENSED INTO THE SERVOS AGAINST PRESSURE SENSED OUT OF THE SERVOS



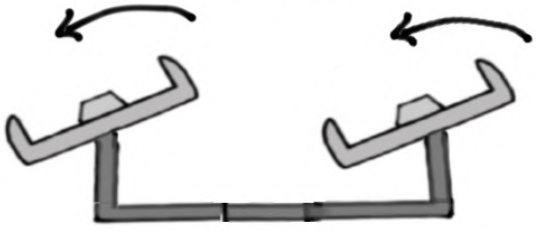
If THERE is A DIFFERENCE THE HOPS shuts off hydraulic fluid FROM THE AFFECTED SYSTEM (S)



Roll Flight Controls – Ailerons

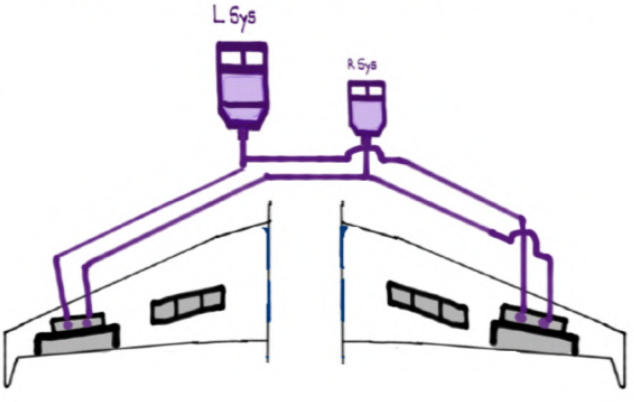


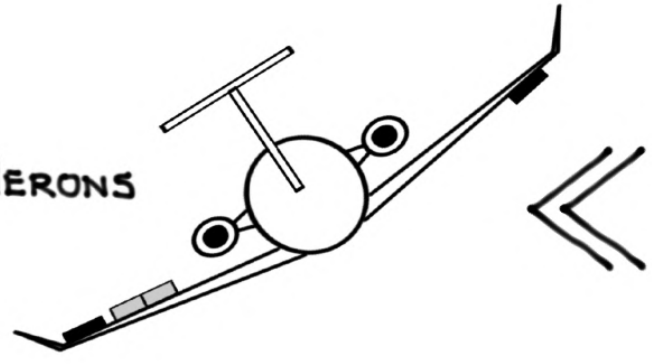
– Control yoke movement results in activation of:



- Pushrods
- Cables
- Bell cranks

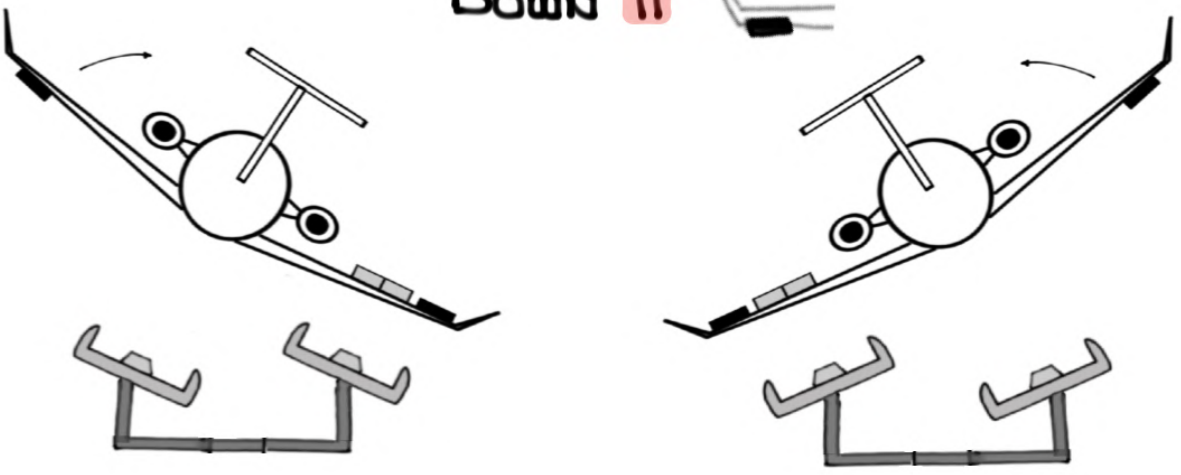
Hydraulic Boost Actuators





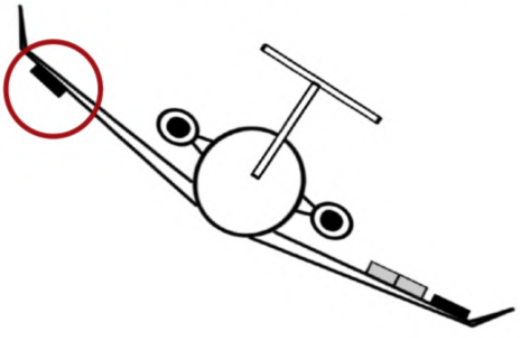
- Aileron deflection: Up 11°

Down 11°

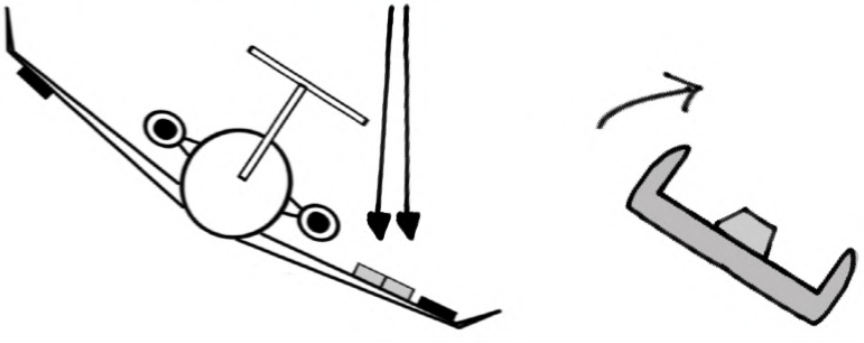


- Trim Tab (left aileron only): Up 15°

Down 15°



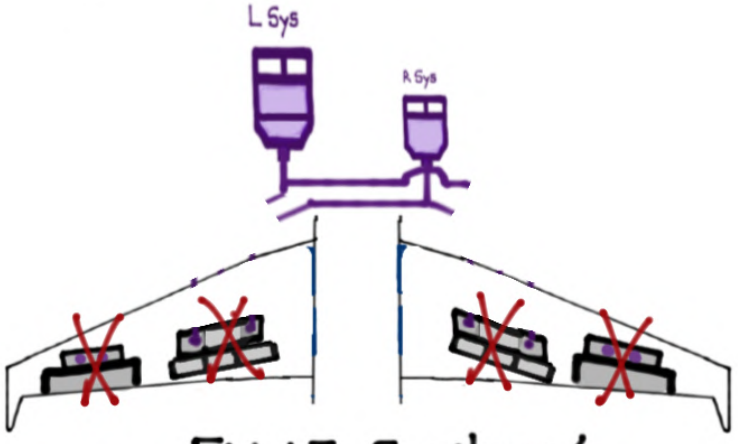
- Roll augmentation: mid and outboard panels augment the up aileron up to 26°



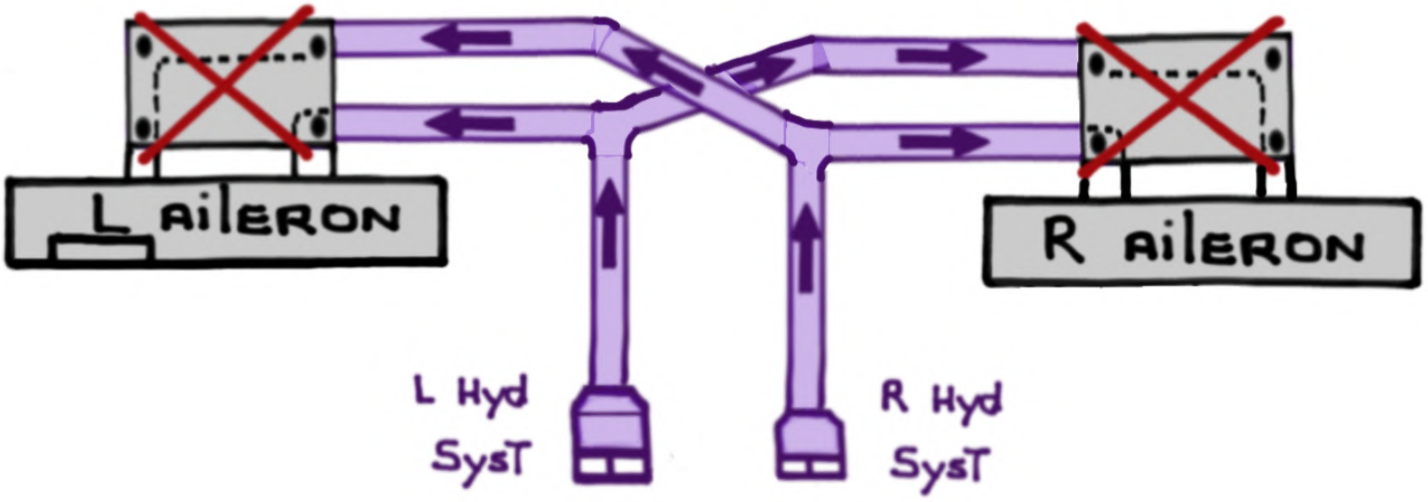
- HOPS Activation

LATERAL CONTROL Hyd OFF

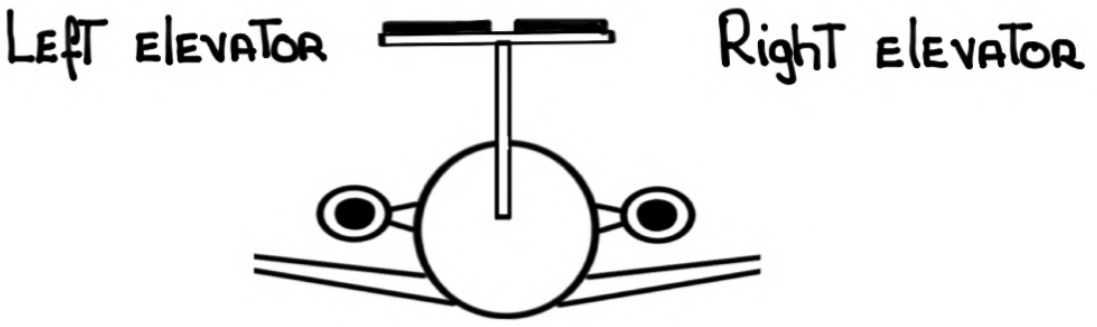
- If one aileron is jammed both ailerons are affected
- No hydraulic pressure = manual reversion
- Force to move ailerons is much greater
- No ground/flight spoilers



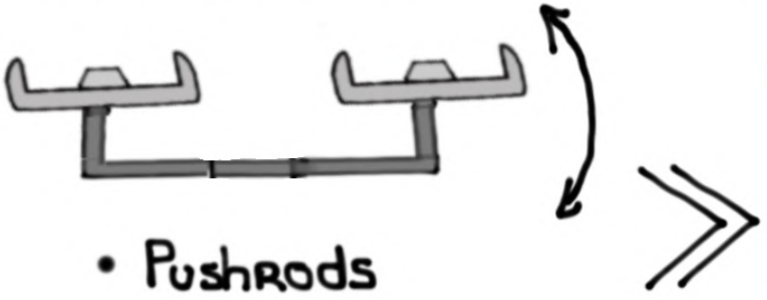
Flight Spoilers/
Speed Brakes



Pitch Flight Controls - Elevators

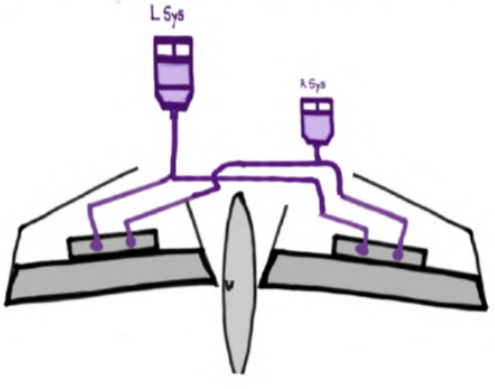


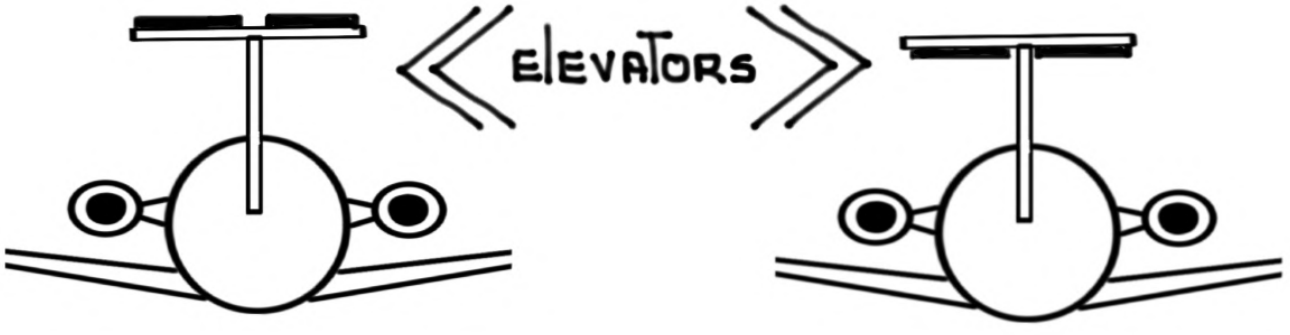
- Each yoke is connected to <u>both</u> of the aircraft elevators
- Each yoke is also connected to the other yoke by a mechanical torque tube beneath the cockpit floor
- Moving one yoke moves <u>both</u> elevators
- Control yoke movement results in activation of:



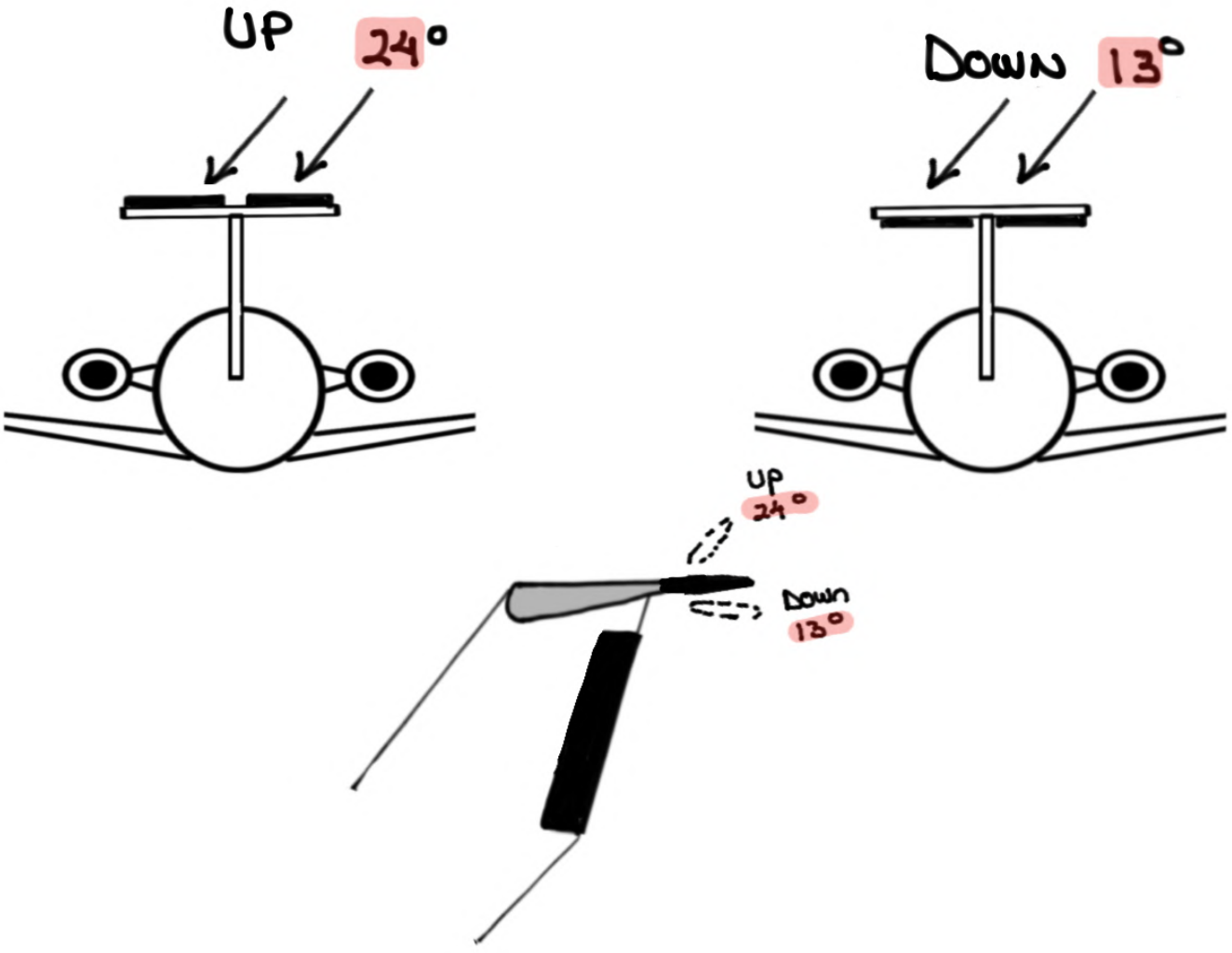
- Pushrods
- Cables
- Bell cranks

Hydraulic Boost Actuators





- Elevator deflection:



- Elevator Trim Tabs *

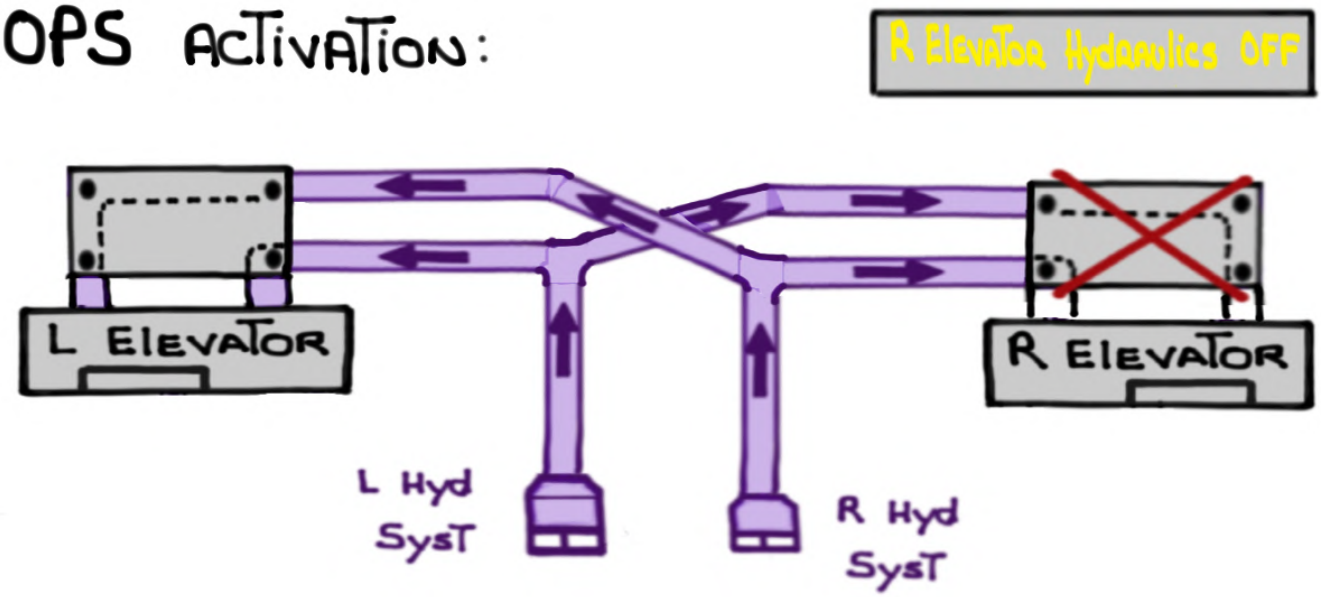
  Electrically controlled by switches on the control columns or manually controlled by control wheels located on each side of the center pedestal

* Trim Tabs are heated (175°F ± 20°F) R MAIN AC

– Elevator Trim Tabs deflection:

Electrically:		Mechanically:	
UP	21°	UP	22°
Down	7°	Down	8°

– HOPS activation:



- Left <u>and</u> Right Hydraulic pressure to affected actuator is shut off
- Flight is continued with remaining actuator
- If both actuators are affected:
  1. No hydraulic pressure = manual reversion
  2. Force to move elevators is much greater

Yaw Flight Controls - Rudder

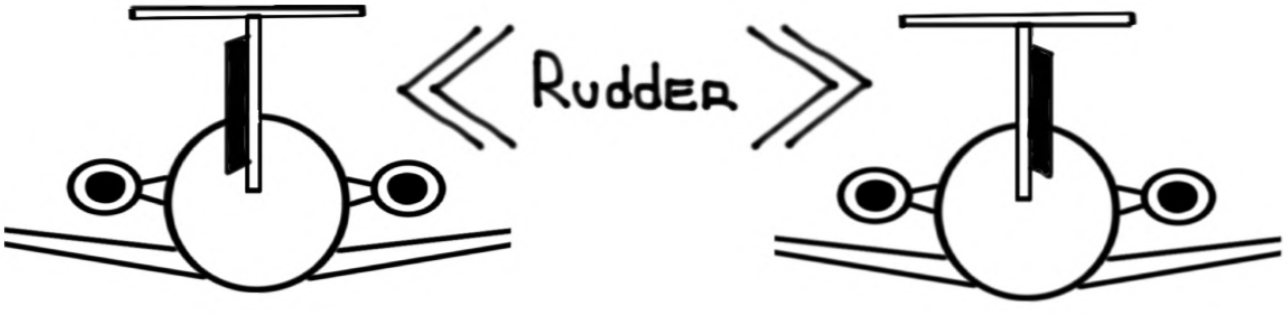
- Single rudder operated by the pilots' pedals and yaw damper system

- Rudder pedal movement actuates a series of cables and bell cranks that in turn actuate a dual tandem hydraulic boost actuator dedicated to moving the rudder

- Rudder pedal movement results in activation of:

- Pushrods
- Cables
- Bell cranks

Rudder actuator



- A **Rudder Limit** CAS message indicates maximum rudder hydraulic assist condition

- Rudder Trim is accomplished by moving the entire rudder surface via a rudder trim control wheel on the center pedestal (7.5° L/R)

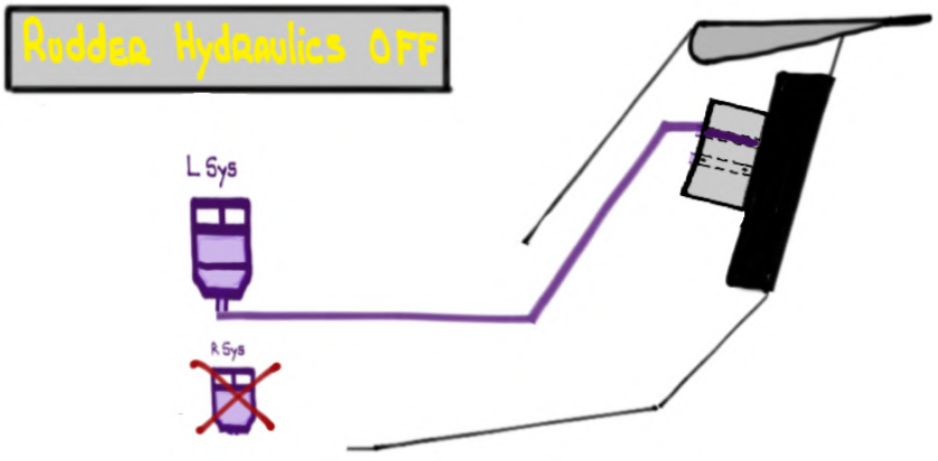
- The Yaw damper system damps <u>Dutch Roll</u> tendencies associated with the G450's swept-back wing design

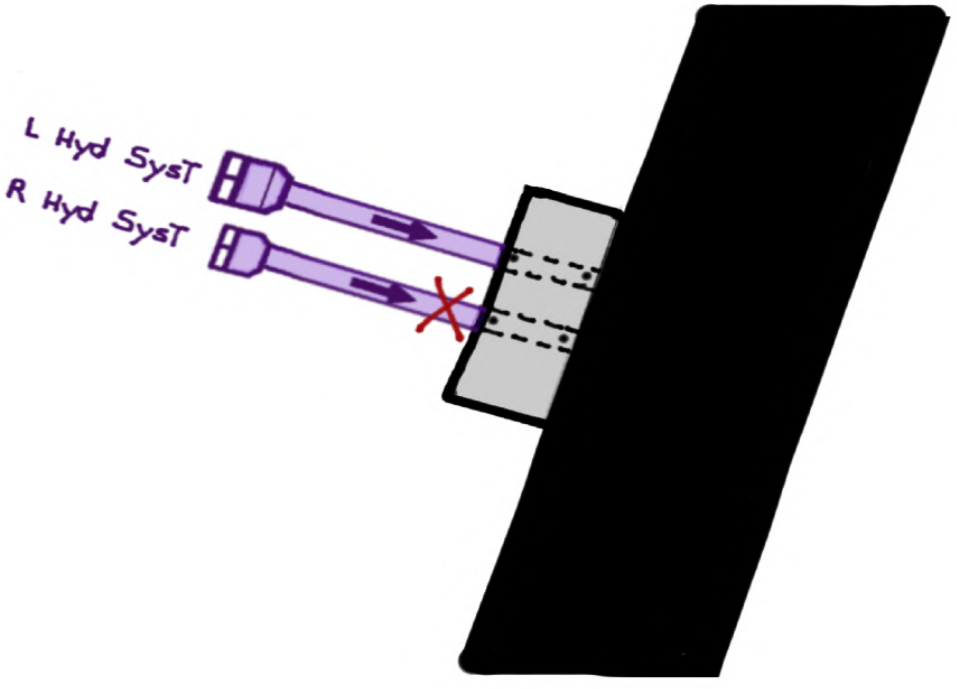
- <u>Two (2) channels:</u> <u>Two (2) computers:</u>

Fail Operational: If a YD and/or FGC fails the remaining YD and/or FGC would automatically take over the duties of the failed YD and/or FGC

- HOPS ACTIVATION:

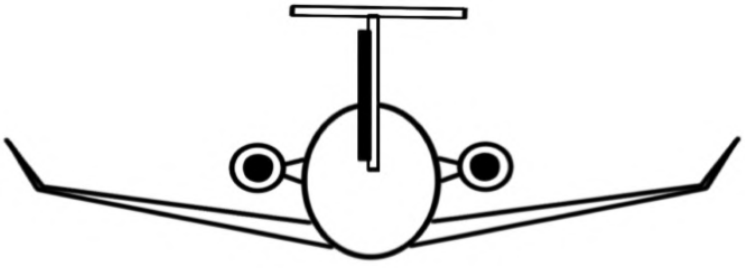
AFFECTED HYDRAULIC SYSTEM IS SHUTOFF





- Automatic Overload Limiting System:
  Prevents excessive overload on vertical stabilizer during high speeds by:

① Limiting rudder travel, and



High speed

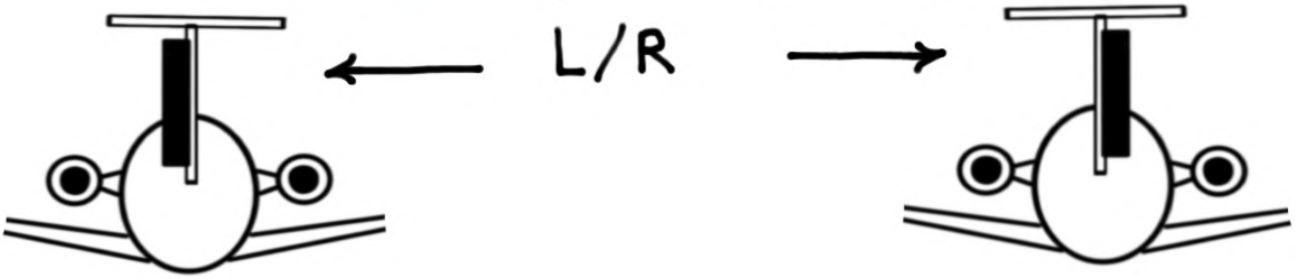
Low speed

② Limiting Hydraulic pressure

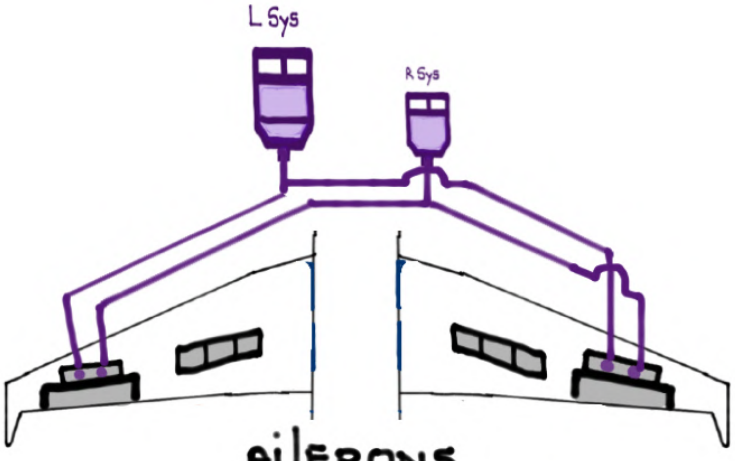
- If there is a loss of one Hydraulic system the pressure from the remaining system is ramped up to 3,000 Psi and a **Single Rudder** CAS message is displayed

- Rudder deflection:

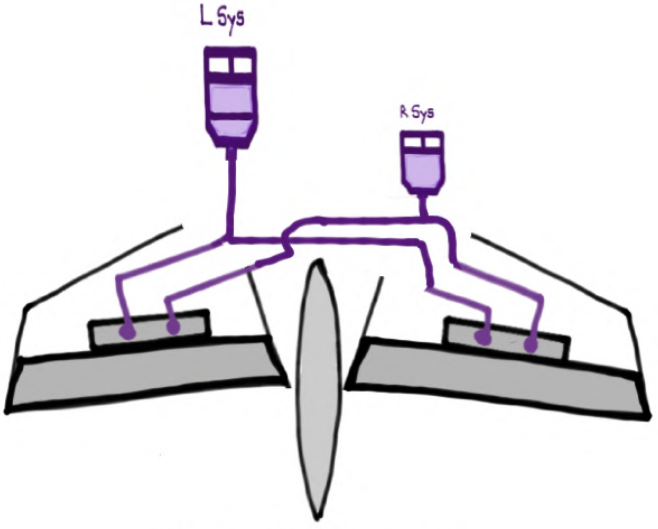
Up to 22° depending on speed



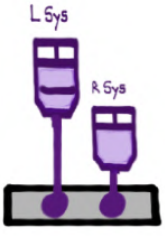
Hydraulic Boost Actuators



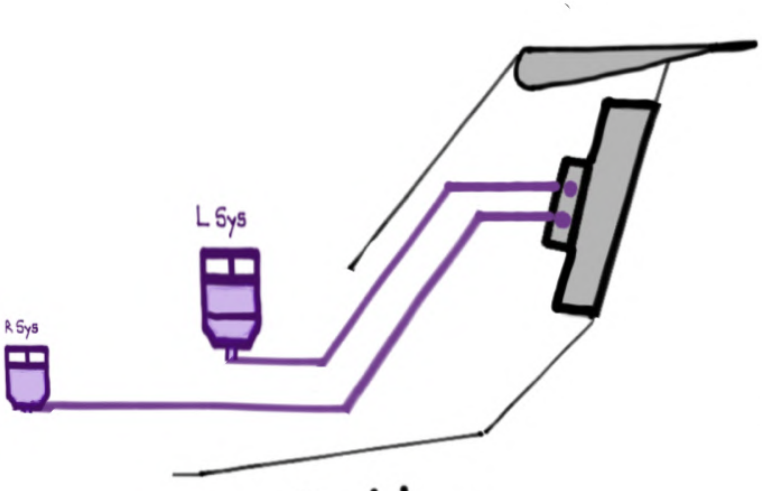
Ailerons



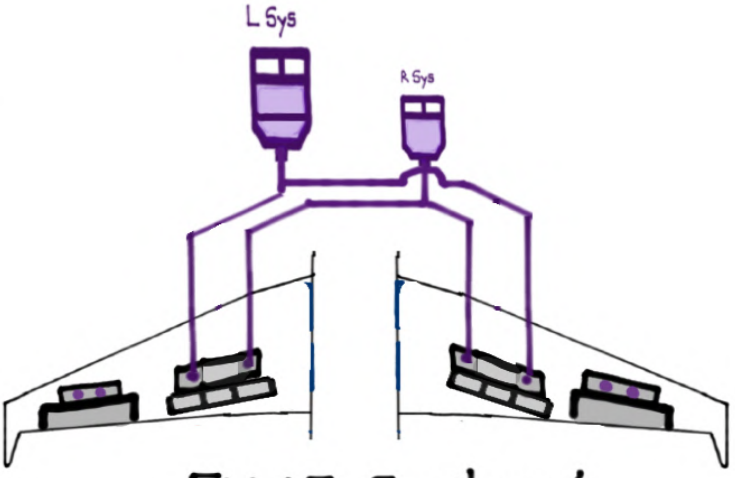
Elevators



← Hydraulic Boost Actuator



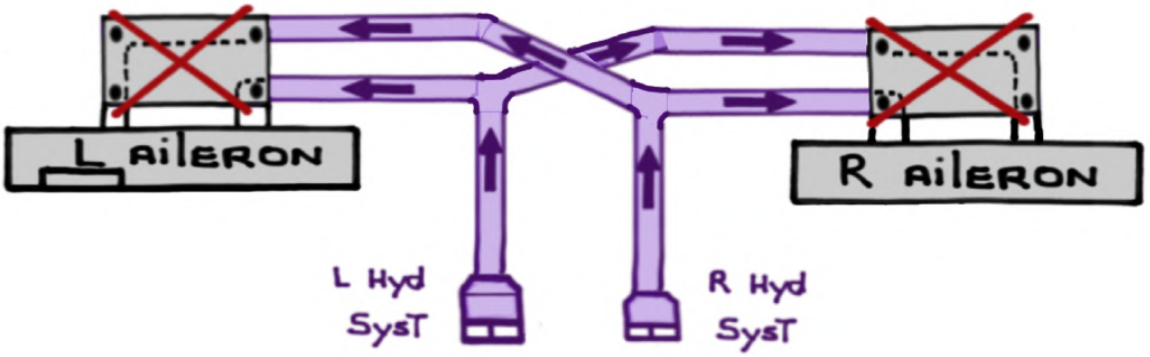
Rudder



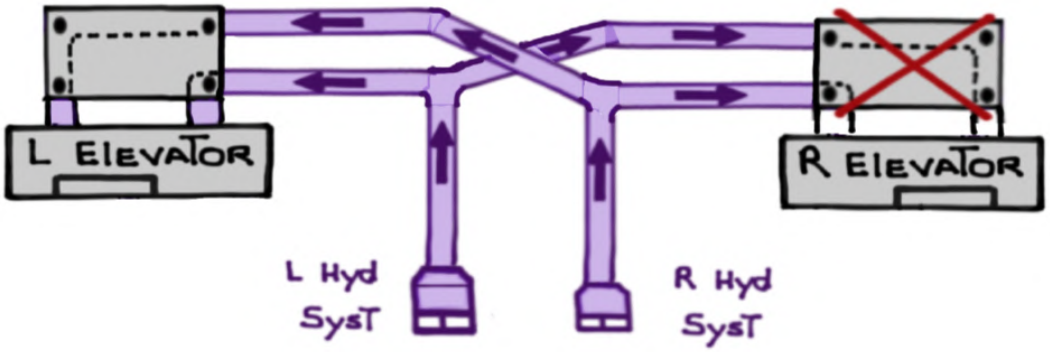
Flight Spoilers/
Speed Brakes

Hard Over Prevention System (HOPS)

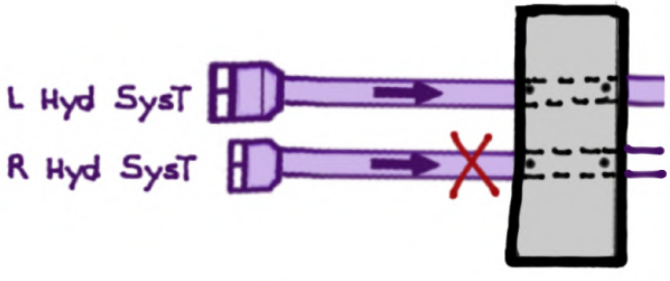
Ailerons: ailerons/spoiler actuators



Elevators: affected actuator only

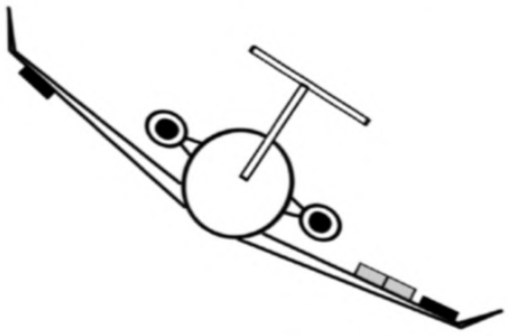


Rudder: affected Hydraulic System (s)



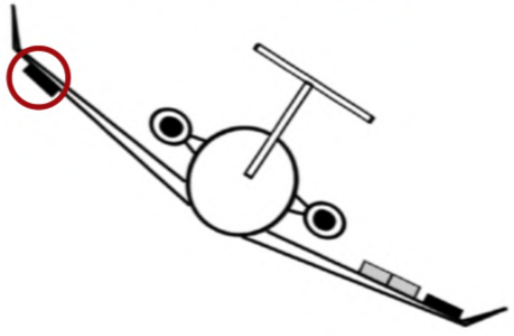
- Aileron deflection:

Up 11°
Down 11°



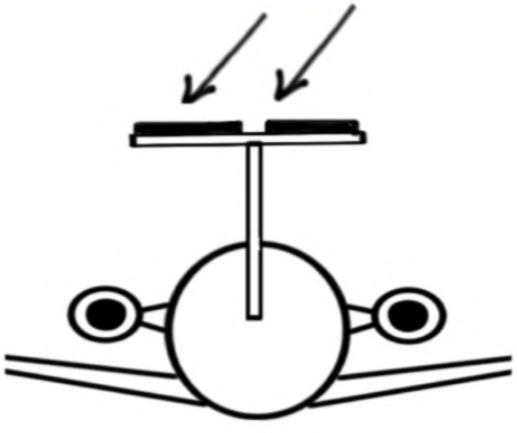
- Trim Tab deflection:

Up 15°
Down 15°

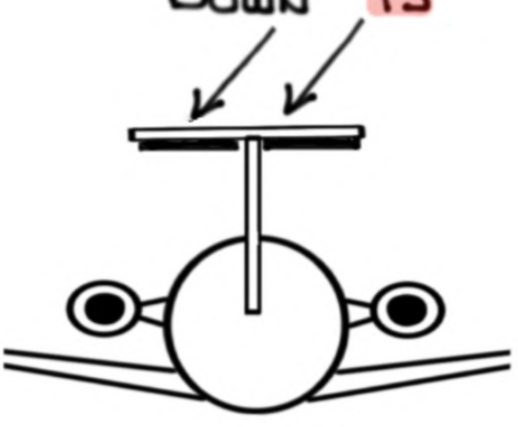


- Elevator deflection:

Up 24°

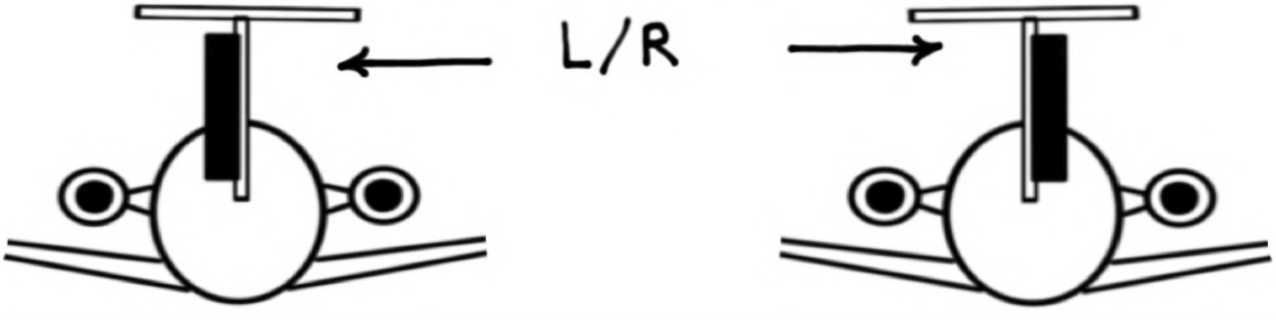


Down 13°



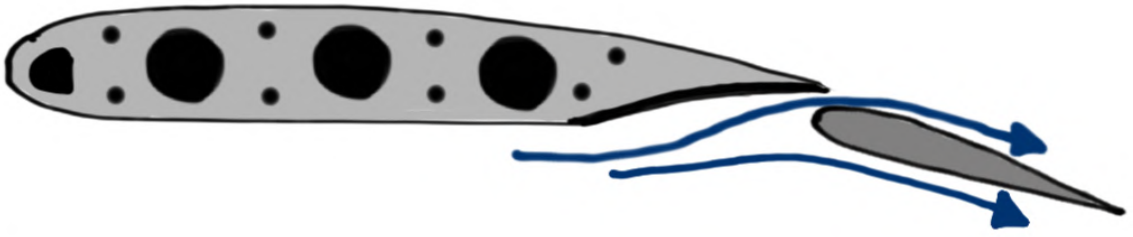
- Rudder deflection:

Up To 22° depending on speed



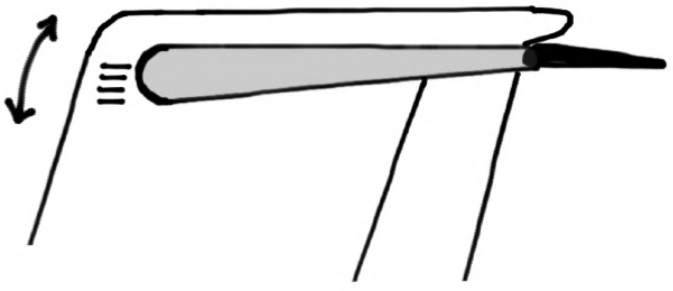
FLAPS/STAB

- Fowler Type, single surface flaps



- Horizontal stabilizer moves in conjunction with flap movement in order to minimize pitch changes as the flaps extend/retract and the Center of Lift moves

Flaps 0: -1.0°
Flaps 10: -2.3°
Flaps 20: -3.4°
Flaps 39: -4.6°



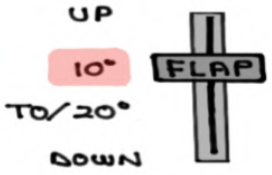
- Flap/Stab control unit is located in the AEER

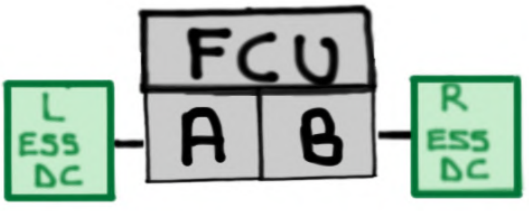
- Horizontal stabilizer is driven by Two (2) AC motors powered by the L Standby AC R Standby AC buses

- Flap/stab indications on PFD (HSI) disappear thirty (30) seconds after the flaps have reached the UP (zero) position

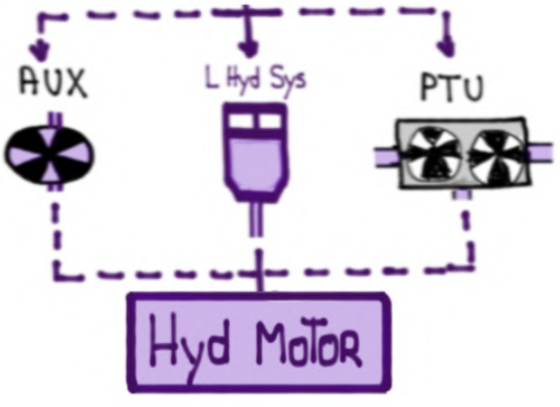
- Flaps:

Electrically - controlled

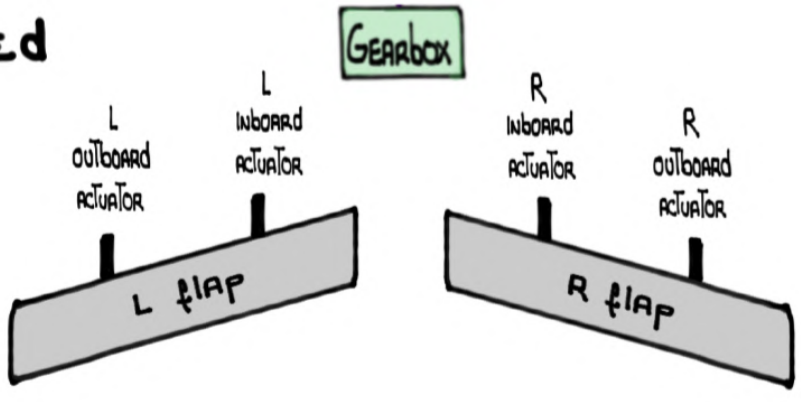




Hydraulically - powered

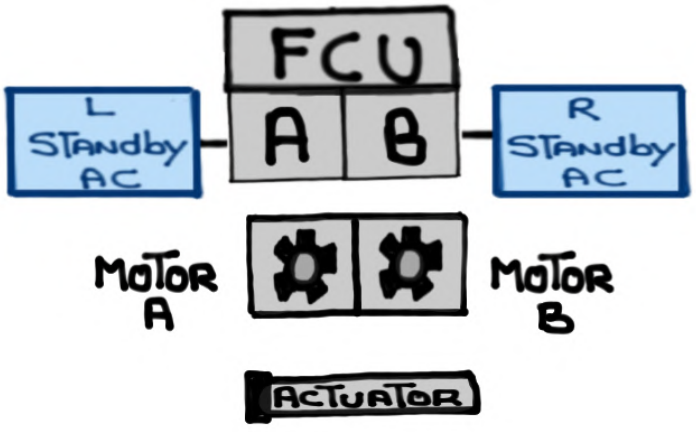


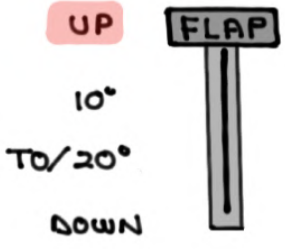
Mechanically - actuated

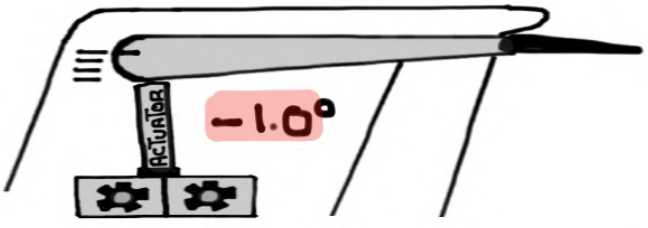


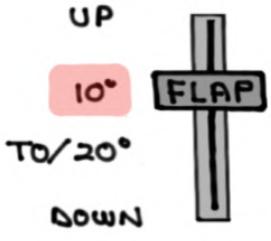
- HORIZONTAL STABILIZER:

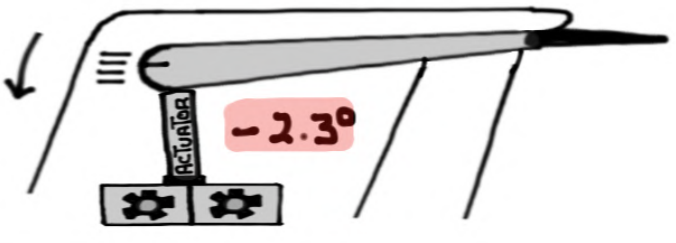
ELECTRICALLY - CONTROLLED AND ACTUATED

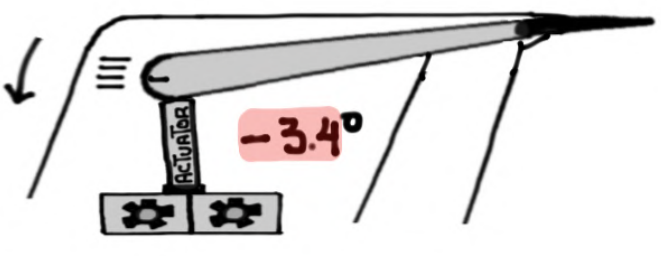


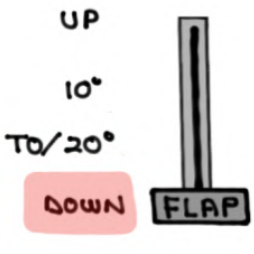


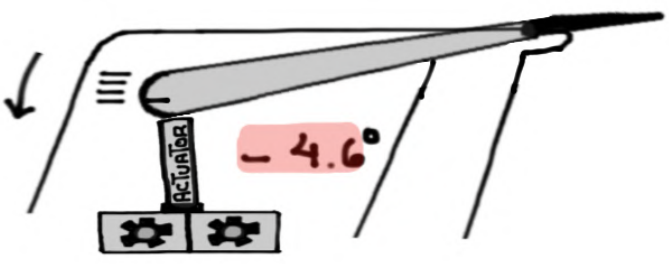


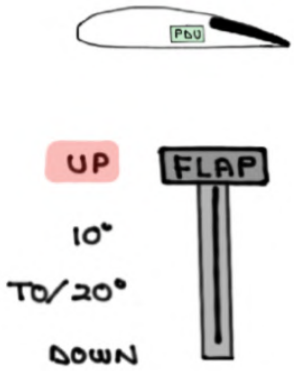
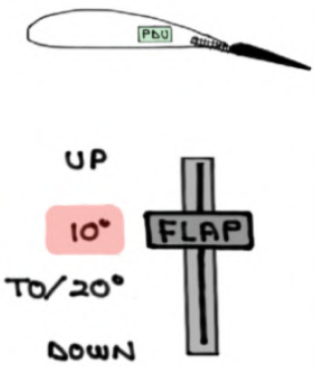
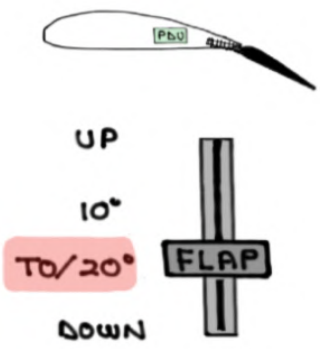
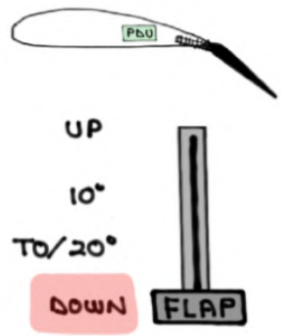






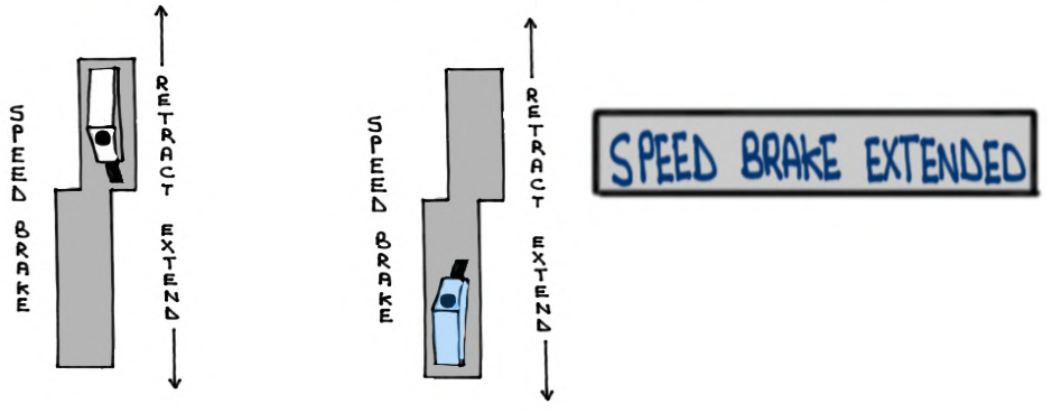




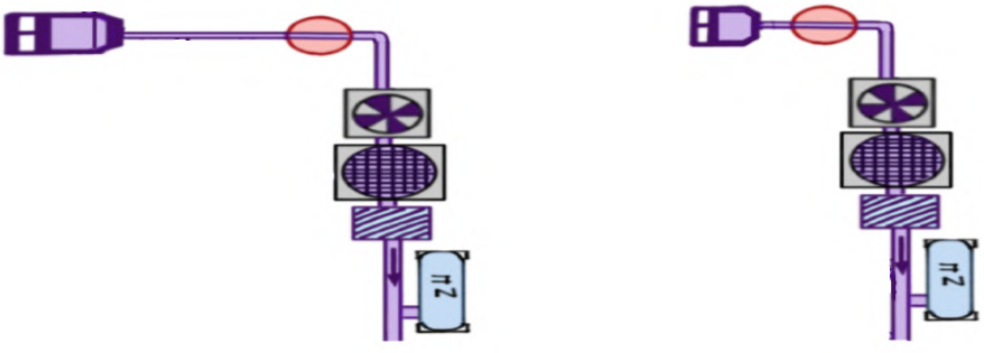
Flap 0	Flap 10	Flap 20	Flap 39
			
MAXIMUM EXTENSION/EXTENDED SPEED			
	VFE 250 KCAS	VFE 220 KCAS	VFE 180 KCAS
MAXIMUM G-LOADS			
-1 TO +2.5g	0 TO +2g	0 TO +2g	0 TO +2g 0 TO +1.5g (>MLW)
MAXIMUM OPERATING ALTITUDE			
	≤ 25,000'	≤ 25,000'	≤ 20,000'

Spoilers

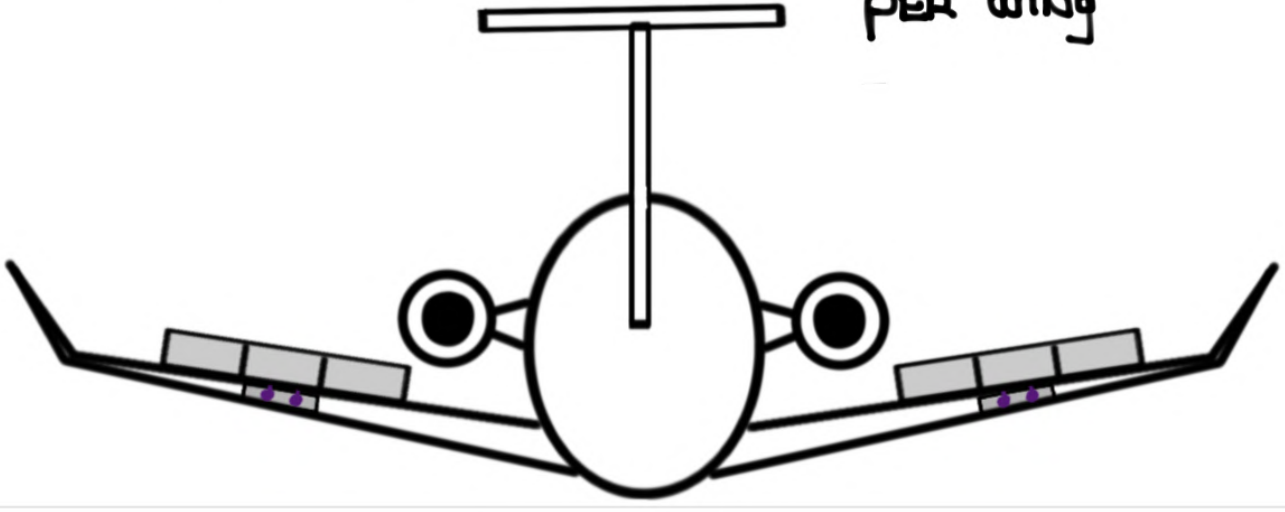
- **Electrically** - controlled via speed brake handle:



- **Hydraulically** - powered by:

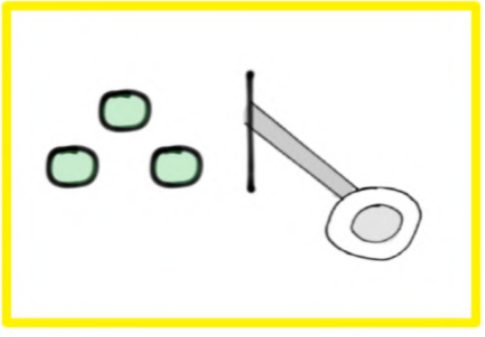


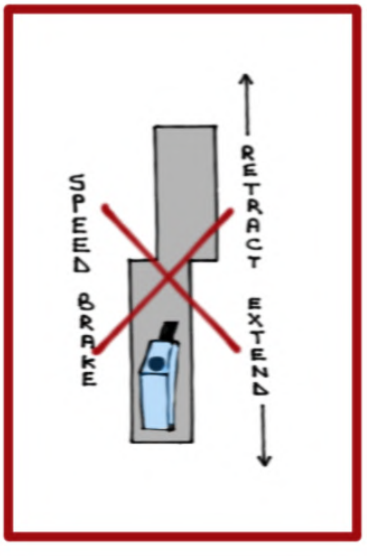
Six (6) Spoiler panels = Two (2) Hydraulic actuators per wing



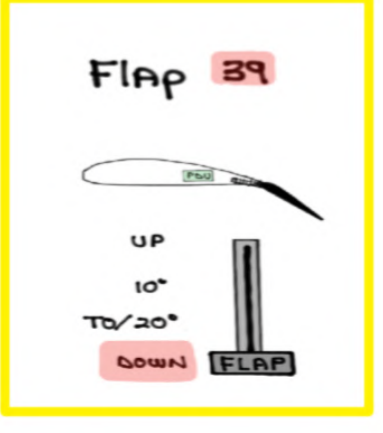
Spoilers

Do not extend spoilers **inflight** with gear down or flaps 39°





Prohibited



Do not arm ground spoilers for Touch and go landings

Spoilers

① Roll augmentation: Mid and outboard panels

up to 26° *

* Full aileron deflection with speed brakes deployed: 55°

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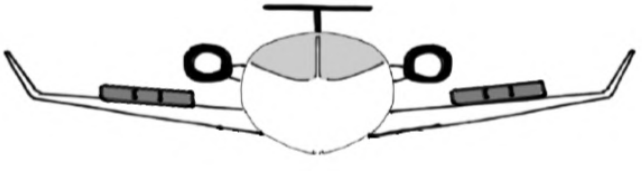
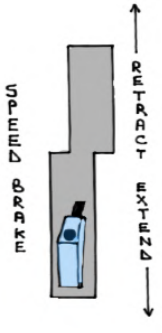
② Speed brakes (in-flight)

up to 26°





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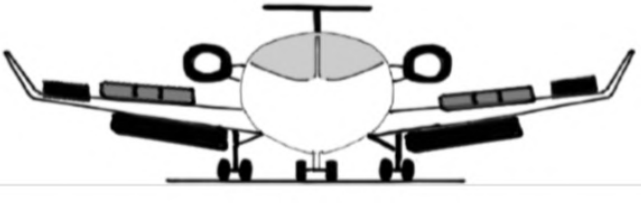
③ Ground spoilers (on ground)

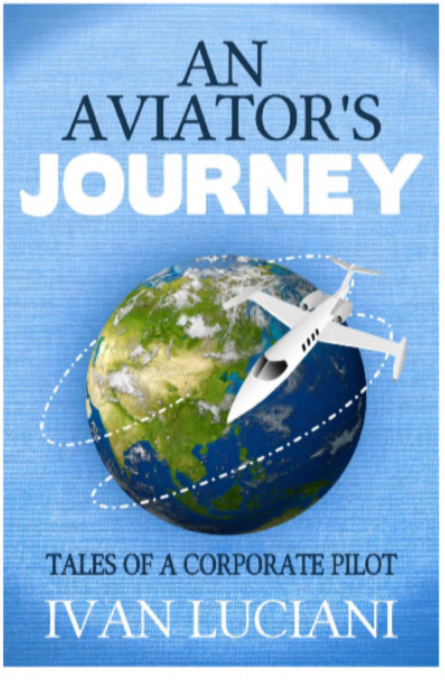
55° ±4°

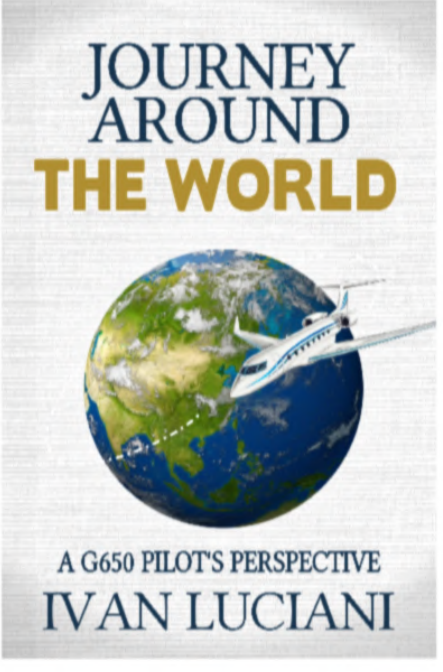


REMINDER: these system notes are intended for study purposes only. Always refer to official Gulfstream manuals and other approved references when operating your aircraft.

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!