



# Airplanes Flight Controls

Carl Thibault

June 23,2010



Airframe Anatomy

Static Stability

Fixed Wing Control

Control Surfaces

The Elevator

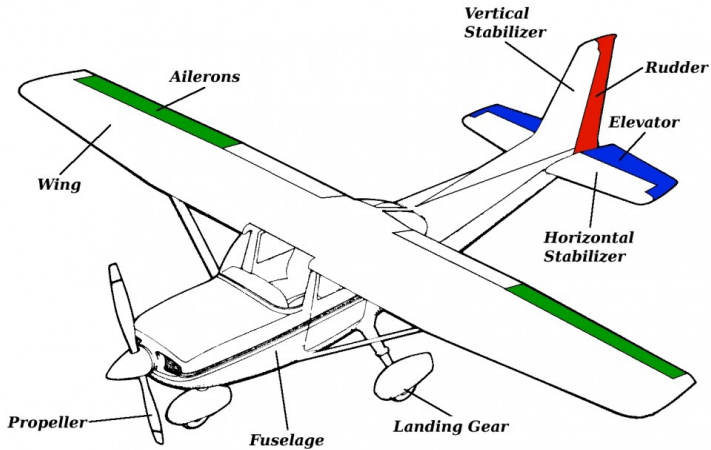
The Ailerons

The Rudder

lets Build a UAV



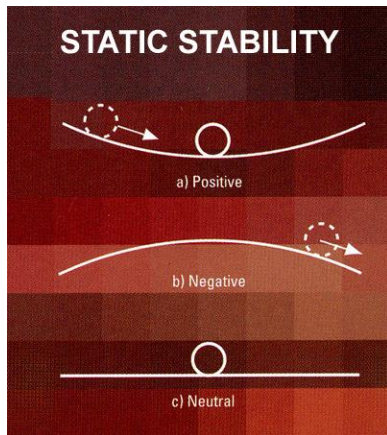
## Airframe Anatomy





## Static Stability

- Static stability is the characteristic of a system to return to equilibrium after a disturbance. Requires a restorative force or moment
- Stability is not enough for flight even if the wright brothers aircraft was statically unstable they were successful because they had enough control to counter act the behaviors of the aircraft.

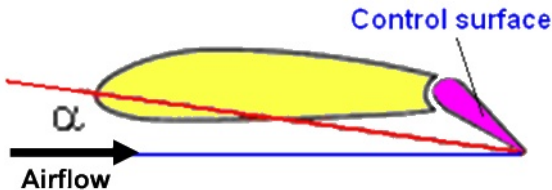




## Control Surfaces

### Wings with adjustable lift

- The airfoil section is generally symmetric
- A flap or tab is actuated by the pilot /control system to change the camber of the airfoil
- angle of attack can be modified changing to effect the lift force.





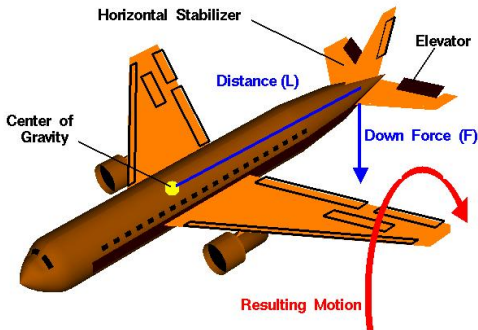
## The Elevator and Horizontal Stabilizer

The horizontal part of the tail that controls the pitch angle by generating positive or negative lift causing the appropriate moment.



### *Horizontal Stabilizer - Elevator*

Glenn  
Research  
Center





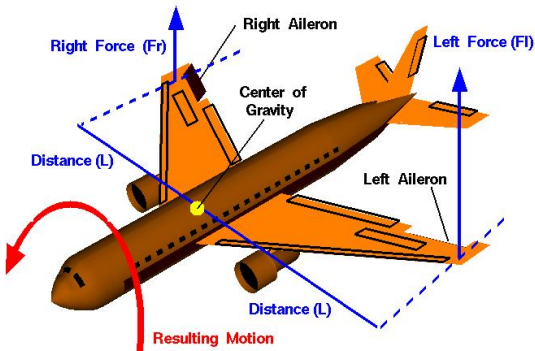
## The Ailerons

The moving parts close to the wing tips of the main wings and create a differential of lift between the right and left side resulting in a rolling moment.



### *Ailerons*

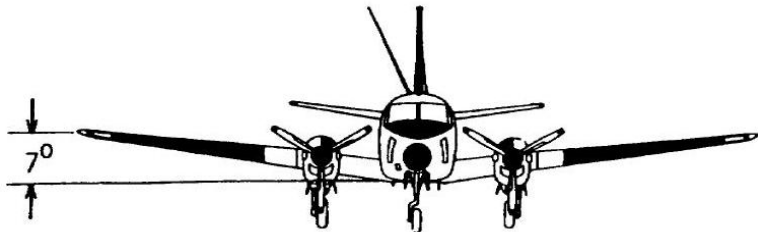
Glenn  
Research  
Center





## Dihedral Angle

The dihedral adds stability to the aircraft and







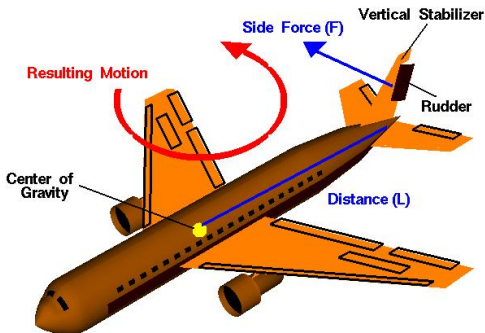
## The Rudder and Vertical Fin

The rudder is the vertical that controls direction of flight like on a ship the rudder adds moment about the z axis or Yaw by producing lift normal to the direction of flight.



### ***Vertical Stabilizer - Rudder***

Glenn  
Research  
Center





## The Classic Paper Dart

