

GLIDER BASICS



DRISHTI

A Revolutionary Concept

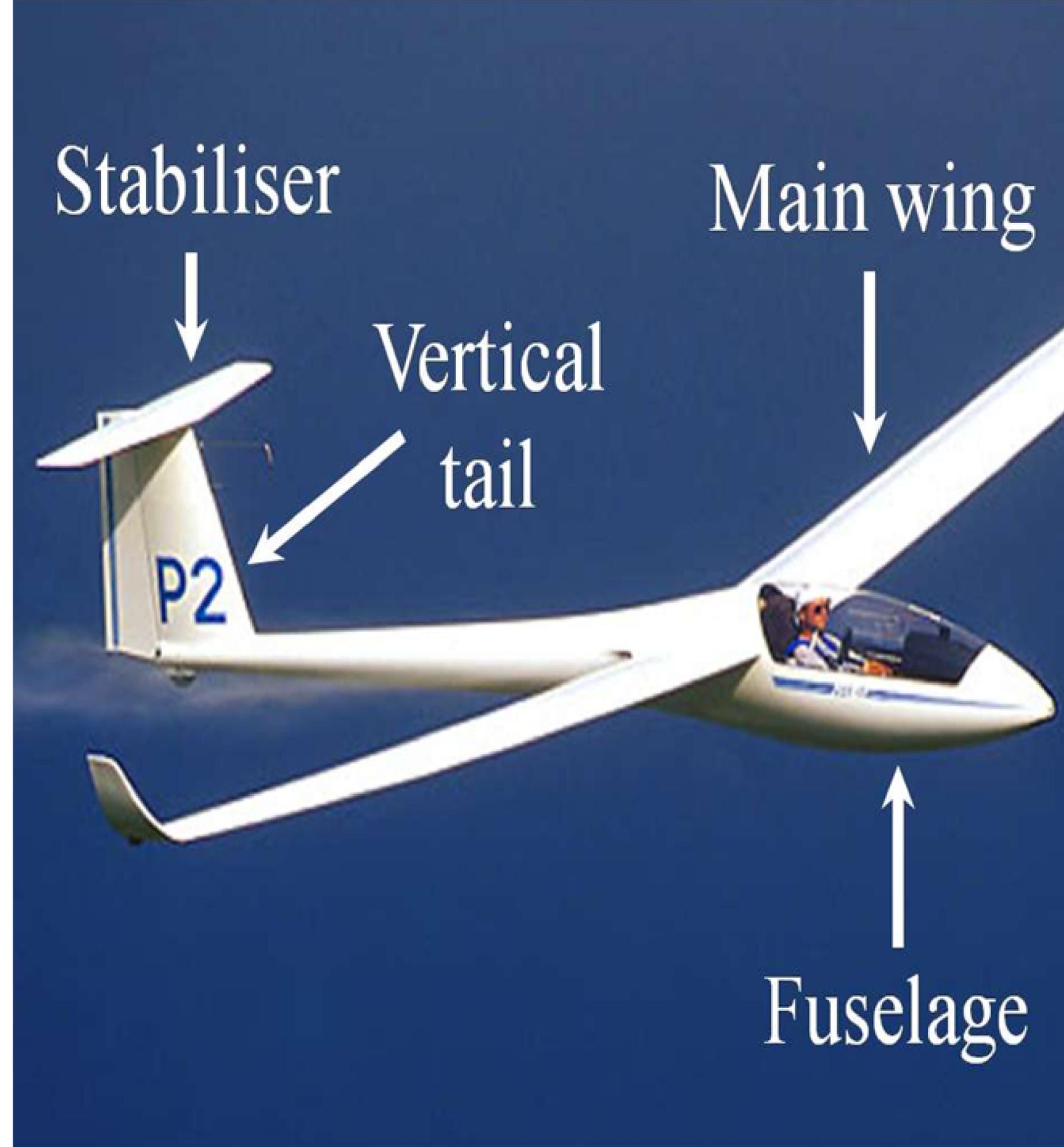
What is Glider?

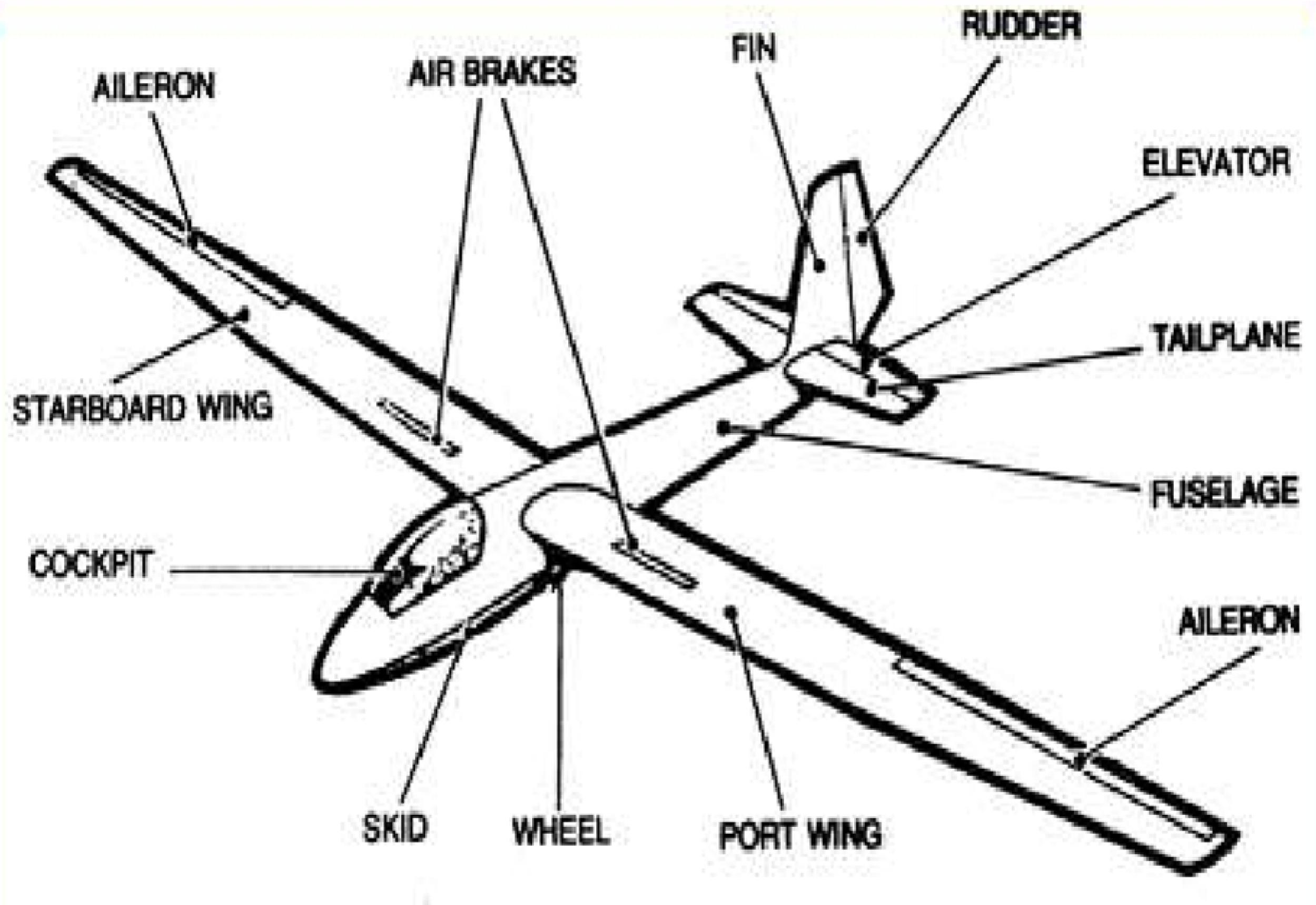
A light engineless aircraft designed to glide after being towed aloft or launched from a catapult.

Parts of a Glider

A glider can be divided into three main parts:

- a) Fuselage
- b) Wing
- c) Tail





Basic Terminology of Wing

Camber Line

A line joining the leading and trailing edges of an airfoil equidistant from the upper and lower surfaces . High camber found on slow flying high lift aircraft.

Camber

It is the asymmetry between the top and the bottom curves of an aerofoil in cross-section.

Chord Line

Line connecting Leading Edge to Trailing Edge

Leading Edge

Front edge of wing

Trailing Edge

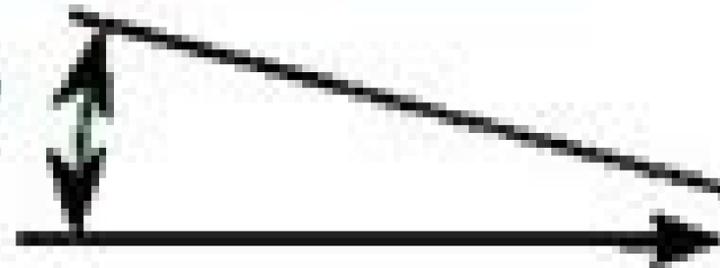
Back edge of wing

Airfoil

Cross-Sectional shape of a Wing.

angle of attack

α



relative wind

leading edge

chord line

camber line

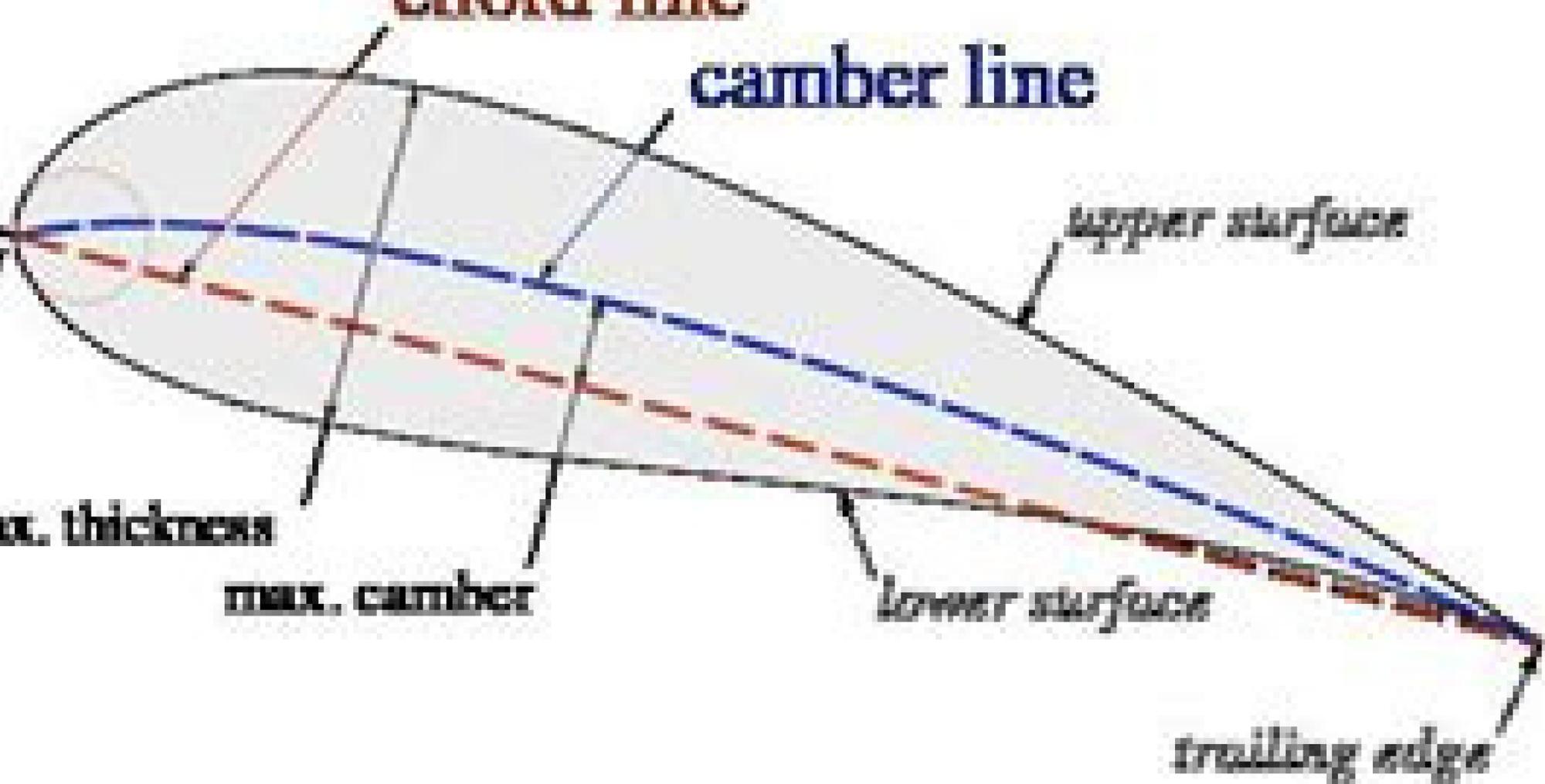
upper surface

max. thickness

max. camber

lower surface

trailing edge



Wing

The point in the airfoil where the lift (For Glider) can be supposed to be concentrated upon is called the center of pressure.

Generally, it is located at $c/4$, where c is the chord length.

The point where the weight of the glider acts is termed as the center of gravity (CG).

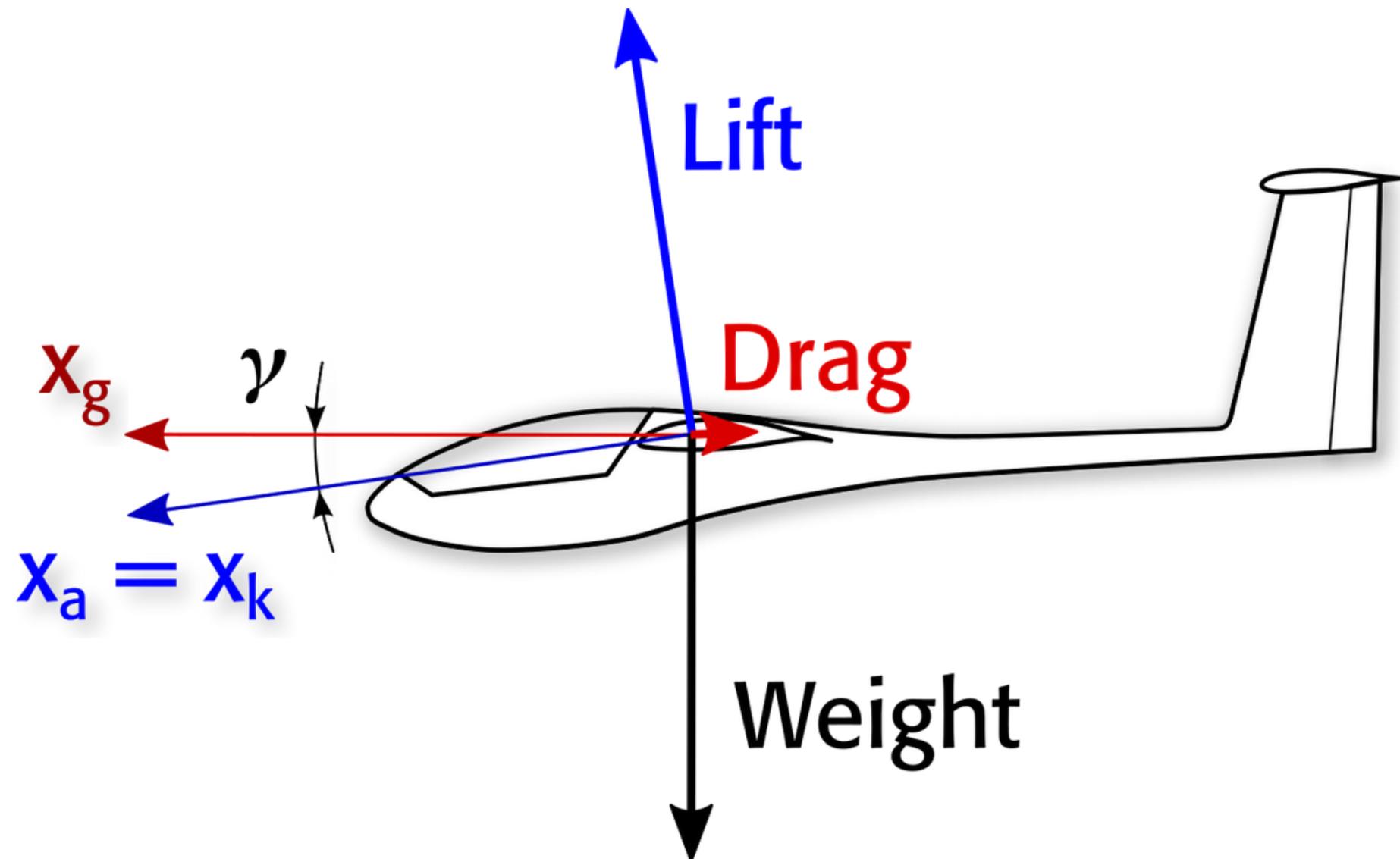
For weight balance, the center of gravity must coincide with the center of pressure.

To bring the CG to $c/4$ we add some weight to the nose in the form of coins and paper clips.

How Airplanes Fly?

Essentially there are 4 aerodynamic forces that act on an airplane in flight. These are:

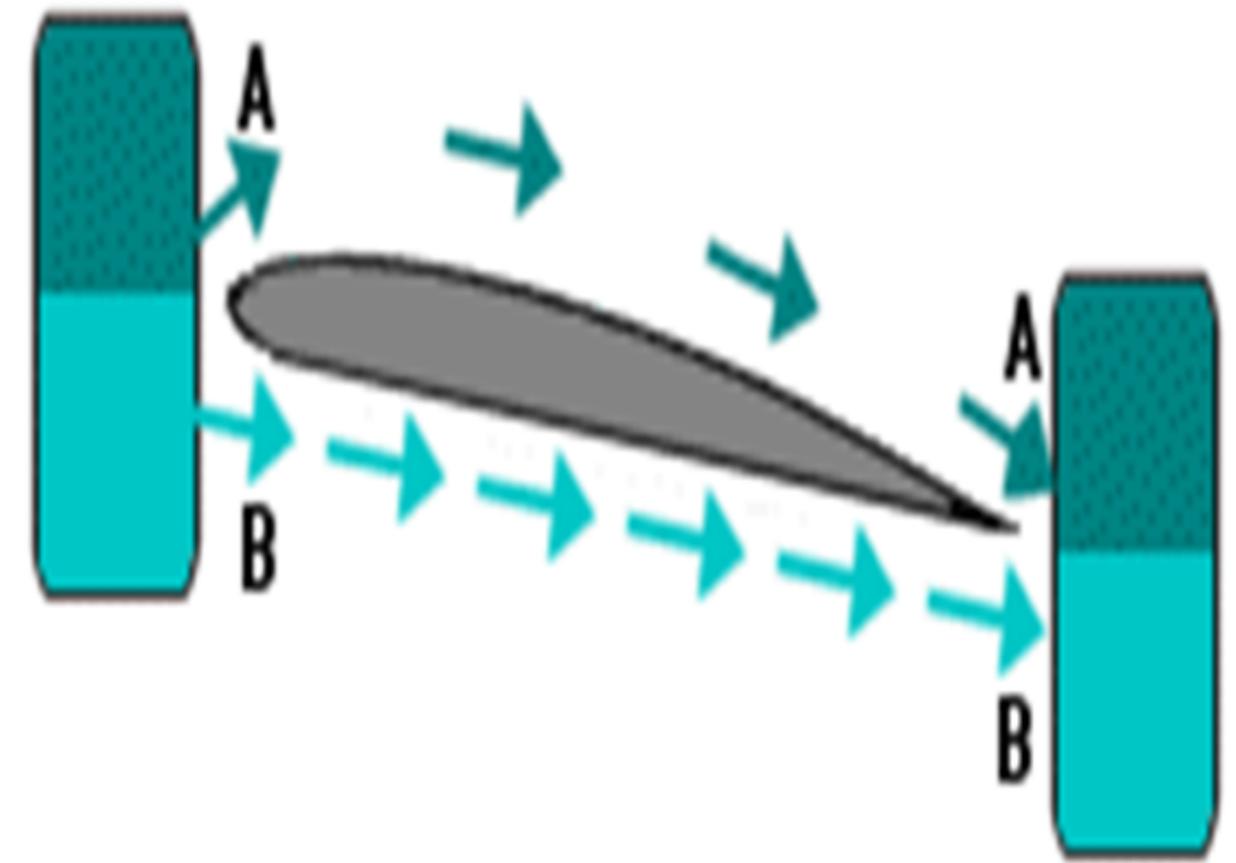
- Lift: Upward force (Generated by wing)
- Gravity: Downward force (Due to weight of the plane)
- Thrust: Driving force (Power of the airplane's engine)
- Drag: Backward force (Resistance of air)



How Wings Generate Lift?

As the fluid elements approach the wing, they split at the leading edge and meet again at the trailing edge.

As a result, the air must go faster over the top of the wing since this distance traveled is larger. Bernoulli's equation implies that pressure will be lower on the upper surface. The generation of Lift is explained by Coanda Effect.

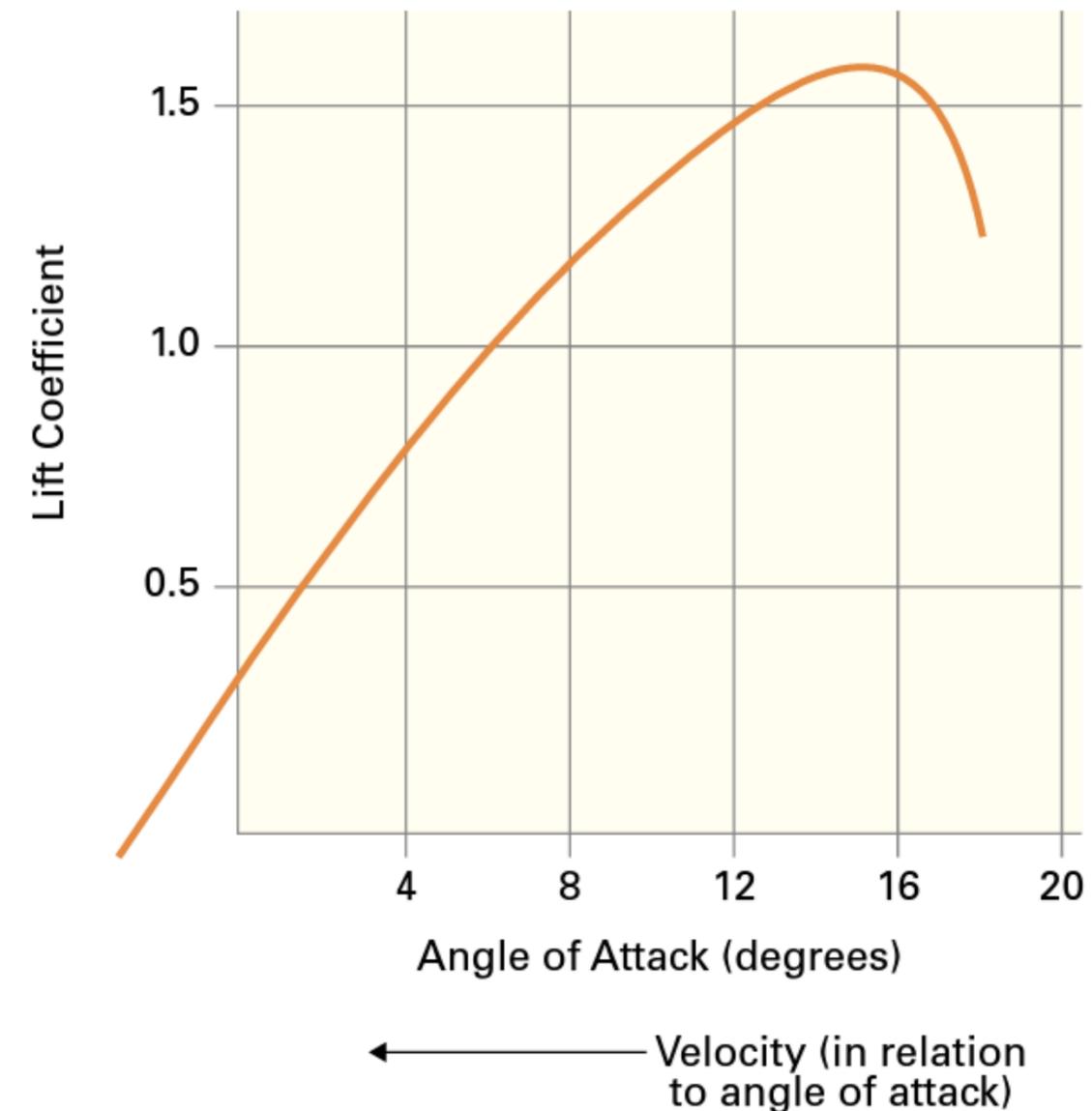


Angle of Attack

It is the angle the wind makes with the wing (relative wind).

As the angle of attack increases, so more lift is generated -but only up to an angle called critical angle of attack until the smooth airflow over the wing is broken up and so the generation of lift cannot be sustained.

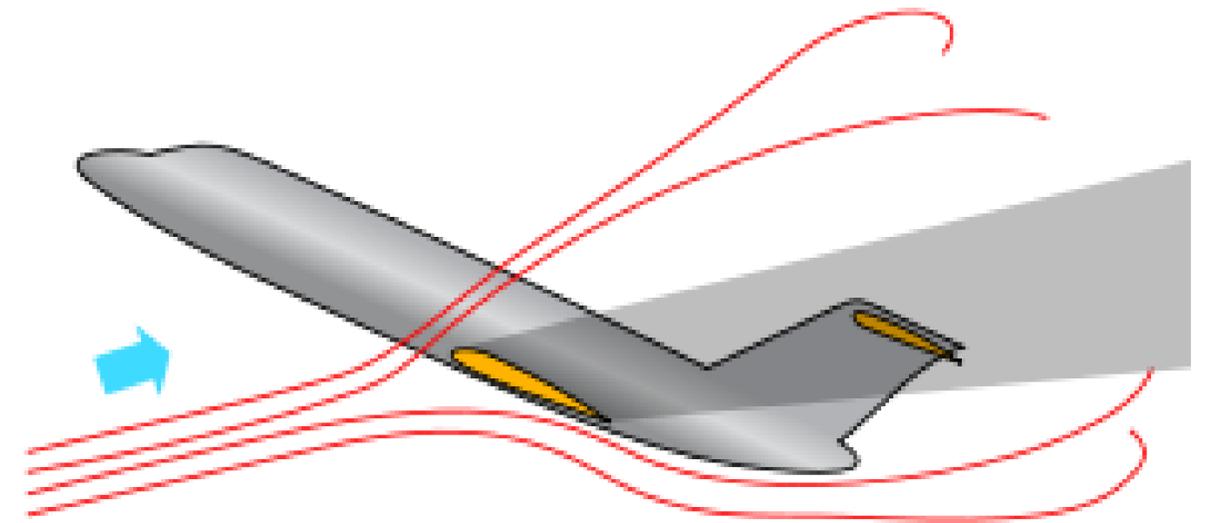
When this happens, the sudden loss of lift will result in the airplane, known as **Stall**, where the weight of the airplane cannot be supported any longer.



Stall

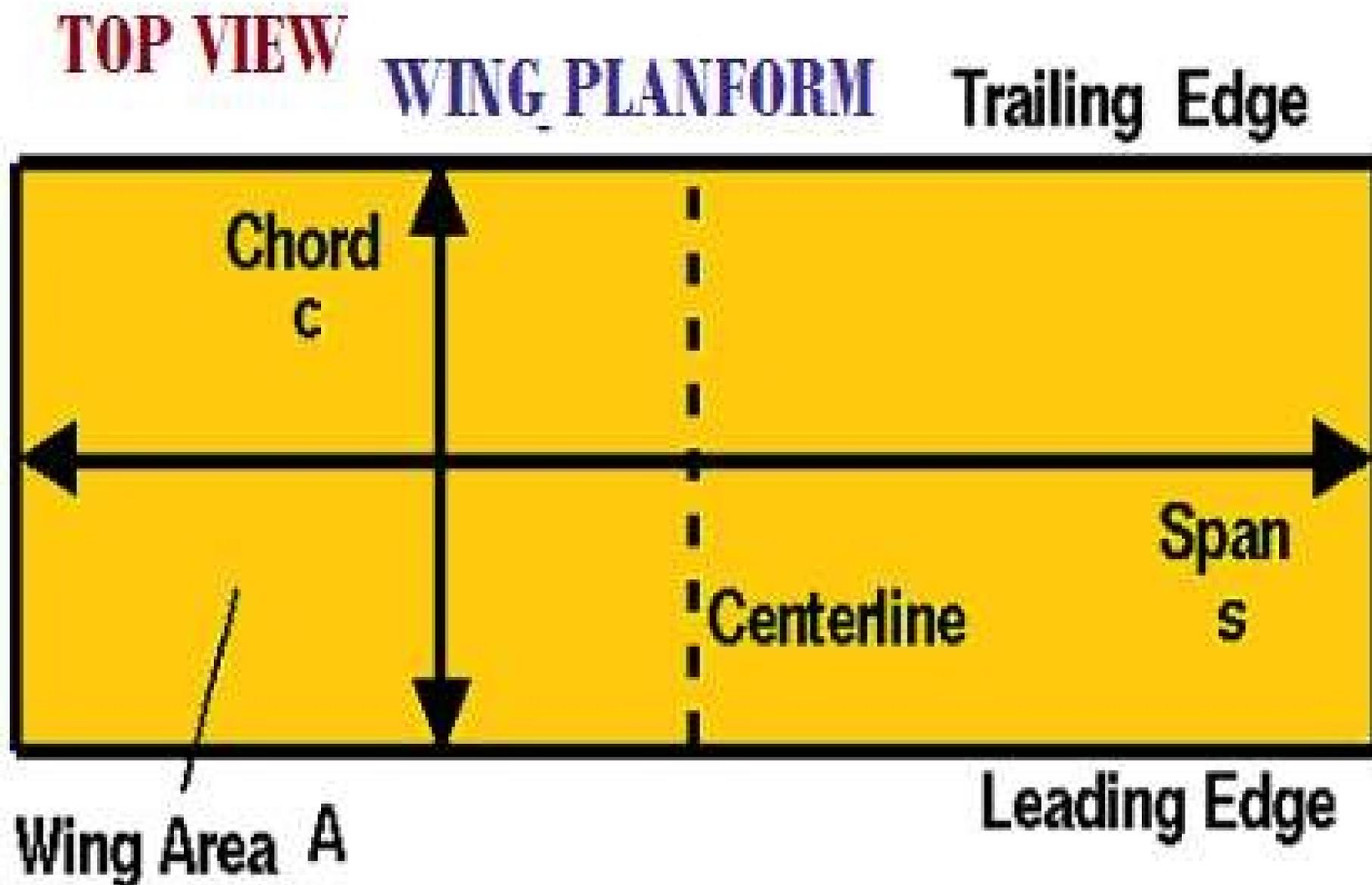
The stall is a reduction in the lift coefficient generated by a foil as the angle of attack increases. This occurs when the angle of attack exceeds the critical angle of attack of the foil.

The critical angle of attack is typically about 15 degrees, but it may vary significantly depending on the fluid, foil, and Reynolds number.



Aspect Ratio

It is the ratio of the wing span to the wing's chord length(c).



Aspect Ratio = AR

$$AR = \frac{s^2}{A}$$

$$AR = \frac{s}{c} \text{ for rectangle}$$

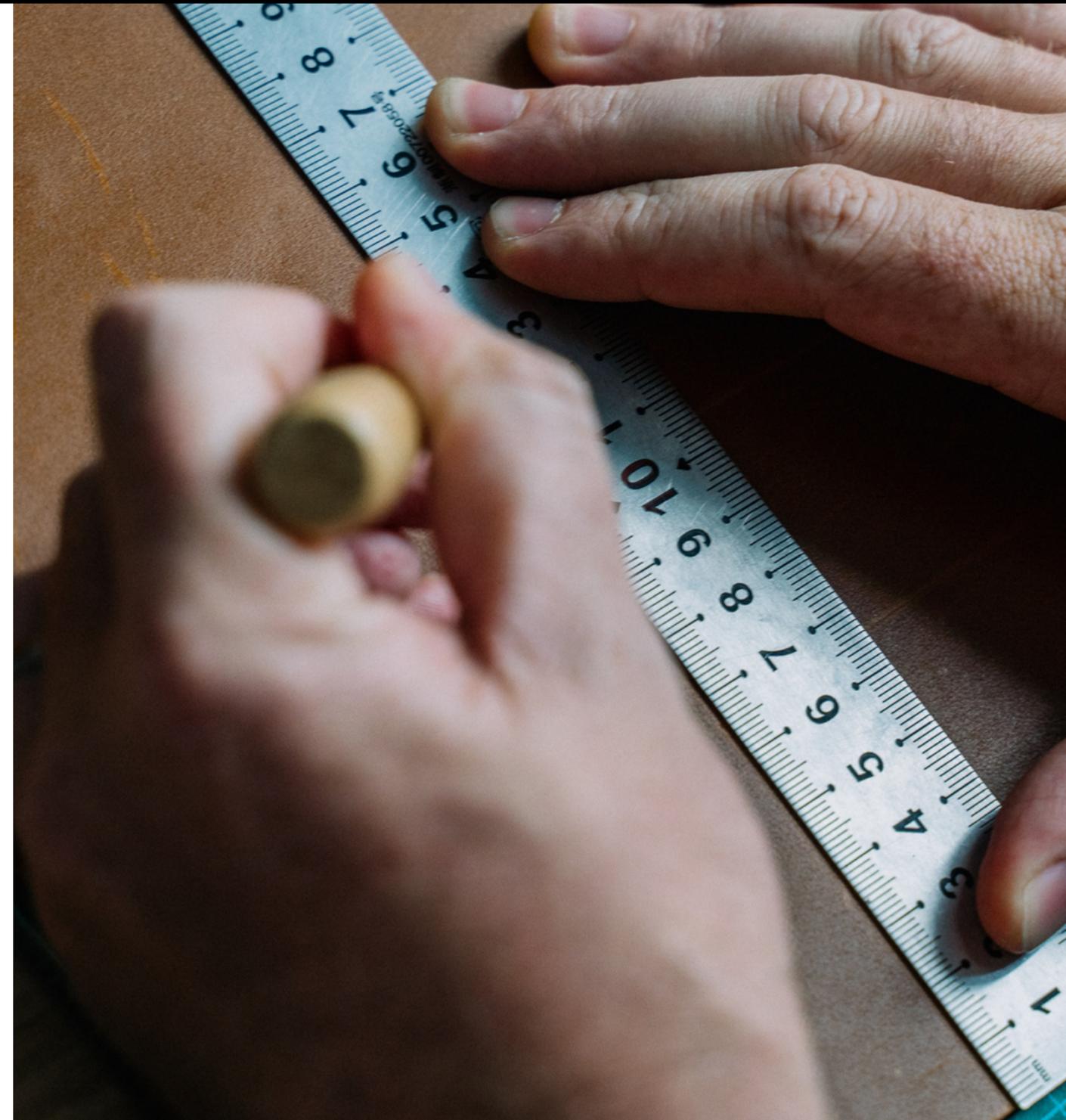
Dimensions

Aspect Ratio = 8-12

Horizontal Stabilizer = 20-25% of wing area

Vertical Stabilizer = 40% to 50% of
Horizontal Stabilizer area.

Length of fuselage = 65%-75% of span



**THANK
YOU**

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