

AIRFOILS

An airfoil or airfoil section may be defined as any surface designed to obtain lift. It has been found that the most suitable shape for producing lift is a curved or cambered shape.

CAMBER

The camber is the curvature of the upper and lower surfaces of an airfoil. Usually the upper surface has a greater camber than the lower.

EQUILIBRIUM

When two forces are equal and opposite, the aircraft is said to be in a state of equilibrium. Therefore, when thrust and drag are equal and opposite, the aircraft will continue to move forward at the same uniform rate of speed. Equilibrium refers to steady motion and **not to a state of rest**.

If either of these forces becomes greater than the force opposing it, the state of equilibrium will be lost.

LIFT AND WEIGHT

When lift and weight are equal and opposite, the airplane will be in equilibrium.

- However if lift is greater than weight, the airplane will climb.
- However if weight is greater than lift, the airplane will sink.

THRUST AND DRAG

When thrust and drag are equal and opposite, the airplane will be in equilibrium.

- If thrust is greater than drag, the airplane will accelerate or gain speed.
- If drag is greater than thrust, the airplane will decelerate or lose speed.

COUPLES

When 2 forces are equal and opposite, the airplane is said to be in a state of equilibrium. When two forces such as lift and weight are equal and opposite, but parallel rather than passing through the same point, they are said to form a couple. A couple will cause a turning moment about a given axis (couples act around the C of G).

- *If the weight is ahead of lift, the couple created will turn the nose of the airplane down.*
- *If lift is ahead of weight, the couple created will turn the nose of the airplane up.*
- *If drag is above thrust, the couple formed will turn the nose of the airplane up.*
- *If thrust is above drag, the couple formed will turn the nose of the airplane down.*

RELATIVE AIRFLOW

A term used to describe the direction of the airflow with respect to the wing.

Relative airflow, also known as relative wind, is created by the motion of the airplane through the air. It is also created by the motion of air past a stationary body or by a combination of both. Therefore, on a take-off roll, an airplane is subject to the relative airflow created by its motion along the ground and also by the moving mass of air (wind).

STREAMLINING

Is a design device by which a body is so shaped that drag is minimized as the body moves forward through the air.

AILERON DRAG

- When an aircraft banks to make a turn, one aileron is depressed and the other is raised.
- The down going aileron being depressed into the compressed air flow, causes drag.
- The up going aileron, moving up in a more streamlined position, causes less drag.
- The result is a yaw in the opposite direction to which bank is applied.

LIFT AND DRAG CURVES

The lift and drag of an airfoil depend not only on the angle of attack but also upon:

- the shape of the airfoil
- the plan area of the airfoil(wing area) = S
- the square of the velocity (true airspeed) = V^2
- density of the air = ρ

Hence the lift of the airfoil can be expressed as a formula by: $C_L \cdot \frac{1}{2} \rho V^2 \cdot S$

And the drag by: $C_D \cdot \frac{1}{2} \rho V^2 \cdot S$

C_L	Coefficient of lift
C_D	Coefficient of drag

Lift Drag Ratio: Used to express the relation between lift and drag and is obtained by dividing the lift coefficient. by the drag coefficient.

Best lift-drag ratio: Reaches its maximum at 0 degree angle of attack, obtain the most lift for the least amount of drag.