

LING CLUB

IT KANPUR

RC PLANES:

INTRODUCTION AND DESIGN

Terminology

1.Wing 2.Fuselage 3.Vertical Tail 4. Horizantal tail





Control Surfaces: Aileron, elevator, Rudder, Flaps



Left aileron down, right one up causes a roll to the right Left aileron up, right one down causes a roll to the left

Airflow hits the deflected rudder surface and forces the nose of the plane round Right rudder cause right yaw Left rudder cause left yaw

Air hitting under the elevator forces the nose downward Air hitting the top of the elevator forces the nose upward













How wings generate lift?

A cross section of a typical airplane wing will show the top surface to be more curved than the bottom surface. This shaped profile is called an '**airfoil**' (or 'aerofoil').



Angle of attack

A crucial factor of lift generation is the Angle of Attack - this is the angle at which the wing sits in relation to the horizontal airflow over it. As the angle of attack increases, so more lift is generated - but only up to a point 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 entering into a stall, where the weight of the airplane cannot be supported any longer.



However, a direct *reaction* to lift is drag and this too increases with airspeed. So airfoils need to be designed in a way that maximizes lift but minimizes drag, in order to be efficient.



DESIGNING RCPLANE

- First Decide the wing loading of your plane.
- Conventionally we take Wing Loading for these type of planes as 35-45.
- Using formula for Lift-

Lift, $L = 1/2 \times \rho \times U^2 \times C_L \times S$

p = Avg. Density of air at Certain Height (in Kg/m³)

- U = Relative vel. of air (in m/s)
- C_L = Cofficient of Lift

S = planform area of wing/Projection of wing area on horizontal plane (in m²)

The lift coefficient is determined from this equation

USING DESIGN FOIL

The shape of the airfoil is determined using a software called Design Foil, with the help of the lift coefficient obtained.

The tutorials of this software will be e-mailed to you

WING DIMENSIONS

- For Level flight, Weight = Lift (W=L)
- Using wing loading value, we obtain the planform area.
- To get the value of Chord Length, we assume Aspect Ratio (AR) around 6 to 8.
- In rectangular wing AR = span/Chord
- Weight is approx. 2 kgs

OTHER PARTS

- Fuselage 70-75 % of wing span.
- Horizontal Stabilizer 25% of the wing area
- Vertical stabilizer 50% of HS

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