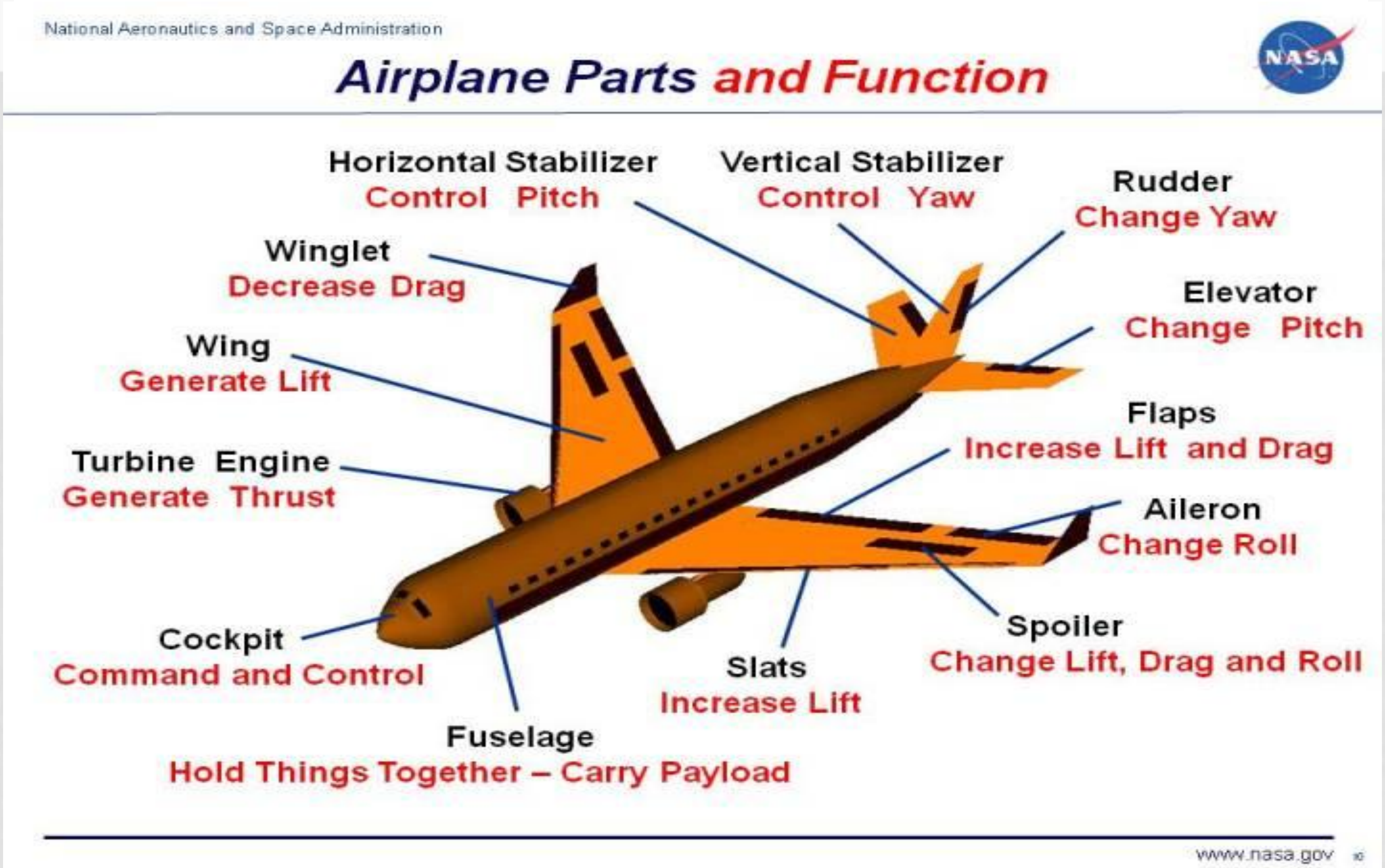
AEROMODELLING CLUB
IIT KANPUR

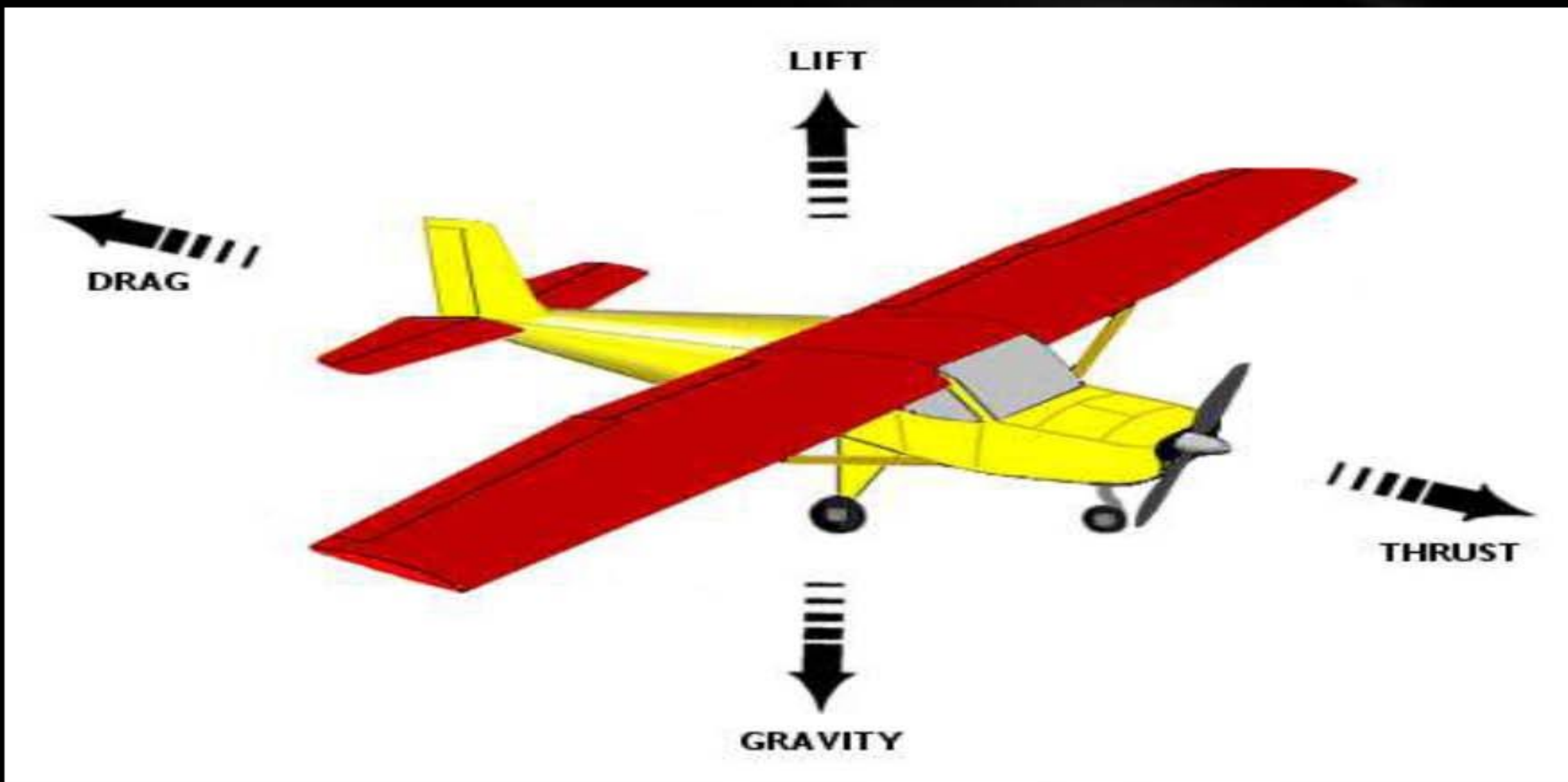
LECTURE 1:

BASIC TERMINOLGIES
AERODYNAMIC FORCES
MECHANICS OF FLIGHT

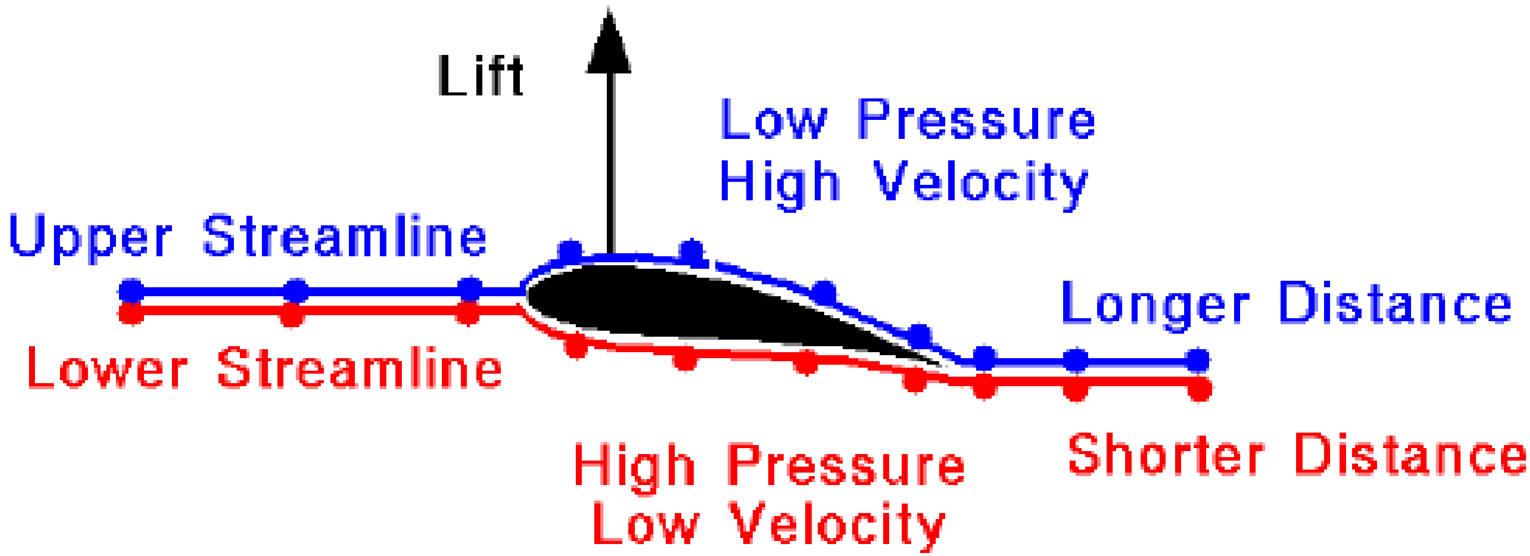
TERMINOLOGY



AERODYNAMIC FORCES



Popular & Incorrect theory for lift generation



"Longer Path" or "Equal Transit" Theory

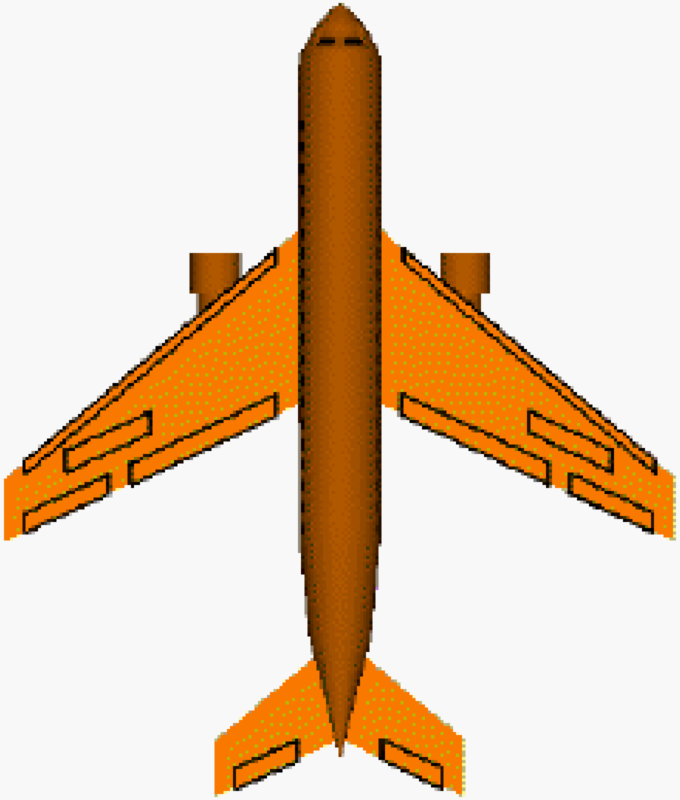
Top of airfoil is shaped to provide longer path than bottom. Air molecules have farther to go over the top.

Air molecules must move faster over the top to meet molecules at the trailing edge that have gone underneath.

From Bernoulli's equation, higher velocity produces lower pressure on the top.

Difference in pressure produces lift.

Factors Affecting Lift

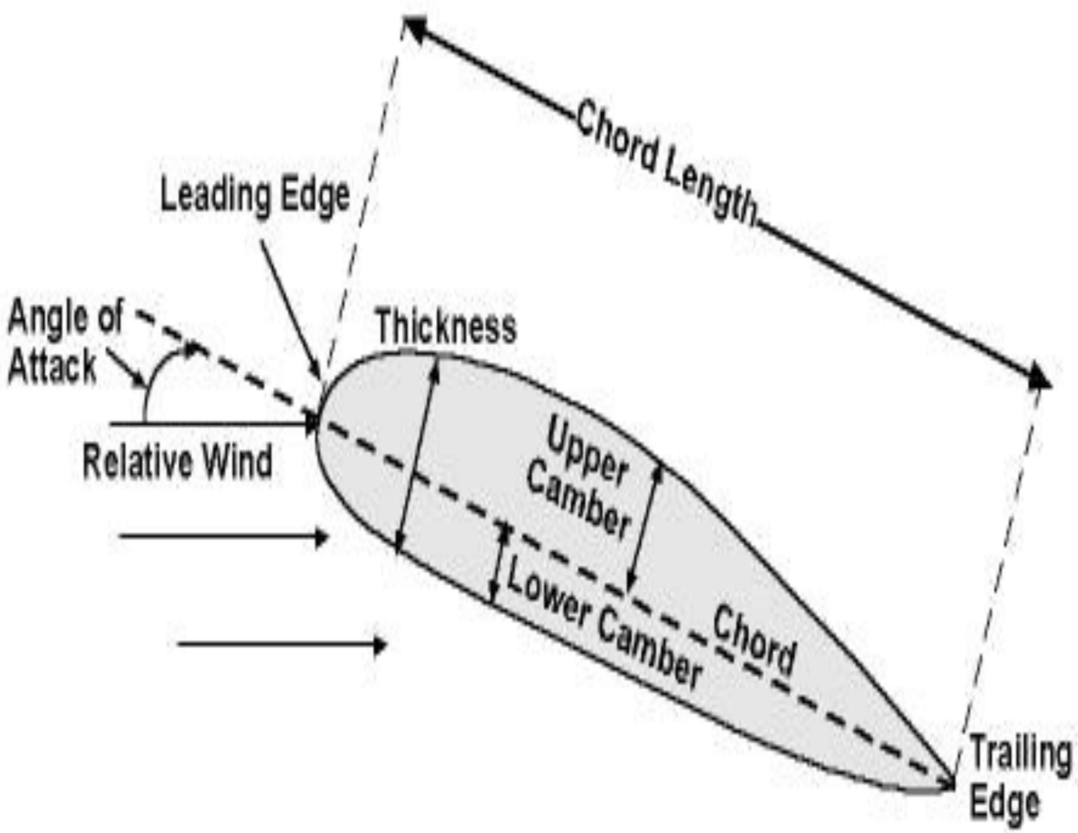


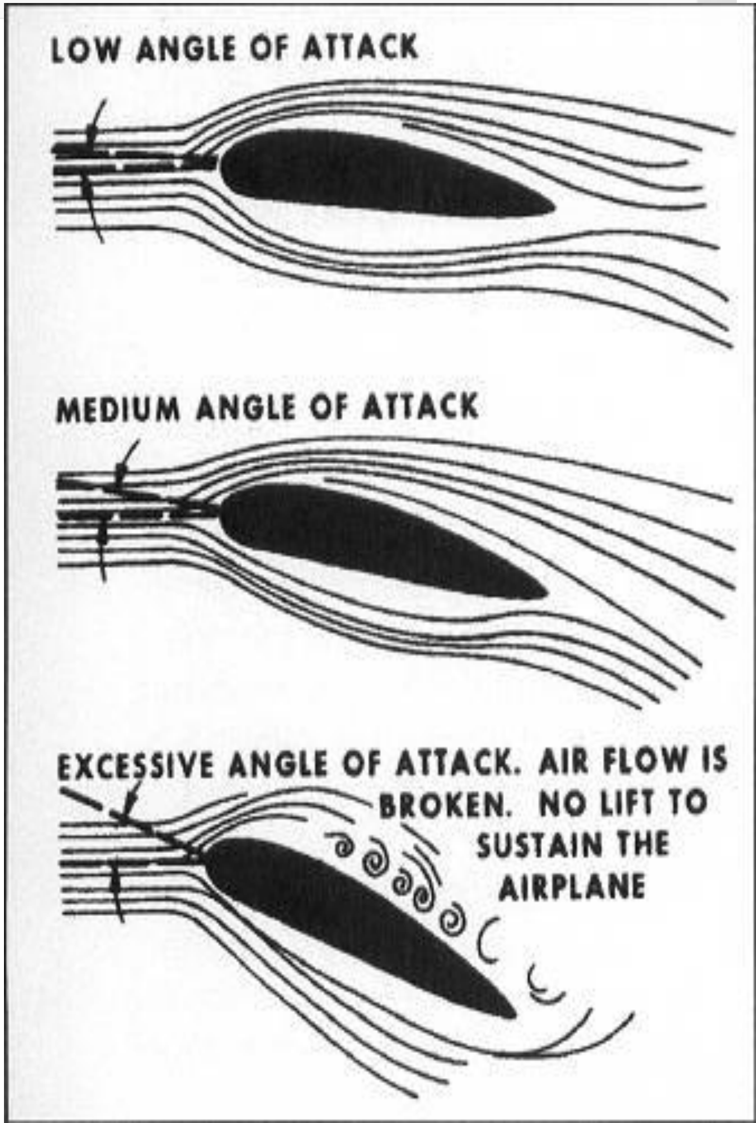
The Object : Shape and Size

The Motion: Velocity and Inclination to Flow

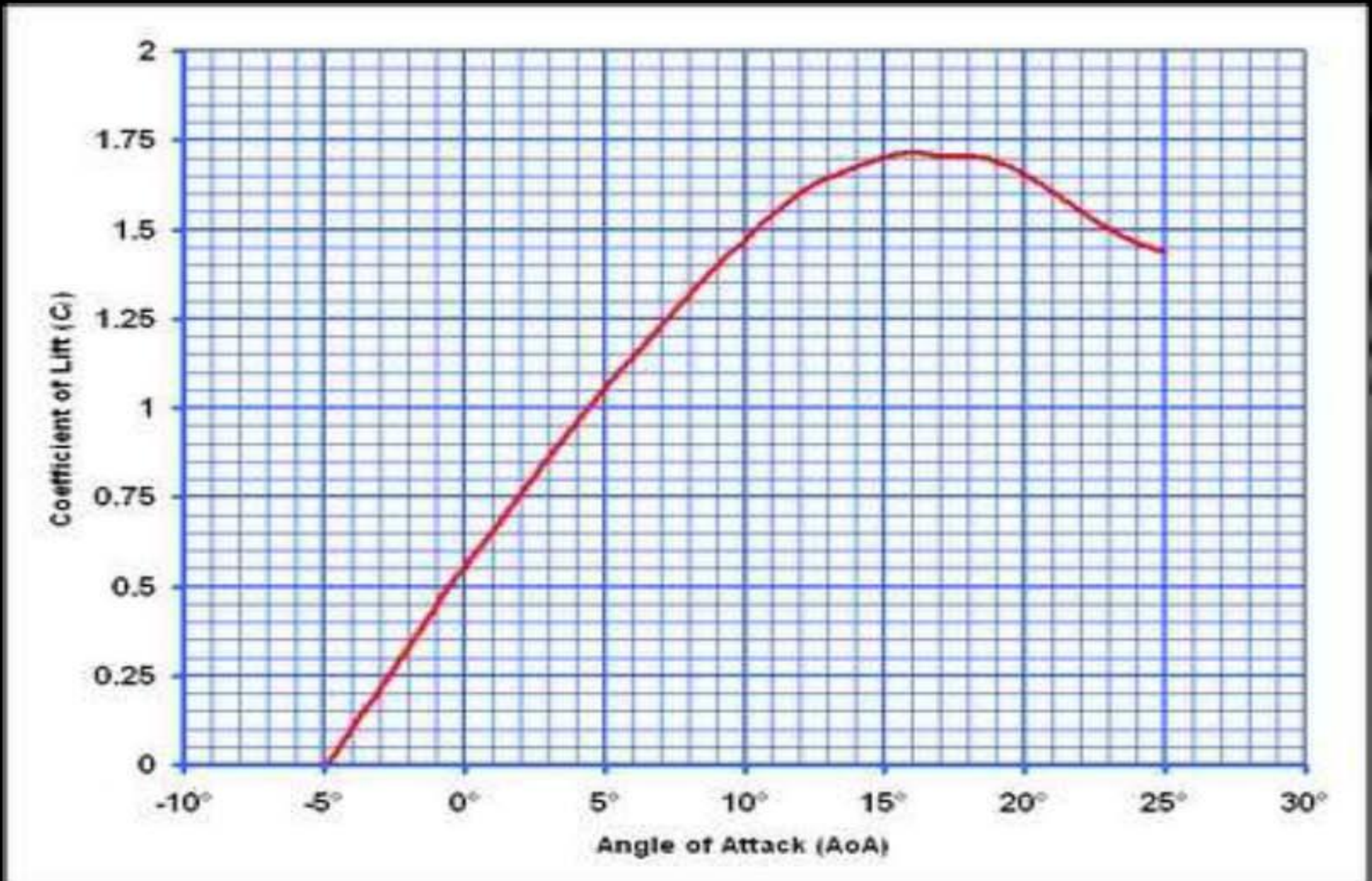
The Air : Mass, Viscosity, Compressibility

ANGLE OF ATTACK



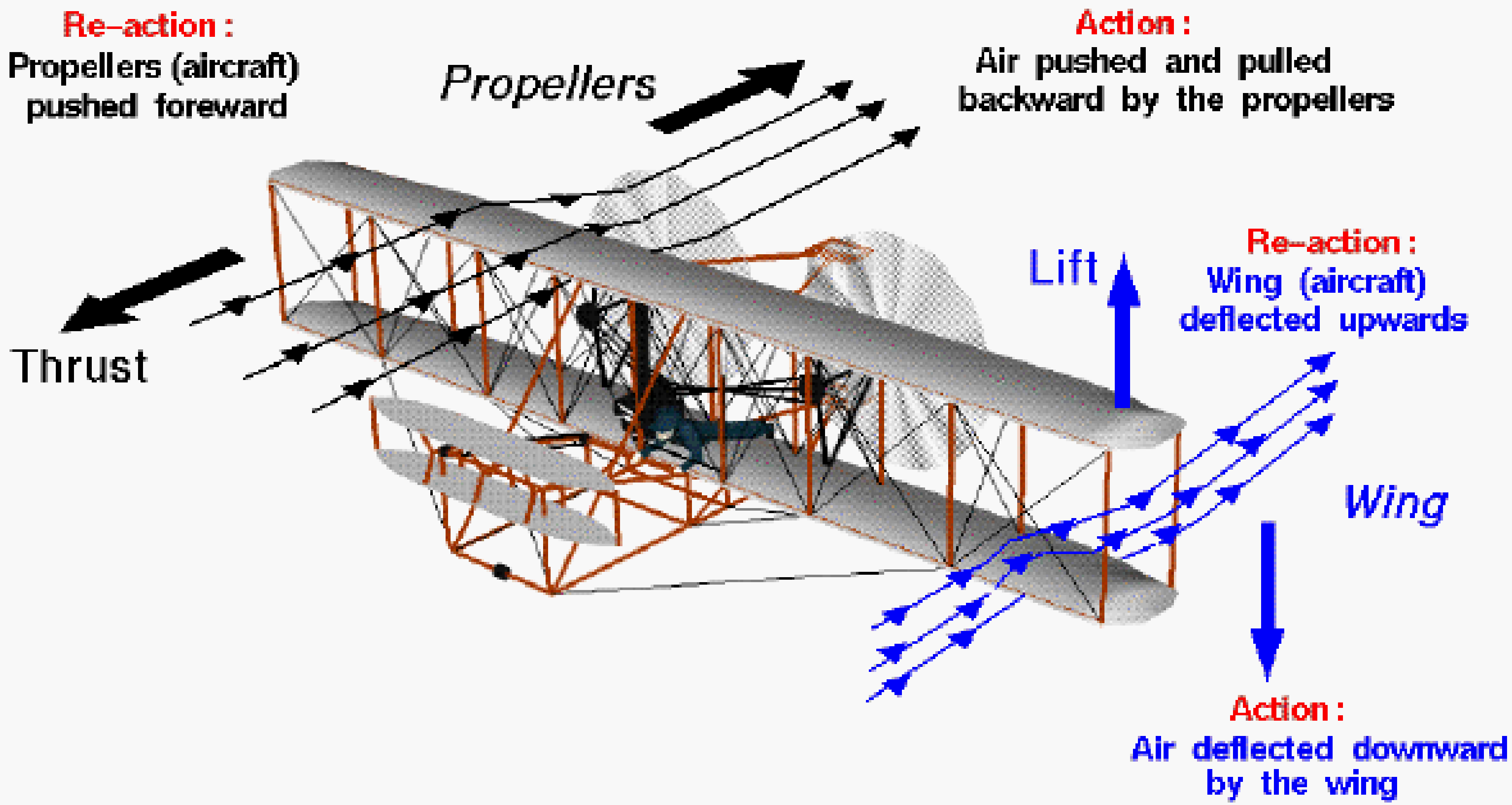


VARIATION OF LIFT COEFFICIENT WITH ANGLE OF ATTACK



Newton's 3rd Law for Aerodynamics

For every action, there is an equal and opposite re-action.



DESIGNING YOUR AEROMODELS

- Decide the loading on your lifting surface, which generally is the wing.
- Conventionally, the loading is taken as 35-45 for a typical RC plane.
- Formula for lift:

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

THE LIFT EQUATION

In the previous equation, symbols used are:

- p = Avg. Density of air at Certain Height (in Kg/m3)
- U = Relative vel. of air (in m/s)
- CL = 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

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** –

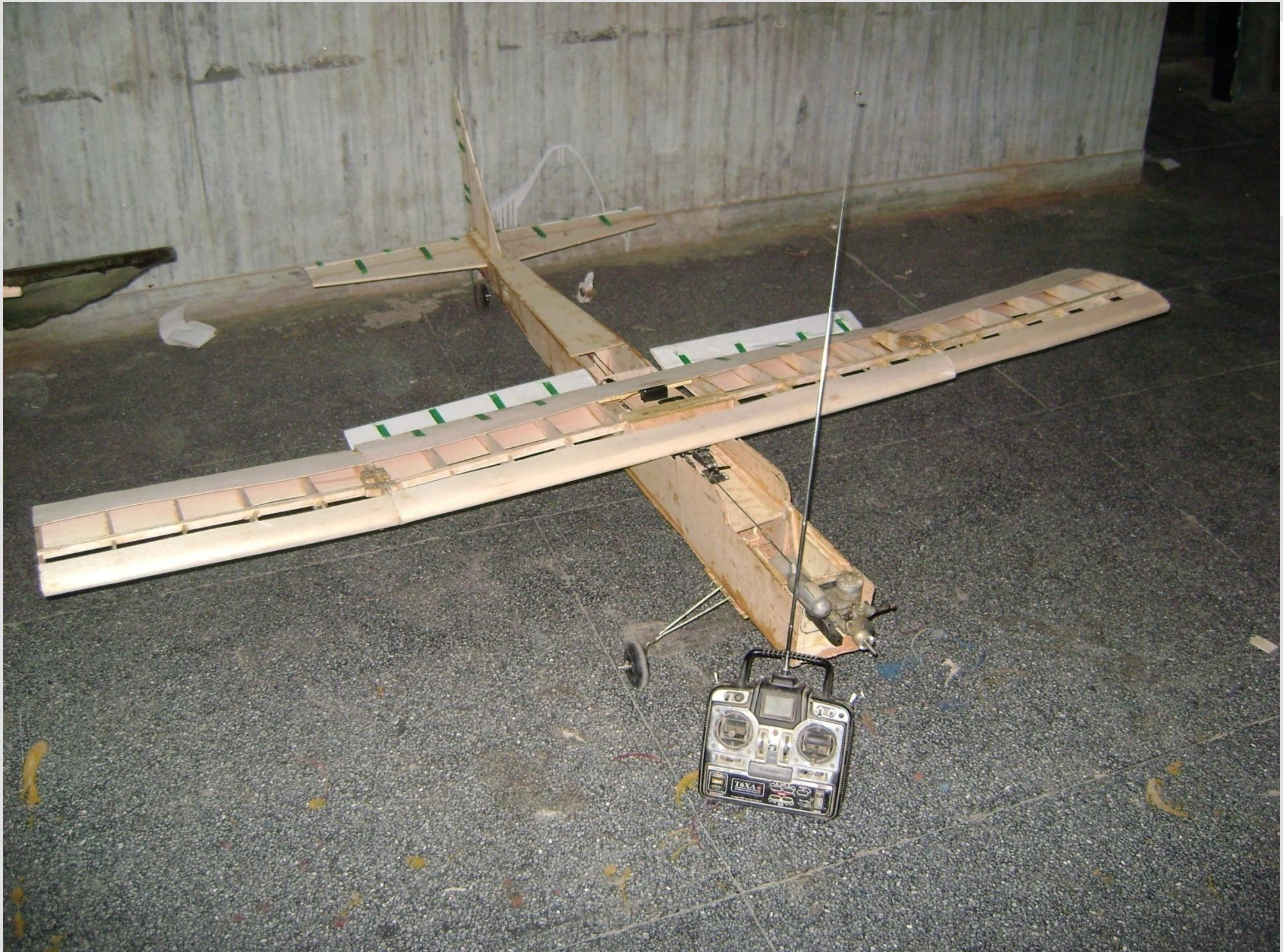
70-75 % of wing span.

- **Horizontal Stabilizer** –

25% of the wing area

- **Vertical stabilizer** –

50% of Horizontal Stabiliser



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Thank You!