# GENERATION OF LIFT

There are several theories used to describe how a lifting force is generated by the action of air in motion past an aerofoil.

Lift is generated in accordance with the fundamental principles of physics, the most relevant being:

* + - **Conservation of Energy**, which says that energy is neither created nor destroyed.
    - **Conservation of Mass**, including the common assumption that the aerofoil's surface is impermeable for the air flowing around.
    - **Conservation of Momentum**, which is a direct consequence of Newton's laws of motion, especially Newton's second law which relates the net force on an element of air to its rate of momentum change.

# Conservation of Energy

The term energy may be defined as the capacity for doing work. The law of conservation of energy suggests that unless extra energy is introduced into a system the overall energy content must remain unchanged.

# Conservation of Mass (The Continuity Equation)

This is a simple algebraic equation that relates the values of density, velocity and area at one section of a stream tube to the same quantities at any other section. Since mass can be neither created nor destroyed, we have mass in = mass out.

For steady fluid flow this can be expressed as:

**ρ1 A1V1 = ρ2A2V2**

As flow is virtually incompressible at low speeds then ρ1 = ρ2. The equation now reads A1V1 = A2V2

If A2 is less than A1, then the velocity of the fluid must increase for the equation to be valid. (Similar to the egg timer principle, where sand travels through the throat of the timer quicker)

This is valid for aerodynamics up to about ⅓rd the speed of sound.