



A E R O D Y N A M I C S

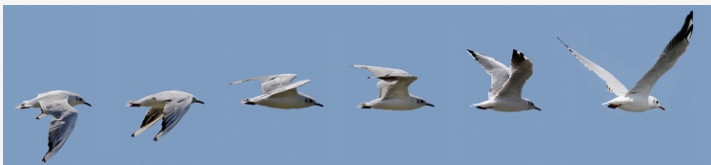
S T E M

Aerodynamics is the branch of physics that deals with the dynamics of air as it interacts with solid objects, such as aircraft wings. Anything that flies, such as aeroplanes, helicopters, and birds, utilise the principles of aerodynamics to move through the air.



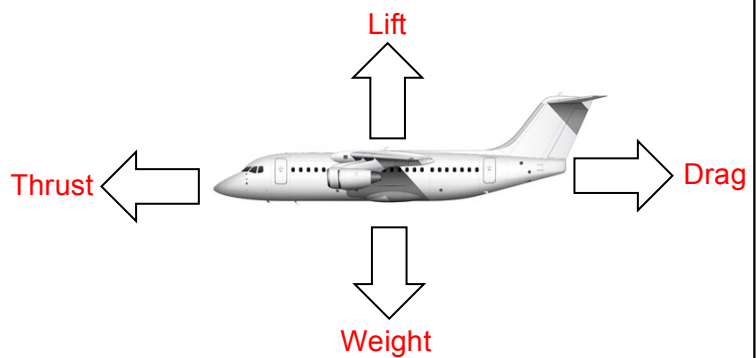
Aircraft are able to fly because of two key effects. The first effect is the "push" given by the engines which propel the aircraft through the air. The second effect is the movement of air over the wings which creates the lifting force required to keep it up in the air. In simple terms, the wings of an aircraft generate **lift** force and the engine creates the **thrust** to propel the aircraft through the air.

For birds and other flying animals, the flapping motion of their wings creates both lift and thrust.



If the wings of an aircraft could flap they would also propel it through the air and maintain lift, and so an engine wouldn't be needed. It would be an extreme engineering challenge to design an aircraft with flapping wings, which is why aircraft are designed to keep the source of lift (the wings) and thrust (the engine) separate.

To gain an understanding of the **aerodynamic forces** necessary for flight, consider the image below showing an aircraft flying through the air.

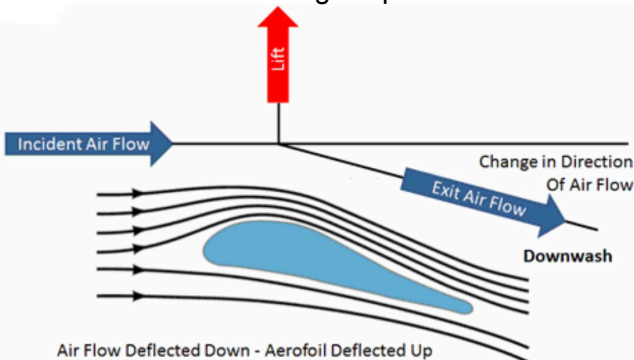


If the aircraft is moving at constant velocity with no acceleration, the forces shown in the image must balance.

This means that the lift force (L) generated by the aircraft wings must equal the aircraft weight (W) due to gravity. Similarly, the thrust force (T) generated by the aircraft engines must equal the drag force (D) caused by air resistance.

Text source: <https://www.pearl-world-physics-problems.com/aerodynamics-for-kids.html>

Wings are also called **aerofoils** and their shape generates **lift**. The lift on an aerofoil is primarily the result of its angle of attack and shape. When oriented at a suitable angle, the aerofoil deflects the oncoming air resulting in a force in the direction opposite to the deflection. This force is known as aerodynamic force and can be resolved into two components: lift and drag. This "turning" of the air around the aerofoil results in lower pressure on one side and higher pressure on the other.



People are just not aerodynamic creatures. Nothing in the shape of a human creates lift when we're moved through the air. This means that the Gravity Jet Suit has to create all the lift with pure thrust.

However, Gravity are currently developing a Jet Suit with deployable wings...

