



S&I Article

How Airplanes Stay Up in the Sky

The Mystery of Flying Machines

Have you ever looked up at the sky and wondered, how does such a heavy airplane stay in the air?

An aircraft like a passenger plane can weigh **hundreds of tons**, yet it flies smoothly across continents. Many people think airplanes fly just because of powerful engines. But here's the truth:

Engines help move the airplane forward but they don't keep it up.

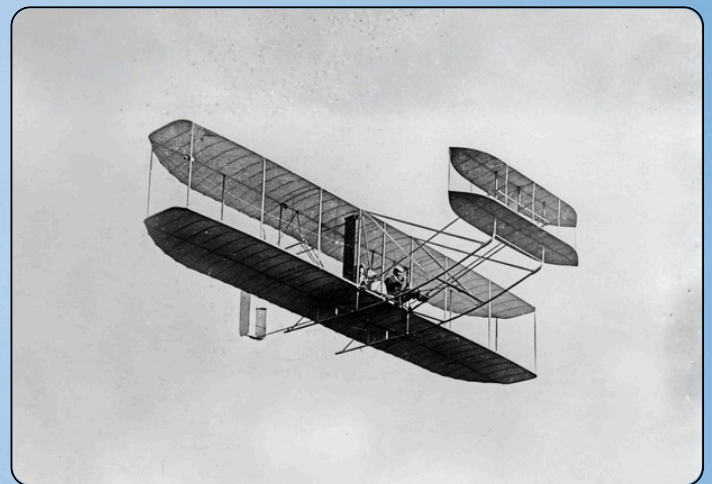
The real reason airplanes fly lies in fascinating scientific principles involving **air pressure, motion, and airflow**. In this article, we will explore two important ideas:

- Bernoulli's Principle
- Coanda Effect

History of Flight

The dream of flying is as old as humanity. Early inventors tried to mimic birds, but success came only when science was properly understood.

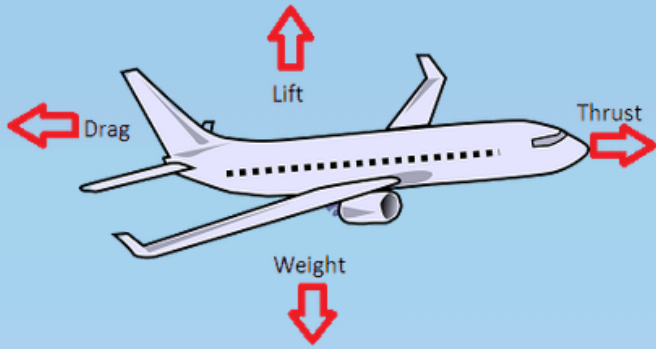
In 1903, the Wright Brothers achieved the first powered flight. Over time, aircraft became faster, safer and more efficient.



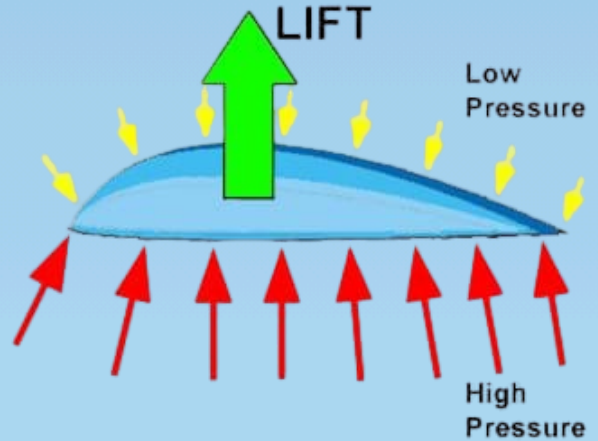
The Four Forces of Flight

Before diving deeper, let's understand the **four main forces** acting on an airplane:

1. **Lift** - Upward force
2. **Weight** - Downward force (gravity)
3. **Thrust** - Forward force (from engines)
4. **Drag** - Air resistance



How it works on a wing



For an airplane to fly:

Lift must be greater than Weight

So the big question is how is lift generated?

Meet the Wing: The Real Hero

The shape of an airplane wing is called an **airfoil**.

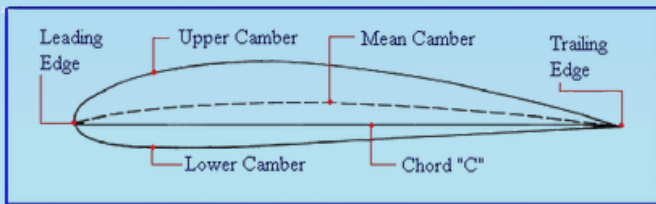


Figure 3-1 Cross section of an airfoil

Features:

- Curved top surface
- Flatter bottom surface
- Tilted slightly upward (angle of attack)

This design helps manipulate airflow and create lift.

DIY: Creative Thinking

Design your own aircraft:

- Draw a wing
- Explain how it creates lift
- Suggest one innovation

Bernoulli's Principle: Faster Air, Lower Pressure

This is **Bernoulli's Principle**, which says:

When the speed of a fluid (like air) increases, its pressure decreases.

- Air moves **faster over the curved top** of the wing
- Air moves **more slowly under the wing**
- Faster air → lower pressure
- Slower air → higher pressure

This pressure difference creates **lift**

DIY Activity: Paper Strip Lift Test (Bernoulli in Action)

Materials:

- A strip of paper

Steps:

1. Hold the paper under your lips
2. Blow air over the top

Observation:

The paper rises!

Why?

Fast air above → low pressure → lift

Coanda Effect: Air Likes to Stick

The Coandă Effect explains:

Fluids (like air) tend to follow curved surfaces.

On an airplane wing:

- Air sticks to the curved upper surface
- It bends downward as it flows
- This creates a downward deflection of air

According to Newton's Third Law:

If air is pushed down, the wing is pushed up.
This also contributes to lift!

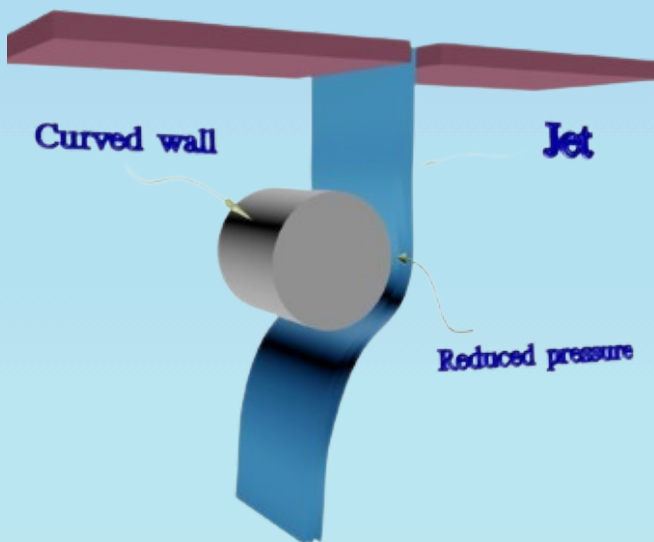
DIY Activity: Spoon & Water Experiment (Coandă Effect)

Materials:

- Spoon
- Running tap water

Steps:

1. Hold the spoon near a thin stream of water
2. Observe how water bends and sticks



Observation:

Water follows the curved surface

Conclusion:

This is similar to how air flows over wings!

Bernoulli vs. Coanda: Which is Correct?

The truth is:

Both are correct, and both work together

Concept	Explanation
Bernoulli's Principle	Pressure difference creates lift
Coanda Effect	Airflow bending creates lift

Modern science combines:

- Bernoulli's Principle
- Coandă Effect
- Newton's Laws of Motion

Flight is not due to one idea but a combination of many.

The Future of Flight

Future innovations include:

- Electric aircraft
- Solar planes
- Flying taxis

India is moving towards sustainable aviation.

Project idea for Students: Build a Simple Glider

Materials:

- Thermocol / cardboard
- Glue
- Small weights

Task:

- Design and test your glider
- Record flight distance

Conclusion:

From Curiosity to Innovation. Airplanes stay up not because of engines but because of science. Bernoulli's Principle explains pressure. The Coandă Effect explains airflow. Together, they create lift