



# Aerodynamics

The fundamental forces of flight

# Introduction

Aerodynamics is the way air moves around things. The rules of aerodynamics explain how an airplane is able to fly. Anything that moves through air reacts to aerodynamics.

What if you threw a Paper Airplane or you saw a kite gliding through the sky. They both react to Aerodynamics.

# The Principles of Aerodynamics

The four forces are lift, thrust, drag, and weight. All of these are required to have a successful flight.

If you've flown on a Plane before, you might have noticed that at the tip of the Wings, the tip is curved up. Those are called Wingtips. Some planes also have different kind of Wingtips too.

The purpose of these curved wingtips is to prevent high air pressure above the airplane from flowing over and under the wings. As the high air pressure pushes across the wings, it encounters the curved wingtips where it's blocked. [2nd Resource](#)

# Different kinds of Drag

2nd Resource

There are 3 different kinds of Drag. The first one is... Interference Drag. Interference Drag is the drag on an aircraft caused by the interaction of two aerodynamic bodies. Formula --> Larger Angle = Less Drag, Smaller Angle = More Drag. Is Interference Drag good? No.

Next is Form Drag. Form Drag is the turbulence created as the air tries to flow around the Aircraft. What causes Form Drag is sometimes when the Plane is flying in harsh Weather the air pressure creates turbulence (Rough Air Currents). Other items like antennas, landing gear, etc will create Form Drag. Thinner and more streamlined designs will have less Drag.

Now we are moving on to Skin Friction Drag is caused by the rough imperfections of an Airplane's surface. A good example is the rivets located on the Airplane's skin. These bumps disrupt the Airflow from flowing smoothly.

# Key Important parts of a Plane **Part 1**

**Fuselage:** The fuselage is one of the major aircraft components with its long hollow tube that's also known as the body of the airplane, which holds the passengers along with cargo. This area includes the cockpit, so the pilots are in the front of the fuselage. Even though there are different types of fuselages, they all connect the major parts of an airplane together.

**Empennage:** The empennage is the tail end of the aircraft. It helps with the stability of the plane and has two main components called the rudder and the elevator. The rudder helps the aircraft steer from right to left, and the elevator helps with the up and down movement.

**Power Plant:** The power plant of an airplane structure includes the engine and the propeller. The engine itself is a complicated system comprised of many smaller parts like cylinders, fans, and pistons. Together, these aircraft engine parts work to generate the power or thrust of an aircraft. **1st Resource**

# Key Important parts of a Plane Part 2

Landing Gear: You cannot have a safe plane without having the landing gear. Not only are these parts imperative in order to land, but the landing gear is also used to help an aircraft take-off and taxi. The landing gear includes shock absorbers for a smooth landing and takeoff as well as the wheels on the plane.

- 1st Resource (See references Slide for resources.)

# Main Part (Wing Shape)

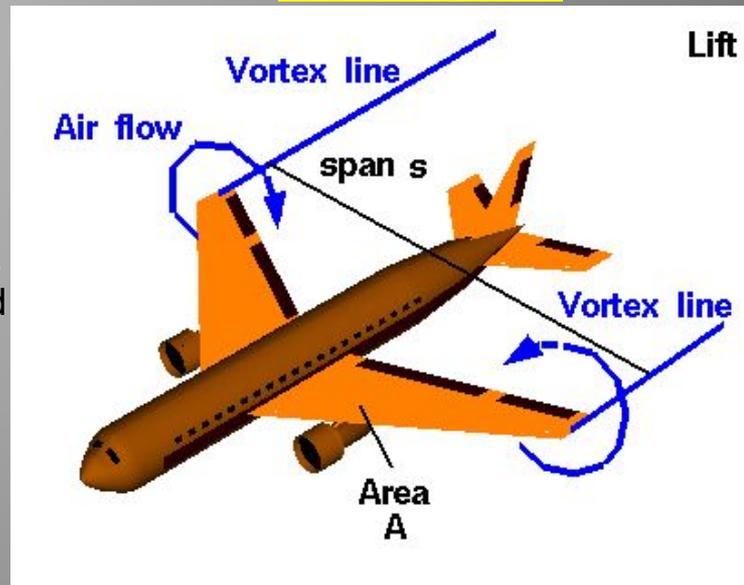
This is the Main Part of my Project. I would like to talk about different Wing shapes which help the Plane fly in different ways!

First things first. Different Planes might have different Wing Shapes including the Wingtip also known as a Winglet. Both Wingtip and Wing have a crucial part in Flight.



~These are the different types of Wingtips/Winglets a Plane could have

This is what happens when Plane doesn't have Wingtip. The Air flow jumps back and reduces Lift. ----->



# Different Properties

Wing Shapes sometimes also depend on the Plane. **EX:** A more streamlined design will have a different kind of Winglet like the Raked. A Boeing 737 will have a Blended Winglet.

A Raked tip might look like it is for smaller Planes, actually some Boeing's and other Big Planes use them too.

You might have noticed if you've seen a Plane before that at the front of the Plane its wide and the Shape of the Wing is going back a bit.

An airplane's wing has a very special shape called an airfoil. It looks a bit like a teardrop, curved on top and flat on the bottom. The curved top forces the air above to move faster, and, according to Bernoulli's principle, fast air has lower pressure. The higher pressure below the wing pushes the wing up, lifting the plane into the sky!

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