Airplane Design
Wondered How a Planes Flies?

All about LIFT!

LIFT = a mechanical force generated by a solid object as it moves perpendicularly through a fluid (e.g. an airplane through air)
Conservation of Mass & Bernoulli Principle

Fluids will always get from point “A” to point “B” in the same amount of time.

The speed of the fluid changes the pressure. Lower pressure causes faster air movement.

Bernoulli's Principle?

High Velocity / Low Pressure

Wing

Low Velocity / High Pressure

B
Three Keys to Flying

Air current splits. Part of air current travels on top of wing, part of air current travels under wing. Both air current sections will get to end of wing at same time.

Top of wing is longer distance for air current to travel across. The air must move faster than section of air under wing to get to end of wing at same time.

The faster air traveling above the wing has lower pressure than the slower air moving beneath wing. The greater pressure under the wing...
The explanation of lift is simplified and very basic. There are many forces acting on the airplane’s wing. There are additional concepts to consider:

- The air flowing off the end of the wing travels forward.
- The air stream does not meet again perfectly off of the wing.
- Complicated Fluids Dynamics...many people spend their entire career studying the air flow movement around airplane wings.
can be?!
Flight Innovators

QuickTime™ and a Animation decompressor are needed to see this picture.
Wing Designs

Wright Brothers studied at several different cross sections of wing designs to determine the best design.

Wright Brothers tested the effectiveness of their wing designs in their own wind tunnel.
You get to follow in the footsteps of the Wright Brothers!!!

You'll design your own plane & test it in a wind tunnel. Here are a couple tips to help you with your airplane design:
Wing Cross Sections

- Good Stall Characteristics - Very Safe
- Good Stability. Good for Personal Aircraft and Training Planes.
- Good For Transport, Freighters and Bomber Planes.
- Good For Racing aircraft, Fighters and Interceptors Planes.
- Good Stability. Good for Personal Aircraft and Training Planes.
- Good For Transport, Freighters and Bomber Planes.

Designing a wing shape effects an airplane’s take off. Designers should also pick a wing shape that enhances the plane’s overall design.
Angle of attack refers to the angle of the wing when wings are not parallel to the ground. A shallow angle of attack may increase lift forces.
The body of an airplane is aerodynamic (skinny and long) to limit drag forces.

The tail of the airplane keeps the plane upright. The plane would not tip forward or backward at a severe angle.