

Principles of Flight

One of the most innovative and imaginative inventions has been in the area of flight. People have been dreaming of flying for years. Even great inventors, like Leonardo DaVinci, thought people should be able to fly like birds. Flight was first developed to overcome passions and dreams, only later was it utilized for transportation. Each human journey into the sky involved Technology! (designing, building and using a device to extend the human potential)

Aircraft Categories

- ◆ **Lighter - than - air aircraft**
- ◆ **Who can give me an example of an aircraft that is lighter - than - air?**

Hot Air Balloons

Lighter - than - air

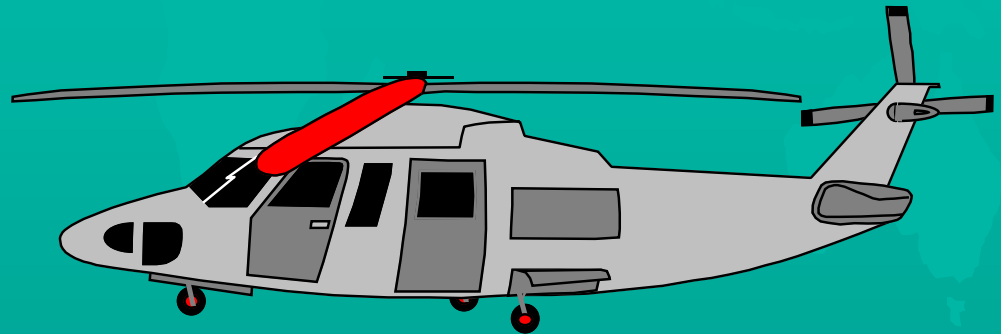
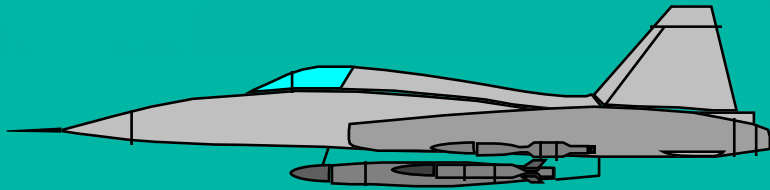


Aircraft Categories

- ◆ Heavier - than - air aircraft
- ◆ Who can give me an example of an aircraft that is heavier - than - air?

Jets and Helicopters

Heavier - than - air



First Aircraft

Does anyone know what the first really successful aircraft was in 1783?

The first really successful aircraft of any kind was a hot air balloon designed by the French in 1783. They weren't even really sure how the balloon went up, but it did.

Have you ever heard of the Hindenberg?

What was it?

How did it work?

What happened to it?

Blimps

**Today we use blimps instead of dirigibles.
Blimps use helium gas, which is much
safer than hydrogen.**

Have you ever seen a blimp?

What do they look like?

What are they used for?

First Flight

Do you know who made the first controlled flight in 1903?

The Wright brothers (Orville and Wilbur)

The Wright brothers experimented with gliders and even built a wind tunnel to help them develop ways of controlling airplanes in flight. In other words they had to know about the forces acting against the plane in order to overcome them.

Flying Forces

All airplanes must overcome four forces acting against them in order to fly. It's like a four-way tug of war with the plane stuck in the middle.

Can you name the four forces acting on a plane as it flies?

Flying Forces

◆ Drag

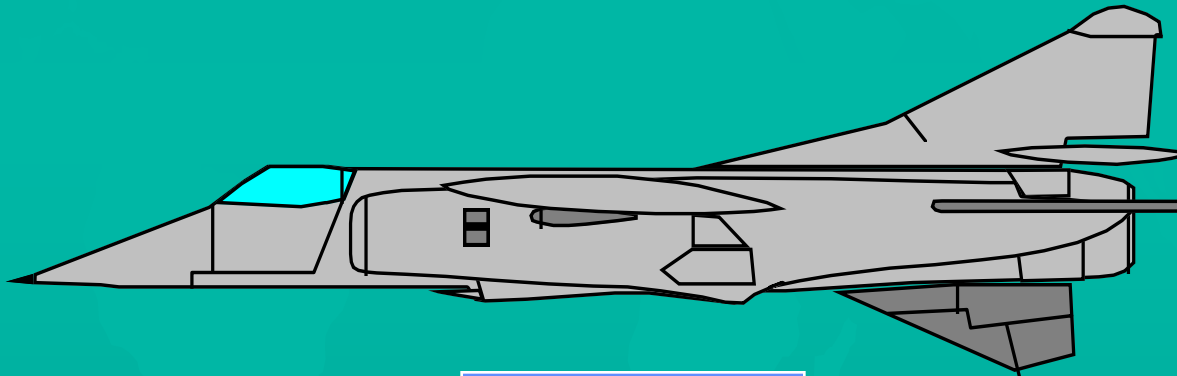
◆ Lift

◆ Thrust

◆ Weight

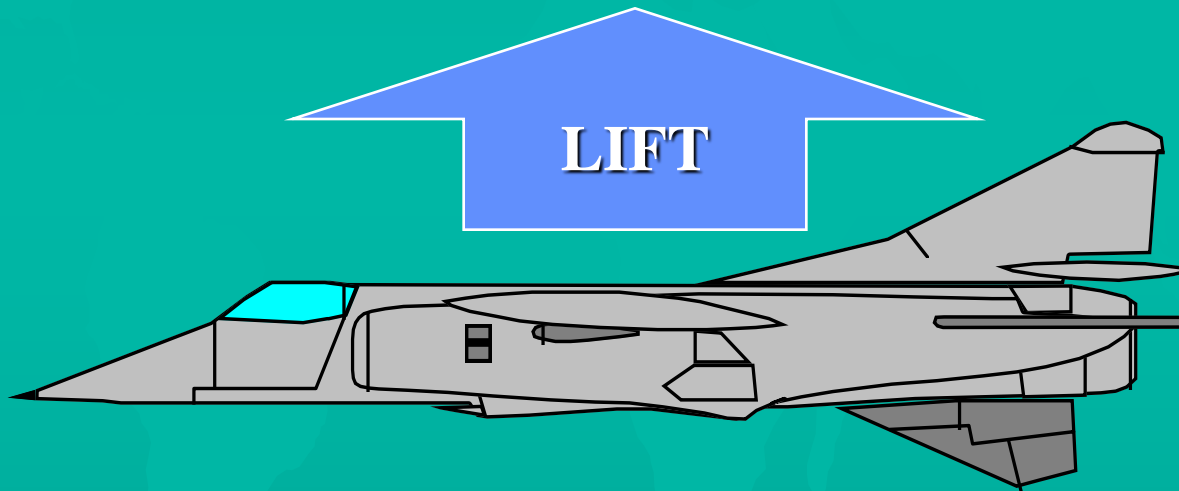
WEIGHT

The gravitational pull on the plane



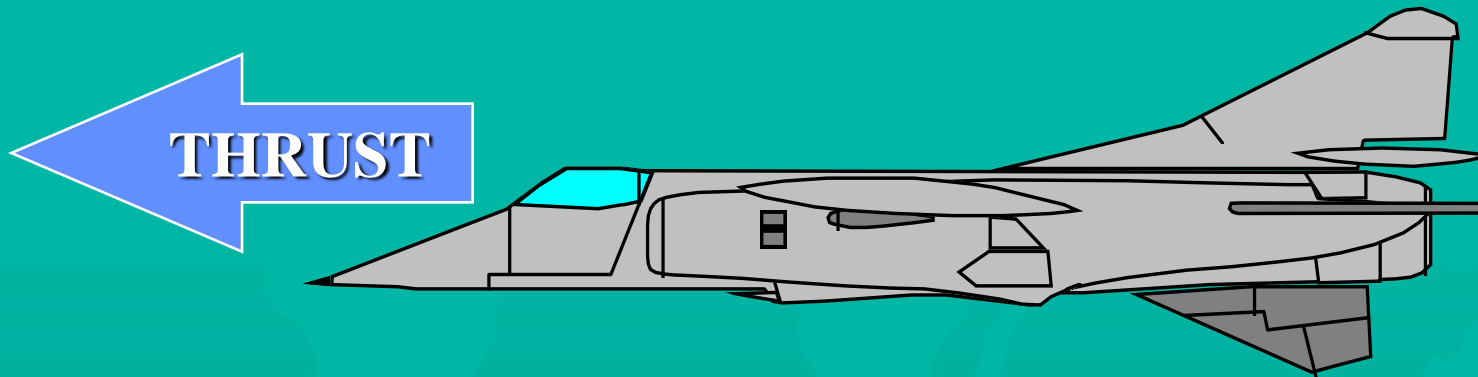
LIFT

Upward force that wings causes



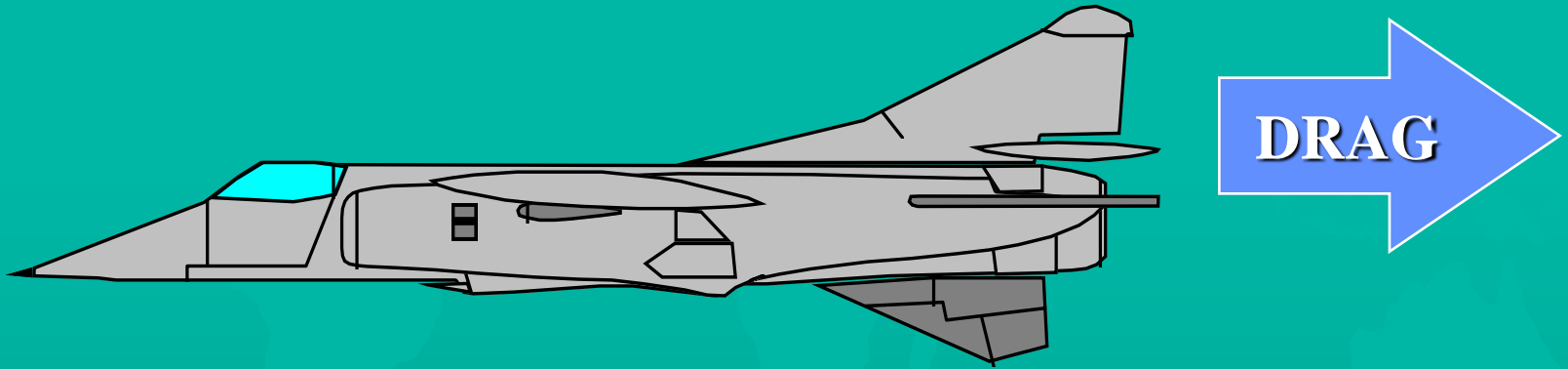
THRUST

Forward motion by engines or jets

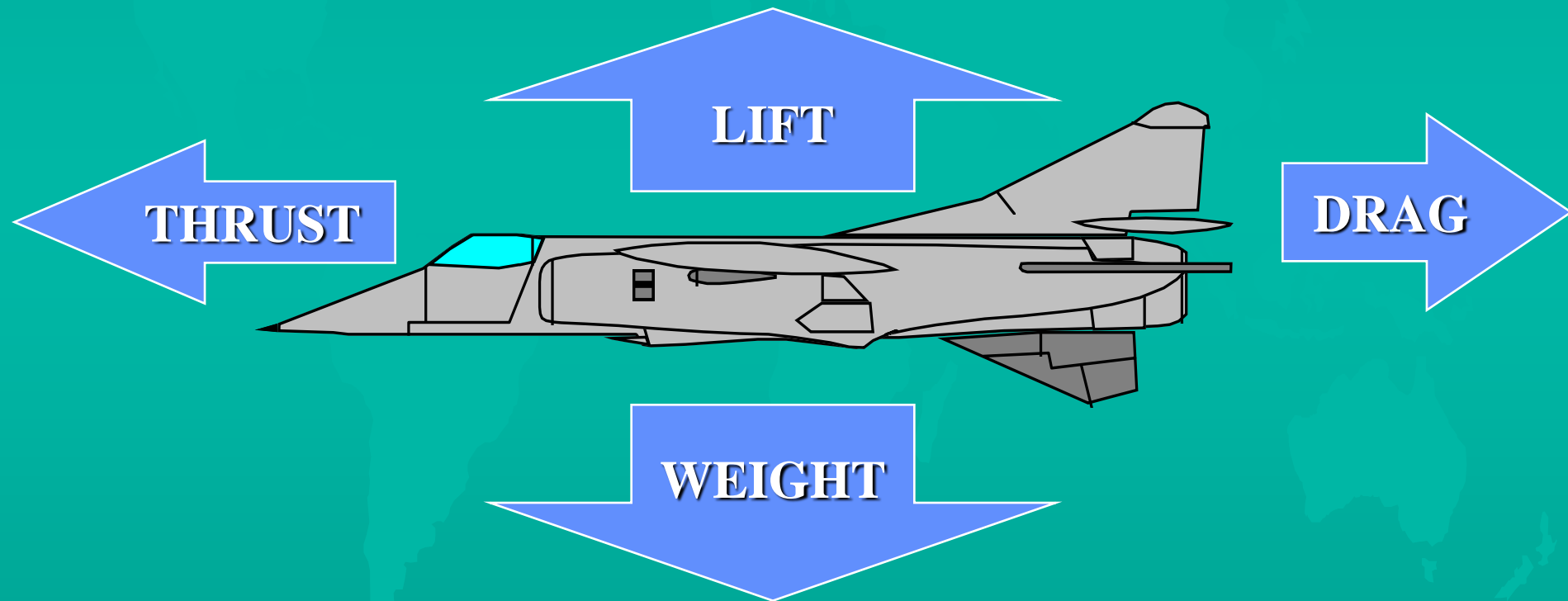


DRAG

Air friction on the plane



Flying Forces on an Airplane



Bernoulli's Principle

A Swiss scientist, named Daniel Bernoulli, discovered that when air speeds up its pressure is decreased and when air slows down its pressure is increased. Therefore the air that speeds up over the top of a wing creates a slight suction, which pulls upward on the wing. At the same time, the air flowing below the wing slows down and bunches up, causing an upward force on the wing. Lift is a combination of these two forces.

Bernoulli's Principle

LIFT

Air spreads out
causing low pressure

**Air at
rest**

wing

Air bunches up
causing high pressure