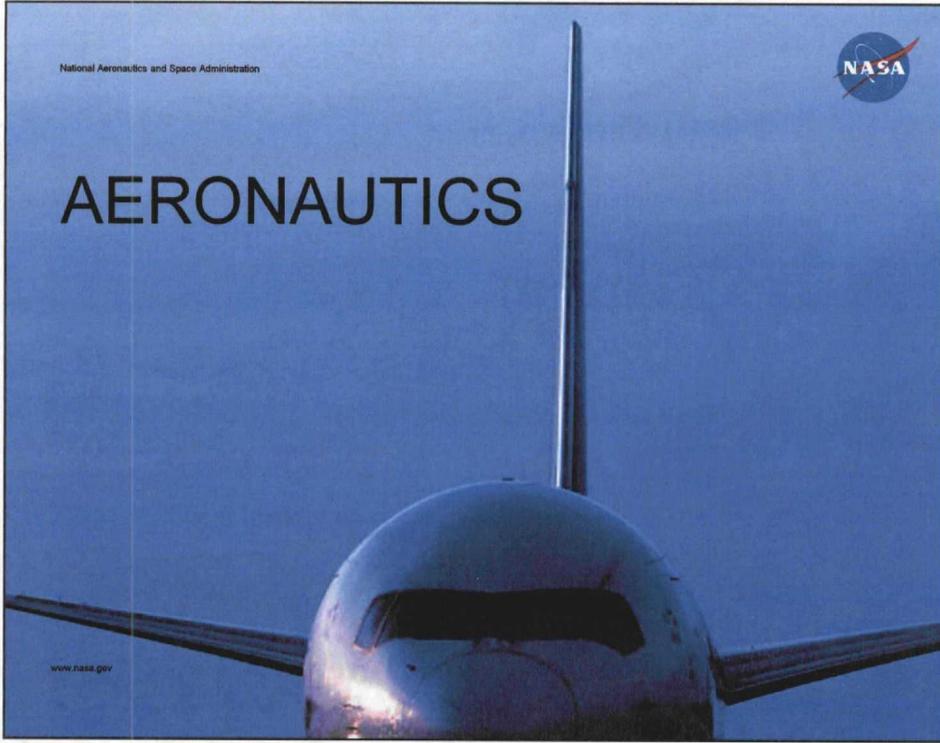


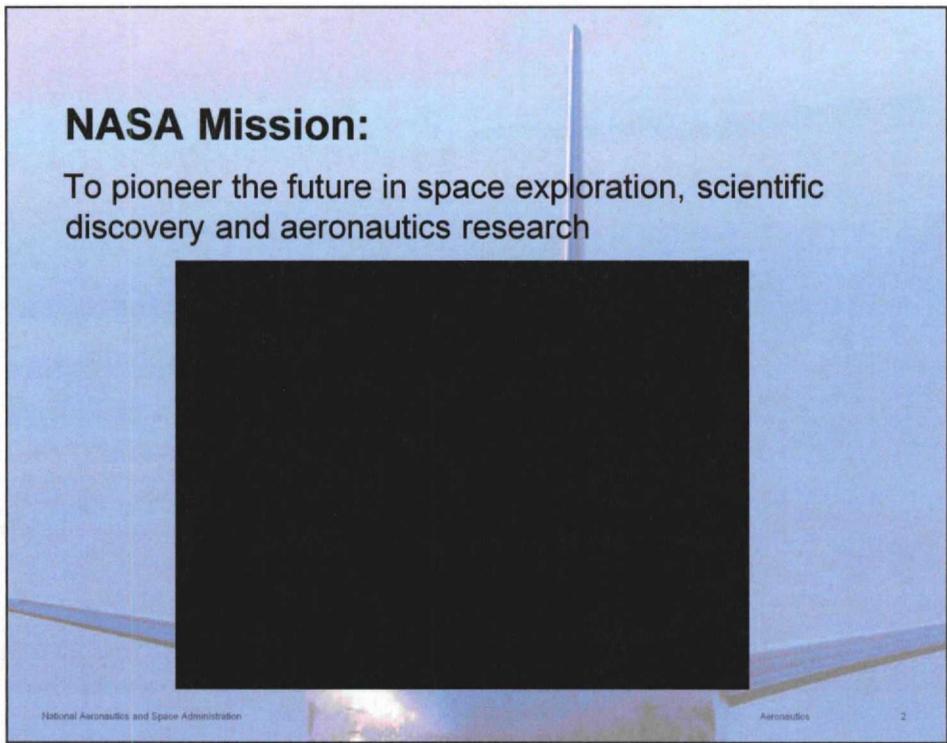
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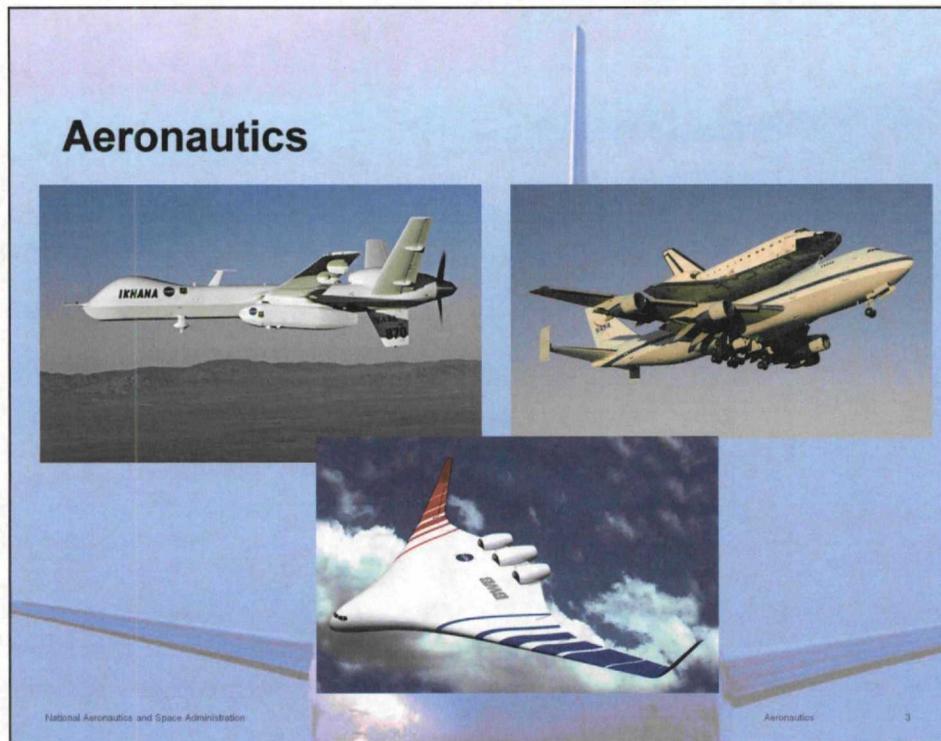
# AERONAUTICS

[www.nasa.gov](http://www.nasa.gov)





NASA's mission and focus. Feel free to discuss your job at NASA and how this mission statement relates to what you do.

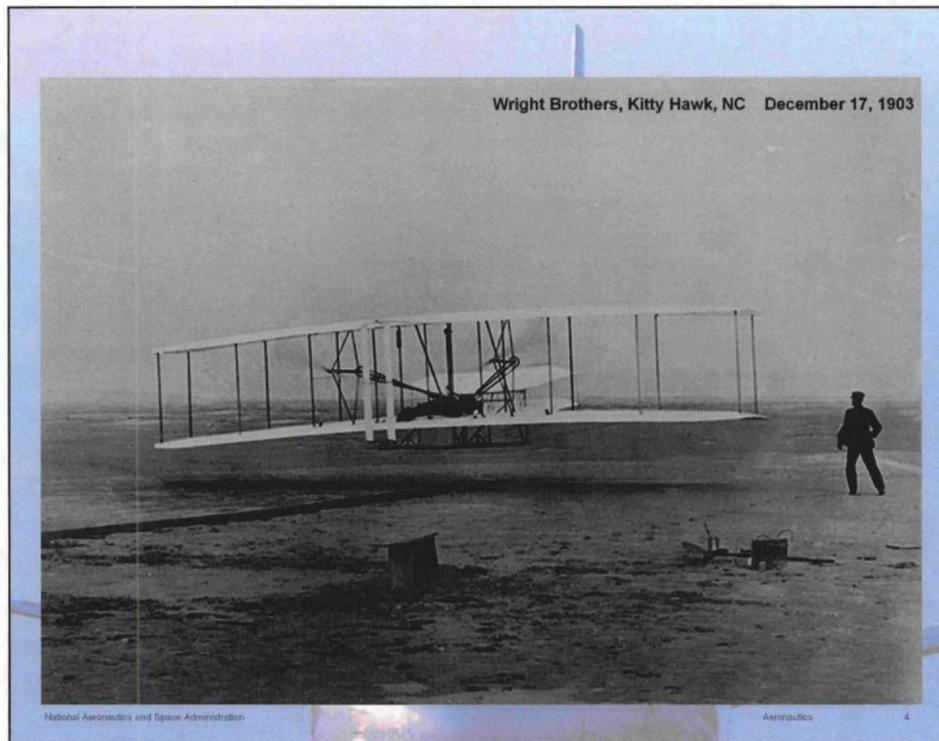


Engage the students by asking questions such as;  
 Does anyone know what NASA stands for?  
 What is Aeronautics?  
 The science of flight that deals with all types of aircraft.

Displayed images from top left clockwise:

A **UAV**, or Unmanned Aerial Vehicle, flies without a human crew on board the aircraft. UAVs have a variety of uses such as, scientific research, search and rescue missions, or use in the military for gathering information and/or attacking. The image here was taken in 2007. With its sensor pod under its left wing, NASA's remotely piloted Ikhana unmanned aircraft cruises over California during the Western States Fire Mission. The flight was part of the Western States Fire Mission being conducted by NASA and the U.S. Forest Service, which is demonstrating improved wildfire imaging and mapping capabilities of a sophisticated thermal-infrared imaging sensor and real-time data communications equipment developed at NASA's Ames Research Center.

**Space Shuttle Endeavour** – on its way back to the Kennedy Space Center in Florida. Mounted atop its modified Boeing 747 carrier aircraft, Endeavour was carried aloft on the first leg of its trip back to Kennedy early Wednesday morning, Dec. 10, 2008 from Edwards Air Force Base in the high desert of Southern California.



It is important to mention who flew the worlds first successful airplane.

A: Orville and Wilbur Wright, it flew 120ft in 12 seconds!

You can do this by asking them if they know, or by simple discussion.

Other important dates (if you want to discuss History of Flight further)

400 BC - China Discovery of the kite that could fly

1485 - Leonardo da Vinci – More than 100 drawings illustrated his theories on flight

1783 - First Hot Air Balloon

1799 - Discovery of gliders

1891 - Samuel P. Langley invents first steam-powered engine



Ask students if they can name a few components then show them the pictures to see how many they got right.

The **fuselage**, or body of the airplane, is a long hollow tube which holds all the pieces of an airplane together. The fuselage is hollow to reduce weight. As with most other parts of the airplane, the shape of the fuselage is normally determined by the mission of the aircraft.

The **flaps** slide back and down to increase the surface of the wing area. They also tilt down to increase the curve of the wing.

Can they figure out what's missing? (It's on the next slide)

## Aircraft Components



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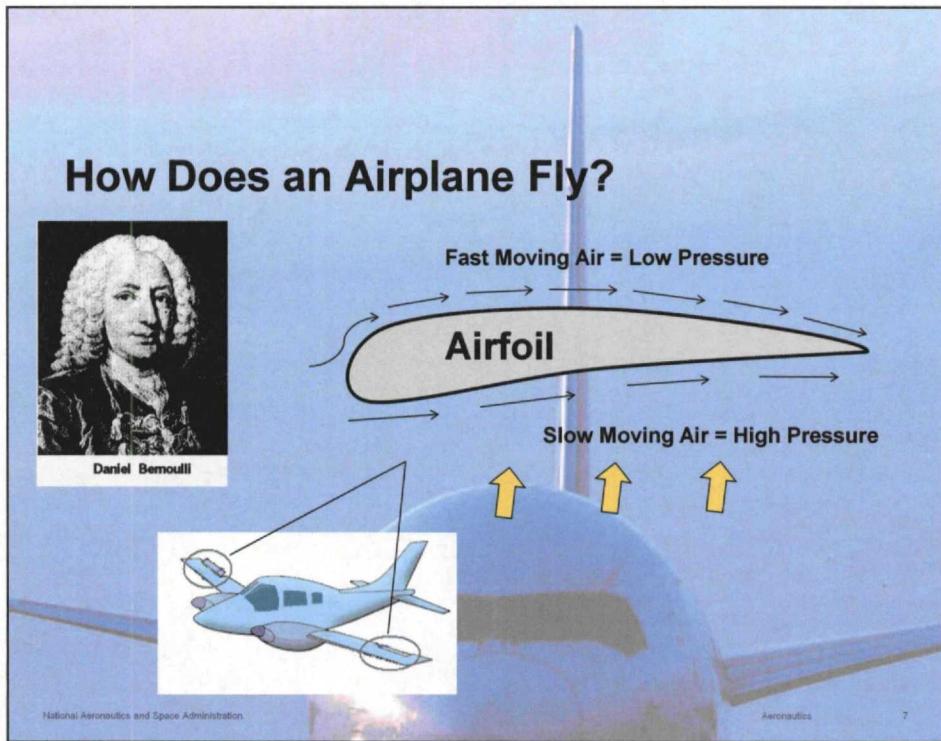
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Most landing gear can be folded into the fuselage during the flight and opened for landing.

Brakes for the wheels are like the brakes for cars.

Top Image: U.S. Navy F/A-18E Super Hornet

Bottom Image: U.S. Air Force F-102 Delta Dagger

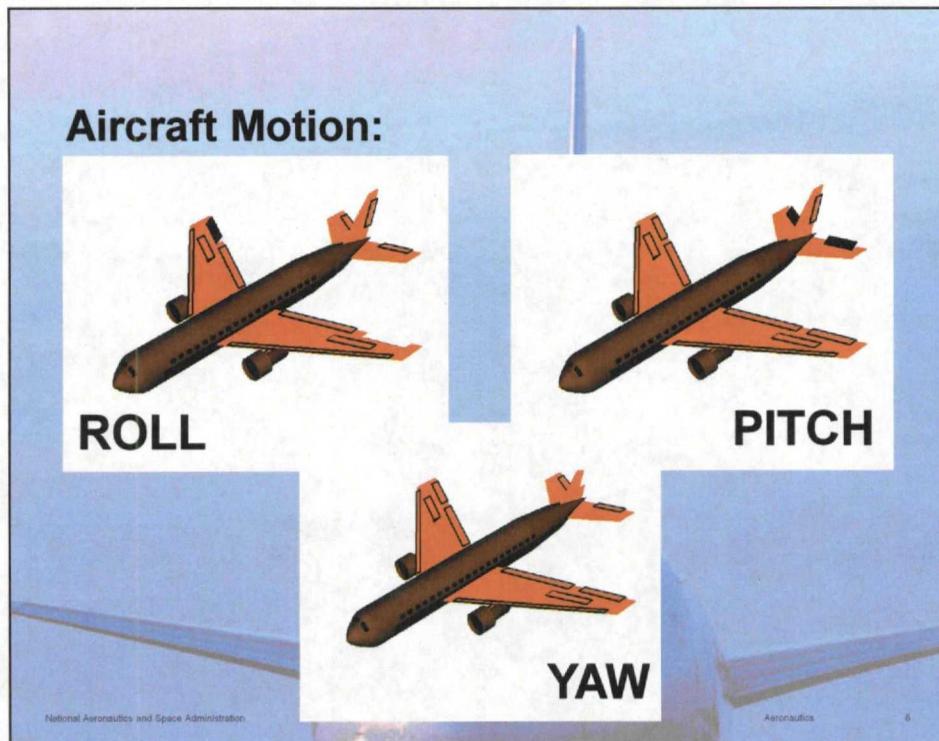


Displayed is the cross-section of a wing, or **airfoil**, with the leading edge to the left.

The airfoil's shape forces air to move over and under the wing. This shape helps birds and airplanes fly. One explanation of an airplane flies comes from a scientist named Daniel Bernoulli. He discovered that moving air makes different pressures on wings. Air moves faster across the longer top part of the wing. This makes low pressure on top. High pressure forms under the wing.

The high pressure under the wing pushes it up into low pressure on top. This lifts the entire airplane

Using curves to change air pressure is a trick used on many aircraft. Helicopter rotor blades use this trick. Lift for kites also comes from a curved shape. Even sailboats use this concept. A boat's sail is like a wing. That's what makes the sailboat move.



Use this opportunity to discuss the different Aircraft Motion.

**Roll** motion is an up and down movement of the wings.

Caused by the downward movement of **ailerons** .

Ailerons are hinged on the wings.

This moves the plane to the side and helps it turn during flight.

Ailerons usually work in opposition: as the right aileron is deflected upward,

A **pitch** motion is an up or down movement of the nose of the aircraft.

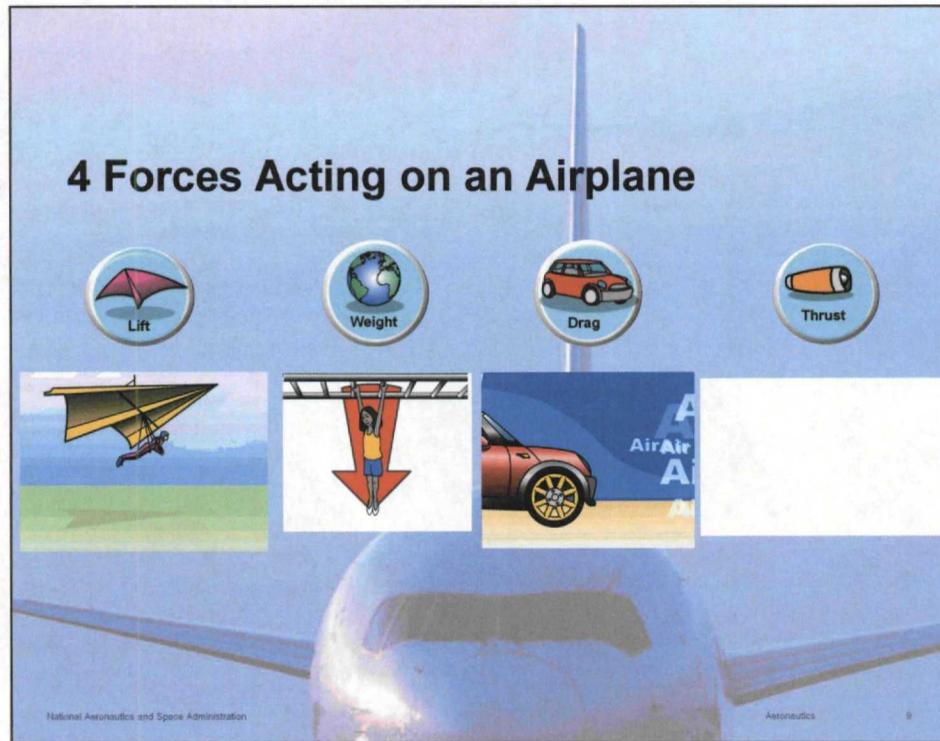
Caused by raising or lowering the **elevators**.

Elevators are at the rear of the plane.

The **yaw** motion is a side to side movement of the nose of the aircraft.

Caused by deflection of the **rudder**.

The rudder is located at the back of the plane.



Engage the students. Does anyone know what forces act on an airplane? As the force pops up, does anyone know what lift means? Weight? Drag? Thrust?

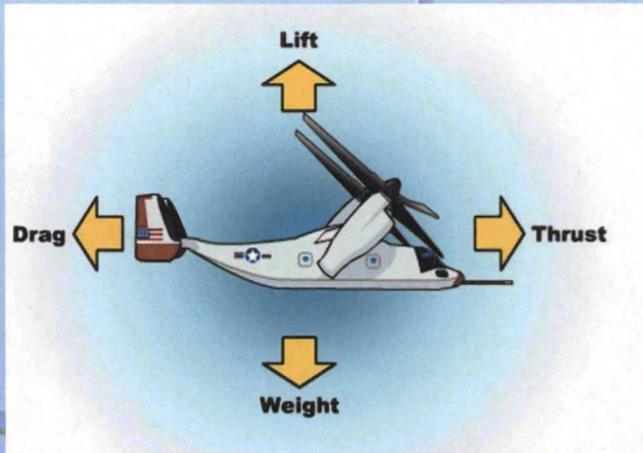
**Lift** is the upward force that causes an object to fly.

**Weight** is a force that is always directed toward the center of the earth.

As an object moves through the air, it pushes aside air molecules. The air resists the motion of the object creating the resistance force called **drag**.

**Thrust** is the force that moves an aircraft forward.

## 4 Forces Acting on an Airplane



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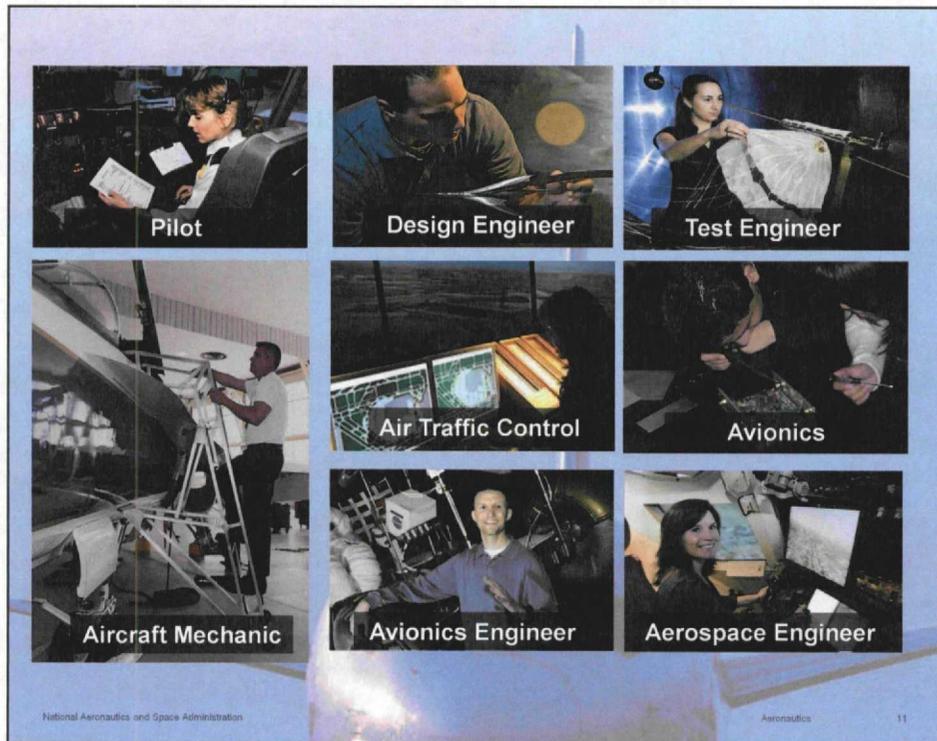
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Can anyone tell you how the forces work together?

**Lift** works opposite to **weight**

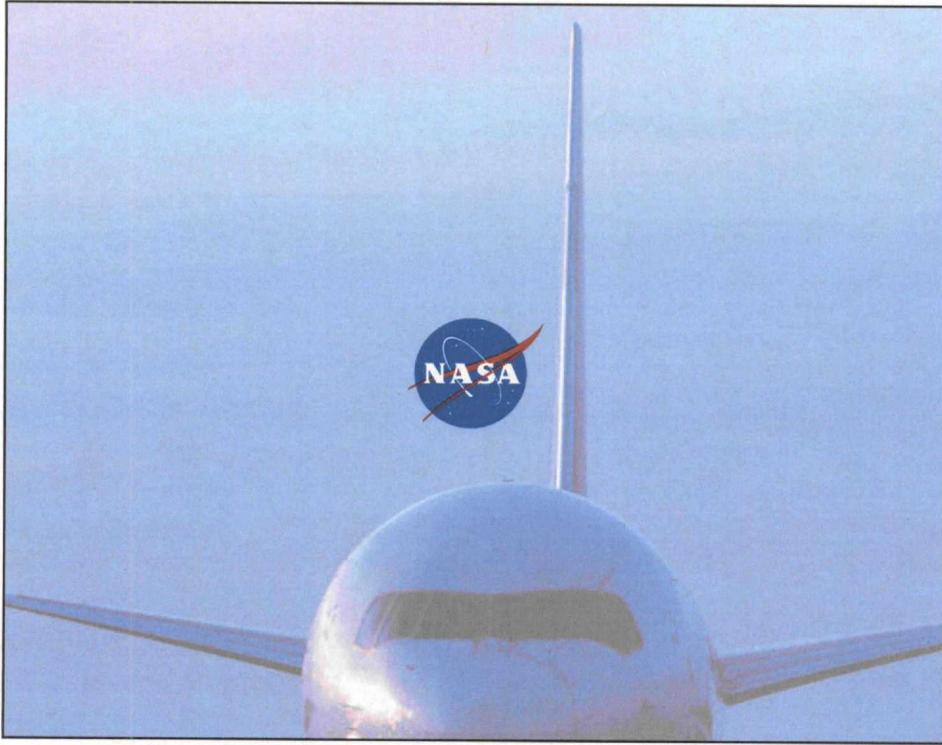
**Thrust** works opposite to **drag**



This slide shows students the diversity of people who share a common interest and work in the aeronautics industry.

Some additional careers are:

- Aircraft Crew Member
- Avionics
- Ground Support Services
- Operations
- Safety Training
- Weather Analyst



NASA Presentation Sign-Off Page