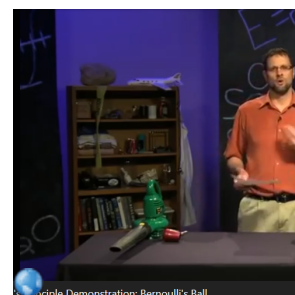
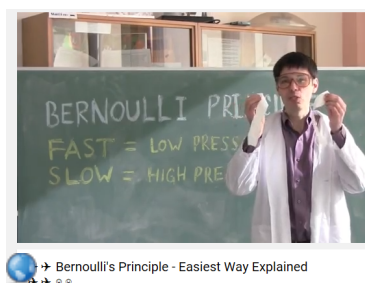
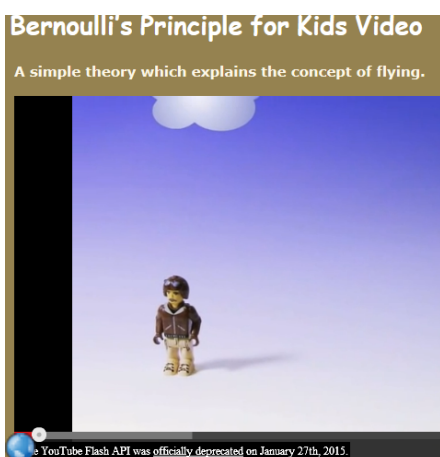


Video for Bernoulli's Principle



How to test the aerodynamics of a plane or aircraft before flying?

Aerodynamicists use **wind tunnels** to test models of proposed aircraft. In the tunnel, the engineer can carefully control the **flow conditions** which affect **forces** on the aircraft. By making careful measurements of the forces on the model, the engineer can predict the forces on the full scale aircraft. And by using special diagnostic techniques, the engineer can better understand and improve the performance of the aircraft.



NASA recently tested a full-sized tail from a 757 commercial aircraft that was modified and equipped with tiny jets called "sweeping jet actuators" to blow air across the rudder surfaces.

The test vertical tail is an actual 757 tail that came out of an aircraft bone yard in Arizona and was refurbished into a wind tunnel model.

The tunnel hosted the 26-foot 757 tail for a series of tests of an innovative Active Flow Control system that one day might allow airplane builders to design smaller tails, which would reduce weight and drag, and help improve fuel efficiency. The "flow control" comes from the actuators, which are devices that essentially blow air in a sweeping motion along the span of the tail and manipulate that flow of air.

The image was taken inside the National Full-Scale Aerodynamic Complex, a massive wind tunnel located at NASA's Ames Research Center in Moffett, Ca. In the image, an engineer braces himself against the strong winds in the tunnel as he holds a wand emitting a stream of smoke that's used to visualize "in flight" air flow across the tail.

Actuator technology will be installed for flight tests on the tail of Boeing's ecoDemonstrator program 757 flight test aircraft in early 2015 as part of an agreement with NASA.



ASA Now: Engineering Design: Wind Tunnel Testing

5 min

Great Planes Boeing 747 and 777 National Geographic Documentary



Great Planes Boeing 747 and 777 National Geographic documentary

More videos on youtube under "great planes"

Lighter-Than-Air (Airships)

In the early 1900's people found that if you filled balloons with special gases that were lighter than air, the balloon would rise. A gas called hydrogen was used at first but hydrogen explodes if it comes in contact with a spark or a flame. In 1937, a large airship filled with hydrogen called the Hindenburg burned, killing 36 people.



The most common gas used today is helium which does not burn and is much safer than hydrogen. (Helium is a gas used in weather balloons and the birthday balloons). Balloons like this are sometimes given metal frames for support and adding a propeller helps them travel around. Lighter-than-air balloons can carry very heavy loads if they are large enough, but today, their main purpose is for advertising. The "Goodyear Blimp" is a famous example of a modern lighter-than-air balloon.



Molecules in Motion

The gas molecules in air are always moving, but when they are heated they become even more active and move farther apart. Since the same number of molecules takes up more space, the warmer air becomes ~~not crowded~~ less dense and rises. Then as it cools down, the molecules move closer.

