

12. Bernoulli's Principle

Subject: Aerodynamics

Objective: To demonstrate the principle of lift in airplanes.

Logistics: Students can work alone or in groups of three or four.

Materials:

sheets of paper for cutting into strips

cardboard sheets

fan

funnel for fan

stick with string with paper clip on end (for holding paper planes)

Procedure:

Step 1: To demonstrate the pressure difference between moving and static air, take a sheet of paper, cut it in two halves, and blow between the two pieces while holding them vertically. Before blowing, ask the class whether the sheets will separate or move together. Each student can try this in his or her seat. The two sheets will move together. Ask where the air pressure is greater—between the sheets or outside them? (Outside according to the Bernoulli's Principle)

Step 2: Students can calculate the weight of an airplane that has 150 passengers, baggage, 1000 gallons of fuel at 6 pounds per gallon, and the fuselage. A DC-9 has a maximum takeoff weight of 121,000 pounds. Show cross-section of a wing and the airflow. Airflow is faster above the wing than below. Therefore, pressure on top of the wing is less than below the wing. The difference in pressure is the lift.

Step 3: Have students make paper airplanes out of a sheet of paper or cut up cardboard to make planes. Punch one hole in nose of each plane. One by one each student can hook up string on the end of a stick and with a paperclip. They then can hold their plane in the airflow of a fan. (Fan must have channeled airflow for this to work.)

Vocabulary: *Bernoulli's Principle, lift, fuselage, static*

What they Learn: Students see how a simple experiment can explain something as great as the flight of airplanes.