

## AEROSPACE & DEFENSE

### LESSON #4 - "OVER AND UNDER" - VELOCITY & LIFT Sherilynn Admire, M. Ed.

Airplanes stay in the air by 4 factors; Thrust, (pushing the plane through the air), Drag, Lift, Weight (gravity). All these factors must be in equal play for the airplane to fly through the air.

Velocity (speed) of air and Lift are 2 factors that keep the plane in the air. The amount of velocity flowing over and under a wing helps the airplane take off, fly, and land.

The force that lifts an airplane and keeps it in flight, comes from air flowing swiftly over the wing and under the wing. The air has to move faster OVER the wing to reach the rear of the wing at the same time air goes UNDER the wing. This action causes less pressure on the wing which then causes the wing to rise.

**Vocabulary:** Velocity Fluid Pressure Wing Force Thrust

**Discovery:** Daniel Bernoulli (Bernoulli's Principle) discovered a fluid (in this case air) "the speed of fluid determines the amount of pressure that fluid can exert." Because of the shape of a wing (curved on top and straight on bottom) air traveling over the top of the curved wing must go farther, thus faster than air traveling under the wing to reach back of wing at same time. When this happens, the pressure on the top of the wing is lower than the pressure under the wing and thus the wing will lift.

**Activity:** Make a wing and demonstrate velocity and lift.

**Materials:** Book, Piece of paper

**Procedure:** Place the end of the paper inside of the book  
(1/2 of the paper sticking out of top).

Hold the book chin high and blow across the paper, slowly at first. What do you observe? Which forces are at work? The air flowing over the top of the wing must move faster than air under the wing which allows the wing (paper) to lift. Try varying your "wind speed" (your breath) and observe what will happen.

**Draw a picture of the air going over/under the wing and write a sentence explaining what you have observed.**