



Title: What Was in the News??

Grade Level: 4-7

Time Allotment: Two class periods of 50 minutes each

Overview: Through an interactive lesson involving video, internet, and hands-on activities students will study the forces affecting the flight of an airplane.

Subject Matter: Physical Science

Learning Objectives:

Students will be able to state the four forces of flight and how they affect the flight of an airplane.

National Standards:

Science: All students should develop an understanding of motions and forces.

Media Components:

Video: **Follow Your Dreams: The Bessie Coleman Story**

Websites: **Your Own Flight: Forces of Flight**

<http://www.fi.edu/flights/own2/forces.html>

Forces of Flight

<http://www.planemath.com/activities/pmenterprises/forces/forces1.html>

Materials:

Pieces of paper (8 _ x 11)

Pieces of paper (4 cm x 8 cm)

Straws

Ping Pong balls

Tape

Large balloons

Prep for Teachers:

Step 1: Bookmark the web site used in this lesson.

Step 2: Cue the videotape used in this lesson.

Step 3: Obtain materials listed in this lesson and set up the experiments.

Step 4: When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information during or after viewing of video segments, websites or other multimedia elements.



Introductory Activity: Bessie Coleman was influenced by an article in a newspaper to become a pilot.

Step 1: **CUE and START** the video when Bessie Coleman is picking up the newspaper while standing in front of the ironing board. This clip goes from 16:00 to 17:20 on the timer. As a *Focus for Media Interaction* have students be able to tell what influenced Bessie Coleman to become a pilot.

Step 2: **STOP** the video after Bessie describes what she read about in the newspaper.

Step 3: Bessie read an article describing the Orville and Wilbur Wright making the first flight in a power-driven airplane on December 17, 1903, near Kitty Hawk, North Carolina. Orville flew a distance of 120 feet, remaining aloft for 12 seconds. This article inspired Bessie Coleman to want to be the first black woman pilot.

Step 4: In order to become more familiar with the four forces of flight and how they work, students will do the following activities.

Step 5: Crumple on piece of paper into a ball.

Step 6: Hold the paper ball in one hand and a flat sheet of paper the same size in the other hand.

Step 7: Drop both pieces of paper and observe what happens. Describe what was observed.

Step 8: The flat sheet of paper showed increased resistance to air or *drag*.

Step 9: Experiment with ways to change the paper so that there is less drag on it as it falls.

Step10: Hold a piece of paper (4 cm x 8 cm) close to your mouth and blow gently over the top of it and observe what happens. Describe what was observed.

Step11: As you blow over the top of the small piece of paper, you make the air above the paper move faster than the air underneath the paper. The slower air underneath is at a higher pressure and pushes the paper upwards. This is called *lift* or the Bernoulli Effect.

Step 12. Hold two pieces of paper (4 cm x 8 cm) in front of your face (one in each hand with the papers touching) and try to blow them apart. Describe what happens to the two pieces of paper. Where is the air moving the fastest and slowest? Use Bernoulli's Principle to explain what happened.

Step 13. Discuss how a swimmer propels themselves through the water. This forward motion is a form of *thrust*. How can a swimmer increase their thrust? (wear fins). The thrust of an airplane is created by the propeller.



Step 14. *Weight* is the gravity of the earth trying to pull an airplane down. So lift must overcome weight in order for an airplane to fly. Lift is created by movement of wind over the wings and flaps.

Learning Activity:

Step 1: Take students to the computer lab and go to the website **Your Own Flight: Forces of Flight** <http://www.fi.edu/flights/own2/forces.html>. Divide the class into four groups. *As a Focus for Media Interaction have each group of students investigate one of the four forces of flight.*

Step 2: Have each group give a summary of what it found out about their force....i.e., lift, drag, thrust, weight.

Step 3: Go to the website **Forces of Flight** <http://www.planemath.com/activities/pmenterprise/forces/forces1.html>. Use the same four groups of students as above. *As a Focus for Media Interaction have each group of students investigate the same force of flight again.*

Step 4: Have each group of students create a poster about their force.

Culminating Activity: Students will make a hovering ball that demonstrates lift or Bernoulli's Effect.

Step 1: Place a large balloon around the opening on the long end of the straw.

Step 2: Seal the balloon to the straw with a piece of tape.

Step 3: Blow up the balloon and pinch the neck of the balloon to keep the air inside.

Step 4: Bend up the end of the straw and place a ping pong ball over the opening.

Step 5: Predict what will happen to the ball when the air in the balloon is released and the ball is in the moving stream of air.

Step 6: Release the neck of the balloon while holding the straw horizontally with the short end pointing up.

Step 7: Observe what happens.

Step 8: The steady stream of upward air is enough to overcome the force of weight or gravity. The ball stays in the center of the stream of air because of the Bernoulli Effect. The pressure in a moving stream of air is less than the pressure of the surrounding air. The surrounding air pushes toward the ball causing it to remain centered in the stream of air.

Step 9: Try tilting the straw slightly. How far can it be tilted before the ball will fall?



Step 10: Try different sizes of balloons and Styrofoam balls.

Cross Curricular Extensions:

Language Arts: Write a story with the author being an airplane and tell what it feels like to fly through the air. Describe how the four forces of flight feel.

Social Studies: Research the development of airplanes and how they have effected the movement of goods in this country.

Community Connections:

Go to a local general aviation airport (small planes) and talk to pilots about the forces of flight. If this is not possible, invite a pilot into the classroom.