William M. Staerkel PLANETARIUM

Teacher's Guide to

FLIGHT ADVENTURES

OBJECTIVES:

- To learn that a force is a push or a pull on an object. Weight, lift, thrust and drag are forces.
- To see how airplanes can generate lift to overcome the force of gravity
- To see how forces can change the position or motion of an object.
- To see examine how early pioneers of flight used models to experiment. These models are used to test ideas and solve problems.
- To learn how NASA uses models to improve flight technology.

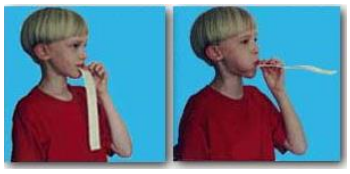
This show conforms to the following Illinois state science standards: 11.A.2b, 11.B.2a, 11.B.2c, 12.D.2b, 12.F.2c, 13.B.2a, 13.B.2b. Next Generation Science Standards: 5.PS2.1

BRIEF SHOW DESCRIPTION:

Discover the science of flight through the eyes of a young girl and her grandfather as they explore how birds, kites, planes, and models fly. Learn about the history and future of flight and how NASA is discovering new and safer ways to travel with the help of future engineers and aviators—like you! Join us in this collaboration with the Chanute Air Museum in Rantoul! This show was originally produced by the Children's Museum of Indianapolis. Target audience: ages 8 and up (grades 3-5)

PRE-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- If you take two sheets of paper and you wad up one of them, then drop them both, the wadded paper will hit the ground first. But why? What is the air doing to the flat (unwadded) paper? Try paper of different shapes. Use an handkerchief and, by attaching string to the corners, construct a parachute.
- Airplanes generate lift by way of "Bernoulli's Principle." You can demonstrate this simply by cutting a piece of paper roughly six inches long and an inch wide. Put the end of the paper just under your lip and blow across the top of the paper. What happens to the paper? Air pressure is pushing on the paper from all directions. When you blow across the top you lower the pressure on the top. Pressure from below pushes the paper up.



- The books say we live in a world of 14 pounds per square inch of air pressure. But how much is that? Take a scale that you would use to weigh yourself and, using ONLY your thumb (roughly 1 square inch), push on the scale until it reads 14 pounds. Is this easy to do?

POST-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

- Visit the Chanute Air Museum in Rantoul (www.aeromuseum.org) to see a timeline of flight history, a barnstorming exhibit, flight simulators, a missile silo used for training, plus many different kinds of airplanes.
- Take in a rocket launch with Central Illinois Aerospace (http://www.ciarocketry.org/) during one of their launches in Dodds Park in Champaign. CIA routinely conducts "make & take"

workshops where youth can build their own rockets. In fact, check out what it looks like if you were aboard the rocket: http://www.youtube.com/watch?v=JBArHQQr6vc

- Build a foam plate glider. The plans can be found here: http://www.modelaircraft.org/files/education/FPG-9pattern.pdf And instructions are here: http://www.modelaircraft.org/files/education/docs/fpg9instr.pdf
- Build an egg carton gilder – plans are here: http://www.modelaircraft.org/education/priceless.aspx
- To illustrate air pressure, an adult can conduct this activity. Put a small amount of water in an empty soda pop aluminum can and place on a hot plate. As the can heats up and the water begins to boil, you'll see steam coming out of the can. Using a pair of metal tongs, grab the can and turn it upside down into a tub of cool water. Low air pressure is created in the can as some of the water condenses and outside air pressure then crushes the can. This can be quite dramatic (and loud)!
- Host a paper airplane contest. Have prizes for design, duration in the air, distance and accuracy. How does adjusting elevators on a paper airplane affect its motion? Have students make predictions and then try it! Check out: http://teacher.scholastic.com/paperairplane/
- Host a kite flying contest. Try http://www.fdkf.org/contests/contest_criteria.html
- Use a box fan and construct a wind tunnel (http://www.grc.nasa.gov/WWW/k-12/WindTunnel/build.html)

VOCABULARY LIST:

Aviation	Thrust	Technology]
Aeronautics	Drag	Bernoulli's Principle
Air	Gravity	Wright Brothers
Lift	Model	Octave Chanute
Force	Science	

INTERNET RESOURCES:

- Chanute Air Museum: http://www.aeromuseum.org.
- Champaign County Radio Controlled Club: http://www.ccrcc.info/main/
- Academy of Model Aeronautics: http://www.modelaircraft.org/
- Where is the international space station? : http://www.heavens-above.com
- NASA's aeronautics page: http://quest.nasa.gov/aero/background/
- NASA's flight page: http://www.grc.nasa.gov/WWW/k-12/UEET/StudentSite/index.html
- Aeronautics research: http://www.hq.nasa.gov/office/aero/
- More info on paper airplanes: http://teams.lacoe.edu/documentation/classrooms/amy/geometry/projects/airplane/airplane_sites.html
- National Air & Space Museum: http://airandspace.si.edu/education/onlinelearning.cfm
- Indianapolis Children's Museum: http://www.childrensmuseum.org
- Flight timelines: http://www.loc.gov/exhibits/treasures/wb-timeline.html or http://teacher.scholastic.com/activities/flight/timeline.htm