



Drexel-SDP GK-12 ACTIVITY

Activity: The Power of Flight

Subject Area(s) **Astronomy**
Associated Unit **Space, module 3**
Associated Lesson **embedded**
Activity Title **The Power of Flight**
Grade Level 6 (3-8)
Activity Dependency **None**
Time Required **50 minute lesson**
Group Size **2**
Expendable Cost per Group **approx. \$2**

Summary

A paper airplane challenge that introduces forces & motion as well as the application of models in design. Students are given paper of varying weights as well as paper clips, binder clips and tape. They will build three model airplanes and improve them over 3 test flight to fly further and straighter.

Engineering Connection

Flight and space travel would not be possible were it not for the work of engineers. In this activity, students will explore some of the principles involved in the design of flight craft, and will engage in the process of testing and de-design as part of the activity.

Keywords

Space, flight, airplanes, aeronautical engineer

Educational Standards

3.1.7 B Describe the use of model as an application of scientific or technological concepts.

3.2.7 A,B,C & D Inquiry & Design

3.4.7 C. Identify and explain the principles of force and motion

3.6 C. Explain physical technologies of structural design, analysis and engineering, personal relations, financial affairs, structural production, marketing, research and design.

3.7 A Describe the safe and appropriate use of tools, materials and techniques to answer questions and solve problems.

3.7 B Use appropriate instruments and apparatus to study materials.

3.7C Explain and demonstrate basic computer operations and concepts

3.7 D Apply computer software to solve specific problems.

Pre-Requisite Knowledge

None.

Learning Objectives

Students will be able to:

Identify forces and explain why they lead to a specific motion.

The students will understand the concept of lift, as well as the basic Bernoulli principle of flight.

Students will design model paper airplanes and evaluate and compare designs.

Materials List

Student directions sheet (Space SD-1

Student activity worksheets (Space SA-1.1-1.3)

Regular 8.5x11 paper

Legal size paper

Construction paper/ card stock/ some heavier weight paper

Paperclips

Scotch tape

Rulers (preferably tape measures)

*Computer with Microsoft Excel

*not necessary but makes a nice extension for classes learning Excel

Introduction / Motivation

A paper airplane challenge that introduces forces & motion as well as the application of models in design. Students are given paper of varying weights as well as paper clips, binder clips and tape. They will build three model airplanes and improve them over 3 test flight to fly further and straighter.

Review the background material with the students, discuss the vocabulary, then begin the activity.

Vocabulary / Definitions

Word	Definition
Aeronautical engineer	An engineer concerned with the design and construction of aircraft.
lift	An upward force caused by the rush of air over the wings, supporting the airplane in flight.
drag	The force that resists the motion of the aircraft through the air.
Bernoulli principle	Bernoulli's Principle states that an increase in the velocity of a fluid is always accompanied by a decrease in pressure.

Procedure

Background

Students will be able to identify forces and explain why they lead to a specific motion. The students will understand the concept of lift, as well as the basic Bernoulli principle of flight. Students will design model paper airplanes and evaluate and compare designs. Students will assess the effectiveness of a model airplane in relation to a commercial airplane.

Before the Activity

Collect and distribute materials.

With the Students

Procedure:

1. Introduce concept of LIFT using gravity with a BALL.
2. Hold ball in your hand. Ask class, what keeps ball up? (answer- forces upward from your hand)
3. If I move my hand, what happens? (Ball drops) Why? (gravity)
4. How come the ball does not move UP? (the forces are balanced between your hand and gravity)
5. To make the ball move UP I would need more force in the upward direction. This is called LIFT.
6. Airplanes rely on LIFT. It is created by “stretching the air” over the wing of the airplane.
7. This “stretching” is known as Bernoulli’s principle.
8. You can imagine different designs of airplanes are more or less effective at “STRETCHING” the air....therefore they create more/less LIFT.
9. Today’s challenge is to do just that. Given your supplies of paper, I want your team to design a paper airplane. The goal is to design an airplane to fly the furthest. To do this your plane will need to create enough lift to stay in the air, as well as prevent too much DRAG (friction) that would slow it down.
10. Pass out supplies (several pieces of each type of paper to each group of 3 students). Pass out student activity worksheet. Leave scotch tape and paperclips/binderclips on front table for teams to use as necessary.
11. Give students plenty of time to test different designs (construct, draw the model, as well as tests its flight length). When the

final design is ready, have a competition to see whose can fly furthest and whose can fly the straightest.

12. Using Excel students are to then take their data from their trial records of their different designs and make an appropriate bar or line graph.

Safety Issues

- None

Troubleshooting Tips

Help the students to maintain symmetry in their design and to maintain balance in both axes of their airplane.

Investigating Questions

See Activity Embedded Assessment

Assessment

Pre-Activity Assessment

None

Activity Embedded Assessment

Print the following questions into a student worksheet:

The Power of Flight

Team Name:

Team Members:

Date:

Engineering Challenge: To design a model paper airplane for distance.

Requirements:

The model must fly straight.

More than one design must be tested (at least 3).

Each design should be tested more than once and all test flight data should be recorded.

Supplies: Paper (3 different types), paperclips, binderclips, tape, measuring tape.

Team notes

Space SD-1

Team Name:

Team members:

Date:

Flight Data Log: Make sure to include how you made each design, a sketch of the model, and the test flight lengths and notes.

Model test design #1

How I made it:

Model sketch:

Test flight 1:

Test flight 2:

Test flight 3:

Notes on test flights:

Space SA-1.1

Team name:

Model test design #2

How I made it:

Model sketch

Test flight 1:

Test flight 2:

Test flight 3:

Notes on test flights:

Space SA-1.2

Team Name:

Model test design #3

How I made it:

Model sketch:

Test flight 1:

Test flight 2:

Test flight 3:

Notes on test flights:

Space SA-1.3

Post-Activity Assessment

Evaluation will be based upon teacher observation of student participation as well as completion of the activity worksheet.

Activity Extensions

Students can research at home about airplanes and what types of designs of airplanes are currently used in the commercial flight industry. Another extension could be to have students design kites to learn about lift forces.

Owner

Drexel University GK-12 Program

Contributors

Noelle Comolli

Copyright

Copyright 2007 Drexel University GK12 Program. Reproduction permission is granted for non-profit educational use

Version: Mar 2007