

OUTREACH EDUCATION PROGRAM



Program: Barnstorming

Grade Level: 6th grade

Group Size: up to 30

Length: 90 minutes

Location: On-site at schools

Overview

After an introductory presentation about the forces of flights, students work in small groups to explore Newton's Third Law of Motion and Bernoulli's Principle by doing small table top experiments. They then learn how airflow affects an airfoil in a wind tunnel, and maneuver a remote controlled plane to see how aircraft control surfaces affect movement.

Outcome

- Use the scientific method while completing experiments
- Apply Newton's Third Law of Motion and Bernoulli's Principle to the science of flight
- Identify forces acting upon an airplane in flight

Activities

- **Table Top Experiments:** Students get hands on experience with a variety of small experiments and demonstrations designed to introduce them to Newton's Third Law of Motion and Bernoulli's Principle. Utilizing the Scientific Method, students hypothesize the experiment's outcome, often to amazing and unexpected results—all the products of simple gravity and air pressure.
- **Wind Tunnel-** Students operate a portable wind tunnel in order to learn how airflow affects an airfoil in flight. Students hypothesize and experiment with varying velocities of wind and work together to engineer a design for a wing. Students learn a brief history of wind tunnels and how they are used today by engineers and scientists.
- **P-40 Flight Simulator:** The culmination of the Barnstorming experience, students become a pilot as they sit at the controls of a remote control P-40 aircraft using a control stick and rudder pedals. Students see first-hand the movements of the control surfaces and how they impact an aircraft's flight. Upon successful completion of their flight, students earn their pilot wings.

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Standards Supported-Common Core/HCPSIII/NGSS/PLTW

Common Core

English Language Arts

CCSS.ELA-LITERACY.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Math

CCSS.MATH.CONTENT.6.SP.B.5.B Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

Hawaii Content & Performance Standards III

SC.6.1.1 Formulate a testable hypothesis that can be answered through a controlled experiment

SC.6.7.1 Describe examples of how forces affect an object's motion

Next Generation Science Standards

MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MA-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

This program supports **Project Lead the Way's** Aerospace Engineering unit and Stability and Motion: Science of Flight.