

TITLE:

Foamie Flyer

GRADE LEVEL:

3-5

SUBJECT AREA:

Mathematics, Grade 3-5

Florida Sunshine State Standards:

Florida Sunshine State Standards

MA.B.1.2.1: uses concrete and graphic models to develop procedures for solving problems related to measurement including length, weight, time, temperature, perimeter, area, volume, and angle.

MA.B.1.2.2: solves real-world problems involving length, weight, perimeter, area, capacity, volume, time, temperature, and angles.

MA.B.4.2.2: selects and uses appropriate instruments and technology, including scales, rulers, thermometers, measuring cups, protractors, and gauges, to measure in real-world situations.

MA.E.3.2.1: designs experiments to answer class or personal questions, collects information, and interprets the results using statistics (range, mean, median, and mode) and pictographs, charts, bar graphs, circle graphs, and line graphs.

NCTM Mathematics Standard:

Representation Standard: Use representations to model and interpret physical, social, and mathematical phenomena.

Connections Standard: recognize and apply mathematics in contexts outside of mathematics.

Problem Solving Standard: apply and adapt a variety of appropriate strategies to solve problems

Description/Abstract of Lesson:

Students will build their own flyer. When launching the flyers, form groups of 3 or 4 so that all students are not launching at the same time. This is an outdoor activity. Foamie Flyers must be launched away from other children. Save the unused parts of the plate for the extension activities.

<http://www.avkids.com/lounge/teachersguide.htm>

OBJECTIVES:

Students will investigate the principle of thrust.

TEACHER MATERIALS/TECHNOLOGY CONNECTION:

metric tape, metric ruler, standard American ruler and tape measure, stop watch (for measuring time), meter sticks or tapes, paper, stapler

STUDENT MATERIALS/TECHNOLOGY CONNECTIONS:

1 piece of paper 15cm x 22cm, tape, ruler

DURATION:

60 min

ESSENTIAL QUESTIONS/KEY VOCABULARY:

Essential Questions

Does the amount of thrust affect the Foamie Flyer's flight?

Key Vocabulary: *thrust, lift, gravity, drag, wings, nose, fuselage, ailerons, flaps, pitch, roll, yaw, bank*

Thrust is the force that moves a plane through the air. Because airplanes fly in a three-dimensional environment, the following terms refer to the various directions an airplane can move:

Pitch—to move the nose of the airplane up or down

Roll—to tilt one wing up and the other wing down

Yaw—to point the nose of the airplane left or right while remaining level with the ground

Bank—to tilt the airplane inward while making a turn

Airplanes, including even the Foamie Flyer, use a variety of “control surfaces” to change the speed and direction in which they fly. These control surfaces include:

Ailerons—movable sections, hinged on the rear edge of the wing near the wingtip, that cause the airplane to roll

Flaps—movable sections, hinged on the rear of the wing, that can be lowered to increase lift and drag during takeoff or landing

Stabilizer—the vertical stabilizer is the upright portion of the airplane tail, while the horizontal stabilizer is the small wing usually located on the back of the airplane.

GROUPING FOR INSTRUCTION:

Groups of 3

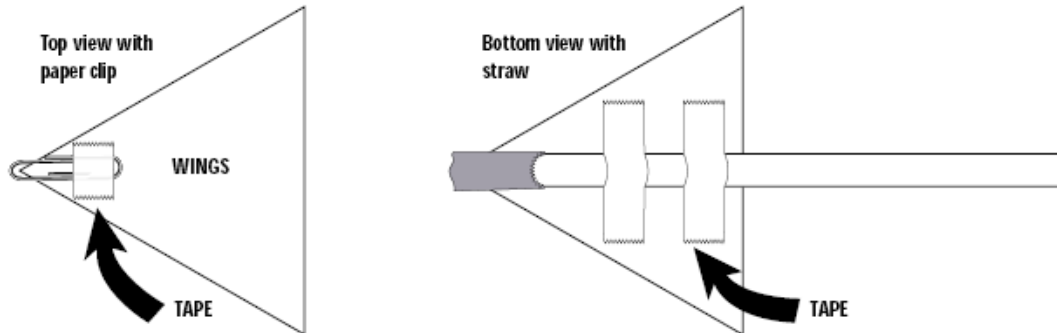
LESSON LEAD/OPENING:

Read aloud Stan & Jan Berenstain's *The Berenstain Bears Fly-It! Up, Up, and Away* for grades 2-3. Also, consider Susan Sloate's *Amelia Earhart: Challenging the Skies* for grade levels 4-6.

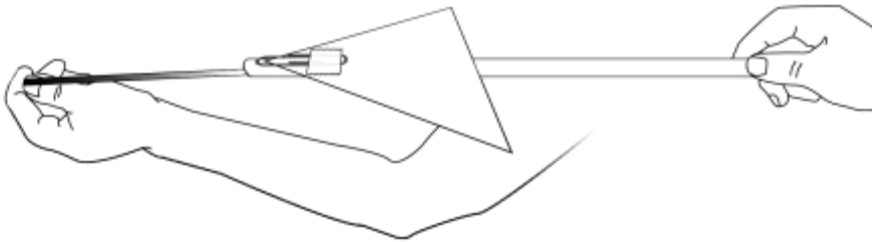
STEPS TO DELIVER LESSON:

1. Give each child the materials.
2. Instruct students to fold back the top three centimeters of the straw and insert the rubber band into the fold.

3. Fold the straw over the rubber band and secure the end with masking tape. This creates the launcher for the flyer.
4. Instruct students to cut a triangle out of the foam plate from the flat inverted side of the plate. A good size to start with is 13 cm x 13 cm x 13 cm (equilateral triangle).
5. Tape the paper clip to the top of the foam wings. Then, tape the wings to the top of the launcher so that it extends slightly over the tip.



6. Hook the rubber band around the tip of your thumb and pull back on the opposite end of the flyer. Release the straw and the flyer will fly forward.



7. There should be a designated launch starting line. Call groups forward, one at a time, to launch their flyers. Each child should launch the flyer using two different amounts of thrust. They should first pull the nose of the flyer halfway to their elbow and let it fly. Next, they should pull the nose of the flyer all the way to their elbow and let it fly. The group should observe the changes in their flyer's flight and distance. These observations can be recorded on the Student Data Sheet, Blackline 1.

GUIDED PRACTICE:

Discussion:

1. Does the amount of thrust affect the Foamie Flyer's flight?
2. What other factors affect how your flyer flew?
3. Why was your flyer successful or unsuccessful?
4. How does the thrust of the Foamie Flyer compare to the thrust of a real airplane?

INDEPENDENT PRACTICE:

Students are responsible to answer the discussion questions on their own before class discussion of responses.

DIFFERENTIATED INSTRUCTION:

Extensions:

1. Students can cut wing flaps and ailerons into the back of the foam wings and observe the changes in flight.
2. Students can alter the weight of the flyer and to observe the changes in flight by adding weight behind the wings with tape or paper clips.
3. Students can use the leftover foam plate parts to add stabilizers and rudders to their flyers and observe changes in flight.
4. Try different size foam wings to observe changes in flight.

LESSON CLOSURE:

Share out student responses in their data sheets

ASSESSMENT:

Participation and responses to questions on data sheet

RESOURCES:

Title: *Inventor's Workshop: Flight*

Author: Belinda Recio

Number of Pages:

Grade Level: 3–6

Review: This inventor's kit comes with all the materials necessary to construct a diamond kite, snake kite, two types of gliders, and a parachute. *Inventor's Workshop: Flight* is a fully illustrated guide to inventive thinking, problem solving, and flying creations. The kit even comes with information on how you can patent your own flying machine and obtain a legal document that proves it's your invention.

Rating: 🍎 🍎 🍎 🍎

Color Illustrations: No

Color Photos: No

B&W Illustrations: Yes

B&W Photos: No

Publisher: Running Press

ISBN: 0762403462



Title: *The Aircraft Encyclopedia*

Author: Roy Braybrook

Number of Pages: 188

Grade Level: 5 to advanced

Review: This book is similar to *A Field Guide to Airplanes*, except it has several color illustrations and photos. It is full of facts and statistics covering a wide variety of planes, including military, commercial, and private. This book would also be useful for identifying various aircraft.

Rating: 🍎 🍎 🍎

Color Illustrations: Yes

Color Photos: Yes

B&W Illustrations: Yes

B&W Photos: Yes

Publisher: Aladin Paperbacks

ISBN: 0671553372



Title: *How Do Airplanes Fly?*

Author: C.E. Thompson

Number of Pages: 32

Grade Level: 2-4

Review: This straightforward book explains many of the major principles of flying, and answers many questions that are often posed by young people interested in flying, such as “How does the pilot turn left or right?” or “How does the pilot land the plane?” or “What happens when a plane takes off?”

Rating: 🍎 🍎 🍎 🍎 🍎

Color Illustrations: Yes

Color Photos: Yes

B&W Illustrations: Yes

B&W Photos: No

Publisher: Troll

ISBN: 0590897403 OOP see Troll version



Title: *The Berenstain Bears Fly-It! Up, Up, and Away*

Author: Stan & Jan Berenstain

Number of Pages:

Grade Level: 2-3

Review: *Fly-It!* is a really cool book. It is one in a series of books that gives experiments to try out through most of the book. The story starts with the kids on a trip to the Bearsonian Institution, where they meet up with Professor Actual Factual who explains the principles of flight. From there, the kids create several airplanes that they fly using the information they learned at the museum.

Rating: 🍎 🍎 🍎 🍎 🍎

Color Illustrations: Yes

Color Photos: No

B&W Illustrations: No

B&W Photos: No

Publisher: Random House

ISBN: 0679973176



Title: *The Magic School Bus Taking Flight*
(Based on *The Magic School Bus*)

Author: Joanna Cole

Number of Pages: 15

Grade Level: 2–4

Review: If your students enjoy *The Magic School Bus* TV shows, then they'll really enjoy this story. As in the show, Ms. Fizzle takes the kids on a field trip, this time to a model airplane show. Their wild adventure begins after they are shrunk inside one of the model airplanes. From this, they learn about the principles of flight while trying to win the air show contest. A great adventure!

Rating: 🍎 🍎 🍎 🍎 🍎

Color Illustrations: Yes

Color Photos: No

B&W Illustrations: No

B&W Photos: No

Publisher: Scholastic

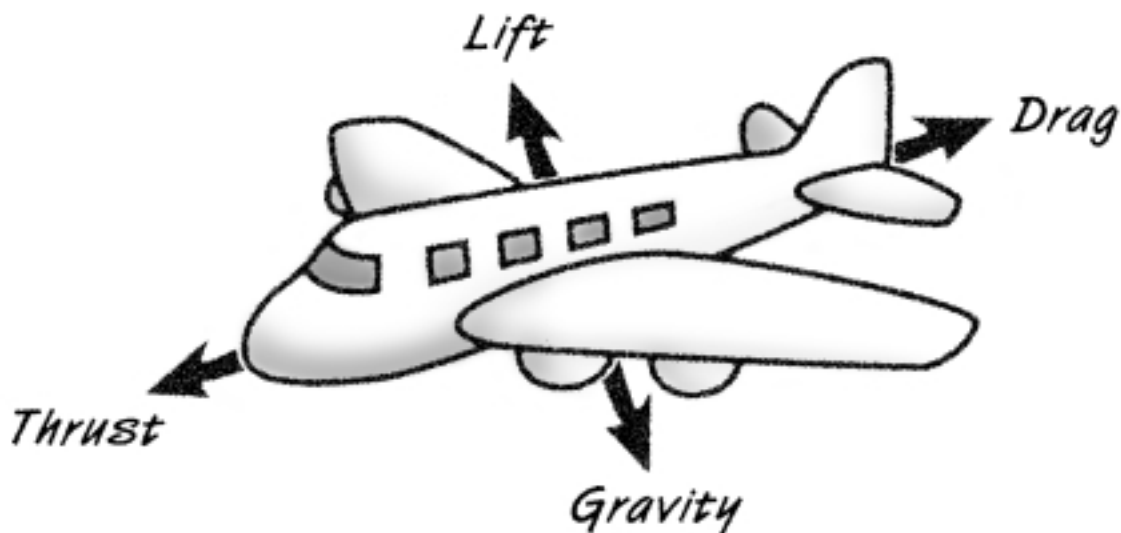
ISBN: 0590738712



The Four Forces of Flight

An aircraft in straight and level flight is acted upon by four forces: *lift*, *gravity*, *thrust*, and *drag*. The opposing forces balance each other; lift equals gravity and thrust equals drag.

Any inequality between thrust and drag, while maintaining straight and level flight, will result in acceleration or deceleration until the two forces again become balanced.



Drag: The air resistance that tends to slow the forward movement of an airplane.

Gravity: The force that pulls all objects towards the earth.

Lift: The upward force that is created by the movement of air above and below a wing. Air flows faster above the wing and slower below the wing, creating a difference in pressure that tends to keep an airplane flying.

***Thrust:* The force that moves a plane forward through the air. Thrust is created by a propeller or a jet engine.**

Student Data Sheet

Foamie Flyer

Captain: _____

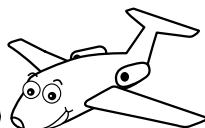
1. Did the amount of thrust affect Foamie Flyer's flight?

2. What did you observe when using different amounts of thrust to launch your Foamie Flyer?

3. How differently did the Foamie Flyer fly after modifications were made to the ailerons, flaps, stabilizers or rudder?

Draw and label a diagram showing how thrust affected the flight of your flyer.

Did You Know?



The Wright Brothers first successfully flew an airplane on Dec. 17, 1903. They discovered that airplanes needed to roll to turn. They invented a system of bending the wings with ropes in order to cause the plane to roll. This system was called wing warping.