

Foamie Flyer

Objective: Investigating the principle of thrust.

Materials:

- Foam paper plates (full size)
- Scissors
- Masking tape
- Large paper clips
- Rubber bands
- Non-bendable straws
- Rulers
- Copies of student data sheet –foamie flyer- 1 for each student.

Background: 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.

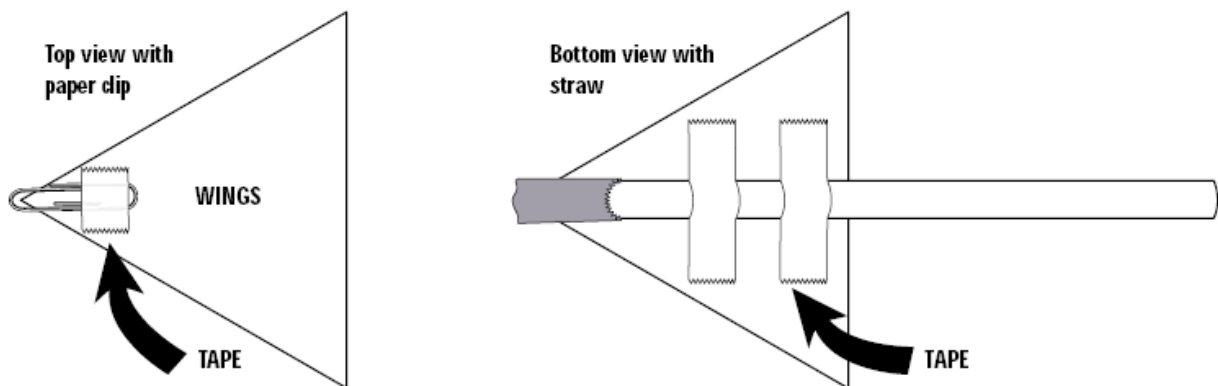
Stabilizer—the vertical stabilizer is the upright portion of the airplane tail, while the horizontal stabilizer is the small wing usually located on the back of the airplane.

Management:

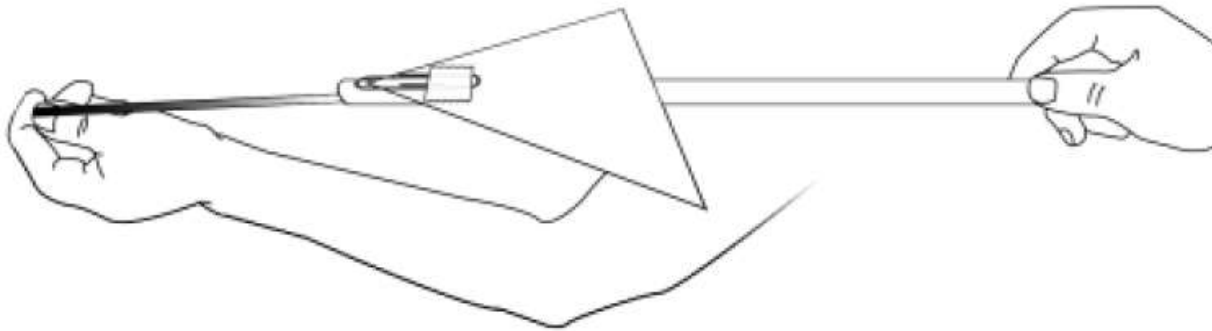
1. 45–60 minutes
2. Students will build their own flyer.
3. When launching the flyers, form groups of 3 or 4 so that all students are not launching at the same time.
4. This is an outdoor activity.
5. Foamie Flyers must be launched away from other students.
6. Save the unused parts of the plate for the extension activities.

Procedure:

1. Distribute materials to each student.
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 student 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.

Discussion Questions:

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?

Extension:

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.

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.*

FOAMIE FLYER

STEP 1. Trace triangle template onto plate & cut out



STEP 2. Connect rubber band with paper clip



STEP 3. Tape paper clip to triangle.



STEP 4. Tape straw onto triangle

