



PAPER AIRPLANE LAUNCHERS

MATERIALS:

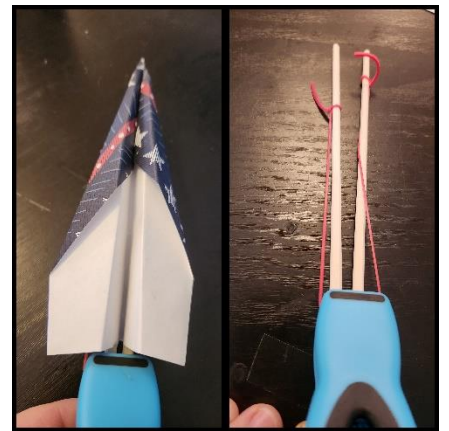
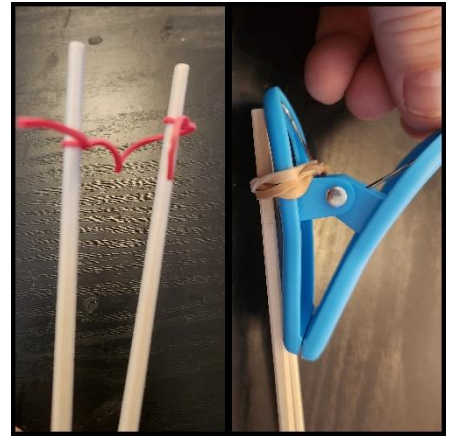
Copy Paper
Scissors
Scrapbook Paper
Chip Bag Clips
Cardstock
Hole Punch
Rubber Bands
Chopsticks

VOCABULARY:

Aerodynamic
Airplane
Drag
Physics
Potential Energy
Kinetic Energy
Pressure
Forces
Thrust
Bernoulli's Principle
Gravity
Flight

CHOPSTICKS LAUNCHER DIRECTIONS:

1. Cut a rubber band to make one elastic piece.
2. Tie each end of the rubber band to the end of two chopsticks.
3. Hold the chopsticks together and lay a chip bag clip on top of the chopsticks at one end. The chip bag clip should have the closed end laying on the chopsticks with the open end at the very end of the chopsticks (see picture for reference).
4. Use a rubber band to secure the bottom of the chip bag clip to the chopsticks.
5. Pull the rubber band loop back and secure it with the chip bag clip (see picture for reference).
6. Make a dart style paper airplane using copy paper, scrapbook paper or cardstock. A good size for the paper is 4"x6". Directions for making a dart style paper airplane can be found at the end of this activity.
7. Lay the airplane on top of the chopsticks with the back of the plane against the closed chip bag clip (see picture for reference.).
8. Press the top handle of the chip bag clip to release the rubber band. The airplane should fling forward and fly.
9. There is a video link to directions at the end of this lesson if you need more help.



RUBBER BAND FLINGER DIRECTIONS:

1. Make a dart style paper airplane. Directions are at the end of this activity.
2. Punch a hold in the bottom of the airplane near the nose of the plane. See picture for reference.
3. Loop a rubber band through the hole and make a knot. See picture for reference.
4. Hold the paper airplane with your fingers back by the end of the plane and place one finger from your other hand through the loop in the rubber band.
5. Pull back on the plane using the hand by the back of the plane so the rubber band stretches on your finger.
6. Release the plane. It should fling forward and fly.



THE STEAM BEHIND THE EXPERIMENT:

Have you ever wondered how an airplane can fly? The simple answer is that as air flows around the wing, the plane is pushed up by higher pressure air under the wing, compared to lower pressure

over the wing. But to understand this phenomenon more deeply, we must look at a branch of physics known as fluid mechanics, and in particular a principle known as the Bernoulli equation. Not only can this equation predict the air pressure around an airplane's wing, but it can also be used to find the force of high winds on a skyscraper, the pressure through a chemical reactor, or even the speed of water coming out of the hose in your backyard. When air flow is split around a wing, the air above the wing moves faster than the air below, due to the wing's shape. Since the velocity of the upper air increases, its pressure must decrease to maintain balance — as described in Bernoulli's equation. This results in greater pressure below the wing than above, which forces the wing upwards, enabling flight!

MAKE IT AWESOME:

Try making paper airplanes of different shapes and sizes to see what happens!

EXTENSIONS:

1. Try using different sizes of rubber bands. How does that affect your plane's flights?
2. Try making up your own launchers!
3. What other changes can you come up with for this experiment?

WEBSITES AND VIDEOS:

1. Video: Bernoulli's Principle Explained: <https://study.com/academy/lesson/bernoullis-principle-lesson-for-kids.html>
2. Chopstick Launcher: <https://youtu.be/SZYOs3MS7w0>

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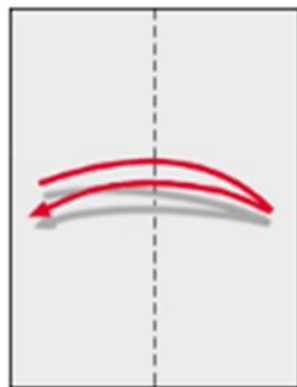
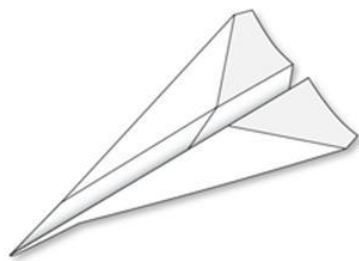
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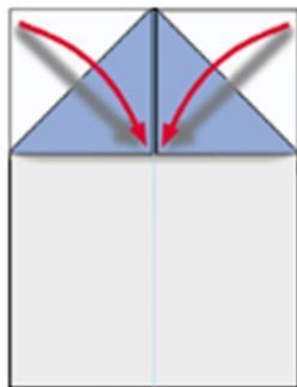
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Basic Dart

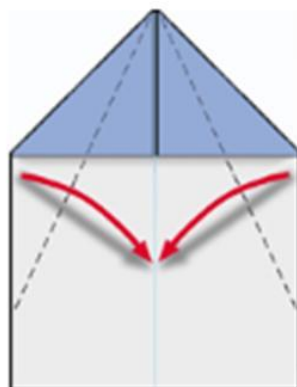
Folding Instructions



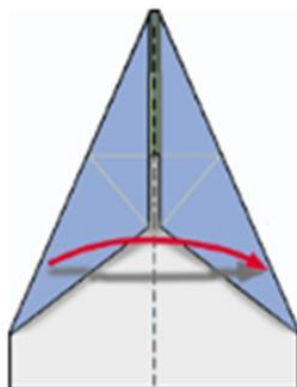
Step 1



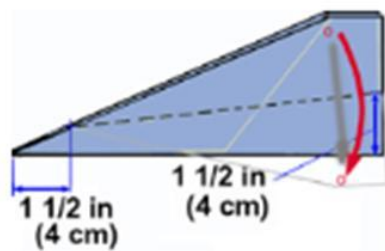
Step 2



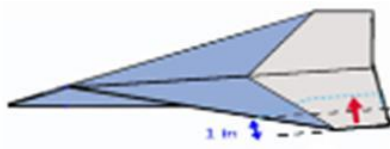
Step 3



Step 4



Step 5



Step 6

Step 1.

Use a sheet of 8 1/2-by-11 inch paper. Fold the paper in half lengthwise and run thumbnail along the fold to crease it sharply. Now, unfold the paper.

Step 2

Fold down the top corners as indicated by the arrows.

Step 3

Fold the two edges toward the center line, as indicated.

Step 4.

Make a valley fold in half. Turn the plane 90 degrees as shown in figure of Step 5.

Step 5

Create a wing crease that begins at the nose as shown.

Step 6.

Form 3-dimensional shape as shown in figure. The Basic Dart is complete.

Bend up the trailing edge of the wings for lift if it has a tendency to nose-dive.