Paper Airplane Tournament

It's a bird, it's a plane, no it's a paper airplane! Construct a sturdy, highflying paper airplane and have your very own paper airplane tournament with your family and friends. Attach it to a launcher and compete to see whose airplane glides the highest, furthest, and longest!

TEKS:

SCI 1.8 D: The student is expected to demonstrate that air is all around us and observe that wind is moving air.

SCI 3.6 C: The student is expected to observe forces such as magnetism and gravity acting on objects.

SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.

SCI 5.6 D: The student is expected to design a simple experimental investigation that tests the effects of force on an object.
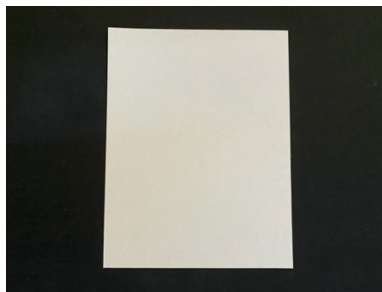
Materials:

- Copy paper
- Paperclips
- Rubber bands
- Tape or stapler
- Various construction materials: cardboard, cardstock, dowels, Legos, pencils, wood, etc.

How To:

Part 1: Build an amazing paper airplane!

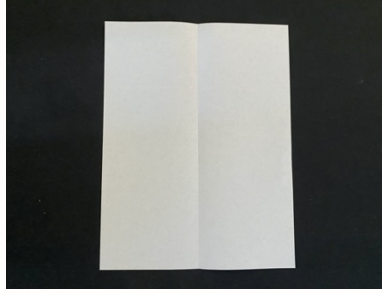1. Take out one 8.5 x 11-inch sheet of copy paper.

2. Fold the paper in half lengthwise (or, hotdog-style) and unfold. This will leave a crease in the paper for you to use as a guide.
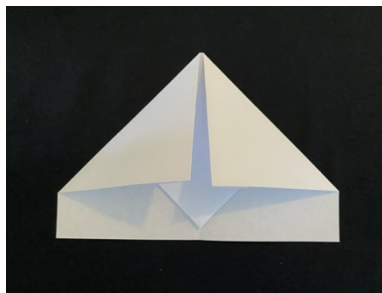
3. Fold the top corners down so they meet at the center crease.

4. Fold the entire top of the paper down, leaving a half-inch space at the bottom (the point should not evenly meet the bottom edge).

5. Fold the newly-created top corners down so they meet in the middle. You should be able to see a small triangle beneath these two new triangular folds.
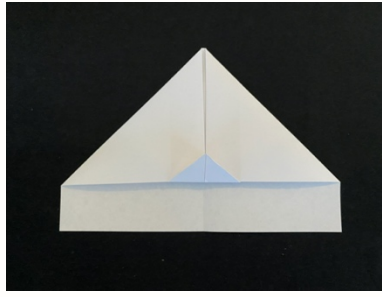
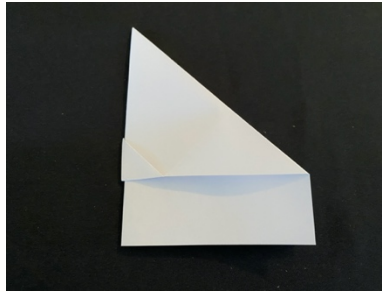6. Fold this small triangle up to hold the previous folds in place.
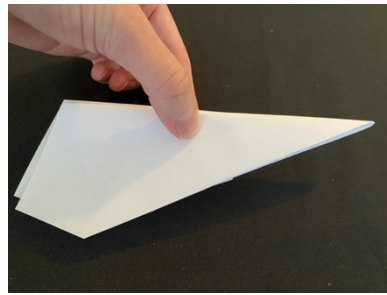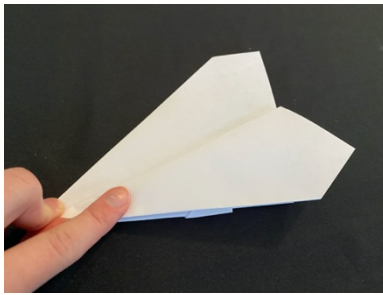
7. Fold the entire paper in half, making sure the previous triangular fold is visible on the outside.

8. Fold the wings down on each side so that their edges meet the bottom edge of the airplane.

9. Your plane is ready to fly! Give it a few test flights before moving on to the next part of the activity.

Part 2: Design a paper airplane launcher
1. Collect a rubber band, paperclip, and a stapler or tape.
2. Staple or tape a paperclip to the nose of your paper airplane. The outer straight part of the paperclip should point backward, parallel to the bottom edge of the plane, so it can serve as a hook to attach to the rubber band.
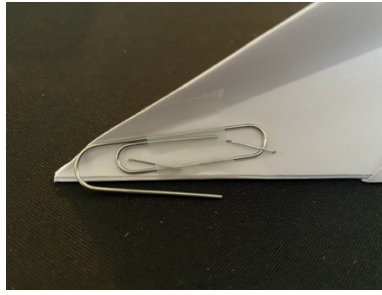
3. Try to launch your airplane using a simple catapult. Hook one end of the rubber band around the paperclip and the other end around your index finger. Aim the plane forward, pull back, and release! It might take a bit of practice, but you should notice that your plane flies much farther and faster when it has a launcher to help it.

4. How can you make your airplane launcher even better? What happens if you use a pencil or wooden dowel instead of your index finger? Or, can you use items from around your house to construct a paper airplane launcher that is more permanent and sits on a table? Check out the photos below for inspiration!
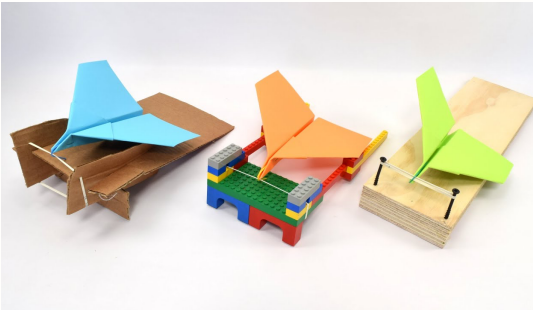
STEM Explanation:

Did you know that a paper airplane is considered a special type of aircraft? An aircraft is simply a "machine capable of flight." But how is something that you make out of just paper able to fly? It has to do with the "four forces of flight" and aerodynamics. The four forces of flight acting on your paper airplane are thrust, lift, drag, and gravity, and they work together with an aerodynamic design to help your plane fly through the air!

Thrust and lift are the two forces that work to get your plane into the air and keep it there. You provide the plane's initial thrust as you launch it forward with your arm. Then, the force of lift comes into play. As your plane flies, air surrounds it on all sides. If the air below the wings is pushing up with more force than the air above the wings is pushing down, the plane will remain lifted in the air. Drag and gravity work against thrust and lift to cause your plane to fall to the ground. The force of drag results from wind resistance that your airplane encounters during its flight and causes the plane to slow down. Gravity is the force that pulls everything towards the ground—including your airplane.

To make a paper airplane fly the farthest, you want to maximize thrust and lift and minimize drag and gravity. To learn how to change these forces, let's consider aerodynamics. First, try and wave your hand out in front of you with your palm facing sideways (perpendicular to the ground). Then, try to wave your hand with your palm facing down (parallel to the ground). Notice a difference? Your parallel hand is more aerodynamic than your

perpendicular hand… it can move through the air more easily! The same thing happens with your paper plane. Aerodynamic shapes that easily slice through the air have less drag, and paper planes with wings that are able to "catch" air have increased lift. Also, planes made with lighter materials have less gravity pulling them down, and increasing the amount of force you use to throw the plane—by using a launcher—provides more thrust.

Career Connection:

Aerodynamicists are engineers who specialize in aerodynamics, or, the study of how air moves around objects. They design and construct the safest and most efficient vehicles that travel through the air.

Resources:

https://www.scholastic.com/teachers/articles/teaching-content/what-makes-paper-airplanes-fly/
https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-aerodynamics-k4.html
https://www.artofmanliness.com/articles/how-to-make-the-worlds-best-paper-airplanes/
https://www.scientificamerican.com/article/build-a-paper-airplane-launcher/

Image Sources:
https://deceptivelyeducational.blogspot.com/2014/07/how-to-make-paper-airplane-and-launcher.html
https://www.scientificamerican.com/article/build-a-paper-airplane-launcher/
https://learn.adafruit.com/paper-airplane-launcher-with-CRICKIT