

Tiny Gliders

Up, up, and away! Design, build, and test a teeny-tiny aircraft to learn about the four forces of flight.

TEKS:

SCI 4.7: Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions. The student is expected to plan and conduct descriptive investigations to explore the patterns of forces such as gravity, friction, or magnetism in contact or at a distance on an object.

SCI 4.8: Force, motion, and energy. The student knows that energy is everywhere and can be observed in cycles, patterns, and systems.

SCI 4.8.A: The student is expected to investigate and identify the transfer of energy by objects in motion, waves in water, and sound.

SCI 5.7: Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions.

SCI 5.7.A: The student is expected to investigate and explain how equal and unequal forces acting on an object cause patterns of motion and transfer of energy.

SCI 5.7.B: The student is expected to design a simple experimental investigation that tests the effect of force on an object in a system such as a car on a ramp or a balloon rocket on a string.

Materials:

- Cotton swab
- Notecard or construction paper
- Scissors
- Tape
- Water

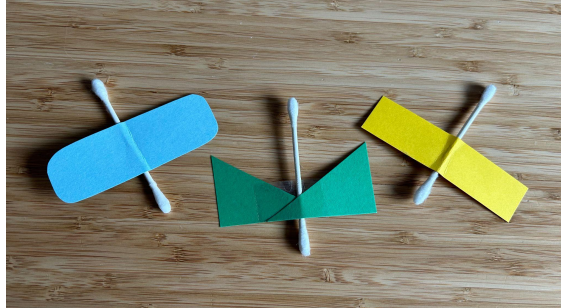
How To:

1. Cut wings for the glider out of the notecard or construction paper. Get creative with your glider's wing shape! Use the photos below for inspiration.

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2. Tape the wings to the center of the cotton swab.
3. Soak one end of the cotton swab in water. This is the front of your glider.
4. Throw the glider through the air and see how far it flies!
5. What adjustments could you make to your glider to make it fly even farther? Can you add a second set of wings? How about a tail? Read through the STEM Explanation below for inspiration.

STEM Explanation:

How did that tiny glider fly through the air? It has to do with the “four forces of flight” and aerodynamics. The four forces of flight acting on your tiny glider are thrust, lift, drag, and gravity, and they work together with an aerodynamic design to help the glider fly through the air!

Thrust and lift are the two forces that work to get your glider into the air and keep it there. You provide the glider’s initial thrust as you launch it forward with your arm. Then, the force of lift comes into play. As your glider 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 glider will remain lifted in the air.

Drag and gravity work against thrust and lift to cause your glider to fall to the ground. The force of drag results from wind resistance that your glider encounters during its flight and causes it to slow down. Gravity is the force that pulls everything towards the ground—including your tiny glider.

To make the glider fly the farthest, you want to maximize thrust and lift and minimize drag and gravity. To learn how to change these forces, it’s important to 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!

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The same thing happens with your tiny glider. Aerodynamic shapes that easily slice through the air have less drag, and gliders with wings that are able to “catch” air have increased lift. Also, gliders made with lighter materials have less gravity pulling them down, and increasing the amount of force you use to throw the glider 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.youtube.com/watch?app=desktop&v=-lBsPFqefDw&ab_channel=ToyTrainTime

<https://howthingsfly.si.edu/forces-flight/four-forces>

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