

Cup Flyer

A high-flying device! Explore how the Magnus effect causes changes in air flow as you launch cups into the air.

TEKS:

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

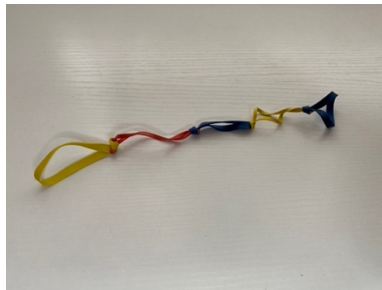
SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.

Materials:

- 2 disposable cups
- 3-5 rubber bands
- Tape

How To:

1. Make a chain of rubber bands that is approximately 12 inches long (3-5 rubber bands).



2. Tape the two disposable cups together, base to base. This is the flyer.
3. Hold the flyer and use your thumb to hold one end of the rubber band chain in place on the center of the flyer.
4. Firmly wrap the rubber band chain around the center of the flyer, overlapping each wrap so that the rubber band stays in place. Make sure you are wrapping the rubber band as tightly as you can (without breaking the cups).

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5. After you've wrapped almost all of the rubber band chain around the flyer's center, pinch the free end of the rubber band between your thumb and pointer finger.
6. Hold the flyer so that the rubber band comes off the underside of the flier, pulling the flyer back with your other hand.
7. Pull back on the flyer as tight as you can (again, without breaking the cups).
8. Aim the rubber band forward, let go, and watch the flyer soar!



STEM Explanation:

Although you aimed the flyer sideways, you might have noticed that the cups actually flew up into the air! Why did this happen? The rubber band launches the cup forward *and* causes it to spin backward. When a backward-spinning cup flies through the air, there is a thin layer of air that also gets pushed backward, and then down towards the ground. The thin layer of air traveling towards the ground represents a downward force. Newton's Third Law of Motion states that for every action there is an equal and opposite reaction. This downward force of air causes an upward force on the cups! Known as the Magnus effect, this trick helps pitchers throw baseballs that curve in the air and soccer players launch balls that can swerve sideways into the net. See what happens if you launch the flyer sideways: does it curve to the side? Does its flight path change if you use different-sized cups or cups made of a different material?

Career Connection:

Aerospace engineers design and build spacecrafts, missiles, airplanes, satellites, and more! They create and test all types of flying machines, ensuring these vehicles are safe and effective for space exploration, transportation, communication, and defense.

Resources:

<https://www.sublimescience.com/free-science-experiments/spinning-cups-flyer/>

<https://www.exploratorium.edu/snacks/curveball-demonstrator>

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