Curiosity Guide #307
Rockets

Accompanies Curious Crew, Season 3, Episode 7 (#307)

Crazy Balloon

Investigation #2

Description

Use Newton's third law of motion to make a balloon behave itself!

Materials

- 9-inch balloon
- Construction Paper
- Scissors
- Ruler
- Tape
- 6 paper cups
- Tweezers

Procedure 1: Test the balloon

1) Stack up a pyramid of 6 paper cups to serve as a target.
2) Blow up the balloon.
3) Try to hit the target with the balloon from 5 feet away.
4) Could you hit the target?

Procedure 2: Make and test modifications

1) Measure and cut a strip of construction paper that is 3 inches long and half an inch wide.
2) Roll the paper strip into a slender tube.

3) Insert the tube in the neck of the balloon. Let the tube expand so that the tube unrolls and contacts the circumference of the opening.
4) Using a pair of tweezers, grasp the center end of the paper loop and gently pull it back out. This should create a paper spiral cone.
5) Completely tape the paper cone and neck of the balloon so that this area is stiff. Leave a small hole in the bottom of the cone so that air can be blown into the balloon.
6) Carefully blow up the balloon.
7) Aim for the target again. Let the balloon go.
8) Could you hit the target this time?

My Results

Explanation

When the balloon is first released, the balloon's shape is constantly changing. The neck of the balloon is flexible and wiggles as the air discharges. Newton's third law of motion states, "Every action produces an equal and opposite reaction." As the air goes out one way, the balloon travels the other way, but because the neck of the balloon wiggles so much, the flight is very hard to control.

Adding the paper cone in the neck of the balloon reduces the amount of wiggling and improves the stability of the flight path.

Think further: Have you ever wondered how a rocket can lift off the ground, or why a blown-up balloon flies around the room when you let the neck of the balloon go? In both cases, energy comes out of a nozzle on the bottom. When that happens, an equal and opposite force pushes the rocket the other direction. We call this upward force **thrust**. If the downward force is strong enough, the upward force will be greater than the force of gravity, and the rocket will lift right off the launch pad. 3…2…1…Blast Off!

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