



## Curiosity Guide #307

### Rockets

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

#### Multi-Staging Balloons

Investigation #4

##### Description

Make a model that shows why rockets have multiple parts that drop off in stages.

##### Materials

- 2 long balloons
- 1 Styrofoam cup
- 2 straws
- Scissors
- Tape
- String

##### Procedure

1. Cut a length of string about 20 feet long.
2. Thread the string through two straws.
3. Tie one end of the string to a door knob or chair. Tie the other end of the string to a second chair.
4. Position the chairs so that the string is stretched tight.
5. Slide the back straw along the string so that the back straw is near a chair. Slide the front straw in front of the back straw.
6. Poke a hole in the side of the cup with the tip of the scissors.
7. Use the poked hole to start a cut with the scissors. Cut the upper half of the cup away to make one continuous foam ring.

8. Cut four pieces of tape about 2 inches long. Drape 2 pieces of tape over each straw, about 4 inches apart. Let the sticky ends of the tape hang below the straws.
9. Slip a balloon through the foam ring. Blow the balloon up a little over halfway. Pinch the neck to keep the air inside.
10. Hold the first balloon neck close to you on one side of the ring. Slip the end of the end of the second balloon through the ring. Blow this balloon up as well.
11. As the second balloon inflates, it will press against the first balloon so that the second balloon will no longer need to be held.
12. Carefully place the two inflated balloons under the straws and secure the tape.
13. When ready, let go of the first balloon.
14. What happens?

## My Results

## Explanation

Once the first balloon deflates, it is left behind along with the foam ring. The second balloon then takes off, traveling further. This idea is called multi-staging. Because a rocket requires so much fuel to get into space, it is more efficient to simply drop off parts of the rocket in stages. Multi-staging reduces the overall mass of the rocket and allows the rocket to propel that much higher.

**Think about this:** You may find this fact hard to believe, but rockets have been around for over 800 years! Although the first rockets in China were not very effective, eventually Chinese rockets became spectacular fireworks. By the 1600's, people realized that the rockets could go even higher if a small rocket was attached to a bigger one. Once the big rocket was finished, the smaller one would ignite and go even higher! This is called **staging** or **step rockets**.

Staging worked so well that our space shuttles work the same way. When the solid rocket boosters are empty, they drop, open parachutes, and fall in the ocean to be reused. Then the tank is dropped. The tank tears apart in the atmosphere. Rocket staging is amazing!

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