

Bag Balloons

Activity Objectives

- To demonstrate that heat can change air
- To determine that hot air rises
- To construct a working model of a hot air balloon

Background

Hot air balloons are one type of aircraft. The four categories of aircraft are airplanes, gliders, rotorcraft, and hot air balloons. In this activity, students construct a working model of a hot air balloon.

There are two ways a balloon can rise. It can (1) be filled with a gas that is lighter than air, such as helium, or (2) it can be inflated with air that is heated sufficiently to make it “lighter” than the air outside of the balloon.

Helium is the second-lightest element, and the main sources for helium are natural gas fields (especially those in Texas, Oklahoma, and Kansas). Heating air makes it less dense, rendering it essentially “lighter”. Gas balloons and hot air balloons float because they are lighter than the air they displace.

Materials

- ✓ Plastic bag (dry cleaner bag or five-gallon trash bag)
- ✓ Paper clips (used for weight)
- ✓ Small pieces of paper or stickers (decorations)
- ✓ String
- ✓ Hair dryer (for heat source)
- ✓ Party balloons

Instructions

1. Divide the class into groups of four, and provide each group with a set of materials.
2. Have the students decorate their plastic bags. Decorations should be small and light, such as small scraps of paper or stickers.
3. Have the students tie a string around the top of the plastic bag.

4. Add paper clips evenly spaced around the bottom of the plastic bag.
5. Have the students hold the plastic bag over the hair dryer (on the high setting) and let the plastic bag fill with hot air.
6. The plastic bag becomes buoyant as it fills with hot air. When the students feel the bag tugging, have them release it. The hot air inside the balloon is lighter than the air in the classroom and begins to float.

Discussion

Have the students identify the different parts of the hot air balloon – plastic bag (hot air balloon); hair dryer (heat source); paper clips (weights for balance and stability).

Ask the students to explain why the hot air balloon works. The hot air balloon rises when the air inside the balloon becomes heated. The heated air is lighter than the classroom air and enables the balloon to float.

Ask the students to tell how hot air balloons are different from balloons filled with helium. Helium is a gas that is lighter than air, even when it's not heated. Helium though, just like heated air, floats in the surrounding air because it's lighter. Helium should not be confused with hydrogen, which is an inflammable gas that was often used in balloons and airships until the explosion of the airship Hindenburg in 1937.

Have the students inflate a party balloon. Ask them to explain why it does not rise. A person's breath may be warmer than room temperature, but it is not hot enough to overcome the weight of the balloon.

Assessment

Using their actual models, have the students explain why their hot air balloons rise.

Extension

Have the students construct another hot air balloon using different sizes and types of plastic bags.

Have the students experiment with different sizes and numbers of paper clips to see the effects of weight on their model balloons.

Have the students research the part that balloons played in the history of flight.