

Blown Over

WEEK

3

Experiment: Air Cannon

Control the wind! Create a balloon-powered cannon that blasts a stream of air powerful enough to knock down obstacles.

MATERIALS (Small Version)

- 16-ounce plastic cup
- Large balloon (six inches or larger)
- Utility knife
- Dime
- Marker
- Scissors
- Tape
- Cotton balls or other lightweight items

MATERIALS (Large Version)

- Plastic trash can or pail
- Duct tape
- 2 bungee cords
- Trash bag or plastic shower curtain
- Electric jigsaw or utility knife
- Fog machine (optional)

INSTRUCTIONS

Place the cup upside down on your work surface and put the dime on the bottom of the cup in the middle. Draw a circle around the dime. Carefully cut the circle out using a utility knife.

Fully inflate the balloon once or twice to stretch it out, but do not tie it off. This will make it easier to stretch later. Use scissors to cut off the neck of the balloon. Stretch the balloon over the top of the cup and tape it in place around the perimeter. You should be able to pull the middle of the balloon back. When you let go of the balloon, a puff of air should shoot out the hole. This puff of air will travel straight for several feet.

Set up some lightweight targets and see if you can blow them away. Make a pyramid with plastic cups or a tower of empty boxes. What's the heaviest thing you can knock over with the power of wind? Place cups in a line—can you aim the air cannon at one and knock it over without moving the others?

To make the optional large version, use a large, plastic trash can and cut a round hole in the bottom with a diameter of about one-third the diameter of the bottom of the can. Measure and draw the circle first, and, depending on the material of the can, use a jigsaw or utility knife to cut the hole. Cut the trash bag into a circle that's bigger than the opening of the trash can. Place the bag over the opening and tape the edges to the sides of the can. It should be a little slack.

Stretch the bungee cords across the opening of the trash can in an X shape and hook them to the edges of the can. Tape the ends of the bungee cords to the can to keep them in place. To shoot the air cannon, turn the can on its side, pull the bungee cords back and let them go. If you have a fog machine, fill the trash can with fog and you can see the shape of the wind that's released.



WHAT'S HAPPENING?

When you snap the balloon, the air inside the cup is compressed and the only place for it to go is through the hole on the opposite end. As the air is forced through the hole, it makes a doughnut shape called a torus. This shape is created because the air leaves the hole at different speeds—the air at the center travels faster than the air at the outer edge, causing the outer edge of the moving air to roll backwards on itself. According to Bernoulli's principle, the faster air moves, the lower its pressure. The torus has higher pressure on the outside of the ring, which holds the shape together until it loses energy.

SAVE THE DAY!

Use your newfound power over the wind and show us what you can do! Record a short video clip of you using your air cannon to knock down a tower, surprise someone with a puff of air or other creative idea. Share it with us at summerbrain@msichicago.org or facebook.com/msichicago.

LEARN MORE

Explore the powers of wind and air in MSI's *Science Storms* exhibit.

RECOMMENDED READING

The Boy Who Harnessed the Wind, by William Kamkwamba

I Face the Wind, by Vicki Cobb

