

# DIY Vortex Cannon!

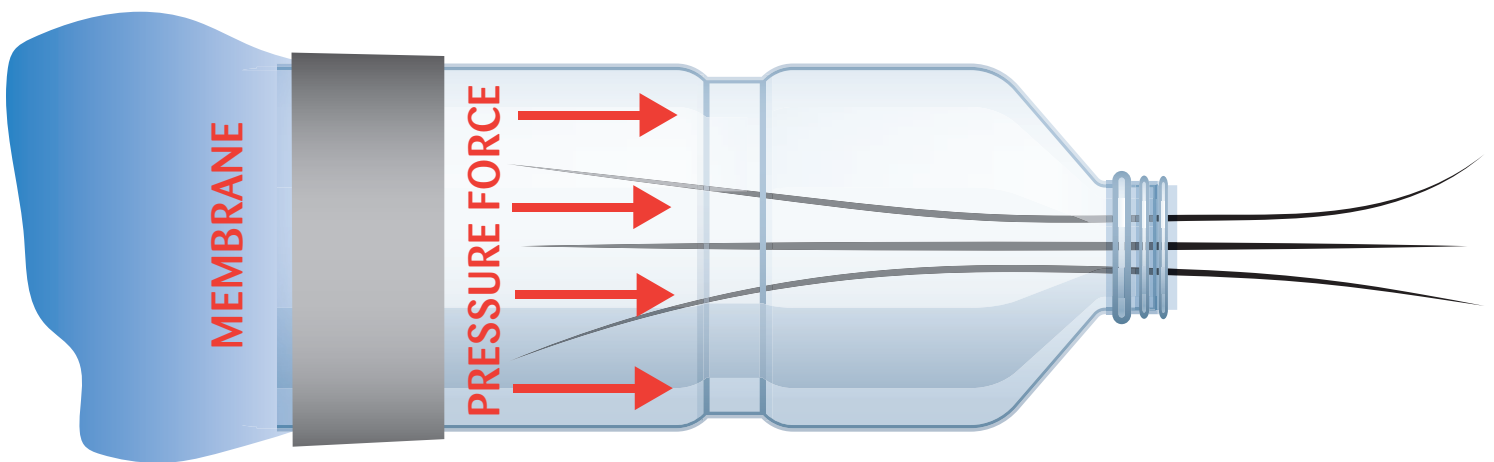
There is fluid moving around us all the time in the form of air. Our air is made up of a mix of different molecules of different gases - mostly nitrogen and oxygen, but small amounts of other gases too such as carbon dioxide, hydrogen and even water vapor. Air just like all other matter can move in response to force and can exert force on something else. The trick is being able to see it! Try building this vortex cannon which will allow you to apply force to air.

## What You'll Need

- Two-liter bottle
- Scissors
- Plastic bag
- Duct tape (other types of tape can work too)
- Paper or plastic cups

## What You'll Do

1. Cut the bottom off the two-liter bottle, about three inches from the end.
2. Cut a piece of the plastic from the bag large enough to fit over the cut end of the two-liter bottle with an inch to spare on all sides.
3. Tape the plastic bag over the cut end of the bottle. After the bag is taped into place, make sure you seal the edge with tape all around the bottle.
4. Press quickly on the plastic bag end. Did you see anything come out of the opening? Have someone hold their hand in front of the open hole and push on the end again. Did they feel anything?
5. Make a pyramid out of your cups. See if you can use your cannon to knock them over. Try it again from further back.





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## Try This:

- Can you make a vortex cannon that produces a stronger force? A weaker force? Try making one by cutting out a hole from the bottom of a paper cup, or use a one-liter soda bottle, or even a box or trash can! Try changing the size of the hole or material you use for covering your cannon.
- What affects the strength of the vortex cannon? Is it the size of the cut hole? The type of material you are pressing on? The size of the container it's made out of?
- So far you probably have only been able to feel the air moving. Try putting a little flour in your cannon and shaking vigorously. It should look like a flour cloud. Make sure to do this outside and try not to inhale the flour!

## What's Going On?

Your container, whether it's bottle, box or cup is filled with air molecules. When you press on the back of the material, it pushes or moves all those air molecules forward. Normally, it would be difficult to push air in one direction, but because the air is trapped in the container, when you push on the back, it only has one way to go. Although you can't see it, all those air molecules are forced forward in a single direction which push other molecules which then push other molecules! At the end of the container, the air molecules are forced out through the small opening which makes a narrow stream of air molecules. This feels like a puff of air!

Moving air can be very powerful! Where can you see it in action? Think about a hurricane or a tornado! That's a lot of force!

Cannon base	Distance from Target	# of cups knocked over
ex. 2 liter bottle	20 inches	1