

# HOW-TO GUIDE: Air Pressure Demonstrations

## Demonstration #1: Collapsing Can

This demonstration will show how rapid pressure changes can crush a can instantaneously. The total time for this demonstration is about 20-30 minutes.

### Step 1

Fill the large container with cold water and ice and set aside.



### Step 2

Add 1 to 2 tablespoons of water to the can and place the aluminum can on the hot plate or cook top. Heat the can until the water is boiling. You will see steam escaping from the can when it is ready, let it continue to boil for 15-30 more seconds.



**Caution:** Do not heat the can when it is empty. The heat may melt the ink on the can or the aluminum itself.

### MATERIALS NEEDED

- Large container or bowl
- Ice
- Hot plate (or electric cook top)
- Empty aluminum can (12 oz.)
- Water
- Pair of tongs

### Step 3

Using the tongs, grasp the can and quickly dunk it in the bowl of ice water. Make sure to dunk it with the opening face down into the water.



### What caused the can to crush?

Things, like wind, always go from high pressure to low pressure!

When the water in the can began to boil, the water vapor (steam) pushed air out of the can. Then when you dunked the can quickly into the cold water, all of the water vapor (steam) cooled and condensed back to liquid water. When the vapor condensed, it created a partial vacuum (extremely low pressure) and allowed the higher air pressure outside of the can to crush it.



**Warning:** The air pressure demonstrations require the use of a heating source like a hot plate or a stove burner and matches or a lighter. Children should not perform this experiment without adult supervision.



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# HOW-TO GUIDE: Air Pressure Demonstrations

## Demonstration #2: Egg in a Bottle

This demonstration will show the relationship between temperature and pressure by fitting a hardboiled egg into a flask and getting it out again without breaking the egg. The total time for this demonstration is about 20-30 minutes.

### Step 1

Hard-boil the egg by placing it in a pot of cool water and bring the water to a rolling boil. Remove the pot from the heat and let sit for 10-15 minutes. Cool the egg further by placing it in cold water for an additional 5 minutes.



### Step 2

Peel the shell off the egg.

### Step 3

Place the egg on the flask to show that it does not fit into the flask. Then remove the egg.



### Step 4

Fold up a small piece of paper so that it will fit into the flask. Light it on fire and drop it into the flask.



### Step 5

Quickly place the egg onto the mouth of the flask. Observe what happens.

### Step 6

Pour water into the flask to wash the ashes out of the flask and off the egg. Pour the water and ashes out.

### MATERIALS NEEDED

- 1 egg
- Stovetop
- Flask (1000 mL) (or any bottle with an opening just too small for an egg to fit)
- Small pot
- Lighter (or matches)
- Water
- Paper

### Step 7

Turn the flask upside-down so that the egg plugs up the mouth. Blow hard into the flask, with it nearly upside down. Observe what happens.



### Why was the egg forced into and out of the flask?

The egg will always go from high pressure to low pressure, just like the wind!

When the piece of paper is set on fire and dropped into the flask, it begins to heat the air. The heated air molecules spread out (some leave the flask). Once the egg is placed on the opening of the flask and the fire goes out, the air molecules cool and move closer together. This creates lower pressure inside the flask. Air with higher pressure from the outside attempts to get in the flask but cannot because the egg is blocking the opening – therefore, the egg is forced into the flask.

To get the egg out, blowing into the flask introduces more air molecules, creating higher pressure inside the flask than outside. The egg is then forced out of the flask in an attempt to even out the air pressure, the same reason it was forced into the flask.

**Warning:** The air pressure demonstrations require the use of a heating source like a hot plate or a stove burner and matches or a lighter. Children should not perform this experiment without adult supervision.