



# Tornado in a Bottle

Suggested Grades: K-8

## Activity Overview

In this activity, you will observe the creation of a water vortex by swirling water in a bottle. The swirling motion of the bottle creates a vacuum. The motion also creates a pathway for the air as the water moves the air mass below.

**Note:** You may need the help of an adult to make a hole in the soda bottle cap.

**Time: 20 minutes****Materials:**

- Two empty soda bottles, washed and with the labels removed (1- or 2-liter bottles work well), with one cap (The other cap can be discarded)
- Drill or other means of making a hole in the bottle lid
- Strong tape, such as duct tape or electrical tape
- Water
- Food coloring

## STEPS

1. Have an adult make a small hole (about 0.25 inches or 7 mm) near the center of the soda bottle cap. See *Figure 1*.
2. Using the duct or electrical tape, secure the cap upside-down onto the bottle so that the threads are exposed. See *Figure 2*.



Figure 1. Drill a small hole in the soda bottle cap



Figure 2. Attach the cap, upside down, to the top of one bottle

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3. Fill the other bottle 2/3 full of water and add a few drops of food coloring.
4. Connect the other bottle assembly to the top of the bottle with water in it. See *Figure 3*.



*Figure 3. Connect the bottles*

5. Invert the bottles so that the bottle containing the water is on top.

6. Start swirling the bottle assembly. **Caution: Do not shake!** As the rotational speed increases, a water vortex will form in the upper bottle and water will start flowing smoothly into the lower bottle. See *Figure 4*.



*Figure 4. Swirl the bottle to create the vortex*

The swirling water is creating a water vortex. The vortex is a funnel shape with a hollow center, just like a tornado. As such, the air from the bottle below can now pass unrestricted through the center of the vortex and into the bottle above.

# Background Information

Weather is the state of the atmosphere, including wind speed and direction, temperature, moisture and pressure. A pilot needs to consider these things while flying since they have a significant impact on the ability of both the airplane and the pilot to perform properly.

When flying long distances, it is quite common to take off and land in completely different weather conditions. Weather conditions also vary along the flight path. Since weather systems are often localized, conditions may change even if you have only flown a few miles. Before pilots take off, it is important that they fully understand how the weather will affect their flight. Some of the items most commonly checked before a flight are wind, temperature and pressure, clouds (height and type) and dew point. Pilots need to be especially aware of severe weather like thunderstorms, tornados and snowstorms.

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