

TORNADO IN A BOTTLE

Thursday, May 28, 2020

Citizens Bank® Phillies
WEATHER
EDUCATION @HOME

10 / FIRST ALERT WEATHER / 62 | PRIMERA ALERTA

NEED

- 2 emptied & cleaned 1-liter soda bottles
 - Water
 - Colored Lamp Oil (Optional)
 - Vortex Connector
- OR
- 1 metal Washer
 - Duct Tape

STEPS

1. Fill one of the bottles about three-quarters full with water.
2. If you have colored lamp oil, add a layer of that to the water. It should float on top.
3. If you have a vortex connector, twist the connector onto the water-filled bottle.
4. Twist the second bottle into the other side of the connector.
5. If you do not have a vortex connector, add the metal washer to the mouth of the water-filled bottle. Without covering up the opening, secure it to the bottle using duct tape.
6. Match the mouth of the second bottle to the mouth of the first, add more duct tape to secure. They should be stacked on top of each other.
7. Flip your two bottles, so the water-filled one is on top and the empty bottle is on bottom.
8. Spin the bottles in a clockwise motion.
9. Watch what happens: You should see a "tornado" (vortex) form.

WHAT HAPPENED?

You made a vortex! In this case, the vortex is the spinning of the liquid along a center line. The spin is maintained thanks to centripetal force. The lamp oil is less dense than the water, so it floats on top of the water and drains first when the vortex forms (this highlights the shape of the vortex). When the water & oil-filled bottle is flipped to the top, gravity pulls the liquid downward into the empty bottle. Without spinning the bottle, the water would just "glug-glug" out of the top bottle into the bottom bottle. The "glug-glug" is caused because air and water would take turns swapping bottles. However, when the bottle is spun, the air can enter the top bottle while the liquid flows into the bottom bottle. This speeds up the process and makes a vortex.

Similar to the vortex in our bottles, tornadoes also have upward and downward motions known as "inflow" and "outflow". Tornadoes are quickly-spinning tubes of air that drop out of thunderstorm clouds and connect to the ground. Tornadoes typically look brown due to the dust and debris they pick up in the column of spinning air (like a vacuum!).