Air Vortex Cannon

Suggested Grades: 3–8

Activity Overview
An air vortex is a spinning mass of air and is created by an airplane's wing. In this activity, you will build an air vortex cannon that creates a blast of air.

Note: For this activity you will be making a hole in the bottom of a cup. You may need to ask an adult to help you with this. It also might be helpful to have someone else help you stretch and tape the balloon to the cup.

Time: 45 minutes

Materials:
- Plastic cup
- Balloon
- Tape—strong tape, such as duct tape, works best
- Scissors

STEPS

1. Begin by gathering the materials you will need as shown in figure 1.

Figure 1. Gather the materials needed for this activity.

2. In the bottom of the cup, cut a hole as shown in figure 2. The hole should remove approximately ¾ of the cup's bottom.

Figure 2. Cut a hole in the bottom of the cup.

3. Blow up the balloon and then let the air back out of it. This helps loosen up the balloon.

4. Tie the bottom of the deflated balloon as shown in figure 3.

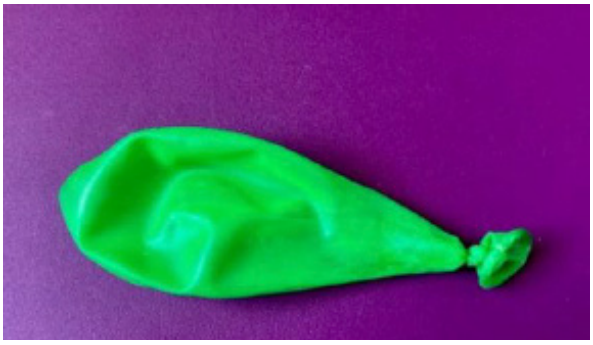

Figure 3. Tie the bottom of the deflated balloon.

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5. Cut of the top third of the balloon as shown in figure 4. Discard the top third (the portion of the balloon that is not tied).

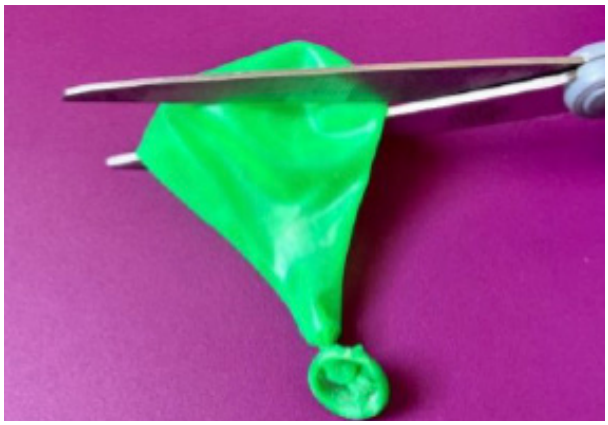

Figure 4. Cut off the top 1/3 of the balloon.

6. Stretch the balloon over the top of the cup. Make sure the end that has been tied is facing outside the cup as shown in figure 5.

Figure 5. Stretch the balloon over the top of the cup.

7. Secure the balloon to the cup using the tape as shown in figure 6. It might be helpful to have someone help hold the balloon while you secure the tape.

Figure 6. Use the tape to secure the balloon to the cup.

That's it! To operate the air vortex cannon, hold the cup in one hand. With the other hand, pull back on the tied part of the balloon as shown in figure 7. Release the balloon and a blast of air comes out of the opening in the bottom on the cup.

Figure 7. Pull back the tied part of the balloon and then release.

Have fun experimenting with your air vortex cannon! Try pulling the balloon more or less to see how it affects the air blast. Come up with a way to see how far the blast of air goes. You can also get another cup and try making a different sized hole in the bottom. Does the size of the hole affect the air blast?

Try setting up small paper tents or other lightweight items and see if you can knock these over with a blast of air.

Why this works: When you pull the balloon back, you are pulling more air inside the cup. When you let go, the air is quickly pushed towards the bottom of the cup. The air in the middle of the cup travels faster than the air near the outside of the cup. This produces a difference in air pressure which is why the air vortex is created.

Background Information

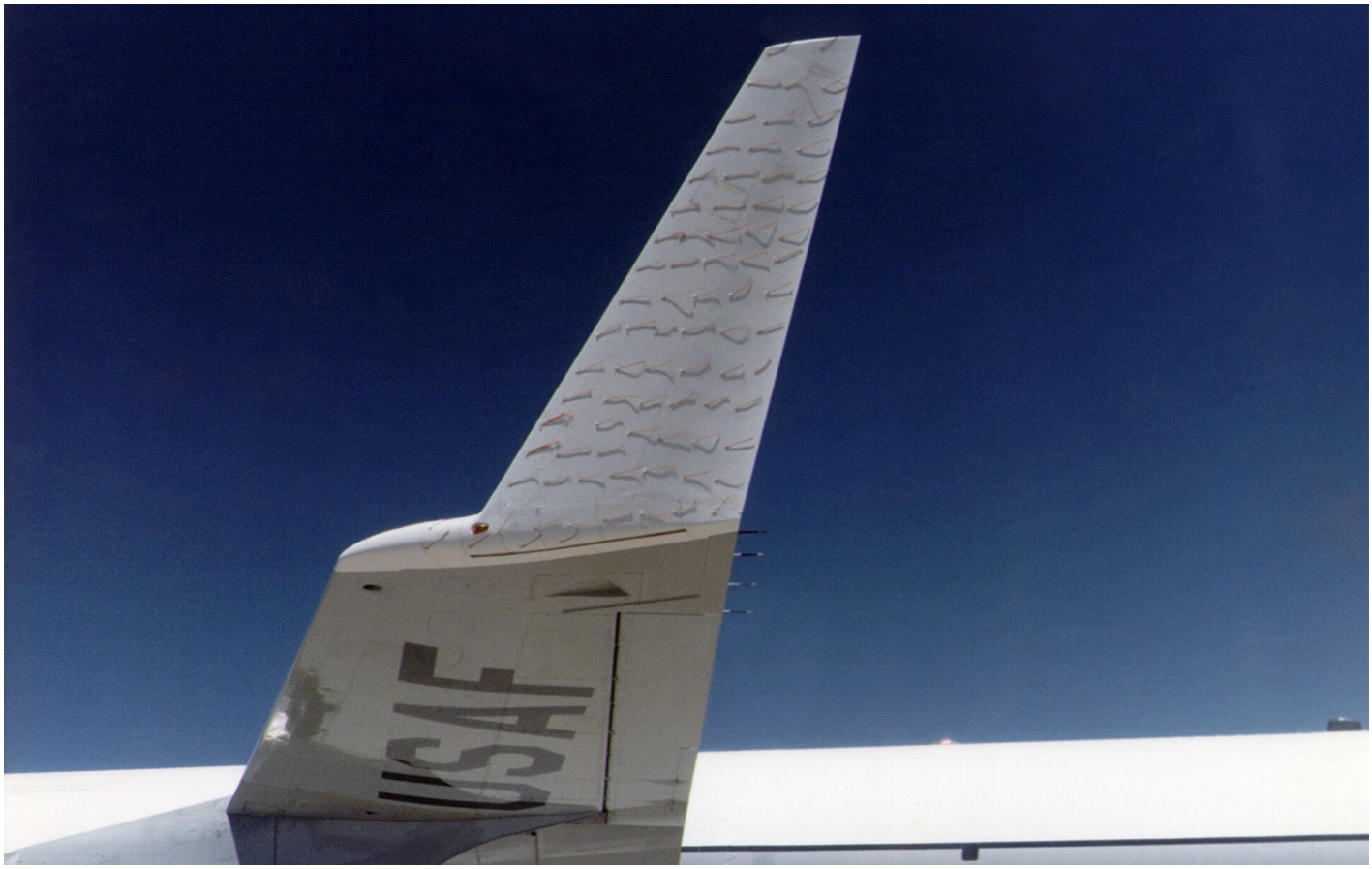

Figure 8. Winglets help reduce air vortexes.

Have you ever seen an airplane wing that has the ends of the wings bent upwards? These are called winglets and were developed by NASA and its partners. They can now be found on many different types of airplanes around the world.

A large part of NASA's mission is helping protect the environment. Making more fuel efficient airplanes is an important part of this. To increase efficiency, NASA studies the movement of air around the wings of airplanes, including air vortexes created when air flows over the wing.

Winglets help reduce the vortexes created at the ends of airplane wings, making the airplane more efficient. As a result, the planes burn less fuel and give off less harmful emissions.

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