

SOUND EFFECTS

Principles of Sound



Activity Overview

In this activity, students will learn about the basic principles of sound and how to amplify and reduce sound volume. Students will construct a speaker to amplify sound and then find a solution to reduce the volume. Students should be familiar with the basics of sound. Introduce the topics of noise pollution and ways NASA quiets aircraft noise.

Optional: Watch this instructional video prior to starting the activity.

<https://youtu.be/ennpLpYMPv8>

STEPS:

- 1 (Optional) Divide students into teams of 2-3 and assign job duties. Suggestions include:
 - Project Manager: Oversees the design, ensures design parameters are met, keeps track of time, coordinates decision-making.
 - Lead Engineer: Leads device construction
 - Lead Scientist: Takes measurements, assesses devices for defects, leads device tests
- 2 Find the center of the paper towel roll and trace the end of the phone with a pencil. Use scissors to cut out the shape and make sure the phone fits snugly into the cutout.
- 3 Trace the end of the paper towel roll on the sides, near the bottom, of the two plastic cups.
- 4 Cut out the holes you traced and insert the ends of the paper towel roll into each cup. (See Figure A)
- 5 Without putting the phone into the paper towel roll, play a consistent sound on the phone, like white noise, and listen carefully to the volume.
- 6 Insert the phone into the paper towel roll and note any differences in the sound volume.
- 7 If a sound meter and/or oscilloscope are available, measure the difference in sound levels when you hold the phone and when you use the speaker device.

CHALLENGE: Design a muffling device that can quiet the noise coming from the cups, which represent the engines of an aircraft. Remind students to leave an opening in their device to allow for engine exhaust. Test the muffling devices using a sound meter. Give students a chance to discuss how well their muffling devices worked and allow them to make improvements.

ASK: How do scientists reduce engine sound in planes and cars?

RESEARCH: Noise pollution, NASA-developed aircraft chevrons, automotive mufflers, turbulence, sound dampening



Middle School Activity

Materials:

- Paper towel tubes
- Disposable plastic cups
- Scissors
- Tape
- Pencil/Pen
- Muffling Materials (i.e. Styrofoam cups, paper, fabric, etc.)
- Smartphone or similar device

Suggested Items:

- Sound/Decibel meter
- Oscilloscope (app versions available)

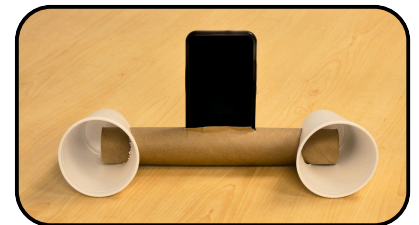


Figure A. A constructed speaker with phone.



Connections

Gas engines in cars make a LOT of noise! When hot gas exiting the engine meets the cooler outside air, it creates pulses of pressure and vibrations that we hear as loud noise.

Mufflers make cars quieter by absorbing and redirecting the vibrations from the engine. Different kinds of mufflers can change the way your car sounds, too!