

DESIGNING QUIETER SPACESHIPS AND HABITATS

ASTRO CUP

INTRODUCTION

As more people start living and working in space, we have to design our crew capsules and space habitats to keep people comfortable. That doesn't just mean comfy beds and space-sweatpants but also includes what our work environments and new homes will sound like on the inside.

First, astronauts have to get to space using rockets, which generate a large amount of noise inside the crew capsule. Once they're in space, astronauts are busy tending to many tasks. They perform daily tasks including science experiments, sleeping in temperature-controlled modules, navigating in near Earth orbit, preparing meals, and exercising. The equipment required to accomplish these tasks in the spacecraft can generate constant noise and high-pitched tones that need to be quieted down to keep passengers comfortable in a small space.

Your mission is to take on the role of an acoustic engineer and investigate different materials that will keep your crew capsule noise at a quiet, comfortable level.

MATERIALS:

- 2 cups (we suggest using a 12-16 oz. plastic or paper cup). One will be your control cup and the second will be your capsule-cup to test out materials.
- 3-6 different everyday household materials that will fit inside your crew capsule cup (e.g. paper, cotton, recycled cloth, tin foil, foam, bubble wrap—you decide).
- Choose 2 space sounds:
 - Space Sound Option 1: Access [this link](#) to hear NASA's historic sound of the Saturn V launching.
 - Space Sound Option 2: Access real ISS sounds with [this link](#).
 - Other options: Research your own space sound or have a friend make a sound for you, like singing a song. Make sure you can repeat the same sound over and over.
- Data table provided below to track your results.

INSTRUCTIONS

Research different types of materials scientists use to make sounds quieter and louder. Make notes of the materials you find. What sort of equipment or different methods are they using to research sound? How are they recording their research?

Decorate your test cup to look like a crew capsule. You can use [Blue Origin's New Shepard crew capsule](#) as inspiration. If you're using a paper cup you can draw your design directly on your cup. If you're using a plastic cup, draw it on a piece of paper, then cut it out and tape it on your cup to create a capsule-cup!

- Without any material inside, place the mouth of your control cup over your ear and play your space sound at a medium level. You don't want it so loud that you'll hurt your ear. Remember the way it sounds.
- Next, fill your capsule-cup with your first material. Make a note on your data table documenting which material you used.
- Place the capsule-cup with the material inside over your ear and play the same sound again. You can use the control cup at any time to help with comparisons. Make a note on your data table if the material you used made it louder, the same, or quieter.
- Repeat for different materials and fill out your data sheet with your findings.
- Repeat the experiment for Space Sound 2, fill out your data sheet, and compare your results.

REFLECTION QUESTIONS

- Which material made your capsule quieter. Was there a material that made it louder? If so, which one?
- After listening to each sound, how did it make you feel? Do you think different noises can make people feel differently? Explain your answer.
- What do you think would happen if you added a window to your capsule? Are there any tradeoffs to having a view, does the sound change?
- Draw your vision for a rocket or space habitat that keep sounds quiet. Label where you would put scientific equipment, the gym, and sleeping areas.

EXTENSION

Send your quiet rocket or space habitat design to space!

Cut out the postcard below and draw your design on the blank side. Put your address and a stamp on the front, place it in an envelope and mail it to: Club for the Future / PO Box 5759 / Kent, WA / 98064. Blue Origin will send it to space and back onboard a future flight of its New Shepard rocket. The postcard will then get stamped 'Flown to Space' and mailed back to you for a special space-flown keepsake.

RESEARCH DATA GOES HERE:

DATA GOES HERE

	Material	Louder	Same	Quieter
Sound 1				
1				
2				
3				
Sound 2				
1				
2				
3				

REFLECTION RESPONSES GO HERE:

On the blank side, draw or write your design for a quieter spaceship or space habitat. Label where you would put the scientific equipment, the gym, and the sleeping area. On this side, write a message, your address, and add a stamp

We may want to post your artwork online! Have your parent or guardian sign below to grant permission.

Parent/guardian

Parent/guardian (printed)

www.clubforfuture.org

CLUB FOR THE FUTURE

Place
Stamp
Here

Your Name

Your Street Address

City, State / Province

Zip Code

Country