

Sweet Dreams Are Made of These

Hands-on Activity for Understanding Radiation Shielding

Student Activity Sheet

Time

30-40 minutes

Materials and Preparation

- 6- 4'x8' sheets of insulating Styrofoam (These can be found at your local home center for \$3-\$5 a piece and are often applied under vinyl siding.)
- 4 rolls of heavy masking tape (1-1/2"-2")
- Paper
- Pens or pencils
- Silicon glue
- Box-cutter type knife to cut the Styrofoam

Key Question

How can NASA engineers use the fewest resources to maximize protection against radiation?

Background

On Earth the layers of our atmosphere help protect us from the sun's most deadly forms of radiation. At 250 miles above Earth, dangerous forms of radiation constantly strike the space station, especially during violent solar storms. The space station's outer layer can repel or absorb some low-energy forms of radiation. High-energy radiation, however, can get through the space station's protective layers.

Effective shielding depends on the type and thickness of the material used. Different types of radiation require different shielding materials. Finding a type of shielding that protects the astronauts from the radiation found in space was a challenge. Another challenge was to determine exactly the right amount of shielding to use. Too much shielding took up too much space and was too difficult to transport to the space station. Too little shielding did not provide enough protection.

Scientists found that any material rich in hydrogen, such as polyethylene, makes very good shielding material. Polyethylene bricks measuring 1"x14"x14" can be transported easily into space in a rack on the space shuttle. Once at the space station, the bricks should be strapped together.

Part One: Designing a Sleep Station

PROCEDURE

(Sketch your work below)

- 1 In your teams sketch out what your sleep station will look like. Keep in mind that three sides will be closed and one will be open. The two open sides allow the astronaut to get in and to get air. You will also want to make sure that a crew member will be able to sleep inside.
- 2 Using your design sketch, build a model of the sleep station according to your specifications. Use heavy masking tape to connect the panels together. **DO NOT USE DUCT TAPE!**
- 3 Choose one member of your team to present your creation to the class. Compare the designs to see ways in which you could improve your own model.

QUESTIONS

1. How many squares did you use? Is this the absolute minimum required for an effective sleep station?
2. How did you link the squares? Is there a way to link them to avoid any radiation leaks through small cracks?
3. How did you determine the general size of the sleep station?
4. Use a dictionary to find the meaning of the word “ergonomics”. Would the study of ergonomics be useful in designing a sleep station? Explain.