# Sweet Dreams Are Made of These

**Hands-on Activity for Understanding Radiation Shielding**

**Teacher Activity Sheet**

## Time

30-40 minutes

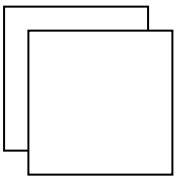
## Materials and Preparation

- **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**

Teacher Preparation

1. Using a sharp knife, cut the Styrofoam into 1' x 1' squares. You should end up with 192 squares.

2. Take 2 squares and place one on top of the other, leaving a lap joint of 1-1/4"-1-1/2" on 2 sides.



3. Carefully glue the 2 squares together to form a "brick". Be as neat as possible!

4. Continue to make these "bricks" until all Styrofoam is used. You should have 96 "bricks" when you are finished.

5. Divide the class into four teams.

## 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 four sides will be closed and two 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?

   *Students should supply these answers. This requires critical thinking skills.*

2. How did you link the squares? Is there a way to link them to avoid any radiation leaks through small cracks?

   *You can evaluate the model according to several criteria:*
   *Were there holes or cracks in their model?*
   *Was the model designed according to criteria?*

3. How did you determine the general size of the sleep station?

   *Answers will vary, but should reflect critical thinking skills.*

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.

   ***Ergonomic:*** *designed for maximum comfort, efficiency, safety, and ease of use, especially in the workplace*

   *Ergonomics would be helpful in designing a space sleep station because a thorough study of the conditions and requirements of sleeping in space would provide for a more effective and comfortable sleeping arrangement.*