


BE A STEM GIANT



A STEM Alliance Program

AEROSPACE ENGINEERING: TOUCHDOWN

Description:

NASA Engineers faced many challenges when developing space crafts for landing on the moon safely. The key is: shock absorption. What do we mean by that?

Materials:

- Masking tape
- 3 rubber bands
- 3 index cards
- 5" x 5" cardboard or poster board
- 4 straws
- Scissors
- 10 mini marshmallows
- 2 Marsh-o-Nauts (marshmallows of normal size with drawn in faces)
- 1 small 2 ounce cup that can hold the Marsh-o-Nauts
- Tape measure or yardstick

The STEM Alliance
is dedicated to growing the next
generation of STEM GIANTS.

Learn more:

www.theSTEMalliance.org



Creating a network of STEM learning opportunities!

Let's do an experiment to better understand *shock absorption*:

Try jumping up into the air without bending your knees. Did you feel a little jolt through your legs when you landed? The cartilage between the bones of your knees absorb the energy of the impact so you don't feel pain in your legs. That's called Shock Absorption. Soft things like cotton balls, bubble wrap, packing peanuts do the same thing to prevent breakage of items they are protecting.

DIRECTIONS FOR THE TOUCHDOWN DESIGN CHALLENGE:

1. **Define the problem and brainstorm:** What kind of shock absorber can you make from the materials listed to help soften the landing? How will you make sure the lander doesn't tip over as it falls through the air?
2. **Design:** Taking all the materials, develop a lunar module prototype to test your shock absorbers. Keep in mind that if you put tape over the cup to prevent the Marsh-o-Nauts from falling out of your lunar module, you will not be able to test if your design works
3. **Test:** Using a yardstick or tape measure, hold your lunar module upright and drop it from 1 foot. Then try it from 2 feet. Keep trying to go higher and higher to see if your design works to keep your Marsh-o-Nauts safe!!
4. **Evaluate and Improve:**
 - a. Did your Marsh-o-Nauts stay in the spaceship?
 - b. What do you do if your module tips over when you drop it?
 - c. What can you do to improve your design if it bounces instead of landing softly?



SEE PAGE 2 FOR HELPFUL TIPS!



For more information about
the Apollo Lunar Module, visit
www.discoveryspace.org



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SUGGESTIONS FOR THE TOUCHDOWN DESIGN CHALLENGE

1

Tape the cardboard to the cup as a base, and make the parts below the platform weigh more than what's on top. This will help the lunar module fall straight down.

2

Take two index cards and fold them like an accordion. This spring will help absorb the shock of your lunar module.

3

Straws can provide a flexible structure.

4

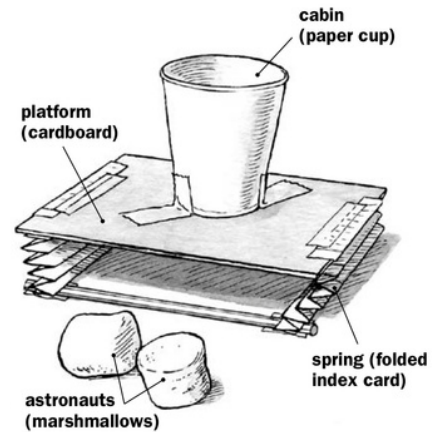
Use the mini marshmallows as soft footpads.

5

Rubber bands can flex and hold things together.

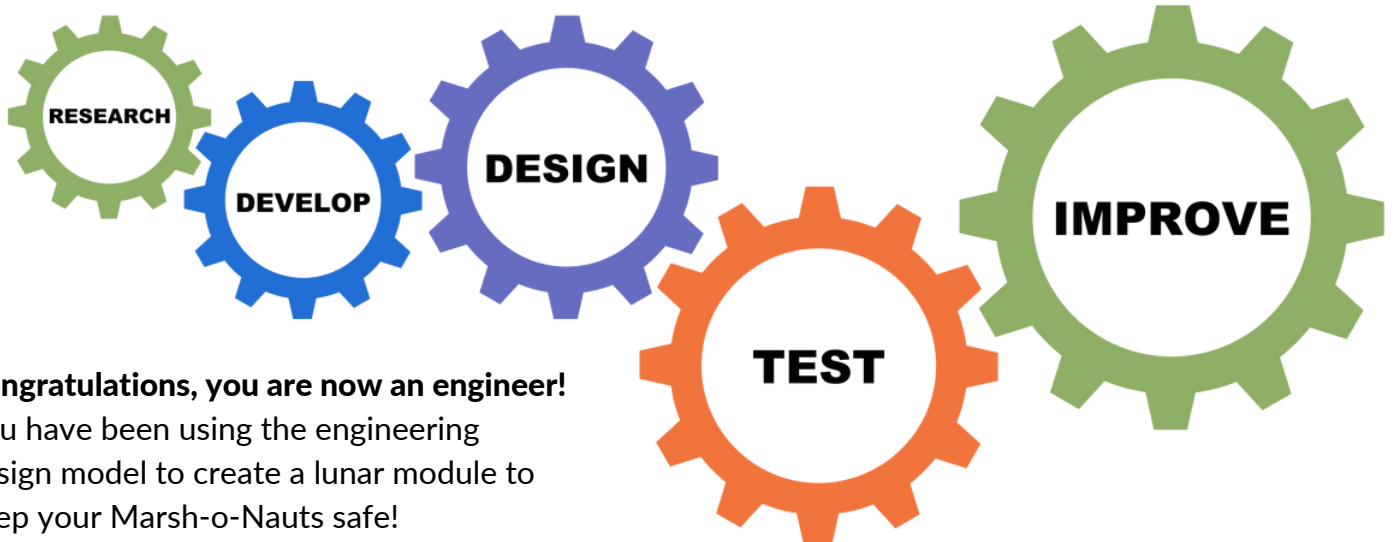
6

Evenly distributing the weight also helps!



Sample Lander Drawing courtesy www.jpl.nasa.gov

ENGINEERING DESIGN MODEL



Congratulations, you are now an engineer!

You have been using the engineering design model to create a lunar module to keep your Marsh-o-Nauts safe!

For more fun engineering challenges, visit

pbskids.org/designsquad/build/