

# LUNAR LANDER





## Next Giant Leap: Lunar Lander

### Objective:

Students build a lunar lander equipped with a landing shock absorber.

### Materials Needed:

- |                     |                |
|---------------------|----------------|
| ✓ Landing Pad       | ✓ Marshmallows |
| ✓ Meter Stick       | ✓ Rubber Bands |
| ✓ Cardboard         | ✓ Straws       |
| ✓ 9oz Plastic Cup   | ✓ Tape         |
| ✓ Index Cards       | ✓ Scissors     |
| ✓ Mini Marshmallows |                |

### Summary of Student Action:

Students use what they know and can investigate about gravity, motion, and forces to design and build a shock-absorbing system that will protect two "astronauts" when they land. Just as engineers had to develop solutions for landing different vehicle types on the Moon, students follow the engineering design process to design and build a shock-absorbing system out of paper, straws, and mini marshmallows; attach their shock absorber to a cardboard platform; and improve their design based on testing results.

### Setup Instructions:

- Lay out all assembly items.
- Designate a landing zone on the floor near the assembly station.
- Use the meter stick to ensure that there is a vertical marker of at least 30 cm from which students can drop their lander onto the landing pad.

### Additional Notes:

Use the two regular marshmallows as the "astronauts." If the "astronauts" bounce out, figure out ways to improve your design. Study any problems and redesign. For example, if your spacecraft tips over as it falls through the air, make sure it's level when you release it. Also check that the cup is centered on the cardboard. Finally, check that the weight is evenly distributed. Add soft pads or change the number or position of the shock absorbers.



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## Landing on the Moon is Tricky

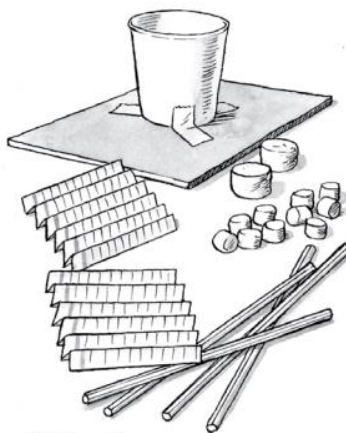
**Your task:** Build a shock absorber for your Lunar Lander that will enable you to land safely on the Moon.

**You will need:**

- ✓ Landing Pad
- ✓ Meter Stick
- ✓ Cardboard
- ✓ 9oz Plastic Cup
- ✓ Index Cards
- ✓ Mini Marshmallows
- ✓ Marshmallows
- ✓ Rubber Bands
- ✓ Straws
- ✓ Tape
- ✓ Scissors

**Procedures:**

1. Design a shock-absorbing system. Think springs and cushions.
2. Put your spacecraft together. Attach the shock absorbers to the cardboard platform.
3. Add a cabin for the astronauts. Tape the cup to the platform. Put two astronauts (the large marshmallows) in it. (NOTE: The cup must stay open—no lids!)
4. Test your Lunar Lander by dropping it from at least 30 cm high onto the landing pad.



A lander under construction

Image:

<https://www.jpl.nasa.gov/edu/teach/activity/touchdown>