

## At Home: Safe Landing

### Student Instructions:

#### Challenge

How can you ensure a safe landing when you drop a cup holding a ball?

Design a lander that includes a cup with a ball inside it. You'll test your lander by dropping it from at least 1 foot off the ground. If the cup lands upright, doesn't fall over, and the ball stays in the cup – you've successfully completed the challenge. And no, you cannot cover the top of the cup to keep the ball inside.

#### Suggested Materials

Substitutions can be made for almost any of these materials:

- 1 to 2 small pieces of cardboard
- Small cup
- Small ball
- Tape
- Plastic shopping bag
- String or yarn
- Index cards
- Straws
- Cotton balls
- Rubber bands

#### 1. Identify the Problem

- The most critical step of any engineering challenge is to **understand the problem** you are trying to solve.
- The two problems you are trying to solve is **slowing the descent of your lander** and **absorbing the energy of impact** when your lander touches the ground.
- How might you slow your lander down?
  - Explore how parachutes work. A canopy is the part of the parachute that fills with air. Air trapped in the canopy slows the fall of a parachute because of air resistance, or the force of the air pushing against the canopy.
- How can you lessen the impact on your lander when it hits the ground?
  - Hint: Think about shock absorbers. They are used to absorb the energy of the impact when gravity slams something into the ground.
  - Springs are a good shock absorbers. What is it about their shape that helps them absorb impact?

#### 2. Collect Materials

- Start collecting materials for your lander.
- Don't have all of the items on the list? That's okay – you don't need all of them. Look around and see if there are other materials you can use instead or do without.
  - Don't have a small ball? Can you make one out of tinfoil?

#### 3. Brainstorm Designs

- Review the challenge and the problems you are trying to solve.
- Look at your materials. Which ones can help you soften the cup's landing? How might you create a parachute to slow the lander's fall?

Download more Distance Learning Implementation Strategies at [DiscoverE.org](http://DiscoverE.org).

#### **4. Build It**

- Start building! If possible, take pictures of the materials as you build. Maybe one at the beginning, one during the process, and one at the end.
- When you are finished building, **make a prediction**. Will your lander stay upright from a 1-foot drop? A 2-foot drop? A 3-foot drop?
- Record your prediction.

#### **5. Test It**

- Test your lander! Start with a 1-foot drop. Did it work? Then see how far a distance it can be dropped before it fails.

#### **6. Share Results**

- Share your results and your design with your teacher or parents.
- Did it work like you thought it would?
- What design changes would you make?

#### **7. Make Changes and Try Again!**