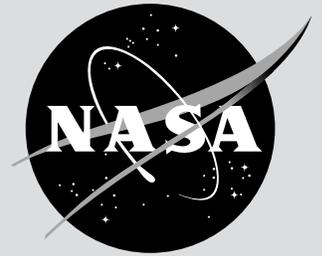


SOFT LANDING



Spacecraft use airbags. Cars use airbags. Packages use airbags. Air makes a great cushion. Three rovers have landed safely on Mars using an airbag system.

WE CHALLENGE YOU TO...

...design and build an airbag system that can safely land an egg dropped onto the floor.

DESIGNsquad[®]
Nation

1. IDENTIFY THE PROBLEM AND BRAINSTORM

- How will you make a frame that holds the egg?
- How will you attach balloons to your frame?
- How should you arrange the airbags to absorb shock?

2. DESIGN AND BUILD

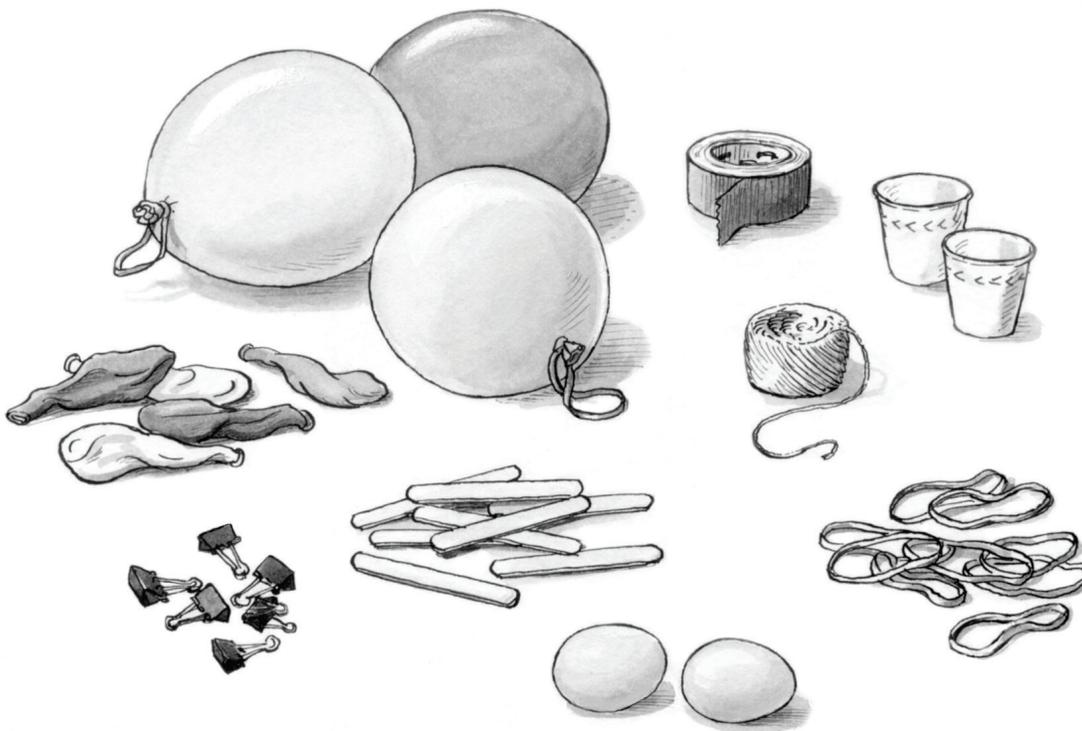
Use the materials to invent your own design.

MATERIALS (per lander)

- 2 hardboiled eggs
- 10 nine-inch balloons
- 10 craft sticks
- 8 small (i.e., $\frac{3}{4}$ inch) binder clips
- 20 assorted rubber bands
- 2 small paper cups (3-ounce)
- Tape (any kind)
- 1 meter (39 inches) string

WORDS TO USE

- **force:** A push or a pull
- **shock absorber:** Absorbs the energy of an impact



3. TEST

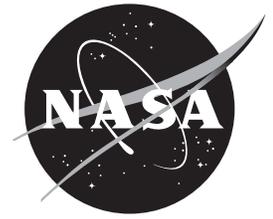
- Drop your lander from a height of 1 meter (39 inches).
- Watch how it bounces and rolls. Did the egg break?

4. EVALUATE AND REDESIGN

- How well did the egg stay in the frame?
- How well do the balloons stay together to protect the egg on all sides?

5. TRY THIS NEXT!

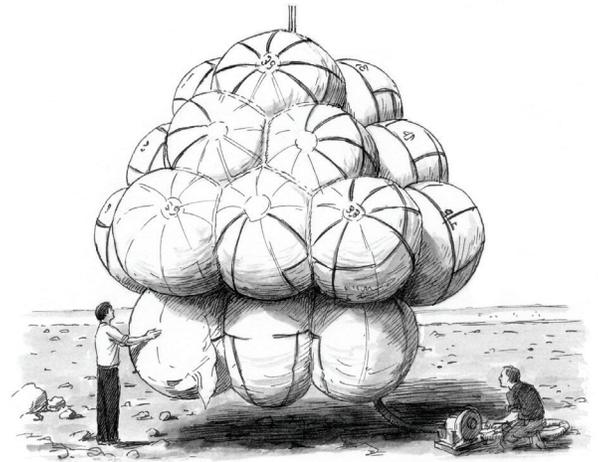
- Drop the lander from 2 meters (78 inches). How high can you go?
- Add a parachute or other system to slow the lander before it hits the ground.



Check out NASA's missions at nasa.gov

NASA EXPLORES SPACE

This picture shows NASA engineers testing an airbag-landing system on Earth. Three rovers have used this system to land safely on Mars. As they approach Mars, they're going about 20,000 kilometers (12,000 miles) per hour. Thanks to a parachute, heat shield, and rockets, the airbag-wrapped rovers hit the surface going about 80 kilometers (50 miles) per hour. One bounced as high as a five-story building. Then after 15 bounces, it stopped rolling, the airbags deflated, and the mission began.



The *Curiosity* rover is on Mars, studying the Martian climate and geology and looking for substances associated with life. *Curiosity* is the size of a small car. It is so big and heavy—about five times larger than earlier rovers—that it couldn't use an airbag-landing system. Instead, it used a rocket-propelled sky-crane that lowered it gently to the surface.

Visit the **Design Squad Nation** website at pbskids.org/designsquad.

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