

TOUCH DOWN!

EXPERIMENT: EGG DROP CHALLENGE

Get your payload safely to the surface. NASA engineers use different strategies and materials to carefully land rovers and other equipment on planets they want to explore. Your challenge is to design and build a lander that protects a raw egg that's dropped from up high.

MATERIALS

- Raw egg
- Container, like a cardboard tube, cup, box or plastic fruit basket
- Pen or pencil
- External protection, like balloons, straws, craft sticks or rubber bands
- Paper
- Internal padding, like paper, cotton balls, packing peanuts or fabric
- Tape
- Scissors



INSTRUCTIONS

Keep your “egg-stronaut” from breaking by designing and building a landing device. Use the engineering design cycle for this experiment: design your landing craft, test it to see if it works, change your design to make it better and re-test to get new results.

Collect your materials. You'll need a container, some internal padding and external protection to safely land your craft. Draw your design ideas on paper before you start to build. Be creative! Try using just one container, one type of internal padding and one type of external protection.

You can get some ideas from NASA engineers. They use different materials and strategies depending on the size, weight and design of the robot they need to land on a distant planet. One design uses more than 20 huge airbags that surround the payload – when the airbags inflate it looks like a giant bunch of grapes! NASA's newest and biggest rover, Curiosity, was too heavy for airbags when it landed on Mars in 2012. So NASA invented a “sky crane” that slowly lowered the rover to the ground using nylon ropes. Engineers are working on new ideas, like a giant balloon that can lift a 7,000 pound vehicle.

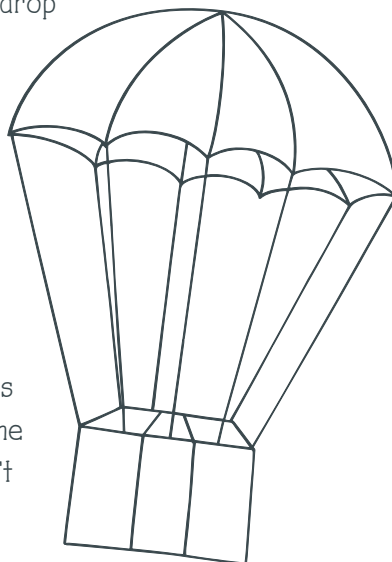
Possible Materials



Build your landing device and put your egg inside. Test it out by dropping your device from up high. If the egg doesn't crack, your design is a success! If the egg cracks, make changes to your design and re-test it.

WHAT'S HAPPENING?

Gravity is a force of attraction – it pulls on a mass, which is how much “stuff” something is made of. Earth's gravity pulls on you and keeps you on the ground; it also holds the atmosphere and the moon in place. When you drop your landing craft, gravity pulls it to the ground. The internal padding that surrounds your egg-stronaut cushions the payload inside the container, like airbags in a car that protect passengers in an accident. The external protection on the outside of the container protects the egg-stronaut by absorbing the impact felt when the landing craft hits the ground.



GAME ON

Once you're successful, try dropping the egg from a higher height or increasing your payload to two eggs. Try landing your craft on different types of surfaces like grass, pavement, or water. How does the surface affect your landing? How might this change your vehicle design?

Have a friendly competition: who can get their egg-stronaut to the surface the fastest? The slowest? From the farthest distance? With the fewest bounces?

TIPS

For a little less mess, use a hard-boiled egg (you'll still see the cracks). You can also cover the landing surface with a garbage bag, or put the raw egg in a sealed plastic bag before putting it in the landing craft.

MORE WAYS TO PLAY WITH LANDERS

Watch the exciting “Seven Minutes of Terror” video about the Curiosity rover landing on Mars at <http://tinyurl.com/kzh8v4p>. Learn more about NASA's designs for landing craft at <http://tinyurl.com/NASAairbags> and <http://tinyurl.com/NASAskycrane>.

RECOMMENDED READING

“Aerospace Engineering and the Principles of Flight” by Anne Rooney

“Rosie Revere, Engineer” by Andrea Beaty