STEM at HOME

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

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# Moon Lander

"The Eagle has landed." Explore the physics of moon landing as you engineer and construct a shock-absorbing system that will protect two "astronauts" when they land on the moon!

## TEKS:

SCI 6.11 A: The student is expected to describe the physical properties, locations, and movements of the sun, planets, moons, meteors, asteroids, and comets.
SCI 6.11 B: The student is expected to understand that gravity is the force that governs the motion of our solar system.
SCI 6.11 C: The student is expected to describe the history and future of space exploration, including the types of equipment and transportation needed for space travel.

## Materials:

- "Astronauts" – 2 goldfish crackers (or other crackers/chips)
- Paper
- Pencil
- Scissors
- Small paper or plastic cup
- Tape

An assortment of the following materials, or similar items found around your house:

- Bubble wrap
- Cotton balls
- Index cards
- Marshmallows
- Pieces of cardboard
- Pipe cleaners
- Pom poms
- Popsicle sticks
- Rubber bands

 

- Straws (biodegradable)
- Toothpicks

## How To:

This is an engineering design challenge! Use the materials provided and the steps outlined below to design, create, and test a moon lander prototype that can safely land two "astronauts" on the moon.

Engineering design process:

1. Identify the problem/Ask a question: What are you trying to accomplish?
2. Research/Brainstorm different ideas: Be creative and curious as you decide on your design. Use paper and a pencil to sketch what you are going to build.
3. Build a prototype: Create what you have planned using the provided materials.
4. Test and revise: Simulate a moon landing by dropping your lander from a height of one foot. If the astronauts stay safely inside, great! How could you make it even better? Re-test at a height of 2, 3, or even 4 feet. If it doesn't work the way you planned, identify the problem and redesign to try and fix it.

Design considerations and tips:

- What part of the moon lander will house your astronauts, and how will you keep them safe and comfortable? For example, you can use the small cup as the lander's "main cabin" and add in cushioning or seating to protect the astronauts.
- How will you ensure the "astronauts" (goldfish or other crackers/chips) stay safely inside the cup during landing without being injured (breaking)? Springs and cushions can help lessen the impact of a landing. For example, bubble wrap, cotton balls, marshmallows, and pom poms are all great cushions, and an accordion-folded index card or spiralized pipe cleaner can act as springs. Can you come up with other creative spring and cushion ideas?
- What other design elements can help your moon lander stay intact and level while approaching the moon? A sturdy base of cardboard, evenly-distributed weight, and a level landing surface will all help provide a smooth moon landing.

## STEM Explanation:

The United States' first moon-landing mission was *Apollo 11*, and on July 20, 1969, Neil Armstrong and Buzz Aldrin became the first humans to walk on the moon! The *Apollo* program lasted from 1962 to 1972 and was comprised of 17 missions. NASA astronautical engineers and scientists worked together to plan, design a prototype, test, and launch the spacecraft missions that have landed on the moon. *Apollo 11* was comprised of three spacecraft modules and its lunar module, called *Eagle*, had shock absorber mechanisms that allowed Armstrong and Aldrin to gently land the spacecraft on the moon's surface.

Shock absorbers dampen the energy of an impact by converting kinetic energy (energy of motion) into potential energy (stored energy). Soft materials and springs are great shock absorbers because they store a lot of potential energy. Spacecrafts travel as fast as 18,000 miles per hour, and the moon's surface is different from the earth's, so lunar module landing gear must be high tech and durable. NASA needs innovative astronautical engineers to create new designs for future moon landings and help humans safely reach even deeper parts of the solar system.

 

## Career Connection:

*Astronautical engineers* design aircrafts and spacecrafts, as well as missiles, probes, and unmanned devices. They often take on specialist roles, focusing on a specific area of spacecraft engineering such as the landing gear, on-flight electronics, guidance system, or onboard research tools.

## Resources:

https://www.nasa.gov/
https://kids.nationalgeographic.com/explore/history/moon-landing/
https://www.space.com/17411-apollo-11-moon-landing-explained-infographic.html
https://airandspace.si.edu/exhibitions/apollo-to-the-moon/online/apollo-11/about-the-spacecraft.cfm
https://pbskids.org/designsquad/build/touchdown/

 