deSTEMber

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

PRESENTED BY: girlstart

Lunar Orbiter

Engineer your own Lunar Reconnaissance Orbiter (LRO) prototype to explore the moon's surface! Design an orbiter that is compact to travel in space, can capture images of the moon, and can record temperature, radiation, and more!

TEKS:

SCI 2.5 D: The student is expected to combine materials that when put together can do things that they cannot do by themselves, such as building a tower or a bridge, and justify the selection of those materials based on their physical properties.
SCI 4/5.3 C: The student is expected to connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

Materials:

- Foam shapes
- 2 googly eyes
- 2 index cards
- 6 x 6-inch piece of aluminum foil
- 2 pipe cleaners
- Plastic spoon
- Scissors
- Small box (~ 3 x 3 x 3 inches)
- Tape

How To:

1. Use the small box as a base for your Lunar Reconnaissance Orbiter (LRO).
2. Then, use other materials to design and engineer your own LRO prototype. Be sure to include a power source, a means to communicate to NASA, and instruments to take pictures and water, temperature, and radiation readings. Remember, be creative and have fun!

3. Design considerations:
    a. Power, space, and communication
        i. The LRO needs energy to run. It can use fuel, batteries, or alternative energy sources like solar power. How will you power your LRO? How will it move around?
        ii. When the LRO records data, images, and readings, it must communicate the information back to NASA. How will your LRO send information?
    b. Surface – light and images
        i. The LRO needs "eyes" to see the terrain on the moon and what the surface looks like. What devices can you add to the LRO to help NASA "see" the moon?
        ii. It is very dark in space! LRO uses radars and lasers to detect the amount of different types of light shining from the Sun onto the moon's surface, some of which aren't visible to the human eye. What can you add to the LRO to detect light?
    c. Environment – water, temperature, and radiation
        i. Temperature can tell us a lot about an environment. It can help us find things important for survival like ice or fire. What device can we add to the LRO to measure temperature?
        ii. Earth has layers of gases in our atmosphere to protect humans from high levels of radiation, but the moon does not have an atmosphere. Radiation is extremely harmful to humans, so do you think you should measure radiation on the moon?

STEM Explanation:

It has been 50 years since the expedition of *Apollo 11*, the first mission to land people on the moon! The *Apollo* program lasted from 1962 to 1972, and was comprised of 17 missions. This program inspired the public to explore our lunar neighbor and taught NASA how to overcome gravity to safely land on and return from the moon. Before sending future human missions to the moon, NASA launched the Lunar Reconnaissance Orbiter (LRO) in 2009 to collect information about the moon. Learning more about the moon's surface, atmosphere, and environment can help future astronauts visit the moon again and remain on the moon longer!

Did you know?

- NASA sent the last manned mission to the moon in 1972, called *Apollo 17*. It has been 47 years since someone has walked on the moon!
- The *Apollo 11* mission made Neil Armstrong and Buzz Aldrin the first men on the moon. They explored the surface for a little over 2 hours. The astronauts of the *Apollo 17* mission spent the longest amount of time on the moon – 75 hours (3 days)!
- The LRO was launched in 2009 to explore the moon for one year. NASA has extended the mission and the LRO is still collecting and sending data to NASA with updated technology and processes.
- The LRO is powered by solar panels that send energy to its lithium battery, and it uses fuel to move around. It communicates to NASA using an antenna with radio waves and stays on course by locating itself using a star tracker.
- The LRO houses an array of equipment to take images of the moon and collect data on temperature, radiation, hydrogen, thermal mapping, and more.

Career Connection:

Aerospace engineers create machines, from airplanes to spacecrafts. They design, develop, and test aircrafts, spacecrafts, and missiles, and supervise the manufacture of these products. Aerospace engineers who work with spacecrafts are called astronautical engineers. Aerospace engineers develop new technologies for use in aviation, defense, systems, and space exploration.

Resources:

https://www.lpi.usra.edu/education/explore/LRO/activities/build_lro/index.shtml
https://www.lpi.usra.edu/education/explore/LRO/background/
https://www.lpi.usra.edu/education/explore/LRO/activities/build_lro/LRO_Spacecraft_Images.pdf
https://files.constantcontact.com/9fab69e5001/73058d3a-1288-43bf-b523-dd41844a931a.pdf

