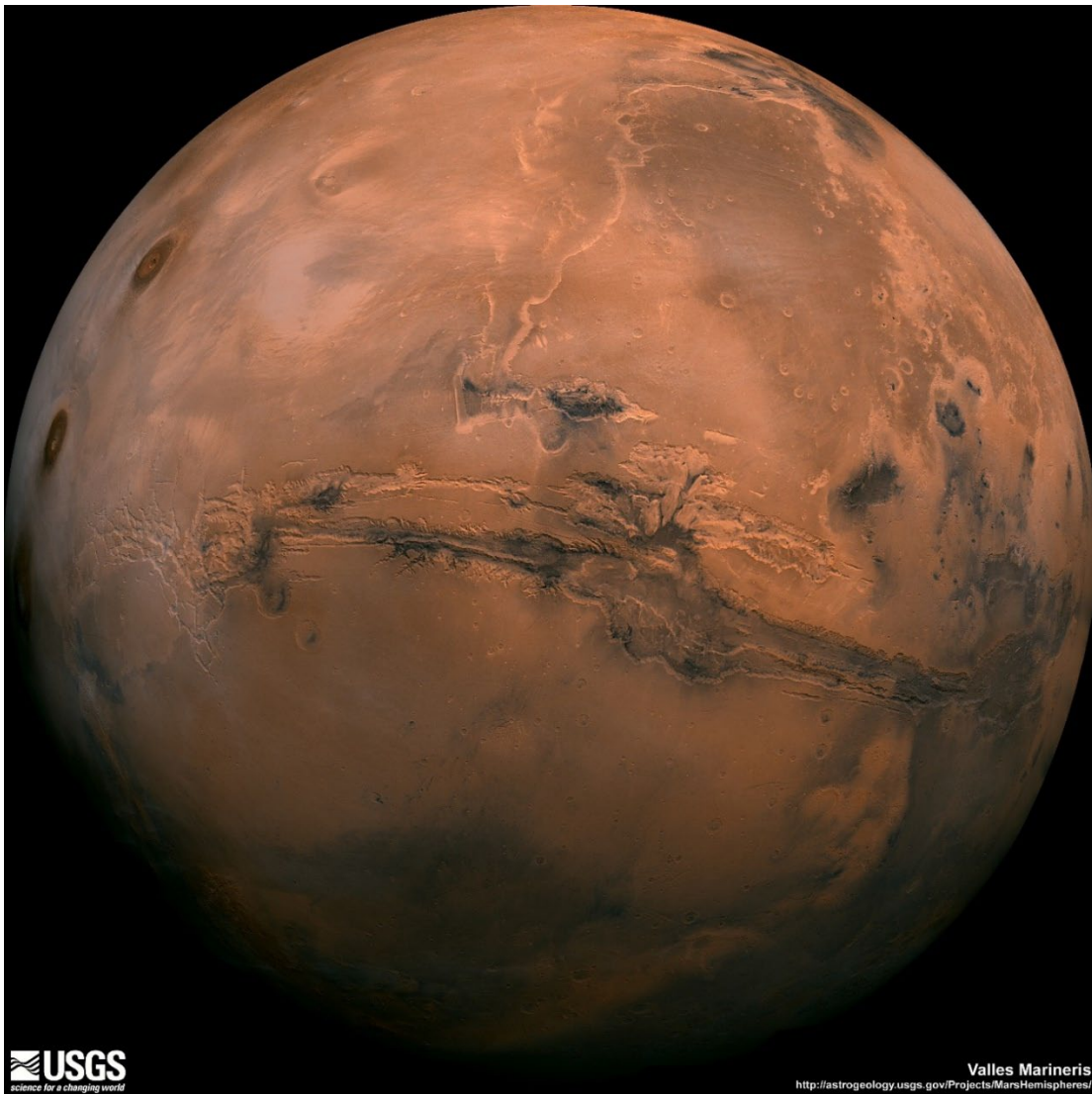


Engineering Activity 4

Remote Sensing Engineering Challenge



Your final design challenge is to engineer technologies that can collect information about the surface of Mars from a distance. You will work with one of three NASA scientists to determine what information is needed. You will test your technologies on multiple sites on Earth to make sure it works before launching to Mars.

DRAFT Materials, do not share

Engineering Activity 4

NASA Scientist Cards

NASA Scientist: Jaime, planetary geologist

“I am interested in how Mars was formed. Minerals can tell me a lot about the planet’s history. What minerals are on the surface?”

Criteria

- The device must be able to identify the minerals that form in water like clays (triangle shape and felt) and sulfates (star shape and foam). It should also be able to identify volcanic minerals (circle shape and construction paper).
- The device must be able to fit through the opening in the Space Screen, which is 9" × 20" (23 cm × 50 cm), for testing.

Constraints

- You may only use the available materials to complete your design.
- You will have two sessions to engineer your remote sensing device(s).

NASA Scientist: Caris, planetary geologist

“I am interested in landing a rover on Mars. Sending a rover will allow us to collect samples and more closely examine what the planet is made of. Is there a flat, open space where the rover could land safely?”

Criteria

- Design a device to identify safe areas for the rover to land.
- The device must be able to determine the size of the area. To land safely, a rover needs an area of 3" × 4" (7.5 cm × 10 cm).
- The device must be able to fit through the opening in the Space Screen, which is 9" × 20" (23 cm × 50 cm), for testing.

Constraints

- You may only use the available materials to complete your design.
- You will have two sessions to engineer your remote sensing device(s).

NASA Scientist: Alex, astrobiologist

“I want to know if Mars can support life. One of the most important materials to support life is water. Are there any sites that show evidence of water?”

Criteria

- Design a device to identify places where water may have been present. Your device should identify landforms, like canyons, that may have been created by water. Your device should also identify minerals that form in water, like clays (triangle shape and felt) and sulfates (star shape and foam).
- The device must be able to fit through the opening in the Space Screen, which is 9" × 20" (23 cm × 50 cm), for testing.

Constraints

- You may only use the available materials to complete your design.
- You will have two sessions to engineer your remote sensing device(s).

Did You Know?

The Lunar Reconnaissance Orbiter is a spacecraft that launched in 2009 to investigate the surface of the Moon. It has six instruments onboard to investigate temperature and radiation. It also includes one “technology demonstration.” This is an instrument being tested to see if it works. Even NASA must do experiments before getting things right!

More to Explore

Find out more about the Lunar Reconnaissance Orbiter.



nasa.gov/mission_pages/LRO/spacecraft/index.html

Engineering Activity 4

Guidelines for Testing Devices

When collecting data with your remote sensing technology...

Do...

- Put your devices through the opening in the Space Screen.
- Reach through the opening in the Space Screen only when you need to push down on straws or scrape the surface.
- Move devices from left to right.
- Be careful when using the Space Screen so it does not fall over or break.

Do not...

- Peek around the sides or into the Space Screen opening.
- Put your face closer to the Space Screen than the edge of the table.
- Try to touch the inside of the model landscapes through the Space Screen with anything other than your devices.

Some of the NASA scientists are interested in the minerals on the surface of the planet. Use the key below to help decode your findings:

Felt triangles

Clay minerals

Construction paper circles

Volcanic minerals

Foam stars

Sulfate minerals

Did You Know?

About half of all Mars missions have failed. Even successful missions have had certain things that didn't work as well as desired. For example, the Curiosity Mars rover wheels get damaged by sharp rocks. Engineers learned from this problem and designed stronger wheels for the Perseverance Mars rover.

Engineering Activity 4

Remote Sensing Plan

Record a plan for your remote sensing device(s). After you test, choose areas of your design that you would like to improve.

Scientist:

Criteria:

What information is your scientist interested in?

What technologies will help you collect the data they need?

How will you improve?

You can use new materials, make your devices smaller, or improve in another way!

Engineering Activity 4

Data Collection

Record any data that you collect using your remote sensing device(s). Make sure that your device(s) can collect all of the data needed by the scientist you are working with. Be sure to visit Site A and Site B.

Site A

Record any data that you collect using your remote sensing device(s). Make sure that your device(s) can collect all of the data needed by the scientist you are working with.

Site B

Did You Know?

Some of NASA's first spacecraft sent their data to Earth so slowly that engineers could color in the image by hand, dot-by-dot.

More to Explore

Find out more about NASA's Mars Missions on the PLANETS website.



<https://planets-stem.org/betars-youth-resources-page/>