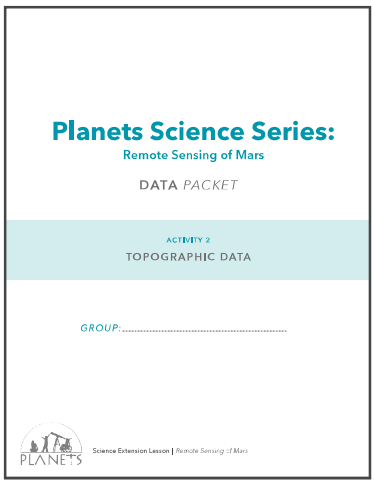
Activity 2: Landing Site Topography (40 min)

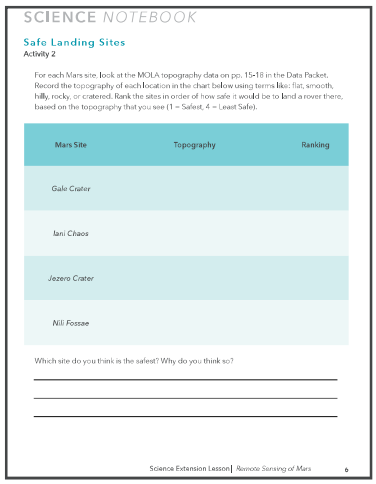
Overview

How can we use maps of landforms to learn more about the surface of Mars? In this activity, youth learn that topographic data can help us to choose a safe and interesting landing site.

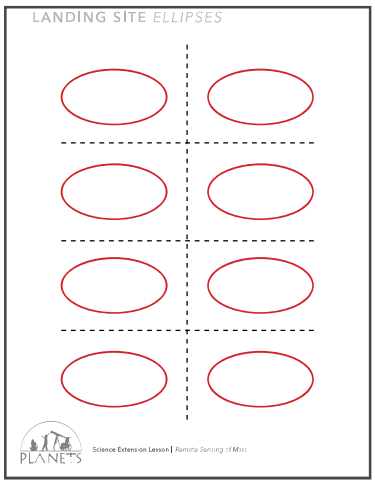
In this activity:



Topographic Data Packet
1 per group



Science Notebook
1 per youth



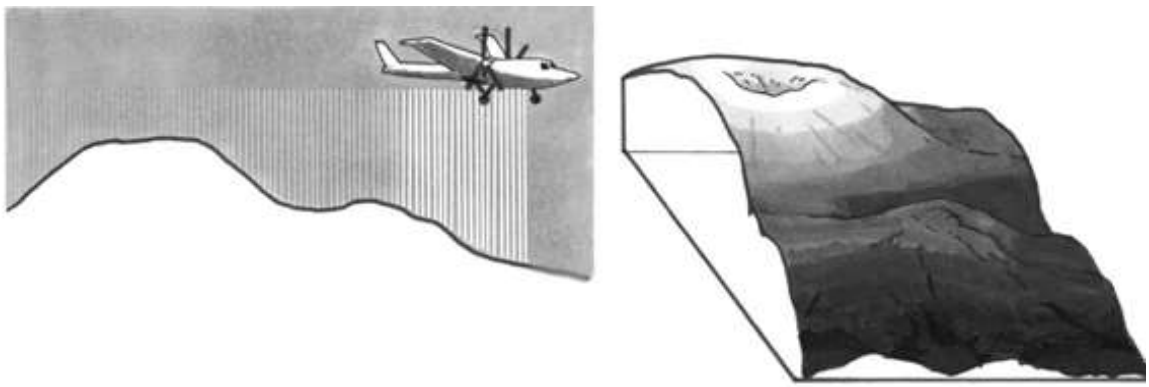
Ellipses Sheet
Cut out 1 ellipse per group

Introduction to LiDAR (5 min)

1. Hand out the MOLA Topography for each group to add to their data packets. These images also show the same area of interest as the CTX images.
   - » If youth have previously completed the Worlds Apart engineering activities, ask them to think back to what LiDAR stands for, how LiDAR works and what it is used for.
   - » LiDAR, or Light Detection and Ranging, is a tool that sends out laser pulses from an airplane or spacecraft to a landscape and measures how long those pulses take to return. The data gathered from LiDAR can be used to create precise, three-dimensional maps of the terrain.

2. Let youth know:
   - » LiDAR is a technique used by scientists to study surfaces of the Earth and other planets.
   - » LiDAR uses laser light bounced off the surface of a planet to measure the height of the surface.
   - » The Mars Orbital Laser Altimeter (MOLA) is a LiDAR instrument that measured the elevation of the entire surface of Mars.

Interpreting LiDAR Data (10 min)



1. Use Jezero Crater: MOLA Topography (Data Packet, p. 13) to guide youth through the following prompts:
   - » Ask youth to explain what they think the color scale means. (The colors represent elevation: Yellow = high elevation, blue = low)
     - ▪ If printed in black and white: brighter = high elevation, darker = low.

» Ask youth to explain what they think the contour lines mean.
  - Each line traces constant elevation. Think of a ring left around the bathtub.

» Point to different parts of the crater and ask youth to interpret the steepness of the terrain based on the contours.
  - Where there are a lot of contour lines close together, the slope is very steep - like hills or mountains. Where they are widely spaced, the slope is shallower – like a flat plain or field. The color scale tells the direction of the slope.

» Ask youth what the criteria might be for a good landing site. A landing site should be on a flat surface, not on a steep surface.

» Point to different parts of the crater and ask youth to interpret the elevation based on the color.
  - The crater rim is high. The crater floor is low.

Analyzing the Site (15 min)

1. Give youth time to look at and describe the topography of each site with their group. Remind them to also look at their CTX and HiRISE data.
   » Have each group share their ideas with everyone.
   » Have youth record their observations of the topography of each site in the table on p. 5 of their Science Notebooks.

2. Ask youth:
   » Why do you think scientists are interested in topographic data? *Topography can help identify and interpret landforms.*
   » Why do you think engineers responsible for landing a rover on Mars are interested in topographic data? *Topography can reveal areas that are safe for landing.*

- » What things can they learn from topography that is uncertain in the CTX photos? *It can be hard to tell what areas are high or low from visible images alone.*
- » How did topographic data help you understand the landforms in the different landing sites?

3. Now ask youth to trace a new landing ellipse within each of the four potential landing sites, using the Ellipses from the last activity.
   - » Tell youth: "Using the ellipse, trace one or more ovals (16x8 km) indicating where you think it might be safe and scientifically interesting to land at each of the four potential landing sites."
     - Remind youth that a safe landing site should be flat (or as close to flat as possible)
     - Remind youth that a scientifically interesting site should be on or near landforms that indicate past water or volcanic activity (both is even better).

4. Ask youth to rank the sites in order of best to worst in terms of safety in the table on p. 5 of their Science Notebooks.

Wrap Up (10 min)

1. Summarize by going through each site and leading a discussion about the topography and landforms at the four sites. Ask:
   - » After looking at the CTX and MOLA Topography images, do you have any better sense of where the best landing site might be?
   - » Did your rankings change with the addition of new topography data?
   - » How/why did the topography data change your decision about the best places to land?

2. Reinforce the connection between evidence for past water on Mars and habitability for life so that youth can use this information later on in the activities.

3. Wrap up for the day by congratulating youth on their scientific work. Let youth know that next time, they will look at one more way they can collect remote sensing information about sites on Mars.