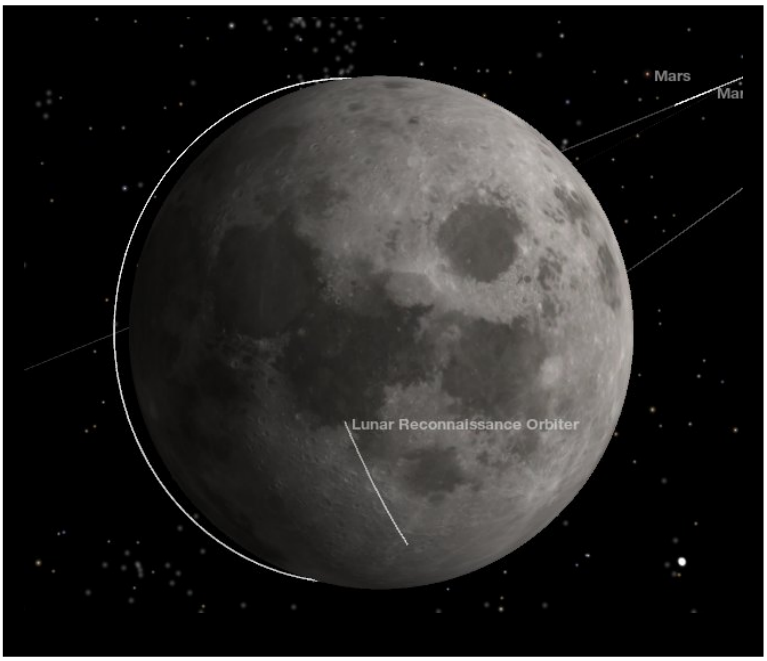
Eye Spy – Exploring the Lunar Surface with LRO



Get the Data

Visit EOSS http://1.usa.gov/GDjJhg to recreate this exact scene. Recommended operating system: Windows Vista or later; Browser: MS Internet Explorer 8 or later.

The Lunar Reconnaissance Orbiter orbits the moon about every 120 minutes, and takes its highest-resolution images of the lunar landscape as it looks directly below its orbit path. The above image shows a portion of the orbit track as it passes over the Apollo-11 landing area just to the left of the 'L' in the spacecraft label.

Step 1 – Advance the date and time of the simulation so that the LRO spacecraft returns to its position over the Apollo-11 landing area.

Answering Questions

Problem 1 – How many hours elapse between the Apollo-11 landing area over-flights?

Problem 2 – How many orbits will the LRO make between over-flights?

Math Challenge

From its orbit the LRO, high-resolution camera can see objects only 1 meter across on the lunar surface, but it can only create an image that is about 2 kilometers wide. At the location of the Apollo-11 landing area, each orbit shifts by about 20 kilometers from the previous ground track. If successive tracks fill up the gaps, about how many weeks will it take to fill-in the full 10-kilometer gap?

Answer Key

Problem 1 – How many hours elapse between the Apollo-11 landing area over-flights?

Answer: The above image corresponds to May 27, 2012 at 6:11 PM EDT. By carefully advancing the time, students will see that the next time the LRO spacecraft passes over this point is on June 10 at 12:48 PM EDT. The time between passes is 14 days and 6 hours or a total of **342 hours**.

Problem 2 – How many orbits will the LRO make between over-flights?

Answer: The satellite's period is about 120 minutes or 2 hours. The time between over-flights is 342 hours, so dividing the time by the period we get 342/2 = **171 orbits**.

From its orbit the LRO, high-resolution camera can see objects only 1 meter across on the lunar surface, but it can only create an image that is about 2 kilometers wide. At the location of the Apollo-11 landing area, each orbit shifts by about 20 kilometers from the previous ground track. If successive tracks fill up the gaps, about how many weeks will it take to fill-in the full 10-kilometer gap?

Answer: Students should draw a scale model of the 2 kilometer-wide field for a pair of tracks separated by 10 kilometers. The gap will be 10 km – 2km = 8 km wide. The next over-flight, number 3, will cover the next portion of the 8 km-wide gap so that a 6 km-wide gap now remains. The next over-flight, number 4, will reduce the gap to 4 km wide. Over-flight number 5 will reduce the gap to 2 km, and finally over-flight 6 will complete the coverage of the original gap. **Starting from Over-flight Number 1, it will take 5x342 hours = 1710 hours or just over 10 weeks to completely survey this area.**