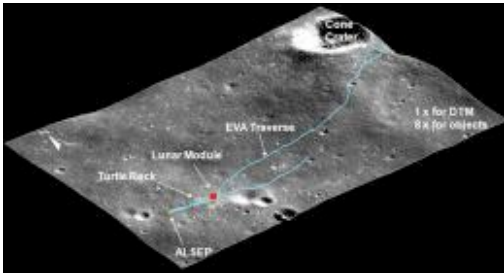


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3D Measurements of Apollo 14 Landing Site



February 2, 2010 by Jordan Lawver

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Images from the LRO Camera taken at slightly different angles were used to make 3D measurements of the Apollo 14 landing site, pictured here. The light blue lines depict Astronaut footpaths. The "1 x for DTM, 8 x for objects" label in the image means that the 3D models have been increased eight times their actual scale size so

they are easier to see. Credit: NASA/Goddard/Arizona State University/The Ohio State University

(PhysOrg.com) -- Can we measure the size and shape of equipment and other objects on the moon using orbital images from the current Lunar Reconnaissance Orbiter mission?

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As an example, to demonstrate the precise 3D measurement capability of the LROC instrument's stereo imagery, three objects and the astronauts' footpaths at the Apollo 14 [landing site](#) are measured and their 3D models reconstructed.

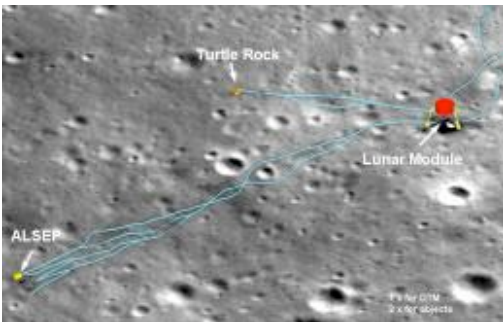
Using two high-resolution images taken from two separate LRO orbits (1,943 and 1,596) by one of LROC's cameras, we can form a stereo image pair for 3D measurements at the Apollo 14 landing site. Thanks to the high image resolution of the LROC NAC cameras, among the visible objects are the descent stage of the Apollo 14 [lunar module](#) Antares, the ALSEP (Apollo [Lunar Surface](#) Experiments Package), and a formation nicknamed "Turtle Rock".



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"Turtle Rock" (Image credit: NASA)

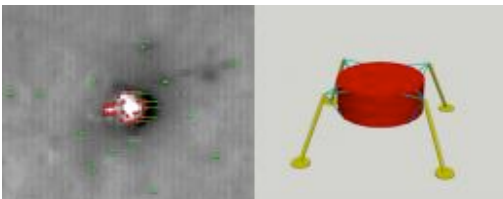
Also visible are multiple astronaut footpaths, clearly indicated by disturbed soils. Data processing methods can be used to identify the objects, as well as measure their sizes and shapes. Such information can then be used to reconstruct [3D models](#), which are displayed on the digital terrain model (DTM) of the site that is automatically generated from the same data set. The above image also shows Cone Crater at the northeast end of the astronaut traverse.



[Enlarge](#)

Closer view of the Apollo 14 landing site. The "1 x for DTM, 2 x for objects" label in the image means that the 3D models have been increased twice their actual scale size so they are easier to see. Credit: NASA/Goddard/Arizona State University/The Ohio State University

In the zoomed image below, the lunar module can be identified by its deck (red points) and distinctive shadow (green lines). These points are measured in the two stereo images and their corresponding 3D ground coordinates are computed. Note that the shadow analysis uses different times and sun angles of the two images for computation. In addition, the nearby terrain is measured at the selected points on the ground (green points) as a reference. From these measurements, we can compute the height and diameter of the lunar module. As the result, the height of the lunar module (descent stage) is estimated as 3.0 meters (about 9.8 feet), compared to the design specification of 3.2 meters (about 10.5 feet). On the other hand, the shadow analysis resulted in a height of the lunar module of 3.2 meters (about 10.5 feet). The diameter of the lunar module is computed as 4.4 meters (about 14.4 feet), compared to the design data of 4.2 meters (13.7 feet).



[Enlarge](#)

Left image credit: NASA/Goddard/Arizona State University/The Ohio State University. Right image credit: The Ohio State University

ALSEP and Turtle Rock are relatively short objects. The LROC NAC image resolution and the imaging geometry is not able to measure a height less than 1 meter (about 3 feet, 4 inches). However, we can measure their horizontal dimensions: 2 meters by 1 meter (about 6.6 by 3.3 feet) for ALSEP (yellow points, below left), and 1.5 meters by 1 meter (about 4.9 feet by 3.3 feet) for Turtle Rock (green points, below

right).



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Credit: NASA/Goddard/Arizona State University/The Ohio State University

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You would think they could do better than that.

Not if you know anything about the subject.

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It would be great if the rest of the moon photos could be released with this quality of resolution without any of the mysterious blurring in selected sections.

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not being a jerk Hungry4info, i'm truly wondering. If google can show me a satellite map with overlain roads of my entire town (or wherever i'd like it to really) why can a multimillion dollar satellite give me a better picture of the lunar surface? Especially since there's no atmosphere to get in the way. I'm asking you since you implied you know about the subject.

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Royale, because those high detail photographs are from airplane flyovers?

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Hmmm... I suspect satellite maps are made using satellites, but hey, its entirely possible they are made using airplane flyovers. Is this actually true or just a guess?

Given the density of the moons atmosphere is very close to 0, I am curious why the satellite they are using here isn't closer to the surface. Closer of course means less coverage area, so the orbit itself might just be a compromise between coverage area and resolution.

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 - Rank: 5 / 5 (1)

Parsec

You are correct, I was thinking of certain google Earth overlays when I responded.

I can resolve a basketball hoop from Google Maps, 18in diameter, compared to 3 meters in this article.

I offer that the satellites capable of the google maps resolution might be way too costly and much higher resolution than those that can be lifted to moon orbit.

This is a a guess as well :)

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- [LordOfRuin](#) - Feb 03, 2010

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The mapping software you see depicting the earth, and in particular, you're house, are made using aircraft flyovers. Some areas aren't as detailed, and they will indeed use lower resolution satellite imagery.

For my own area, Lincolnshire England, I can see that the city of Lincoln where I live, is fairly well covered. However, move out of a well populated area, and the closest zoom level becomes unavailable, and necessitates zooming out to a lesser resolution image.

As for the clever computational use of the existing pictures of the moons surface, well, I'm impressed. Does anyone know what sort of overlap the images can have? I'm guessing that where more than two images cover an object, then feeding that additional data should further improve the results.

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i can only laugh at the weak attempts to give legitimacy to the moon hoax.

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