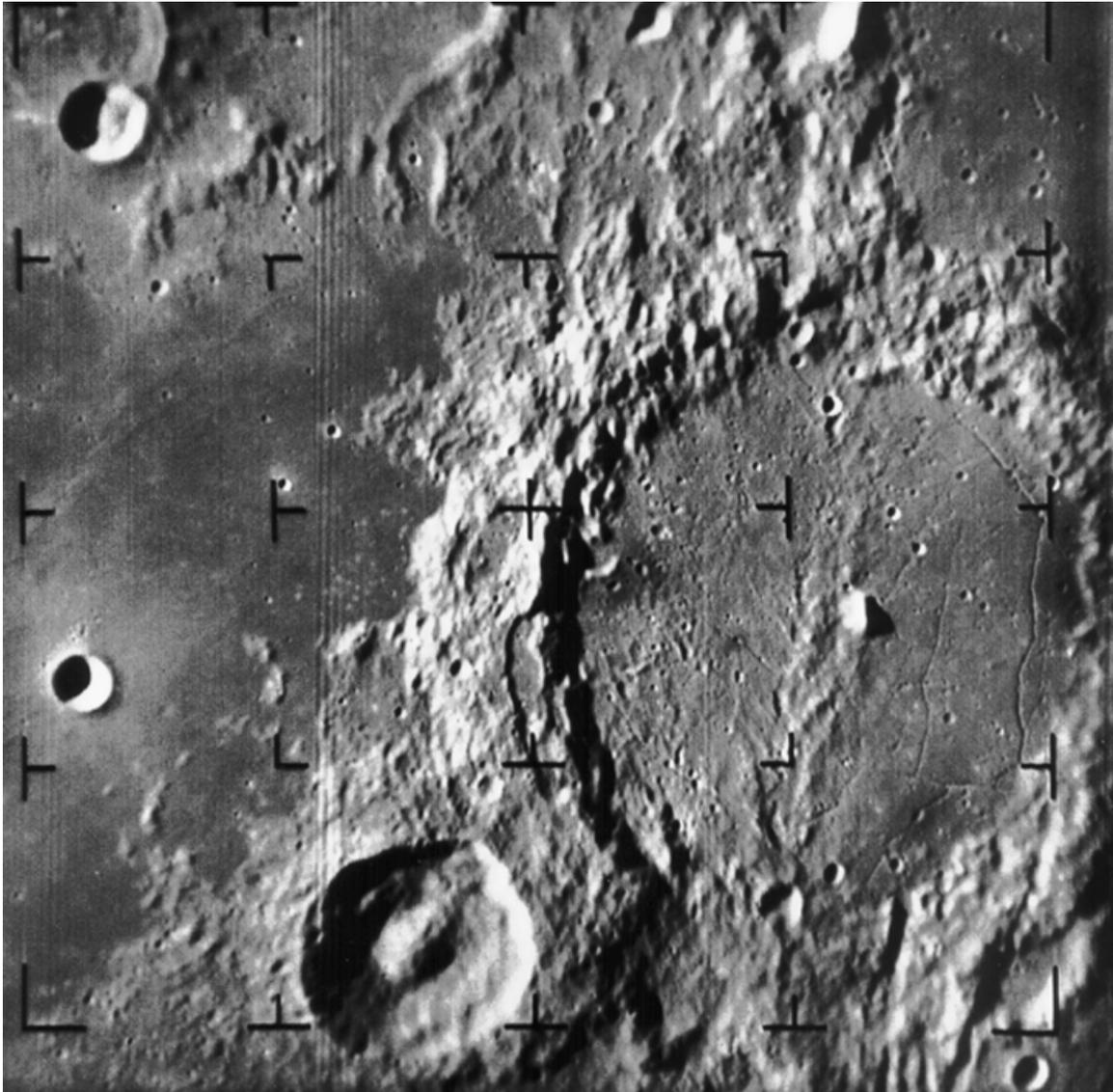


Craters on the Moon

In 1965, the US Ranger 9 spacecraft was launched in order to take detailed photographs of the moon's surface before the Apollo astronauts arrived in 1969. The photograph shows the spectacular Alphonsus crater from a distance of only 442 km, taken about three minutes before the spacecraft crashed on 24 March 1965.



Problem 1 - Using a millimeter ruler, what is the scale of this image in kilometers per millimeter if the width of this picture is 183 kilometers?

Problem 2 - What is the diameter of the crater Alphonsus in kilometers?

Problem 3 - What is the size, in meters, of the smallest thing you can see in the picture?

Problem 4 - How wide are the channels inside the crater Alphonsus?

Problem 5 - Where do you think the safest place would be to land in this image?

Answer Key

2

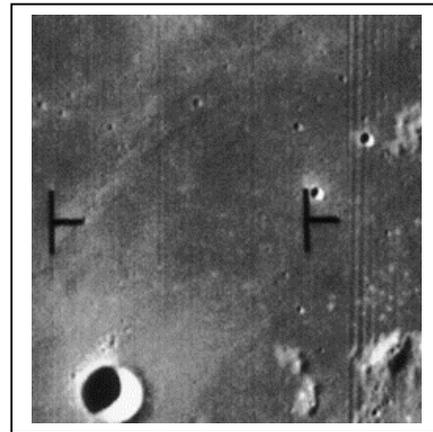
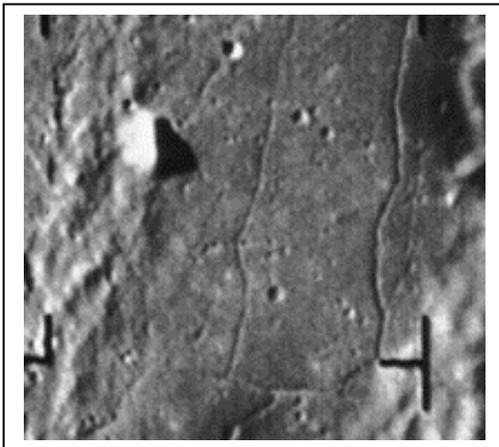
Answer 1 : The image measures 153 millimeters wide, so if this equals 183 kilometers, then the scale of the image is $183 \text{ km}/153 \text{ mm} = \underline{1.2 \text{ kilometers/millimeter}}$.

Answer 2 : The diameter is about 85 millimeters ,which from the image scale equals $85 \text{ mm} \times 1.2 \text{ km/mm} = 102 \text{ kilometers}$. Students may have a discussion about where to measure the edge of the crater. If you select the outer-most edge of the crater wall, the diameter is closer to 110 millimeters so the diameter is $110 \times 1.2 = \underline{132 \text{ kilometers}}$.

Answer 3: By carefully looking at the printed image, the smallest craters are about 0.5 millimeters across. This equals $0.5 \text{ mm} \times 1.2 \text{ km/mm} = 0.6 \text{ km}$ or 600 meters.

Answer 4: The channels, which you can see in the image (below-left) probably created by faults or collapsed lava tubes. In the picture, they are about 0.5 millimeters wide which equals 600 meters. The longest channel is about 73 millimeters long or 88 kilometers.

Answer 5: The safest place is where there are the fewest features that you can see in the photograph (above-right), which means that the surface is probably very smooth.



In 2009, NASA will launch the Lunar Reconnaissance Orbiter. It will take high-resolution pictures of the moon in many locations where astronauts may land in the future. It will also gather data to search for large boulders that may be a landing hazard. From its orbit, LRO will be able to see surface details as small as 1-meter across, which is about the size of a small car!