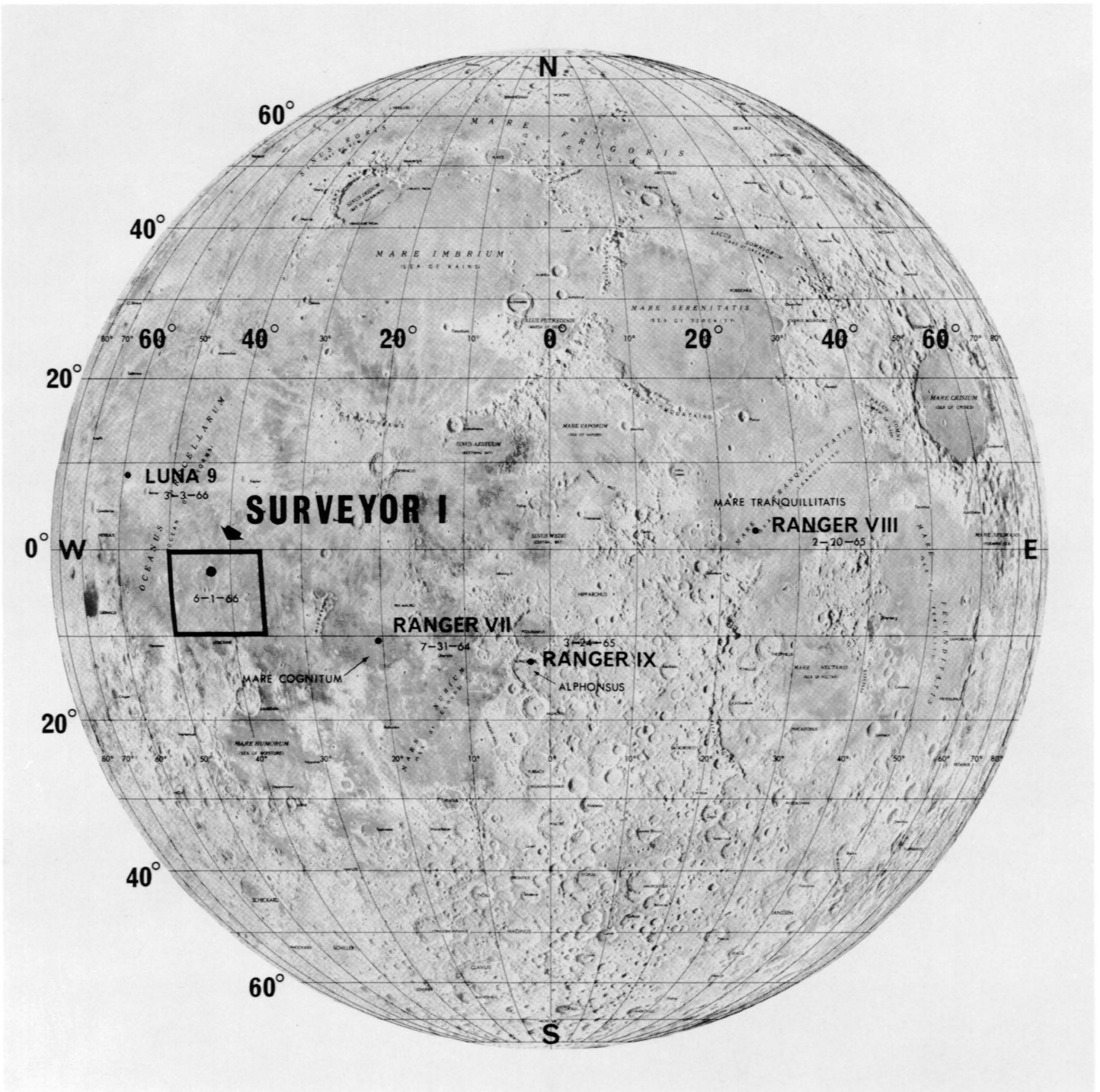
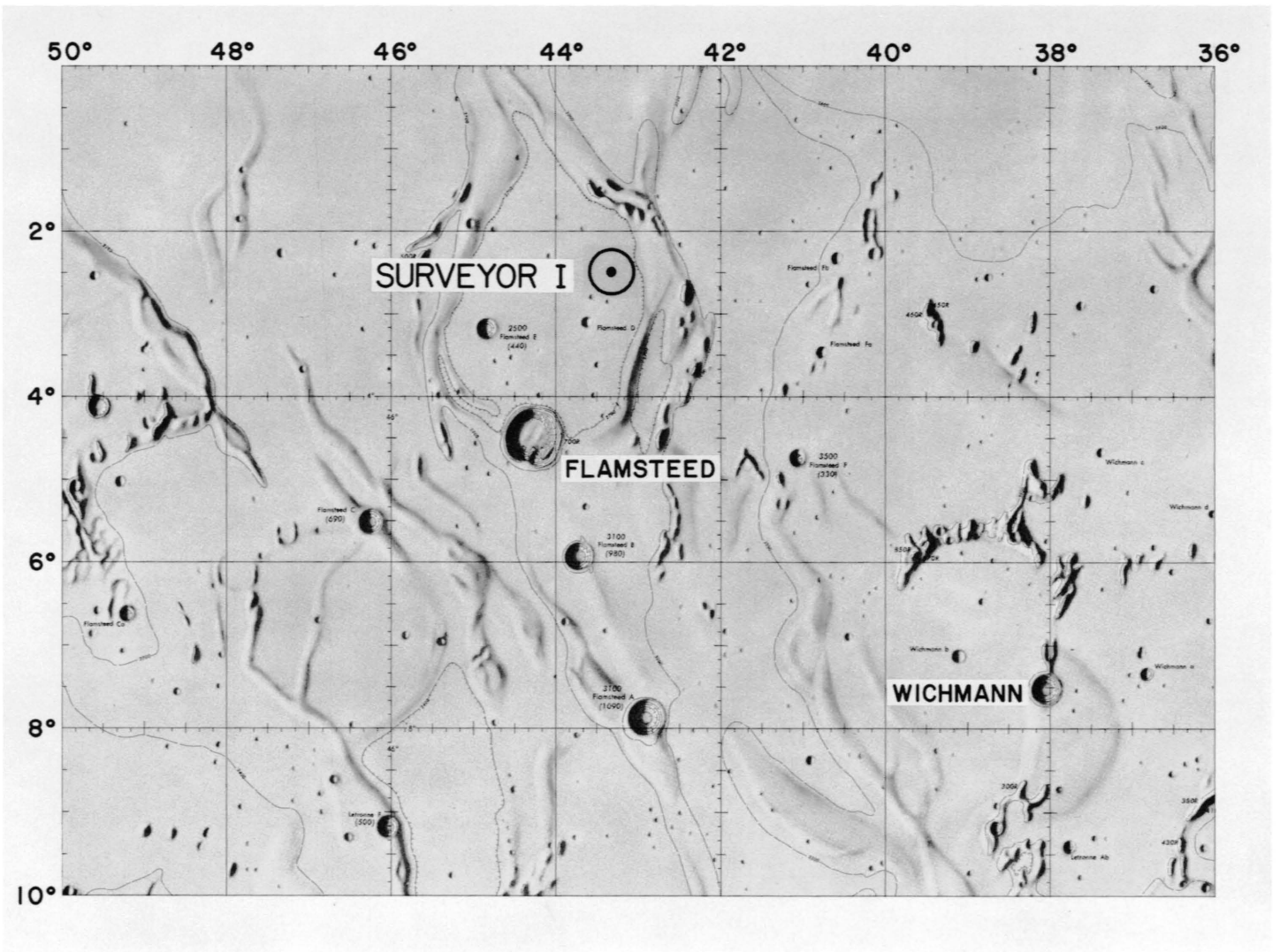


Surveyor I

Surveyor I, first of a series of seven soft-landing spacecraft to be launched to the Moon during 1966 and 1967, was designed and built for the National Aeronautics and Space Administration by Hughes Aircraft Company under contract to the Jet Propulsion Laboratory. JPL is responsible to NASA for the direction of Surveyor Project. It was launched on May 30, 1966, from Cape Kennedy, Florida, by an Atlas/Centaur launch vehicle, built for the Air Force and NASA's Lewis Research Center by the General Dynamics Corporation. Surveyor's television camera was capable of operating at two focal lengths: 100-millimeter, narrow-angle, 6-degree field of view and 25-millimeter, wide-angle, 25-degree field of view. Its two scan modes were a 200-line and a 600-line format. (All photographs in this set are in 600-line format.)



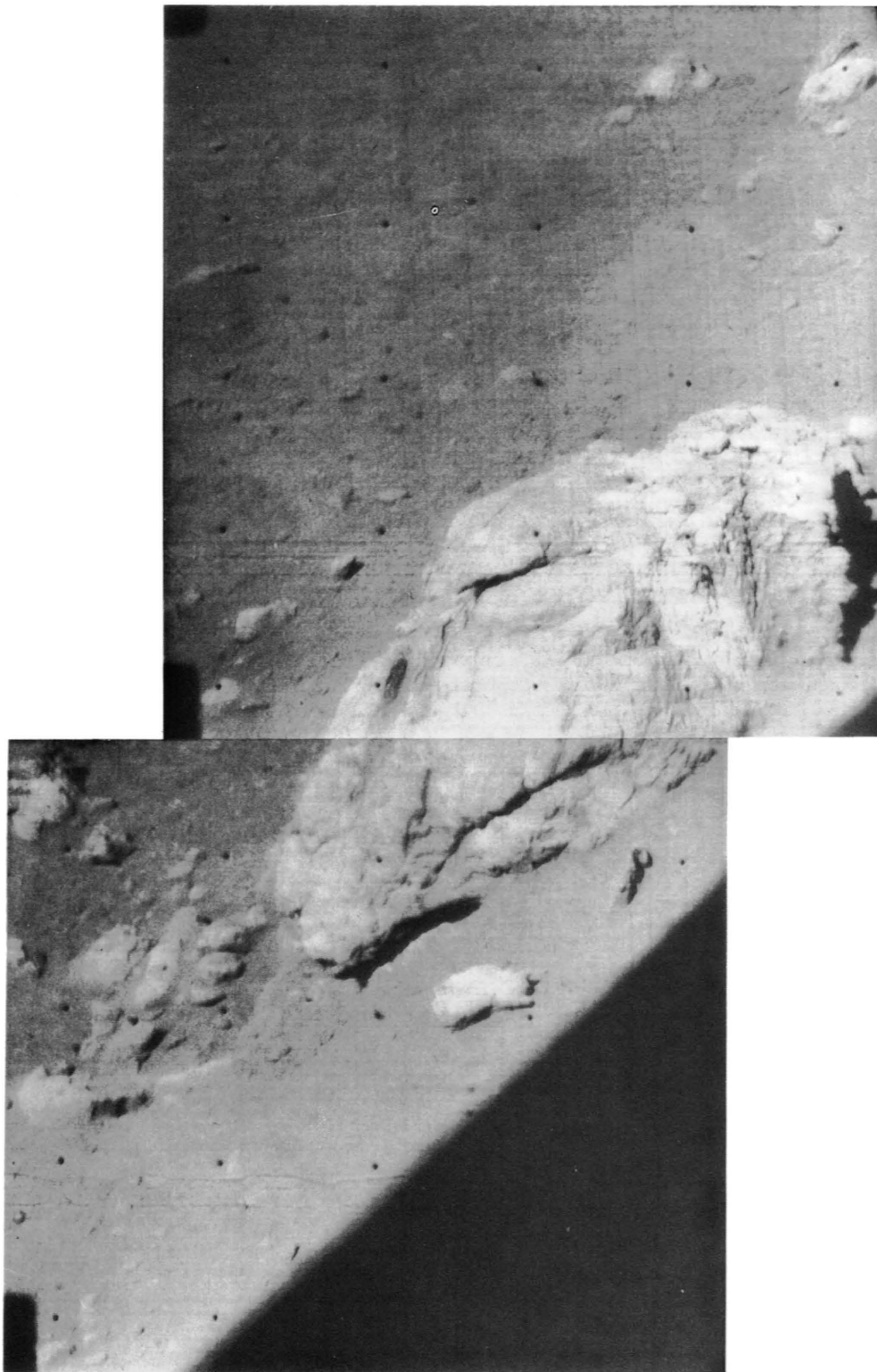
The landing sites of Surveyor I, of the lunar photographic spacecraft Rangers VII, VIII, and IX, and of Luna 9 are inscribed on this map of the lunar globe. Surveyor I made a perfect low-speed, three-point landing on the Moon on June 1, 1966, after a 63-hour, 36-minute flight from Cape Kennedy. During the following 12 days and 10 hours—before the Sun set on Surveyor's landing site in the Ocean of Storms on June 14—the spacecraft's survey television camera scanned and transmitted to Earth 10,338 high-resolution pictures of the lunar surface. The first picture was taken at 7 minutes before midnight, Pacific Daylight Time, on June 1. The final picture, recorded at 9:37 a.m. PDT, June 14, after lunar sundown, portrayed one of Surveyor's landing feet and the surrounding terrain, illuminated by earthshine only. In July, 1964, and in February and March, 1965, Rangers VII, VIII, and IX transmitted to Earth a total of more than 17,000 high-resolution pictures of the Moon's surface as the initial step in the United States' unmanned lunar exploration program. Surveyor I performed the first mission in America's second generation of Mooncraft. The Soviet Union's Luna 9 photographed the extreme western region of the Ocean of Storms after a successful landing in February, 1966.



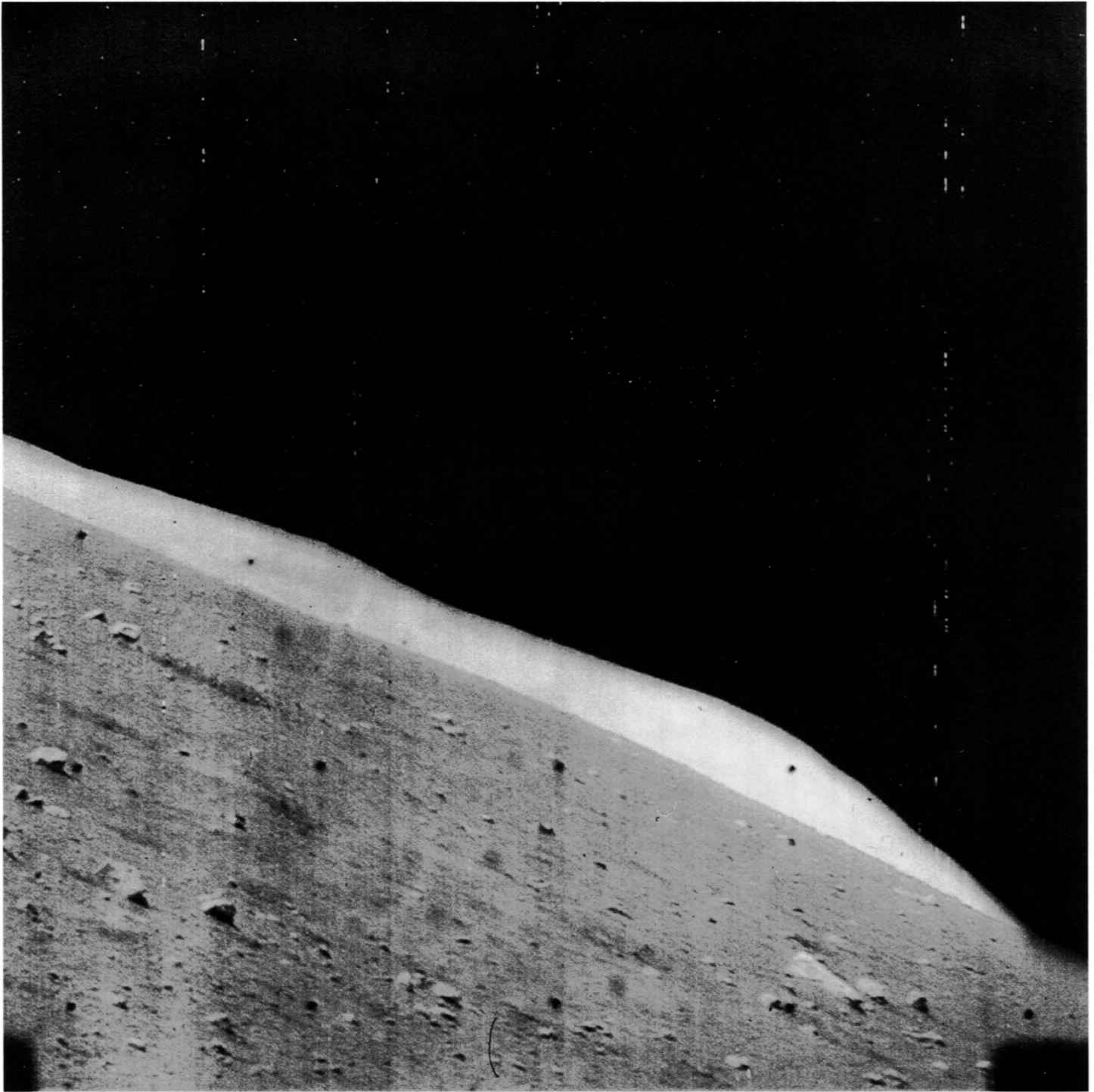
Surveyor I touched down gently on the Moon on June 1, 1966, at 2.356°S latitude and 43.36°W longitude, about 9 miles from its aiming point. The spacecraft landed at approximately 7.5 miles per hour, its three feet touching the surface within 19 thousandths of a second. Two “touchdowns” less than 1 second apart were registered by strain gages on the landing legs, indicating that Surveyor bounced about 4 or 5 inches. The landing site was a smooth area on the debris-filled floor of a “ghost” crater 60 miles in diameter within the Ocean of Storms. Part of the rim of the ancient crater can be seen as a distant mountain range rising beyond the horizon in Sheet 6. Thirty-seven miles to the south-southeast is a newer crater, Flamsteed. Latitudinal line at top of map is the lunar equator.



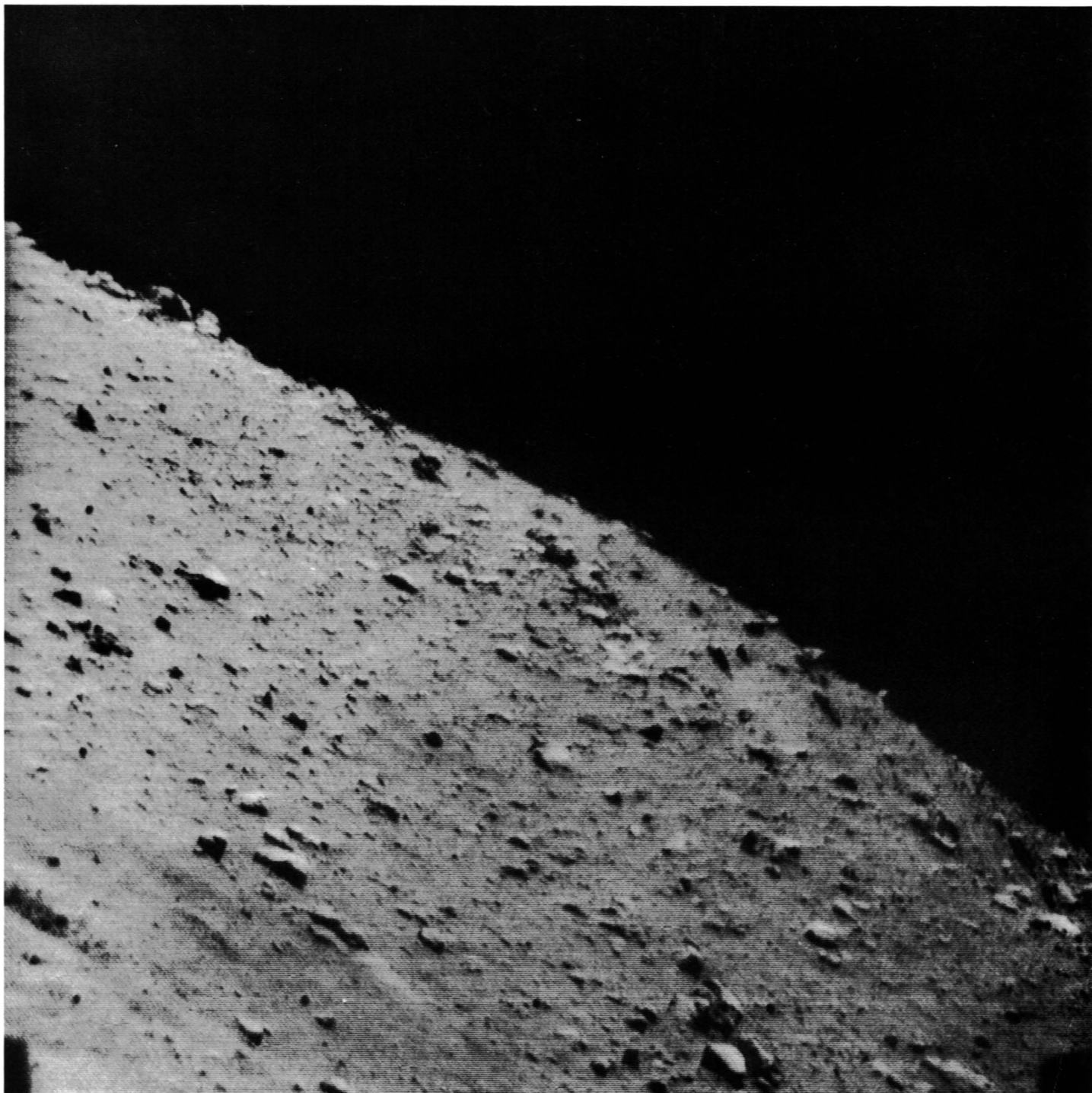
Lunar visitor Surveyor I took this picture of its own shadow against the Moon's surface in the back-lighting provided by the evening Sun. The wide-angle TV picture was taken by Surveyor's camera at 11:55 a.m. PDT, June 13, less than 24 hours before the Sun set on the landing site. The spacecraft's high-gain antenna and solar panel atop the mast, the camera at the right of the mast, and the low-gain antenna at the left edge of the picture are clearly silhouetted against the lunar surface. The regularly spaced black dots are reticle marks arranged on the face of the TV vidicon tube to indicate distortion if any exists. A portion of the horizon can be seen in the upper right corner.



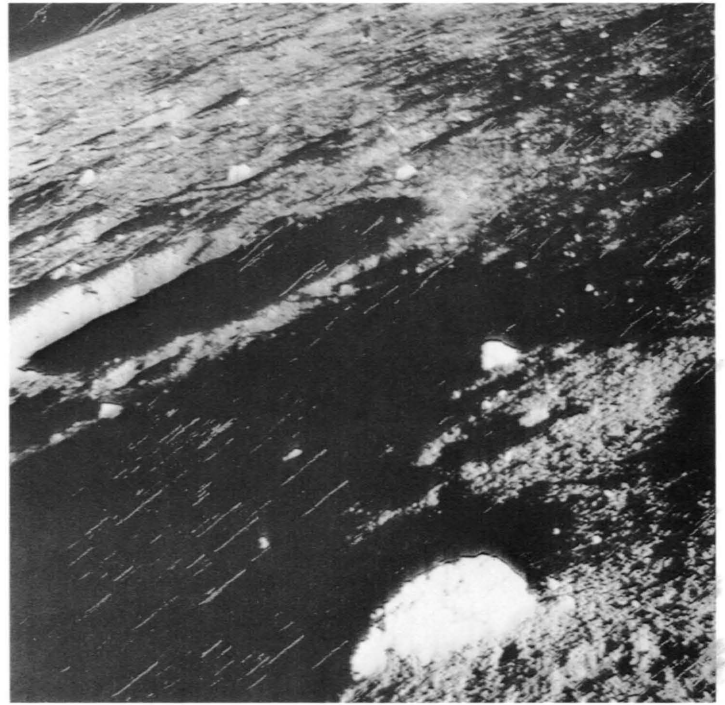
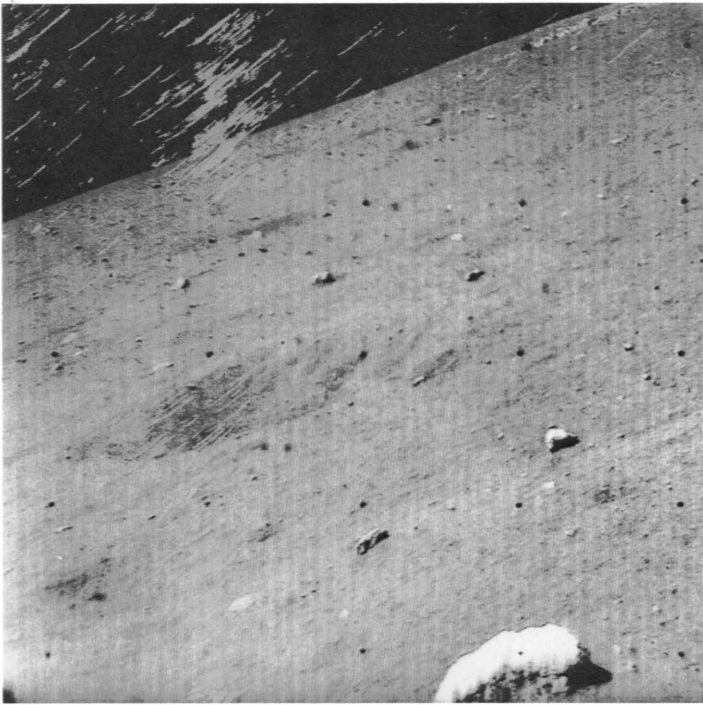
Composite of two narrow-angle pictures taken by Surveyor I on June 3 shows a Moon rock about 6 inches high and 18 inches long. The distance across the center of the top frame is 30 inches, across the bottom frame, 18 inches. The rock is about 12 feet from Surveyor's camera. The diagonal shadow at bottom right was cast by one of the spacecraft's electronics compartments. The bright rock above the shadow is about 1 by 3 inches. The rock fragments at left of the large rock range from several inches to $\frac{1}{8}$ inch in diameter.



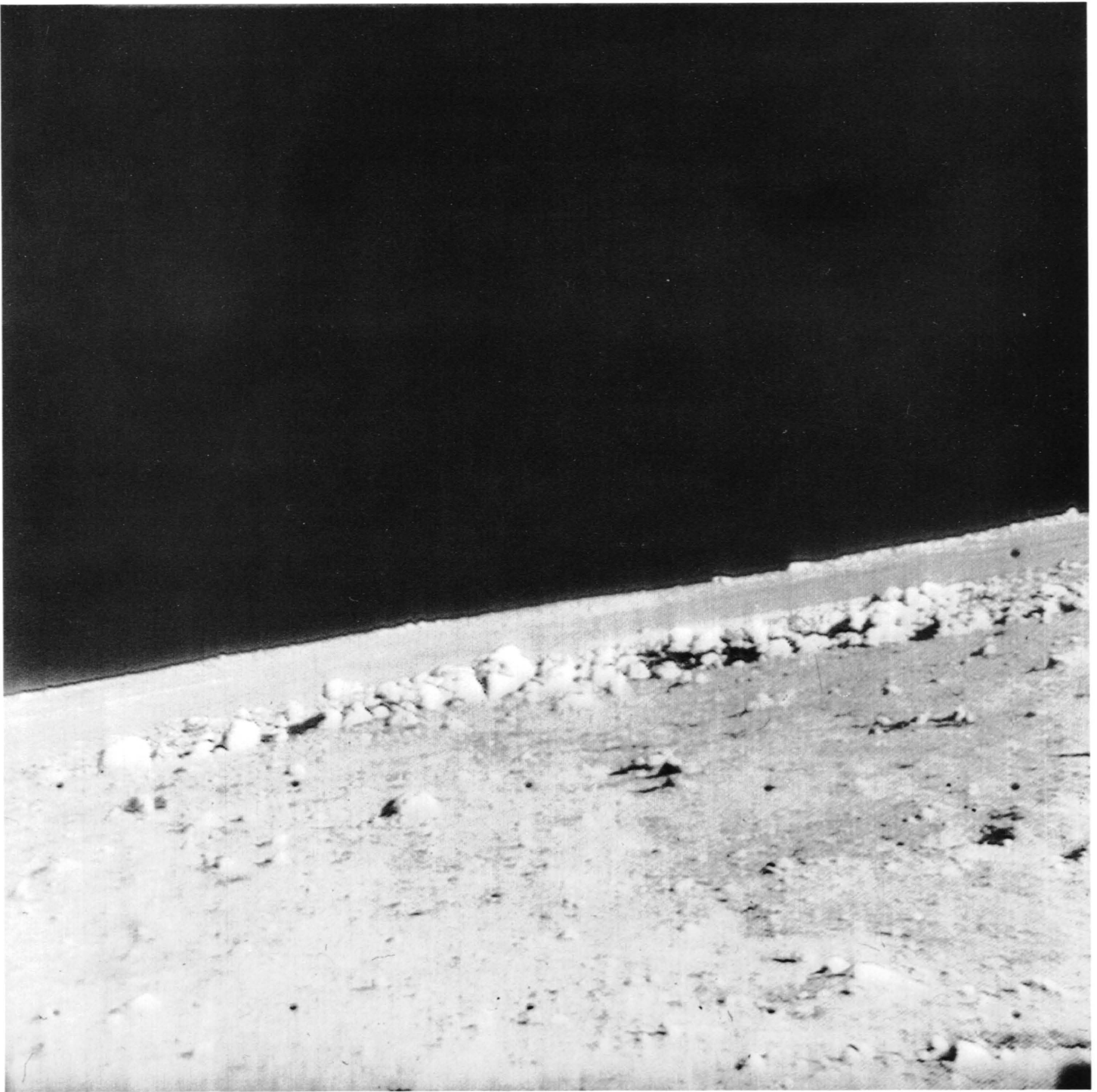
The crest of a small mountain range on the Moon, about 12 miles northeast of the landing site of Surveyor I, is seen in this narrow-angle picture taken on June 10. Only the top of the mountain shows above the near horizon, which is probably less than a mile away. The mountain, rising about 500 feet above the horizon, is part of the rim of a nearly buried ancient crater more than 60 miles in diameter. Parts of the rim can be seen from Earth with large telescope. Surveyor landed inside the "ghost" crater at 11:17 p.m. PDT on June 1.



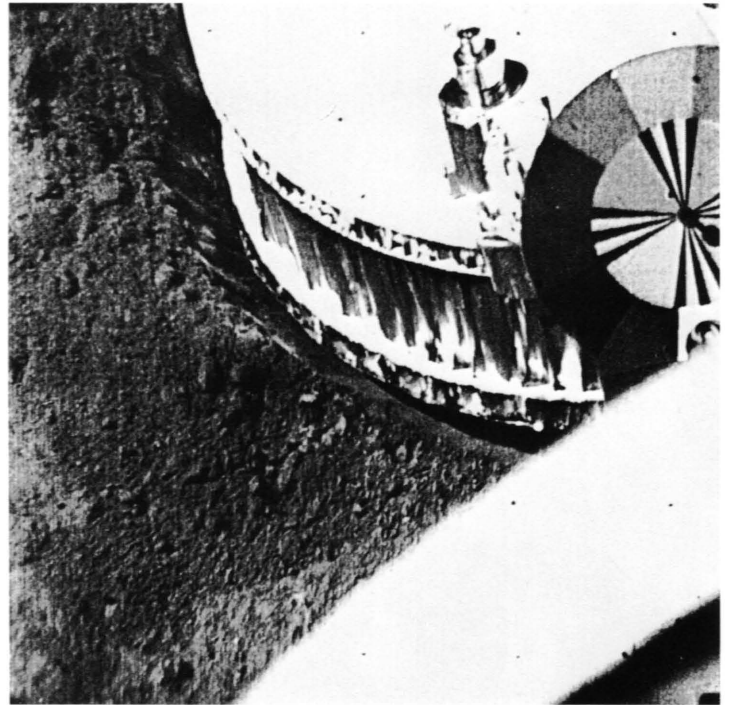
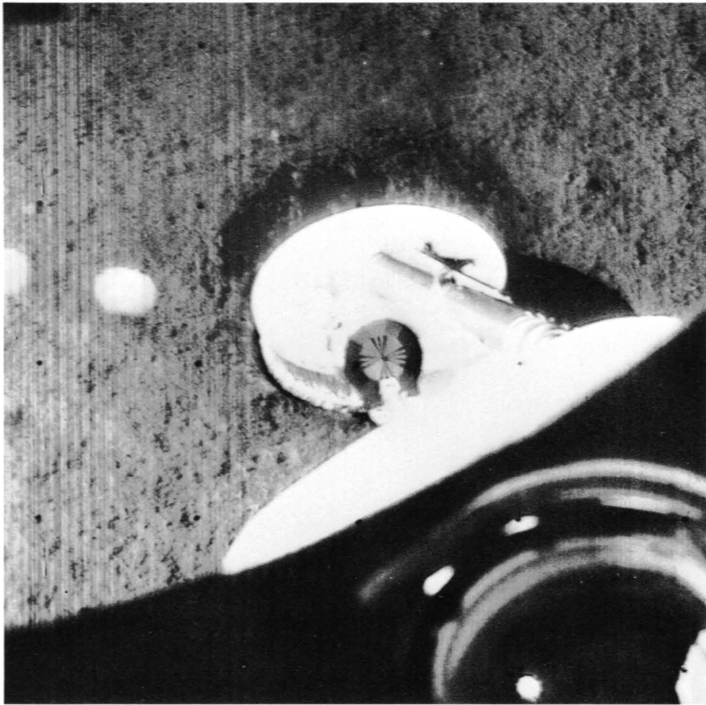
The boulder-strewn surface of the Ocean of Storms as seen by the television camera of Surveyor I shows the outside of a crater rim just right of the center of the horizon. The crater falls away beyond the horizon and to the right of the area covered in the narrow-angle picture. The photograph was taken on June 5, with the Sun almost overhead. The distance along the horizon is several tens of yards. The boulders on the horizon near the upper left may be 1 or 2 yards in length; the smallest rock fragments seen are several inches across. The rocks, which appear to be broken, solid material, apparently were scattered from the crater toward the site of Surveyor. The crater may be as large as $\frac{1}{3}$ mile in diameter. The camera was pointed slightly south of east on the Moon.



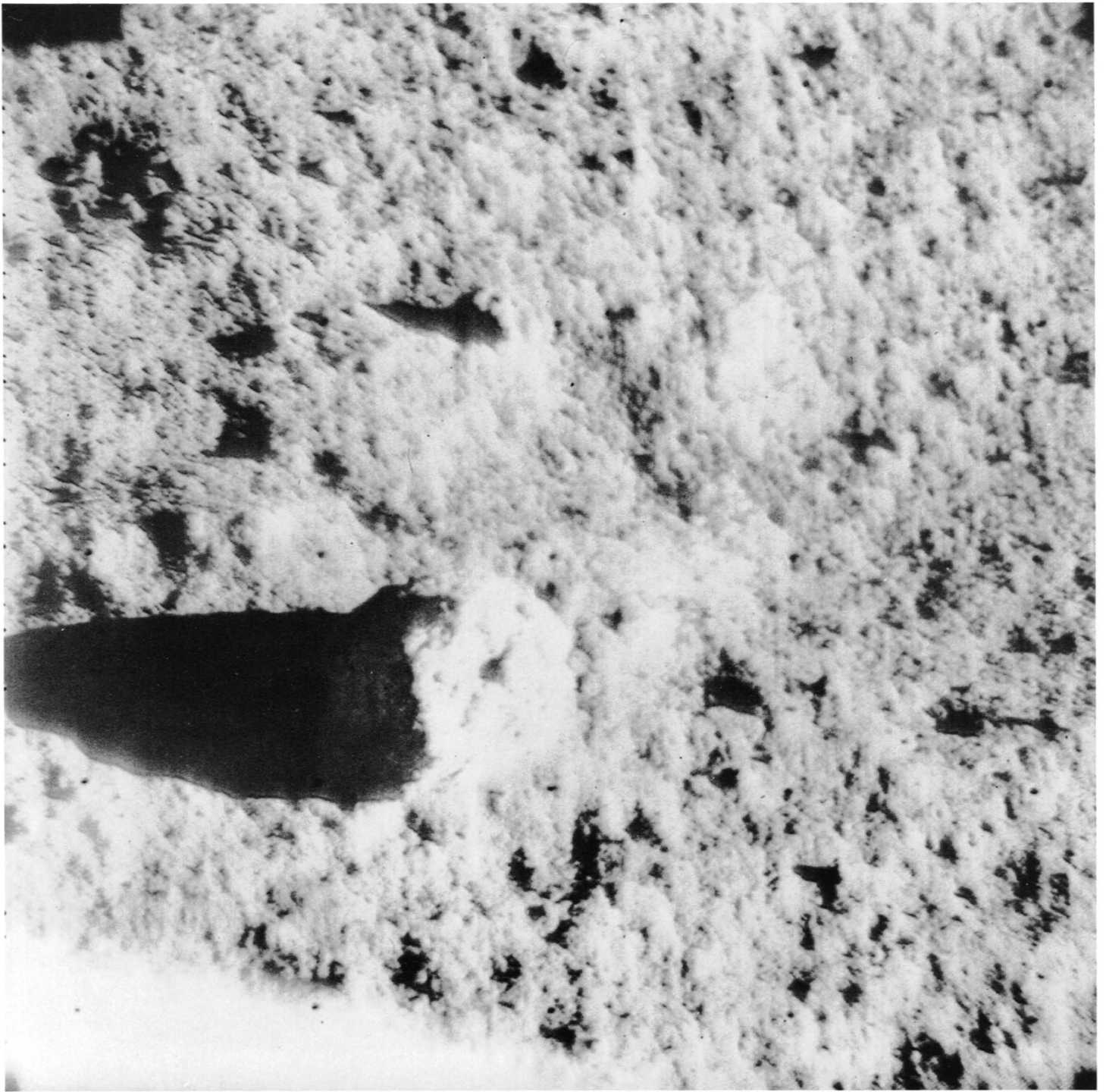
Two wide-angle Surveyor I photographs show a lunar scene—at nearly the same azimuth and slightly different elevations—taken 9 days apart. The effect of the Sun angles on the Moon features is evident. The picture at left was taken on June 5, 2 days before lunar noon; that at right just a few hours before sunset on June 14. The crater at left in both photos is about 10 feet in diameter and lies some 35 feet from the spacecraft. At the lower Sun angle (right photo), about 14 degrees above the western horizon, the far side of the crater is seen to have a raised rim. This feature is not evident in the accompanying picture. The rock in the foreground is about 6 inches high and 12 inches long. Both the crater and the rock can be located in the upper left of the mosaic panorama shown in Sheet 12.



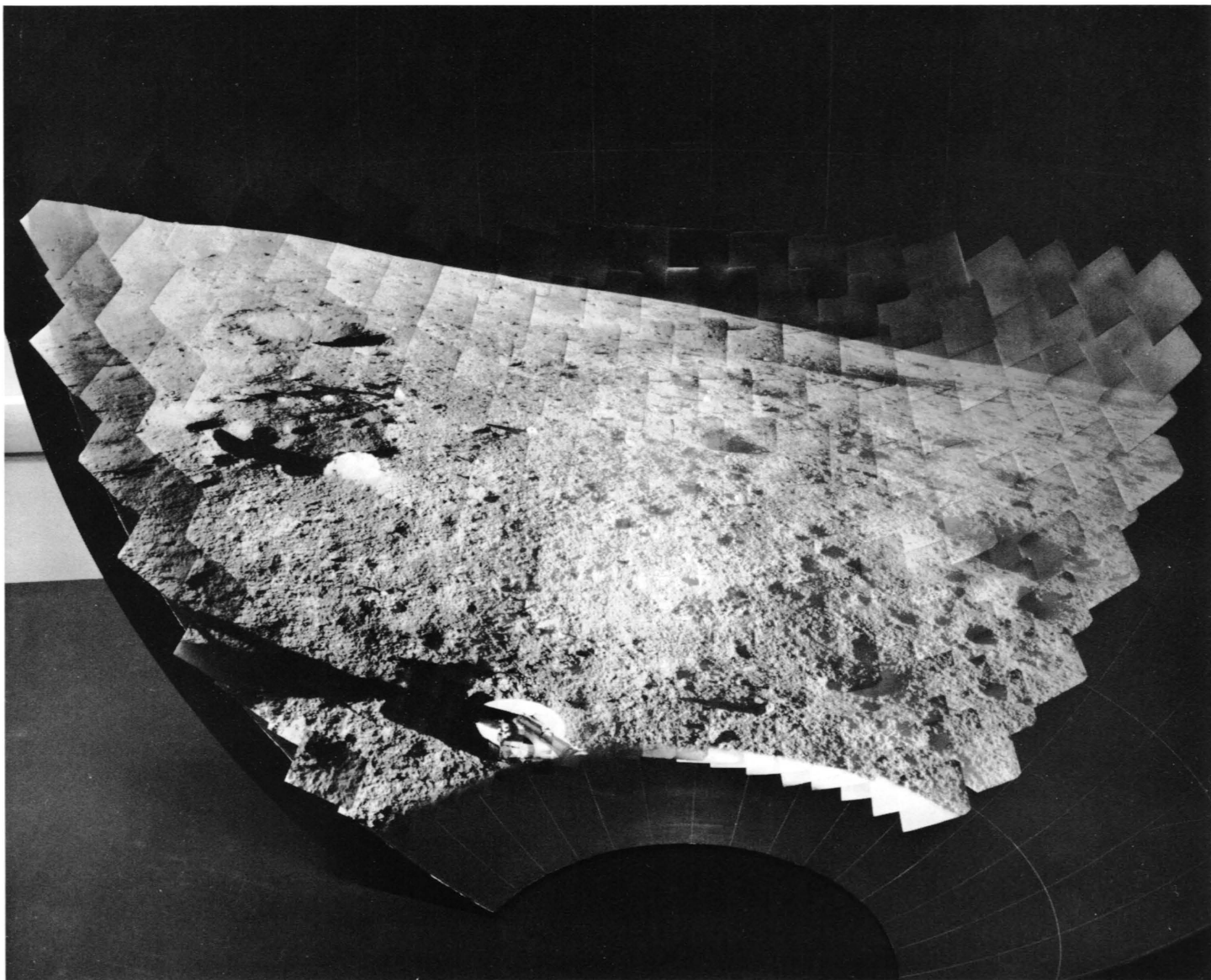
This narrow-angle photograph of the lunar horizon southwest of Surveyor's landing site was taken on June 13, about 24 hours before sunset. The line of large, rounded blocks marks the near rim of an ancient crater several hundred yards in diameter. The crater's far rim can be seen on the horizon.



The photograph at the left is the first 600-scan-line picture taken by Surveyor 1 on June 2. It shows a landing foot resting on the Moon and the surface depression caused by its pressure as the spacecraft landed. Grains as small as $\frac{1}{4}$ inch can be resolved in the wide-angle photo. At right, the narrow-angle view of the same foot has a resolution of $\frac{1}{50}$ inch. Computer filtering of the original data accentuates the fine detail in the disturbed lunar surface as seen in the picture at right. The bright spots in the left picture are reflections of the Sun caused by elements of the camera lens. The dark rings in the lower right are reflections of the camera's filter wheel on the lens, as seen in the camera mirror. The small, dark wheel-like object visible in both photographs is a photometric color calibration target mounted on the landing foot. The attitude-control jet, at left of the calibration target in the computer-enhanced picture, is nearly invisible in the left picture.



A close-up photograph taken at low Sun illumination near the Surveyor I spacecraft shows the cratered and lumpy textured lunar surface. The block casting a long shadow is several centimeters wide. The narrow-angle picture, transmitted to Earth on June 12, is one of more than 10,000 pictures taken by Surveyor I before sundown, June 14.



A spherical mosaic of narrow-angle pictures of the Moon taken by Surveyor's television camera forms a panoramic view of the lunar terrain, stretching approximately 130 degrees across the horizon. Each photo chip is 2 inches square and represents a 6-degree field of view as seen by the camera. The pictures are mounted in overlapping fashion against the concave surface of a 3-foot hemisphere. The survey was made on June 13, about 24 hours before the Sun set on the pictured site.