NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Technical Report 32-1262

Surveyor VI Mission Report

Part III. Television Data

Thomas H. Bird
M. I. Smokler
D. L. Smyth

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

August 15, 1968

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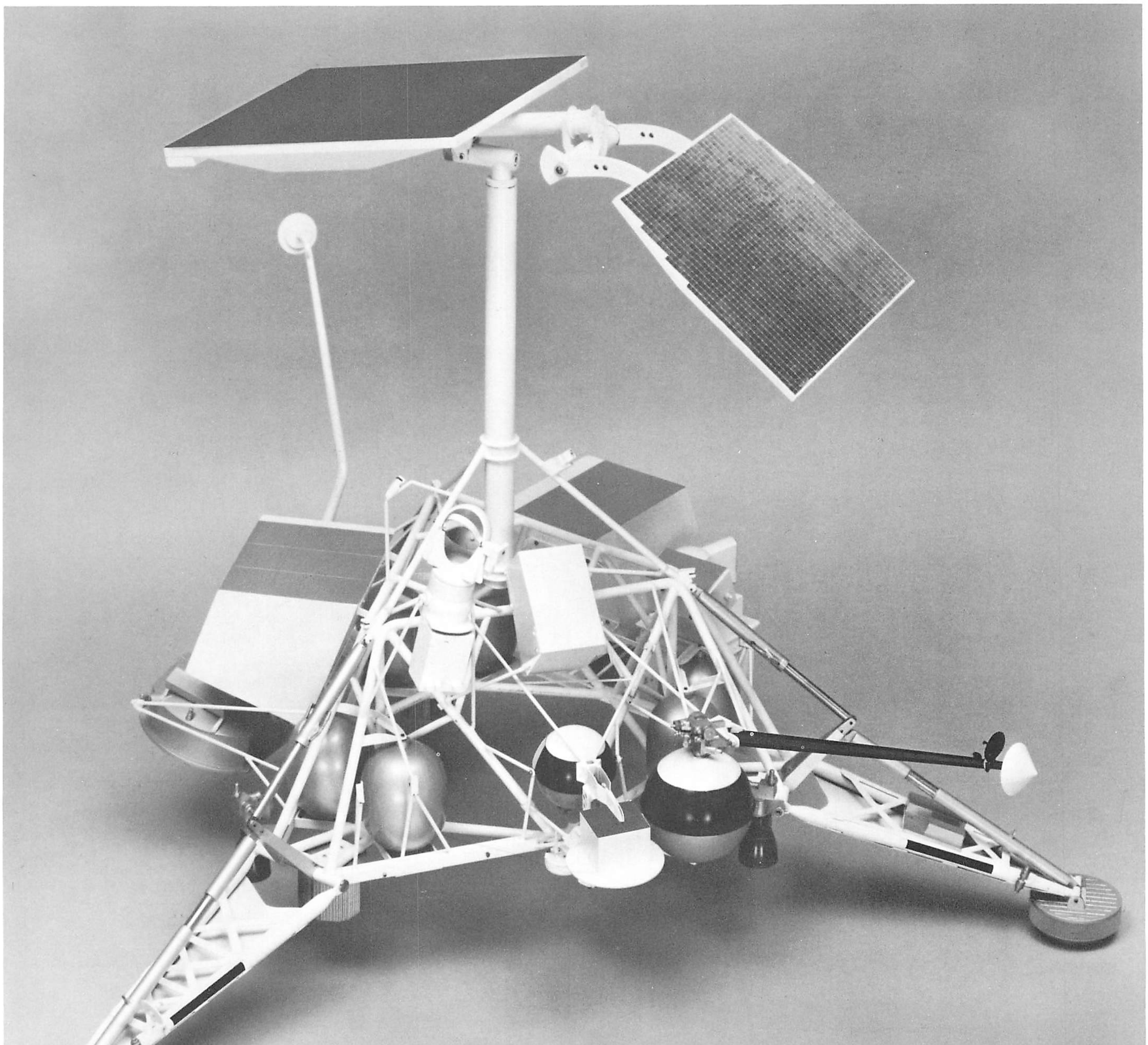

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Prepared Under Contract No. NAS 7-100
National Aeronautics & Space Administration

Preface

This three-part document constitutes the Project Mission Report on *Surveyor VI*, the sixth in a series of unmanned lunar soft-landing missions.

Part I of this Technical Report consists of a technical description and an evaluation of engineering results of the systems used in the *Surveyor VI* mission. Part II presents the scientific data derived from the mission, and the scientific analyses conducted by the *Surveyor* Scientific Evaluation Advisory Team, the *Surveyor* Investigator Teams, and the associated Working Groups. Part III consists of selected pictures from *Surveyor VI* and appropriate explanatory material.

This Part III presents 139 of the total number of television pictures transmitted to earth from the lunar surface, between November 10 and November 24, 1967; 46 mosaics composed of individual frames are also included. Appropriate information for interpreting these pictures is given in the individual sections of the report.

Acknowledgment

The authors wish to acknowledge the valuable assistance provided by Stanley B. Seng of the Space Science Division of JPL, who spent many hours selecting and coordinating the material in this report.

Contents

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I. Introduction

Thomas H. Bird

This volume, Part III of the Mission Report, contains a selection of 139 pictures relating to the *Surveyor VI* mission. Approximately 30,000 individual frames were obtained during the television (TV) activities. These included over 13,850 frames before the spacecraft was translated, and over 16,500 frames at the second landing location.

In addition to the individual frames, copies of 46 selected mosaics of the information collected by the TV camera are presented. Some of these mosaics are copies of preliminary data constructed during the actual mission operational time. Spatial relationships among various features on the lunar surface are best evaluated by reference to the mosaic of the area of interest. The most direct means of locating individual items of interest is by reference to camera azimuth and evaluation and the associated mosaic areas. Also included are several special mosaics showing areas of particular interest.

Individual frames are best identified by the Greenwich Mean Time (GMT) of the record. Differences in recording time between various ground stations may cause variations of ± 1 s in the time related on the frame. This should cause no ambiguity between any two frames as the minimum interval between successive frames was 3.6 s.

The National Space Science Data Center at Goddard Space Flight Center, Greenbelt, Maryland, is responsible for dissemination of *Surveyor VI* pictures and other scientific data. An index and copies of the pictures in various forms can be obtained from that Data Center.

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II. Television Subsystem

M. I. Smokler

The *Surveyor* TV system is designed to obtain video pictures of the lunar surface, lunar sky, and portions of the landed spacecraft. It includes a survey camera capable of panoramic viewing, and a TV auxiliary that serves to process commands and identification signals and to provide appropriate video mixing.

A. Camera Description

The slow-scan survey TV camera, shown in Figs. II-1 and II-2, provides images of the lunar surface over a 360-deg panorama. Each picture, or frame, is imaged through an optical system onto a vidicon image sensor whose electron beam scans a photoconductive surface to produce an electrical output proportional to conductivity changes resulting from the varying receipt of photons from the object space. The camera is designed to accommodate scene luminance levels from approximately 0.008 to 2600 ft-L, using both electromechanical mode changes and iris control.

Frame-by-frame coverage of the lunar surface provides a 360-deg azimuth view and an elevation view from approximately +40 deg above the plane normal to the camera Z axis to −60 deg below this same plane. The camera Z axis is inclined approximately 16 deg from the spacecraft Z axis. Camera operation is totally dependent upon receiving the correct commands from earth. Commandable operation allows each frame to be generated by sequencing the shutter with appropriate lens settings and mirror azimuth and elevation positioning to obtain selected views of the object space. The camera provides a designed resolution capability of approximately 1 mm at 4 m and can focus from 1.22 m to infinity. The 7.3-kg camera consists essentially of six major components: mirror, lens, shutter, filter wheel, vidicon, and attendant electronic circuitry.

The mirror assembly, such as shown in Fig. II-3, contains a 10.5- by 15-cm elliptical mirror supported at its minor axis by trunnions. This mirror is formed by vacuum-depositing a Kanogen surface on a beryllium blank, followed by a deposition of aluminum with an overcoat of silicon monoxide. The mirrored surface is flat over the entire surface to less than 1/4 wavelength at $\lambda = 550$ mμ and exhibits an average specular reflectivity in excess of 86%. The mirror is positioned by means of two drive mechanisms, one for azimuth and

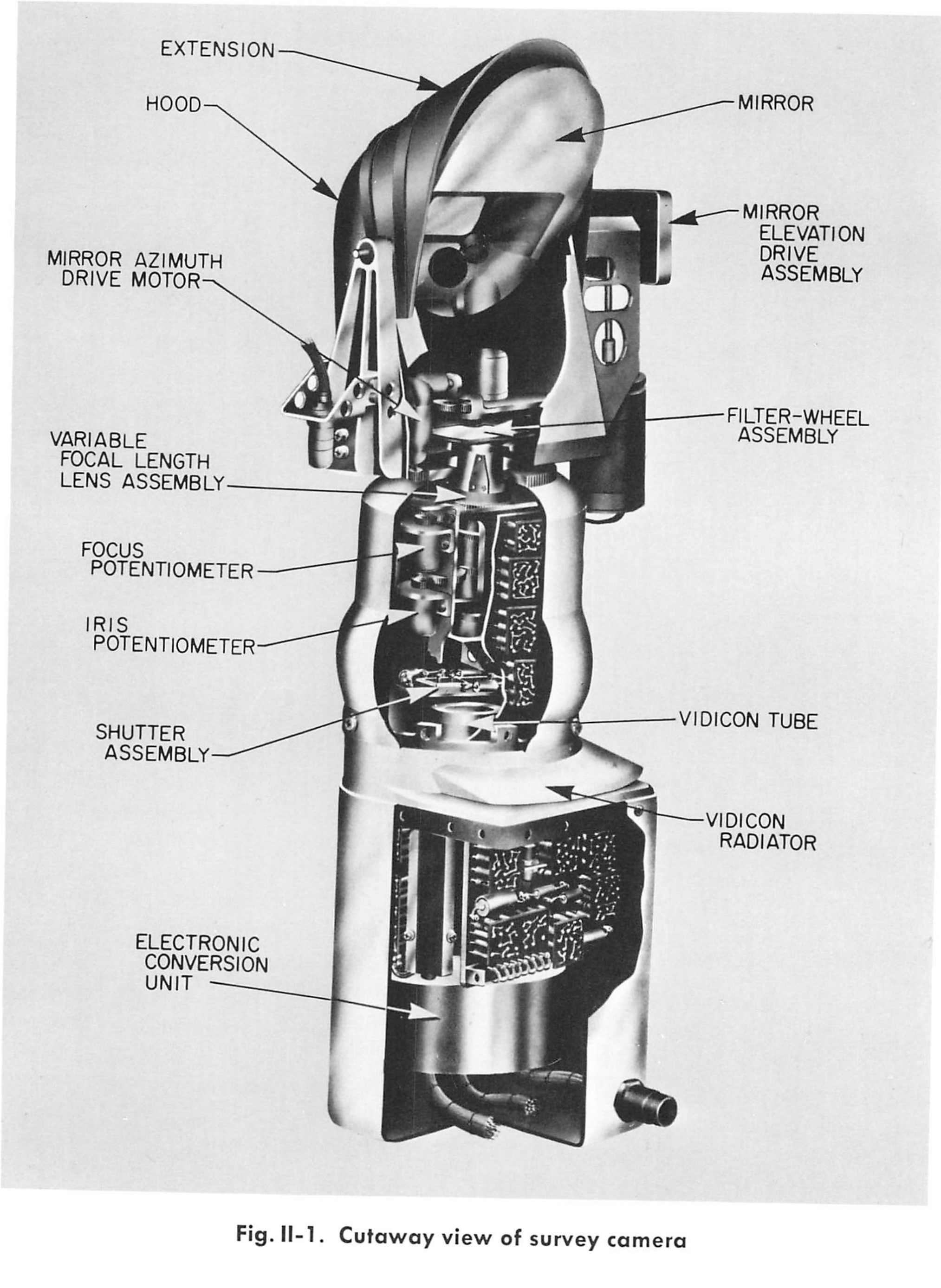

Fig. II-1. Cutaway view of survey camera

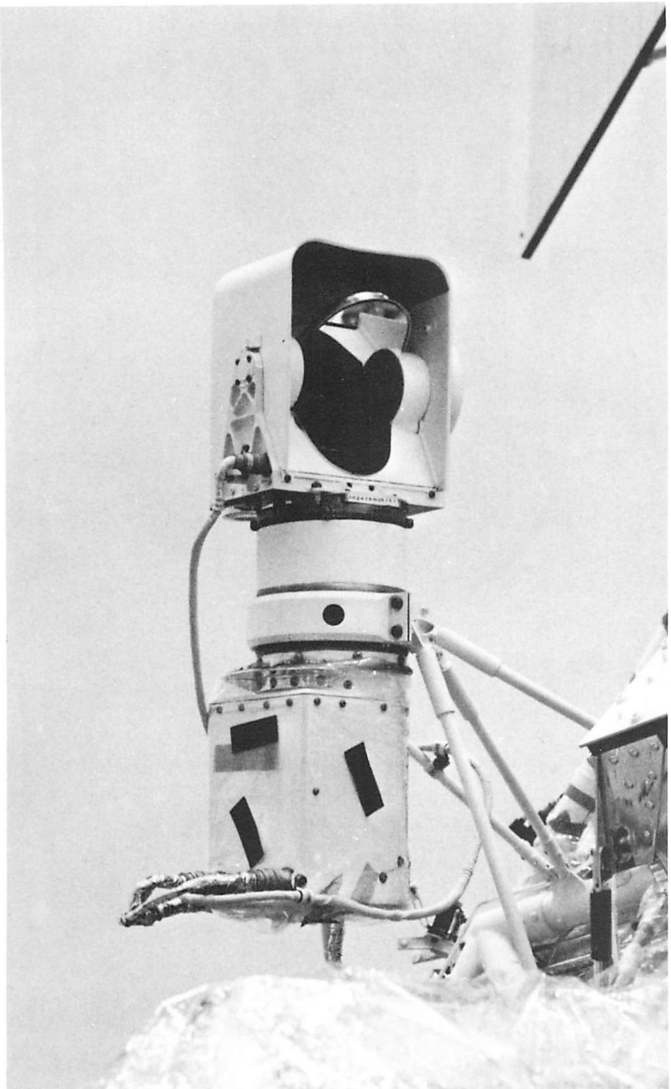

Fig. II-2. Survey camera on spacecraft

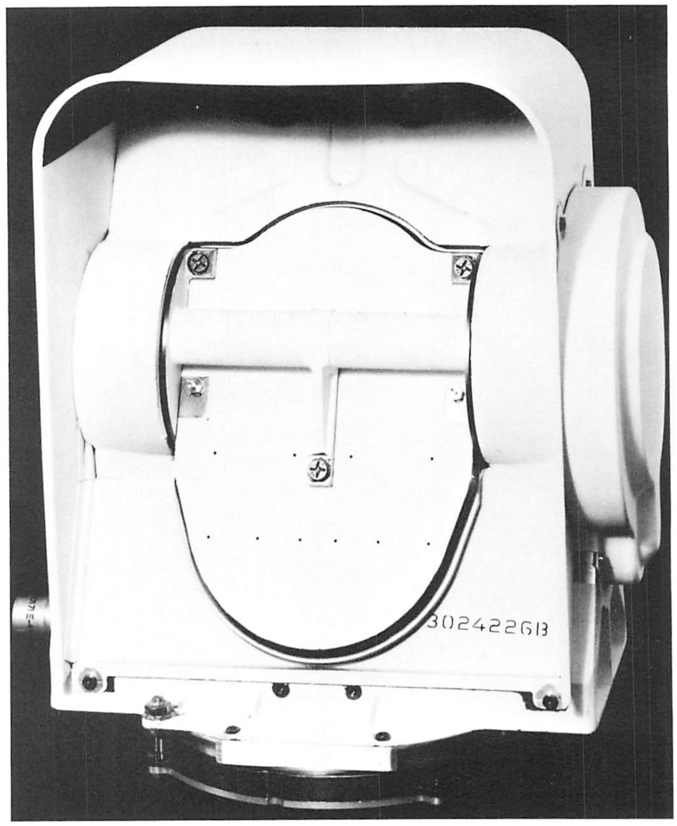

Fig. II-3. Mirror assembly

the other for elevation. The drive mechanisms consist of stepper motors that provide, through appropriate gear reduction, a mirror mechanical step size of 2.5 $\pm$0.1 deg in elevation and 3.0 $\pm$0.1 deg in azimuth. Angular step positions of both axes are sensed by position potentiometers, the outputs of which are digitized and transmitted to earth in pulse code modulation (PCM) form.

The mirror assembly used on *Surveyor VI* is a completely redesigned version of the mirror assembly used on all previous missions. The purpose of the redesign was to improve performance and reliability. Occasional failure to respond to azimuth or elevation stepping commands was corrected by increasing motor torque output and reliability, reducing frictional and inertial loading, and providing adjustable end stops. Pointing accuracy was improved. A labyrinth seal was added to reduce dust accumulation on optical surfaces when the mirror was closed. The hood was extended at top and sides, and the front flange was painted black to reduce glare in pictures. Other design changes enabled removal of the hood or mirror assembly without requiring recalibration or requalification.

The rotation of the mirror in the azimuth direction, while providing the azimuth coverage capability to the camera, creates an image rotational proportional to the angular azimuth position of the mirror, since the image plane and the scanning raster of the image sensor (the vidicon) are stationary with respect to the mirror azimuth axis.

The mirror assembly also contains a four-section filter wheel (Fig. II-4). As redesigned for *Surveyor VI*, three sections contain polarizing filters and one section contains a neutral density filter for nonpolarized observations. Using the mission operations designations of filter positions as Numbers 1, 2, 3, and 4, No. 1 is the neutral density filter. Its transmission characteristic is selected such that the camera's response to nonpolarized light is

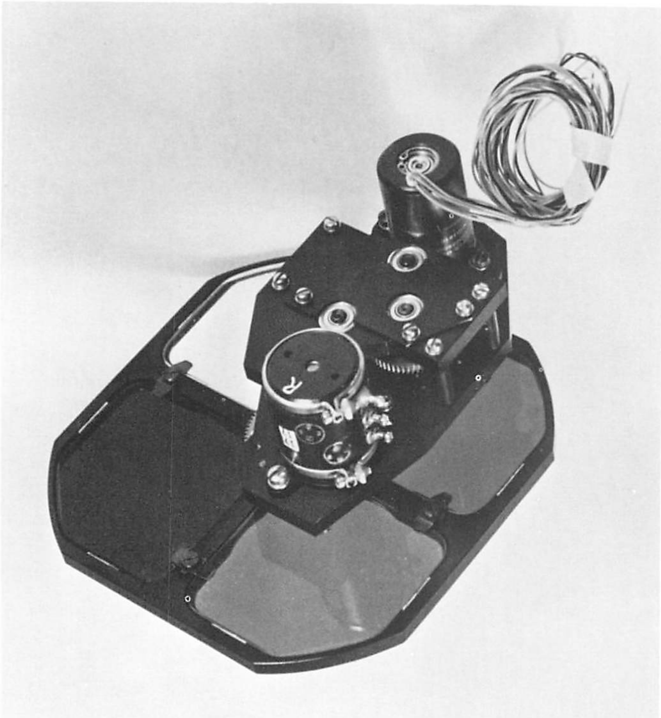

Fig. II-4. Filter-wheel assembly

38%, which is identical to its response when using the polarizing filters to view a nonpolarized light source.

The transmission axes of the polarizing filters, in positions 2, 3, and 4, are at relative angles of 0, 45, and 90 deg, respectively. In the calibration data (see Section II-B), these three transmission axes are coded as N, P, and S, respectively, using identification derived from the manufacturing drawings and etched on the filters. For the 0-deg filter, the plane of polarization accepted is parallel to the elevation axis of the camera mirror. The 45- and 90-deg angles of the transmission axes of the other two filters are angles measured in the counterclockwise direction, looking out from the camera, relative to the above 0-deg reference plane.

In spacecraft coordinates, for the nominal attitude of a spacecraft, the 0-deg filter would accept horizontally polarized light when the optical axis of the camera is in the plane of the 16-deg camera tilt. Under the same conditions, the 90-deg filter would accept vertically polarized light.

The optical formation of the image was performed by means of a variable-focal-length lens assembly between the vidicon image sensor and the mirror assembly. The assembly (Fig. II-5) was capable of providing either a

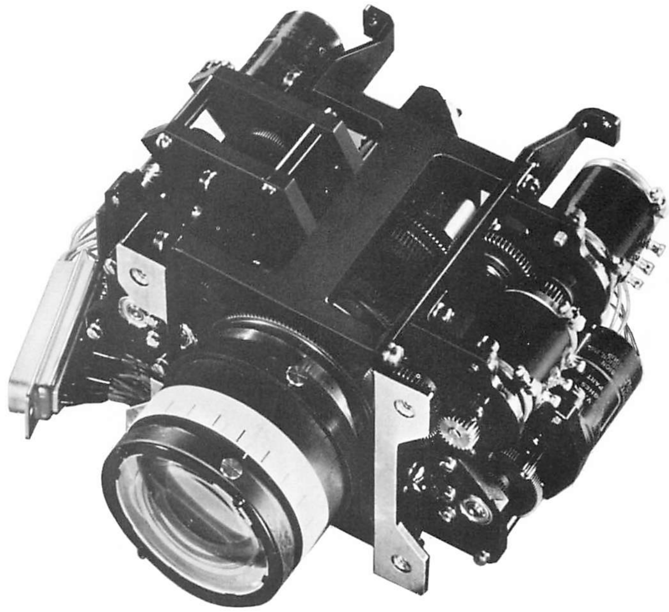

Fig. II-5. Variable-focal-length lens assembly

100-mm or 25-mm focal length, resulting in a vertical field of view of approximately 6.43 or 25.3 deg, respectively, as measured by the angular subtense of the vertical dimension in the video format. Because horizontal scan on this camera was increased by 10%, the horizontal field of view was, therefore, 10% greater than the vertical field of view.

The lens assembly could vary its focus by means of a rotating focus cell from near 1.22 m to infinity, while an adjustable iris provided effective aperture changes of $f/22$ to $f/4$ in half f-stop increments. This resulted in an aperture-area change of $\sqrt{2}$ for each f-stop increment. While the most effective iris control is accomplished by command operation, a servo-type automatic iris was available to control the aperture area in proportion to the average scene luminance. As in the mirror assembly, potentiometers were geared to the iris, focal length, and focus elements to allow ground determination of these functions. A beam splitter, integral to the lens assembly, provided a light sample for operation of the automatic iris.

Three modes of exposure control are afforded the camera by means of a mechanical focal plane shutter (Fig. II-6) located between the lens assembly and the vidicon image sensor. In the *normal shutter mode,* upon earth command, the two shutter blades are sequentially driven by solenoids across an aperture in the shutter base plate, with appropriate delay between blades. The time interval between the blade motions determines the exposure interval, which is nominally 150 ms.

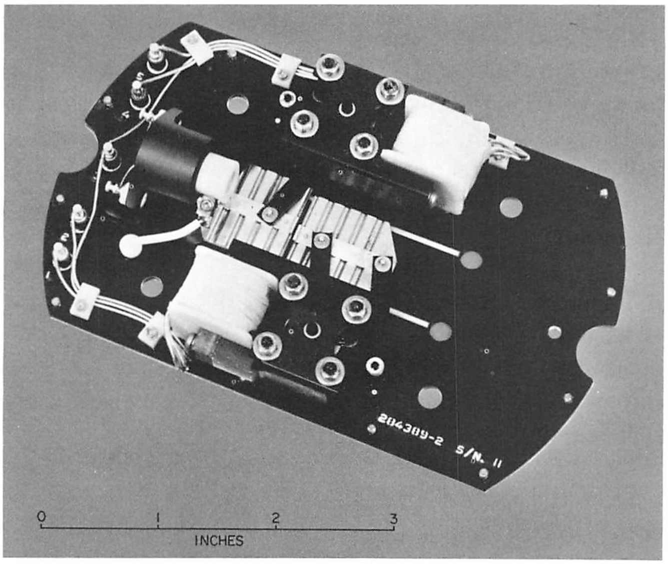

Fig. II-6. Shutter assembly

In the second shutter mode (*open shutter mode*), the blades are positioned to leave the aperture open, thereby providing continuous light energy to the image sensor. This mode of operation is useful in the imaging of scenes exhibiting low luminance levels, including some of the brighter stars. The effective shutter time in this mode is 1.2 s, nominally.

A third exposure mode, used for extremely low luminance levels, such as stellar observations, lunar surface observation under earthshine illumination conditions, and faint solar corona observations, is referred to as the *integrate mode*. This mode is implemented by opening the shutter, turning off the vidicon electron beam, and then, after any desired exposure time, turning on the vidicon electron beam. Scene luminance on the order of 0.008 ft-L is easily reproduced in this mode of operation, thereby permitting photographs under earthshine conditions. Detection of sixth-magnitude stars has been accomplished using this mode of operation with an exposure time of 5 min.

The transducing process of converting light energy from the object space to an equivalent electrical signal in the image plane is accomplished by the vidicon tube; this hybrid tube (Fig. II-7) uses electrostatic focus and electromagnetic deflection. The principle by which the

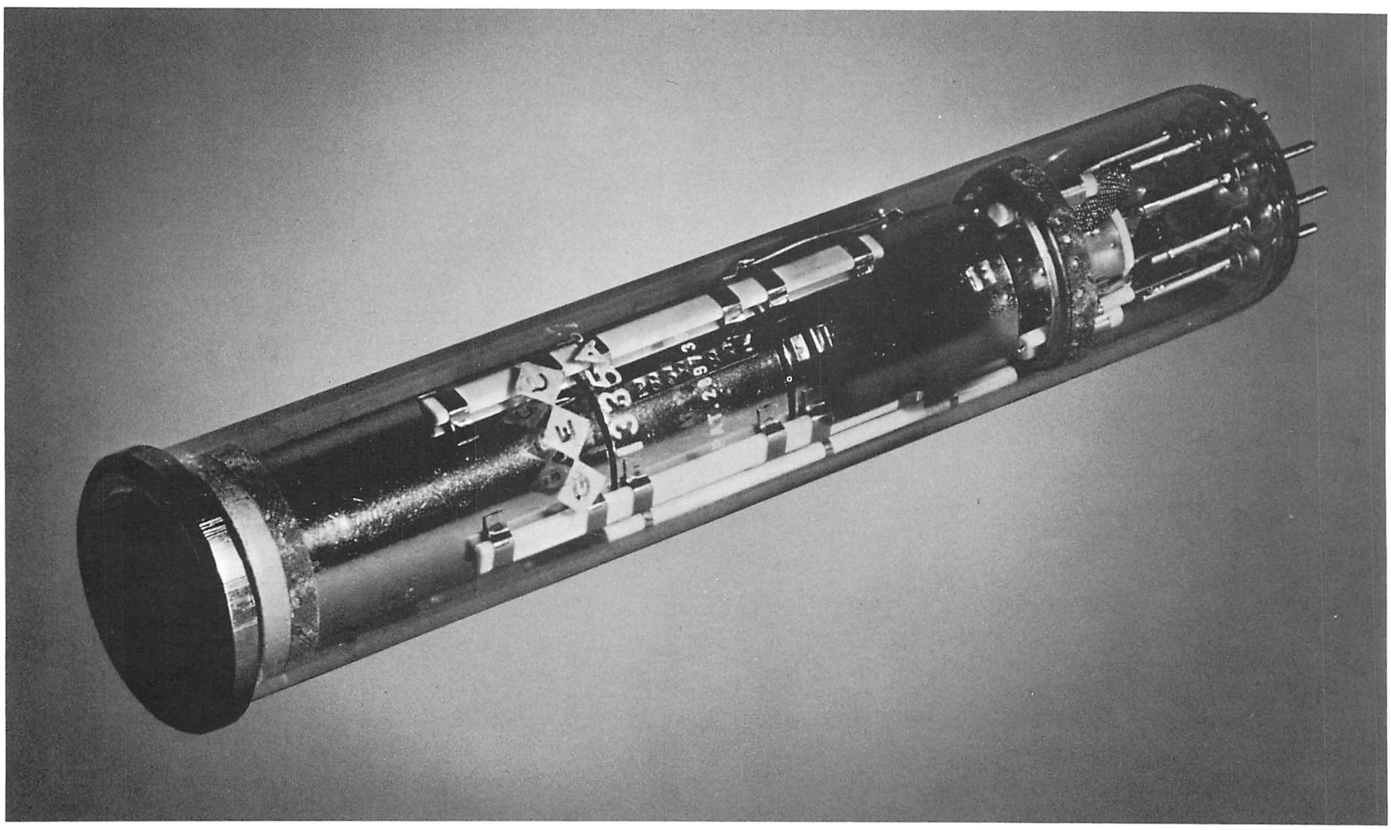

Fig. II-7. One-inch vidicon for survey camera video signal is produced from the photoconductive surface is illustrated in Fig. II-8. A low-velocity scanning beam strikes one side of the surface; the other receives illumination through a signal plate from which the video signal is taken. Light imaged on the photoconductive surface increases conductivity over each differential area proportionately to the integrated illumination on that area. A corresponding positive charge pattern appears on the target. During the succeeding scan the beam deposits sufficient numbers of electrons over each differential area sequentially to neutralize the accumulated charge, thereby generating the video signal.

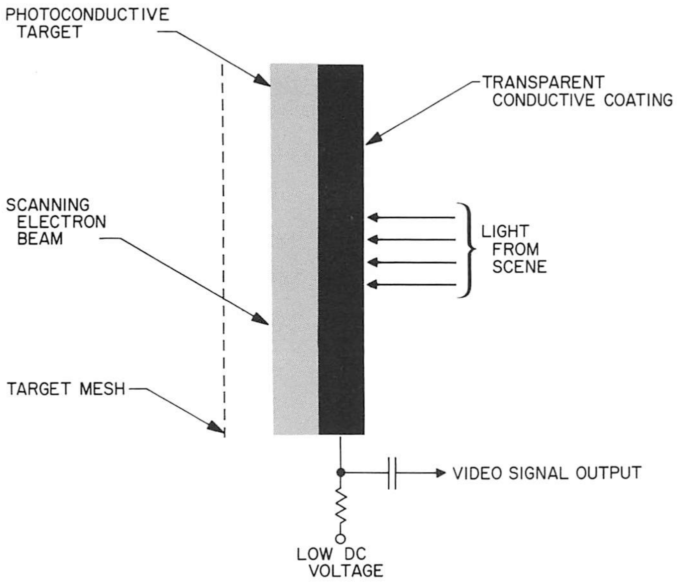

Fig. II-8. Vidicon functional diagram

The photoconductor incorporated in the vidicon sensor consists of a selenium derivative. Integral to the photoconductor surface is a 5 by 5 matrix of dots comprising a reseau that can be used in correcting the image information for nonlinearities and distortions. A reference mark is included in each corner of the scanned format to provide, in the video signal, an electronic level representing optical black for photometric reference. The 10% wider scan described above was provided to ensure inclusion of at least one reference mark under worst conditions of raster size and position change due to lunar temperatures.

Electronic circuitry for timing, power, and amplification functions of the camera is constructed of solid-state components and packaged in module form, as shown in Fig. II-9. The circuitry comprises five functional groups:

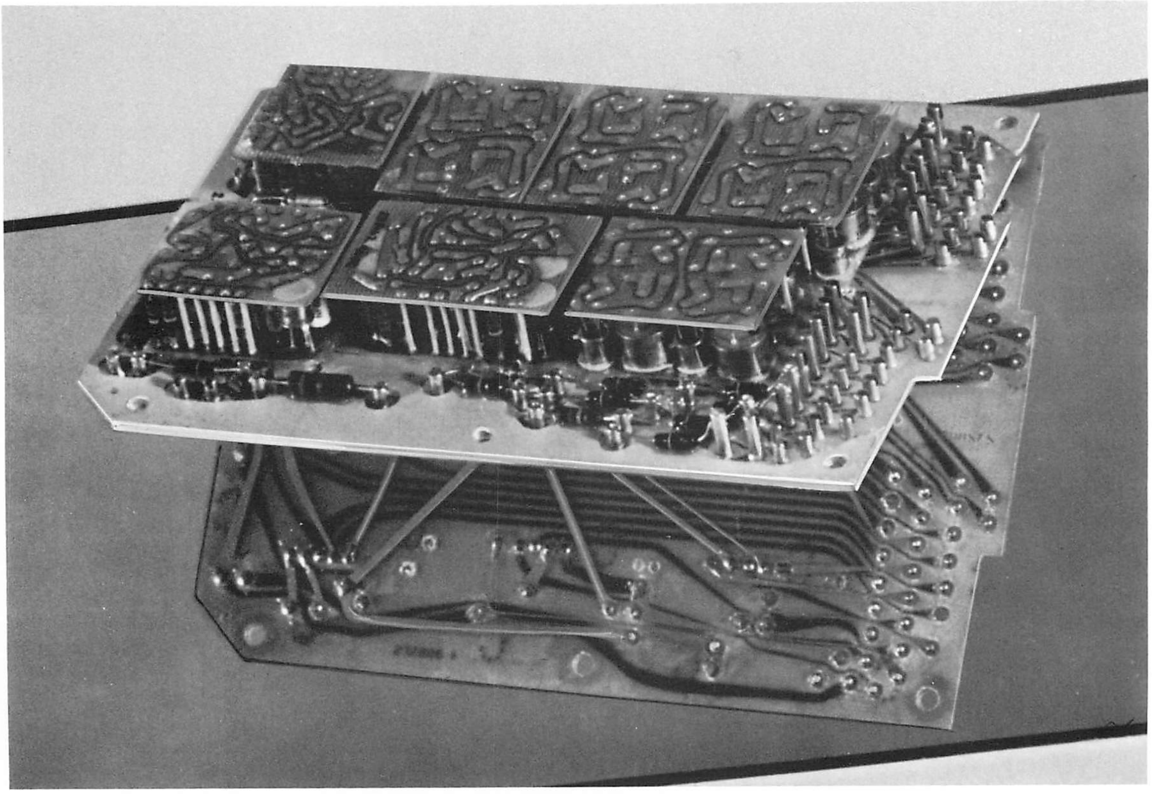

Fig. II-9. Electronic module configuration

(1) Drive circuits for lens and mirror mechanical positioning.

(2) Video amplifier.

(3) Horizontal- and vertical-sweep circuits that create the scanning raster.

(4) Synchronization circuitry for ground recording and reproduction purposes.

(5) Electronic conversion unit to provide voltages and regulation from the spacecraft central power source for camera operation.

Thermal control devices are (1) within the camera, surrounding the vidicon faceplate, (2) on selected electronic modules, and (3) within the mirror assembly for providing and maintaining operational temperatures when the camera experiences low transit- and lunar-temperature conditions.

Functionally, the camera operated in a slow-scan mode, in contrast to the standard scan used in commercial television. Such a reduced scan rate requires less information bandwidth from the spacecraft communications system for a given picture quality, and thus reduces the RF power requirements for the lunar distances involved.

In the normal scan mode of operation, the camera provides one 600-line frame each 3.6 s. Each frame requires 1 s to be read from the vidicon; the transmission of lens- and mirror-position information, plus several temperature measurements, require 200 ms. The remaining 2.4 s are used in erasing the image from the vidicon, in preparation for the next exposure. The video bandwidth required is 220 kHz.

A second scan mode of operation in the camera provides one 200-line frame each 60.8 s. Each frame requires 20 s to complete the video transmission and uses a bandwidth of 1.2 kHz. This 200-line mode is used in instances of omnidirectional antenna transmission from the spacecraft. The 600-line mode can be used only when the directional antenna is oriented toward the earth.

Integral to the spacecraft, and within the viewing capability of the camera, are two photometric/colorimetric reference charts. These charts are located on an omnidirectional antenna and on a spacecraft leg adjacent to the footpad, so that the line of sight of the camera in viewing each chart is normal (± 3 deg) to the chart plane. The charts are identical; each has a series of 13 gray wedges arranged circumferentially. In addition, three color wedges (with known CIE[1] chromaticity coordinates) are located radially from the chart center. A series of radial lines is incorporated to provide a gross estimate of camera resolution. Finally, each chart contains a center post to help determine solar angles, by means of the shadow information, after the lunar landing. Prior to launch, the charts were calibrated gonio-photometrically to allow an estimation of postlanding camera dynamic range.

B. Camera Calibration

To derive maximum scientific information from a picture, it is necessary to have precise quantitative information on the camera that obtained the picture in terms of those parameters that describe the quality of the image. To ensure such precise information, a calibration was performed on *Surveyor VI* with the camera mounted on the spacecraft. Each calibration used the entire telecommunication system of the spacecraft, so as to include those factors of the modulator, transmitter, etc., that influenced overall image-transfer characteristics. This calibration was performed at the launch complex on September 18 through 21, 1967.

Calibration information was used both prior to the mission and during the post-mission data analysis period. Prior to launch, the entire TV ground data handling system (TV–GDHS) was adjusted and calibrated, using the prerecorded spacecraft/camera video signal derived during the calibration of the camera. This allowed the ground equipment to be optimized for the particular spacecraft in terms of real-time receipt and processing of image information. With respect to the post-mission analysis, camera calibration could be used to correct the images for geometric nonlinearities and distortions, falloff of spatial frequency response, photometric nonuniformities, and coherent noise.

Those factors, or parameters, of the camera that control the first-order effects in the resulting images are:

(1) Dynamic range or light-transfer characteristic.

(2) Modulation transfer or spatial frequency response.

(3) Geometric distortion.

(4) Shading.

(5) Vignetting of the lens/vidicon combination.

[1]Commission Internationale d'Eclairage (Internation Commission on Illumination, formerly ICI).

These parameters are calibrated extensively on the *Surveyor* camera.

Calibration stimuli for the TV camera system consist of test slides accurately calibrated and configured for placement in a special light source. Representative samples of these test slides are shown in Figs. II-10 and II-11. Figure II-10 is a sine-wave slide for determining the modulation transfer or spatial frequency response of the system. It should be noted that the true sine wave is used in contrast to the more frequently used square wave, thus enabling a determination of the true Fourier representation of the camera response. Figure II-11 has a series of gray-scale wedges that determine the vidicon erasure characteristics, thereby enabling a correction to be applied as a function of latent image level resulting from previous exposures. Additionally, there is a grid pattern which, by means of either manual or computer techniques, permits nonlinearities and distortions to be removed from each image. Light-transfer characteristics and shading measurements are obtained by exposing the camera to a series of uniform light fields, each progressively brighter, until a saturation point is reached.

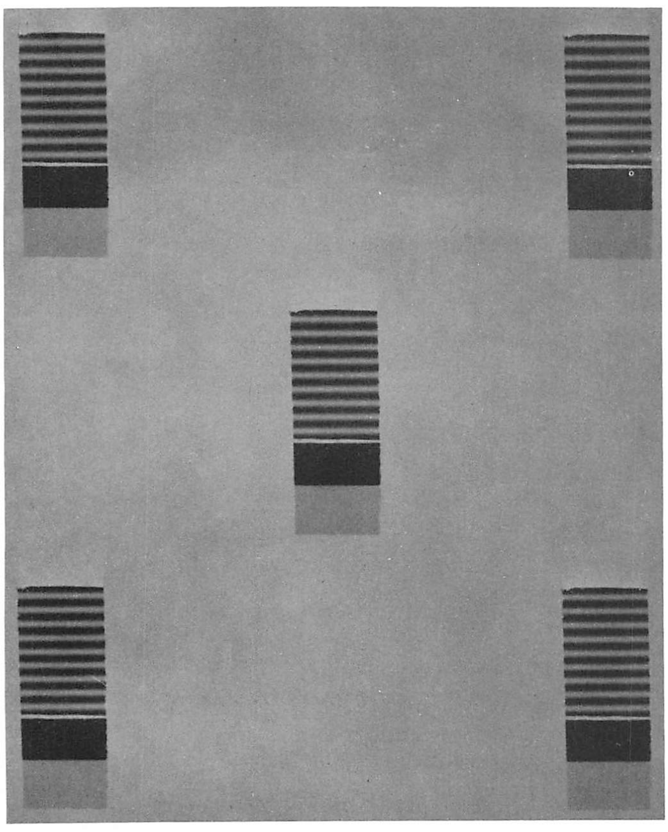

Fig. II-10. Sine-wave target used in determining spatial frequency response of camera during calibration

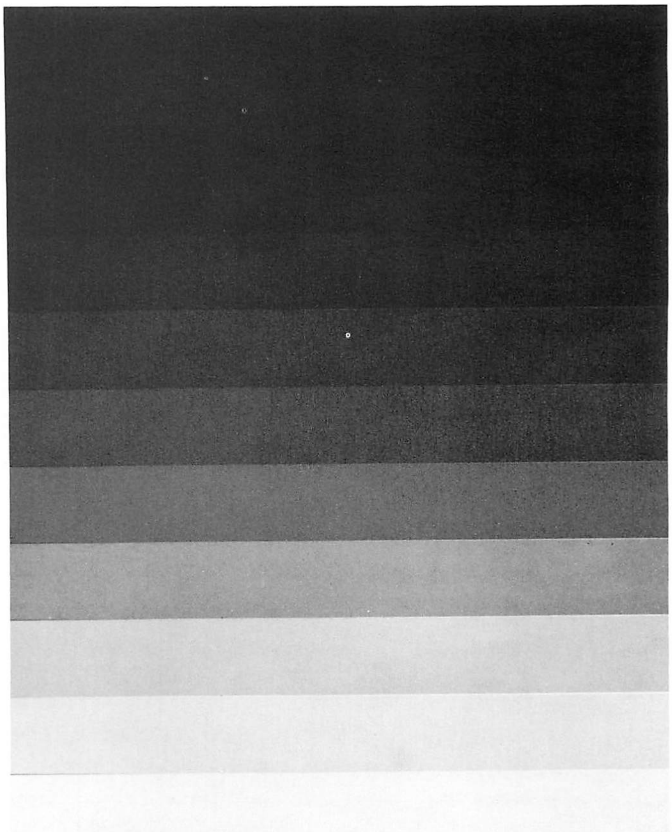

Fig. II-11. Grey-scale calibration target for erasure–characteristic calibration

Data of the type obtained during camera calibration are presented in Figs. II-12 through II-18. The ordinate in the light-transfer graphs is scaled in frequency deviation units at the output of the spacecraft transmitter with sync-tip frequency deviation set to the nominal values of 1.25 MHz for the 600-line scan mode and 5.0 kHz for the 200-line scan mode. The ordinate scale can, therefore, be viewed as a measure of relative video voltage. Figures II-12 through II-14 indicate light-transfer characteristics of the camera in various modes of operation. They are based on actual lunar scene brightness, as determined through appropriate correction–factor calculations. These correction–factor calculations involve the spectra of the camera, standard-eye, measuring photometer, light source, lunar light, and a separate National Bureau of Standards calibration light source. Figures II-13, II-15, II-16, and II-17 show the effect of varying the polarization angle of the incident light using each of the three polarizing filters whose transmission axes are coded as N, P, and S, respectively. Figure II-18 shows the modulation transfer response characteristic in terms of a relative response (normalized to the DC component) with respect to spatial frequency in TV lines per picture width.

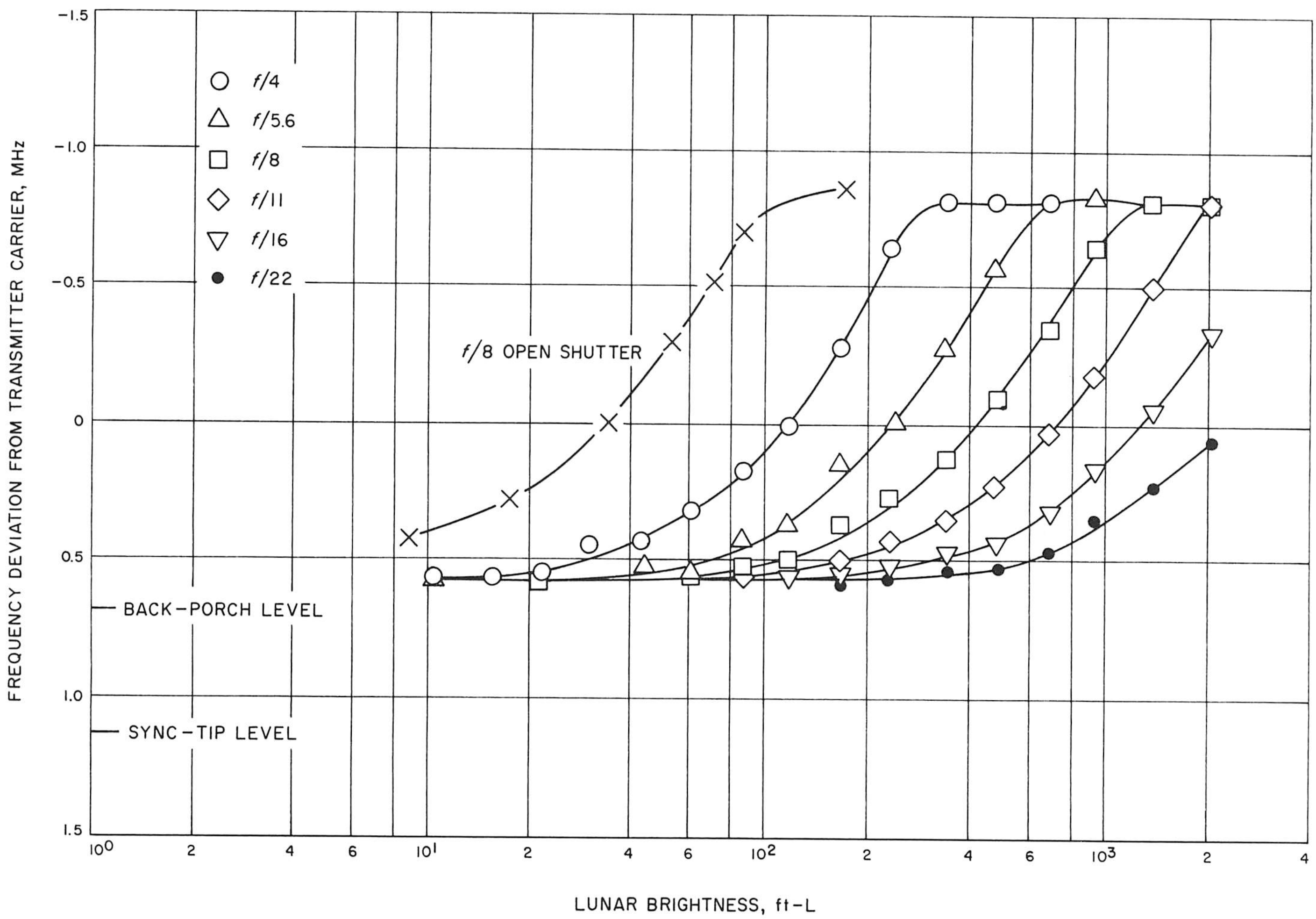

Fig. II-12. *Surveyor VI* light transfer characteristics, 600-line scan mode, transmitter A

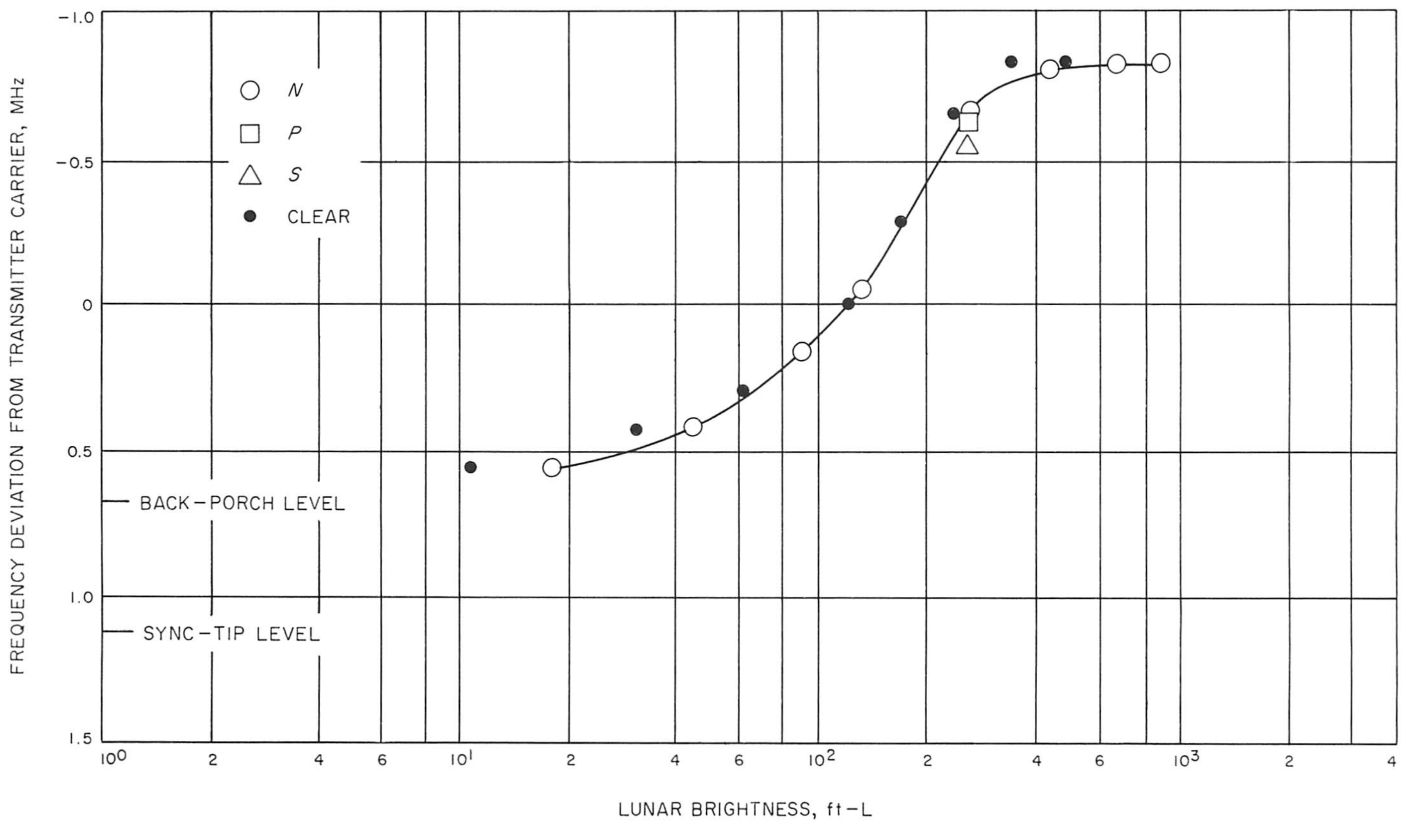

Fig. II-13. ***Surveyor VI f*/4 polarizing filter light transfer characteristics, 600-line scan mode, transmitter A**

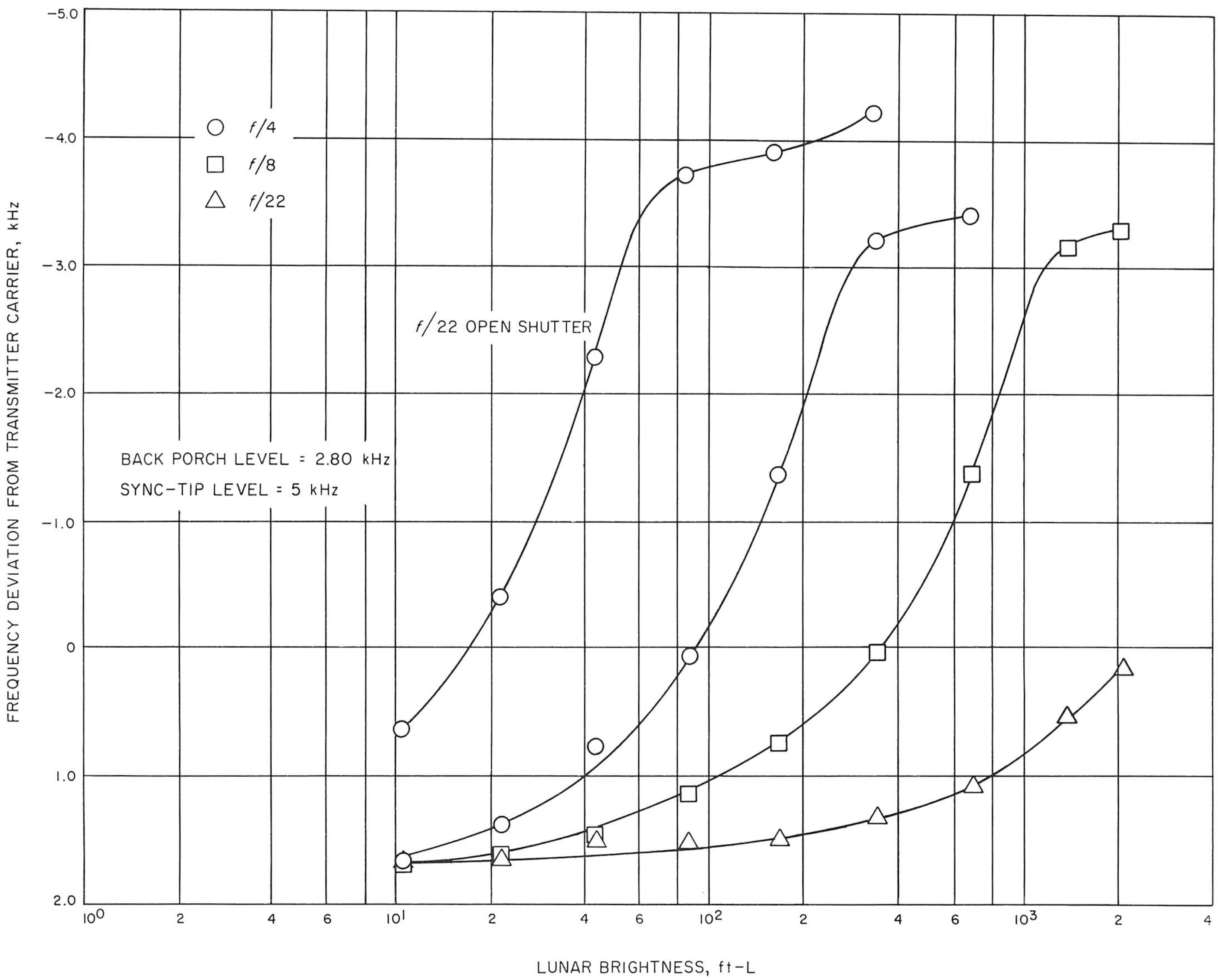

Fig. II-14. ***Surveyor VI*** **light transfer characteristics, 200-line scan mode, transmitter A**

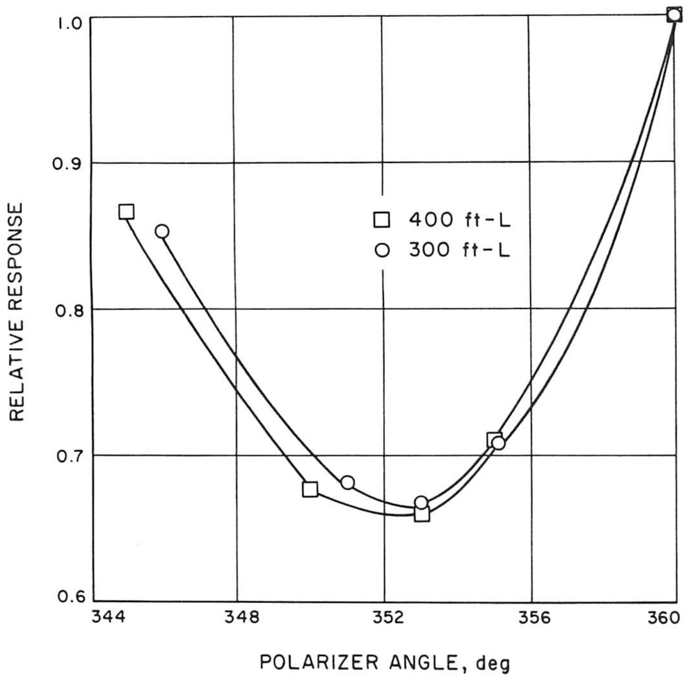

Fig. II-15. *Surveyor VI* polarization null P-filter, *f*/4, open shutter 600-line scan mode, transmitter A

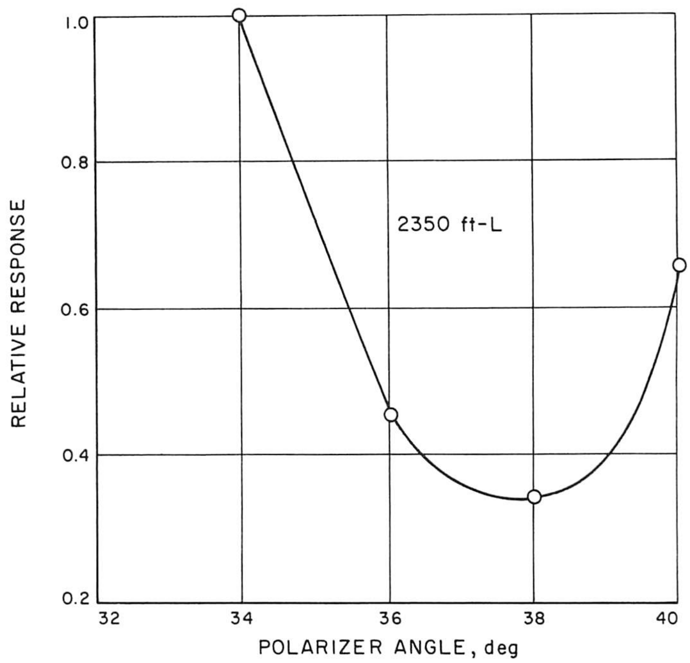

Fig. II-17. *Surveyor VI* polarization null N-filter, *f*/4, open shutter 600-line scan mode, transmitter A

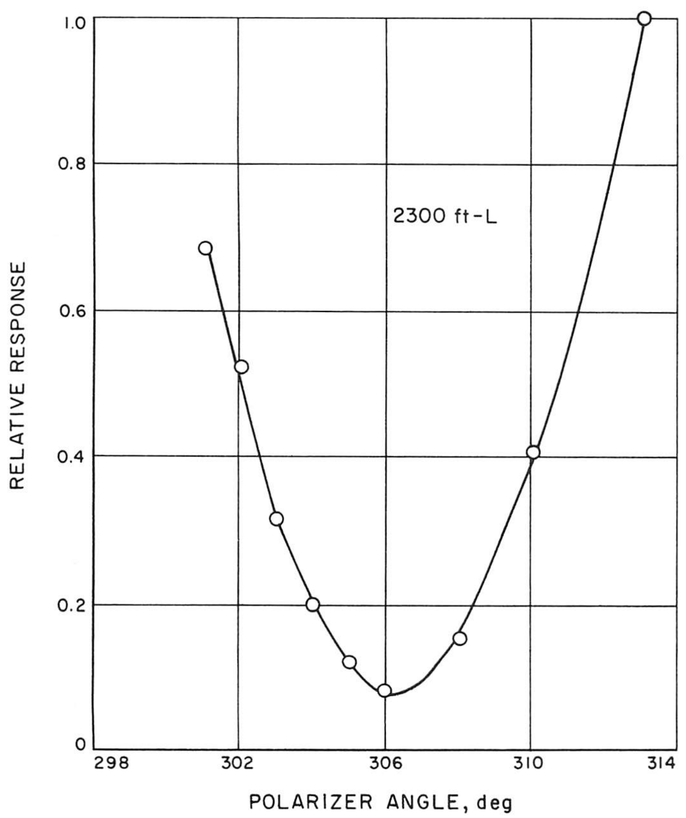

Fig. II-16. *Surveyor VI* polarization null S-filter, *f*/4, open shutter 600-line scan mode, transmitter A

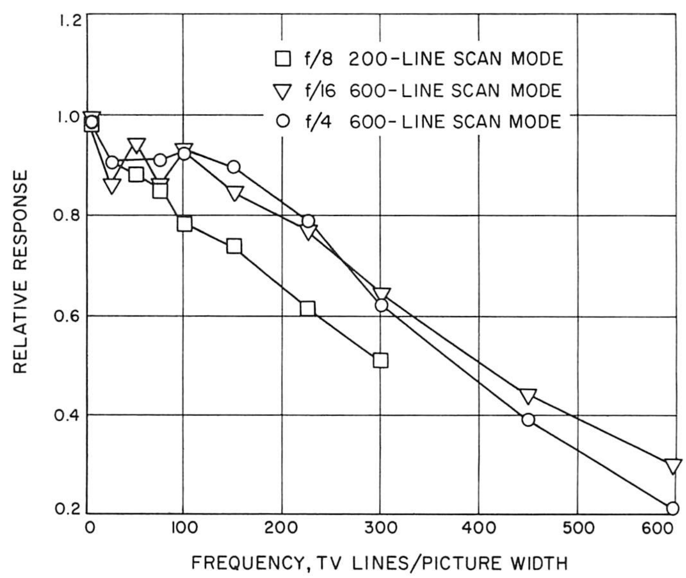

Fig. II-18. *Surveyor VI* frequency response 200- and 600-line scan modes, transmitter A

C. Mission Performance

Surveyor VI TV camera performance was the best yet experienced on a mission in quality and quantity of pictures, as well as in the extent of operations which could be conducted unrestricted by camera problems. The camera performed perfectly throughout the mission.

Picture quality was excellent primarily because the camera characteristics exhibited good dynamic range. A contributing factor was that the optical surfaces remained the cleanest for any mission because the redesigned mirror hood assembly permitted the camera mirror to be fully closed during the transit phase and the postlanding hop experiment.

During the first lunar day, in addition to DSS 11 (Goldstone) operations, the camera was operated from DSS 42 (Canberra), and to a lesser extent from DSS 61 (Madrid), resulting in a total of approximately 30,000 pictures being taken. This is a much greater number of pictures than were taken on any of the previous missions.

The *Surveyor VI* pictures include views of parts of the spacecraft, views of the area beneath the spacecraft using the auxiliary mirrors, panoramic narrow- and wide-angle surveys of the lunar landscape in azimuth and elevation, photometric surveys of specially selected objects, star surveys, focus ranging sequences for mapping of the surrounding lunar surface, shadow progressions, views through different polarization filters, a solar corona sequence which lasted about 6 h following sunset, and earthshine frames.

Among other information obtained on this mission by use of the camera were: the surface-erosion characteristics resulting from firing the vernier engines for the spacecraft hop experiment, views taken after the hop of the imprints made by the spacecraft upon initial landing, stereo frames taken before and after the hop experiment, and the particle accumulation and distribution on the bar magnet.

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III. Orientation of Camera and Sun

Thomas H. Bird

The application of *Lunar Orbiter IV* photographs and correlation of surface features recorded by the *Surveyor VI* TV camera provided the data for determination of the final landing site location for this mission. The coordinates of 0.49°N latitude, and 1.40°W longitude for this landing site are about 1.3 km northwest of the landed position as determined by tracking data.

For the orientation of the *Surveyor VI* spacecraft, there are two sets of attitude data. These result from the liftoff and post-landing translation of the vehicle after about seven earth days on the lunar surface. The translation distance to the second landing site was 2.4 m. The orientation of the spacecraft at the first landing site has been determined from position measurements on a few stars observed with the TV camera, prior to the hop. The spacecraft attitude at this location was with a tilt of 1.9 deg at an azimuth of 307 deg from the north. This places the -*Y* axis of the spacecraft at 119 deg from the north. After the translation, the spacecraft was tilted 4.0 deg at an azimuth of 260 deg from the north (-*Y* spacecraft axis at 114 deg from the north). These orientation figures may have an error of as much as one degree; they represent later determinations than those given in Part II of this report.

At the first landing point, the TV camera was tilted at 15.3 deg to the lunar surface at an azimuth of 70.5 deg. After translation, the camera was tilted 12.0 deg to the lunar surface at a camera azimuth of 57.7 deg. The zero camera azimuth at zero camera elevation was oriented 111.3 deg east of north, before the hop; after the hop, the orientation of this azimuth was 108.3 deg east of north.

The azimuth and zenith plots of the sun position for the *Surveyor VI* mission are shown in Fig. III-1.

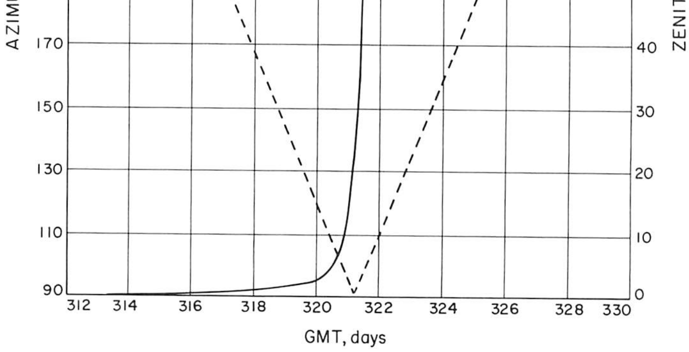

Fig. III-1. Azimuth and zenith track of the sun for *Surveyor VI*

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IV. *Surveyor* Television Ground Recording System

D. L. Smyth

The *Surveyor* Television Ground Recording System produces various types of records at each tracking station. The Goldstone Tracking Station (DSS-11) records the data on FR-800 magnetic tape as a 4 MHz predetected RF signal, on FR-1400 magnetic tape as a demodulated baseband signal, and on 70-mm and 35-mm film as reconstructed video. The overseas stations in Australia (DSS-42) and Spain (DSS-61) produce the same records as DSS-11 with the exception of 70-mm film. In addition to the records made at Goldstone, the video data are transmitted to the JPL/SFOF via 6 MHz microwave, in real time, and recorded on FR-800 and FR-1400 magnetic tapes and displayed on standard video monitors.

Upon receipt of the recorded data from DSS-42 and DSS-61 at JPL/SFOF, the FR-800 magnetic tapes were played and recorded on 70-mm film. All film processing and printing was performed at JPL by the Television Ground Data Handling System (TVGDHS). A complete description of the SC-TVGDHS is included in JPL Technical Report No. 32-1023, *Surveyor I Mission Report, Part I, Mission Description and Performance,* dated August 31, 1966, pp. 116–119.

V. *Surveyor VI* Picture Identification Data

D. L. Smyth

The camera identification data that caption each picture are derived from the telemetry transmitted with the picture. By use of pre-launch calibration data, the telemetry data were converted to engineering units. The data on the picture caption have been validated by editing through the use of mission sequence logs, command data logs, and mosaic references. Table V-1 contains the picture index and identification data. Table V-2 includes a reference list of photographic subjects.

The format of the identification data is as follows:

Time

The Greenwich Mean Time (GMT) of picture receipt by the tracking station is given as day of year, hour, minute and second.

Azimuth

The camera mirror azimuth is given in degrees of mirror rotation. The azimuth range is +132.0 to −222.0 deg in nominal 3.0-deg increments. The positive azimuths are counterclockwise from zero camera azimuth, as seen from above; negative azimuths are clockwise.

Elevation

The camera mirror elevation is given in degrees of rotation about an axis parallel to the azimuth plane. The elevation range is from +70.0 to −222.0 deg, in nominal 5.0-deg increments. The effective viewing range is from +40 to −60.0 deg.

Focus

The distance to the plane of principal focus is given in meters. The range of the focus is from 1.22 meters to infinity for steps 0 to 49, respectively.

Iris

The camera iris setting is expressed as *f*/number. The range is *f*/4.0 to *f*/22.0.

Lens focal length

The focal length of the camera optics is 25.0 mm for wide angle (W) and 100.0 mm for narrow angle (N).

Filter

The filter position is given as "1" clear, "2" vertical, "3" 45-deg diagonal, or "4" horizontal. These filter position numbers express the direction of filter polarization.

Picture perspective

Included as a part of the caption on each picture is a vector diagram indicating the direction of the proper perspective to the reader. The perspective refers to the orientation of the scene as it would appear to the viewer if he were standing at the camera position, looking in the direction of the camera azimuth. The arrows in the vector diagrams point up and designate the direction of local vertical. (See Tables V-3 and V-4 for additional information.)

Table V-1. Selected lunar pictures

Picture[a]	GMT Day	GMT Hour	GMT Minute	GMT Second	Azimuth	Elevation	Focus distance, m	Iris setting	Lens focal length	Filter	Remarks
1	314	01	52	23	78	−45	2.7	f/6.5	W	Clear	—
2		04	08	26	−54	−65	2.4	f/4.0			Processed
3			18	05	−72	−20	2.3	f/5.8			
4			22	53	−18	−20	2.4	f/4.0			
5			23	02	−18	−35	2.4	f/4.0			
6			40	03	108	−5	2.3	f/5.8			
7			43	41	54	−65	2.3	f/7.8			
8			44	50	−54	−65	2.4	f/7.8			—
9			49	36	−90	−35	2.3	f/4.9			Processed
10			49	47	−18	−20	2.4				
11			50	18	−108	−20	2.3				
12			50	28	−108	−35	2.4				
13			53	21	−144	−35	2.4	f/6.7			
14			55	22	−162	−20	2.3	f/6.7			—
15			59	34	−126	−65	2.3	f/6.8			Processed
16		05	05	29	−54	−55	2.5	f/6.7	N		
17			05	34	−60	−55		f/6.7	N		
18			07	34	−63	−55		f/4.0	W		
19			13	59	−60	−70	2.4	f/4.0	W		—
20		06	58	26	90	−15	3.3	f/5.8	N		Processed
21				54	84	−50	3.3				
22				59	78	−15	3.1				
23			59	03	72	−15	3.1				
24				08	75	−20	2.8				
25				13	78	−20	2.2				
26				44	75	−25	2.6				
27				49	72	−25	2.6				
28		07	00	41	78	−25	2.5	f/7.8			
29		07	06	33	81	−20	2.7				
30		07	45	53	−219	−15	1.8				
31	315	01	28	11	−201	−35	2.1	f/9.0			—
32			28	35	−210	−35	1.9	f/9.0			—
33			37	13	−66	−40	3.1	f/5.8			—
34			41	03	−57	−5	27.9				—
35				29	−36	0	27.9				—
36				43	−54	0	27.9				—
37		02	02	28	96	10	28.0				—
38			02	41	78	10	28.0				—
39			03	13	87	15	28.0				—
40			10	31	117	5	27.9				—
41			17	35	−129	−45	3.3	f/7.8			—
42			23	58	−99	−45	3.1				—
43			24	29	−84	−40	3.7				—
44			26	12	−72	−20	14.2				—
45			27	10	−78	−10	28.0				—
46			34	59	−51	−55	2.4				Processed
47			36	57	−51	−55	2.4	f/14.5			Processed
48			37	59	−51	−60	2.4	f/14.6			Processed
49		03	27	17	−39	−70	2.2	f/6.7	W		—
50		03	28	32	−45	−60	2.3	f/6.7	N		—
51		03	28	46	−51	−60	2.4	f/6.7	N		—
52		04	15	25	−54	−5	2.3	f/5.8	W		—
53		04	19	32	36	−50	2.3	f/6.7	W		—

W = wide angle, 25 mm

N = narrow angle, 100 mm

Table V-1 (contd)

Picture[a]	GMT				Azimuth	Elevation	Focus distance, m	Iris setting	Lens focal length	Filter	Remarks
	Day	Hour	Minute	Second							
54	315	04	26	59	−162	−35	2.3	f/10.6	W	Clear	—
55	316	05	32	06	−51	−60	2.5	f/14.6	N	Clear	—
56	316	05	35	25	−51	−65	2.5	f/8.1	W	Clear	—
57	316	07	20	39	−57	−5	28.0	f/6.6	N	45 deg	—
58	317	01	29	38	−51	−60	2.3	f/22.8	N	Clear	—
59	317	01	31	14	−51	−55	48.4	f/8.5	N	Clear	—
60	317	06	51	22	−54	−65	2.3	f/8.5	W	45 deg	Processed
61	318	01	31	41	−9	−20	4.0	f/10.4	N	Horiz.	↓
62	↓	01	57	14	−96	−50	2.9	f/10.4	↓	Horiz.	↓
63	↓	01	57	22	−96	−50	2.9	f/10.4	↓	45 deg	↓
64	319	04	23	38	−213	−35	3.3	f/10.2	↓	Clear	—
65	↓	05	57	33	39	5	20.0	f/8.5	↓	↓	—
66	↓	06	32	48	−150	20	27.9	f/3.8	↓	↓	—
67	↓	↓	38	12	−129	−45	3.3	f/11.2	↓	↓	—
68	↓	↓	38	29	↓	↓	↓	f/11.2	↓	Horiz.	—
69	↓	↓	38	45	↓	↓	↓	f/11.2	↓	45 deg	—
70	↓	↓	39	00	↓	↓	↓	f/5.1	↓	Vertical	—
71	320	03	34	51	−51	−60	2.5	f/20.8	↓	Clear	—
72	321	11	07	03	−54	−65	2.4	f/10.1	W	↓	Processed
73	↓	↓	09	05	−60	−65	↓	f/10.1	↓	↓	↓
74	↓	↓	↓	11	−72	−50	↓	f/10.1	↓	↓	↓
75	↓	↓	↓	52	−54	−50	↓	f/10.2	↓	↓	↓
76	↓	↓	10	30	−18	−20	↓	↓	↓	↓	↓
77	↓	↓	10	55	0	−20	↓	↓	↓	↓	—
78	↓	↓	12	55	36	−35	↓	↓	↓	↓	—
79	↓	↓	13	36	54	−35	↓	↓	↓	↓	—
80	↓	↓	50	58	33	5	16.8	f/7.7	N	Vertical	Processed
81	↓	↓	58	07	−54	−55	2.4	f/20.8	↓	Clear	Processed
82	↓	↓	58	16	−63	−60	2.4	f/20.8	↓	↓	Processed
83	↓	12	08	04	−54	−55	2.5	f/9.2	↓	↓	—
84	↓	12	08	46	−72	−55	2.6	f/9.2	↓	↓	—
85	↓	12	09	08	−45	−50	2.5	f/9.2	↓	↓	Processed
86	↓	02	37	20	54	−5	2.2	f/8.5	↓	↓	—
87	↓	12	31	56	54	−5	2.2	f/7.7	↓	↓	Processed
88	↓	14	44	23	−216	20	34.8	f/11.8	↓	↓	—
89	↓	14	54	18	−198	−35	2.4	f/7.5	↓	↓	—
90	322	06	04	03	−195	−40	2.4	f/7.5	W	↓	—
91	↓	08	34	16	−75	−55	2.5	f/9.2	N	↓	—
92	↓	08	34	21	−72	−50	1.4	f/9.2	↓	↓	—
93	↓	13	43	10	39	−35	2.5	f/11.3	↓	↓	—
94	↓	13	43	28	45	−35	2.5	f/11.3	↓	↓	—
95	323	06	37	08	−147	−15	27.9	f/8.5	↓	↓	—
96	323	07	04	13	−87	−15	27.9	f/8.5	↓	↓	—
97	323	08	28	37	−63	−45	2.8	f/9.2	↓	↓	—
98	324	07	04	16	−15	−25	3.6	f/10.2	↓	↓	—
99	324	07	05	51	−12	−25	3.6	f/10.2	↓	↓	—
100	325	05	31	54	−72	−50	2.3	f/8.6	W	↓	—
101	↓	08	55	48	−12	−25	3.0	f/8.5	N	Horiz.	—
102	↓	10	39	09	−15	−25	3.3	f/10.2	↓	Clear	—
103	↓	11	40	37	−63	−45	2.8	f/8.3	↓	Clear	—
104	↓	11	49	46	−57	−5	27.9	f/8.3	↓	Clear	—
105	↓	13	24	02	−87	−15	20.1	f/7.0	↓	Vertical	—
106	↓	15	06	03	12	−30	2.7	f/9.4	↓	Clear	—
107	↓	15	06	20	9	−25	2.9	f/9.4	↓	↓	—
108	326	07	33	32	−105	−20	27.9	f/6.1	↓	↓	—
109	↓	08	27	32	−72	−65	2.4	f/7.4	W	↓	—
110	↓	08	27	38	−72	−50	2.4	f/7.4	W	↓	—

Table V-1 (contd)

Picture[a]	GMT				Azimuth	Elevation	Focus distance, m	Iris setting	Lens focal length	Filter	Remarks
	Day	Hour	Minute	Second							
111	326	08	27	47	−72	−20	2.4	f/7.4	W	Clear	—
112		08	30	54	36	−20	2.4	f/8.7	W	Clear	—
113		09	36	01	−15	−25	3.3		N	Clear	—
114			37	54	−12	−25	3.4			Vertical	—
115			39	15	−9	−25	3.1			Vertical	—
116			58	45	12	−30	2.6	f/10.6		Clear	—
117		10	38	56	42	−10	2.9				—
118		14	21	09	42	−10	4.7				—
119				25	9	−25	2.9				—
120				30	12	−30	2.7				—
121				42	−9	−25	3.3				—
122				48	−12	−25	3.3				—
123		17		57	117	5	27.8	f/7.8			—
124		17	41	56	129	5	27.9	f/7.8			—
125	328	08	04	59	36	10	3.1	f/6.7	W		—
126		09	12	49	−18	0	28.0	f/5.8	N		—
127		09	53	47	45	5	14.8	f/7.8	N		—
128		11	14	14	36	10	28.0	f/7.8	W		—
129		11	14	29	54	10	28.0	f/7.8	W		—
130		11	47	30	−30	0	28.0	f/5.8	N		—
131		12	49	05	−30	0	28.0	f/5.8	N		—
132		13	18	47	36	10	28.0	f/6.7	W		—
133		14	15	26	−153	−10	27.8	f/3.8	N		Processed
134			21	49							
135			25	25							
136			36	40							
137			38	05			28.1				
138			42	21			27.8			Vertical	
139			56	02			27.7			Clear	

[a] The following pictures were taken in integrate mode; exposure times are indicated:

Picture	Exposure time, s
66	154
133	5
134	10
135	62
137	60
138	60
139	29

Table V-2. Reference list of picture subjects

Subject	Picture number
1. 200-line mode	1.
2. Footpad 3	1, 24, 25, 26, 27, 28, 29, 74, 75.
3. Footpad 2	2, 8, 16, 17, 18, 19, 47, 48, 49, 51, 55, 56, 60, 72, 73, 81, 83, 100, 109, 110.
4. Area to east	13, 65, 78, 79, 80, 93, 94, 101, 102, 106, 107, 112, 116, 117, 118, 119, 120, 125, 126, 127, 128, 132.
5. Area to northeast	20, 21, 22, 23, 37, 38, 39, 129.
6. Area to north	6, 40, 123, 124.
7. Area to west	13, 14, 15, 41, 67, 68, 69, 70, 95.
8. Area to southwest	9, 11, 12, 42, 43, 62, 63, 96, 105, 108.
9. Area to south	3, 33, 34, 36, 44, 45, 54, 57, 85, 97, 103, 104, 111.
10. Area to southeast	4, 5, 9, 10, 35, 76, 77, 98, 99, 113, 114, 115, 121, 122, 130, 131.
11. Alpha-scattering instrument	7, 55, 64, 88.
12. Compartment A	13, 54.
13. Compartment B	30.
14. Spacecraft shadow	13, 14, 54, 112, 125, 128, 132.
15. Auxiliary mirrors	31, 32, 64, 89, 90.
16. Crush block 2	31.
17. Pad 2 throwout	46, 74, 75, 91, 92, 100.
18. Pad 2 trench	49, 50, 51, 55, 56, 58, 59, 60, 71, 72, 73, 82, 83, 84, 109, 110.
19. Pad 3 throwout	22, 23, 24, 25, 26, 27, 28, 29.
20. Leg 3 and trench	1.
21. Magnets and photo chart	46, 47, 48, 51, 55, 58, 59, 71, 72, 73, 81, 83.
22. Omni B photo chart	86, 87.
23. Planets	66.
24 Solar corona	133, 134, 135, 136, 137, 138, 139.
25. Crush block 3	32.
26. Polaroid filter series	67, 68, 69, 70.

Table V-3. Camera azimuth vs lunar-view rotation vs report view; pre-translation (pre-hop)

Az[a]	R[b]	r[c]	Az[a]	R[b]	r[c]	Az[a]	R[b]	r[c]
135	−150	30	12	−2	−2	−111	115	25
132	−147	33	9	2	2	−114	117	27
129	−143	37	6	5	5	−117	119	29
126	−140	40	3	9	9	−120	122	32
123	−137	43	0	12	12	−123	124	34
120	−134	−44	−3	16	16	−126	126	36
117	−130	−40	−6	19	19	−129	128	38
114	−127	−37	−9	22	22	−132	130	40
111	−124	−34	−12	26	26	−135	133	43
108	−120	−30	−15	29	29	−138	135	45
105	−117	−27	−18	32	32	−141	137	−43
102	−113	−23	−21	35	35	−144	139	−41
99	−110	−20	−24	39	39	−147	142	−38
96	−106	−16	−27	42	42	−150	144	−36
93	−102	−12	−30	45	45	−153	146	−34
90	−99	−9	−33	48	−42	−156	149	−31
87	−95	−5	−36	51	−39	−159	151	−29
84	−91	−1	−39	54	−36	−162	153	−27
81	−88	2	−42	57	−33	−165	156	−24
78	−84	6	−45	60	−30	−168	158	−22
75	−80	10	−48	63	−27	−171	160	−20
72	−77	13	−51	65	−25	−174	163	−17
69	−73	17	−54	68	−22	−177	165	−15
66	−69	21	−57	71	−19	−180	168	−12
63	−65	25	−60	74	−16	−183	170	−10
60	−62	28	−63	76	−14	−186	173	−7
57	−58	32	−66	79	−11	−189	176	−4
54	−54	36	−69	82	−8	−192	178	−2
51	−50	40	−72	84	−6	−195	181	1
48	−46	44	−75	87	−3	−198	184	4
45	−43	−43	−78	89	−1	−201	187	7
42	−39	−39	−81	92	2	−204	189	9
39	−35	−35	−84	94	4	−207	192	12
36	−31	−31	−87	96	6	−210	195	15
33	−28	−28	−90	99	9	−213	198	18
30	−24	−24	−93	101	11	−216	201	21
27	−20	−20	−96	103	13	−219	204	24
24	−17	−17	−99	106	16	−222	207	27
21	−13	−13	−102	108	18	−225	210	30
18	−9	−9	−105	110	20			
15	−6	−6	−108	113	23			

[a]Camera azimuth.
[b]Rotation of lunar view.
[c]Angle between report view and lunar view.
NOTE: Negative rotations are counterclockwise in reference to top right corner of frame; positive rotations are clockwise.

Table V-4. Camera azimuth vs lunar-view rotation vs report view; post-translation (post-hop)

Az[a]	R[b]	r[c]	Az[a]	R[b]	r[c]	Az[a]	R[b]	r[c]
135	−146	34	12	−3	−3	−111	112	22
132	−143	37	9	0	0	−114	115	25
129	−140	40	6	4	4	−117	117	27
126	−136	44	3	7	7	−120	119	29
123	−133	−43	0	10	10	−123	122	32
120	−130	−40	−3	14	14	−126	124	34
117	−126	−36	−6	17	17	−129	127	37
114	−123	−33	−9	20	20	−132	129	39
111	−120	−30	−12	23	23	−135	131	41
108	−116	−26	−15	26	26	−138	134	44
105	−113	−23	−18	29	29	−141	136	−44
102	−109	−19	−21	32	32	−144	139	−41
99	−106	−16	−24	35	35	−147	141	−39
96	−102	−12	−27	38	38	−150	144	−36
93	−99	−9	−30	41	41	−153	146	−34
90	−95	−5	−33	44	44	−156	149	−31
87	−92	−2	−36	47	−43	−159	152	−28
84	−88	2	−39	50	−40	−162	154	−26
81	−85	5	−42	53	−37	−165	156	−24
78	−81	9	−45	56	−34	−168	159	−21
75	−77	13	−48	59	−31	−171	162	−18
72	−74	16	−51	62	−28	−174	164	−16
69	−70	20	−54	64	−26	−177	167	−13
66	−67	23	−57	67	−23	−180	170	−10
63	−63	27	−60	70	−20	−183	172	−8
60	−59	31	−63	72	−18	−186	175	−5
57	−56	34	−66	75	−15	−189	178	−2
54	−52	38	−69	78	−12	−192	181	1
51	−49	41	−72	80	−10	−195	184	4
48	−45	45	−75	83	−7	−198	187	7
45	−41	−41	−78	85	−5	−201	190	10
42	−38	−38	−81	88	−2	−204	193	13
39	−34	−34	−84	90	0	−207	196	16
36	−31	−31	−87	93	3	−210	199	19
33	−27	−27	−90	95	5	−213	202	22
30	−24	−24	−93	98	8	−216	205	25
27	−20	−20	−96	100	10	−219	208	28
24	−17	−17	−99	103	13	−222	211	31
21	−13	−13	−102	105	15	−225	214	34
18	−10	−10	−105	107	17			
15	−6	−6	−108	110	20			

[a]Camera azimuth.
[b]Rotation of lunar view.
[c]Angle between report view and lunar view.
NOTE: Negative rotations are counterclockwise in reference to top right corner of frame; positive rotations are clockwise.

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VI. *Surveyor* Mosaics

D. L. Smyth

The mosaics included in this report consist of those prepared in real-time, semi-improved mosaics, improved mosaics, and specially prepared mosaics.

The real-time (operations) mosaics are prepared during operations for immediate analysis of the surface features and camera performance. These mosaics are not of archival quality.

The semi-improved mosaics are prepared during the mission as a better quality print becomes available. This type of mosaic is also the first type prepared from data received from the overseas stations. These mosaics provide a more accurate representation of the surface features and conditions as viewed by the camera. An improved mosaic represents the final or best quality mosaic information constructed during the post-mission data-analysis activities.

The special mosaics are usually prepared of small areas for detailed analysis purposes. Considerable care is taken in the printing and the placement of the frames on a grid for the special mosaics.

Table VI-1 lists the mosaics included and describes their subject matter.

Table VI-1. Selected mosaics

Mosaic	Day	Azimuth, deg (R) (L)	Lens focal length[a]	Identification
1	314	−216 to +126	W	Catalog No. 6–2–SI; semi-improved mosaic (A.M.)
2	321	−216 to +126	W	Catalog No. 6–107–SI; semi-improved mosaic (Noon)
3	328	−216 to +126	W	Catalog No. 6–194; operational mosaic (P.M.)
4	317	−213 to −180	N	Catalog No. 6–41–SI; semi-improved mosaic
5	318	−177 to −144		Catalog No. 6–56; operational mosaic
6	315	−141 to −108		Catalog No. 6–18–SI; semi-improved mosaic
7		−105 to −72		Catalog No. 6–19–SI; semi-improved mosaic
8		−69 to −36		Catalog No. 6–13–SI; semi-improved mosaic
9		−33 to 0		Catalog No. 6–14–SI; semi-improved mosaic
10	319	+3 to +36		Catalog No. 6–78–SI; semi-improved mosaic
11	319	+39 to +72		Catalog No. 6–79–SI; semi-improved mosaic
12	315	+75 to +108		Catalog No. 6–16–SI; semi-improved mosaic
13[b]	318	[+111 to +126 −231 to −216]		Catalog No. 6–54–SI; semi-improved mosaic
14	315	−69 to −33		Catalog No. 6–SE–6; southeast horizon (A.M.)
15	321	−180 to +126	W	Catalog No. 6–SE–9; panorama
16	321	−72 to +36	W	Catalog No. 6–SE–9*; pre-hop area
17	328	−18 to +36	W	Catalog No. 6–SE–11*; partial panorama
18	326	+45 to +33	N	Catalog No. 6–SE–12; block and pad 3 imprint
19	326	+30 to +15		Catalog No. 6–SE–13; camera shadow
20	327	+15 to +3		Catalog No. 6–SE–14; block 1 imprint
21		+15 to +6		Catalog No. 6–SE–15; block 1 imprint
22		+15 to +6		Catalog No. 6–SE–16; block 1 imprint
23		−18 to 0		Catalog No. 6–SE–17; pad 2 imprint
24	321	+87 to +75		Catalog No. 6–SE–18; pad 3, post-hop
25	319	+93 to +69		Catalog No. 6–SE–19; pad 3, pre-hop
26	326	−90 to −36	W	Catalog No. 6–SE–20; pad 3, post-hop
27	314	+87 to +75	N	Catalog No. 6–SE–21; pad 3, pre-hop
28	321/322	+21 to +36		Catalog No. 6–SE–22*; block 2 imprint
29	321	+24 to +48		Catalog No. 6–SE–22*; block 1 imprint
30	322	−18 to −9		Catalog No. 6–SE–22*; pad 2 imprint
31	321	+3 to +57		Catalog No. 6–SE–22*; block and vernier engine 1 area
32	321	0 to +57		Catalog No. 6–SE–22*; block, pad, vernier engine 3 area
33	322	+63 to +93		Catalog No. 6–SE–24; pad 3, post-hop
34	319	−90 to −51	W	Catalog No. 6–SE–25; pad 2, pre-hop
35	320	−105 to +60	N	Catalog No. 6–SE–26; pre-hop panorama
36	320	+60 to −60		Catalog No. 6–SE–26*; pre-hop panorama
37	320	−105 to +15		Catalog No. 6–SE–26*; pre-hop panorama
38	326	−72		Catalog No. 6–SE–35; pad 2 imprint
39	323	−69 to −66		Catalog No. 6–SE–37; pad 2, post-hop
40	323	−15 to −9		Catalog No. 6–SE–39; pad 2 imprint, pre-hop
41	326	−18 to −12		Catalog No. 6–SE–40; pad 2 imprint, pre-hop
42	321	−72 to −63		Catalog No. 6–SE–41; pad 2, post-hop
43	324	−75 to −63		Catalog No. 6–SE–42; pad 2, post-hop
44	314	−90 to 0	W	Catalog No. 211-3323B; USGS; southeast horizon (A.M.)
45	315	−90 to 0	W	Catalog No. 211-3325B; USGS; southeast horizon (A.M.)
46	328	−90 to 0	W	Catalog No. 211-3325A; USGS; southeast horizon (P.M.)

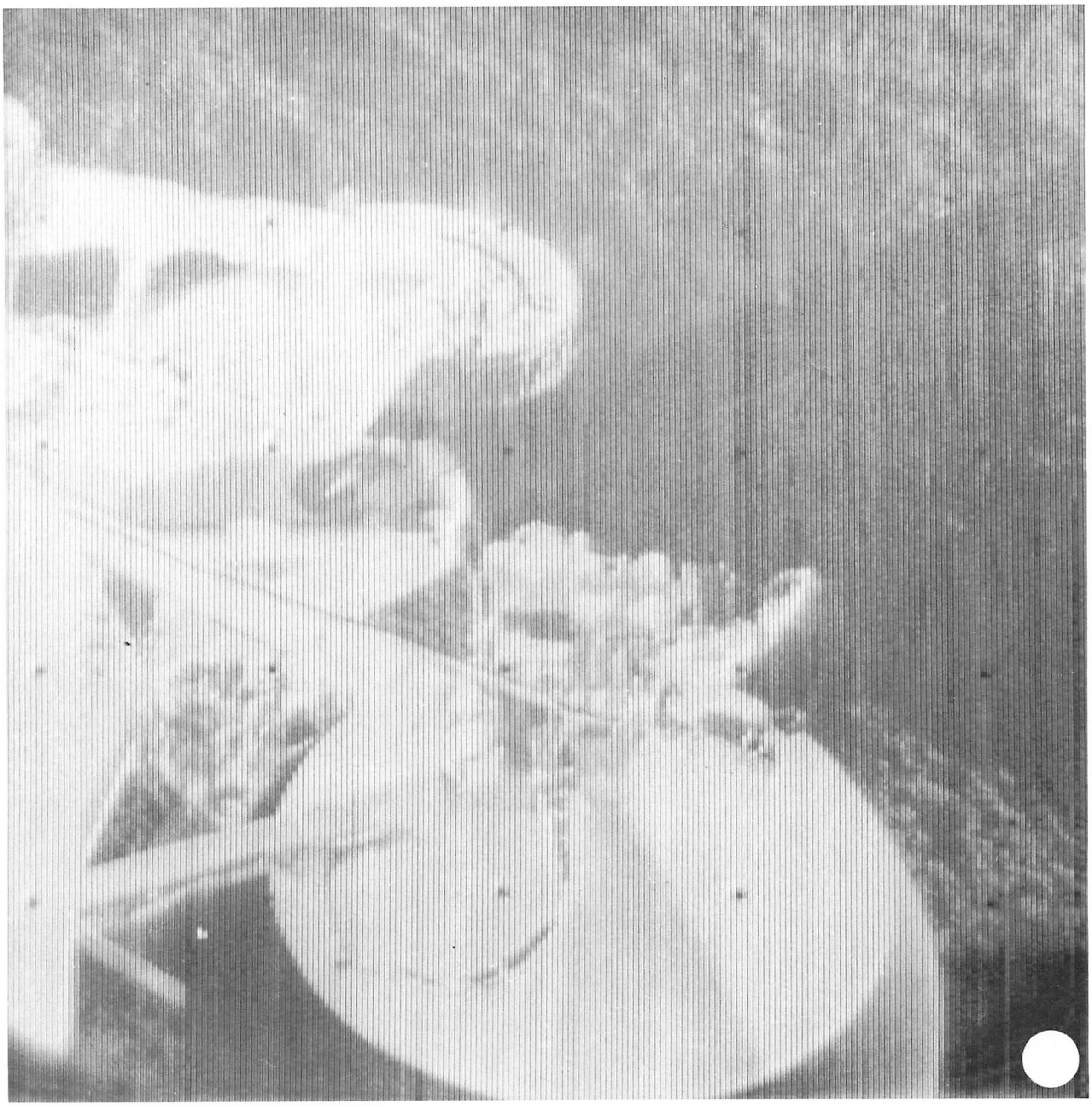
[a]W = wide angle, 25 mm;
N = narrow angle, 100 mm.
[b]End stop coverage.
*This mosaic is part of the one identified by the Catalog No.

VII. Selected Lunar Pictures and Mosaics

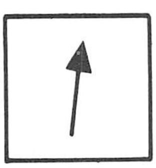
D. L. Smyth

This section contains 139 selected pictures and 46 mosaics representing the *Surveyor VI* area. Each picture in this section is oriented such that the local lunar horizon or surface features appear within 45 deg of the proper perspective to the reader. The reader is assumed to be at the position of the camera mirror. For additional orientation a white dot has been placed on the corner of each picture, which corresponds to the top right-hand corner of the vidicon readout. Generally, TV pictures 1 through 71 represent the pre-hop pictures, and TV pictures 72 through 139 represent the post-hop pictures.

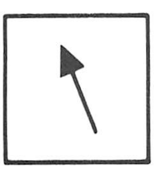
The National Space Science Data Center at Goddard Space Flight Center, Greenbelt, Maryland, is responsible for dissemination of *Surveyor* pictures and other scientific data. An index and copies of pictures in various forms can be obtained from that NASA data center.

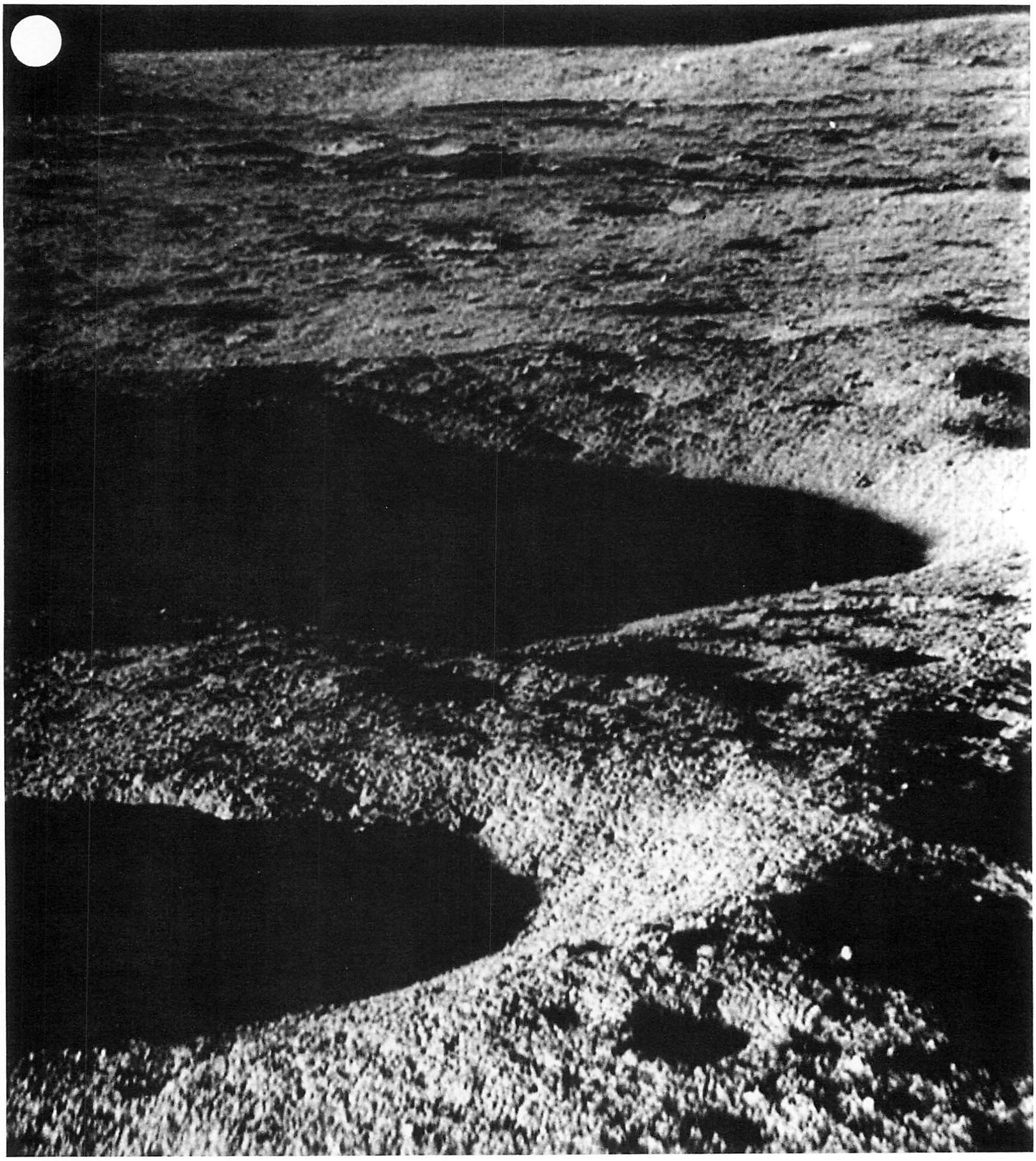


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(1)	**Day 314, 01:52:23**	**78**	**—45**	**2.7**	***f*/6.5**	**W**	**Clear**

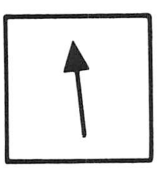


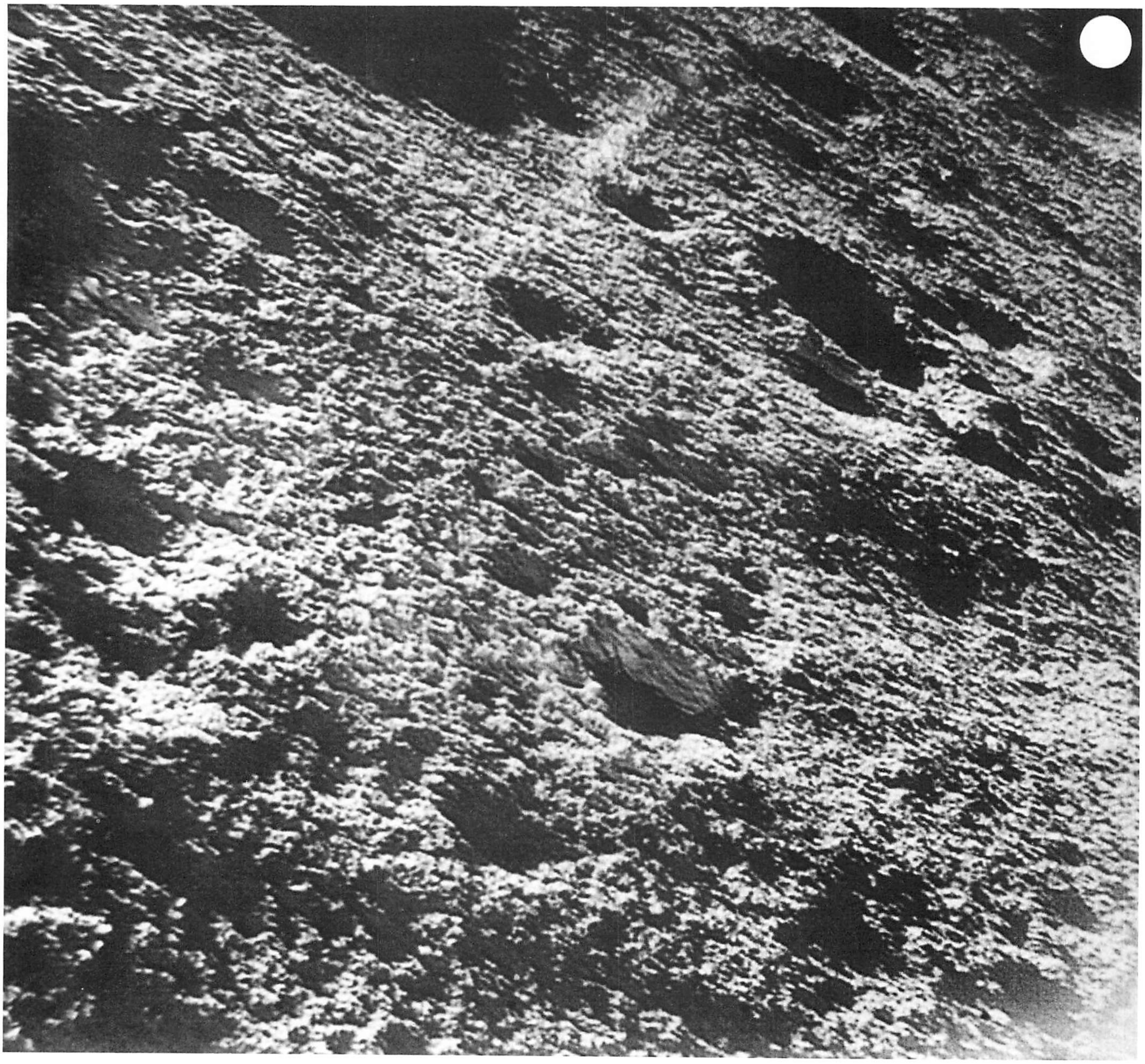
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(2)	**Day 314, 04:08:26**	**—54**	**—65**	**2.4**	**f/4.0**	**W**	**Clear**	**Processed**



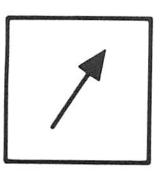


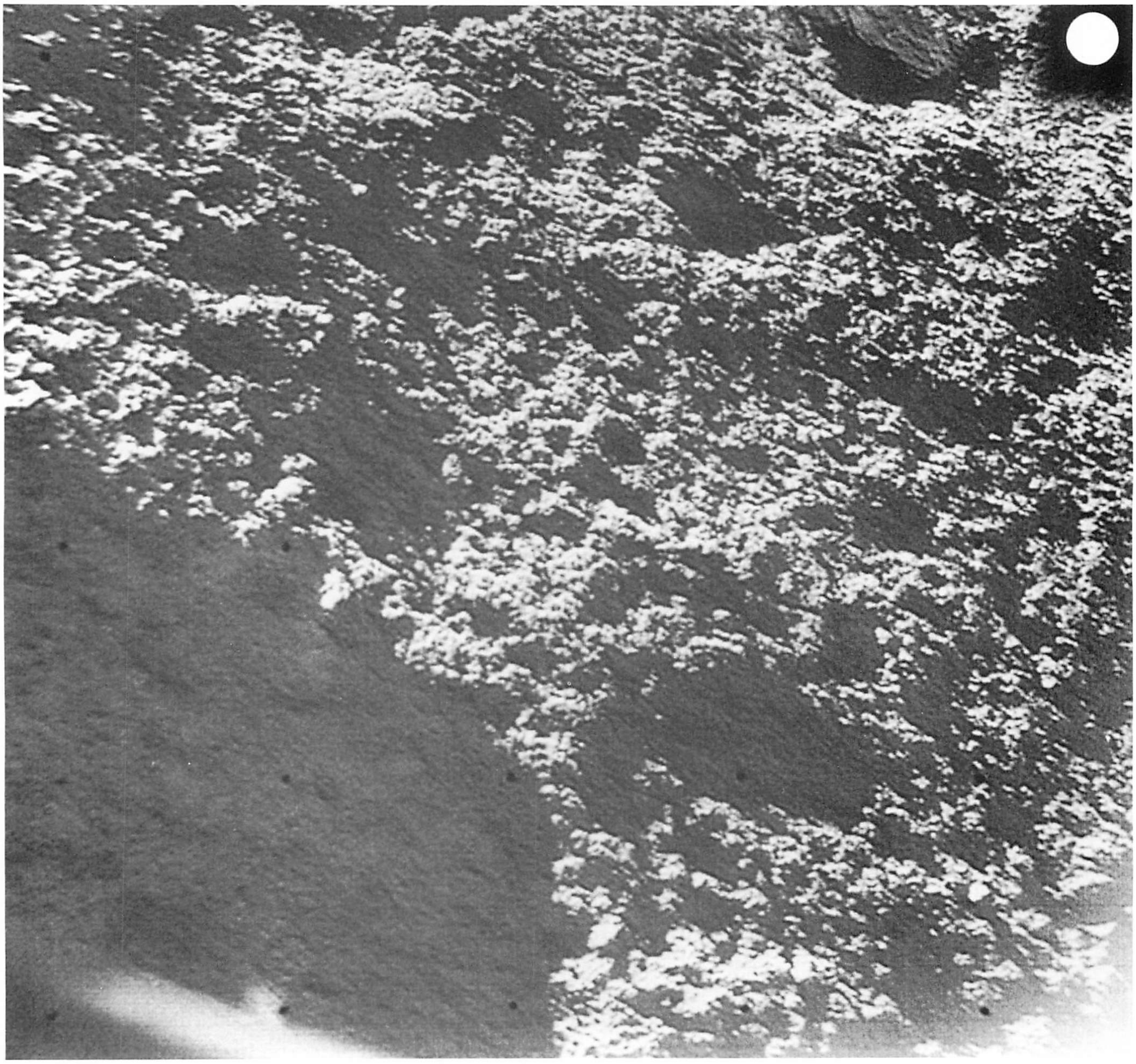
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(3)	**Day 314, 04:18:05**	**−72**	**−20**	**2.3**	***f*/5.8**	**W**	**Clear**	**Processed**



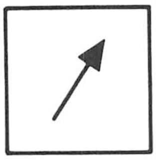


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(4)	**Day 314, 04:22:53**	**—18**	**—20**	**2.4**	**f/4.0**	**W**	**Clear**	**Processed**

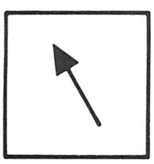


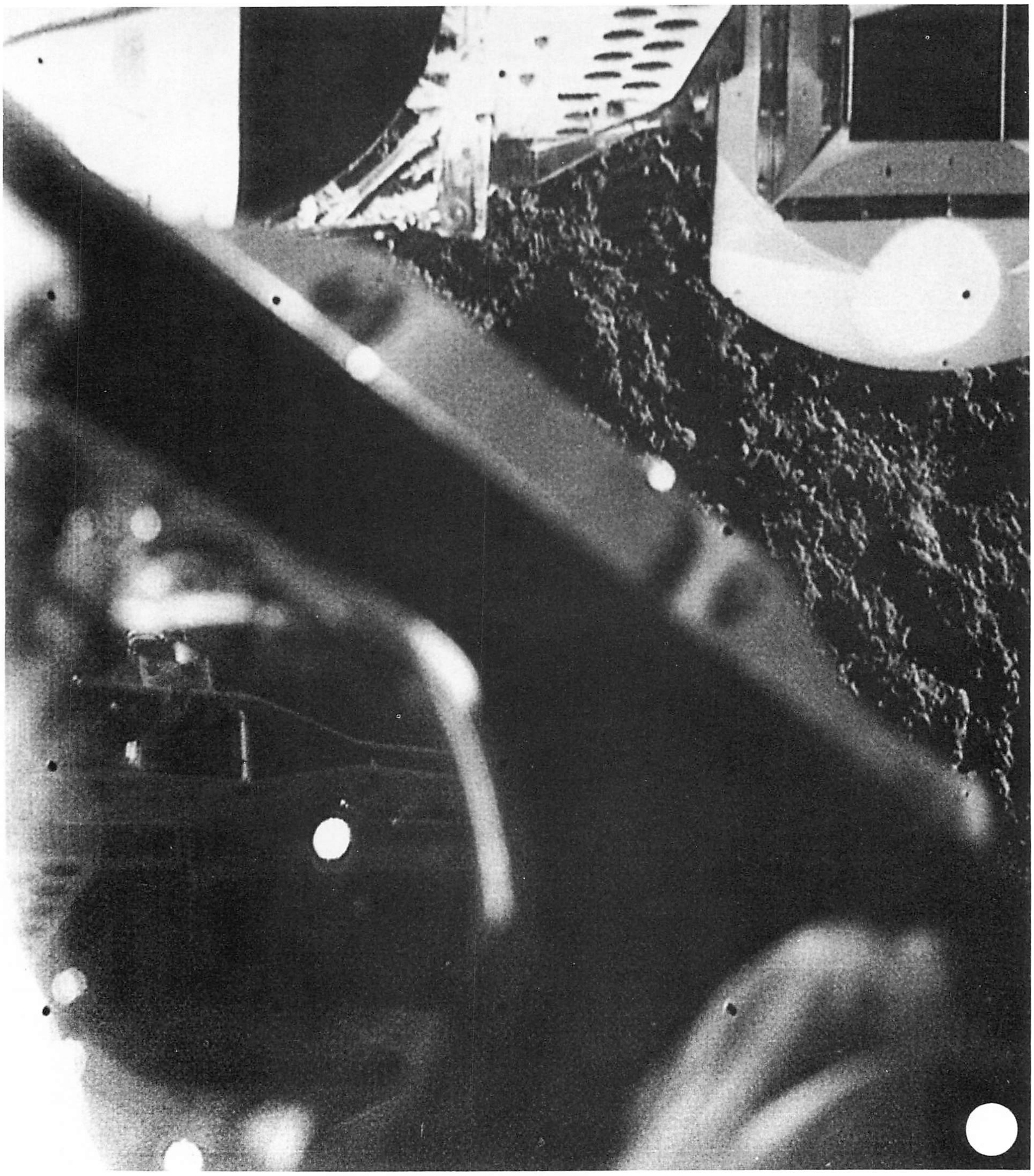


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(5)	**Day 314, 04:23:02**	**—18**	**—35**	**2.4**	**f/4.0**	**W**	**Clear**	**Processed**

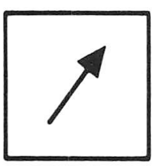


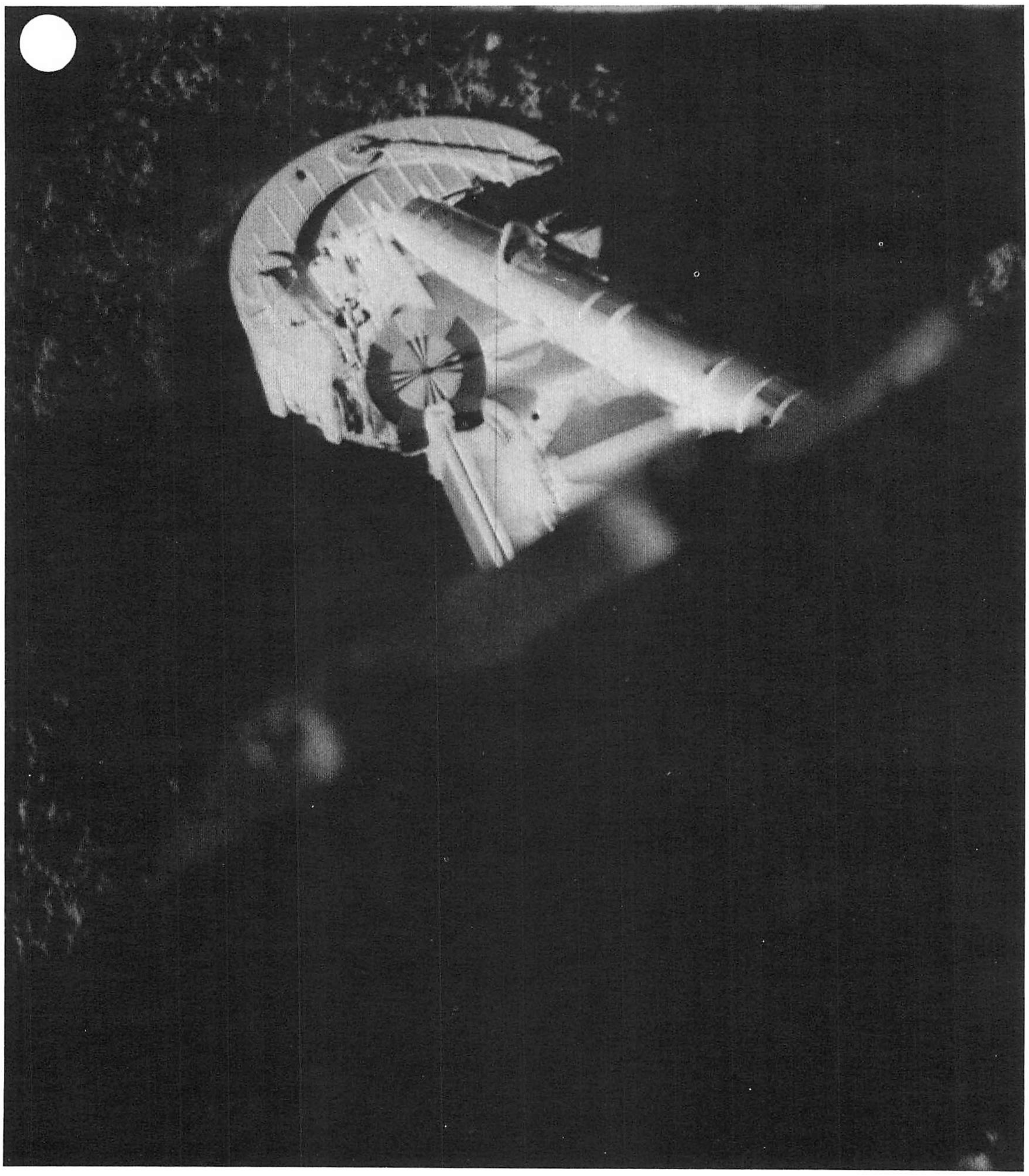
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(6)	**Day 314, 04:40:03**	**108**	**—5**	**2.3**	***f*/5.8**	**W**	**Clear**	**Processed**



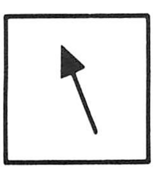


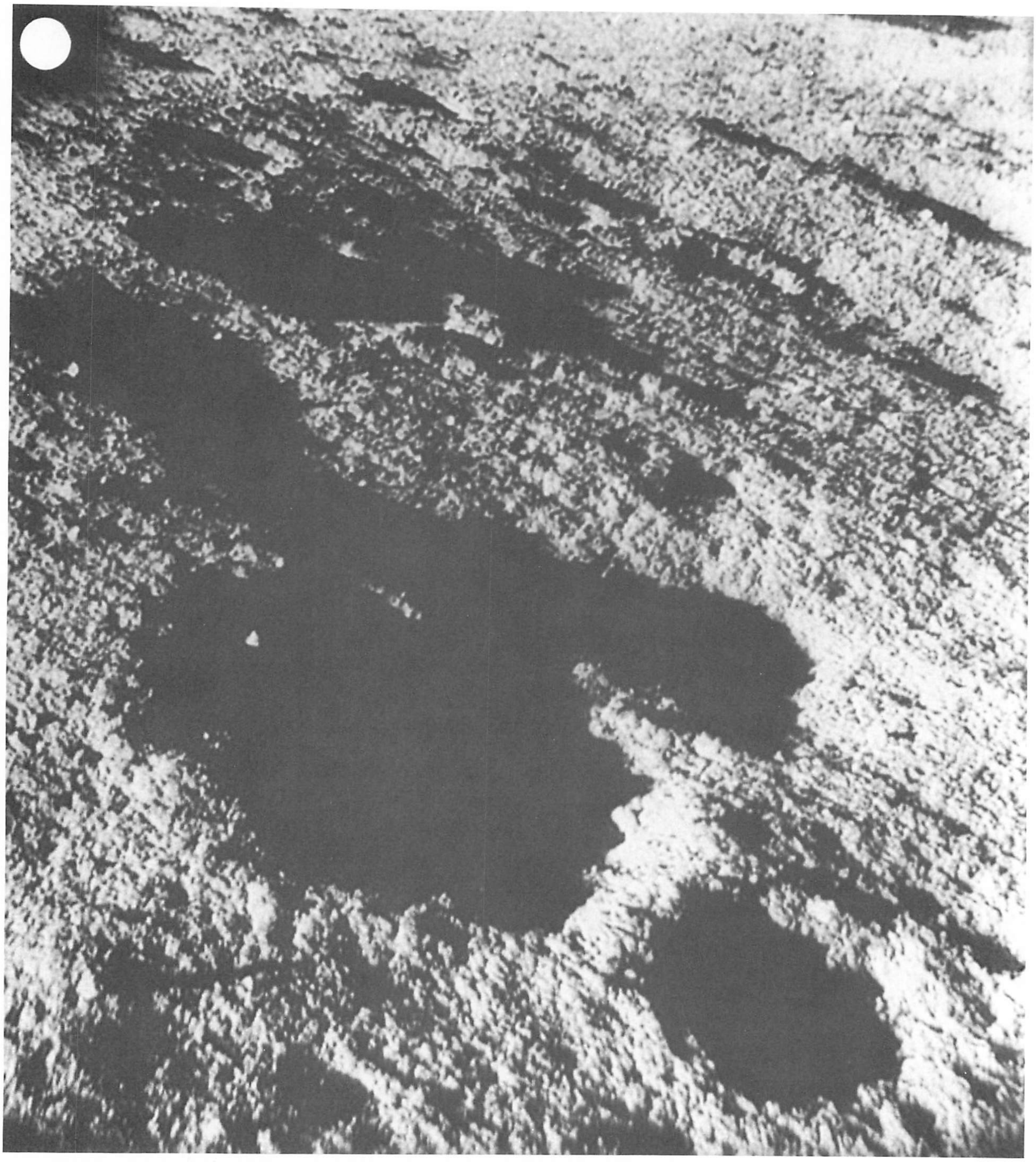
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(7)	**Day 314, 04:43:41**	**54**	**−65**	**2.3**	**$f/7.8$**	**W**	**Clear**	**Processed**



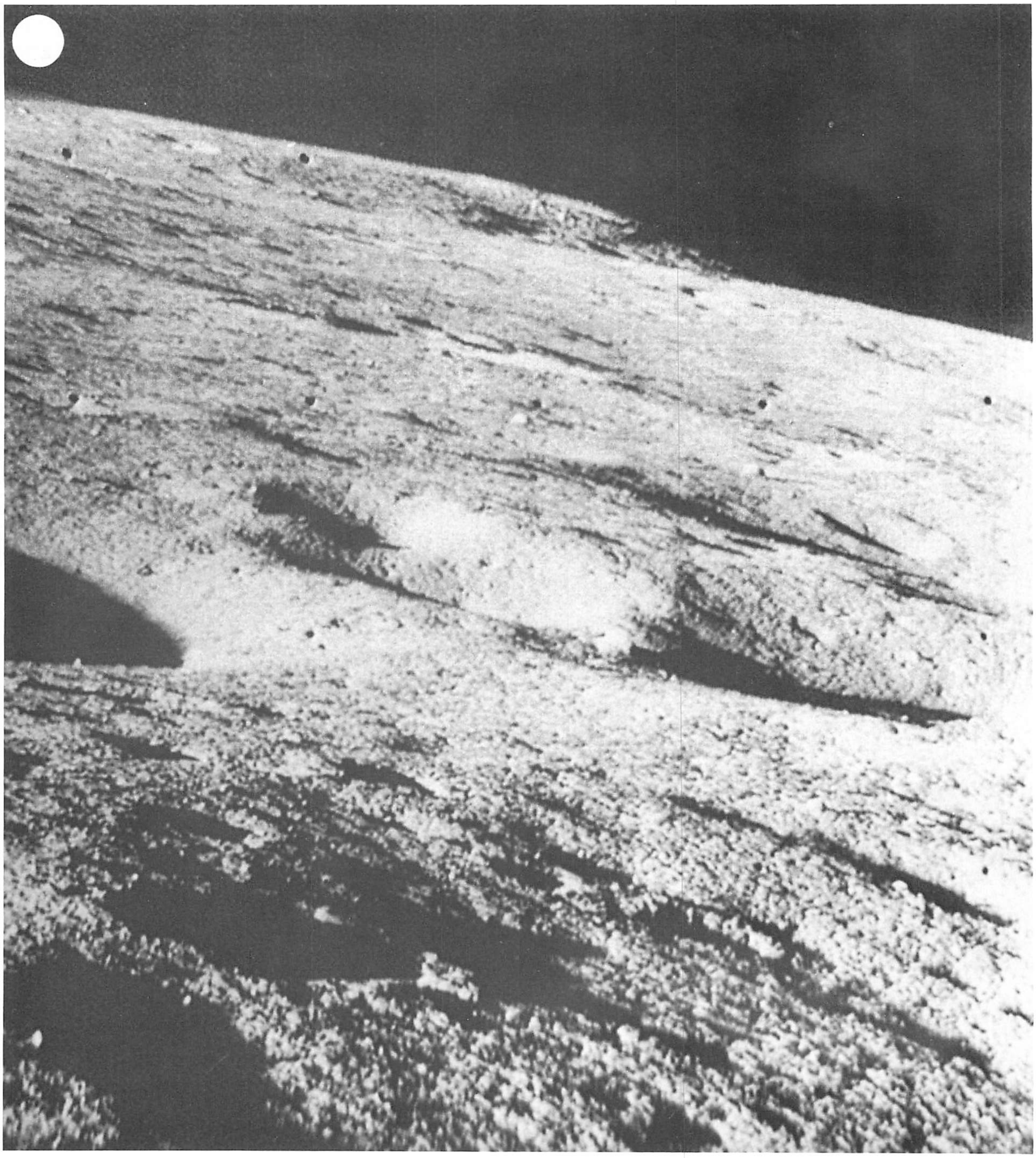


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(8)	**Day 314, 04:44:50**	**—54**	**—65**	**2.4**	**f/7.8**	**W**	**Clear**

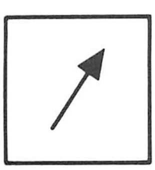


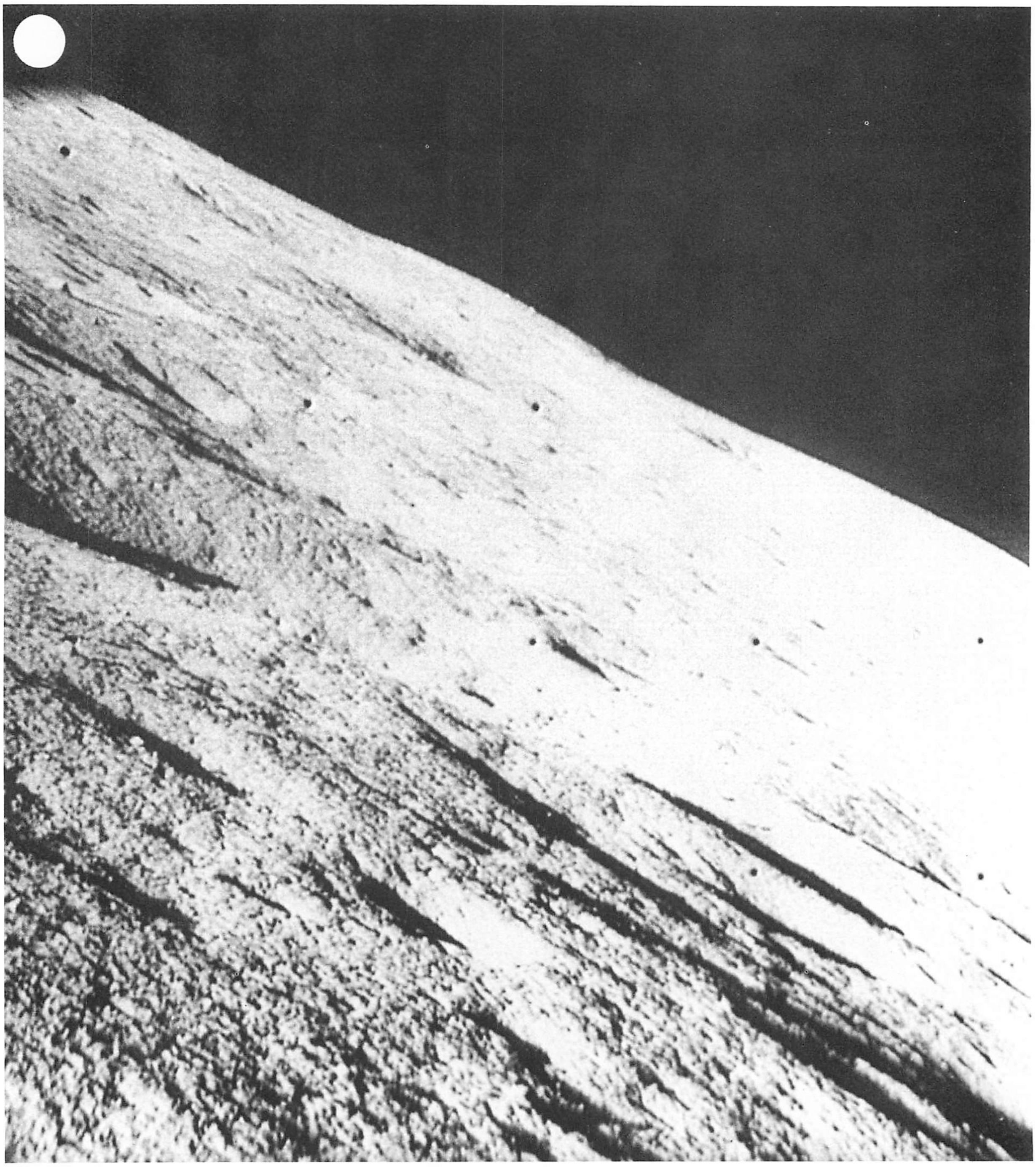


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(9)	**Day 314, 04:49:36**	**—90**	**—35**	**2.3**	**f/4.9**	**W**	**Clear**	**Processed**

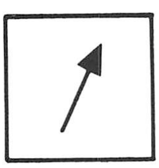


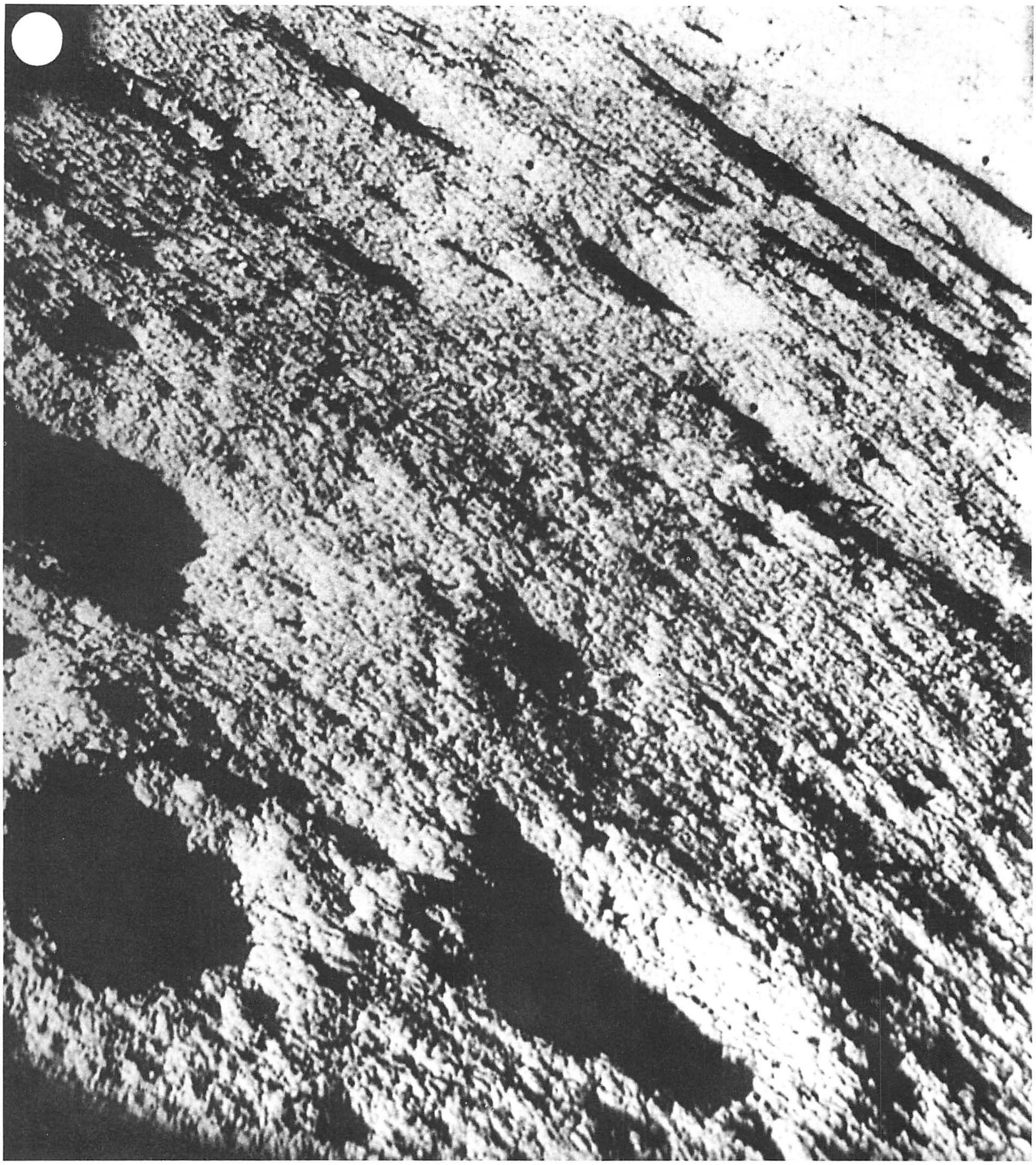
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(10)	**Day 314, 04:49:47**	**—18**	**—20**	**2.4**	***f*/4.9**	**W**	**Clear**	**Processed**



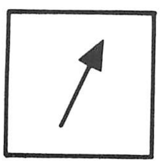


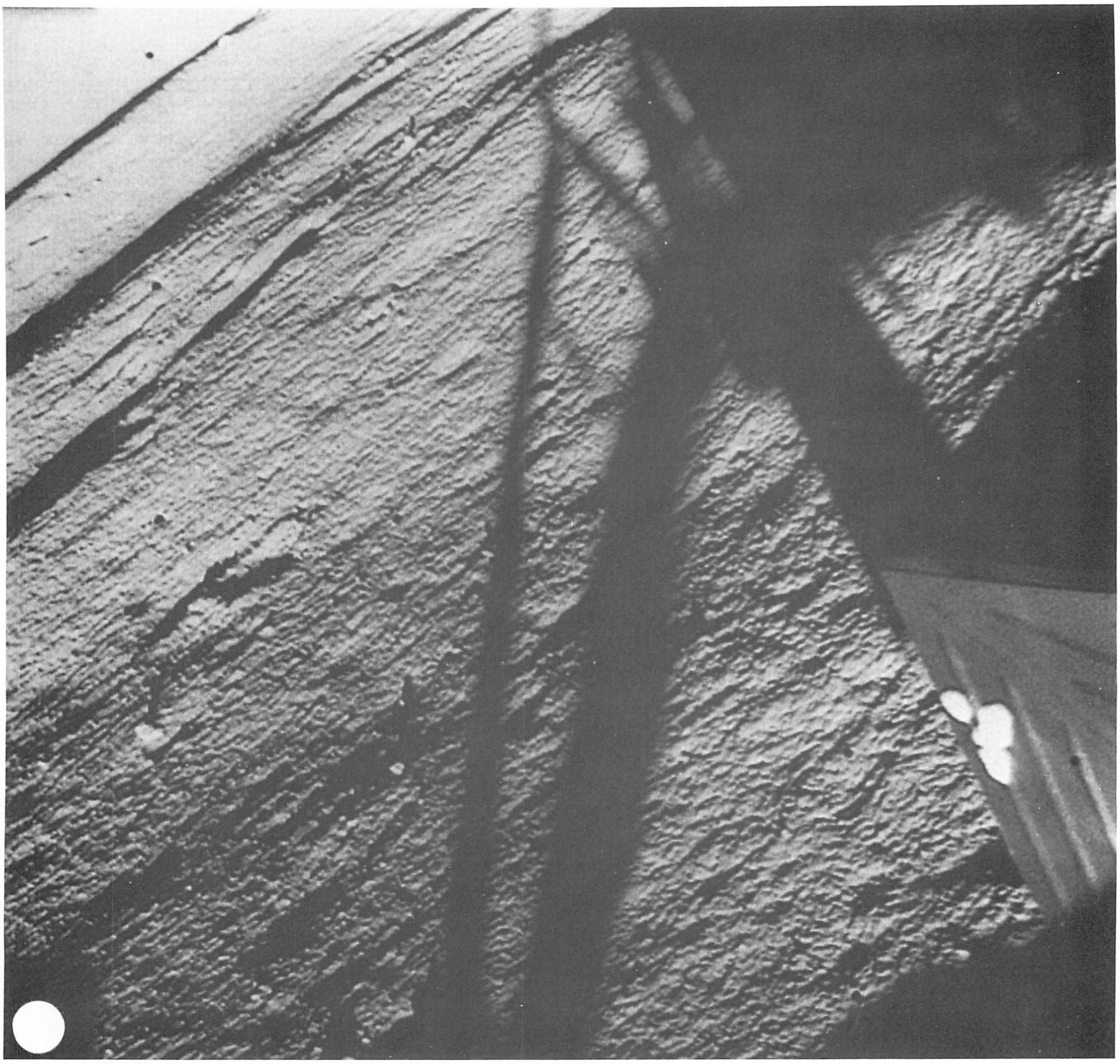
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(11)	Day 314, 04:50:18	—108	—20	2.3	f/4.9	W	Clear	Processed



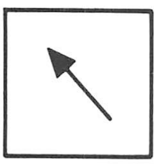


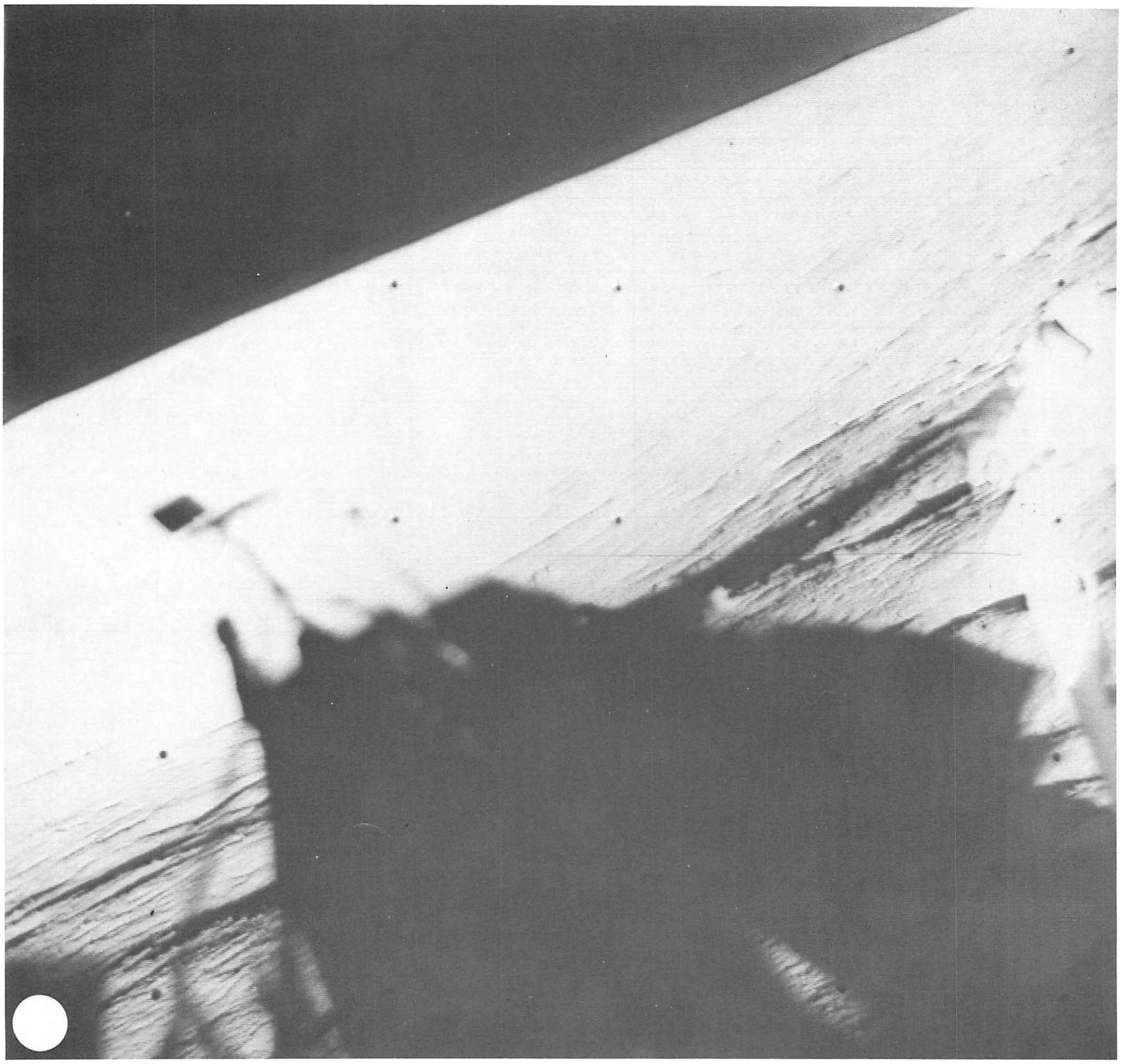
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(12)	**Day 314, 04:50:28**	**—108**	**—35**	**2.4**	**f/4.9**	**W**	**Clear**	**Processed**



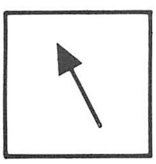


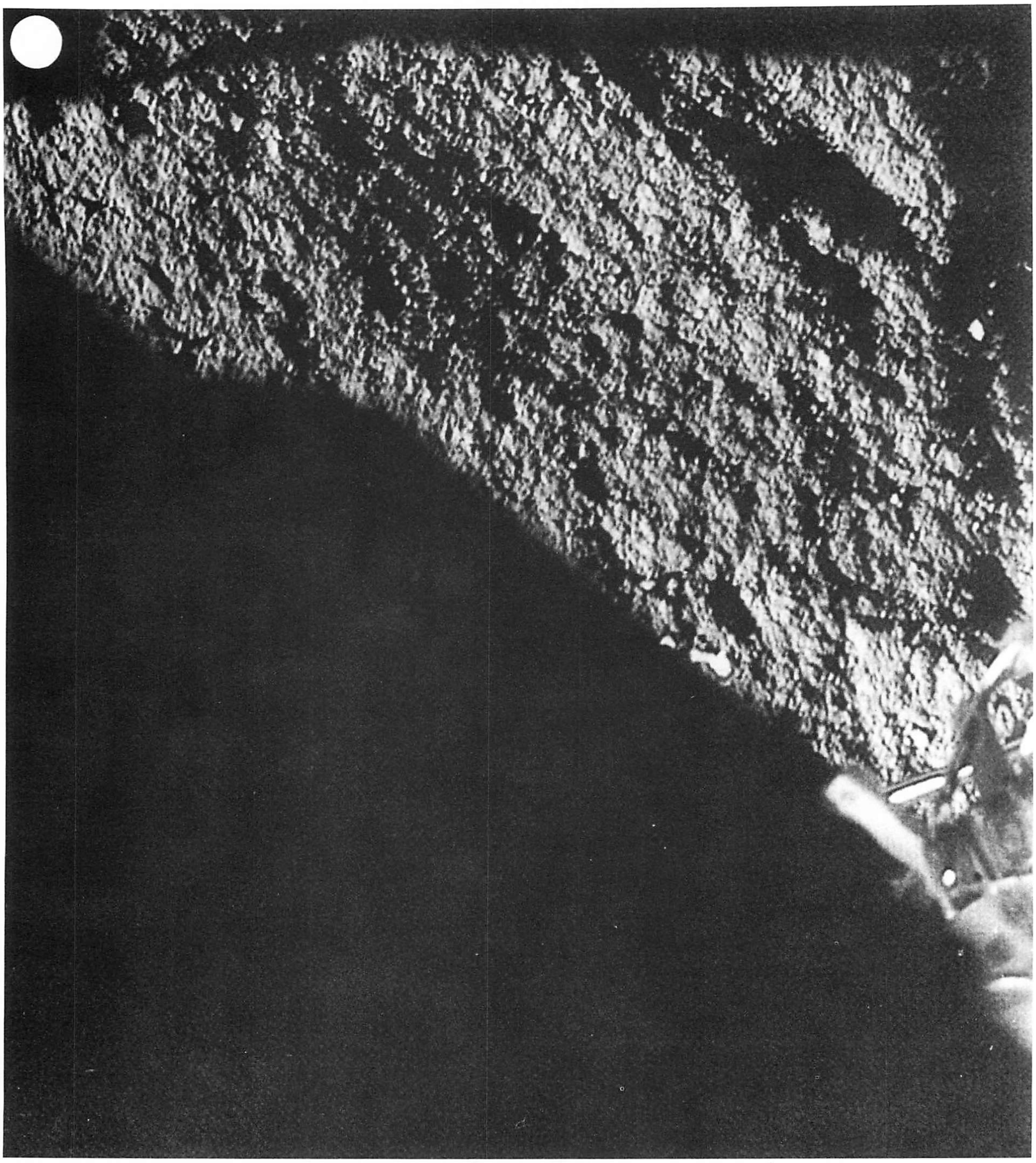
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(13)	**Day 314, 04:53:21**	**—144**	**—35**	**2.4**	***f*/6.7**	**W**	**Clear**	**Processed**



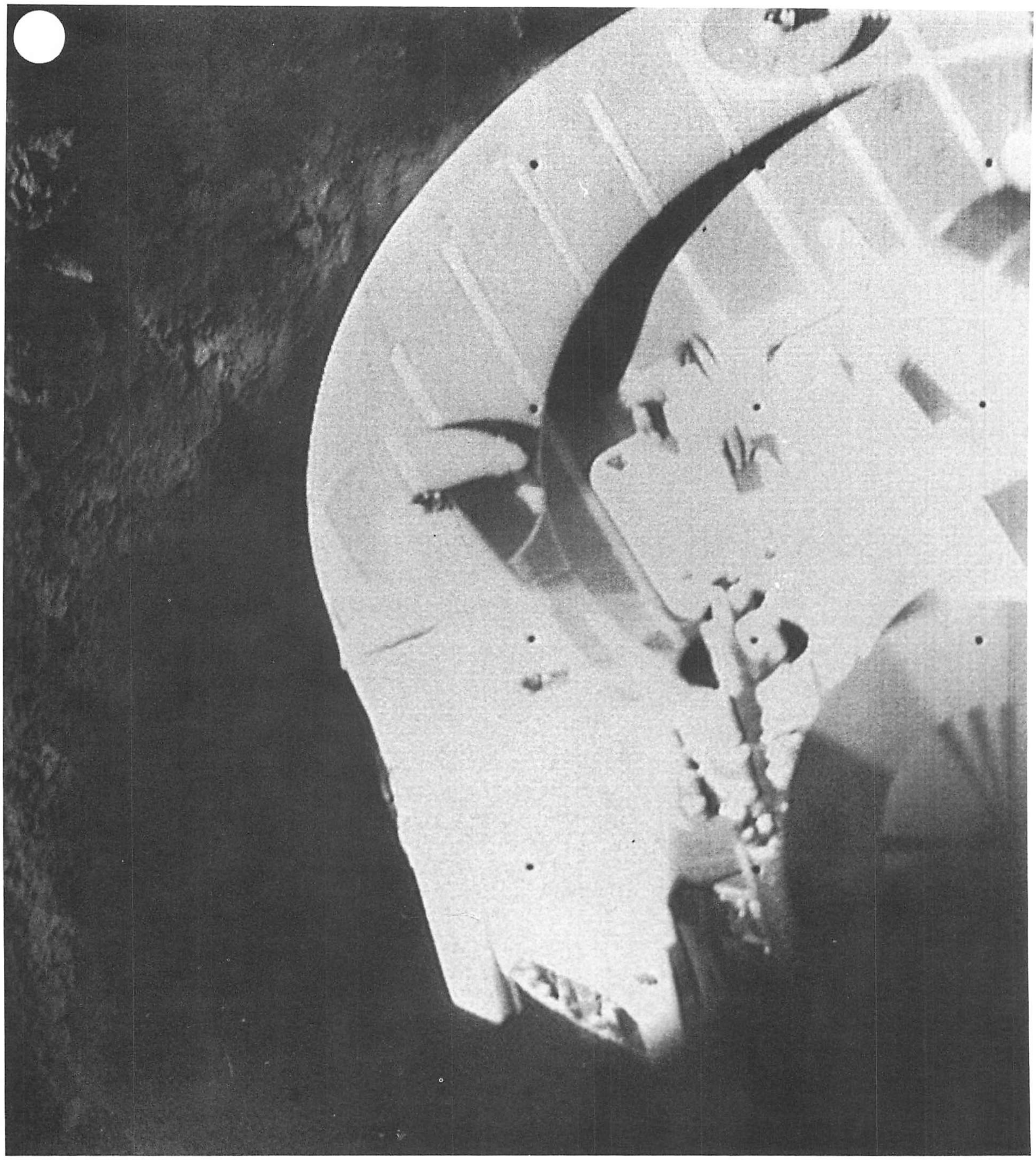


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(14)	**Day 314, 04:55:22**	**−162**	**−20**	**2.3**	***f*/6.7**	**W**	**Clear**

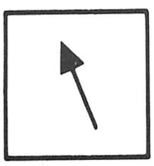


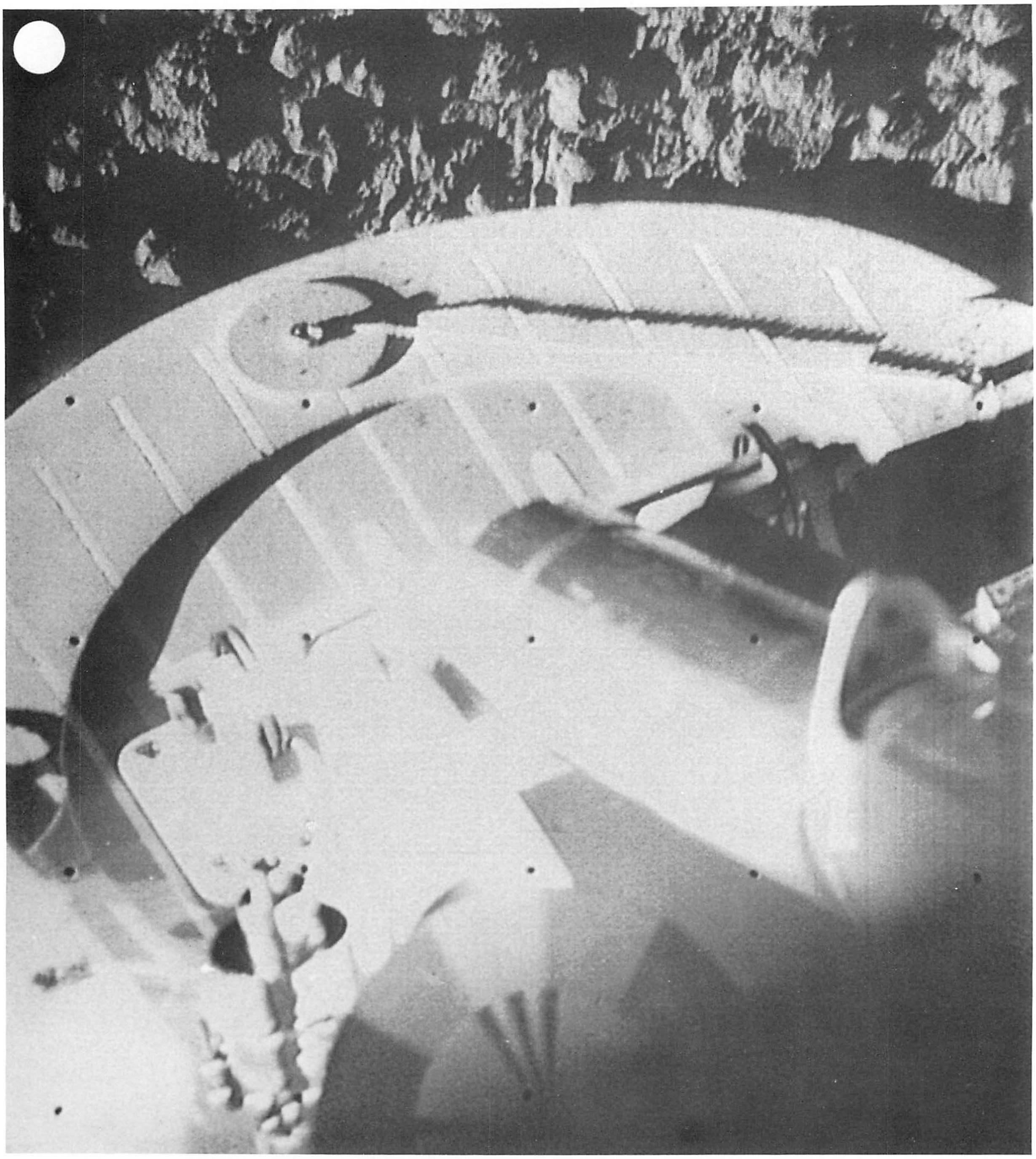


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(15)	**Day 314, 04:59:34**	**—126**	**—65**	**2.3**	***f*/6.8**	**W**	**Clear**	**Processed**

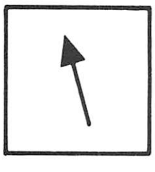


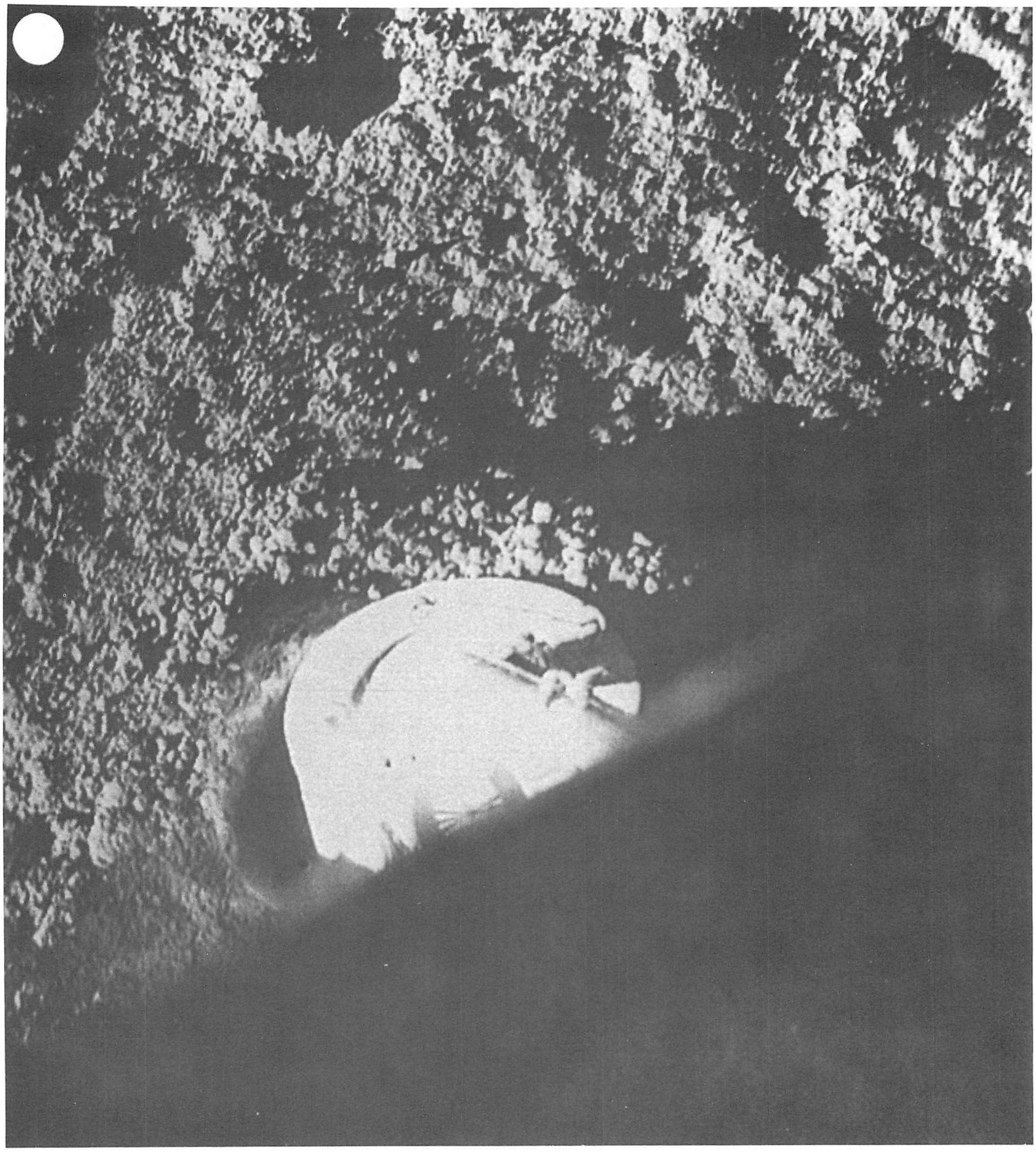
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(16)	Day 314, 05:05:29	−54	−55	2.5	f/6.7	N	Clear	Processed



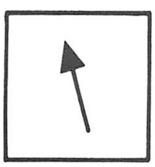


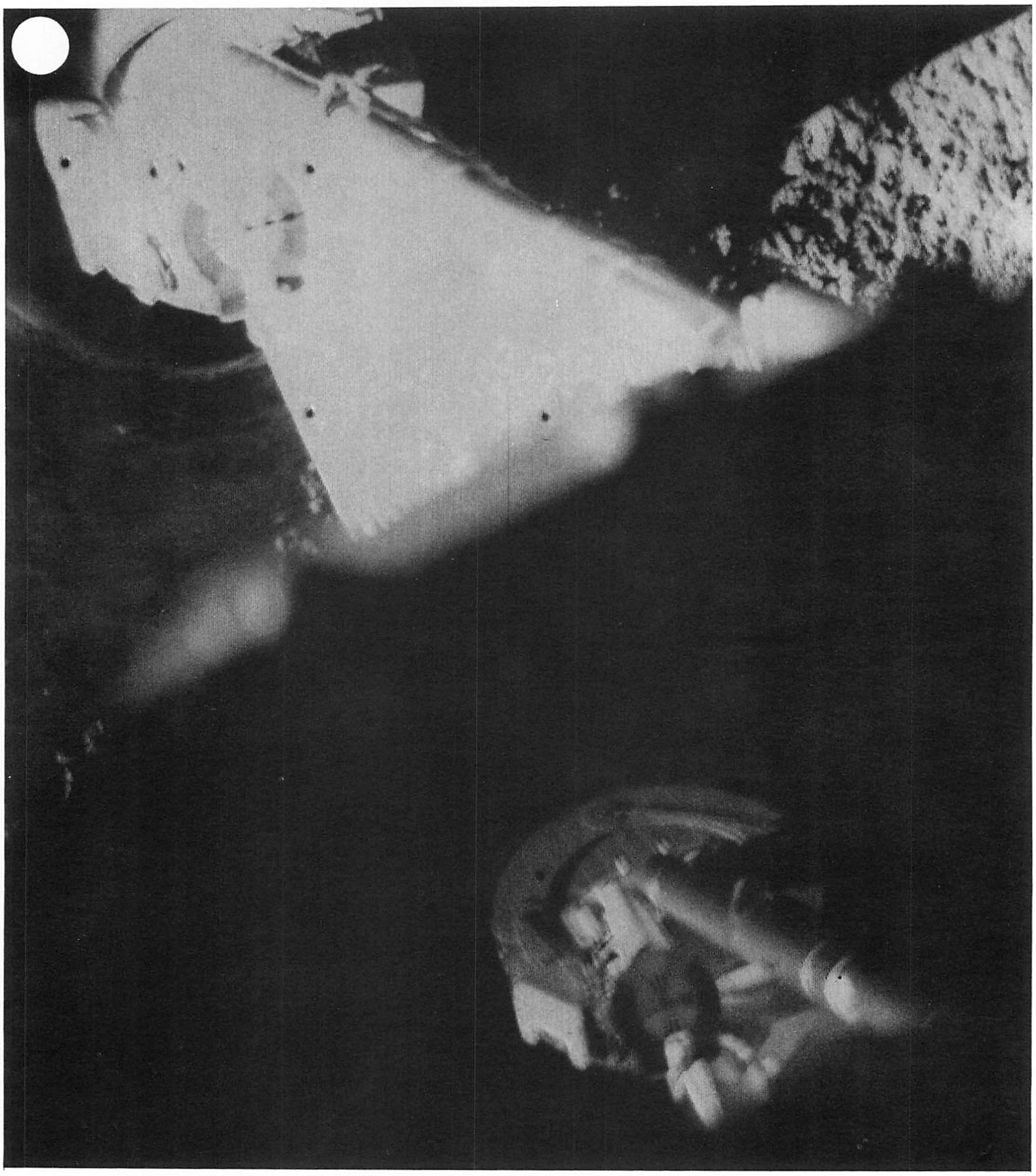
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(17)	**Day 314, 05:05:34**	**—60**	**—55**	**2.5**	***f*/6.7**	**N**	**Clear**	**Processed**



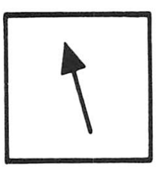


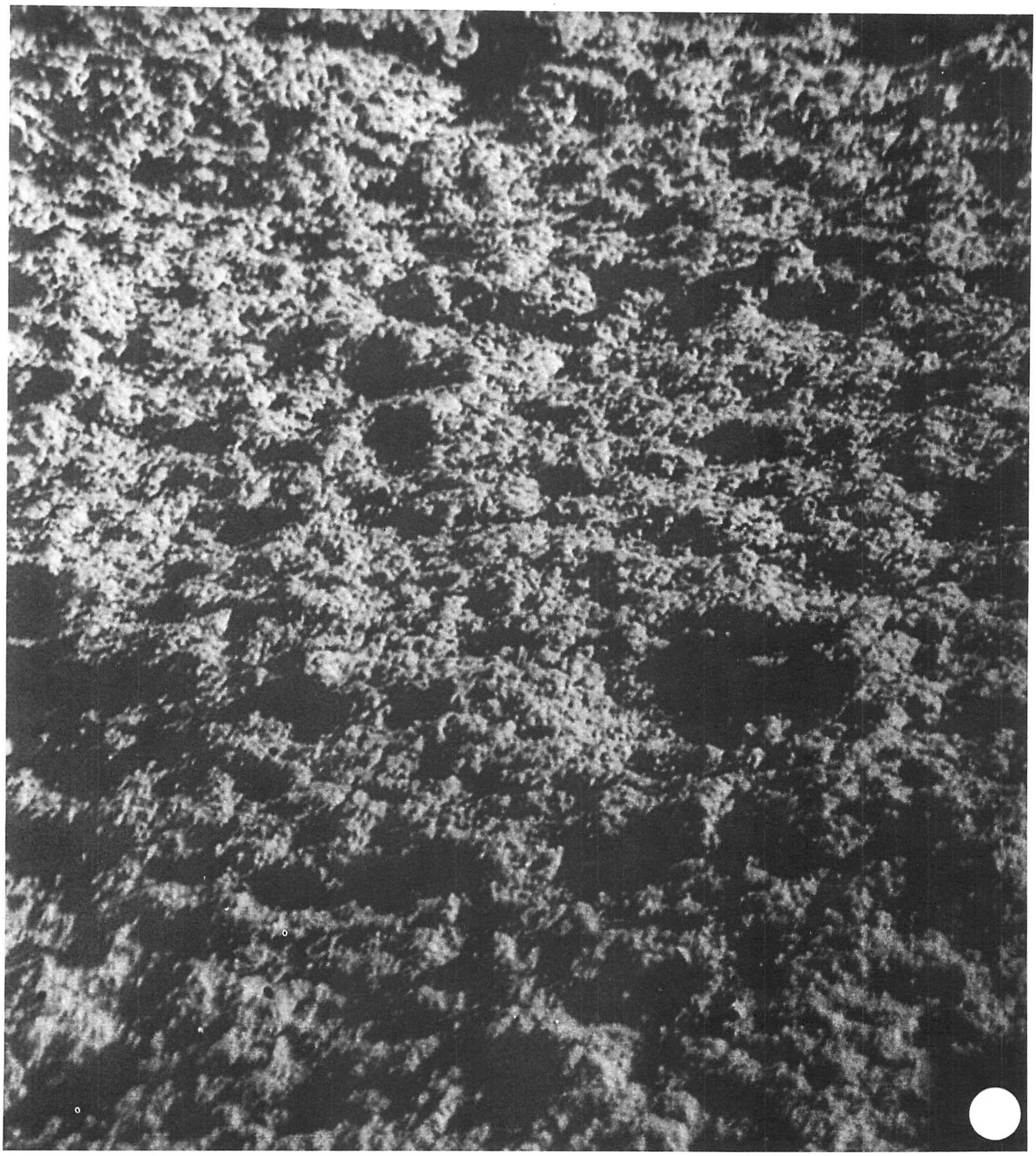
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(18)	**Day 314, 05:07:34**	**−63**	**−55**	**2.5**	**f/4.0**	**W**	**Clear**	**Processed**



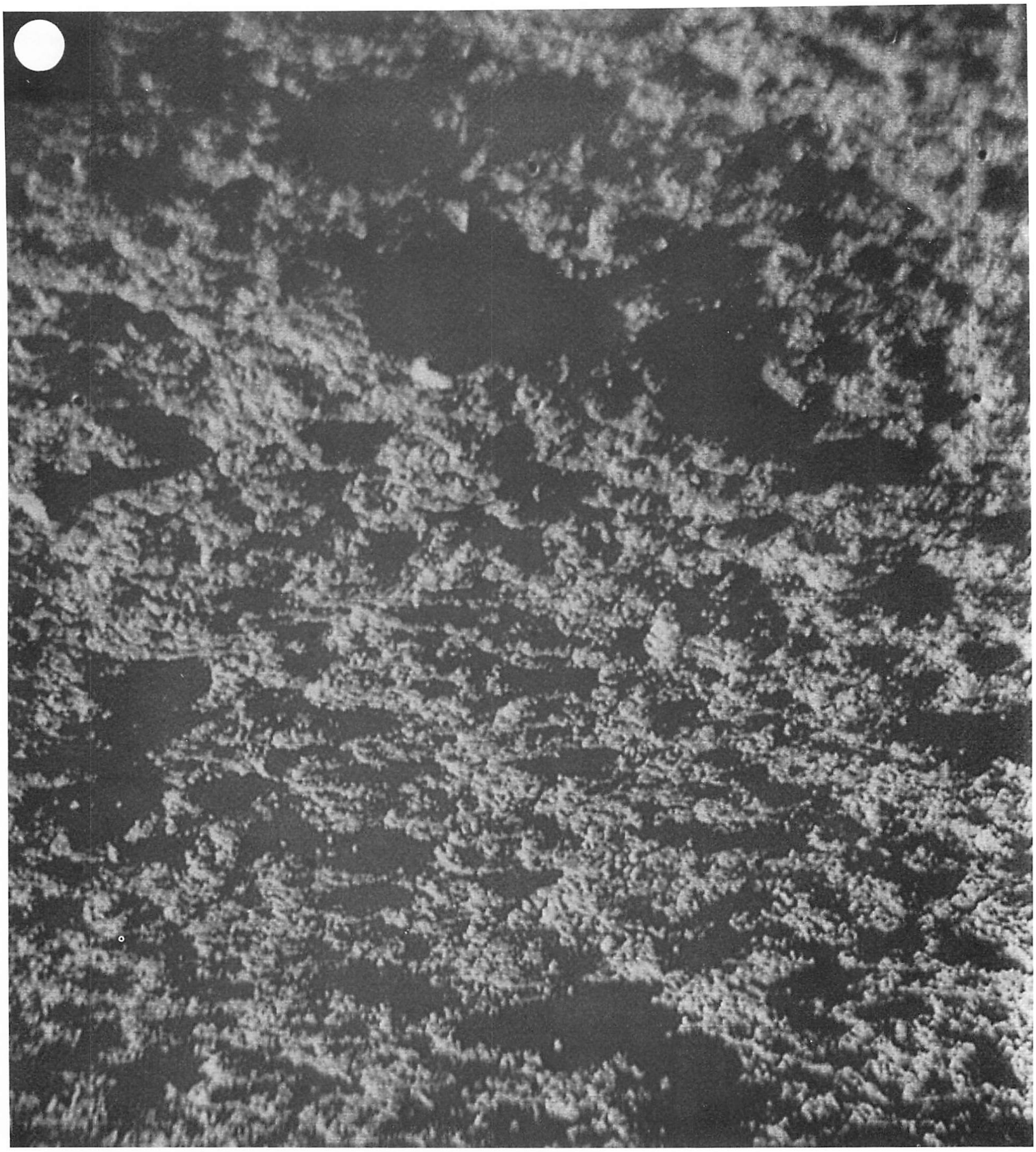


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(19)	**Day 314, 05:13:59**	**—60**	**—70**	**2.4**	***f*/4.0**	**W**	**Clear**

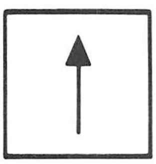


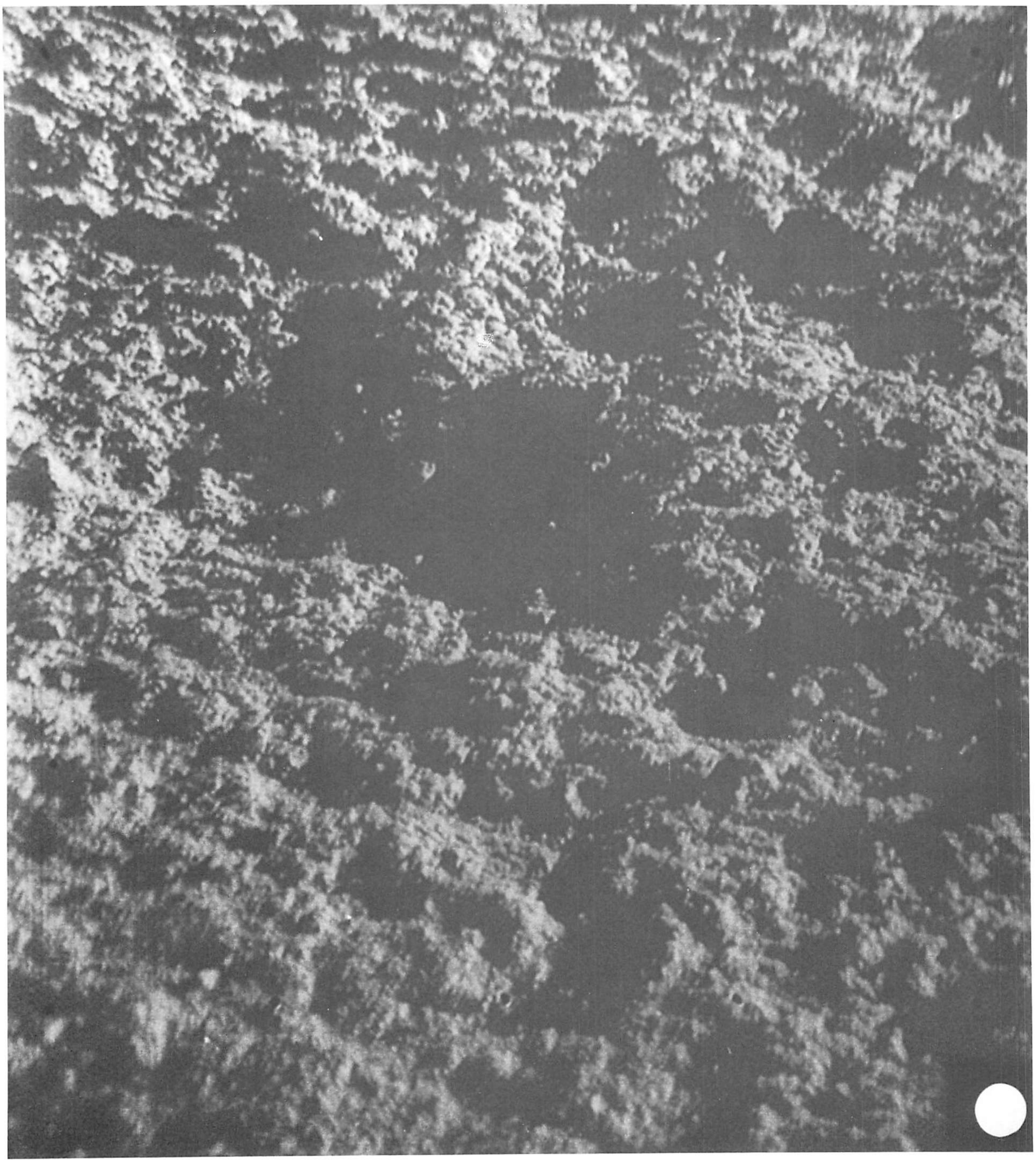


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(20)	Day 314, 06:58:26	90	—15	3.3	f/5.8	N	Clear	Processed

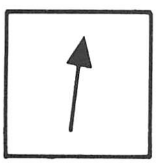


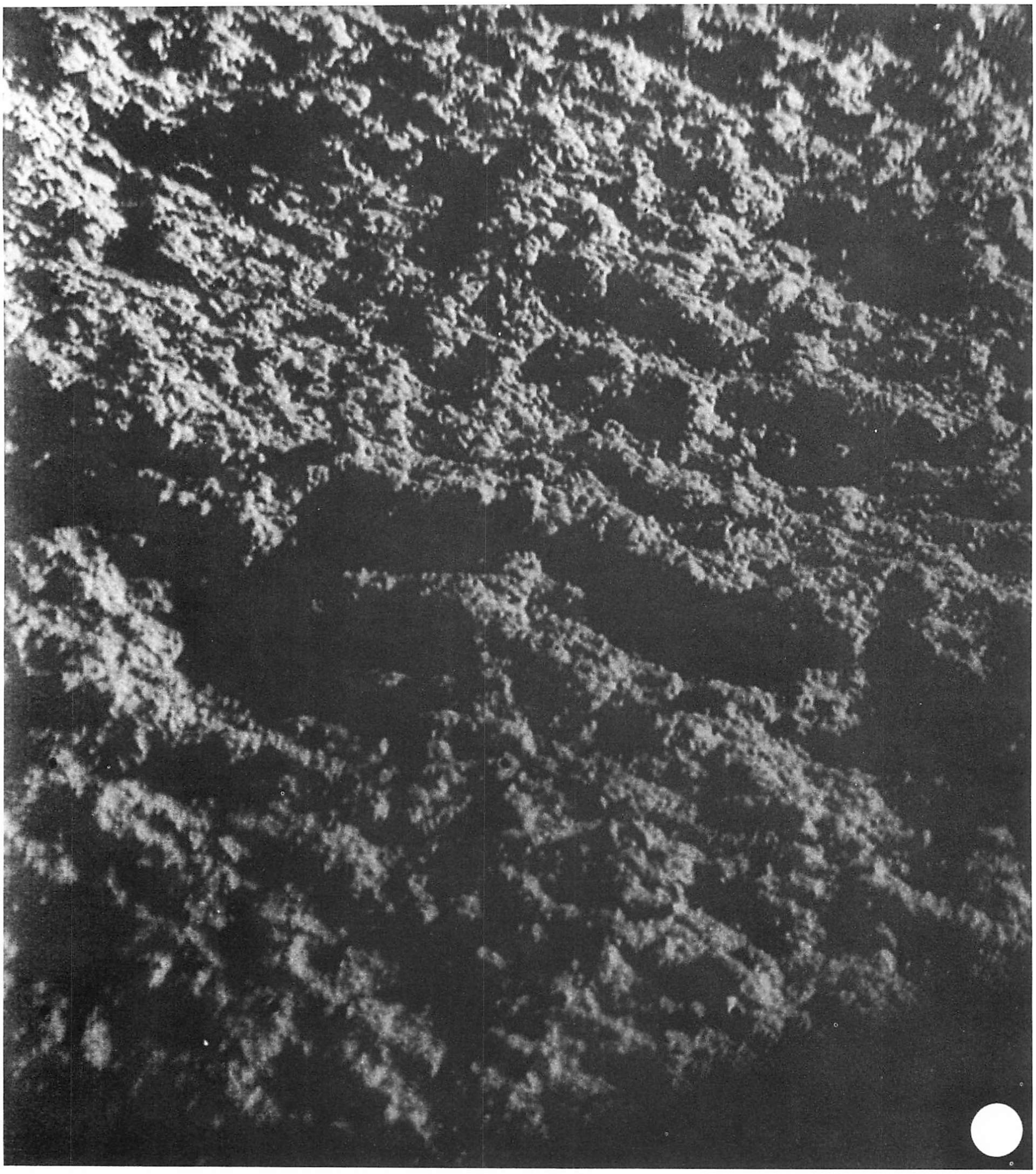
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(21)	Day 314, 06:58:54	84	—50	3.3	f/5.8	N	Clear	Processed



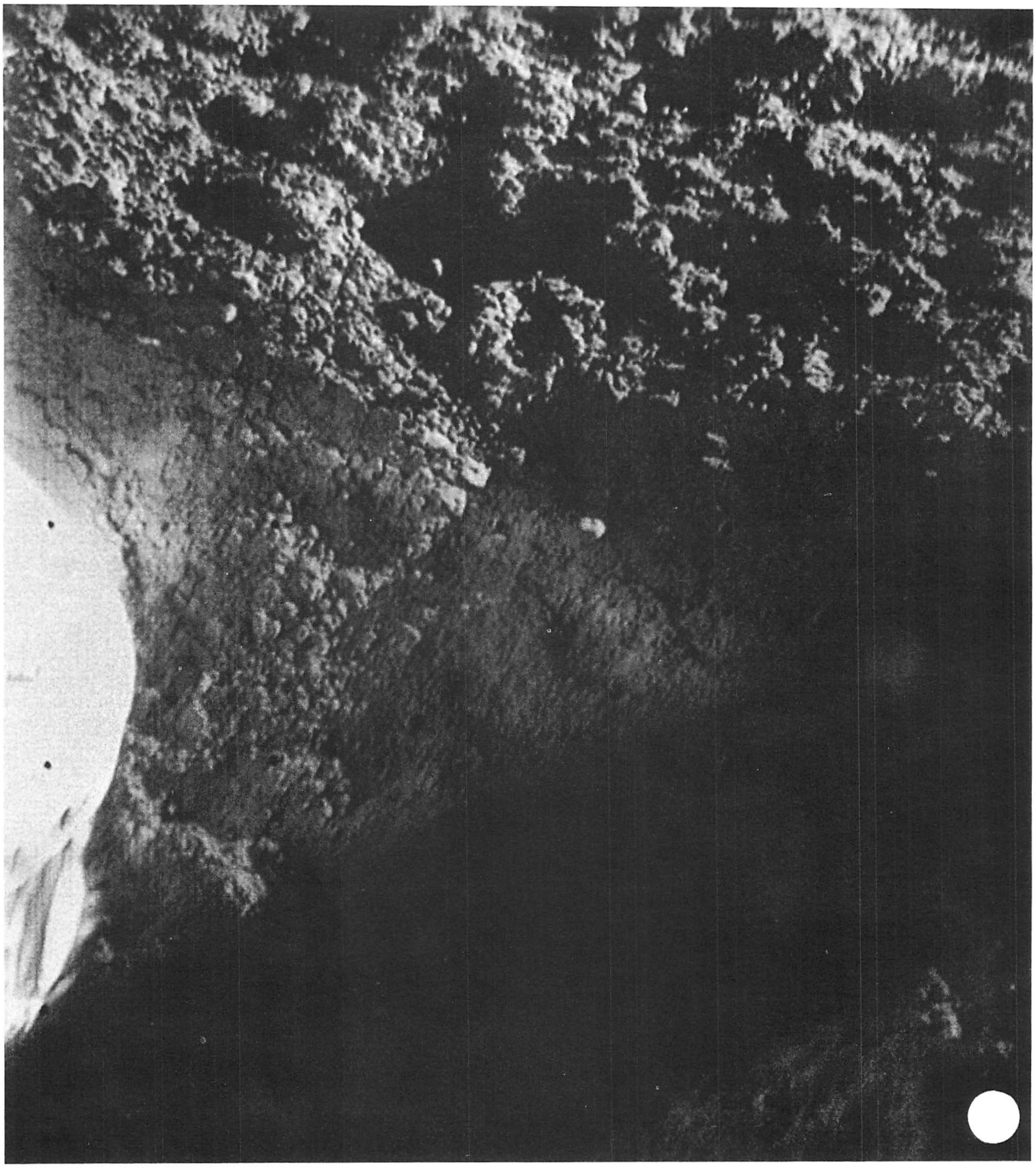


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(22)	**Day 314, 06:58:59**	**78**	**—15**	**3.1**	***f*/5.8**	**N**	**Clear**	**Processed**

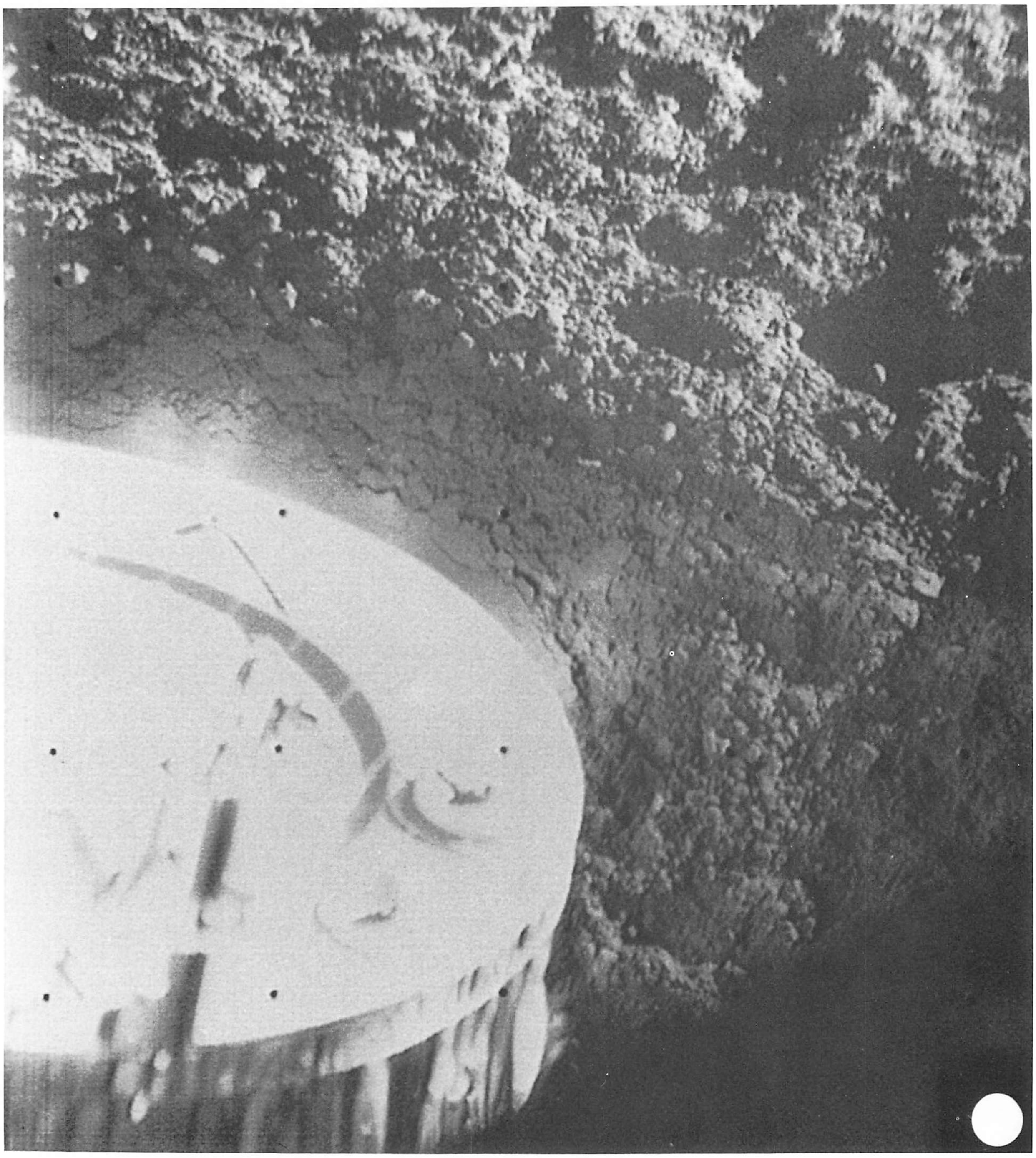




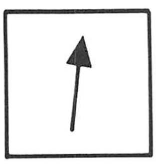
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(23)	Day 314, 06:59:03	72	—15	3.1	f/5.8	N	Clear	Processed

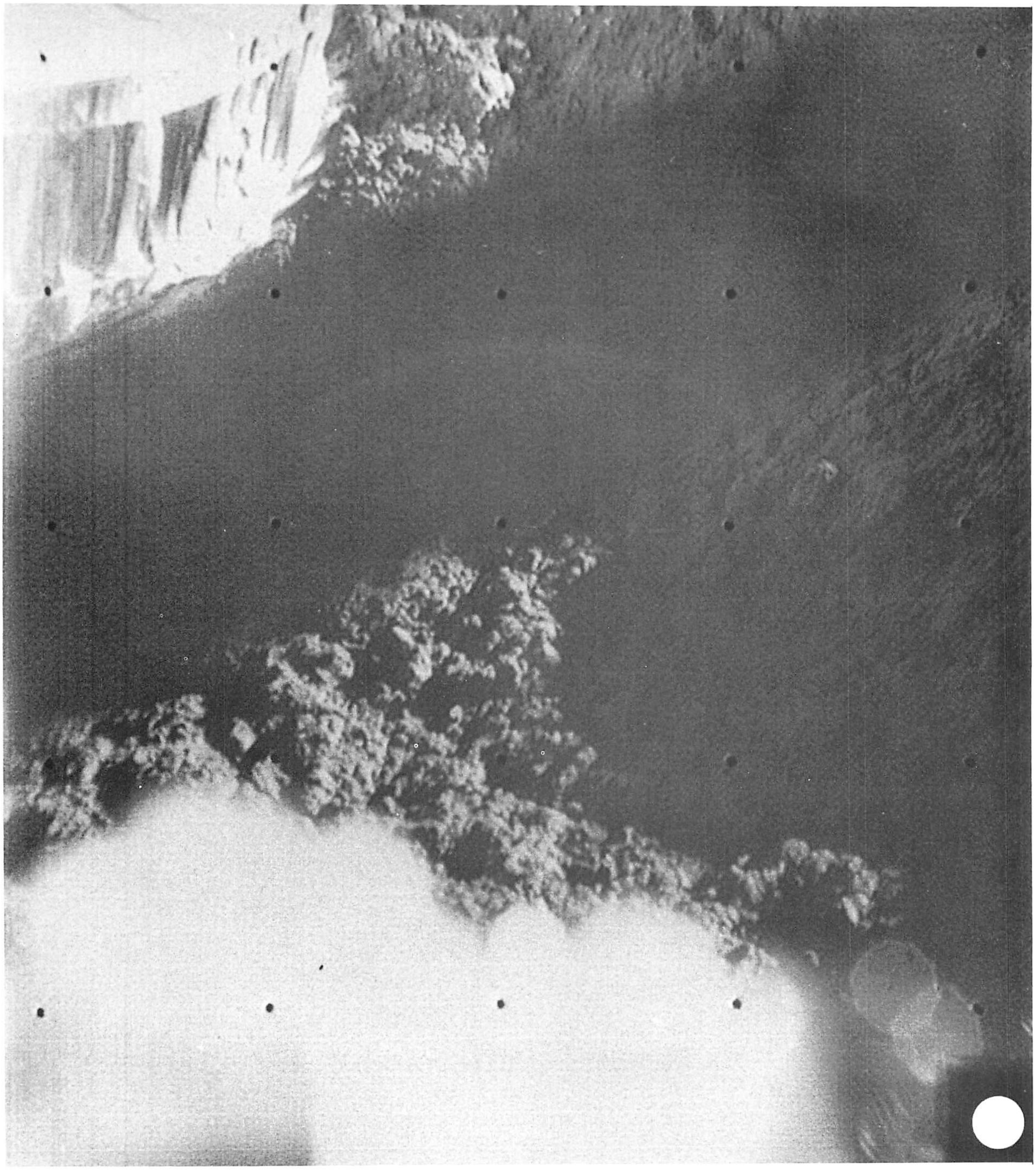


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(24)	**Day 314, 06:59:08**	**75**	**—20**	**2.8**	**f/5.8**	**N**	**Clear**	**Processed**

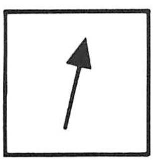


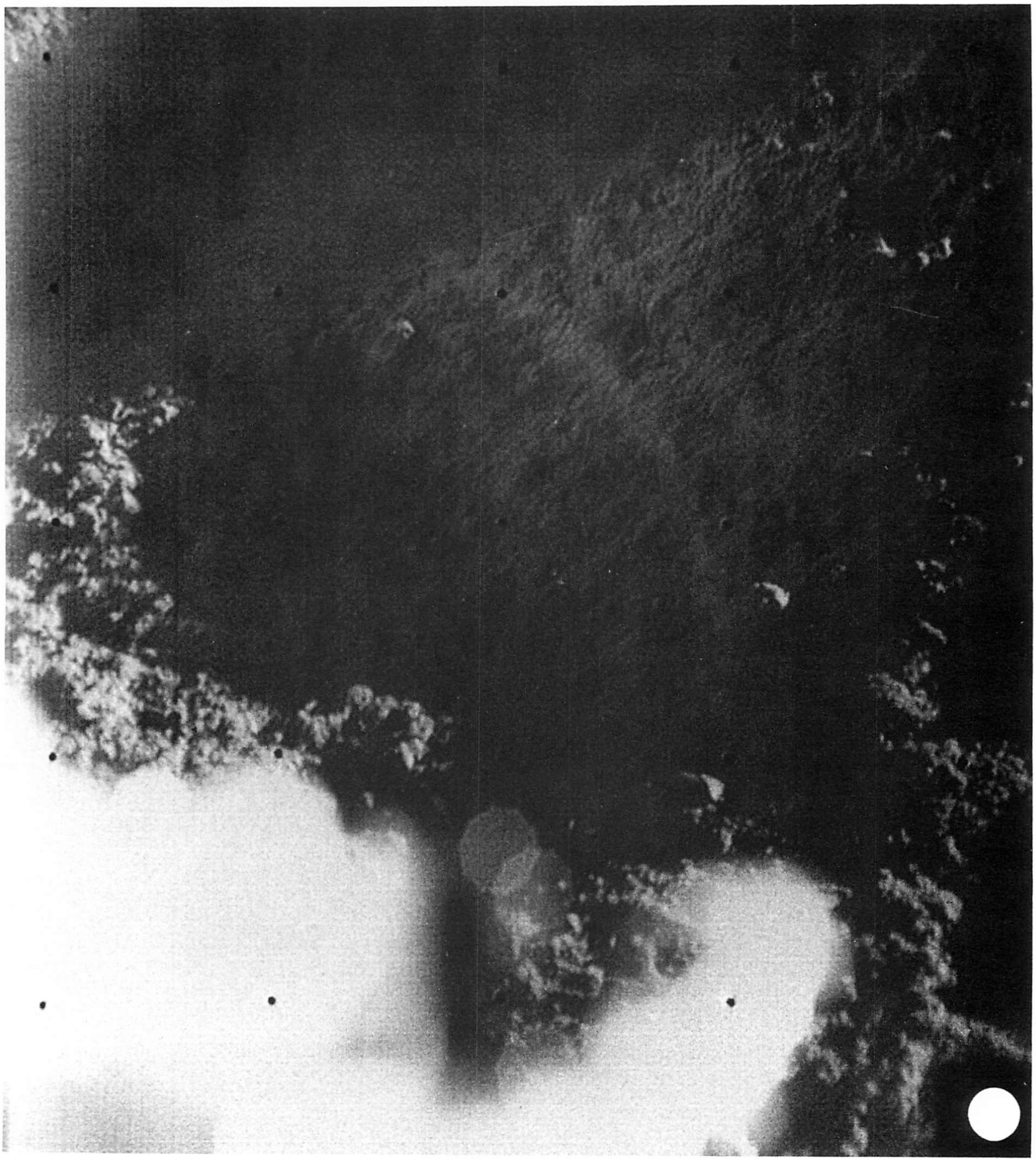
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(25)	Day 314, 06:59:13	78	—20	2.2	f/5.8	N	Clear	Processed



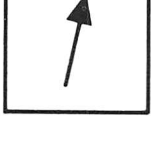


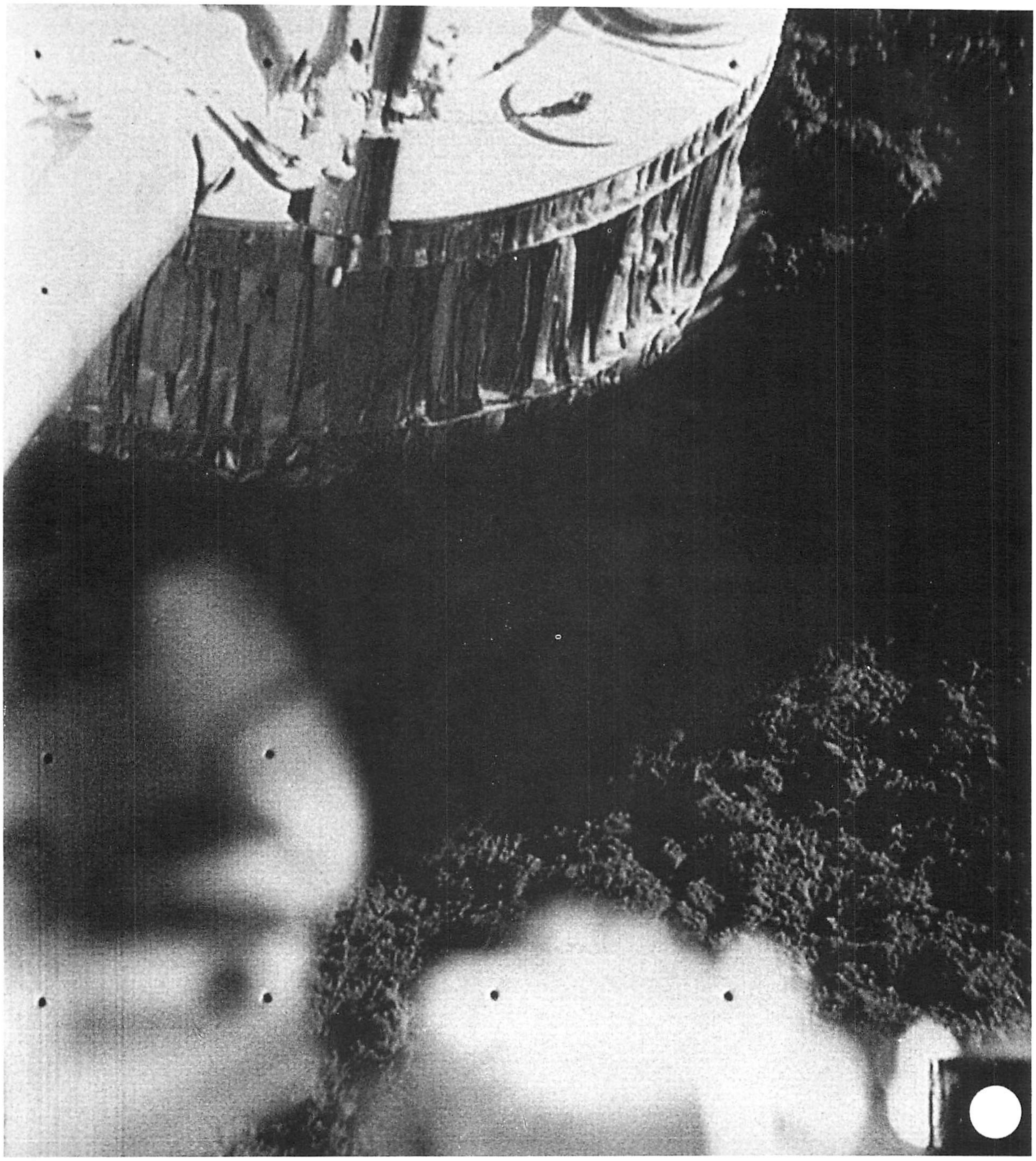
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(26)	**Day 314, 06:59:44**	**75**	**—25**	**2.6**	**f/5.8**	**N**	**Clear**	**Processed**



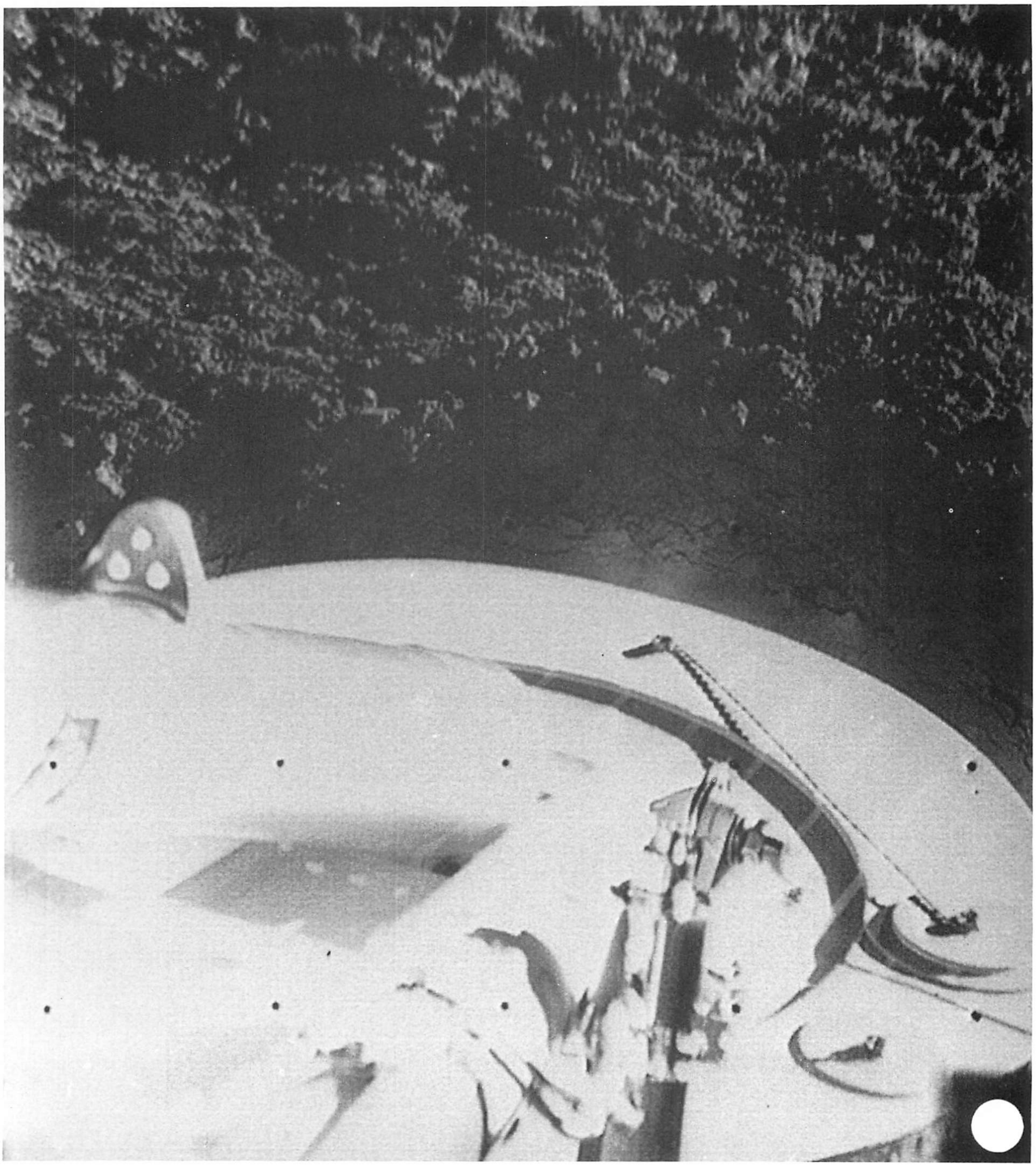


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(27)	**Day 314, 06:59:49**	**72**	**—25**	**2.6**	***f*/5.8**	**N**	**Clear**	**Processed**

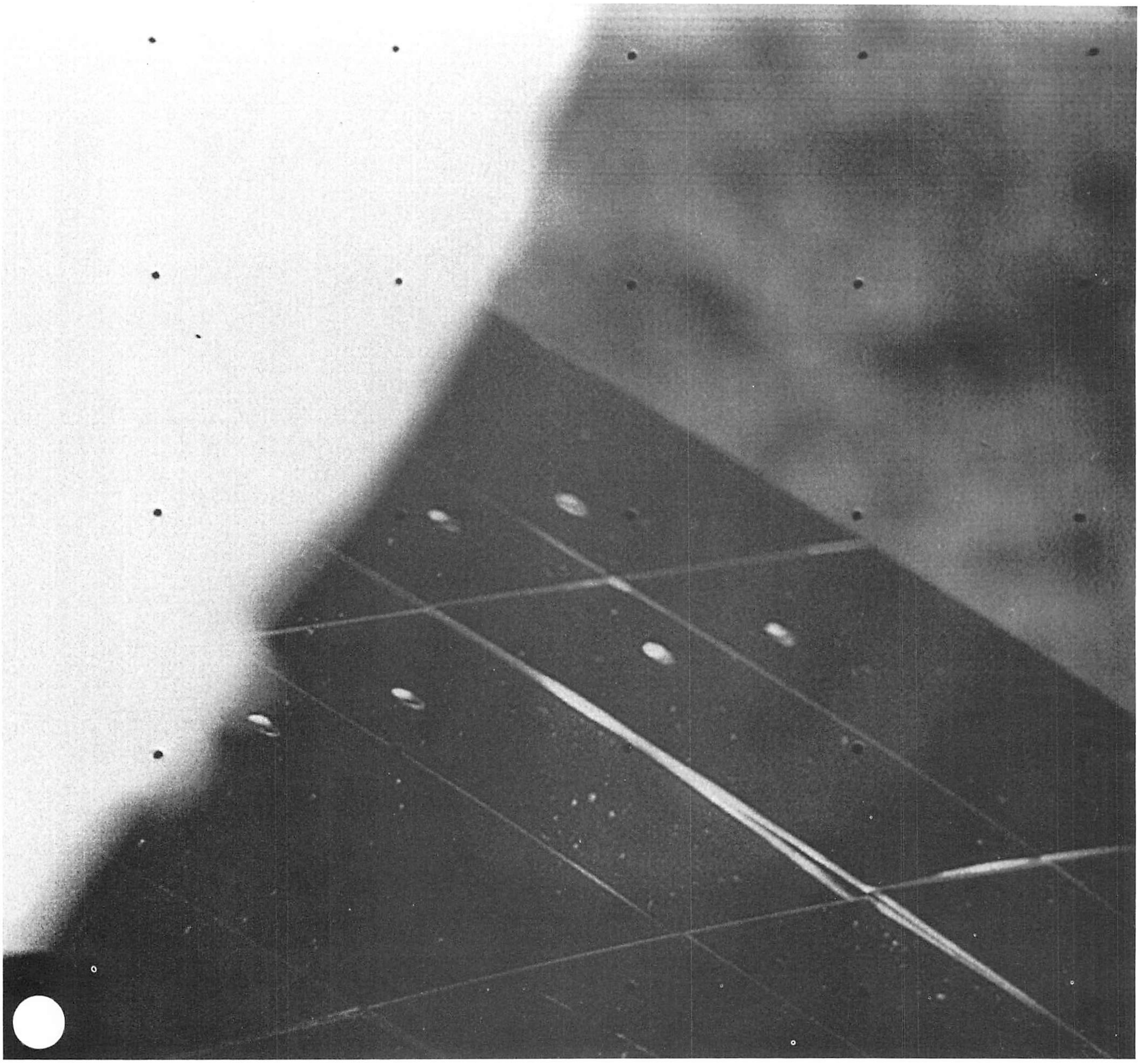




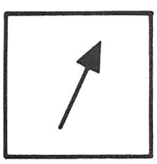
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(28)	Day 314, 07:00:41	78	—25	2.5	*f*/7.8	N	Clear	Processed



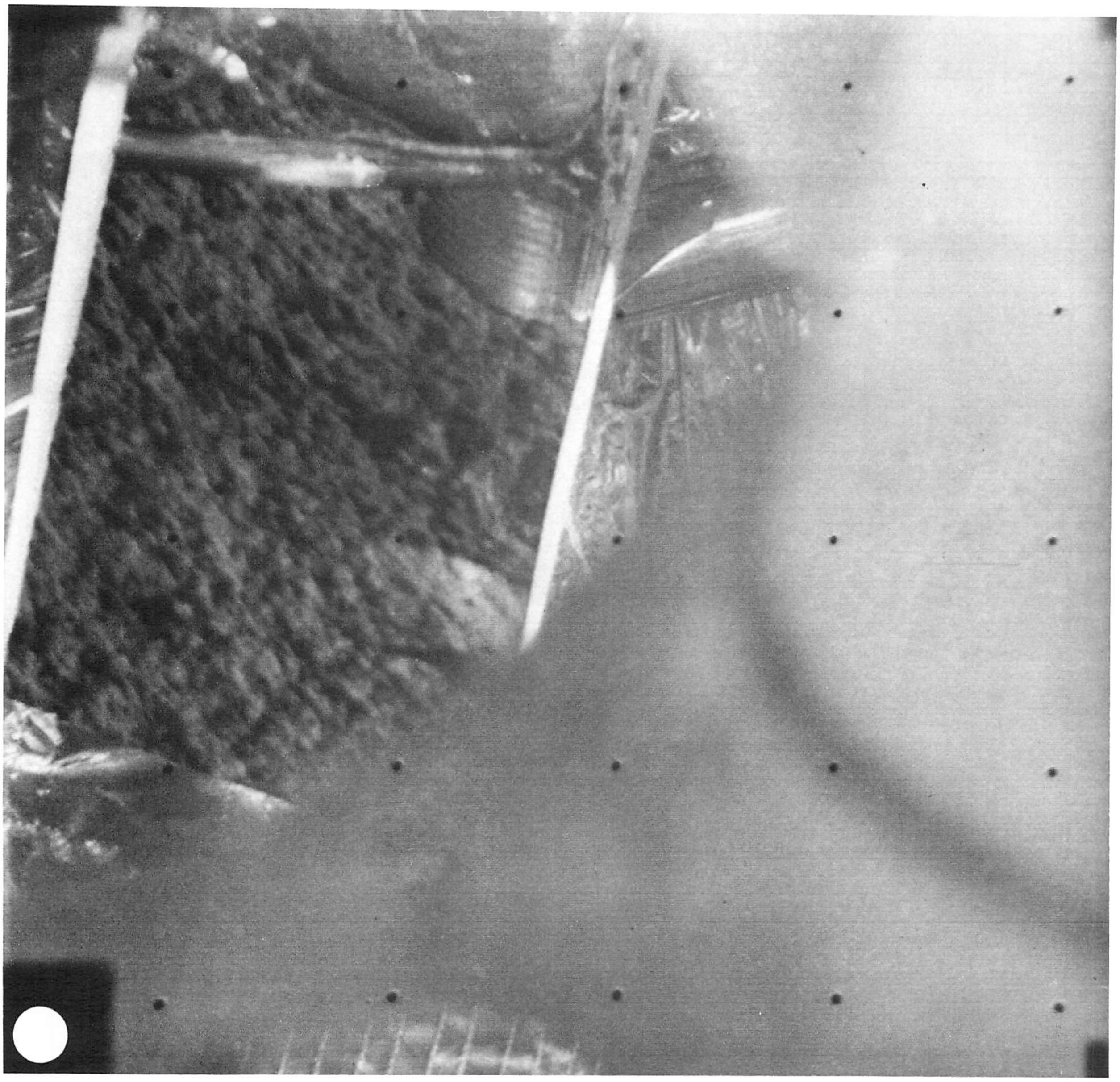
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(29)	Day 314, 07:06:33	81	−20	2.7	f/7.8	N	Clear	Processed



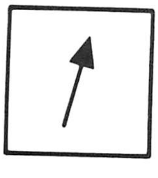
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(30)	Day 314, 07:45:53	−219	−15	1.8	f/7.8	N	Clear	Processed

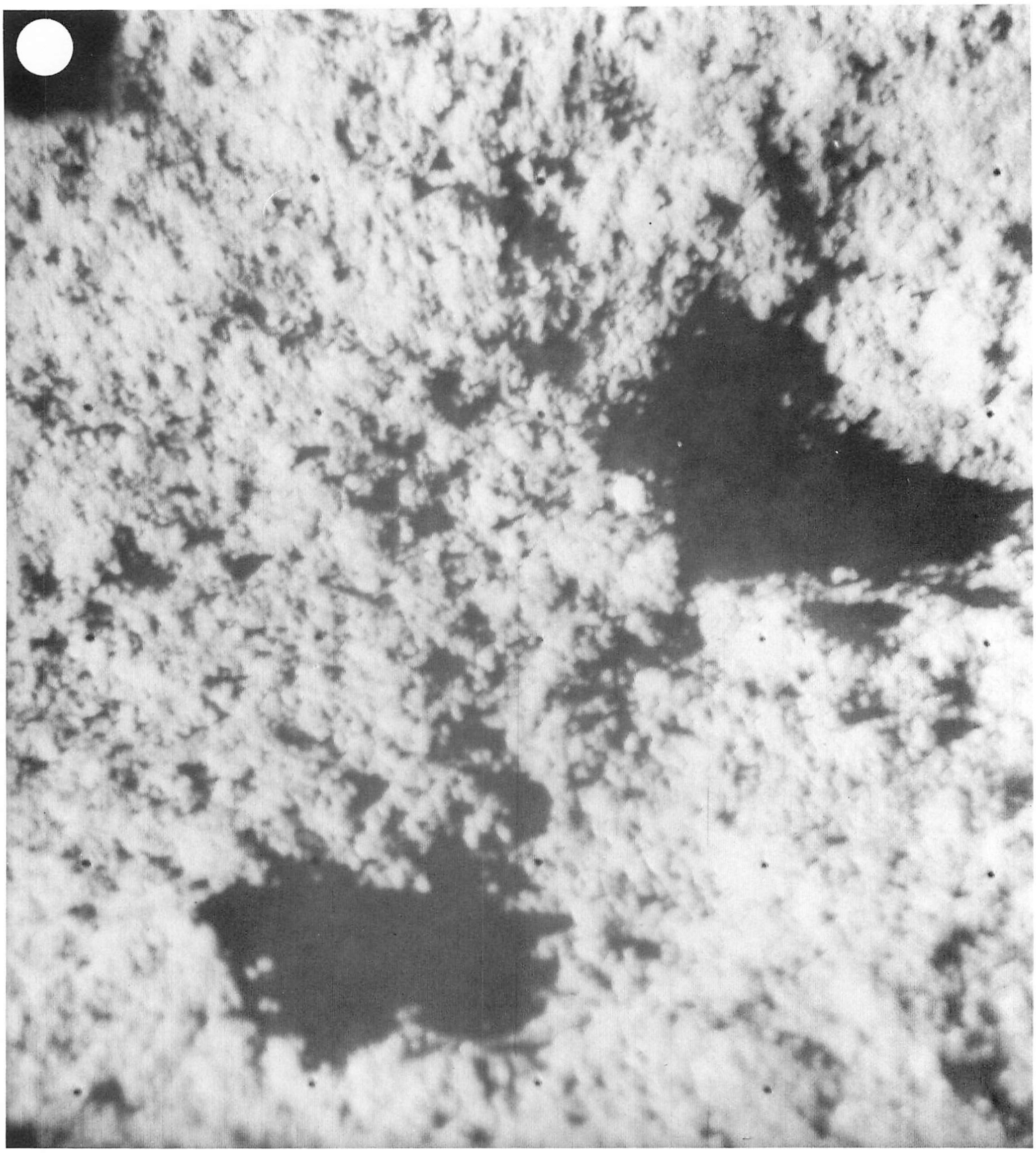


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(31)	**Day 315, 01:28:11**	**—201**	**—35**	**2.1**	**f/9.0**	**N**	**Clear**

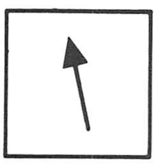


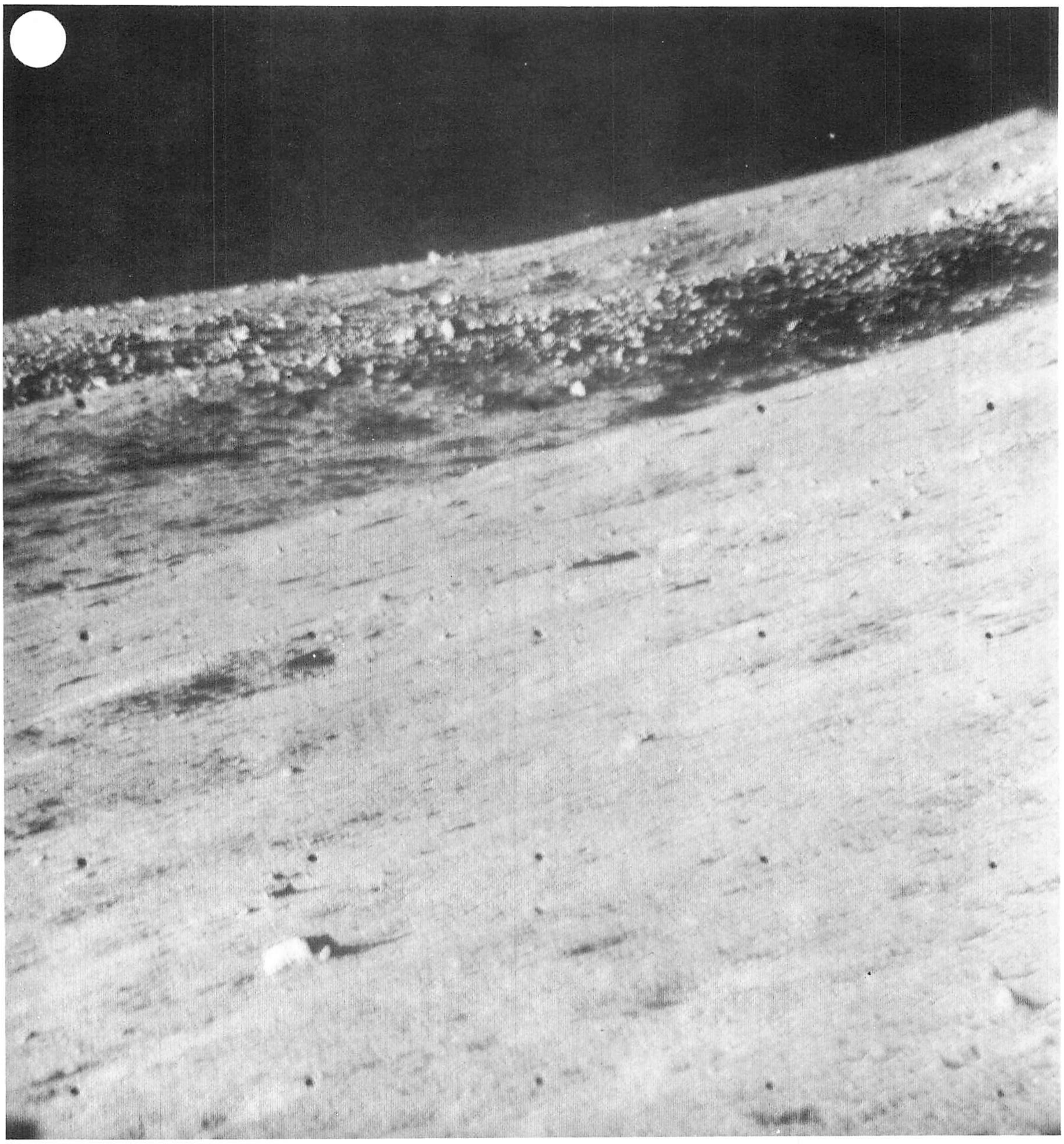
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(32)	Day 315, 01:28:35	—210	—35	1.9	*f*/9.0	N	Clear



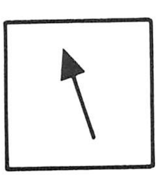


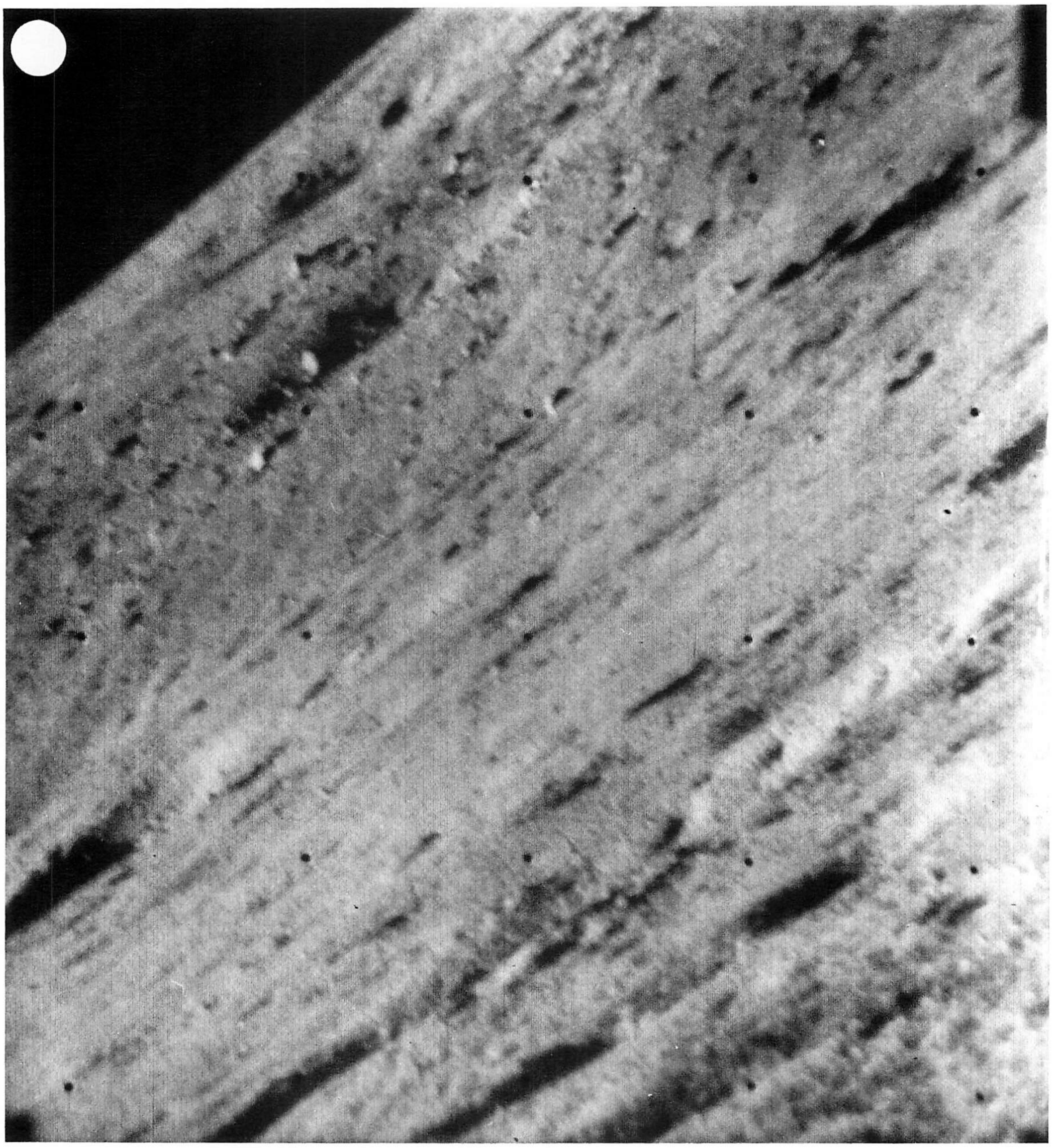
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(33)	**Day 315, 01:37:13**	**—66**	**—40**	**3.1**	***f*/5.8**	**N**	**Clear**



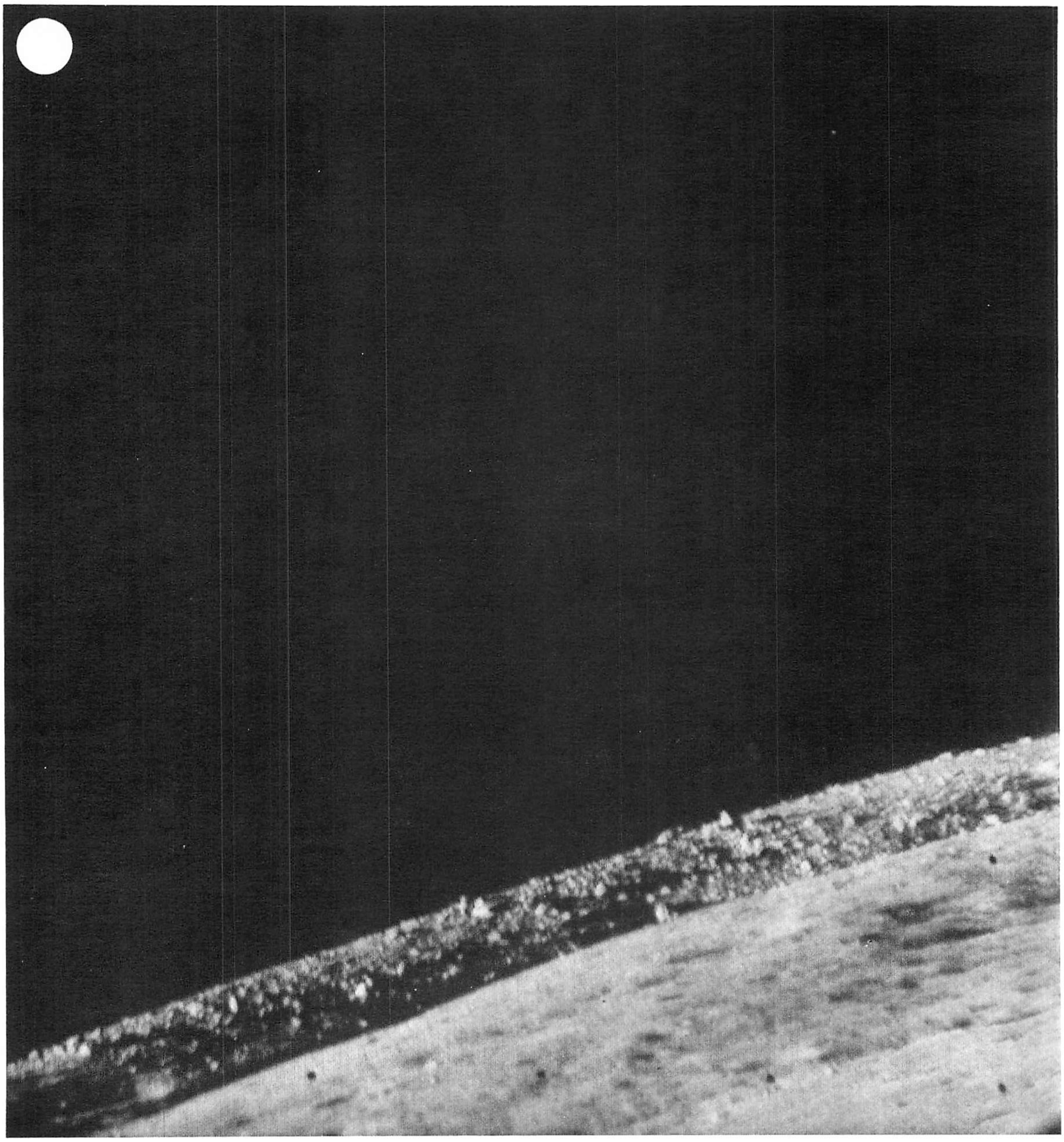


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(34)	**Day 315, 01:41:03**	**—57**	**—5**	**27.9**	***f*/5.8**	**N**	**Clear**

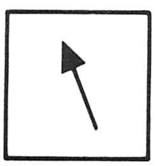


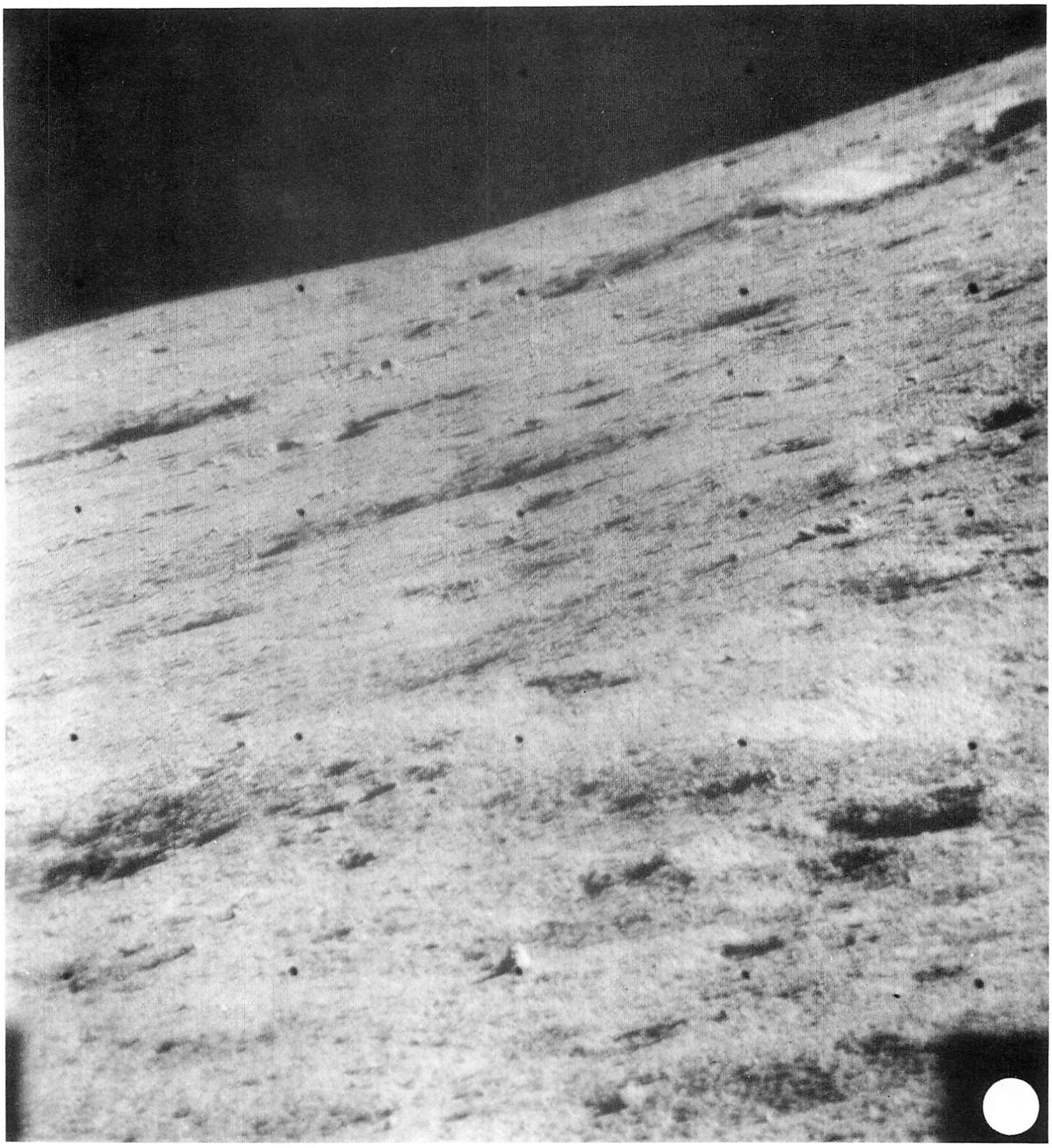


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(35)	Day 315, 01:41:29	—36	0	27.9	f/5.8	N	Clear

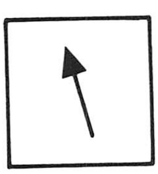


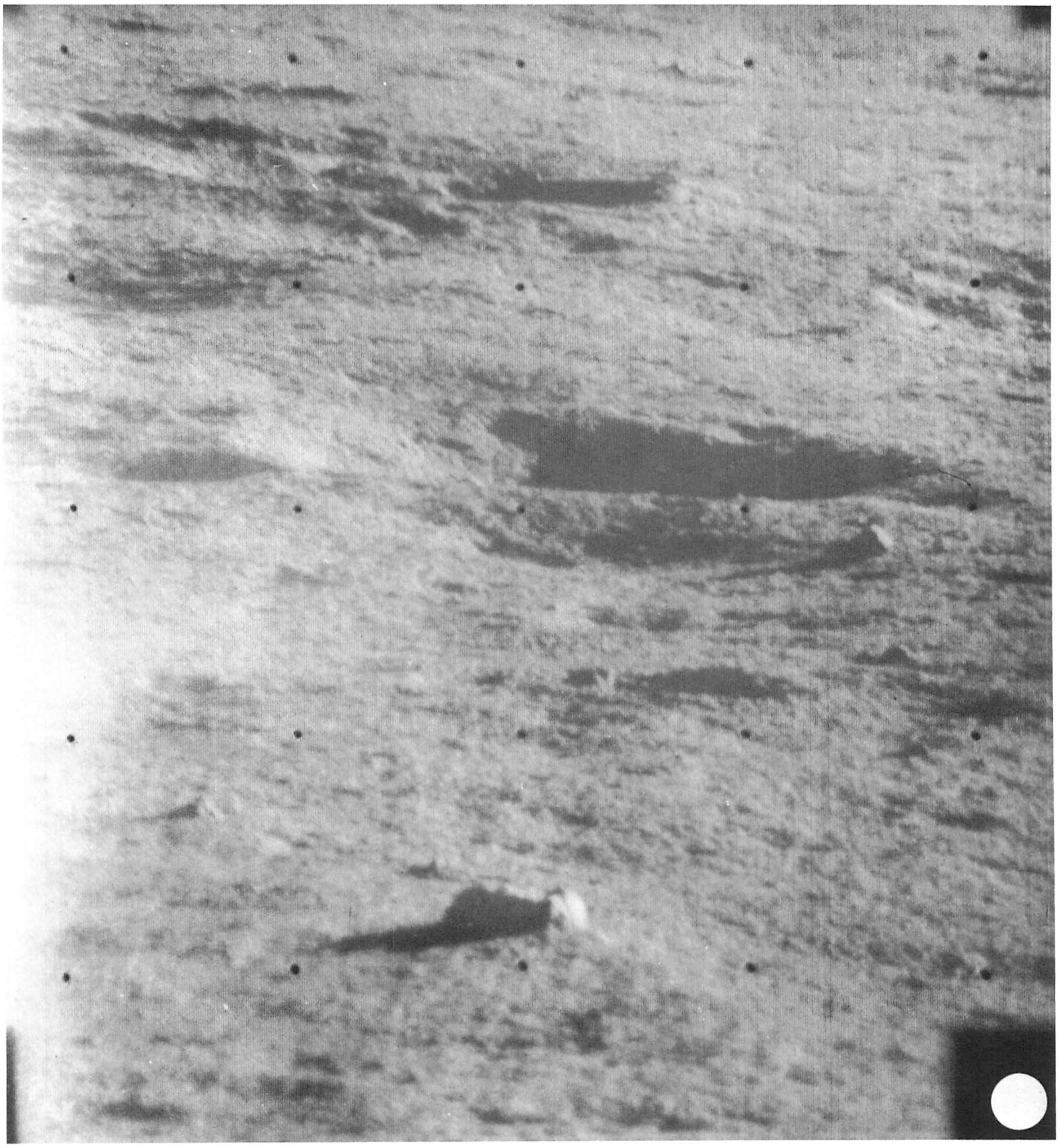
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(36)	**Day 315, 01:41:43**	**—54**	**0**	**27.9**	**f/5.8**	**N**	**Clear**



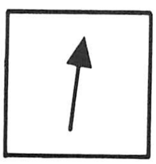


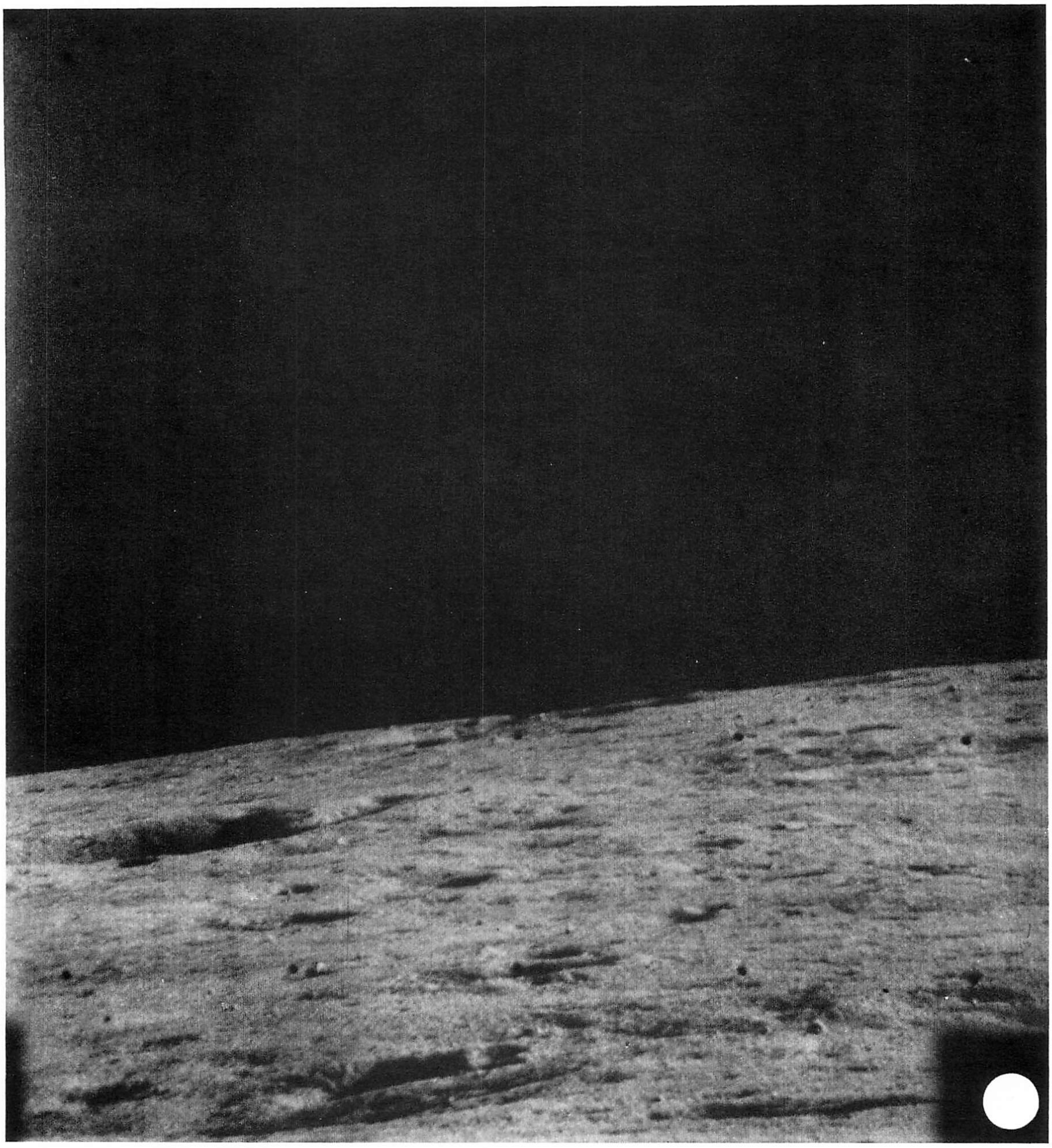
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(37)	**Day 315, 02:02:28**	**96**	**10**	**28.0**	***f*/5.8**	**N**	**Clear**



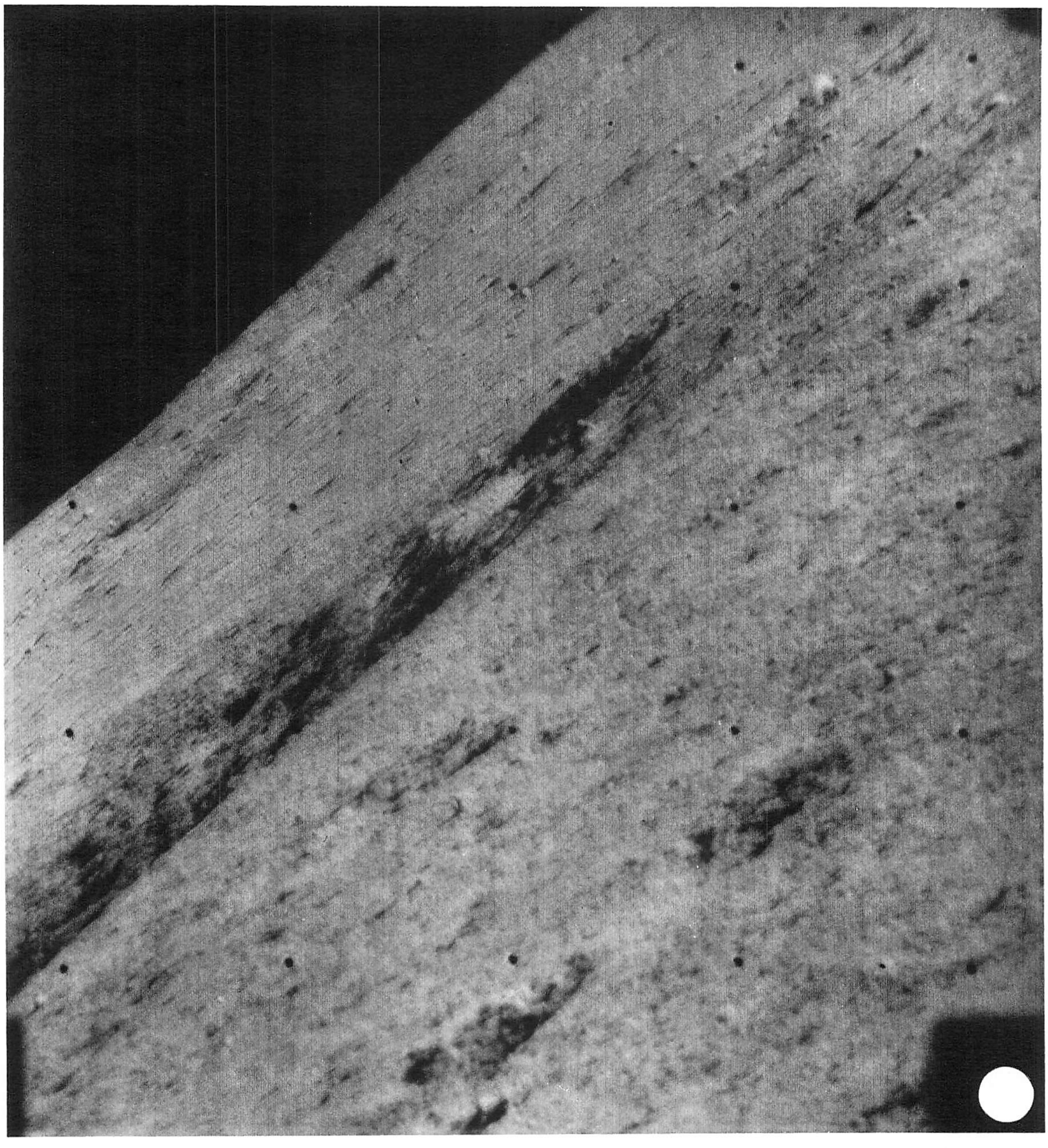


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(38)	**Day 315, 02:02:41**	**78**	**10**	**28.0**	**f/5.8**	**N**	**Clear**

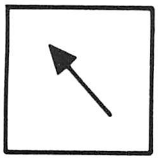


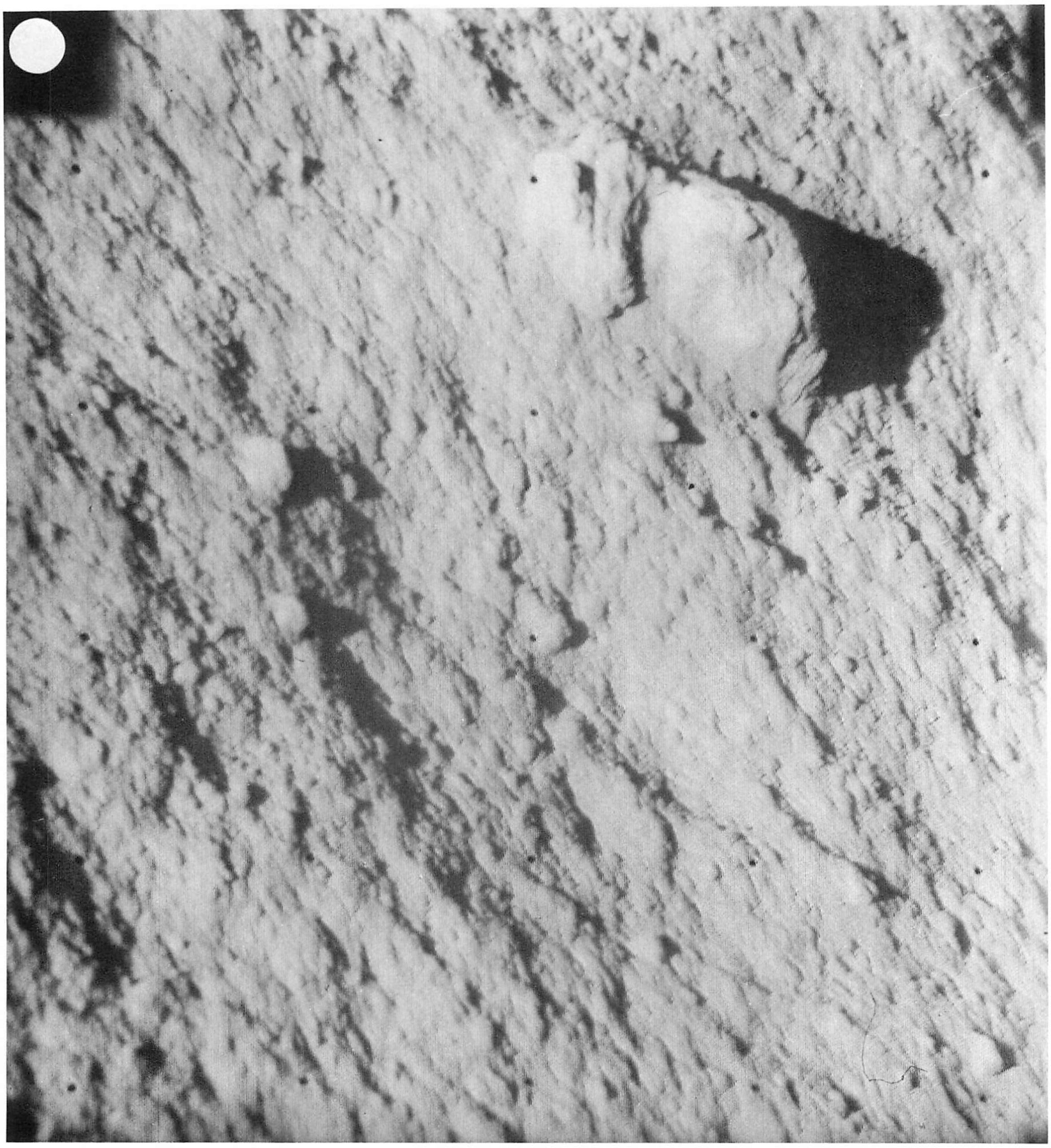


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(39)	**Day 315, 02:03:13**	**87**	**15**	**28.0**	***f*/5.8**	**N**	**Clear**

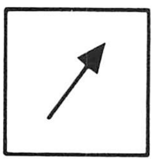


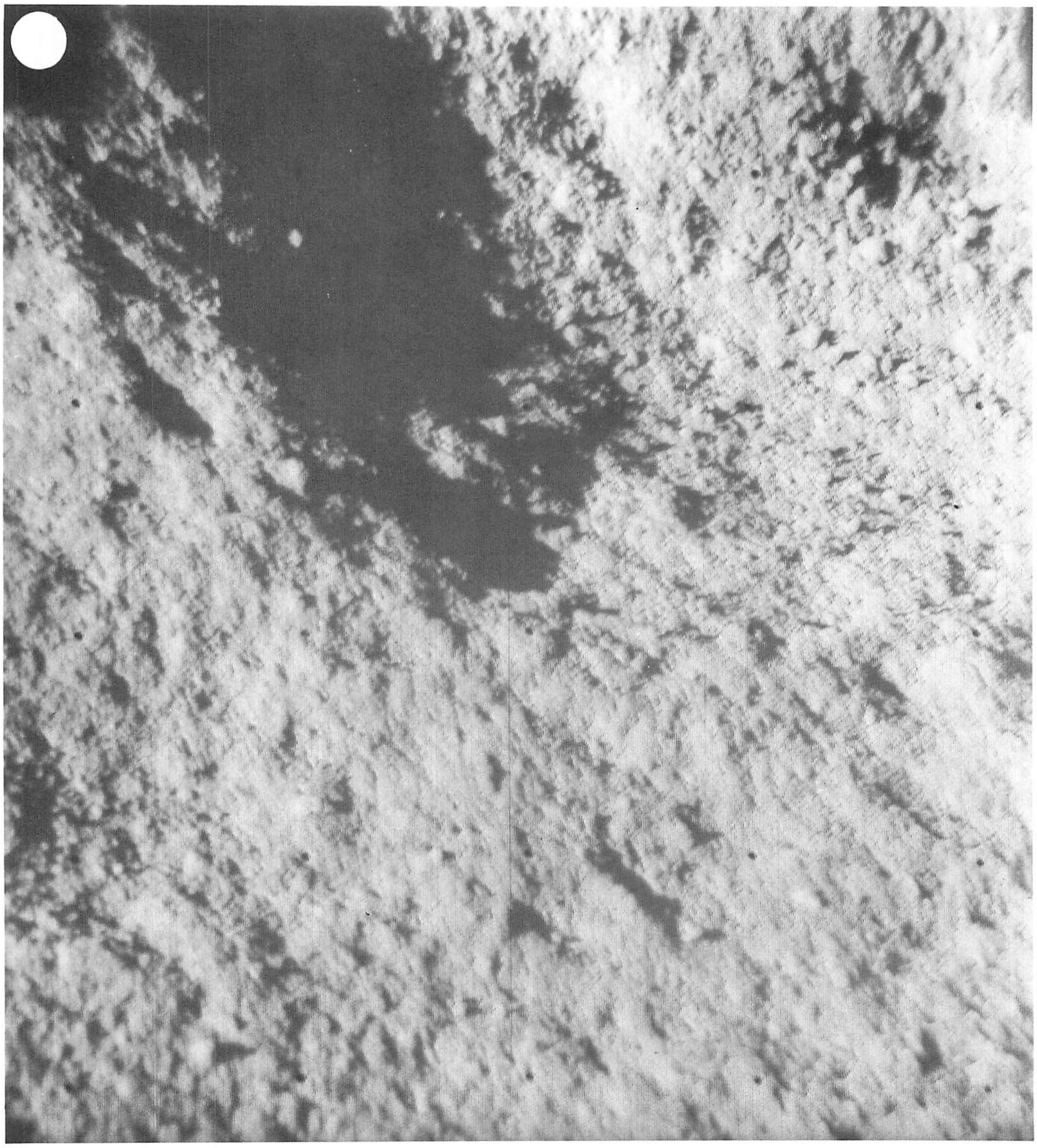
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(40)	**Day 315, 02:10:31**	**117**	**5**	**27.9**	**$f/5.8$**	**N**	**Clear**



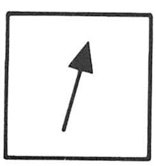


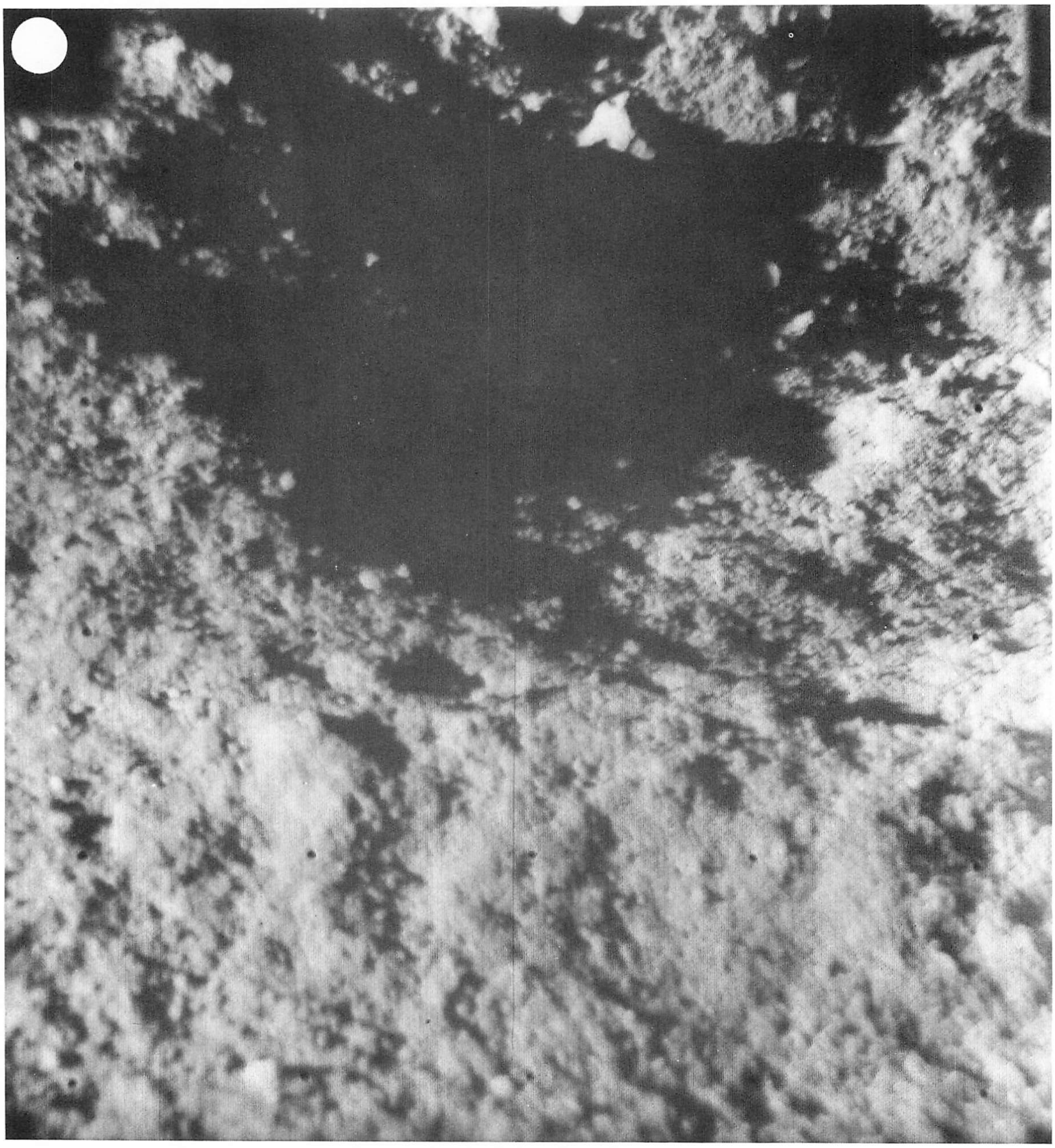
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(41)	**Day 315, 02:17:35**	**—129**	**—45**	**3.3**	***f*/7.8**	**N**	**Clear**



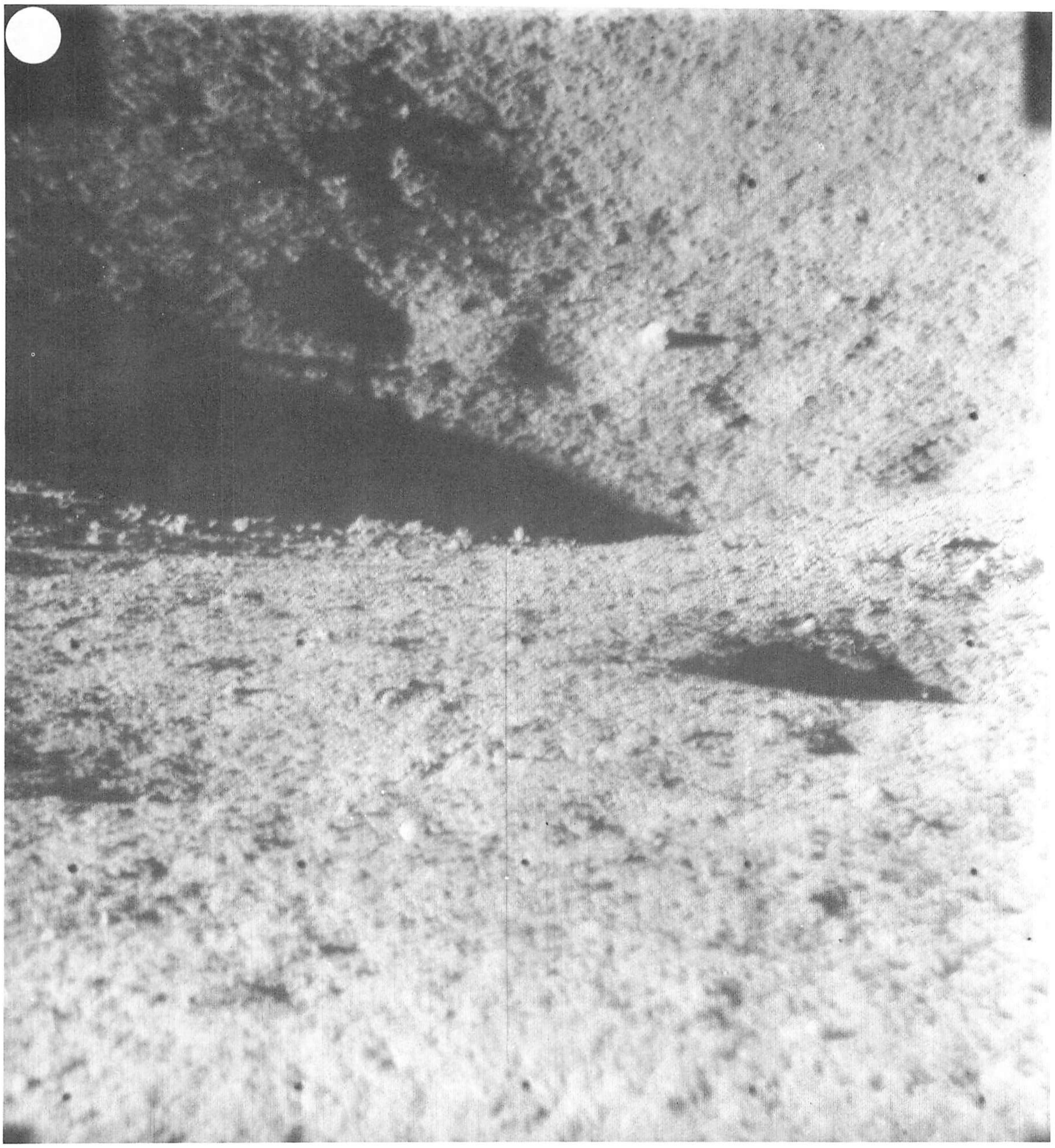


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(42)	**Day 315, 02:23:58**	**—99**	**—45**	**3.1**	**f/7.8**	**N**	**Clear**

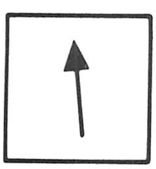


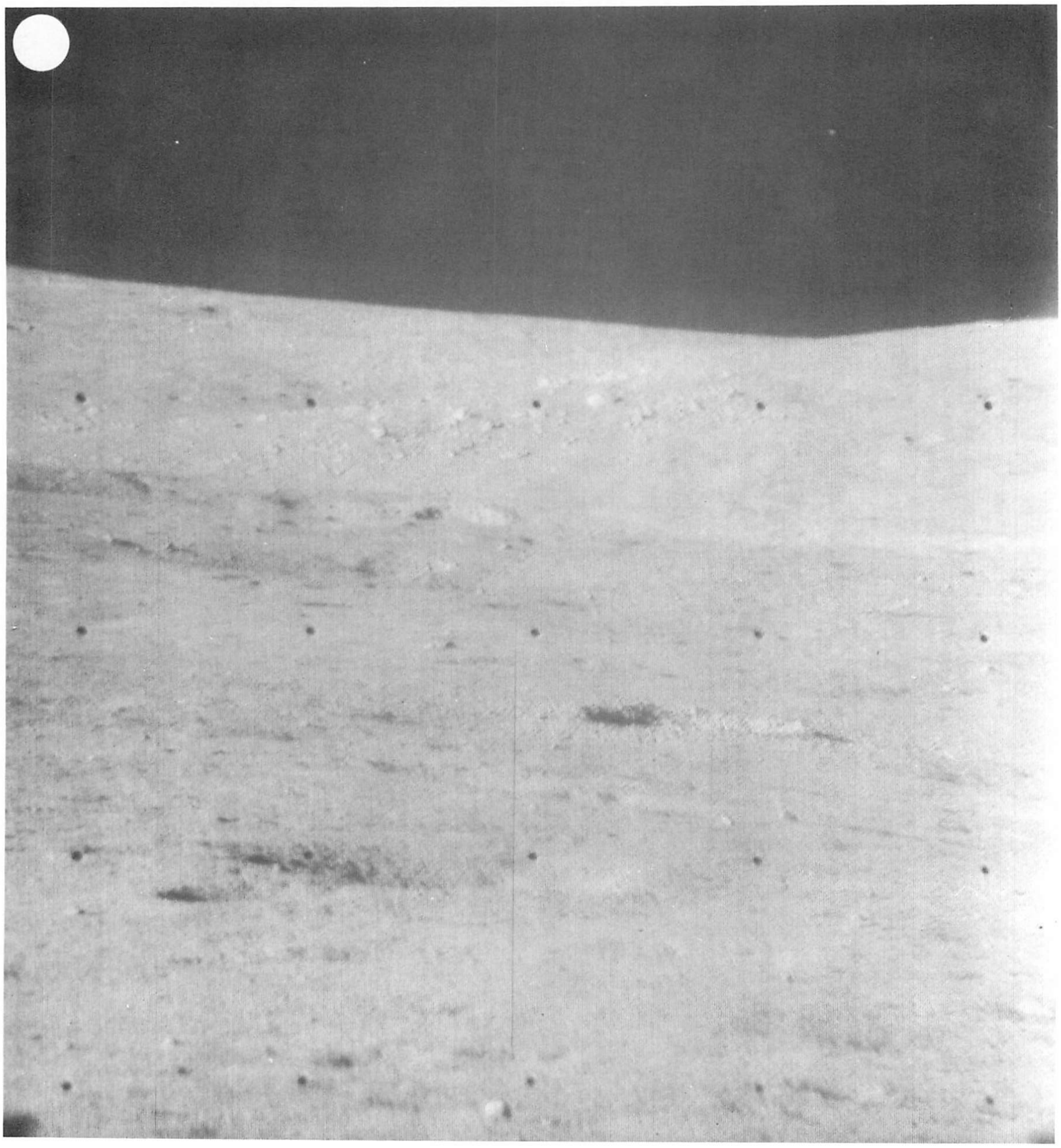


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(43)	**Day 315, 02:24:29**	**—84**	**—40**	**3.7**	**f/7.8**	**N**	**Clear**

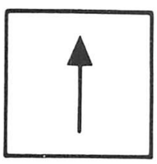


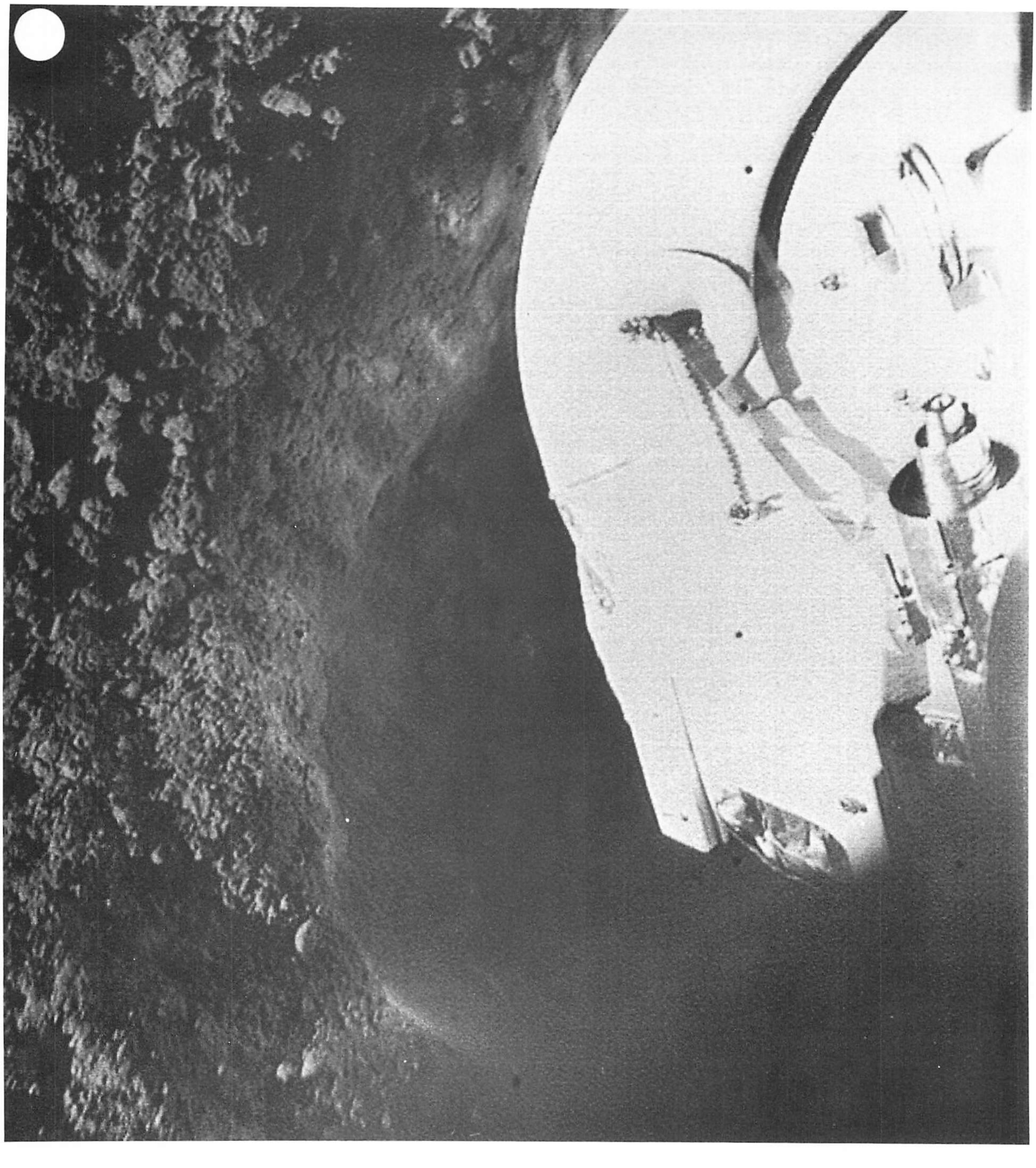
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(44)	**Day 315, 02:26:12**	**—72**	**—20**	**14.2**	***f*/7.8**	**N**	**Clear**



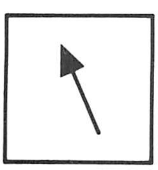


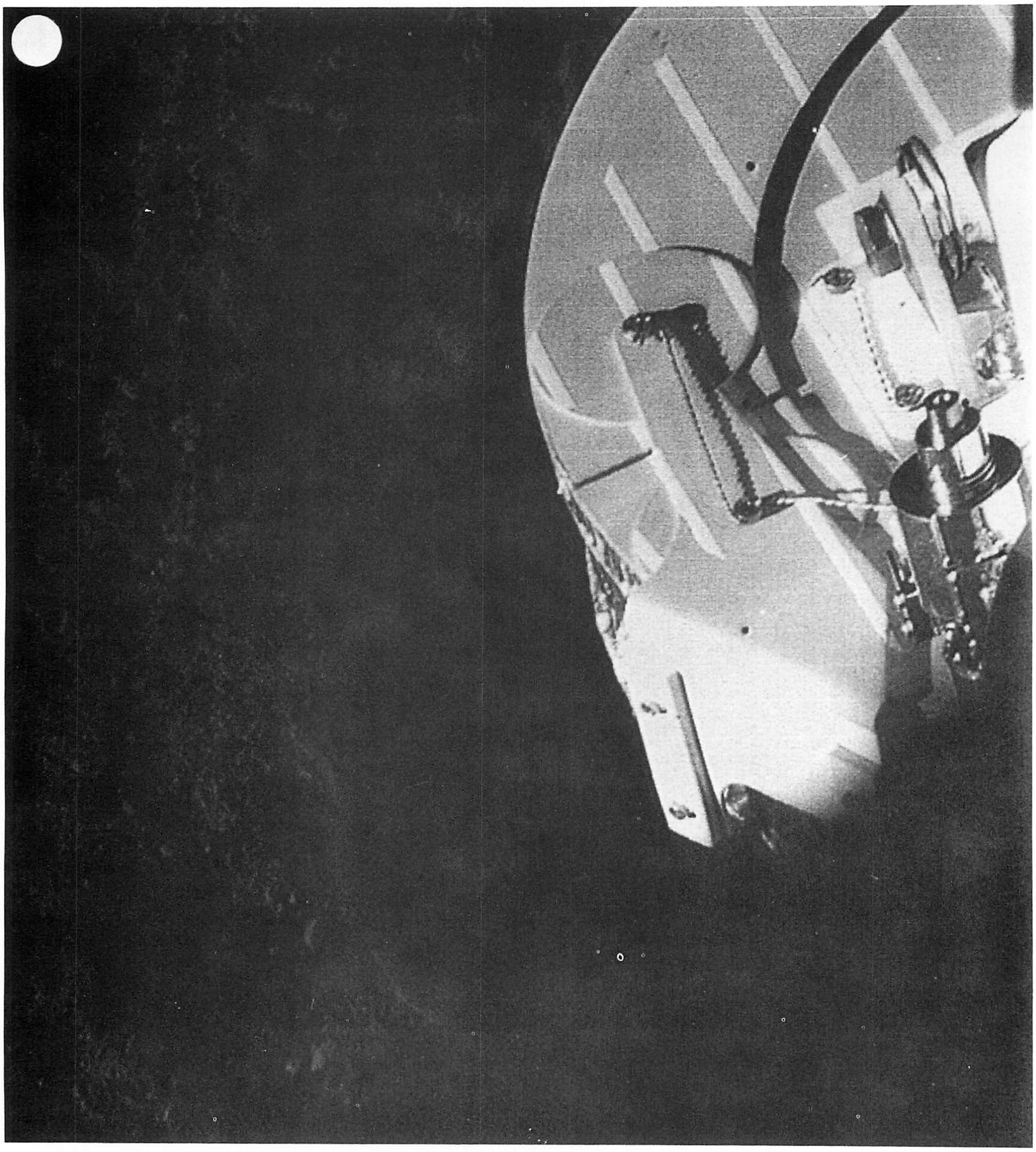
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(45)	**Day 315, 02:27:10**	**—78**	**—10**	**28.0**	**f/7.8**	**N**	**Clear**



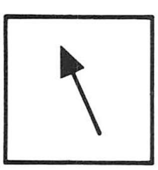


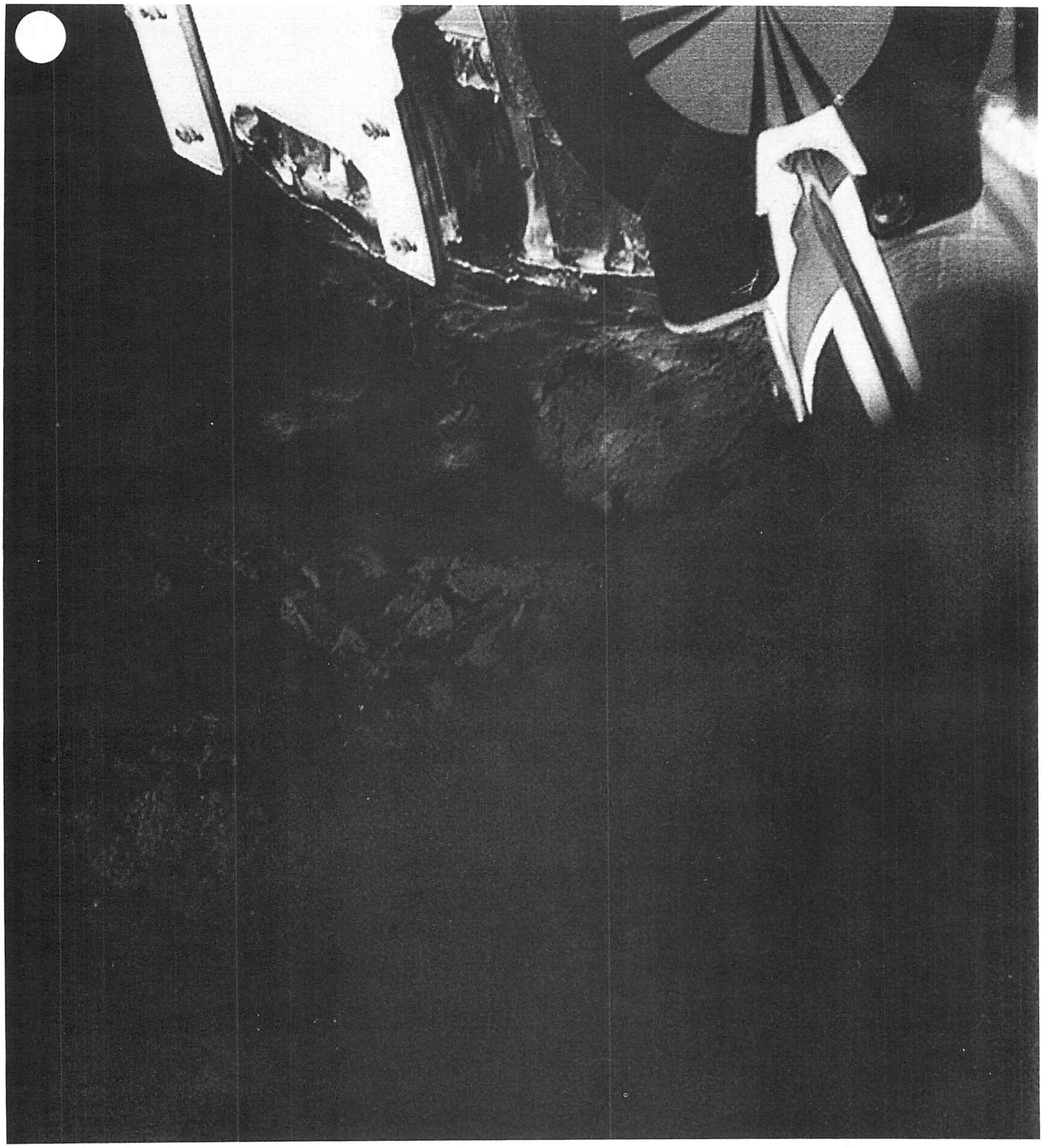
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(46)	**Day 315, 02:34:59**	**—51**	**—55**	**2.4**	***f*/7.8**	**N**	**Clear**	**Processed**



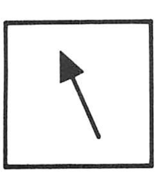


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(47)	**Day 315, 02:36:57**	**—51**	**—55**	**2.4**	***f*/14.5**	**N**	**Clear**	**Processed**

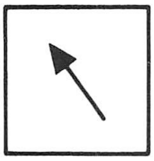


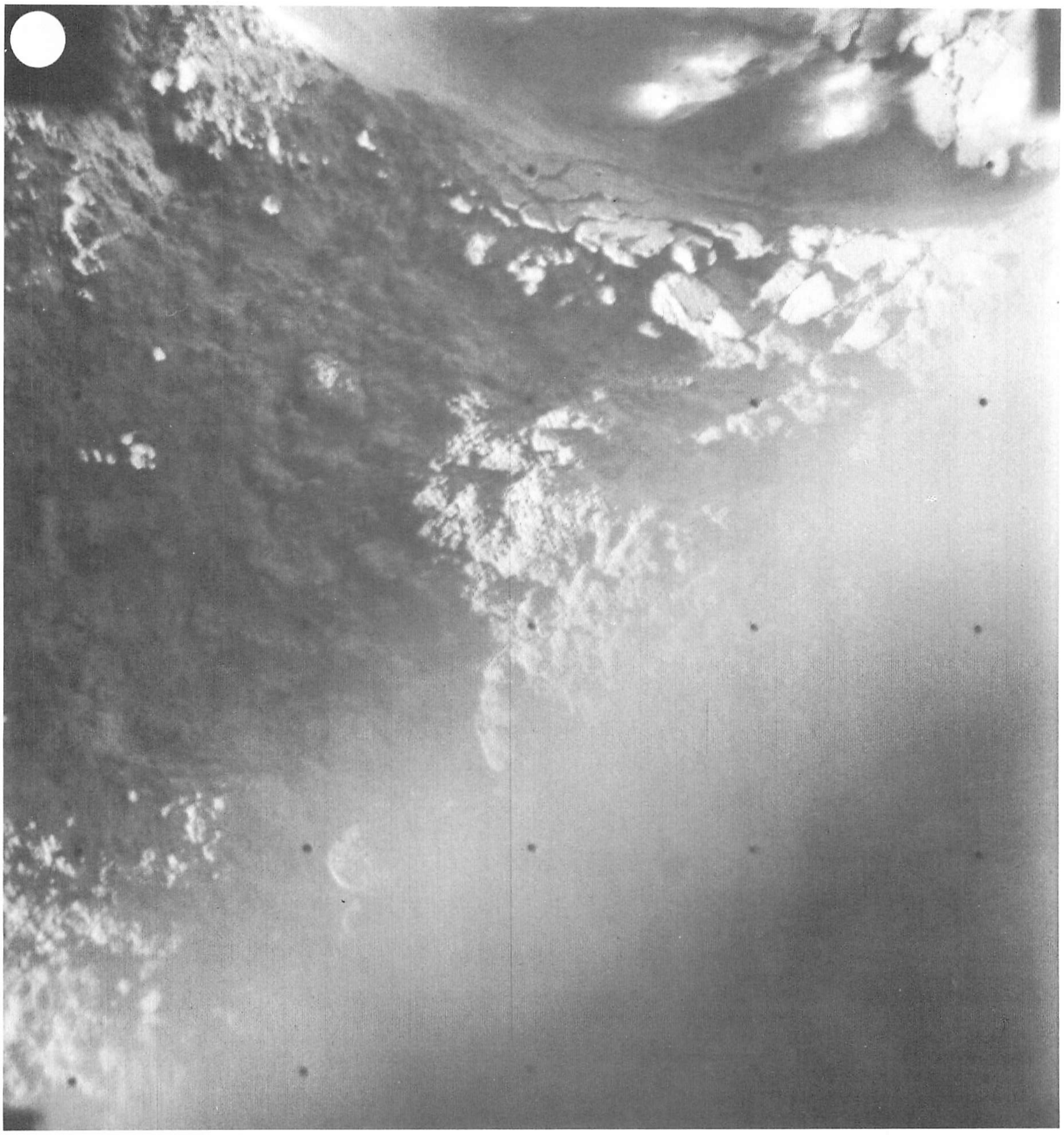


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(48)	**Day 315, 02:37:59**	**—51**	**—60**	**2.4**	**f/14.6**	**N**	**Clear**	**Processed**

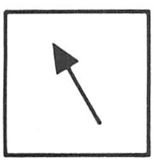


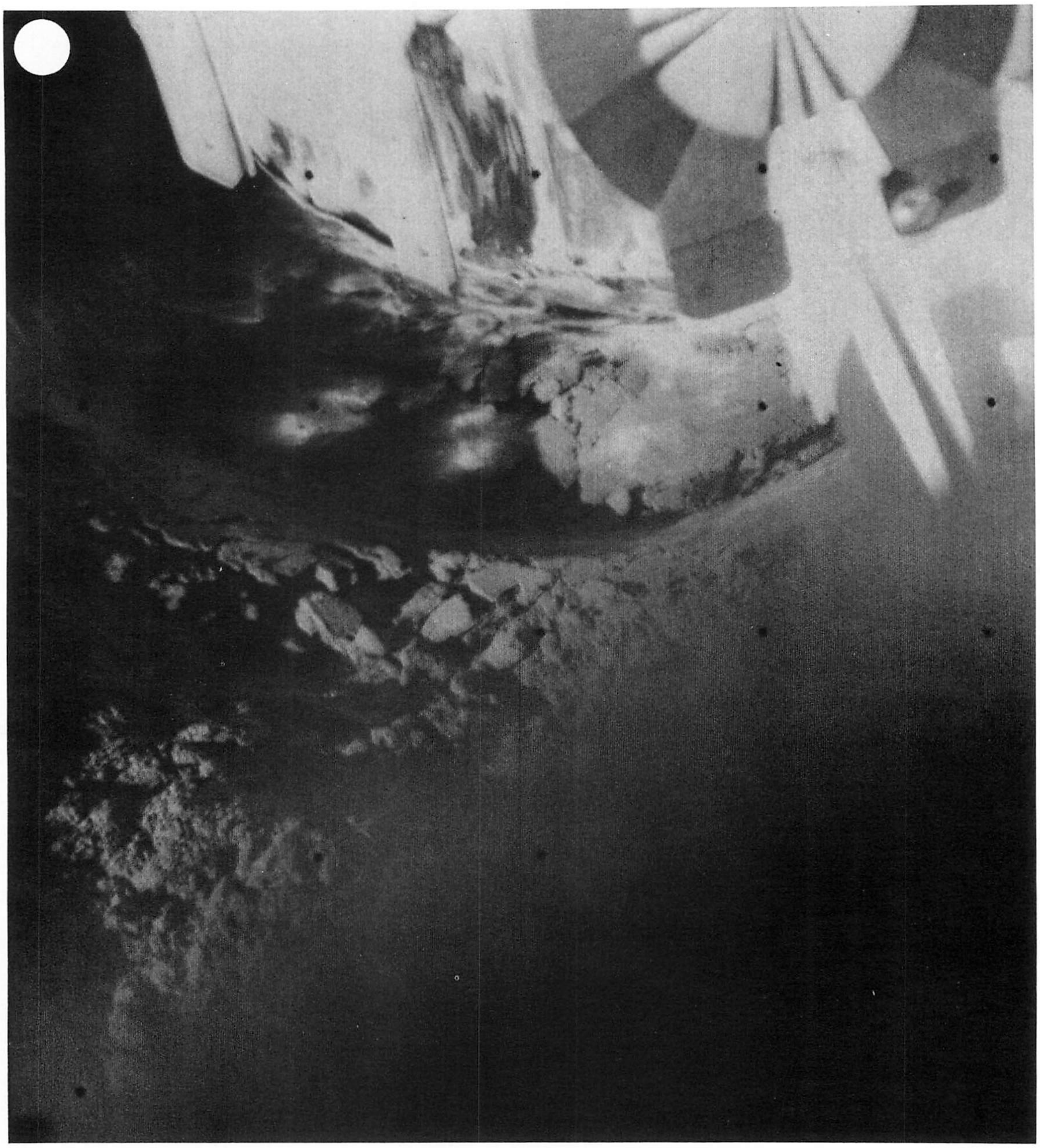
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(49)	Day 315, 03:27:17	—39	—70	2.2	f/6.7	W	Clear



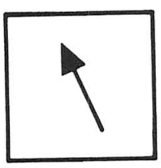


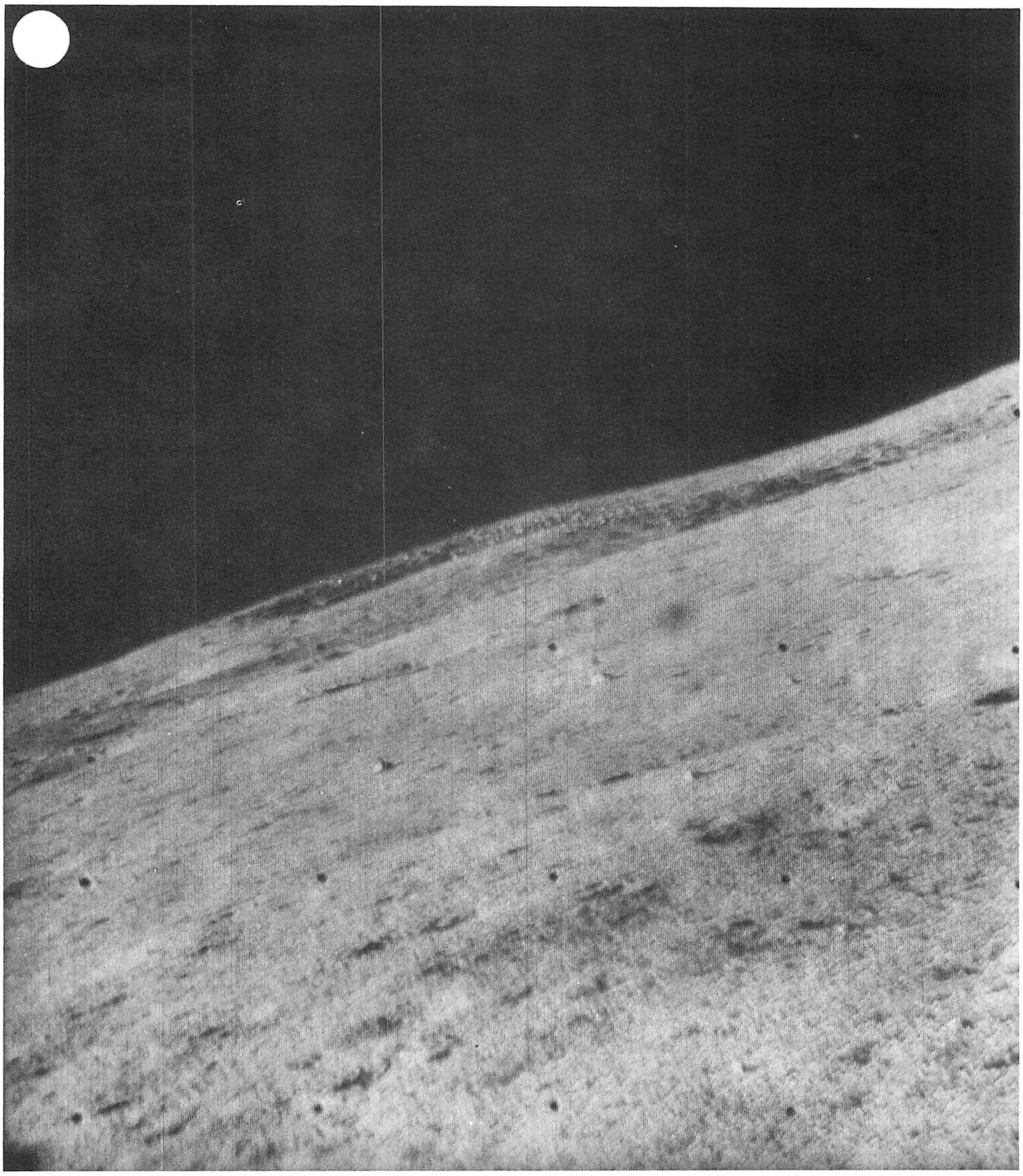
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(50)	**Day 315, 03:28:32**	**—45**	**—60**	**2.3**	***f*/6.7**	**N**	**Clear**



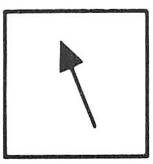


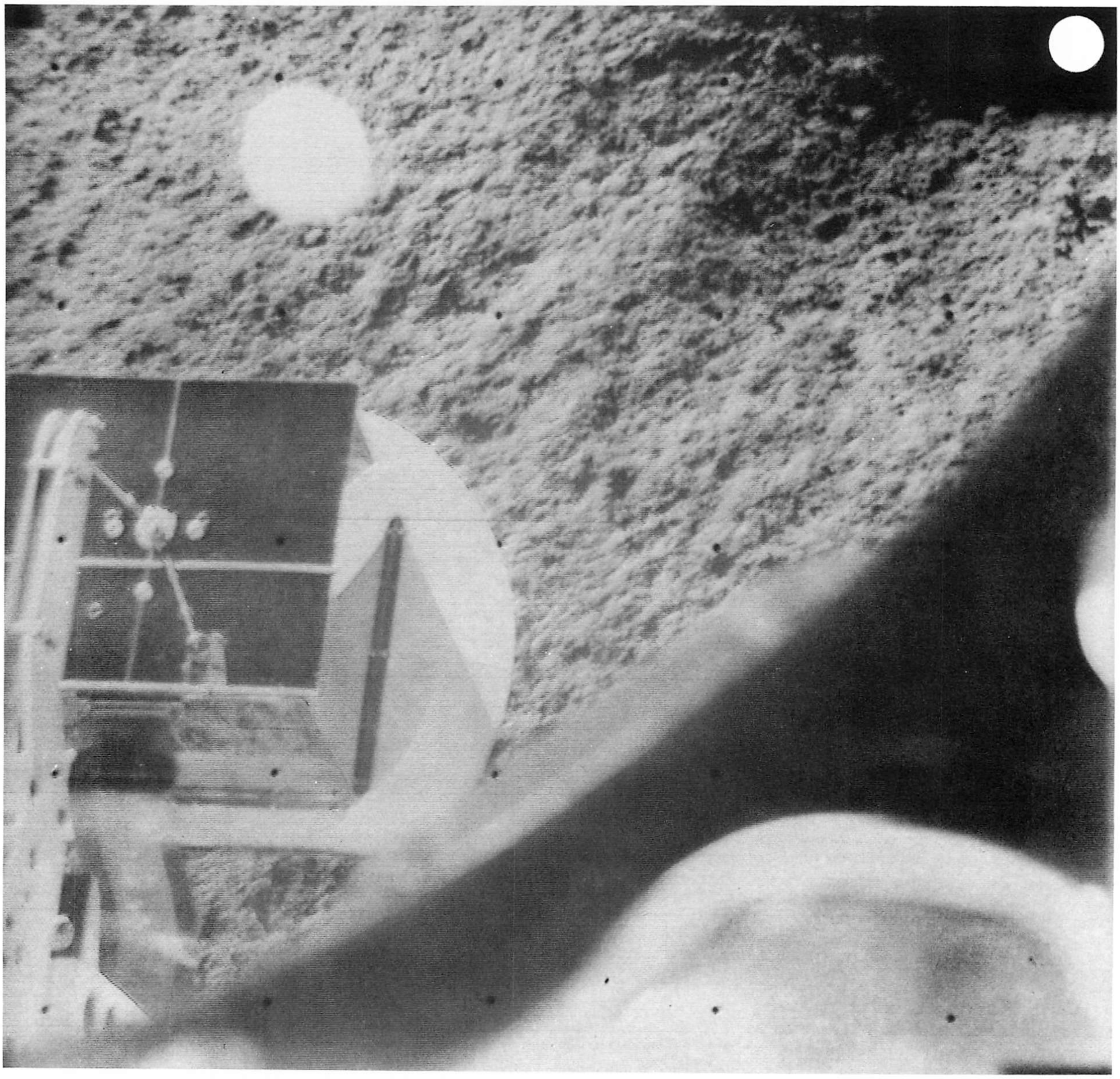
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(51)	**Day 315, 03:28:46**	**—51**	**—60**	**2.4**	**f/6.7**	**N**	**Clear**



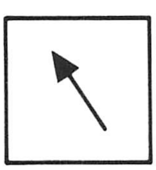


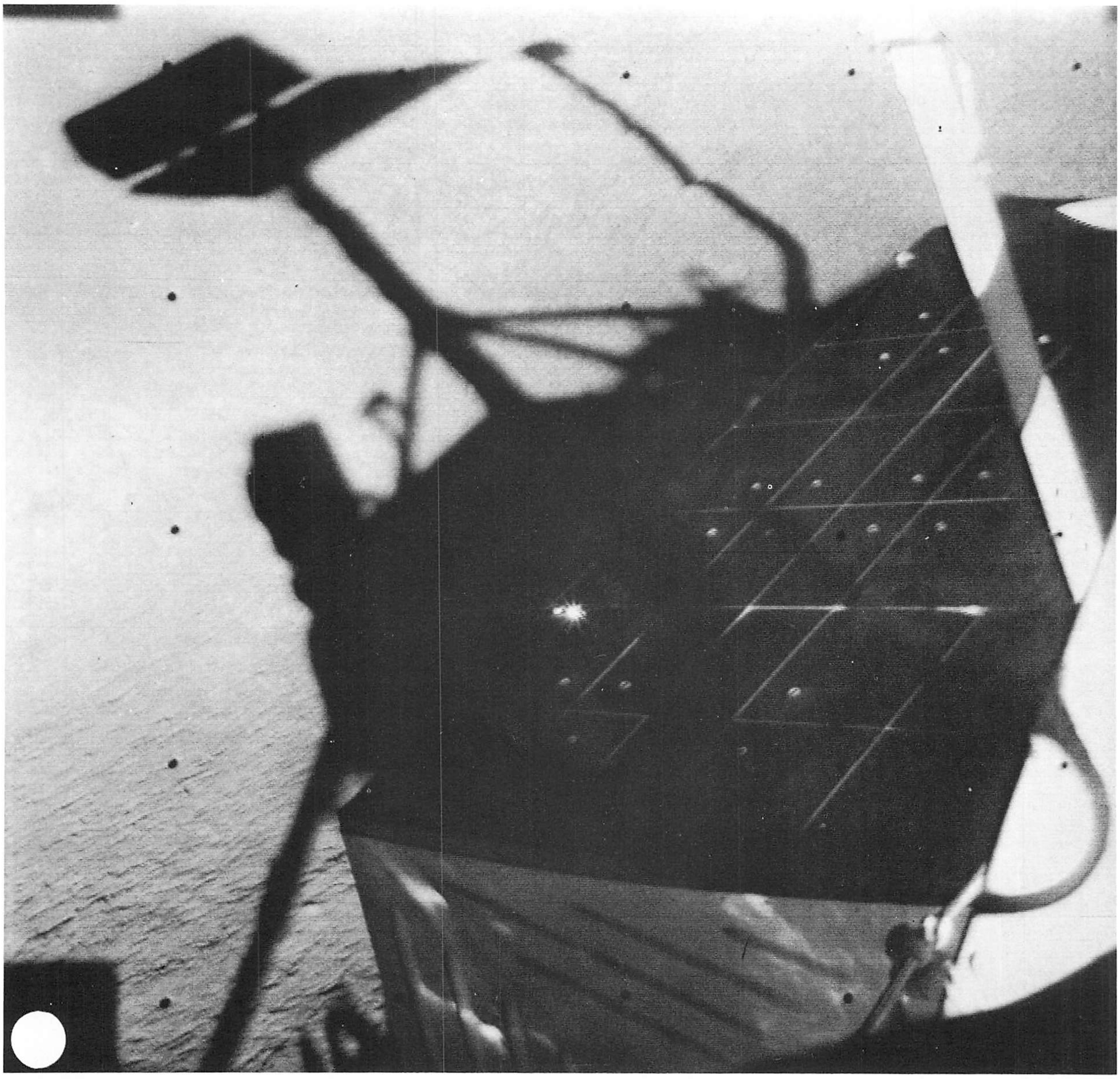
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(52)	Day 315, 04:15:25	—54	—5	2.3	f/5.8	W	Clear



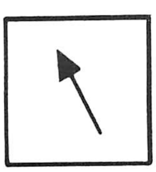


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(53)	**Day 315, 04:19:32**	**36**	**—50**	**2.3**	***f*/6.7**	**W**	**Clear**

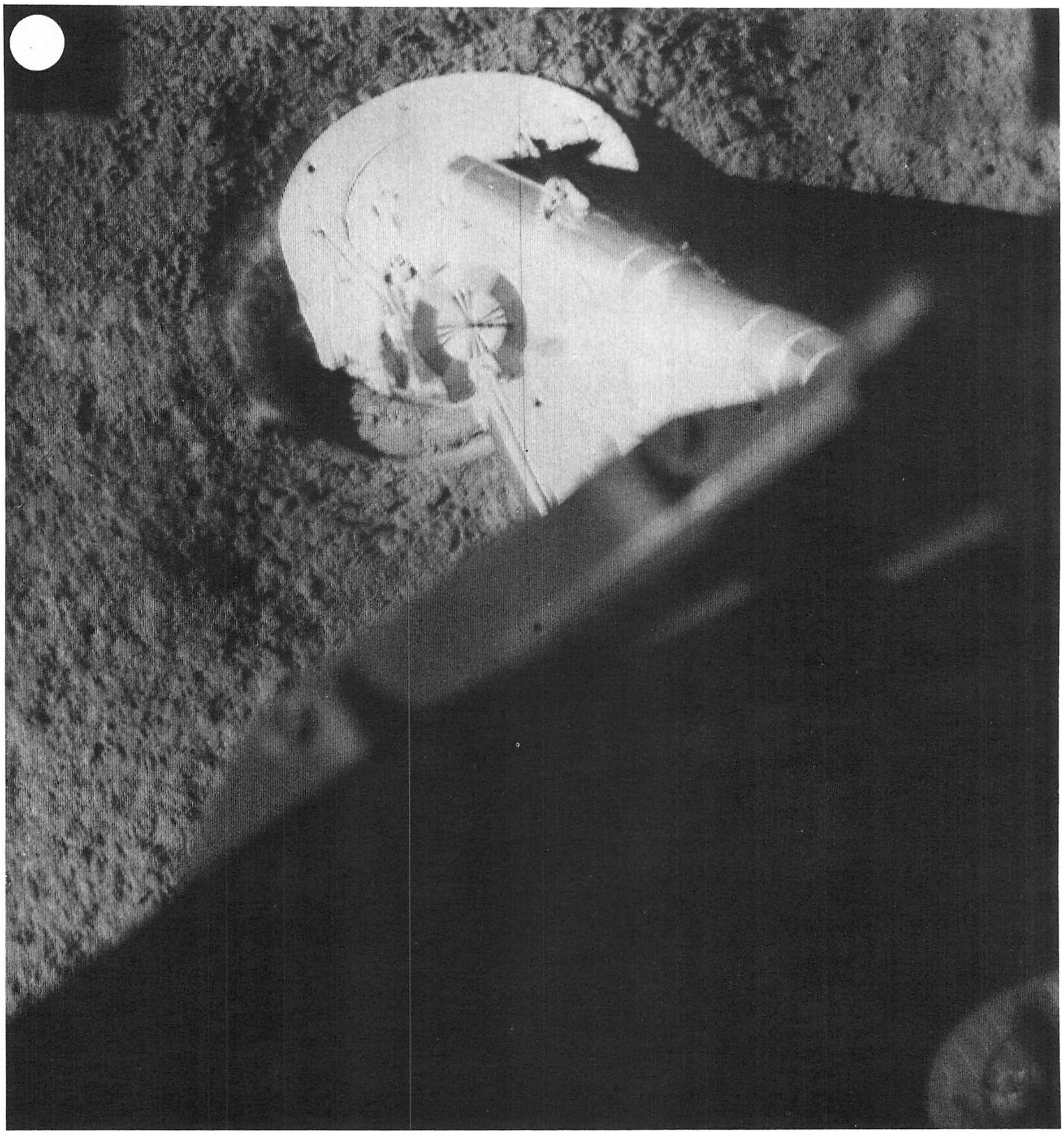




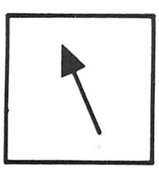
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(54)	**Day 315, 04:26:59**	**—162**	**—35**	**2.3**	**f/10.6**	**W**	**Clear**

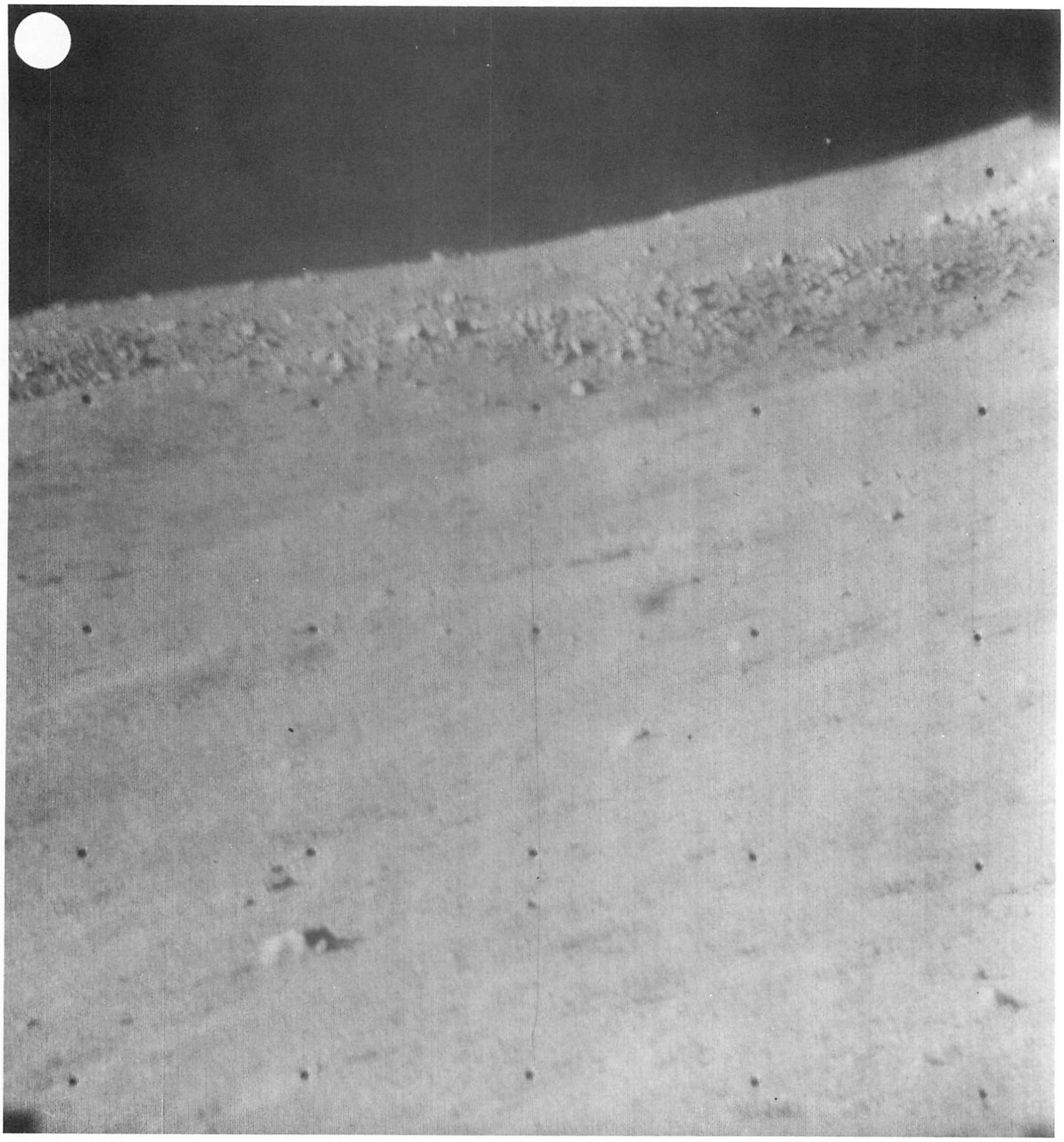


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(55)	**Day 316, 05:32:06**	**—51**	**—60**	**2.5**	**f/14.6**	**N**	**Clear**

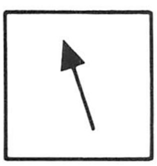


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(56)	**Day 316, 05:35:25**	**−51**	**−65**	**2.5**	***f*/8.1**	**W**	**Clear**

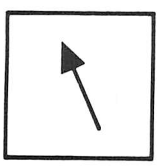


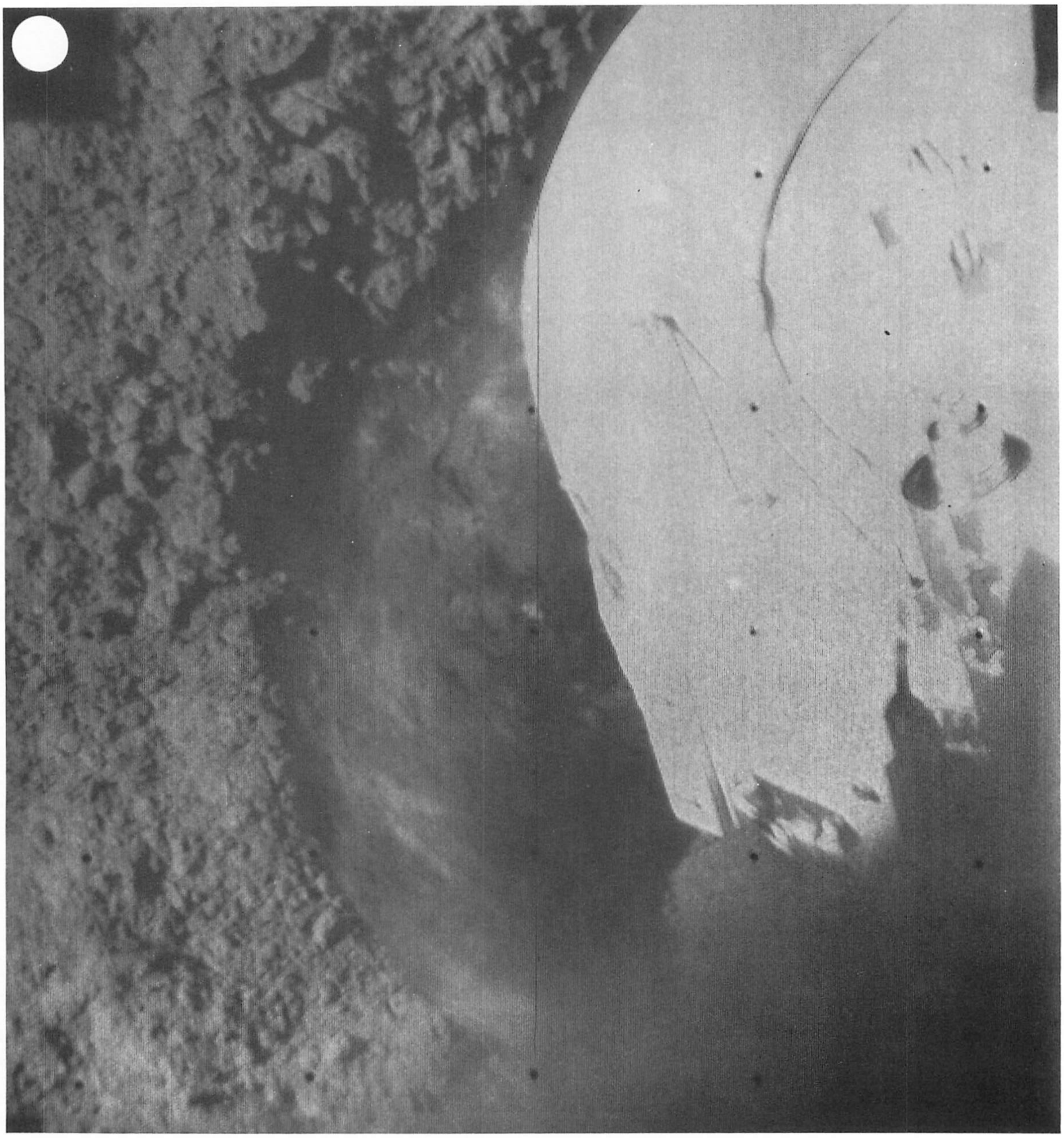


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(57)	Day 316, 07:20:39	−57	−5	28.0	f/6.6	N	45 deg

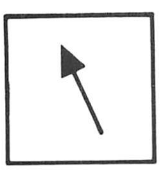


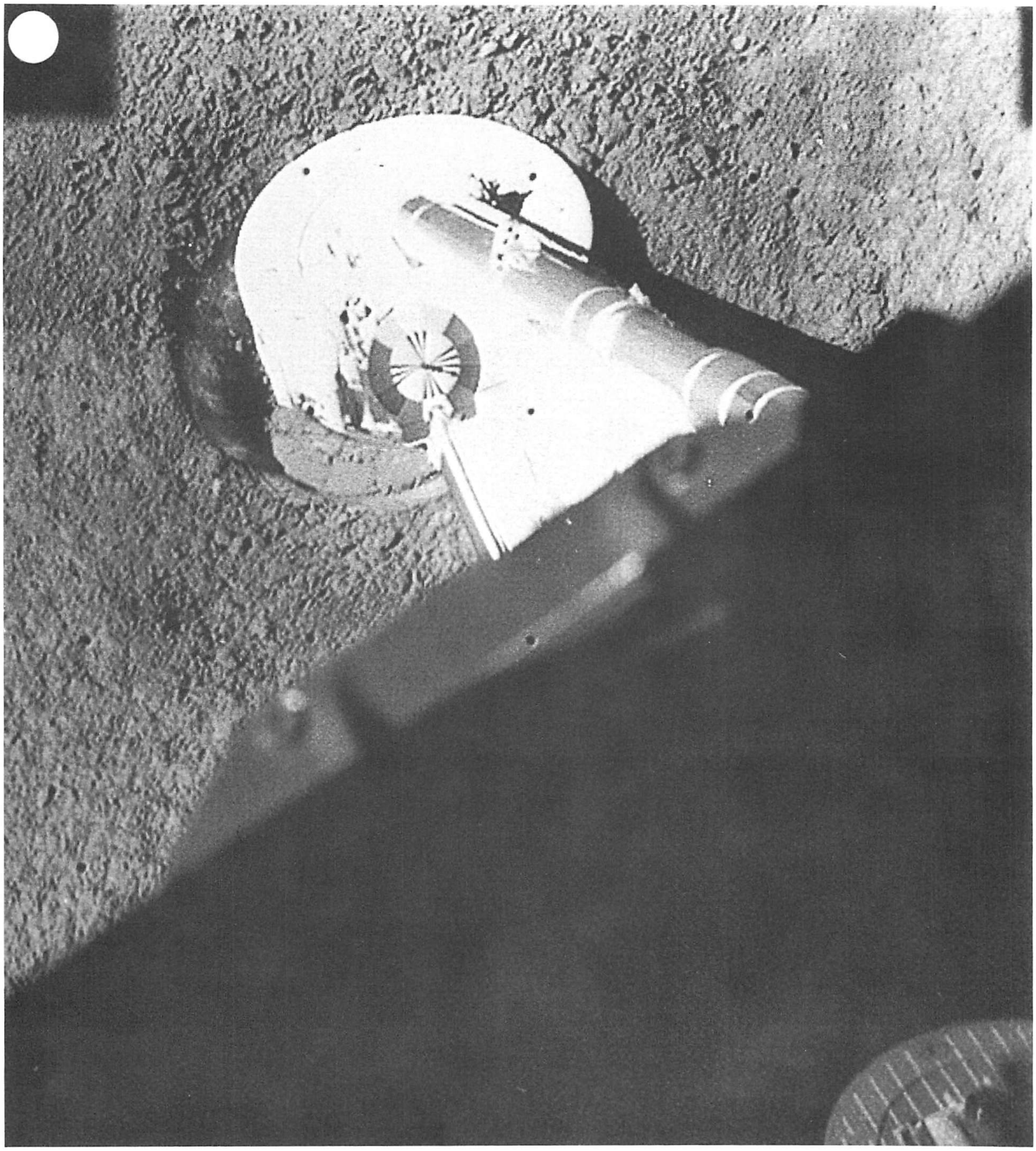
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(58)	**Day 317, 01:29:38**	**−51**	**−60**	**2.3**	**f/22.8**	**N**	**Clear**



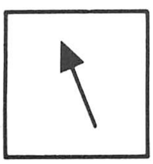


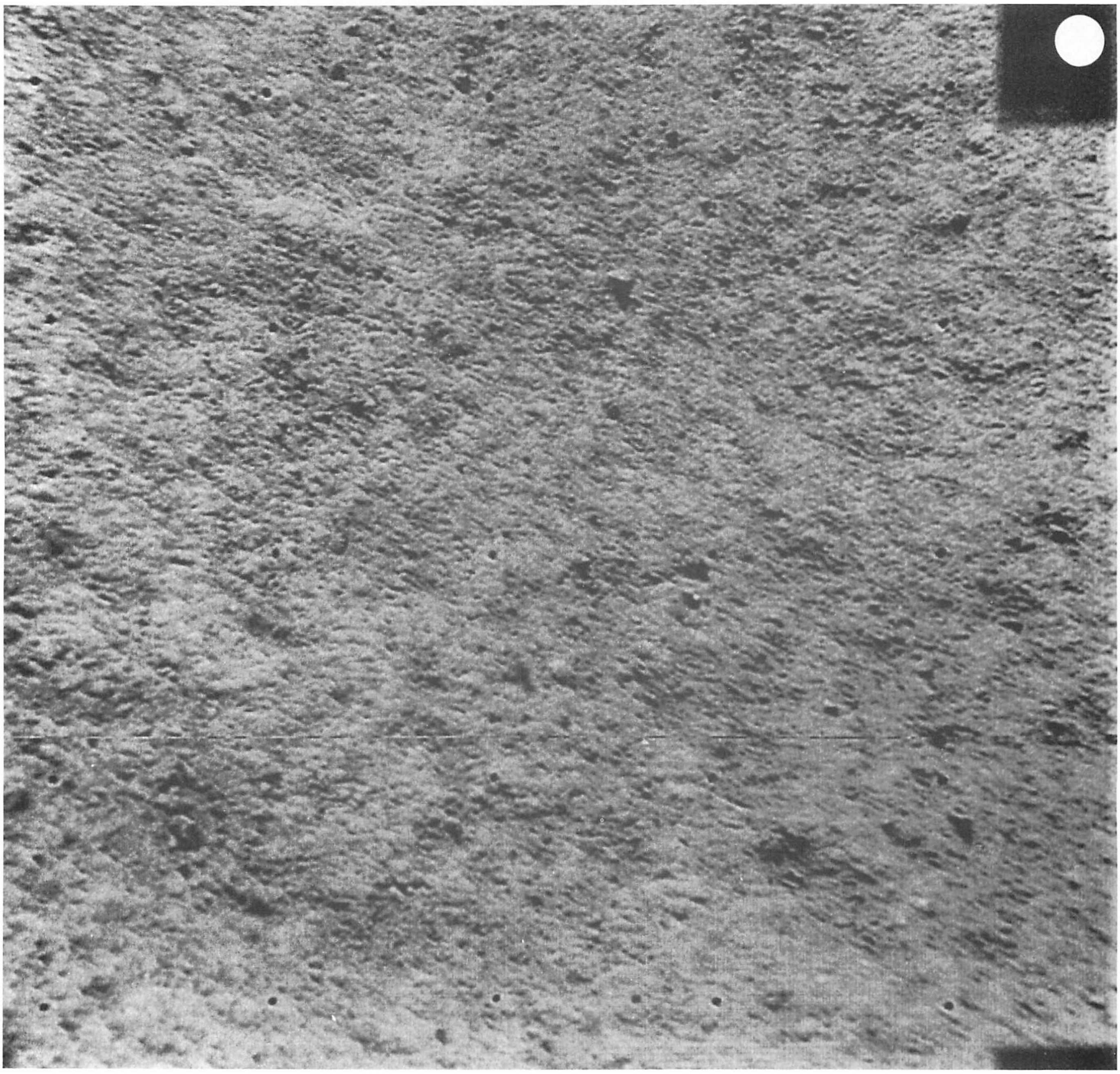
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(59)	Day 317, 01:31:14	−51	−55	48.4	f/8.5	N	Clear



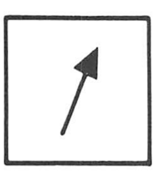


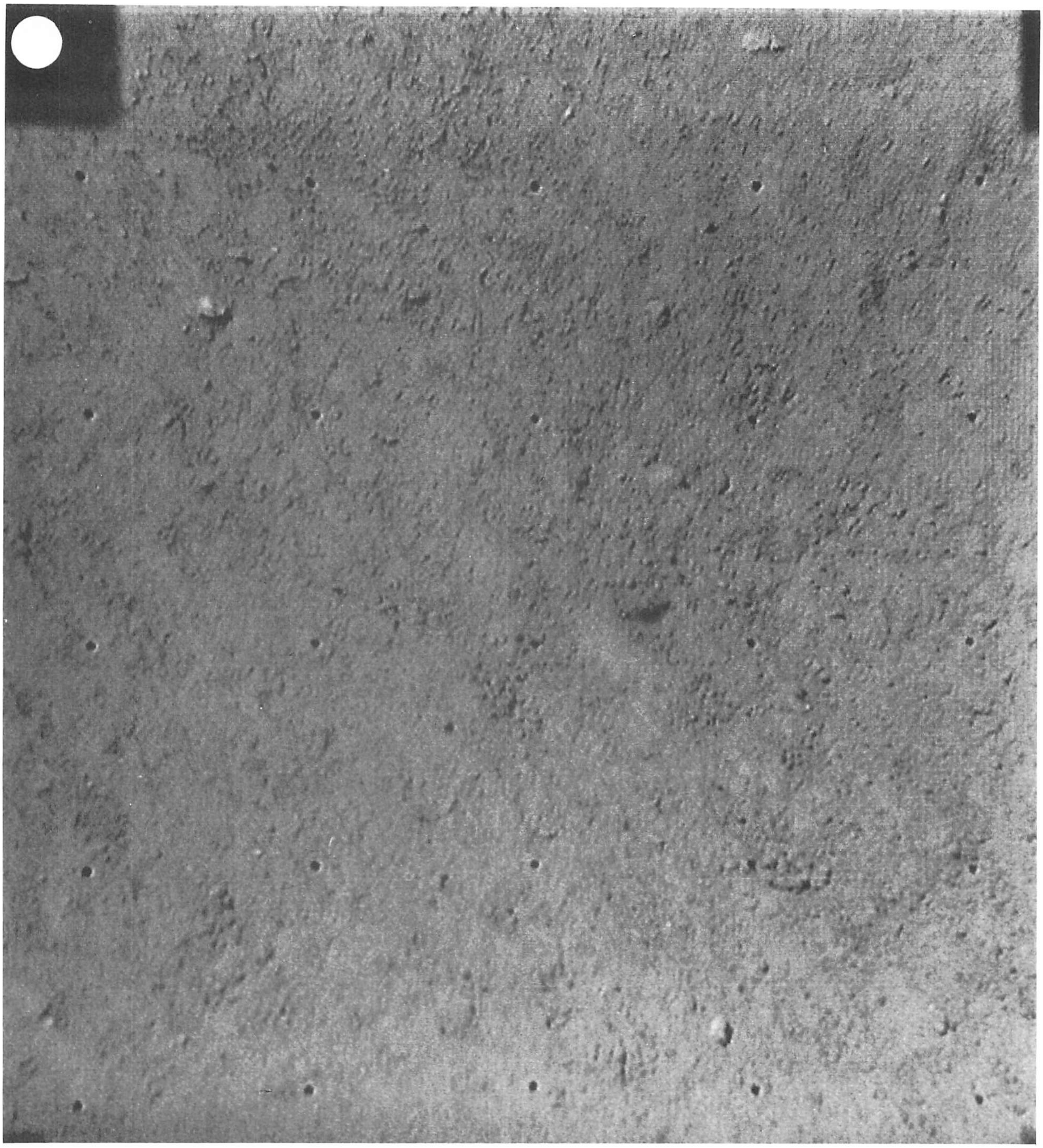
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(60)	Day 317, 06:51:22	−54	−65	2.3	*f*/8.5	W	45 deg	Processed



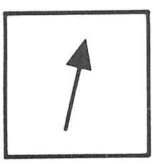


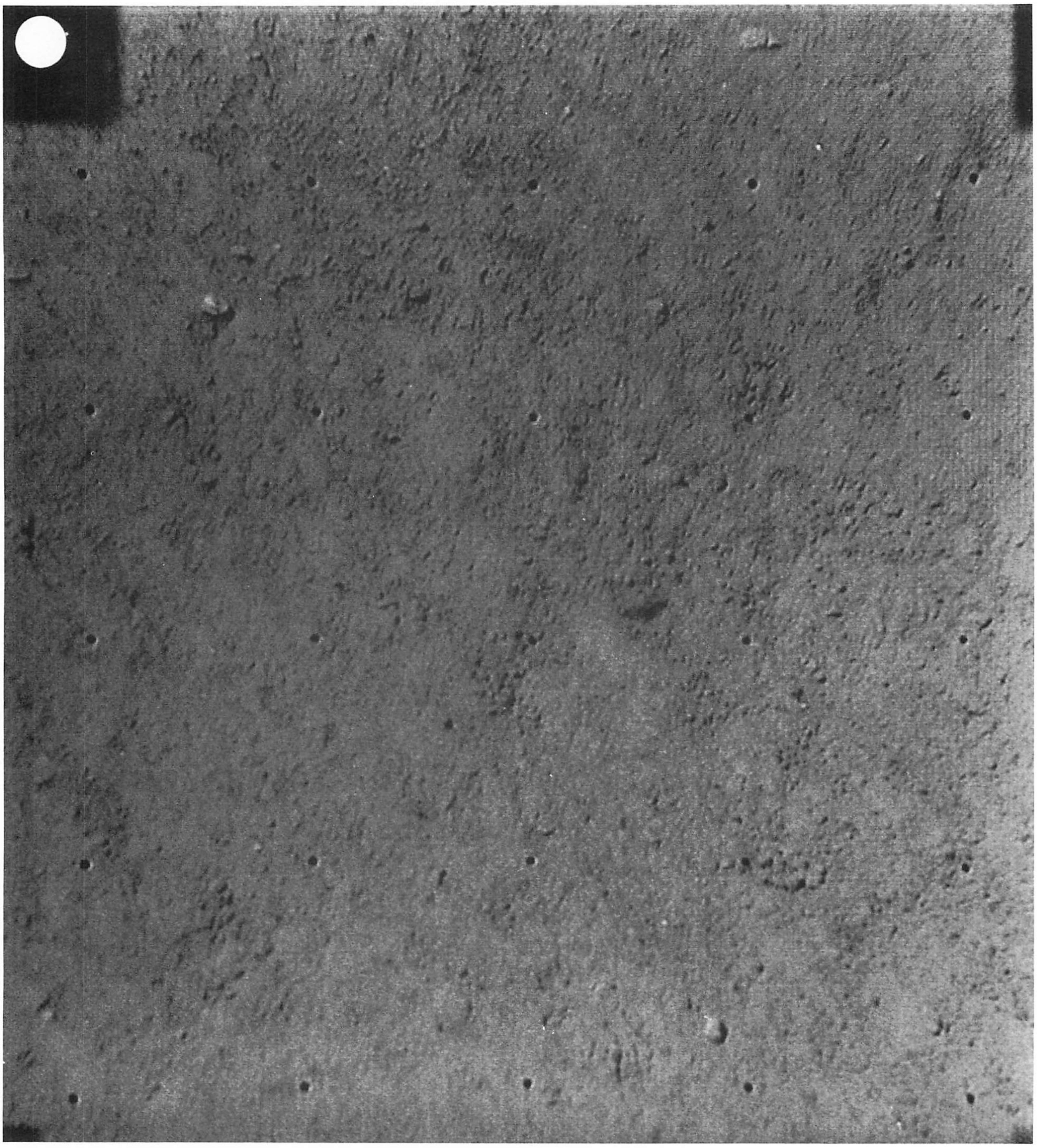
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(61)	**Day 318, 01:31:41**	**—9**	**—20**	**4.0**	**f/10.4**	**N**	**Horiz.**	**Processed**



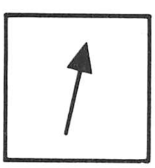


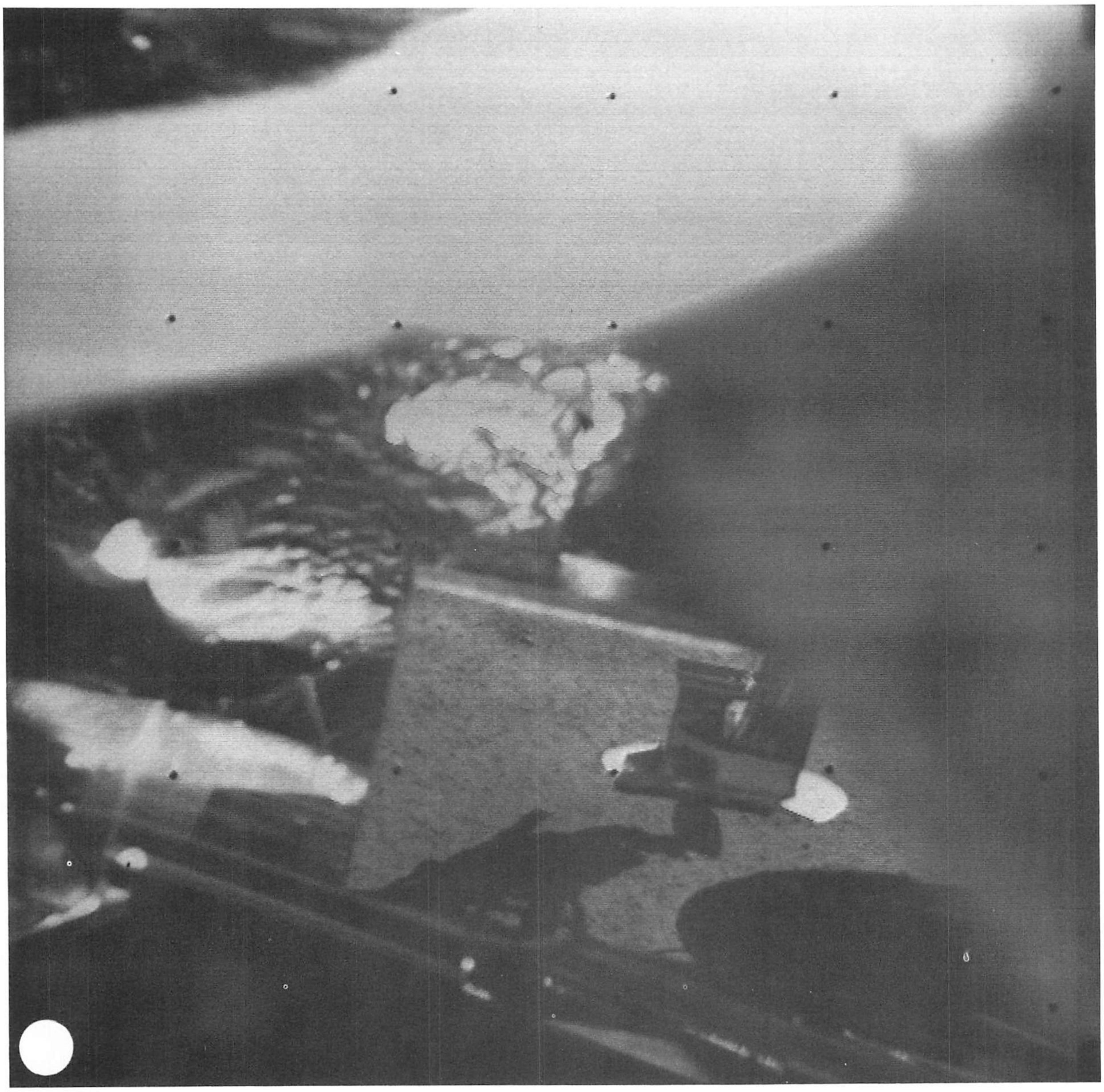
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(62)	Day 318, 01:57:14	—96	—50	2.9	f/10.4	N	Horiz.	Processed



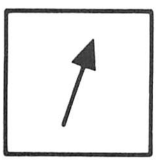


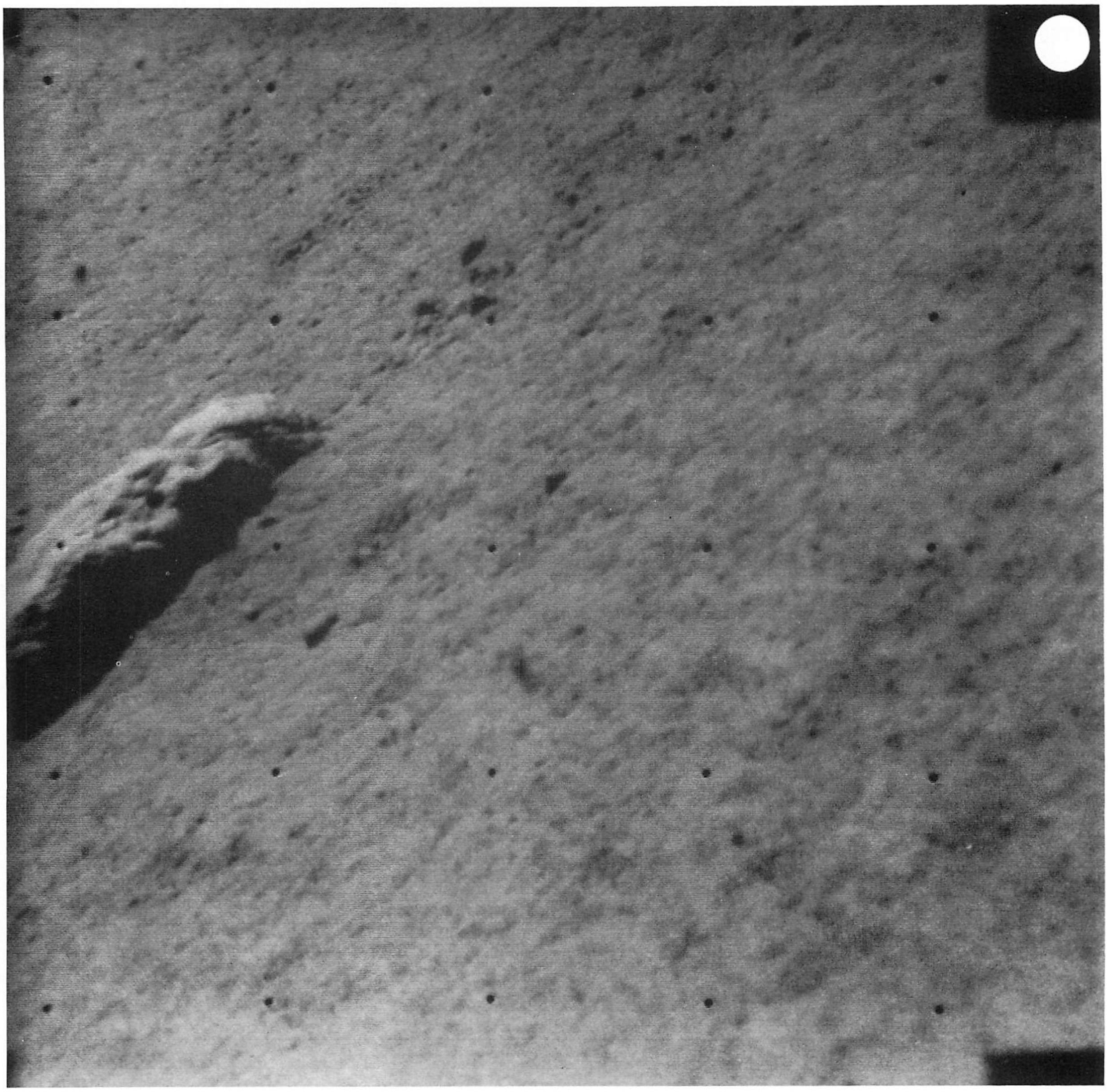
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(63)	Day 318, 01:57:22	−96	−50	2.9	f/10.4	N	45 deg	Processed



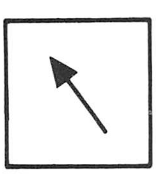


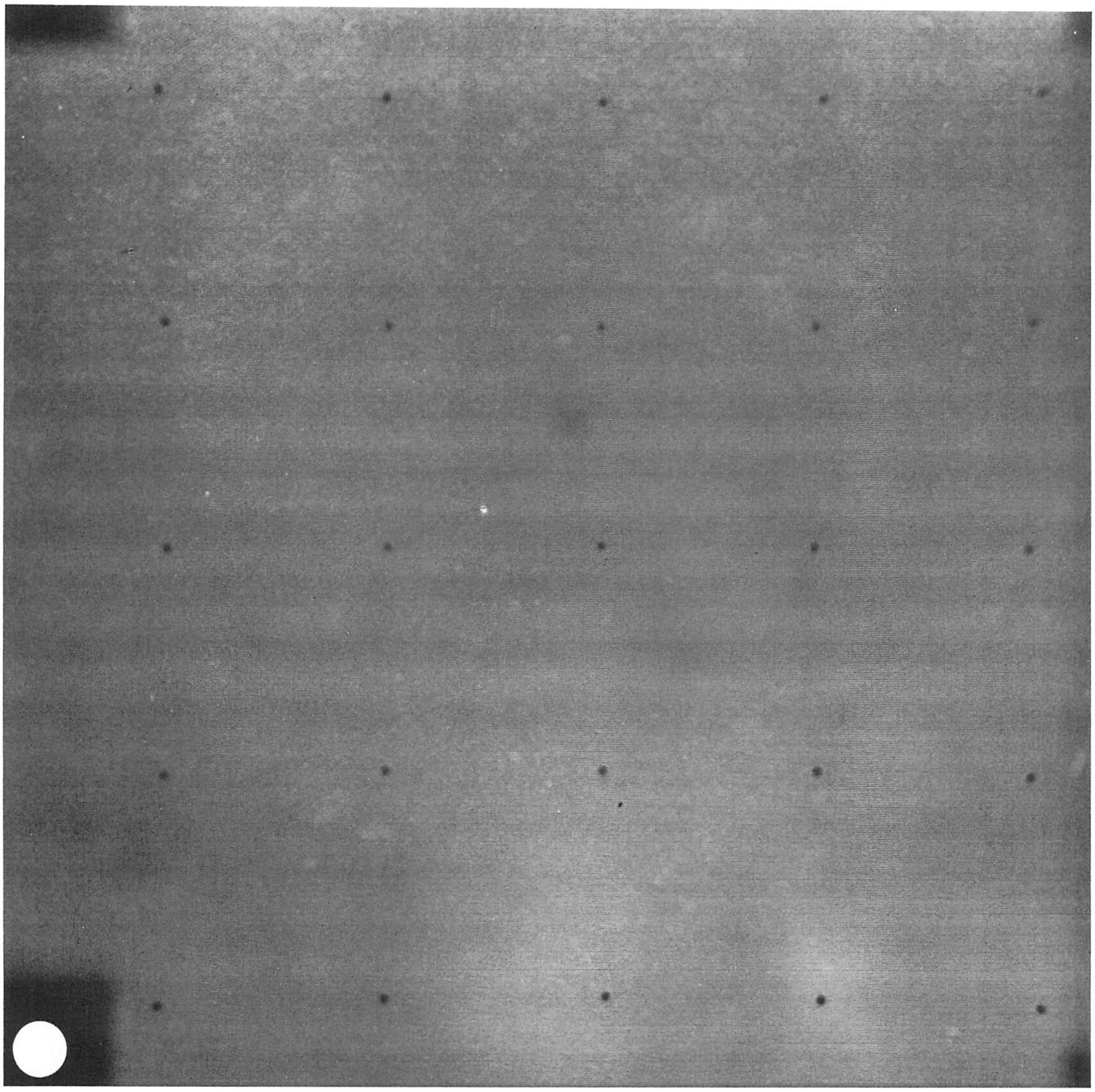
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(64)	**Day 319, 04:23:38**	**—213**	**—35**	**3.3**	***f*/10.2**	**N**	**Clear**



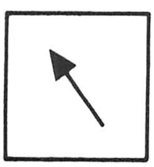


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(65)	**Day 319, 05:57:33**	**39**	**5**	**20.0**	***f*/8.5**	**N**	**Clear**

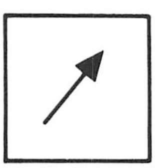


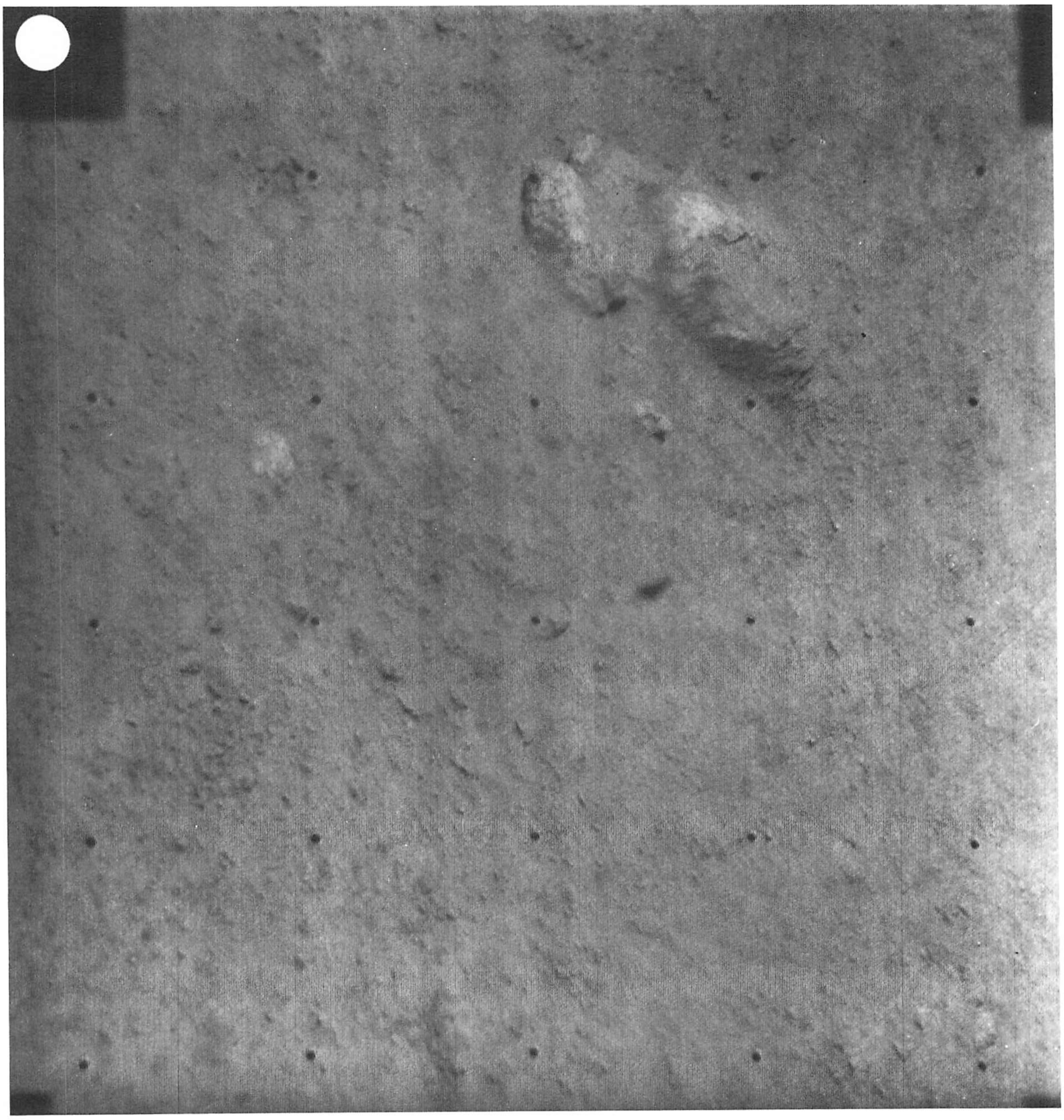


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(66)	Day 319, 06:32:48	—150	20	27.9	f/3.8	N	Clear

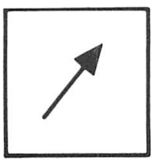


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(67)	**Day 319, 06:38:12**	**—129**	**—45**	**3.3**	***f*/11.2**	**N**	**Clear**

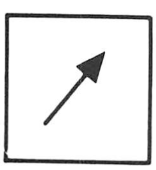




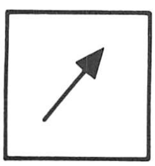
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(68)	**Day 319, 06:38:29**	**—129**	**—45**	**3.3**	**f/11.2**	**N**	**Horiz.**



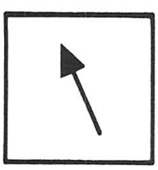
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(69)	Day 319, 06:38:45	—129	—45	3.3	$f/11.2$	N	45 deg

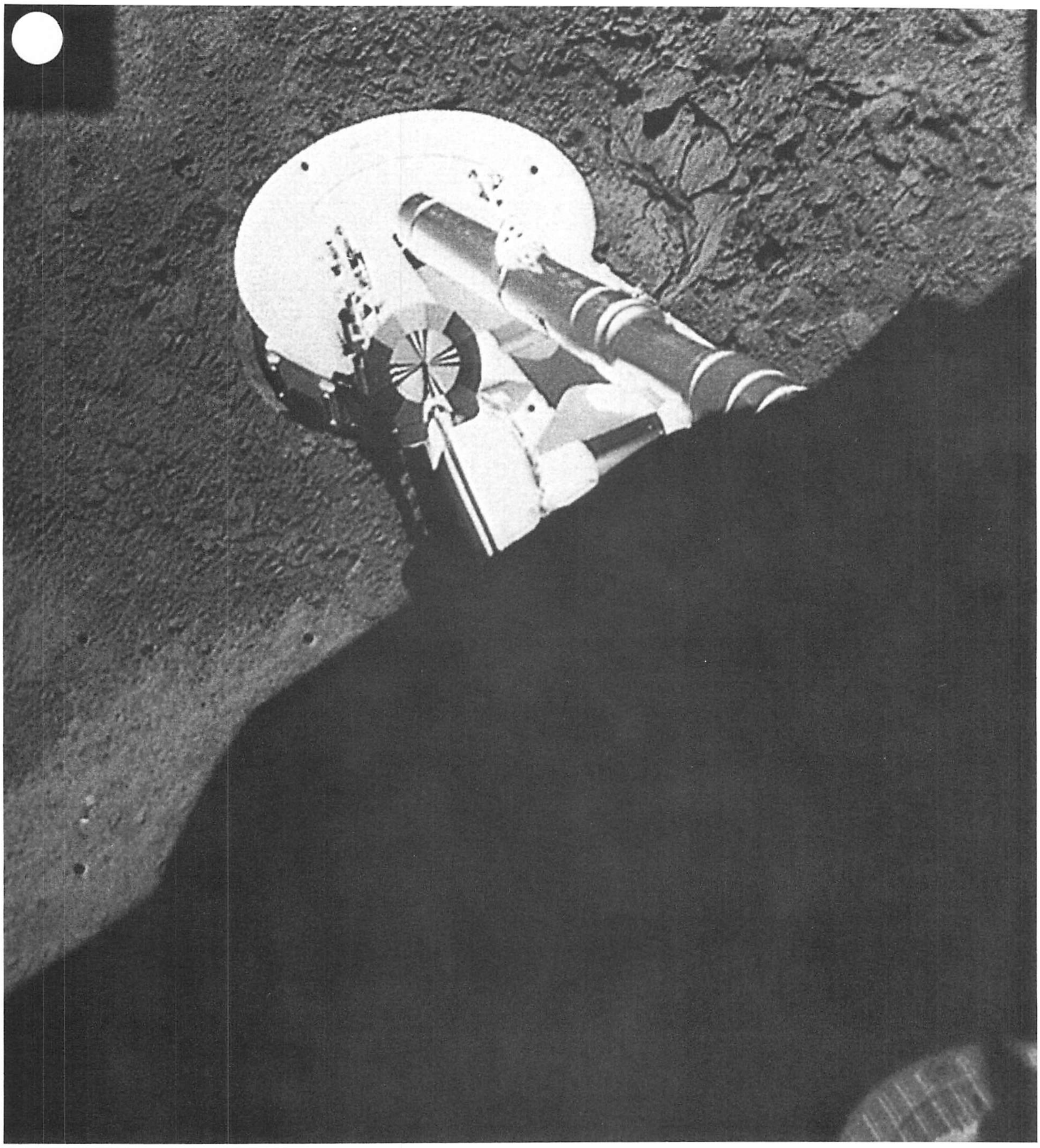


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(70)	Day 319, 06:39:00	—129	—45	3.3	f/5.1	N	Vertical

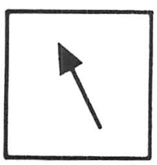


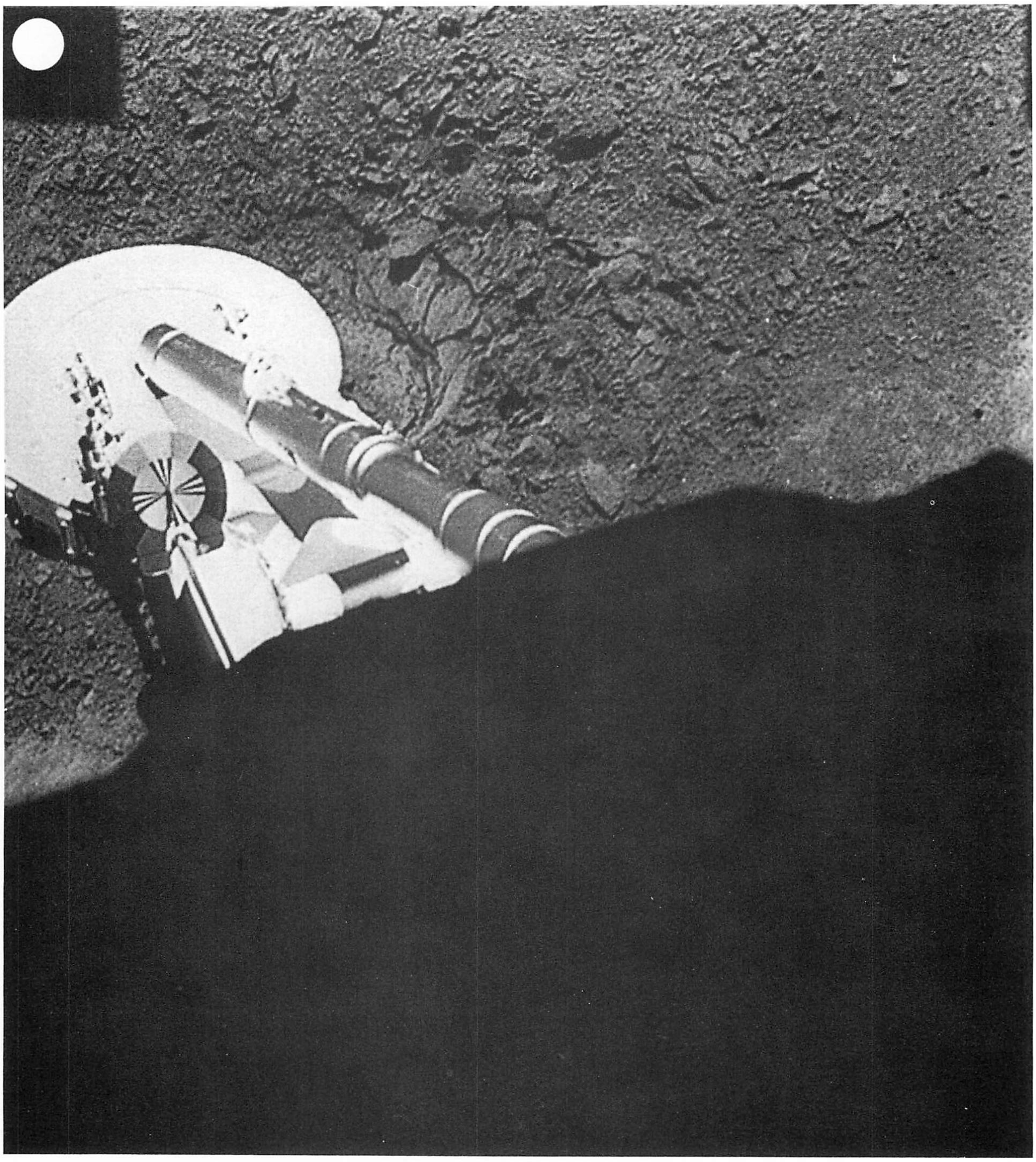
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(71)	**Day 320, 03:34:51**	**—51**	**—60**	**2.5**	***f*/20.8**	**N**	**Clear**



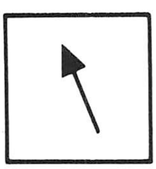


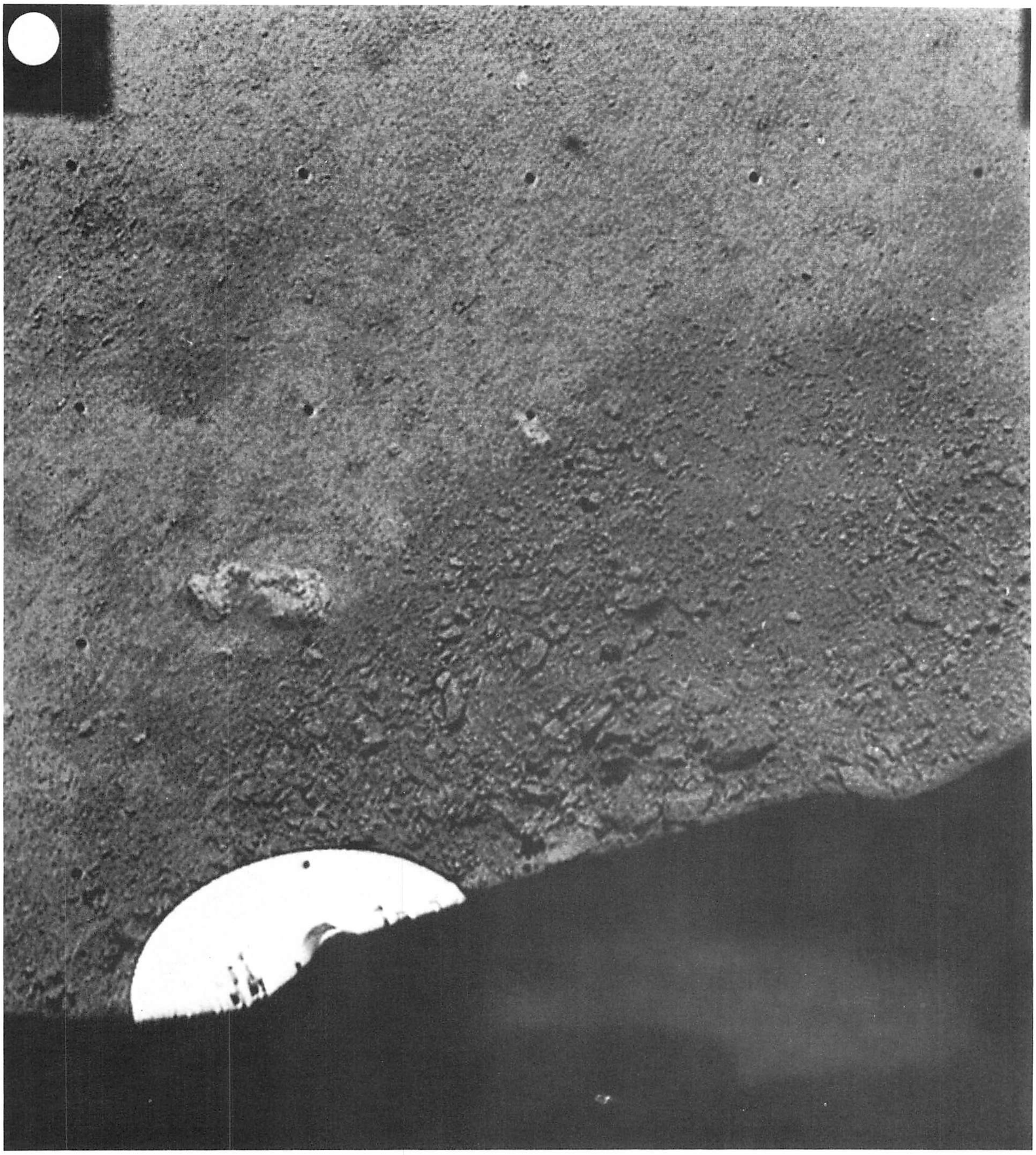
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(72)	**Day 321, 11:07:03**	**—54**	**—65**	**2.4**	**f/10.1**	**W**	**Clear**	**Processed**



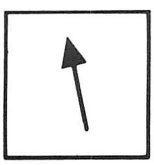


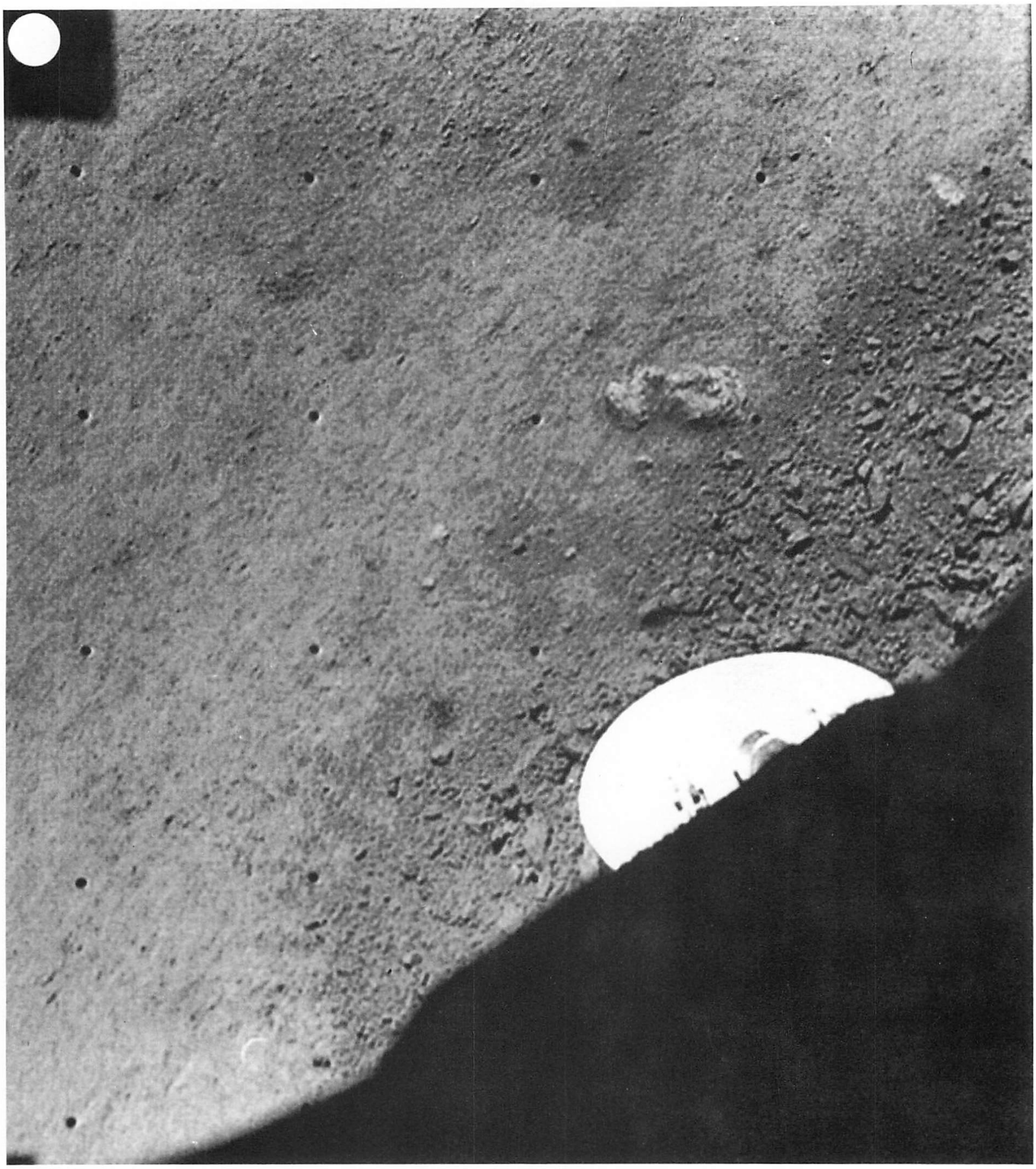
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(73)	**Day 321, 11:09:05**	**−60**	**−65**	**2.4**	**f/10.1**	**W**	**Clear**	**Processed**



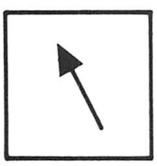


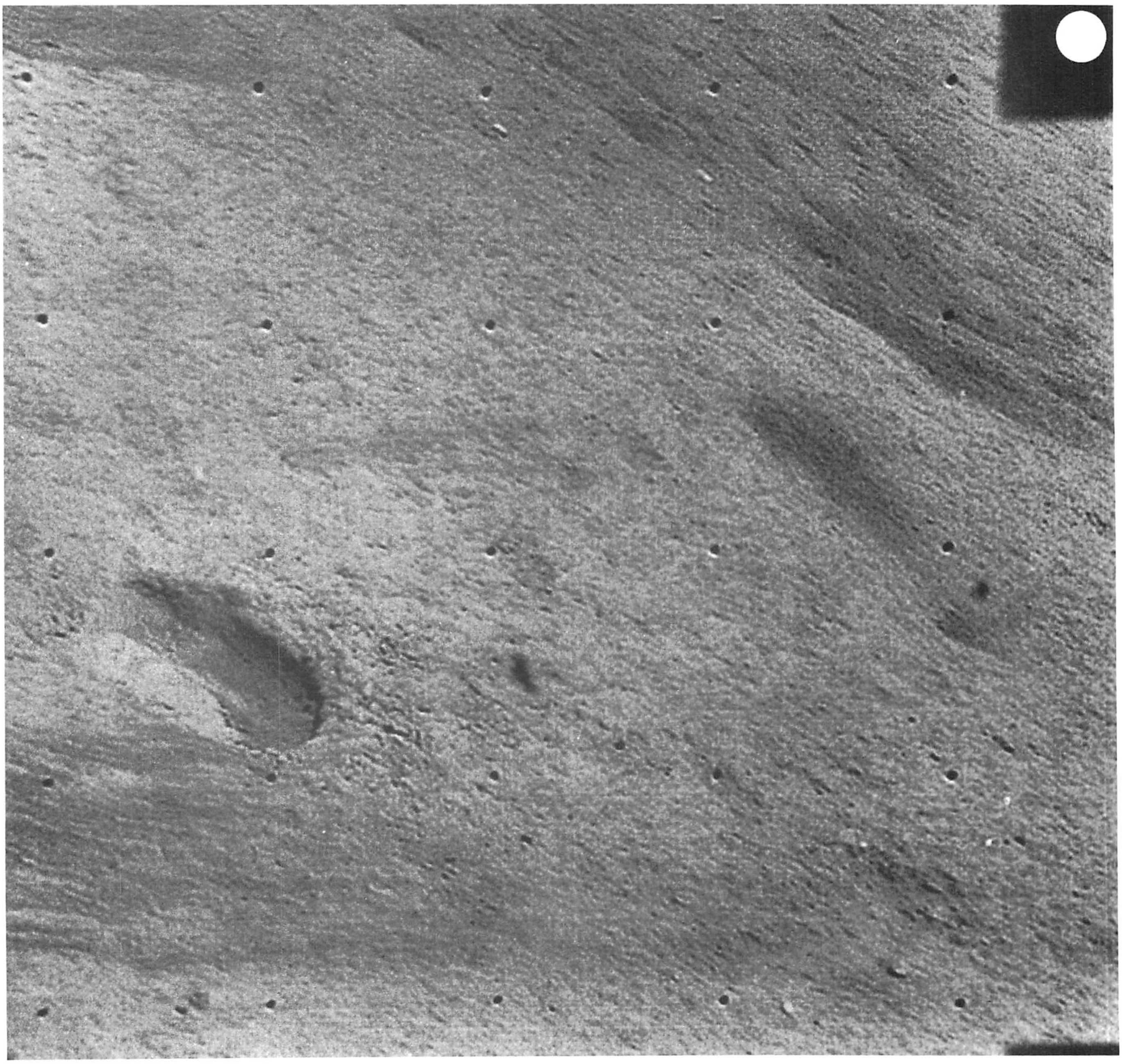
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(74)	**Day 321, 11:09:11**	**−72**	**−50**	**2.4**	**f/10.1**	**W**	**Clear**	**Processed**



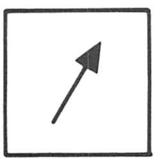


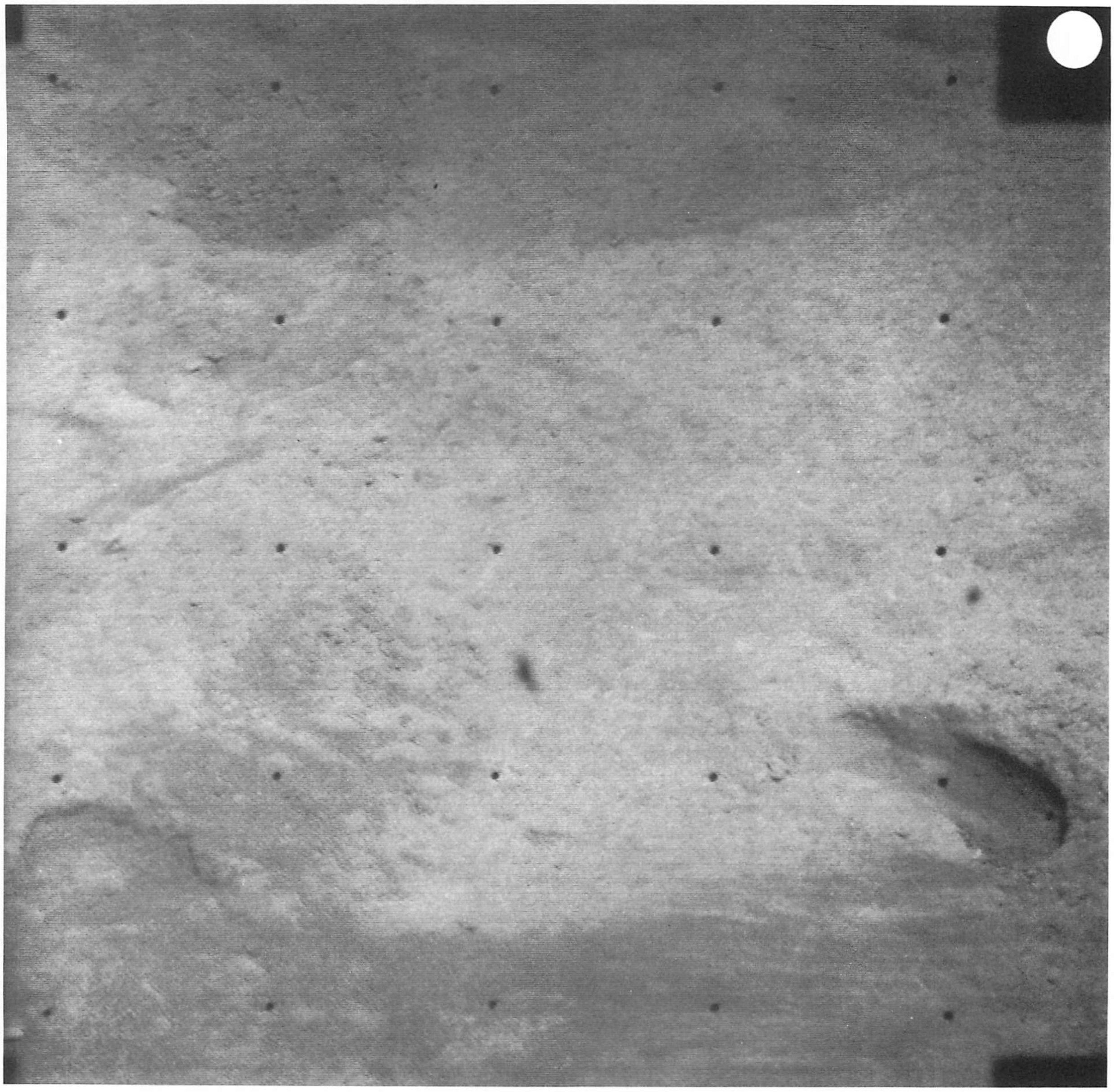
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(75)	**Day 321, 11:09:52**	**—54**	**—50**	**2.4**	**f/10.2**	**W**	**Clear**	**Processed**



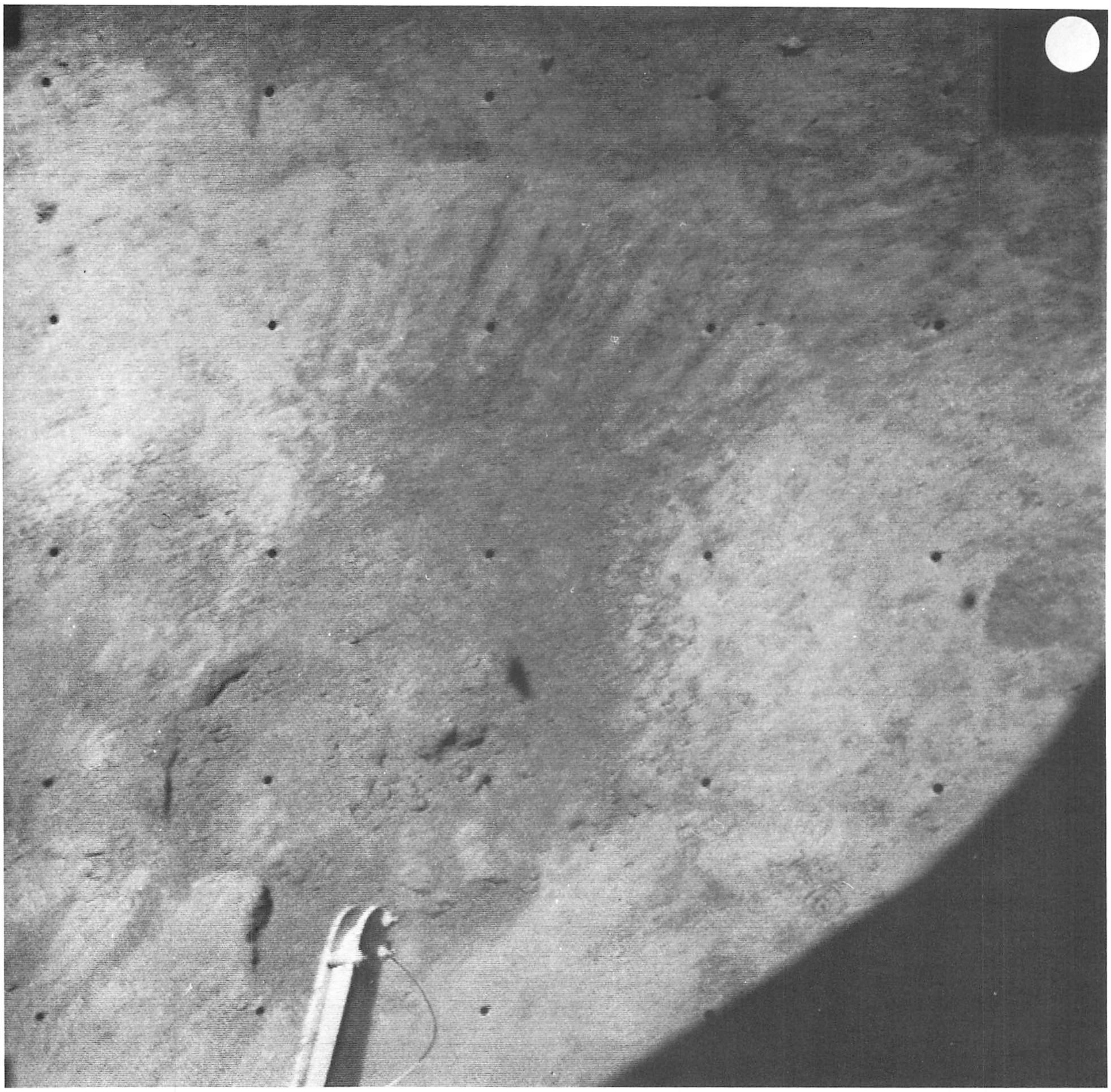


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(76)	**Day 321, 11:10:30**	**—18**	**—20**	**2.4**	**f/10.2**	**W**	**Clear**	**Processed**

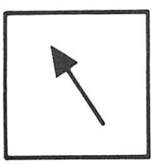


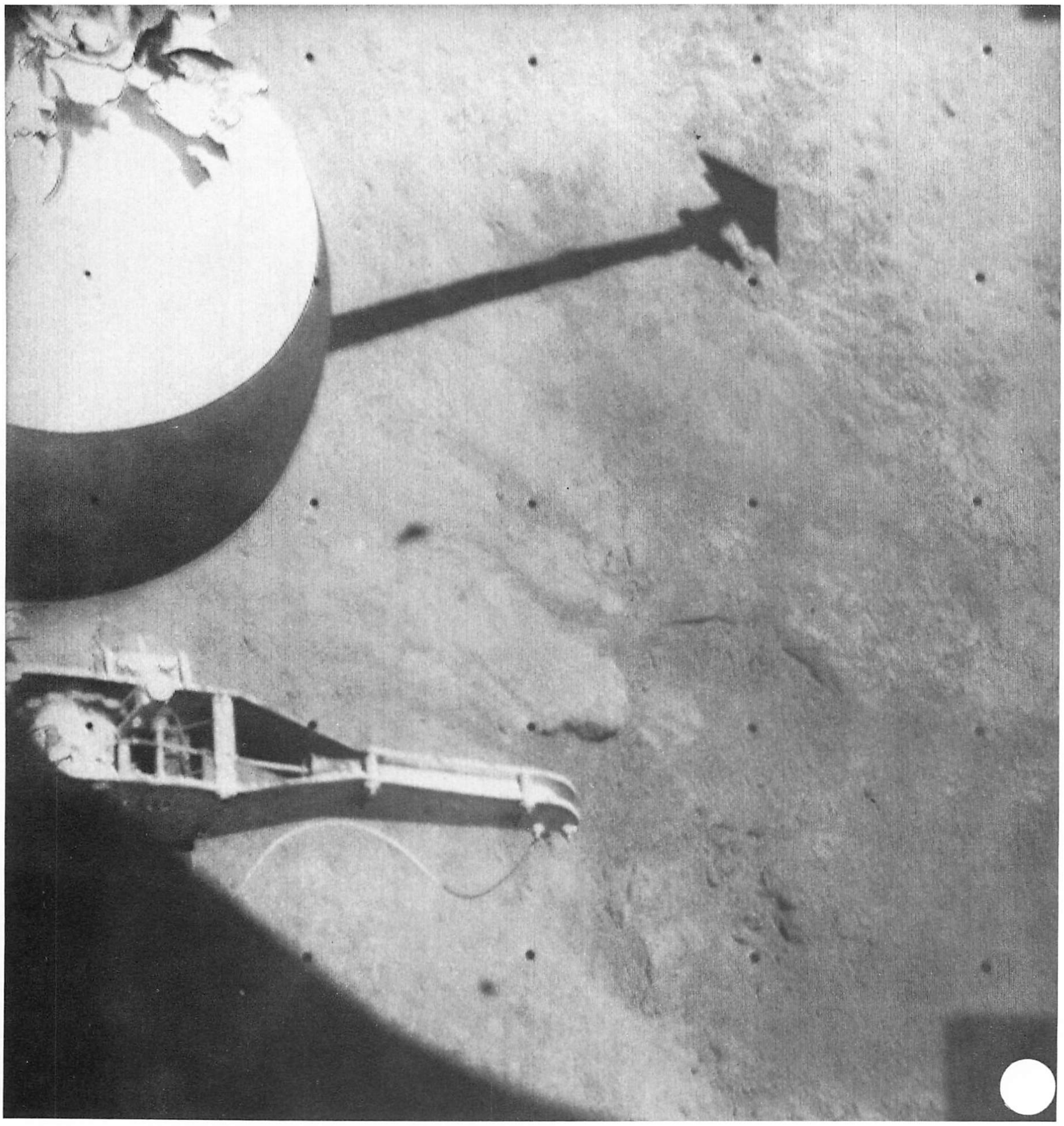


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(77)	**Day 321, 11:10:55**	**0**	**—20**	**2.4**	***f*/10.2**	**W**	**Clear**

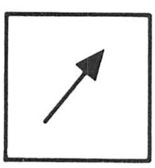


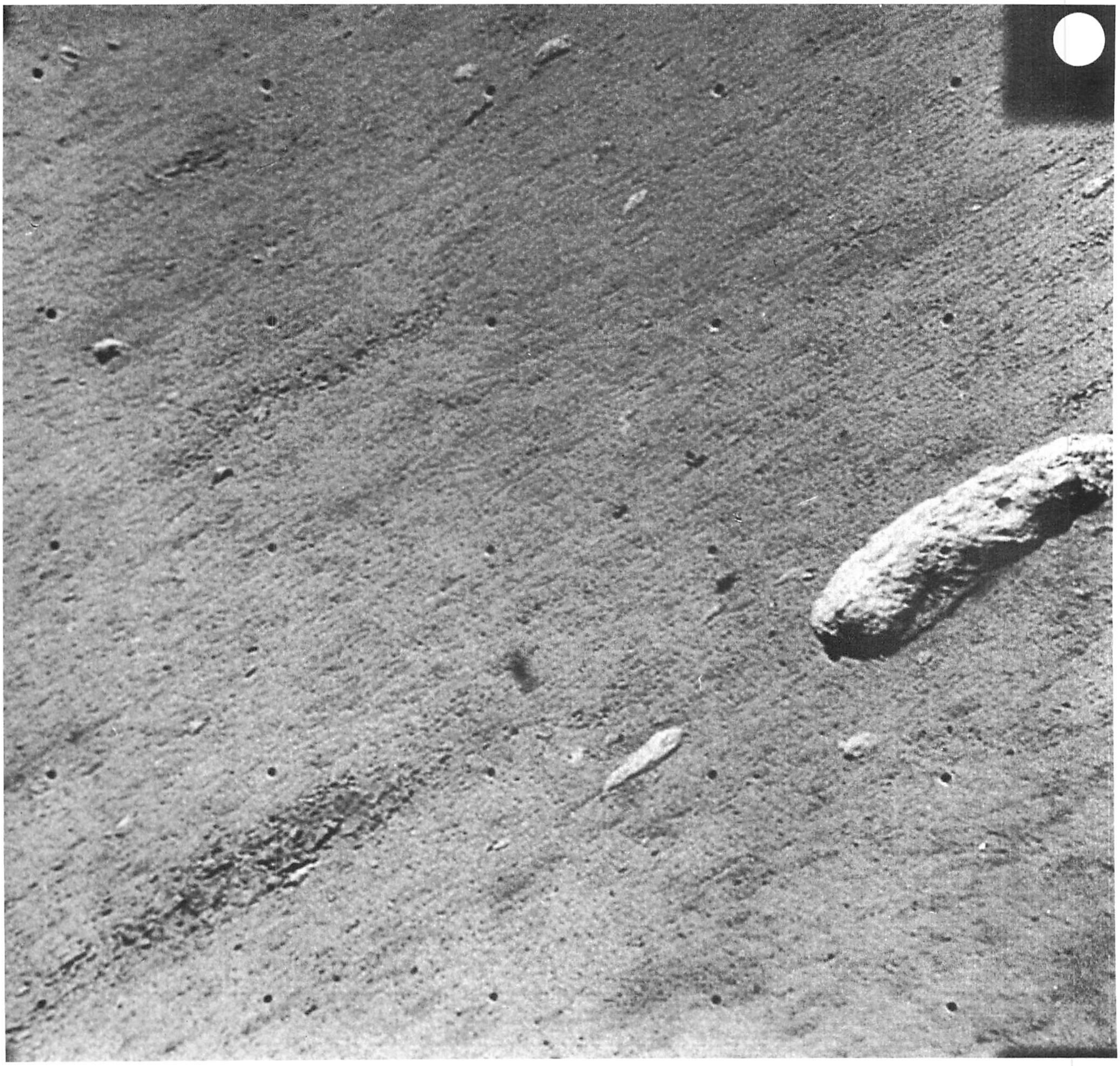
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(78)	**Day 321, 11:12:55**	**36**	**—35**	**2.4**	**$f/10.2$**	**W**	**Clear**



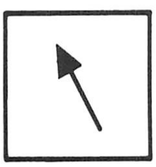


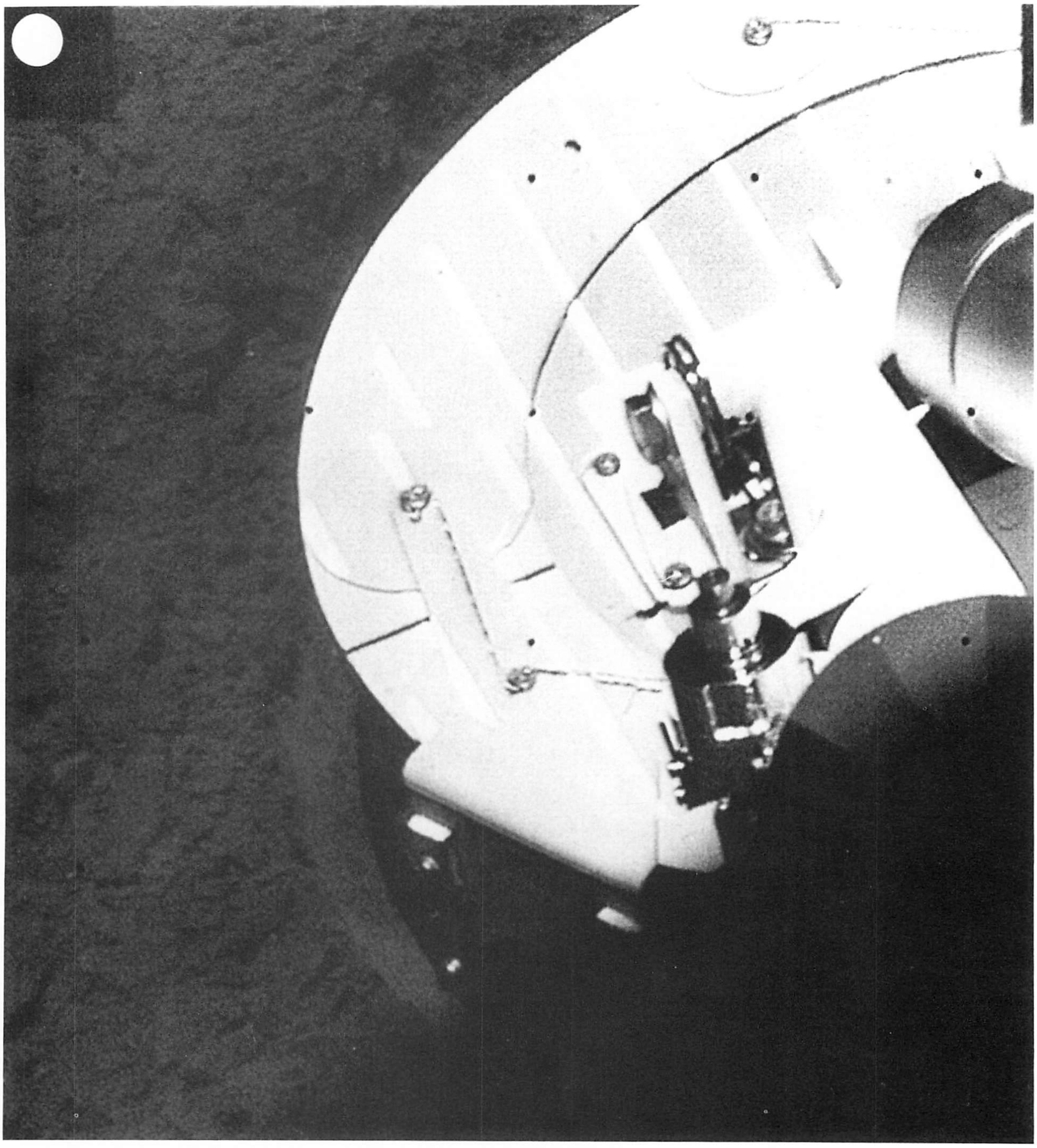
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(79)	**Day 321, 11:13:36**	**54**	**—35**	**2.4**	***f*/10.2**	**W**	**Clear**



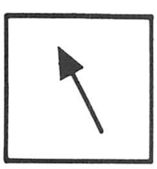


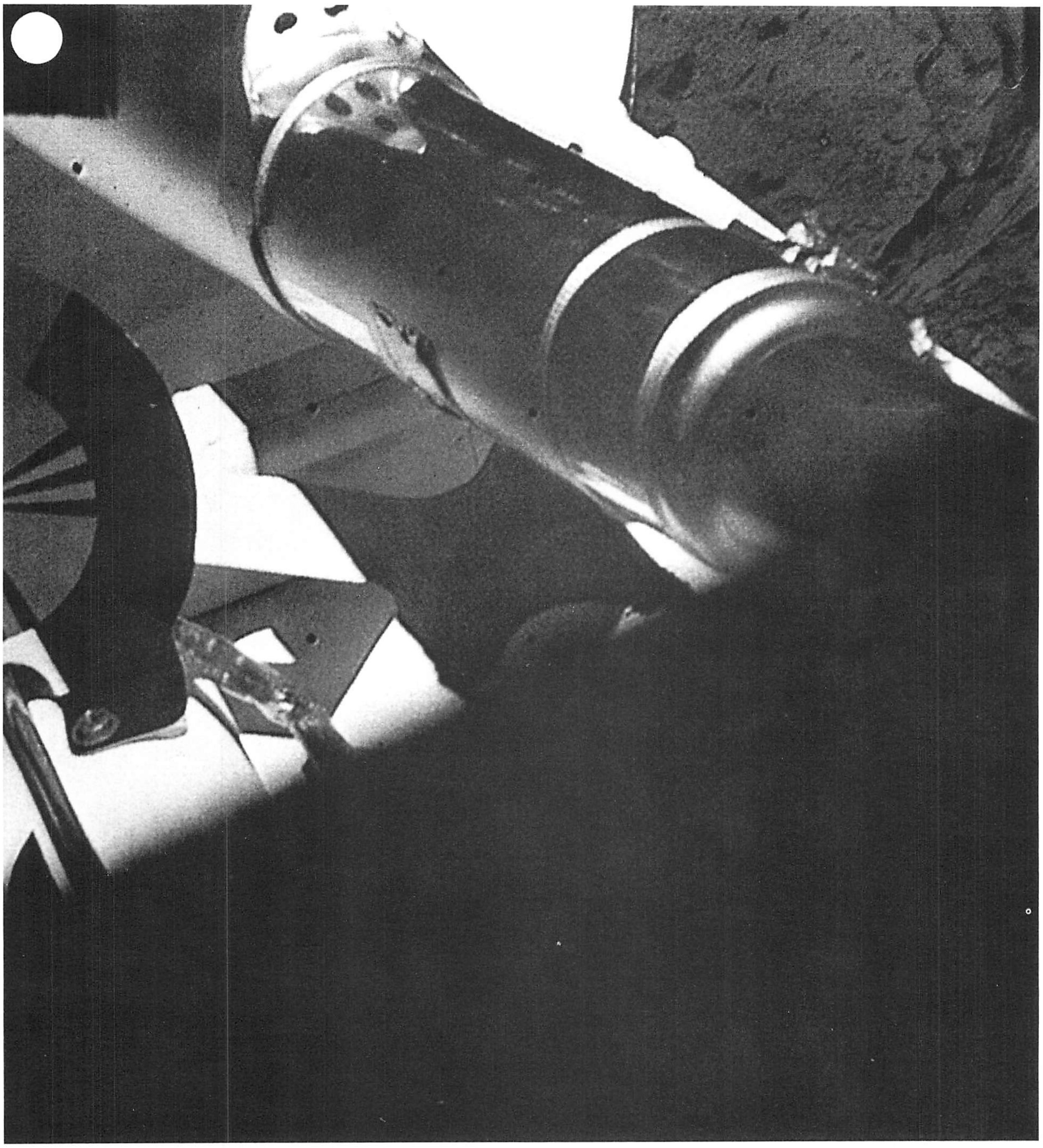
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(80)	Day 321, 11:50:58	33	5	16.8	$f/7.7$	N	Vertical	Processed



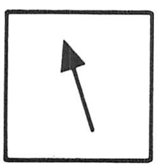


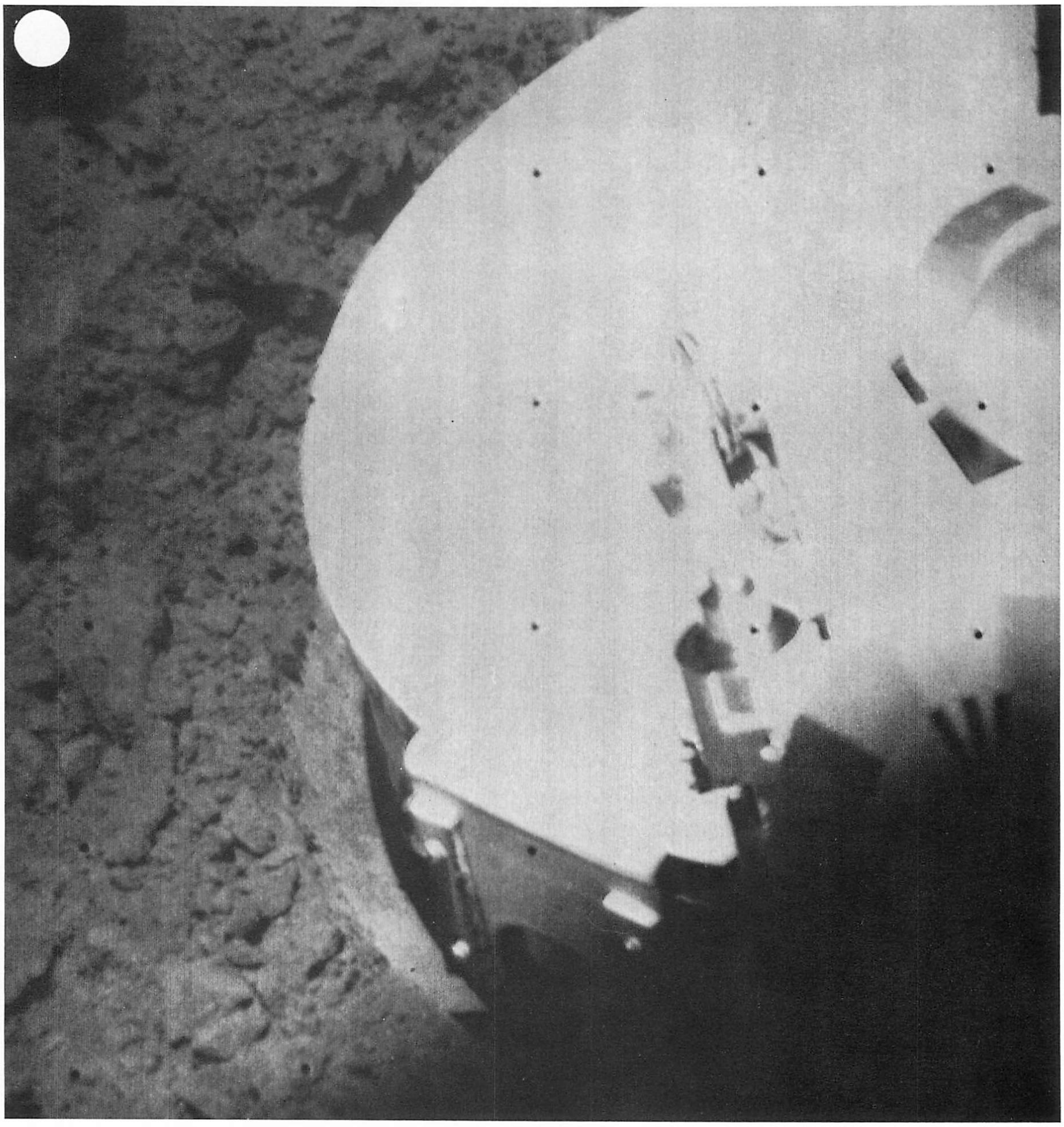
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(81)	Day 321, 11:58:07	−54	−55	2.4	f/20.8	N	Clear	Processed



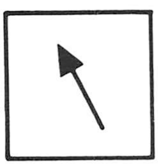


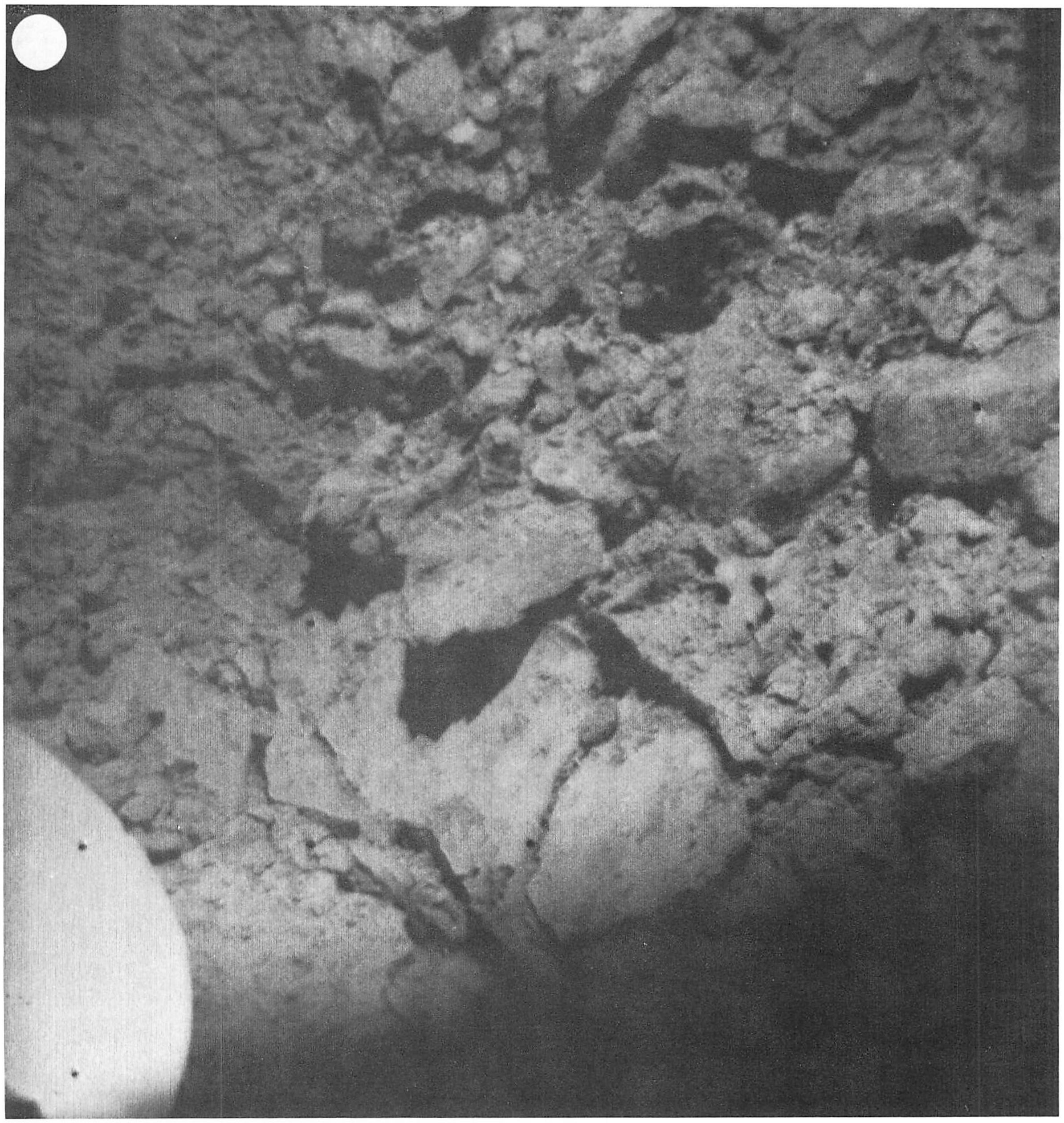
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(82)	**Day 321, 11:58:16**	**—63**	**—60**	**2.4**	***f*/20.8**	**N**	**Clear**	**Processed**



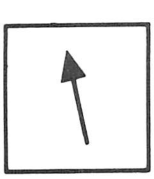


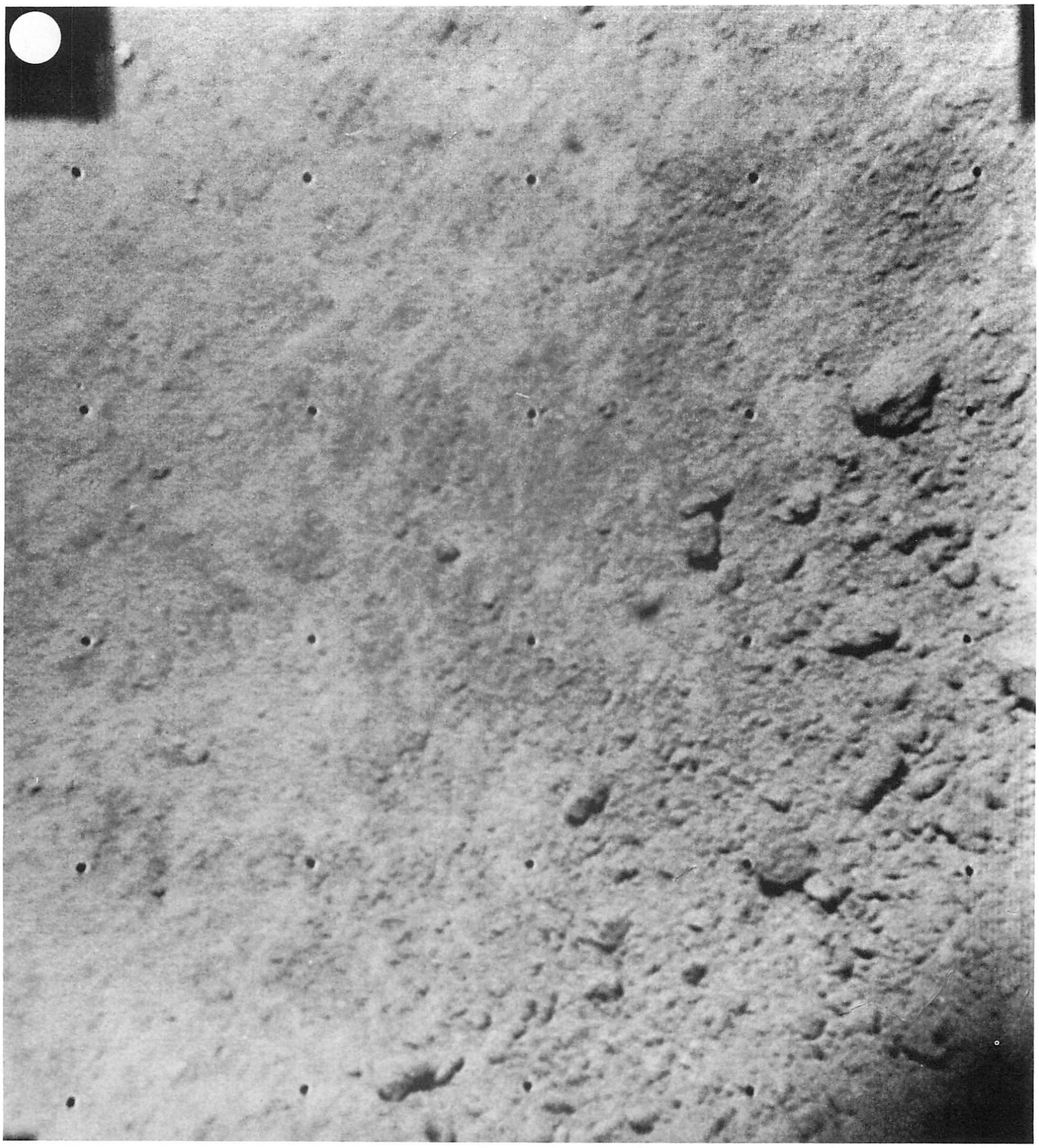
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(83)	**Day 321, 12:08:04**	**−54**	**−55**	**2.5**	***f*/9.2**	**N**	**Clear**



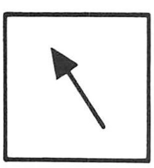


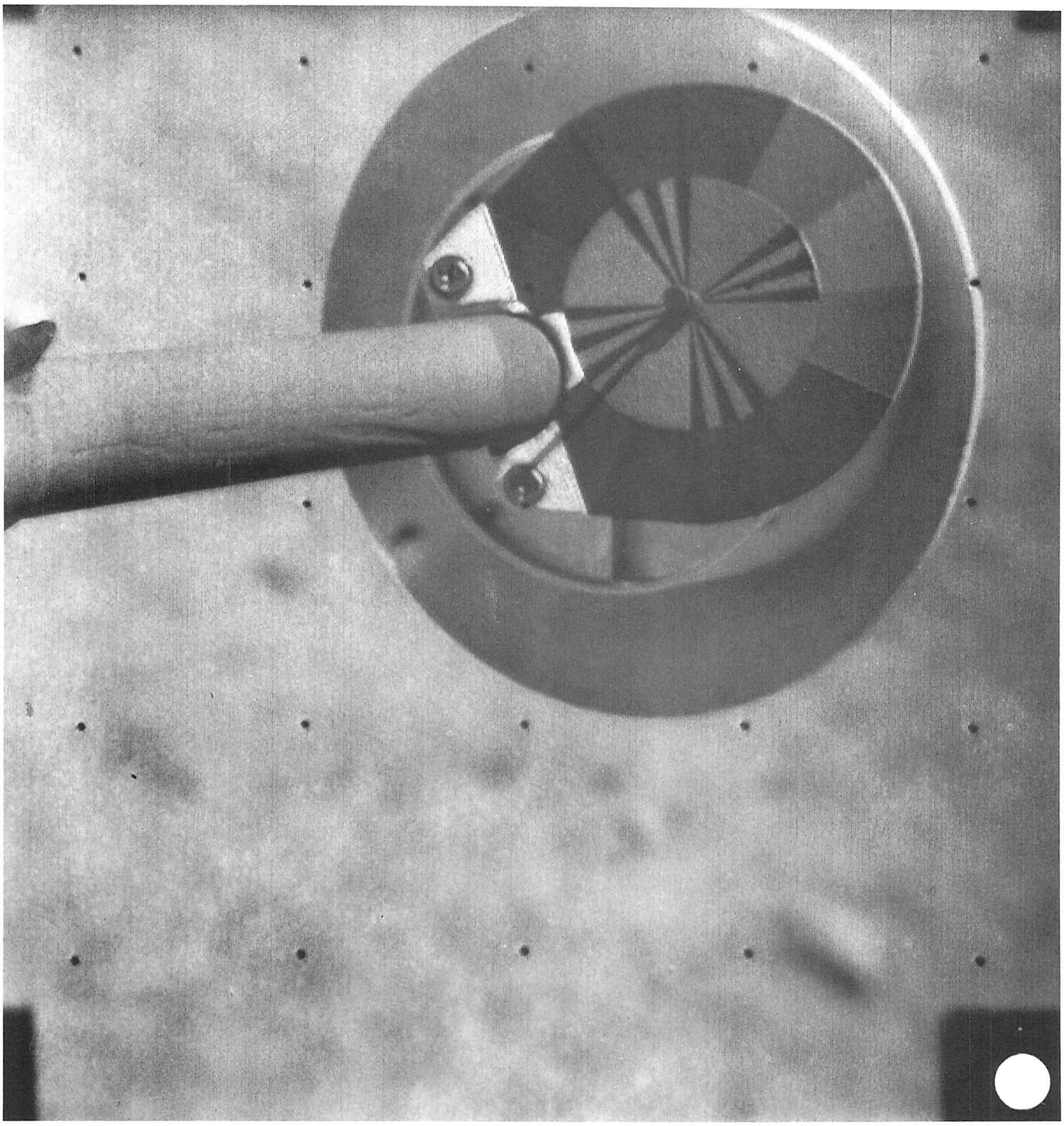
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(84)	**Day 321, 12:08:46**	**−72**	**−55**	**2.6**	***f*/9.2**	**N**	**Clear**



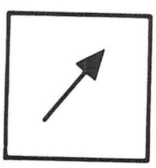


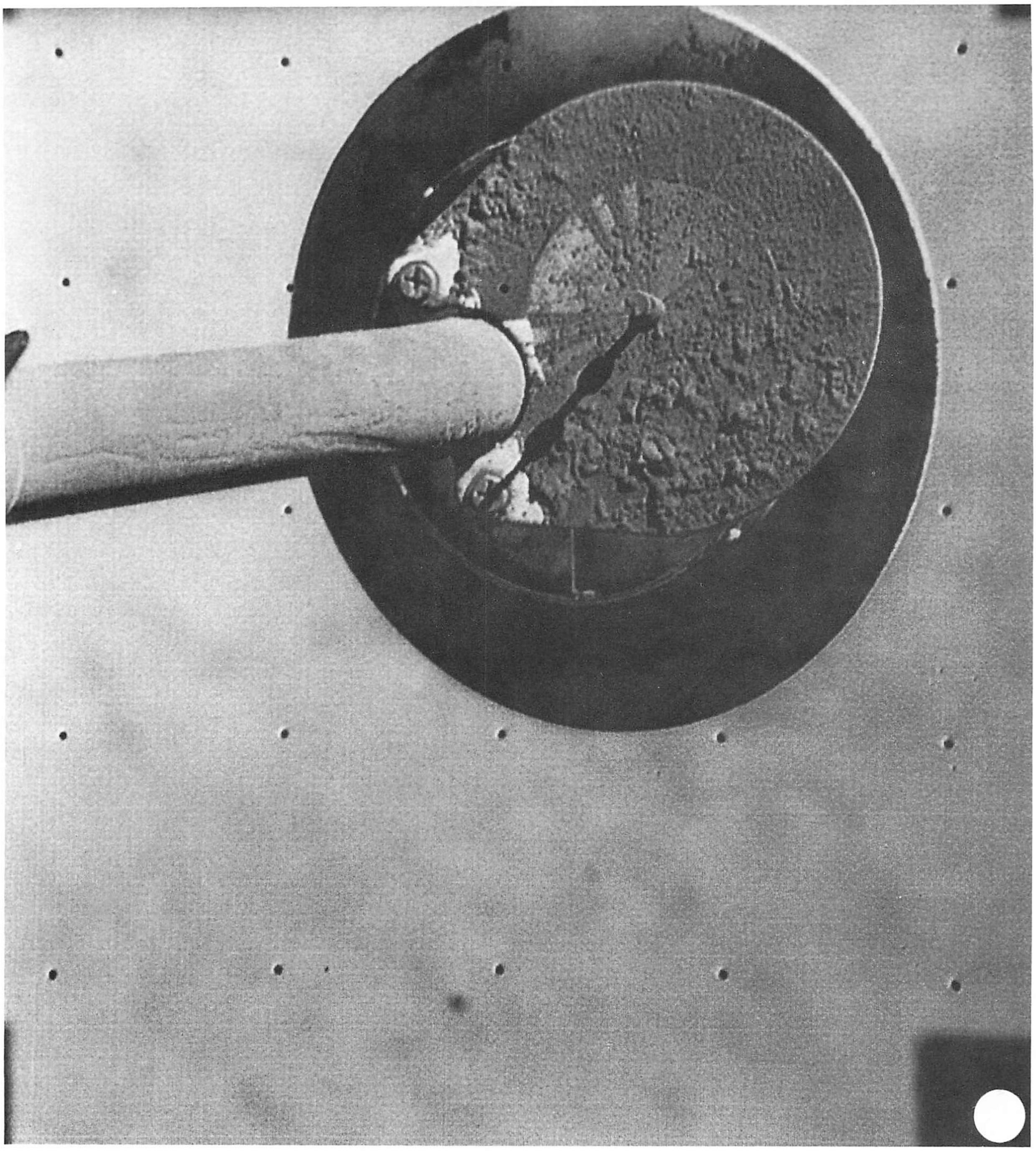
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(85)	**Day 321, 12:09:08**	**−45**	**−50**	**2.5**	**f/9.2**	**N**	**Clear**	**Processed**



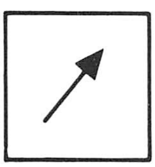


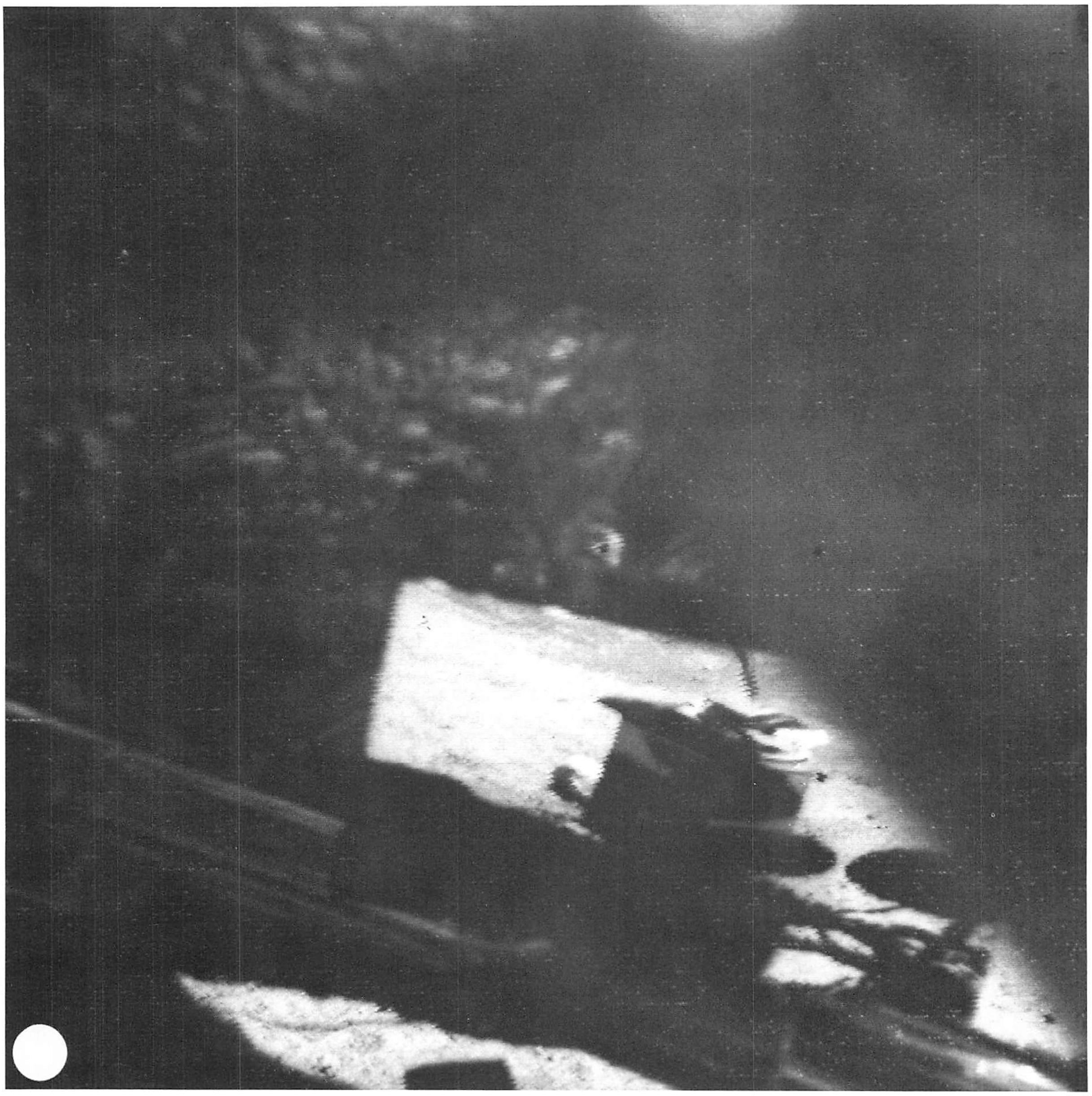
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(86)	**Day 321, 02:37:20**	**54**	**—5**	**2.2**	**f/8.5**	**N**	**Clear**



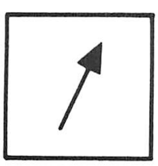


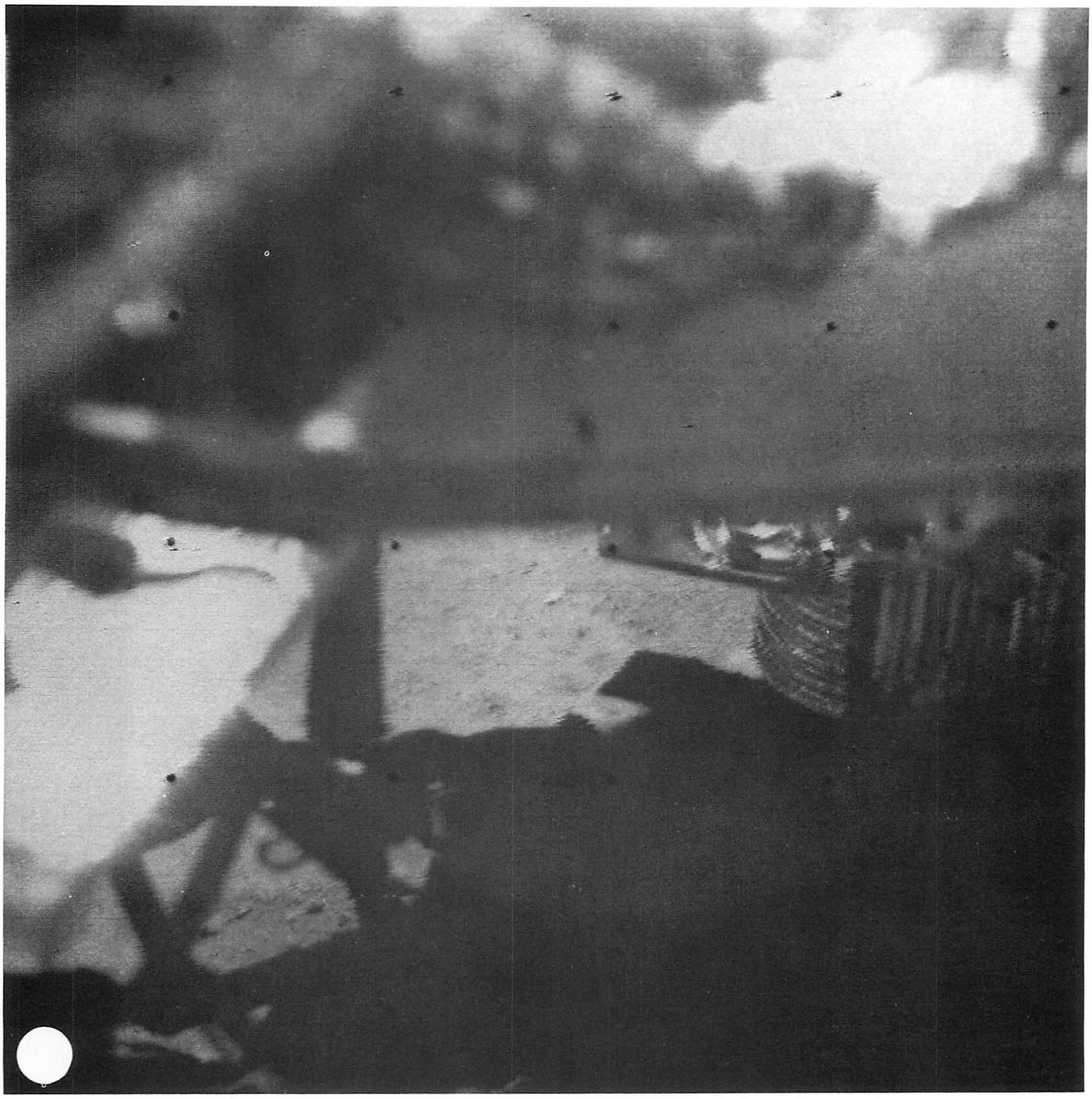
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(87)	**Day 321, 12:31:56**	**54**	**—5**	**2.2**	***f*/7.7**	**N**	**Clear**	**Processed**



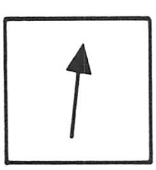


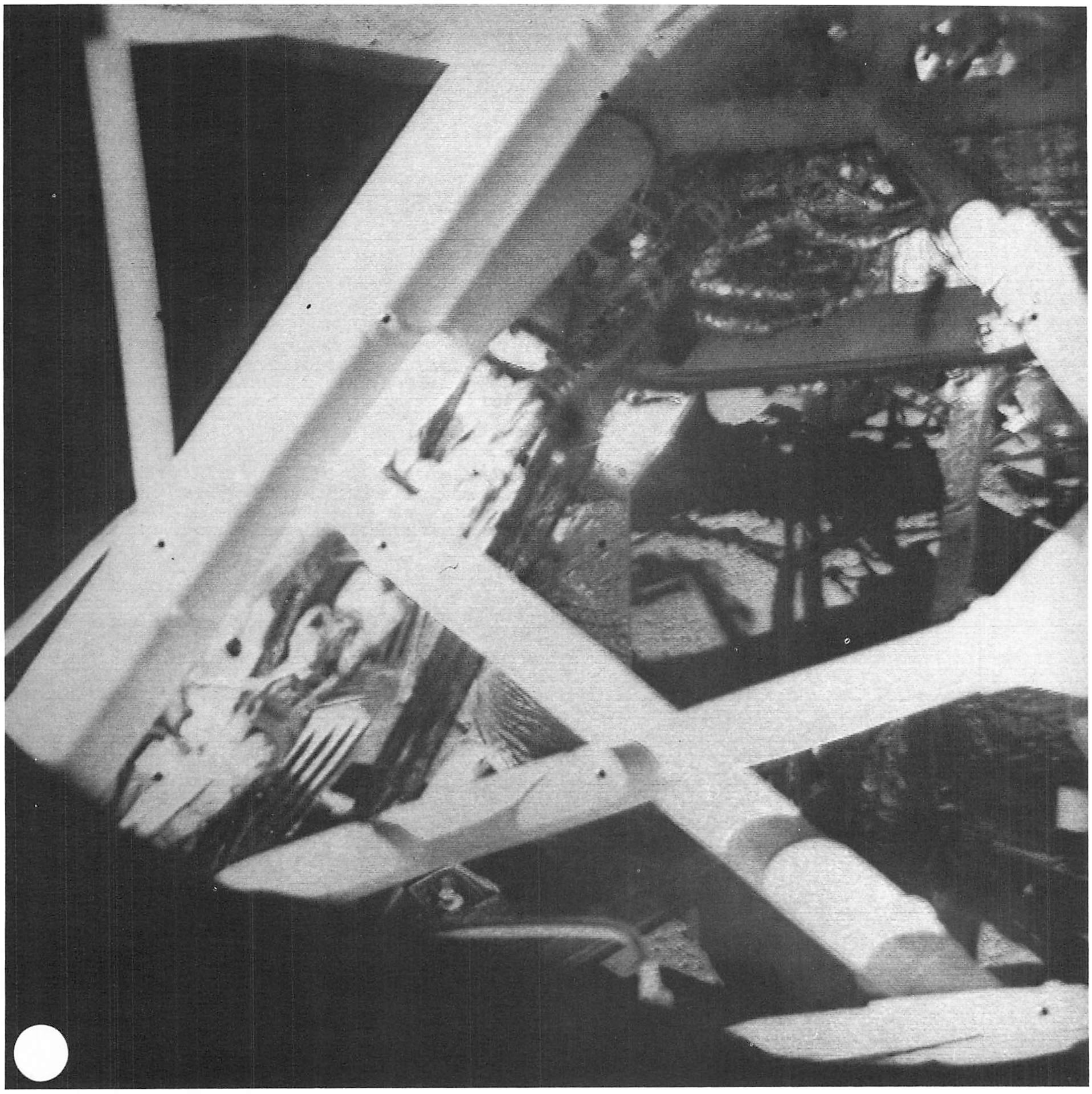
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(88)	**Day 321, 14:44:23**	**—216**	**20**	**34.8**	***f*/11.8**	**N**	**Clear**



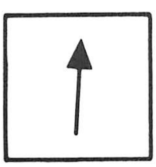


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(89)	**Day 321, 14:54:18**	**—198**	**—35**	**2.4**	***f*/7.5**	**N**	**Clear**

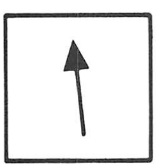




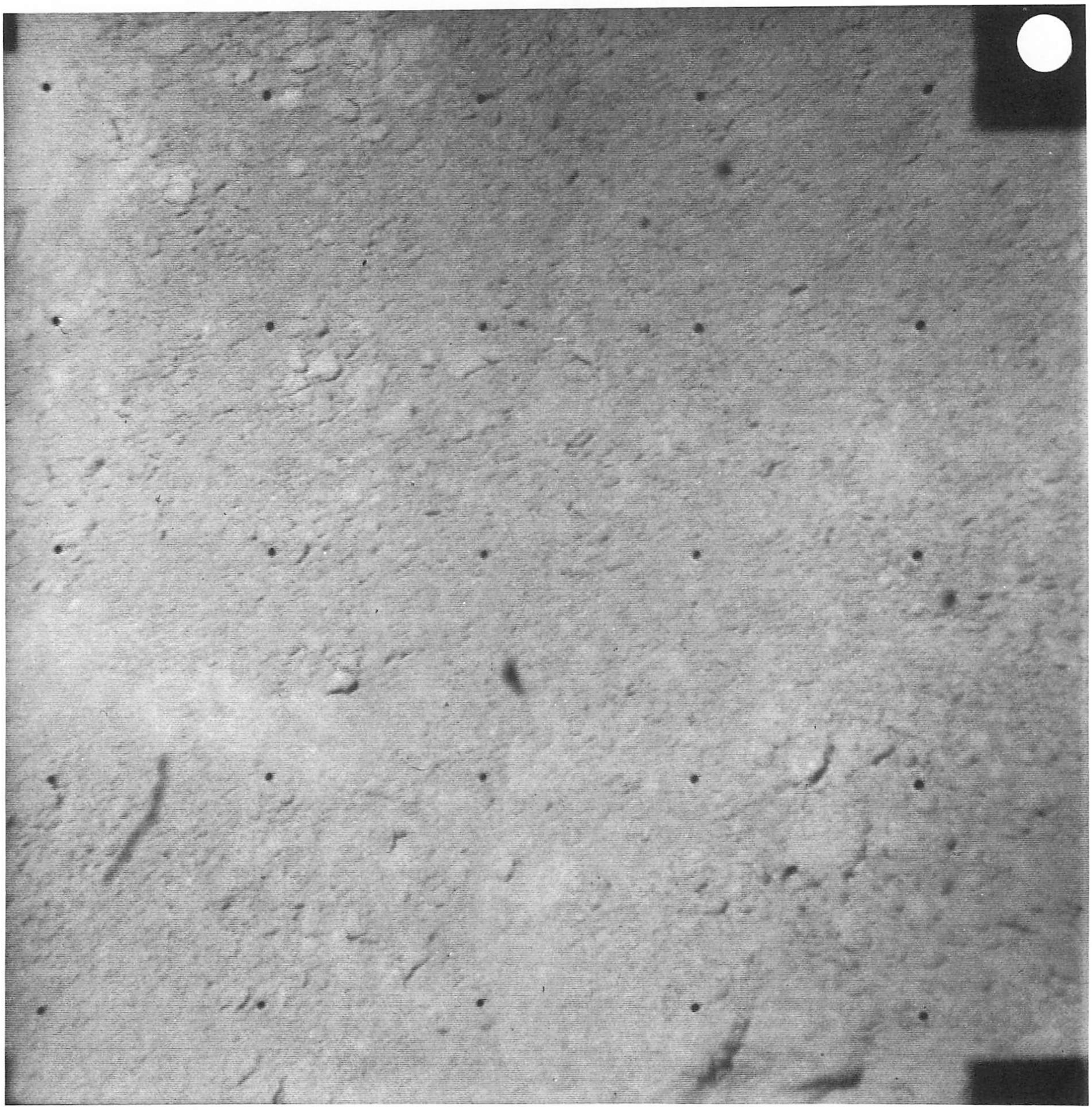
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(90)	**Day 322, 06:04:03**	**—195**	**—40**	**2.4**	***f*/7.5**	**W**	**Clear**



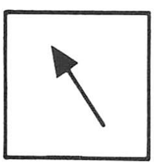
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(91)	**Day 322, 08:34:16**	**−75**	**−55**	**2.5**	***f*/9.2**	**N**	**Clear**

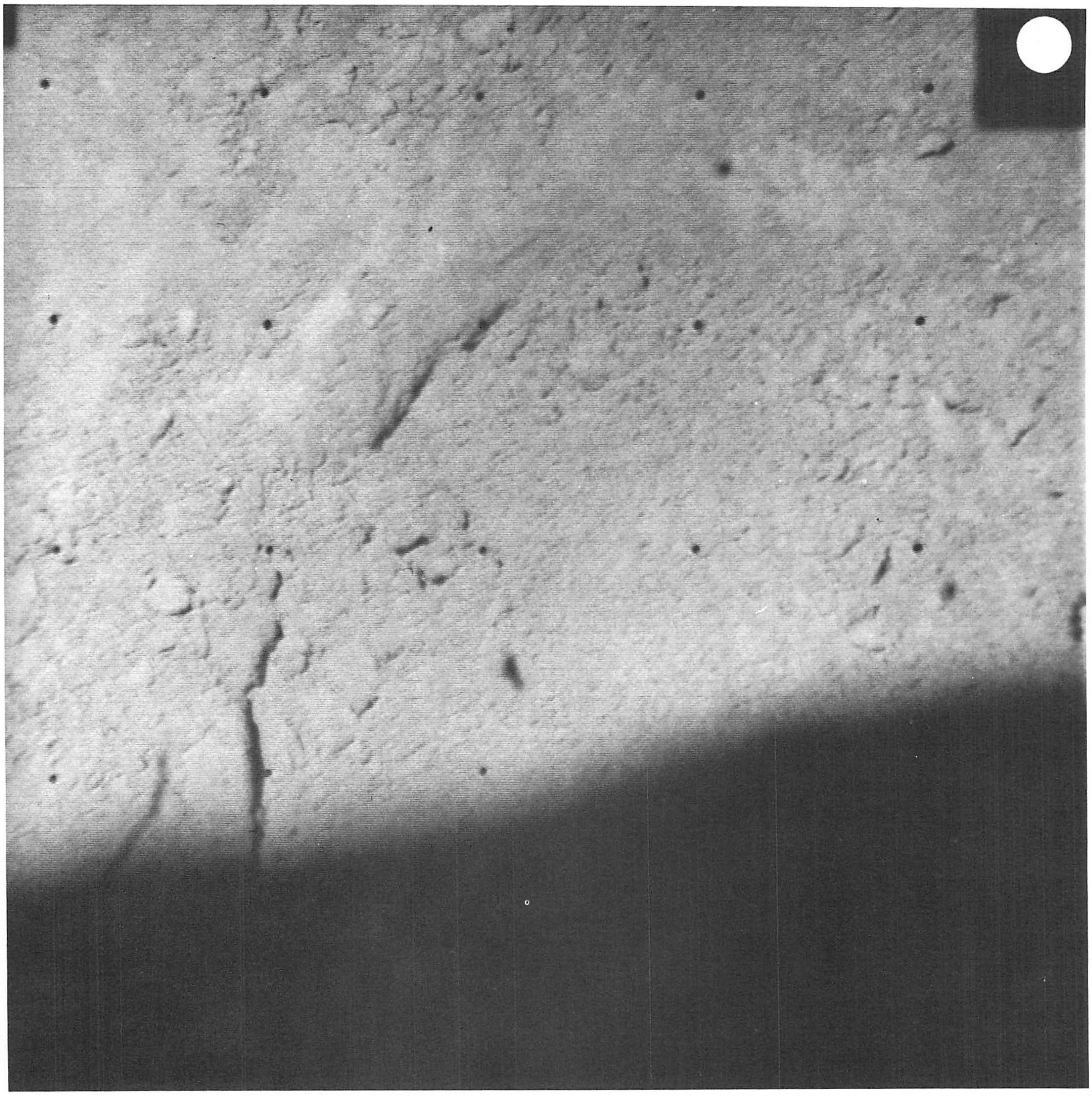


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(92)	**Day 322, 08:34:21**	**—72**	**—50**	**1.4**	***f*/9.2**	**N**	**Clear**

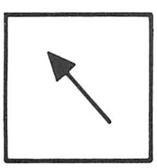


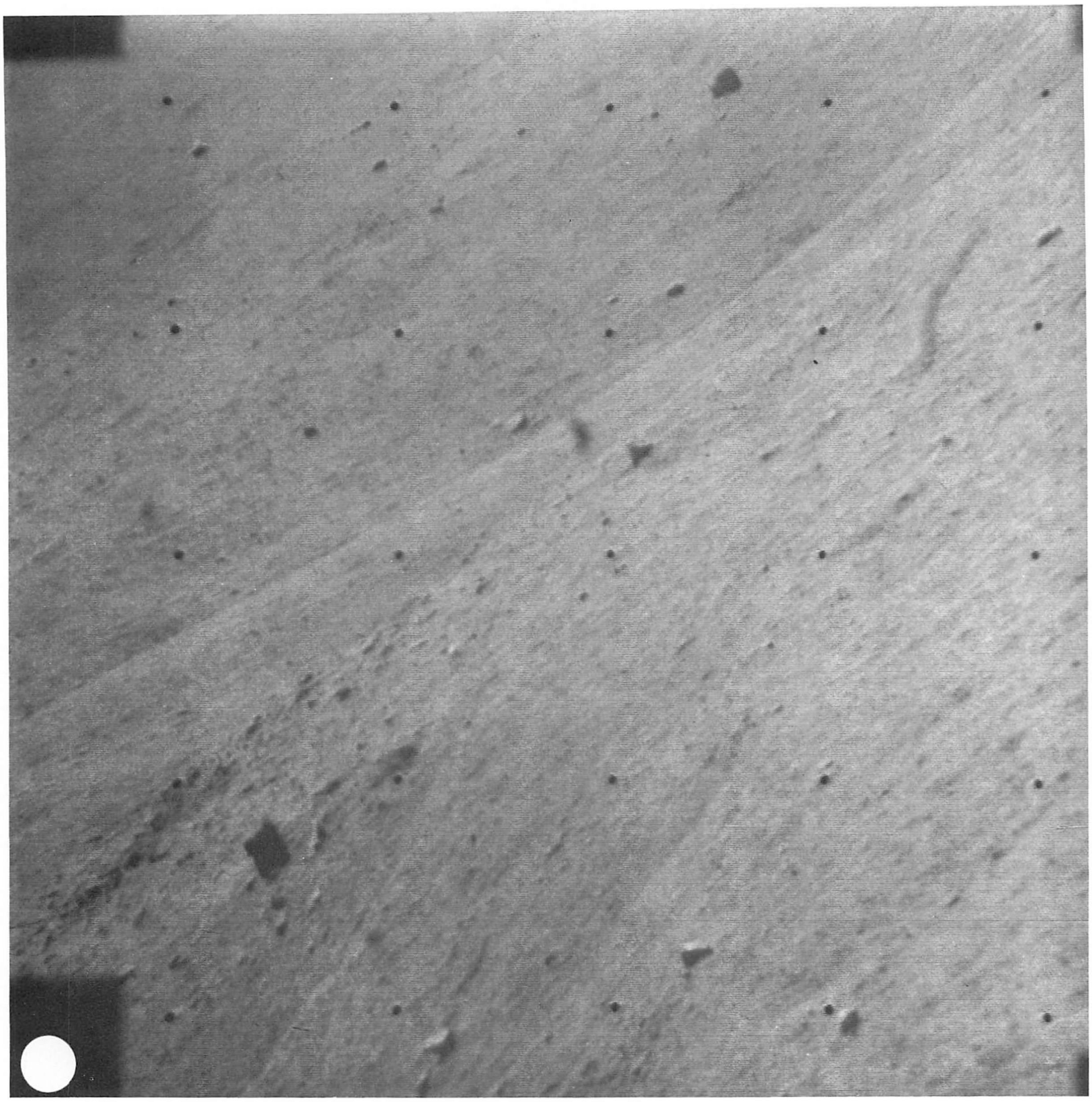
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(93)	**Day 322, 13:43:10**	**39**	**—35**	**2.5**	**f/11.3**	**N**	**Clear**



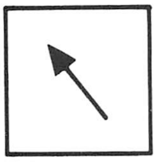


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(94)	**Day 322, 13:43:28**	**45**	**—35**	**2.5**	***f*/11.3**	**N**	**Clear**

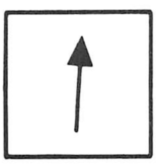


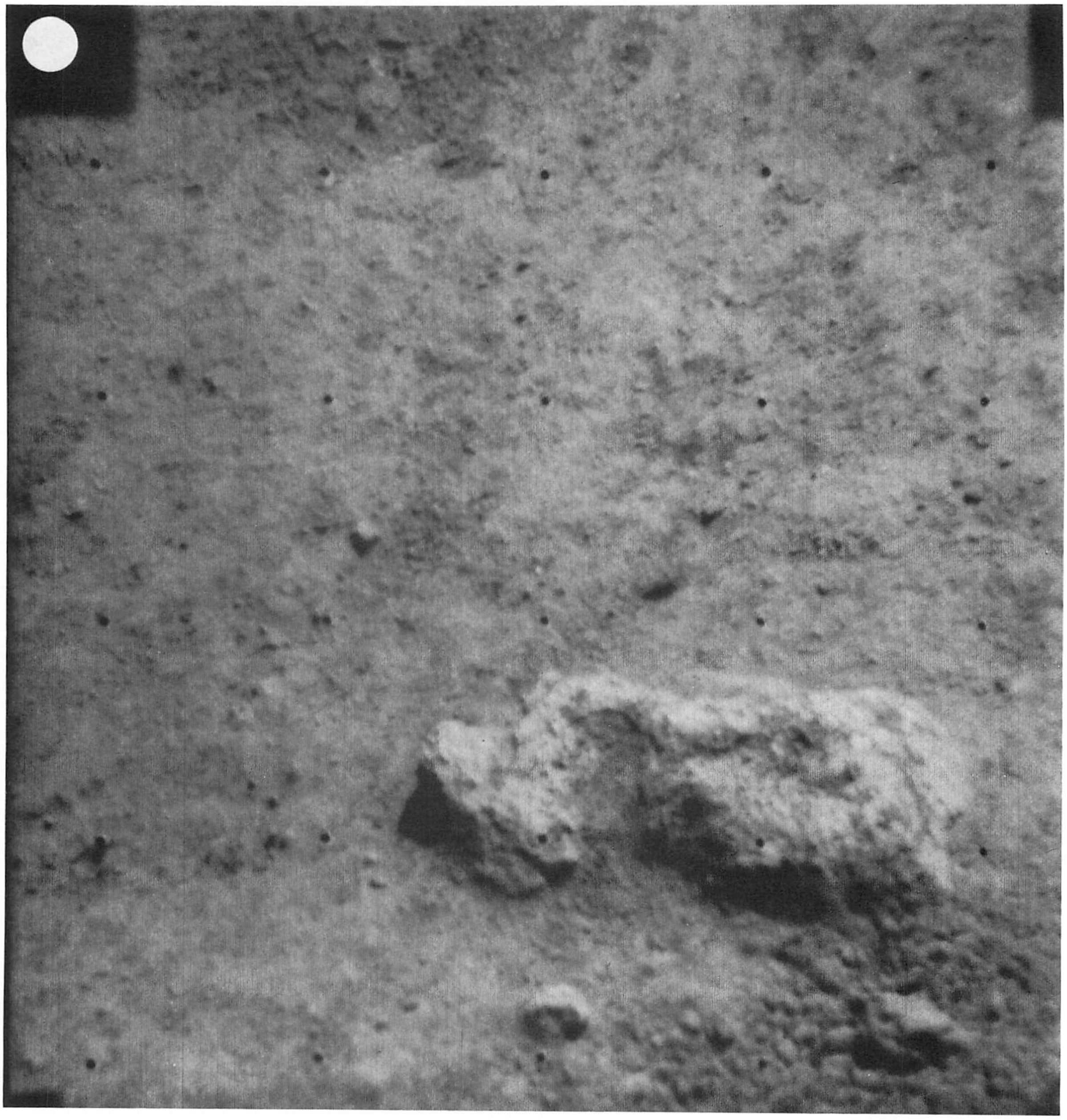


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(95)	**Day 323, 06:37:08**	**—147**	**—15**	**27.9**	***f*/8.5**	**N**	**Clear**

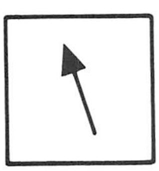


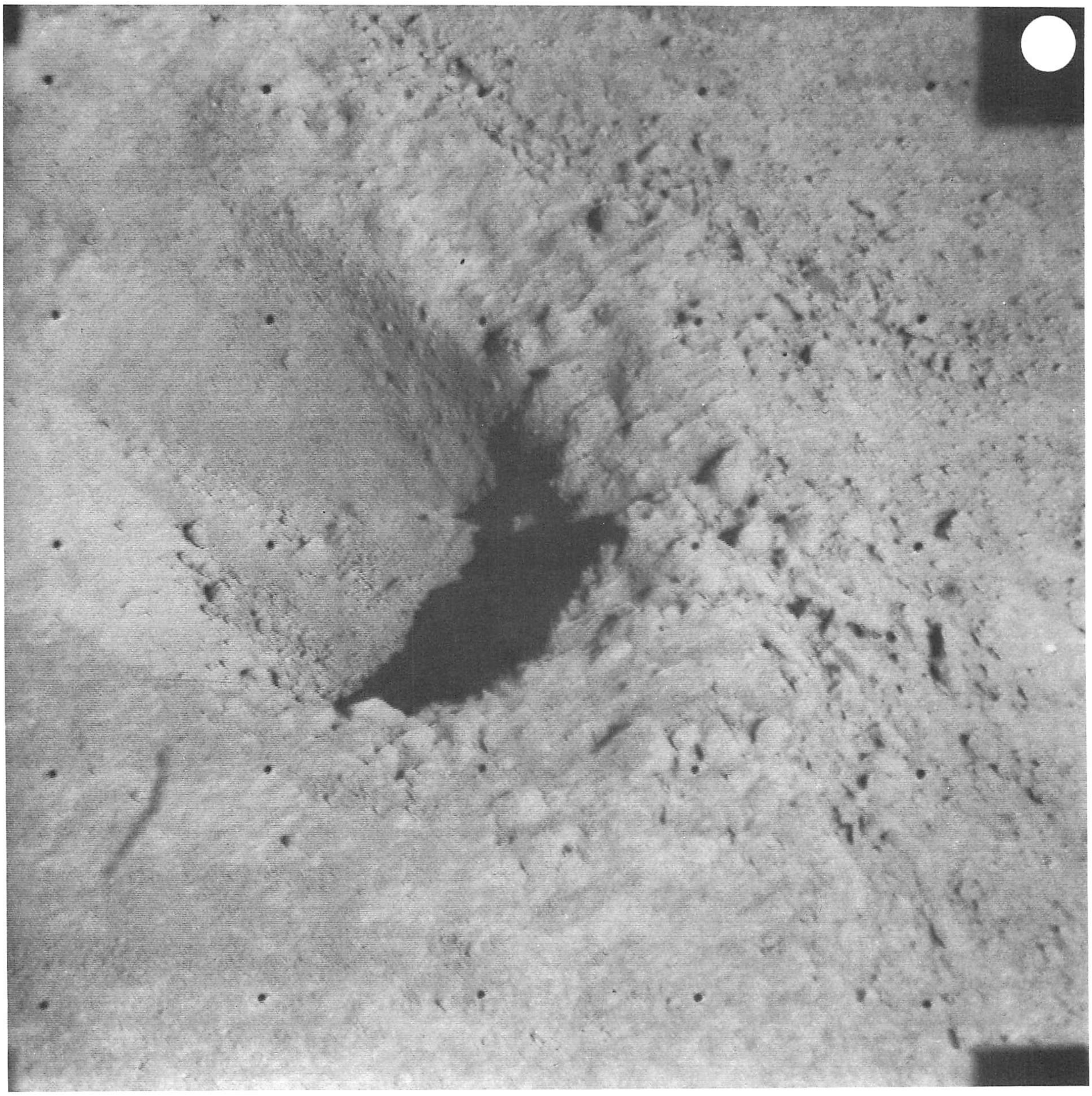
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(96)	Day 323, 07:04:13	−87	−15	27.9	f/8.5	N	Clear



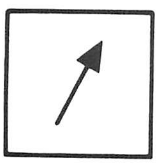


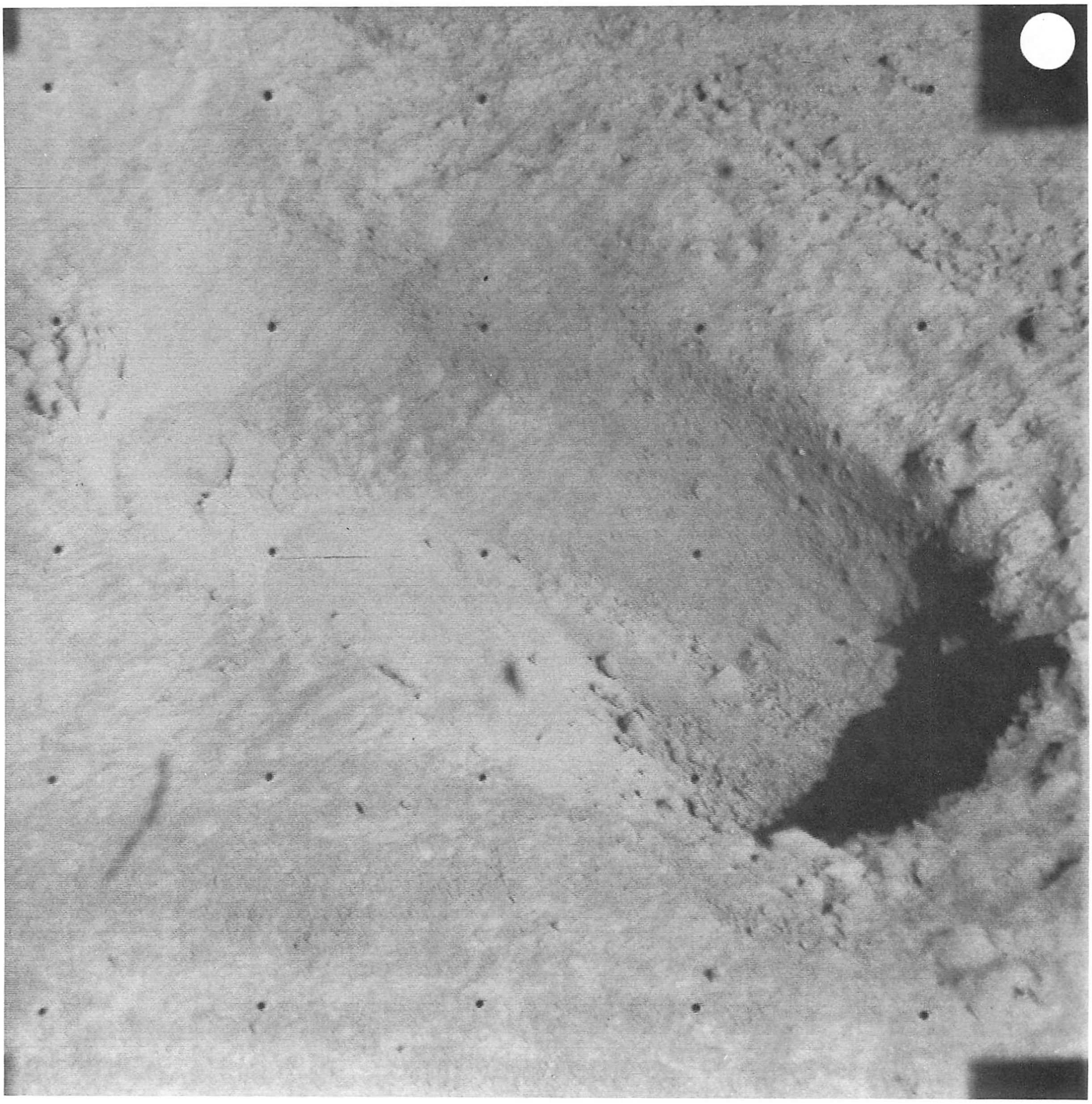
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(97)	**Day 323, 08:28:37**	**—63**	**—45**	**2.8**	**f/9.2**	**N**	**Clear**



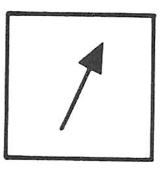


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(98)	**Day 324, 07:04:16**	**—15**	**—25**	**3.6**	***f*/10.2**	**N**	**Clear**

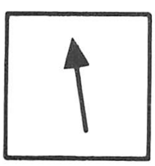


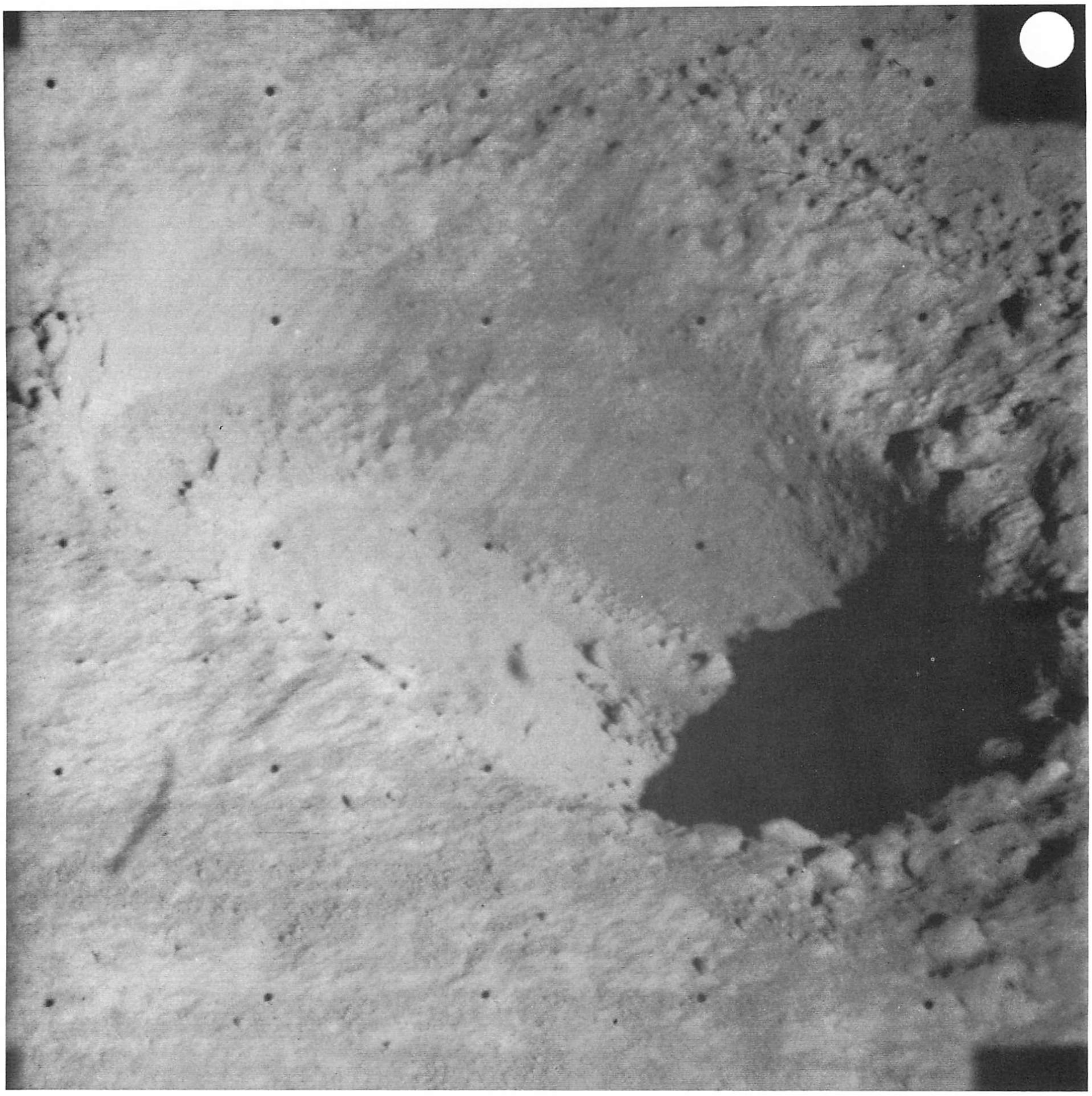


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(99)	Day 324, 07:05:51	−12	−25	3.6	f/10.2	N	Clear

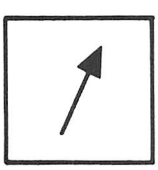


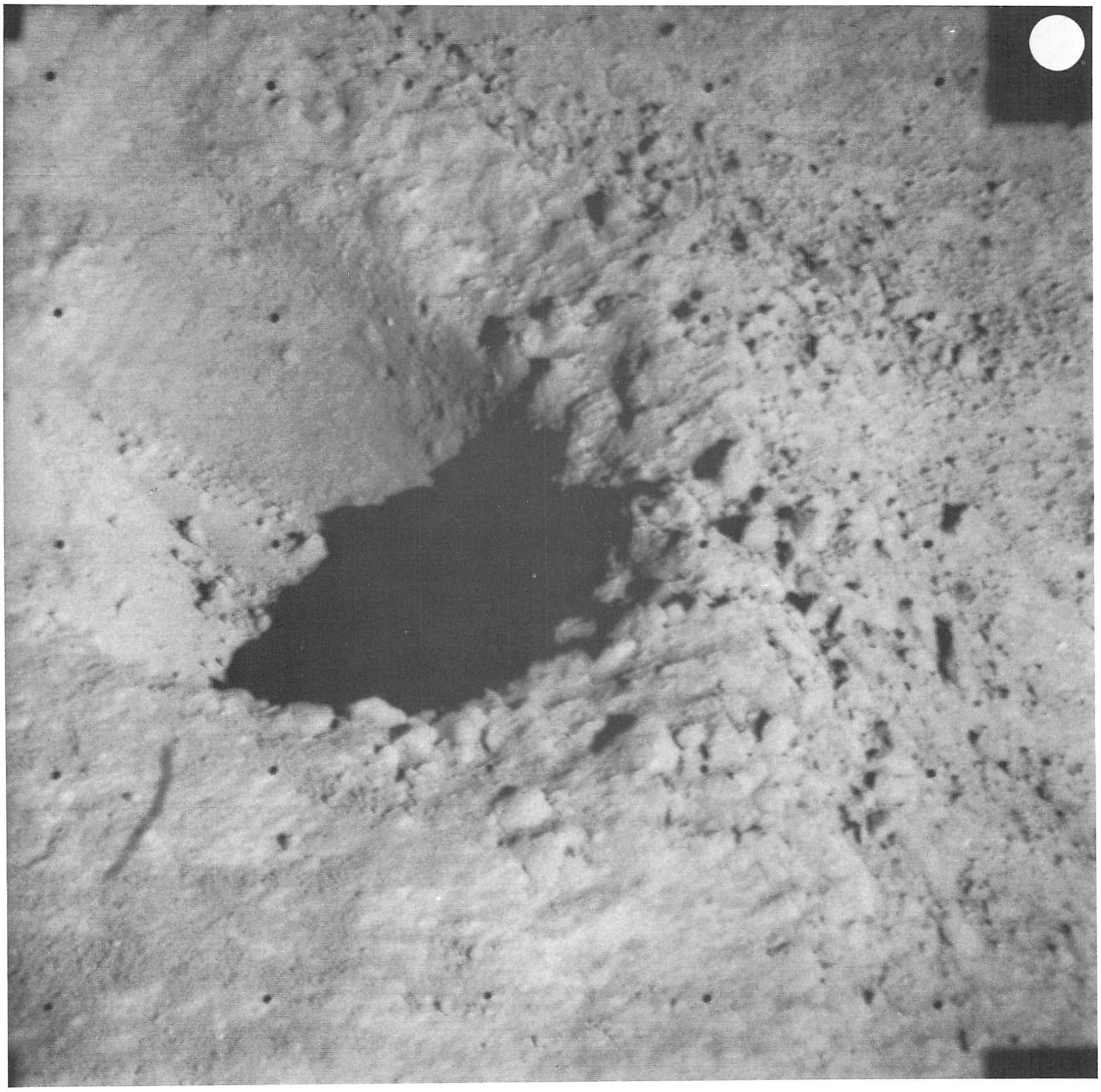
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(100)	**Day 325, 05:31:54**	**−72**	**−50**	**2.3**	***f*/8.6**	**W**	**Clear**



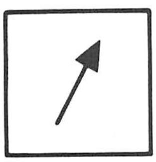


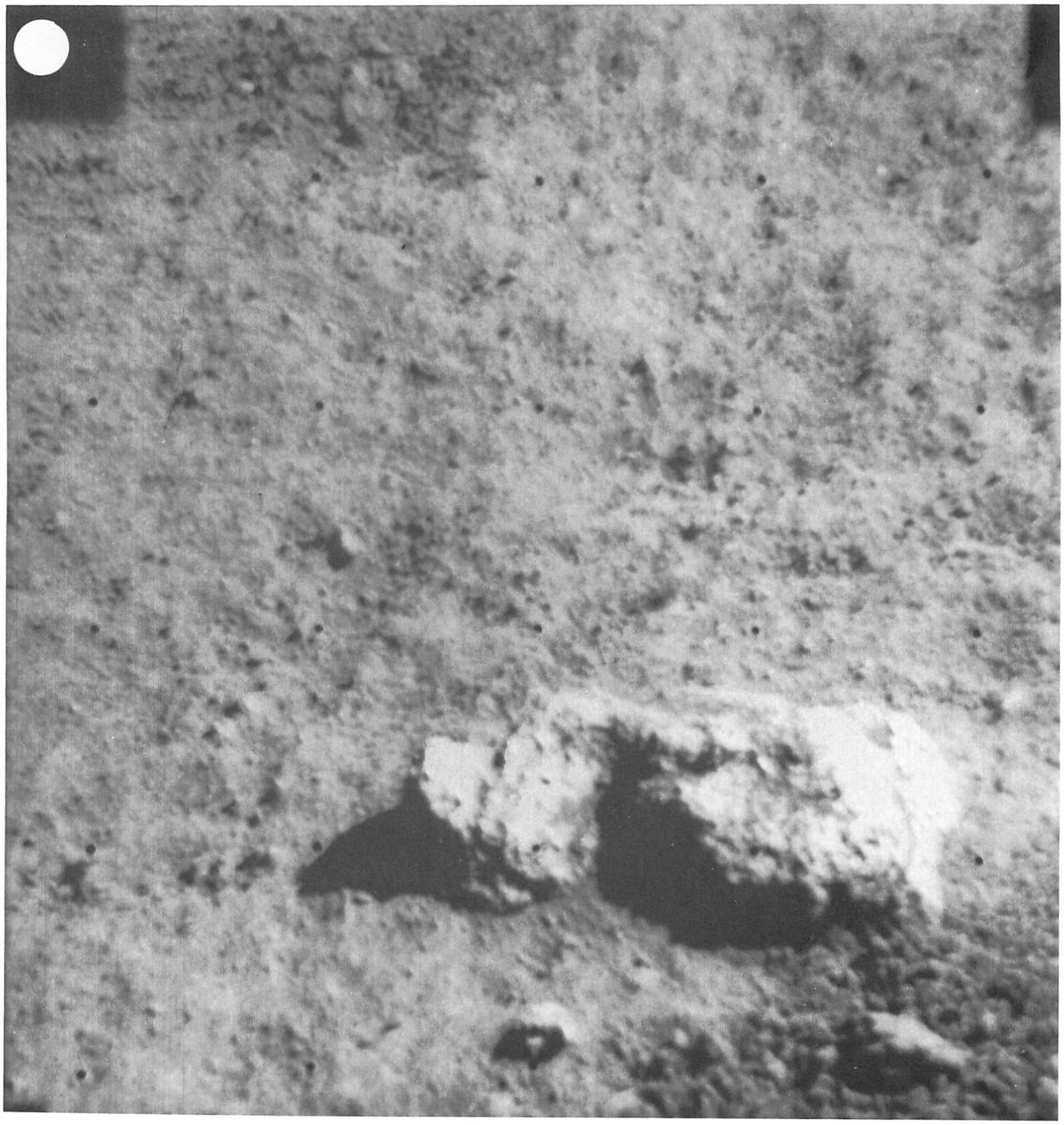
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(101)	**Day 325, 08:55:48**	**—12**	**—25**	**3.0**	***f*/8.5**	**N**	**Horiz.**



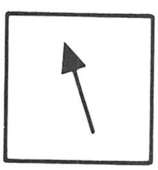


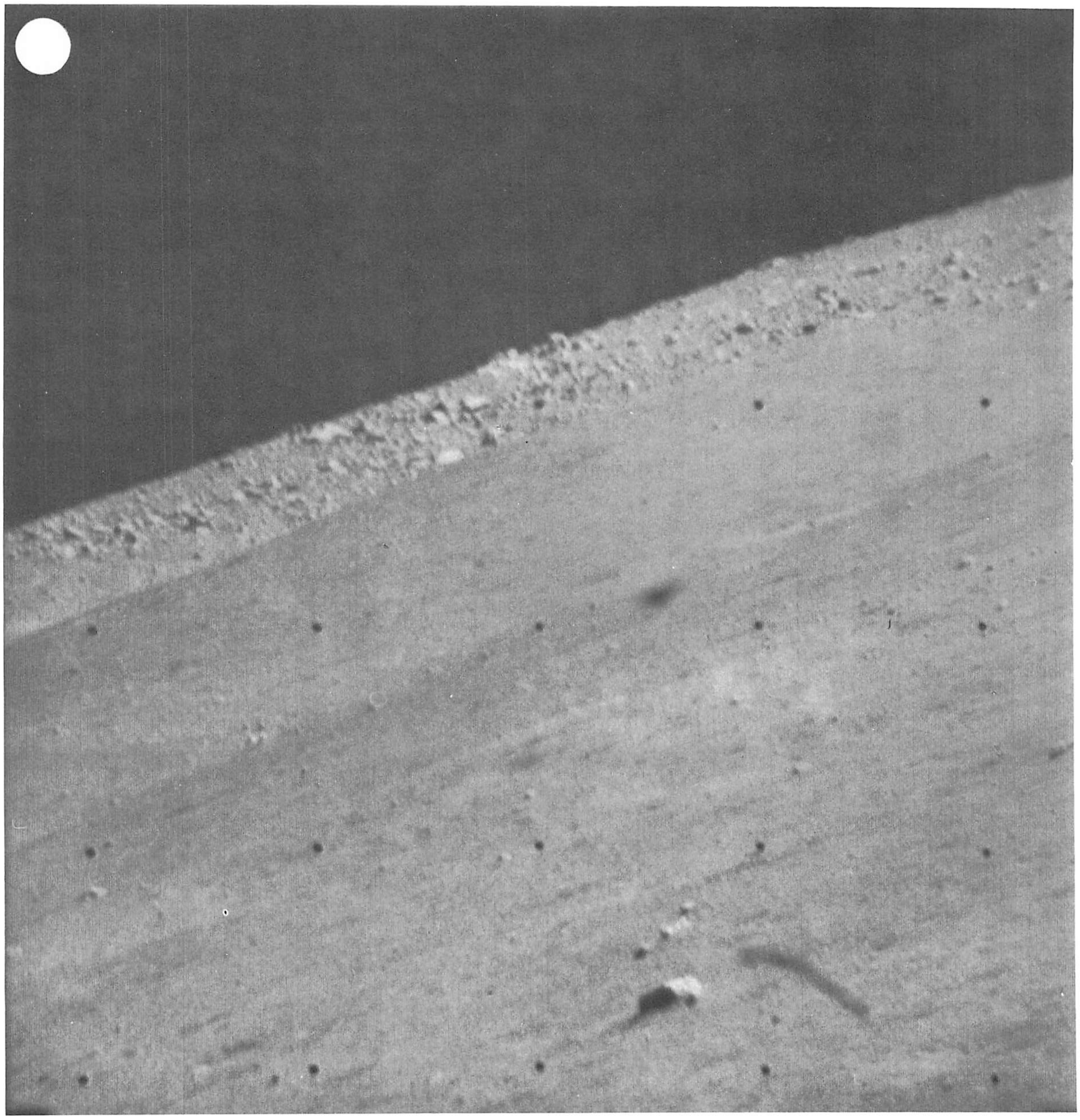
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(102)	Day 325, 10:39:09	—15	—25	3.3	f/10.2	N	Clear



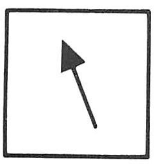


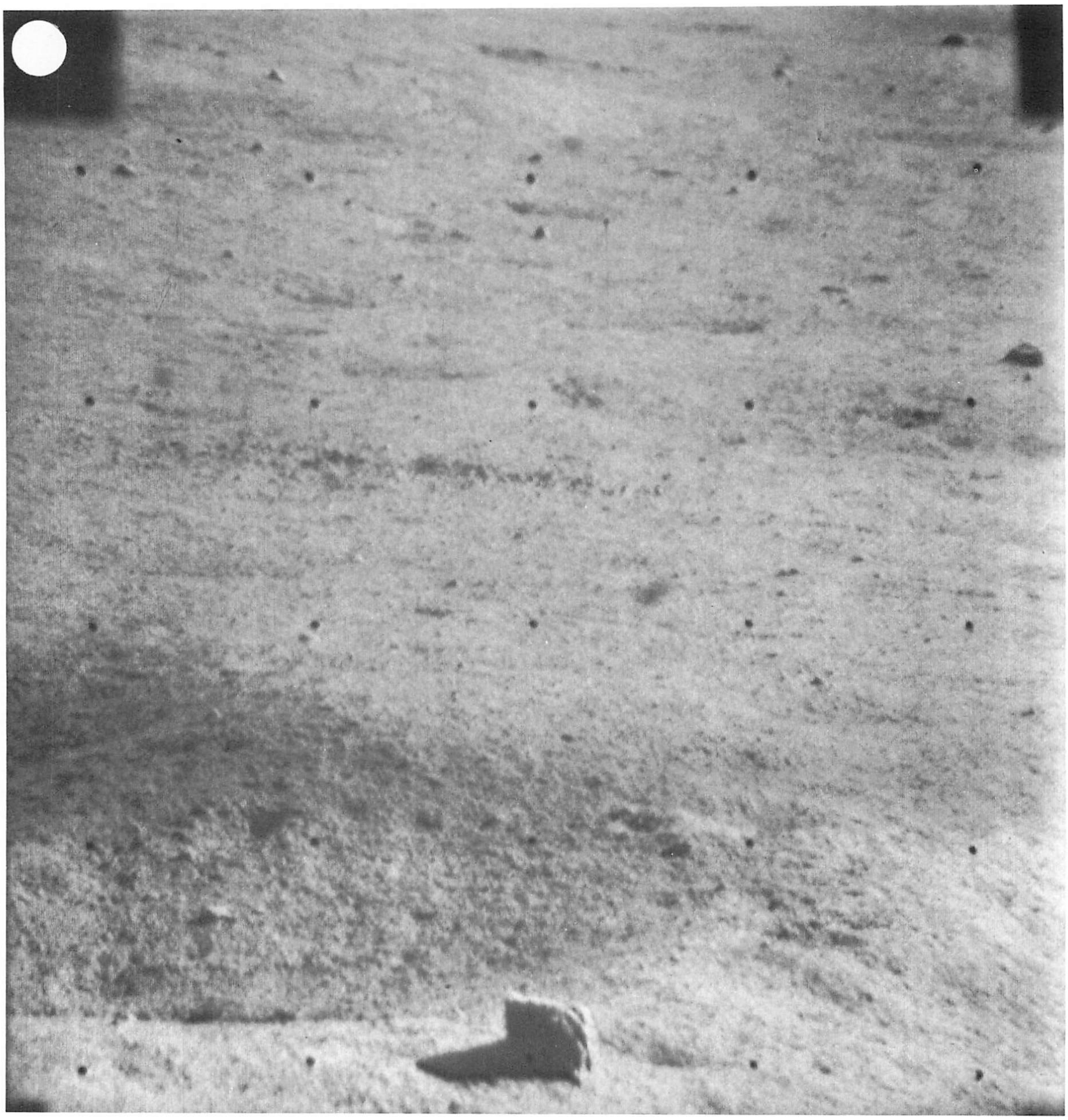
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(103)	Day 325, 11:40:37	−63	−45	2.8	$f/8.3$	N	Clear



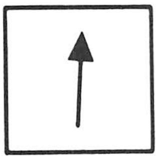


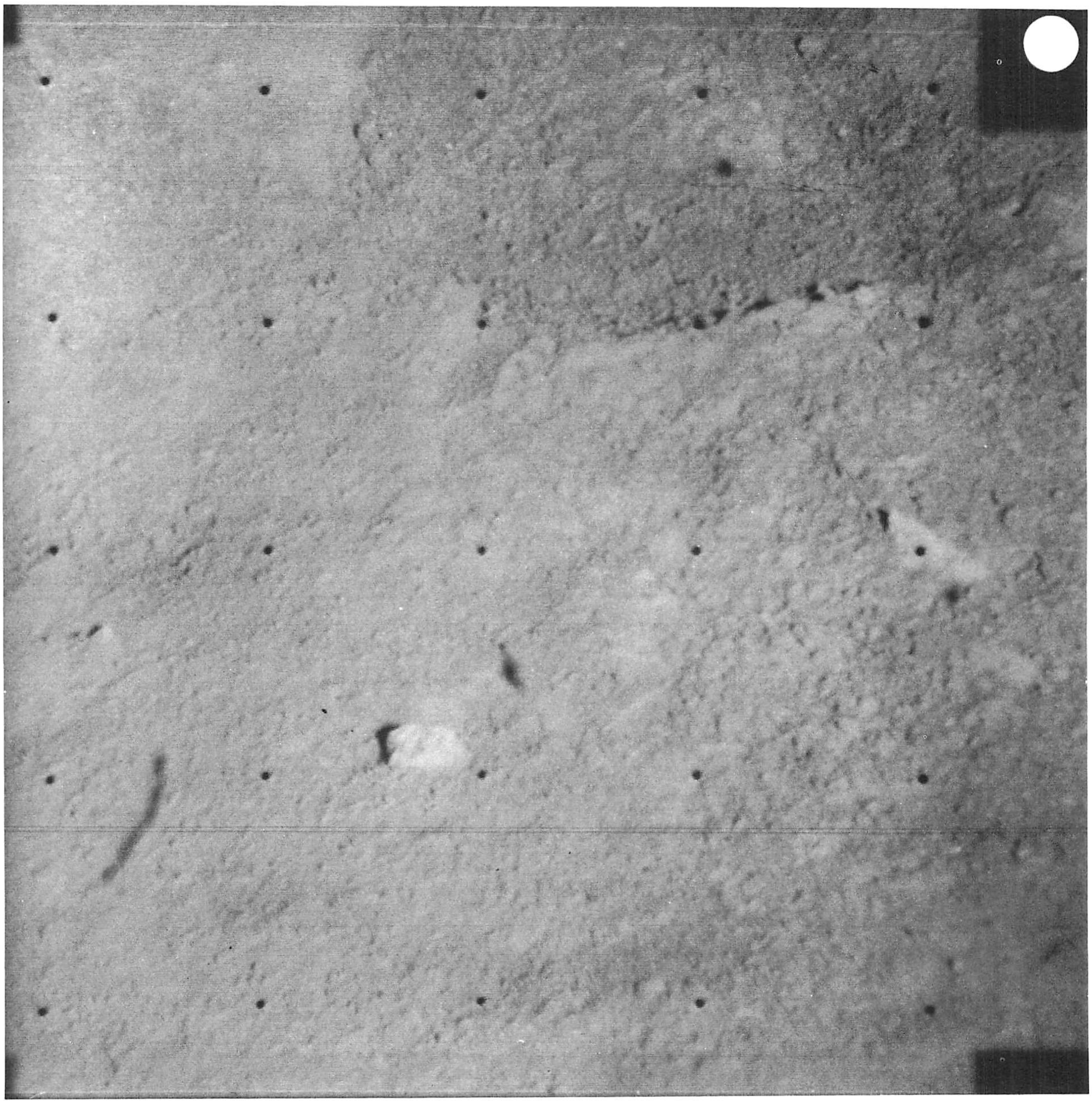
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(104)	**Day 325, 11:49:46**	**−57**	**−5**	**27.9**	**f/8.3**	**N**	**Clear**



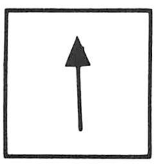


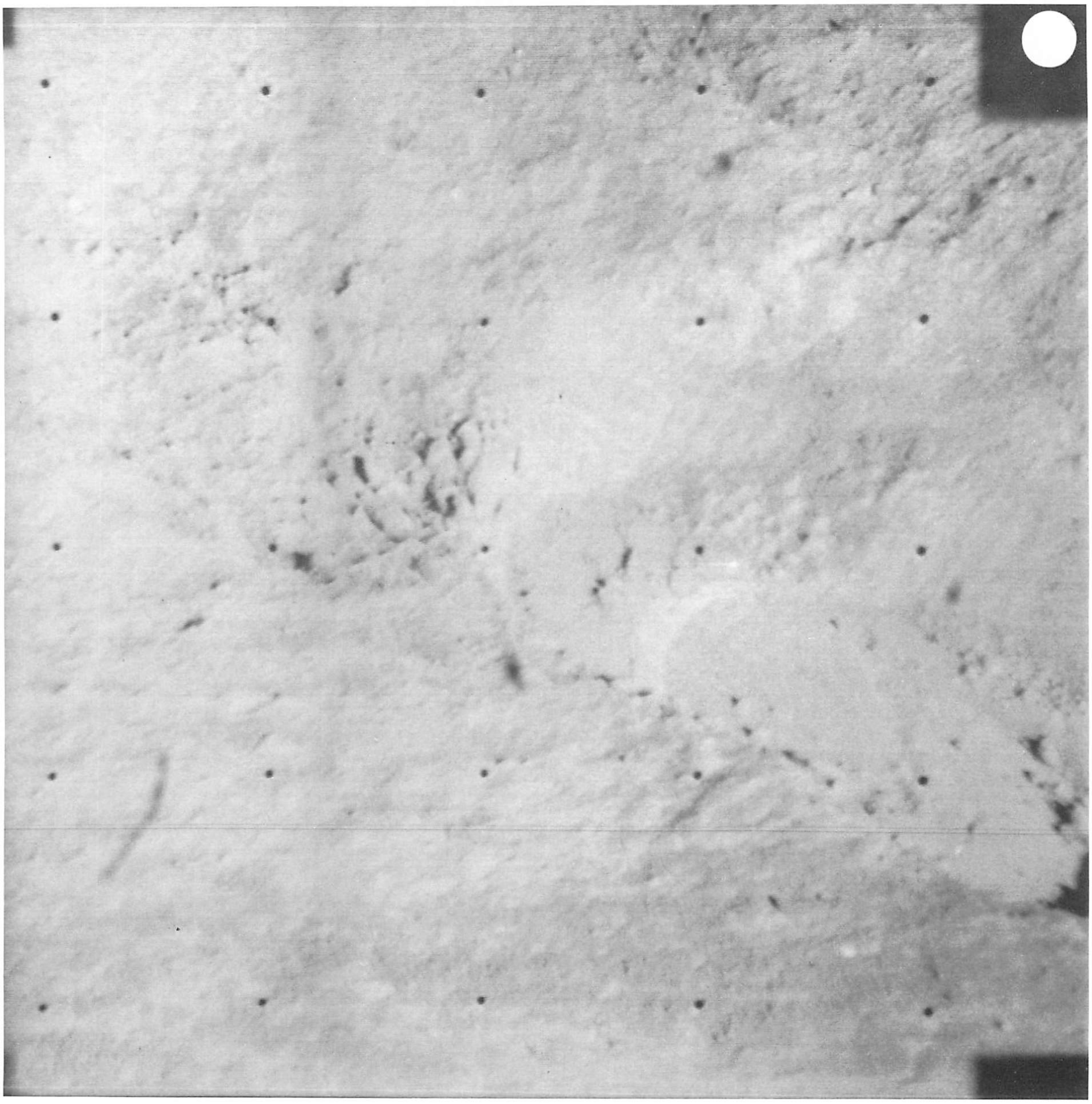
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(105)	**Day 325, 13:24:02**	**—87**	**—15**	**20.1**	***f*/7.0**	**N**	**Vertical**



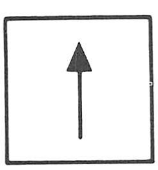


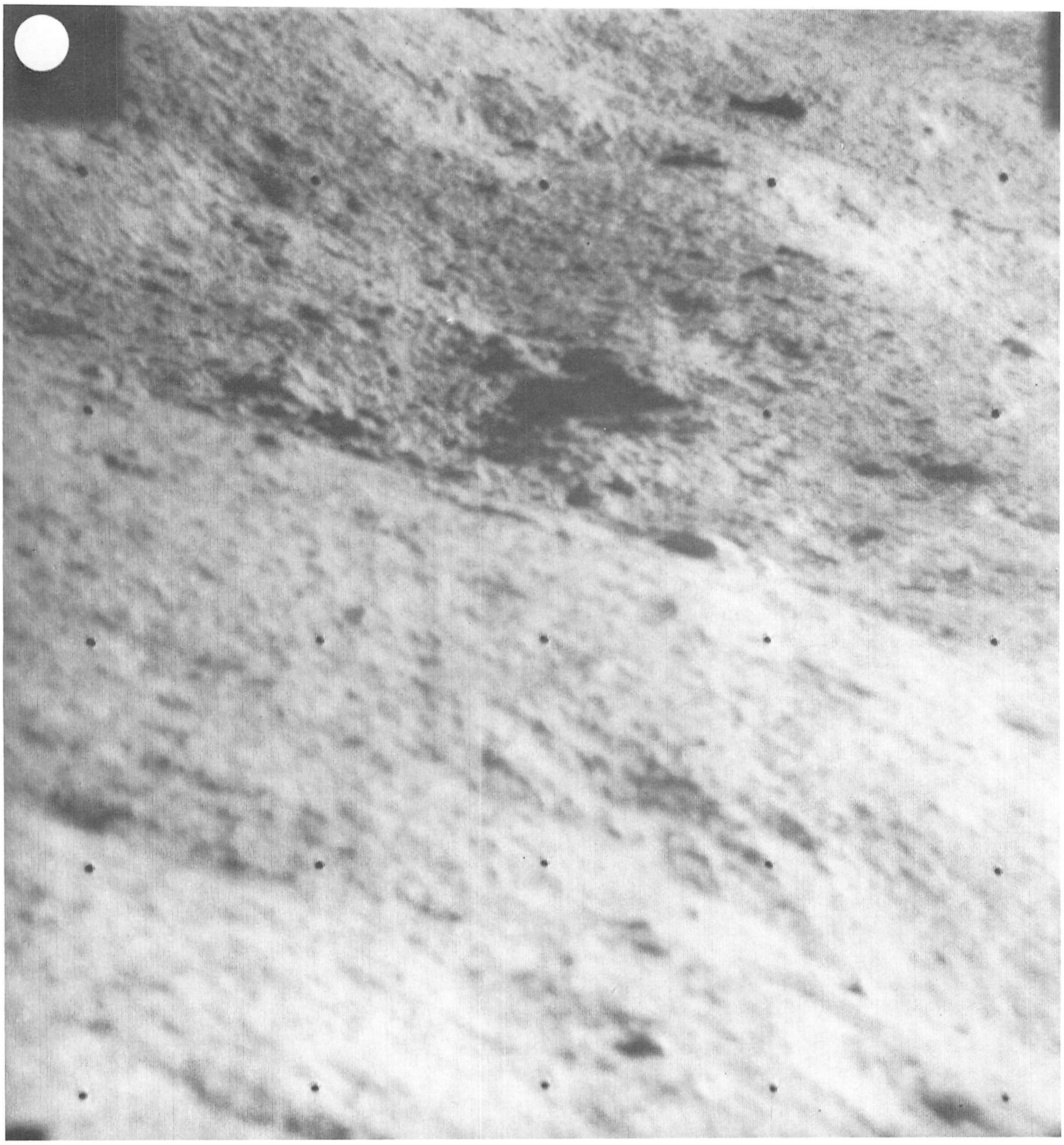
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(106)	**Day 325, 15:06:03**	**12**	**—30**	**2.7**	***f*/9.4**	**N**	**Clear**



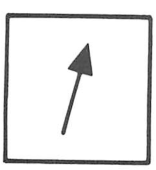


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(107)	**Day 325, 15:06:20**	**9**	**—25**	**2.9**	***f*/9.4**	**N**	**Clear**

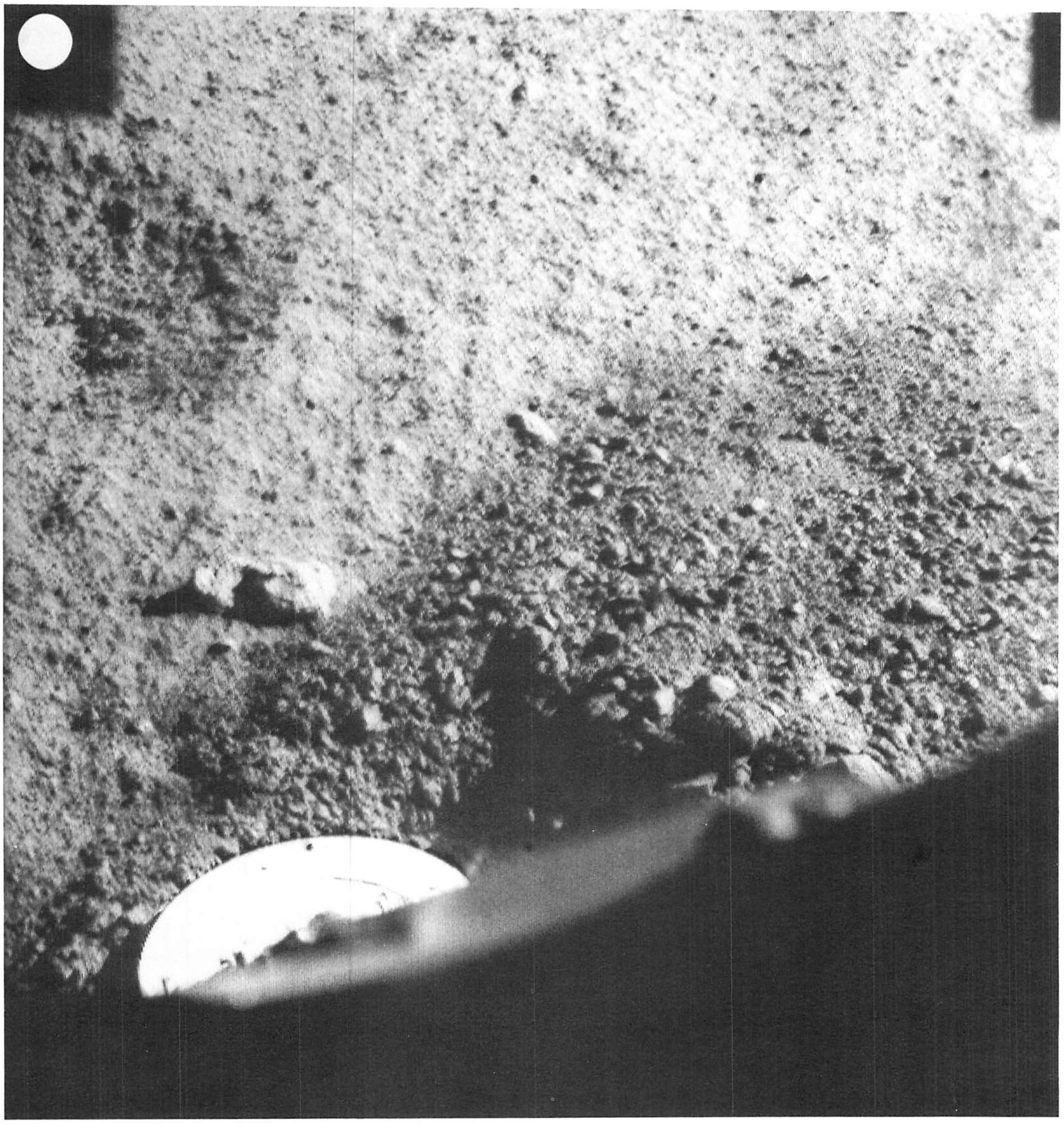




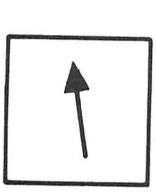
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(108)	**Day 326, 07:33:32**	**—105**	**—20**	**27.9**	**f/6.1**	**N**	**Clear**

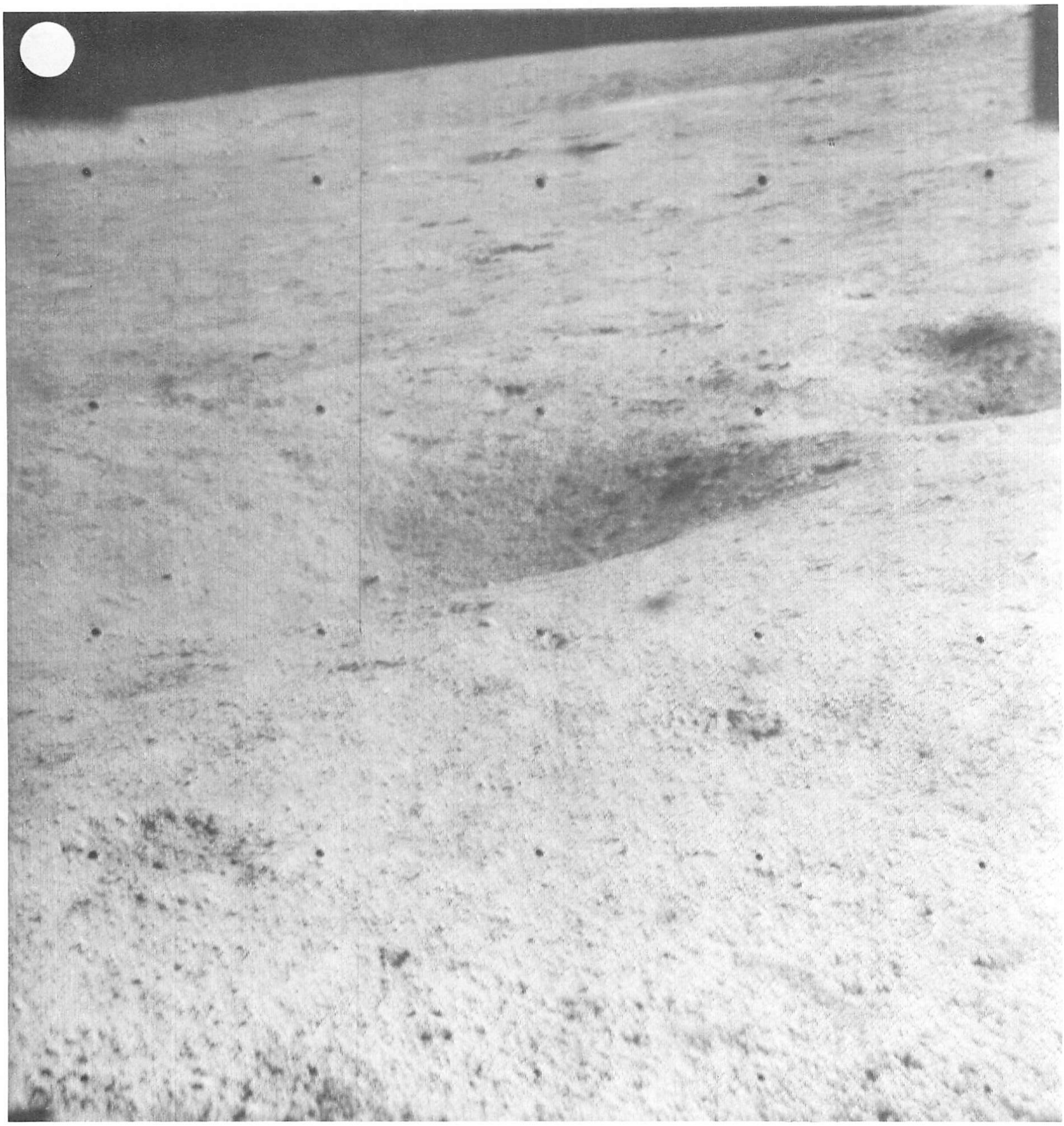


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(109)	**Day 326, 08:27:32**	**−72**	**−65**	**2.4**	***f*/7.4**	**W**	**Clear**

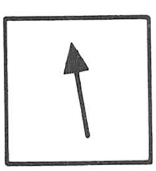


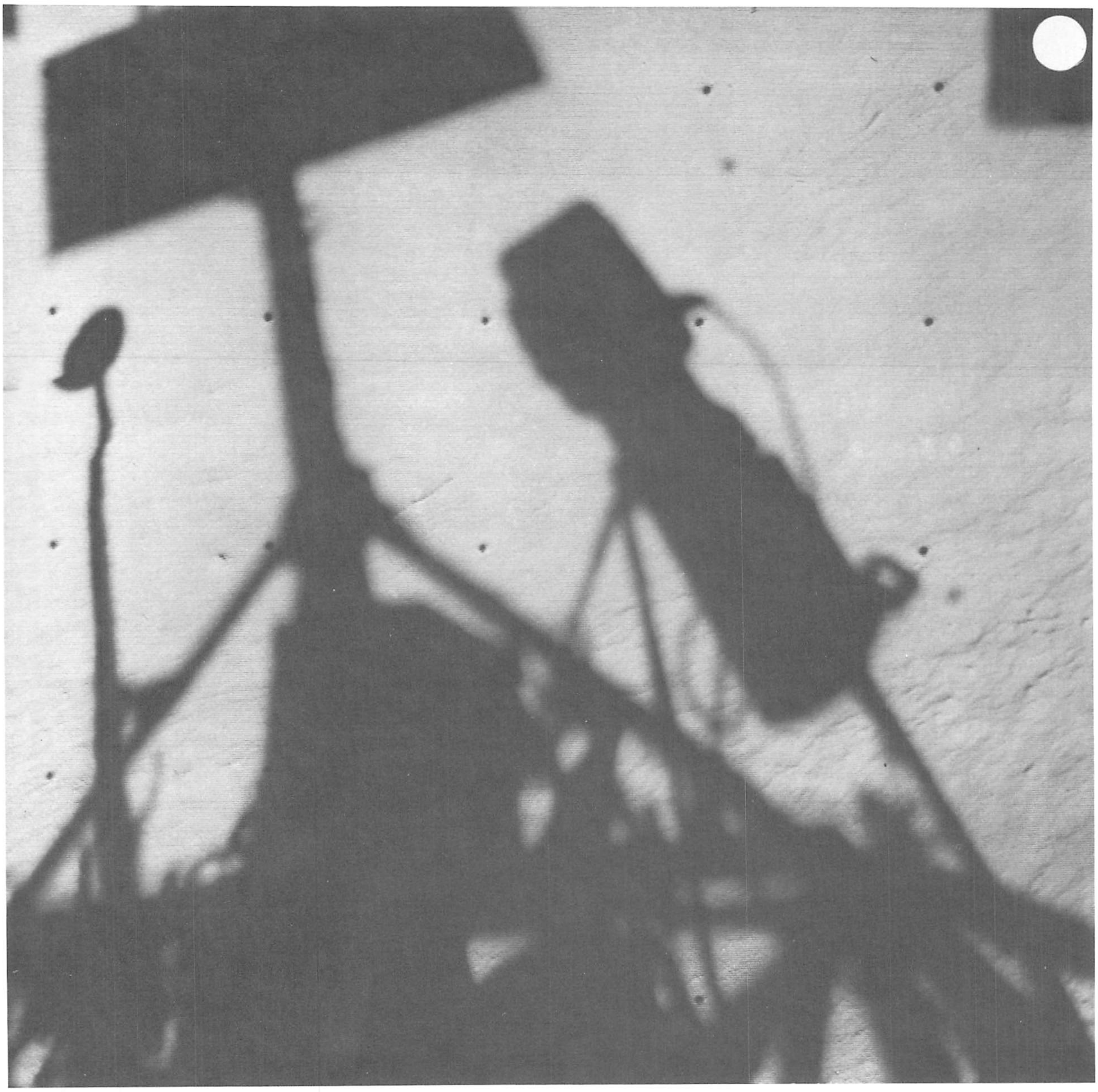
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(110)	Day 326, 08:27:38	—72	—50	2.4	f/7.4	W	Clear



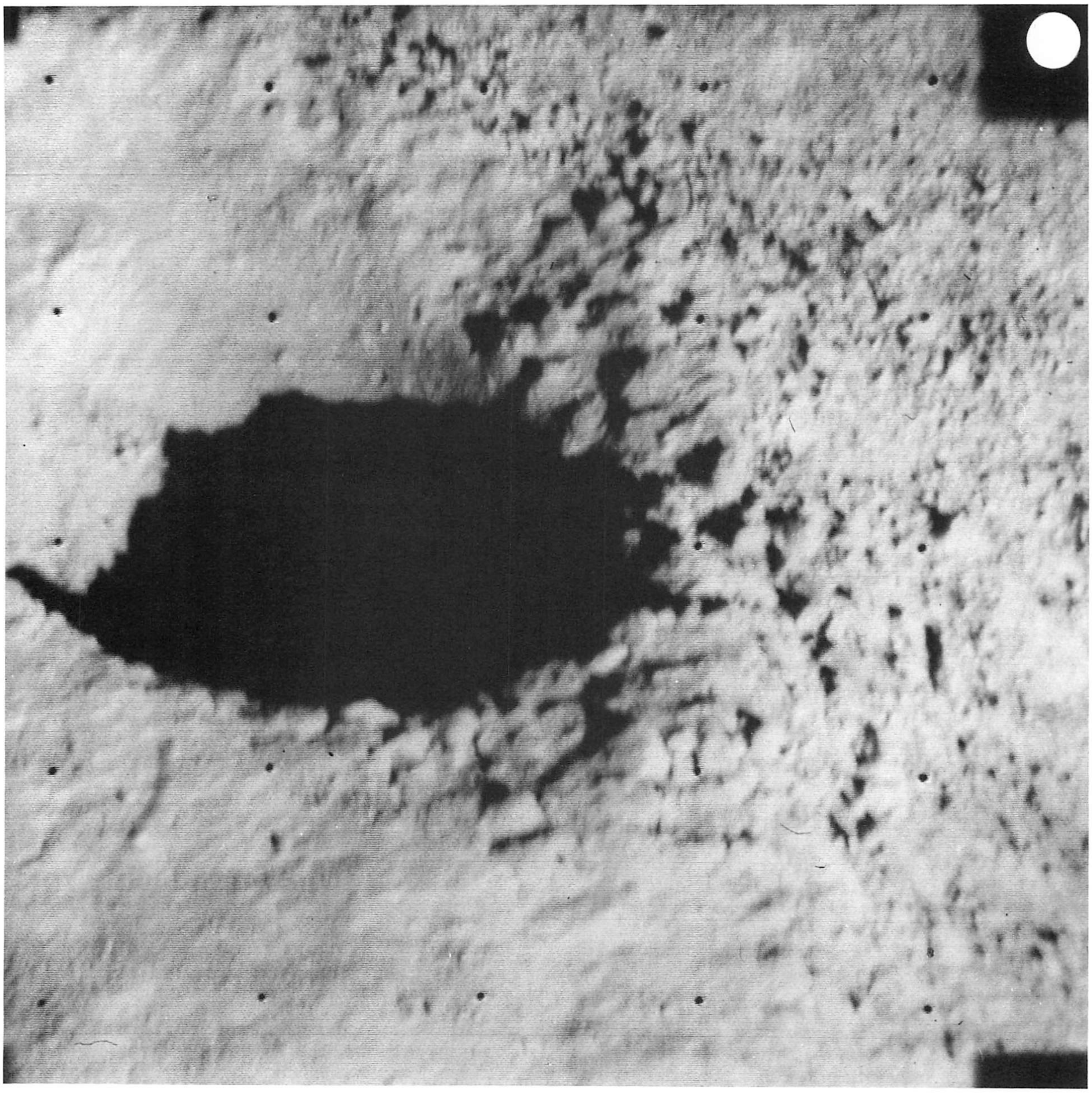


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(111)	**Day 326, 08:27:47**	**—72**	**—20**	**2.4**	**f/7.4**	**W**	**Clear**

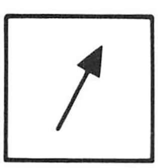


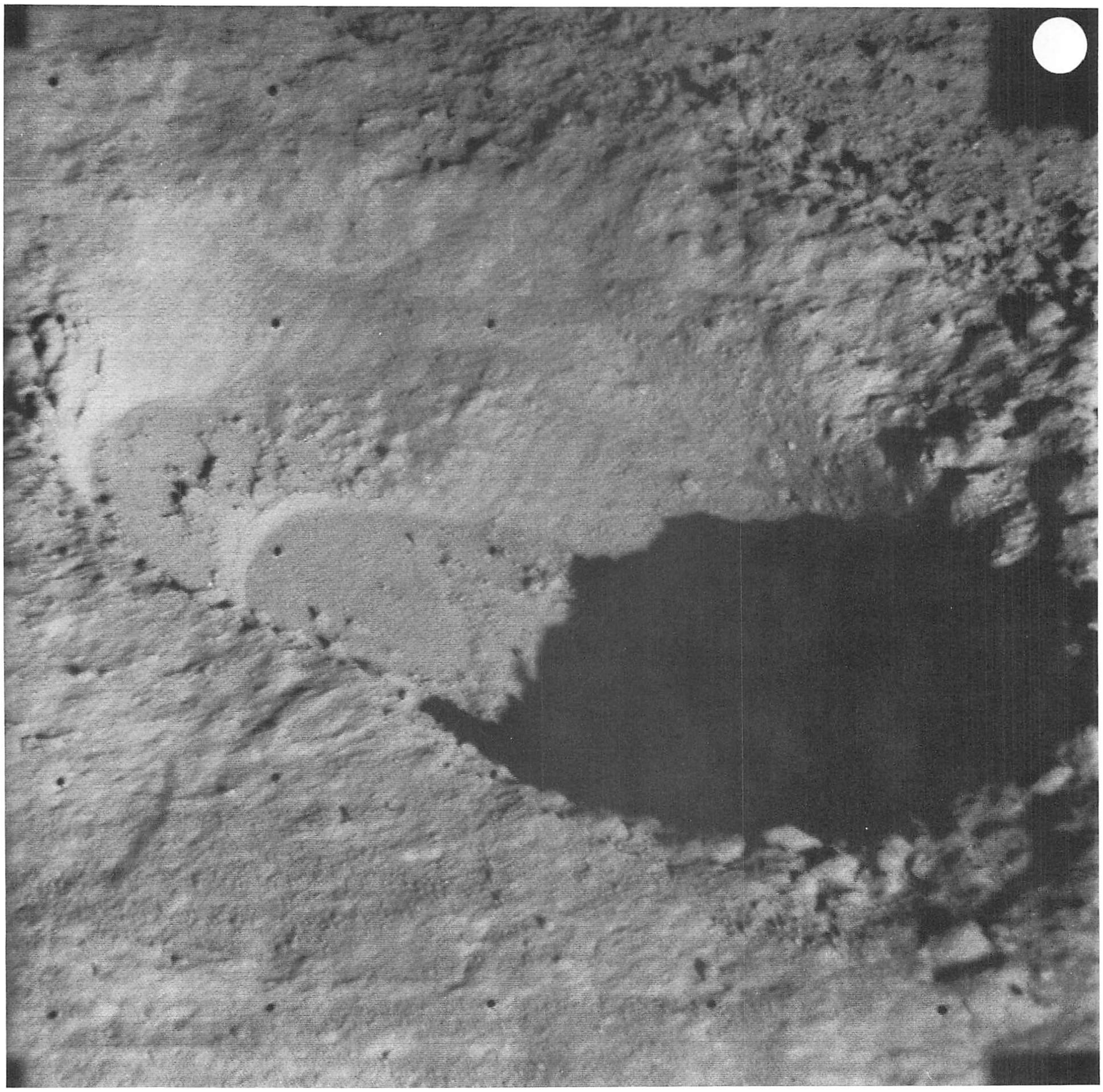


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(112)	**Day 326, 08:30:54**	**36**	**—20**	**2.4**	***f*/8.7**	**W**	**Clear**

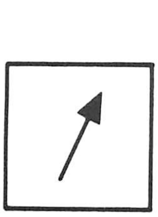


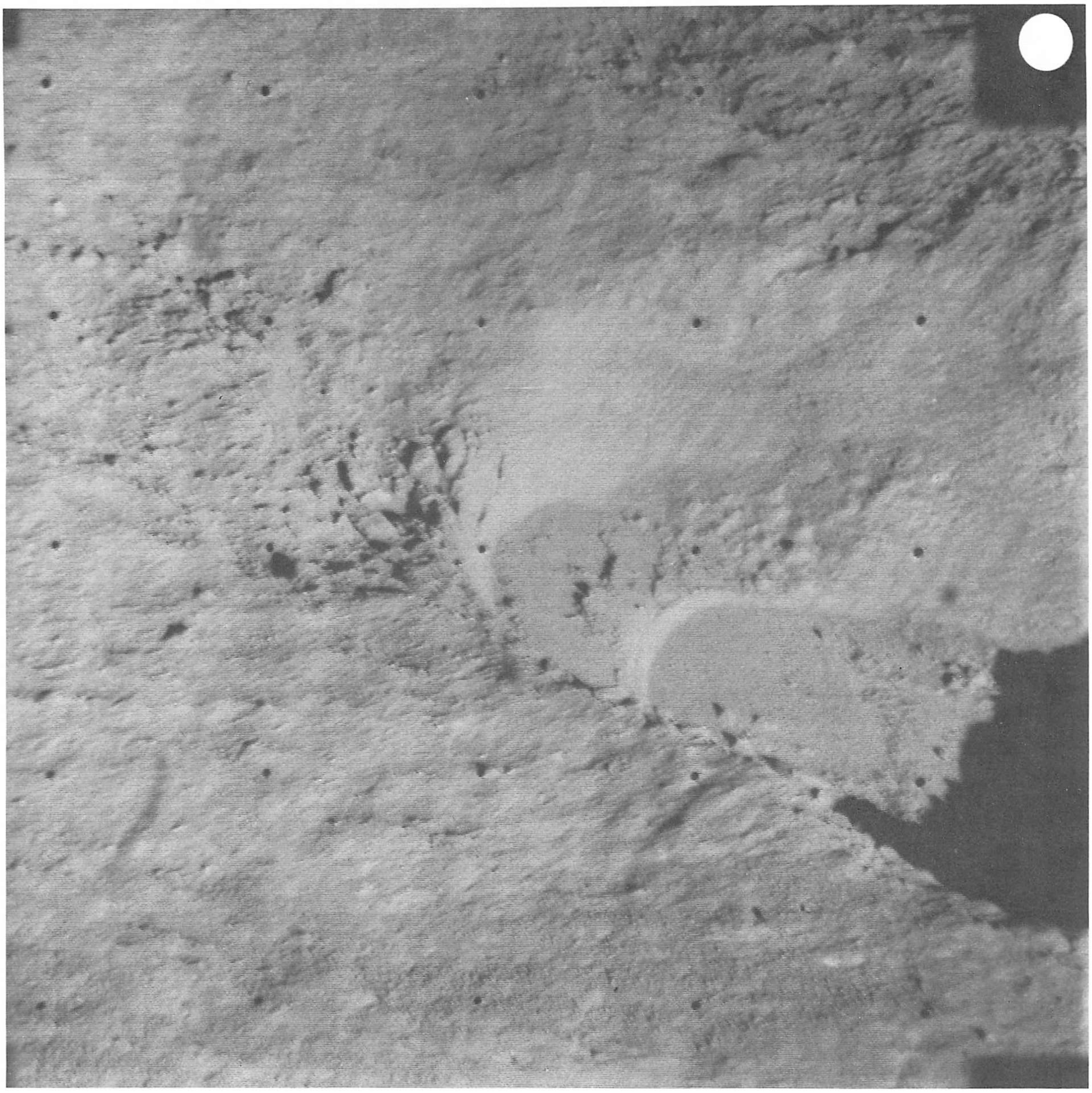
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(113)	Day 326, 09:36:01	—15	—25	3.3	*f*/8.7	N	Clear



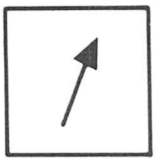


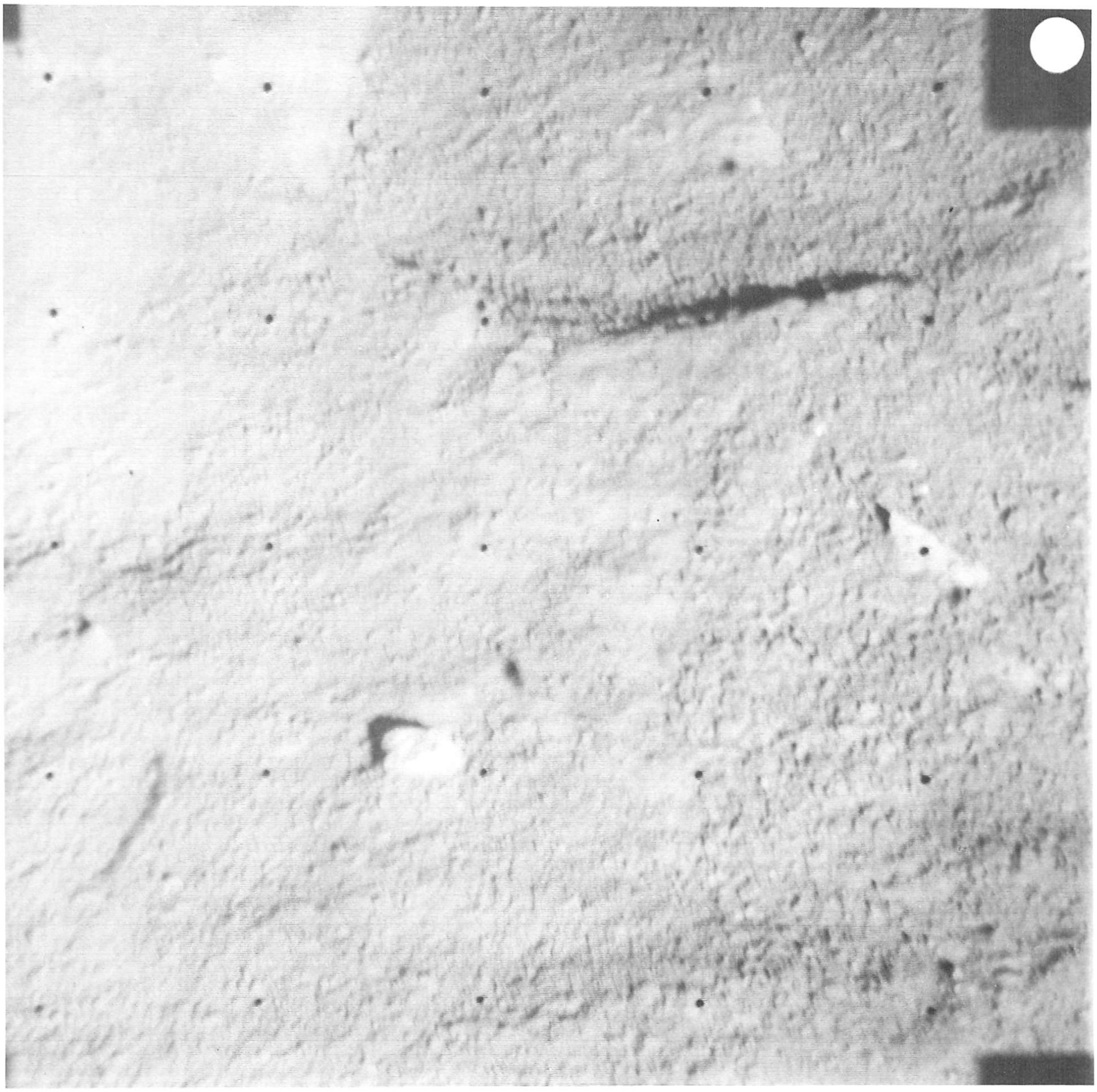
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(114)	**Day 326, 09:37:54**	**—12**	**—25**	**3.4**	***f*/8.7**	**N**	**Vertical**



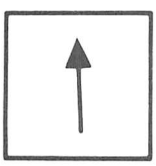


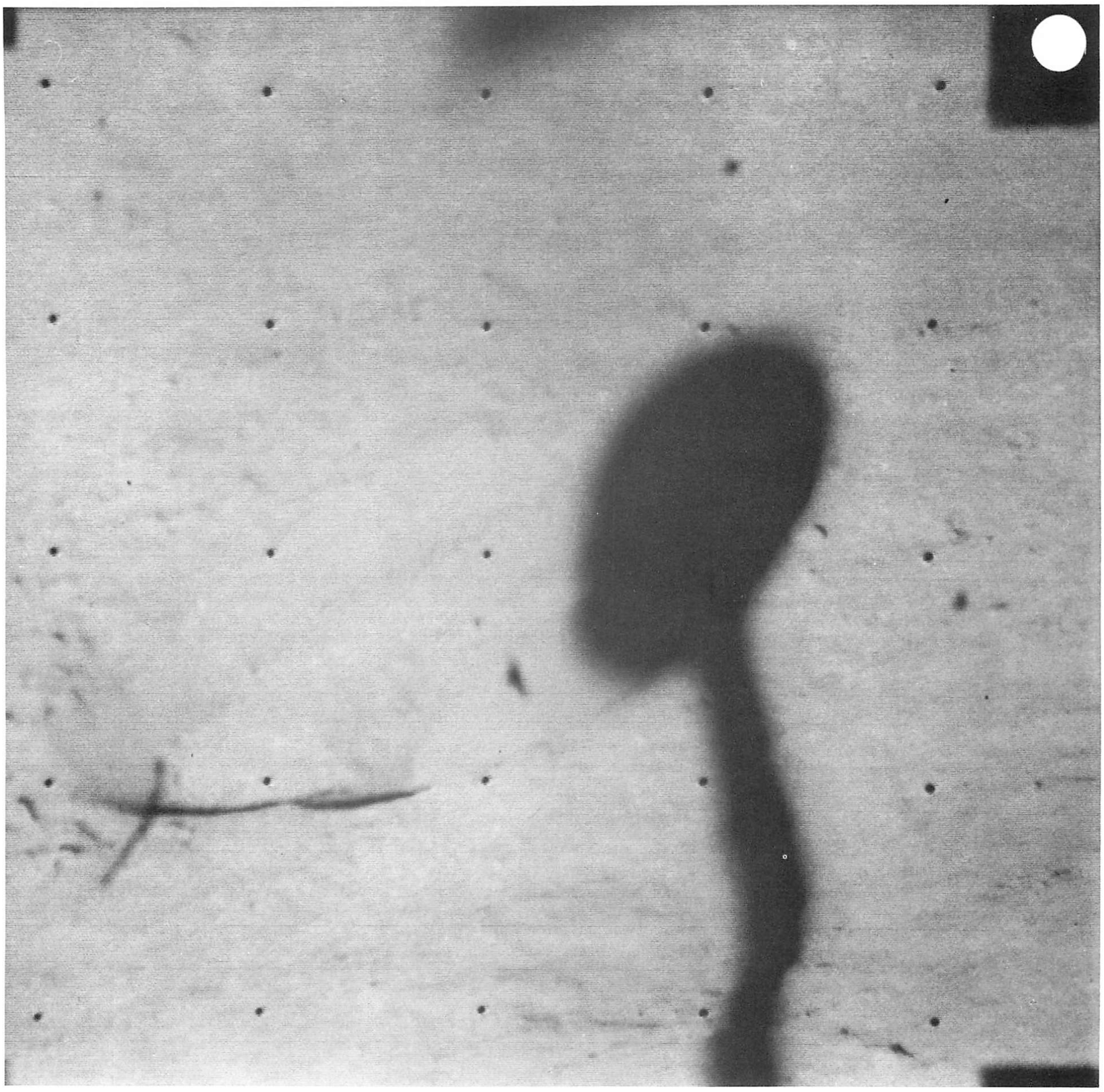
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(115)	**Day 326, 09:39:15**	**—9**	**—25**	**3.1**	***f*/8.7**	**N**	**Vertical**



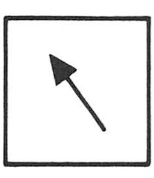


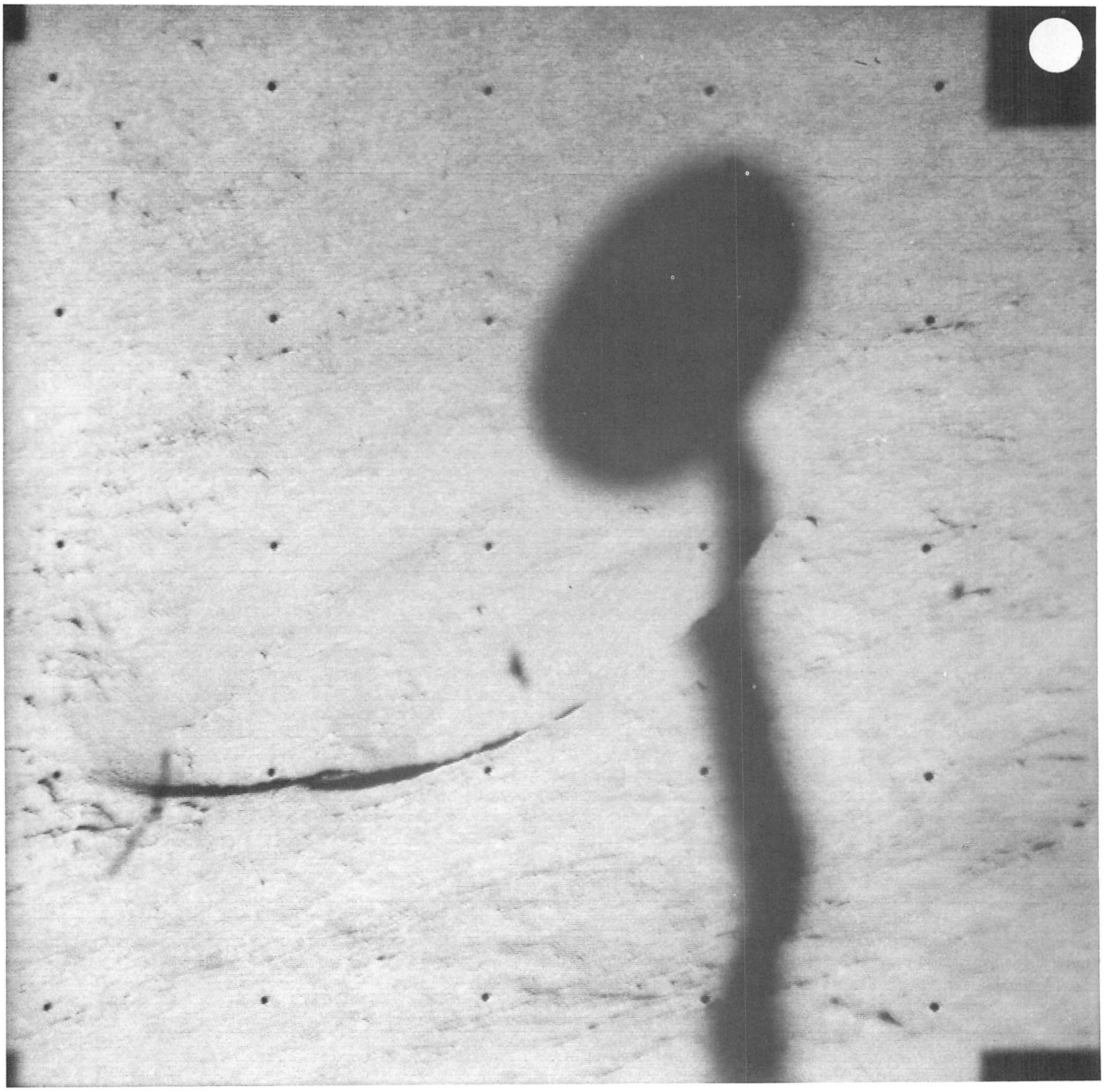
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(116)	**Day 326, 09:58:45**	**12**	**—30**	**2.6**	***f*/10.6**	**N**	**Clear**



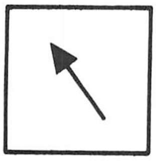


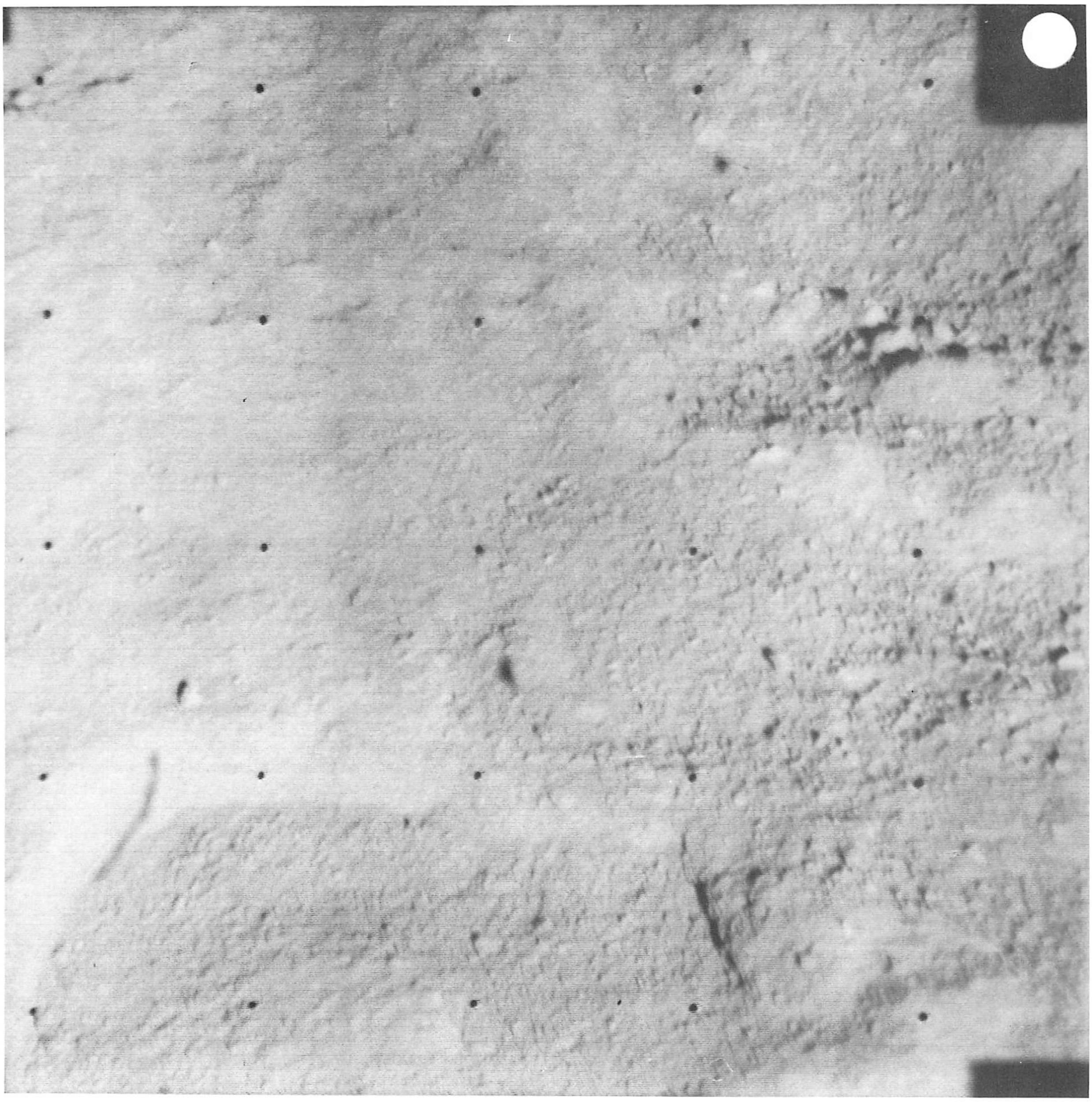
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(117)	**Day 326, 10:38:56**	**42**	**−10**	**2.9**	***f*/10.6**	**N**	**Clear**



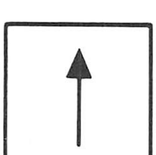


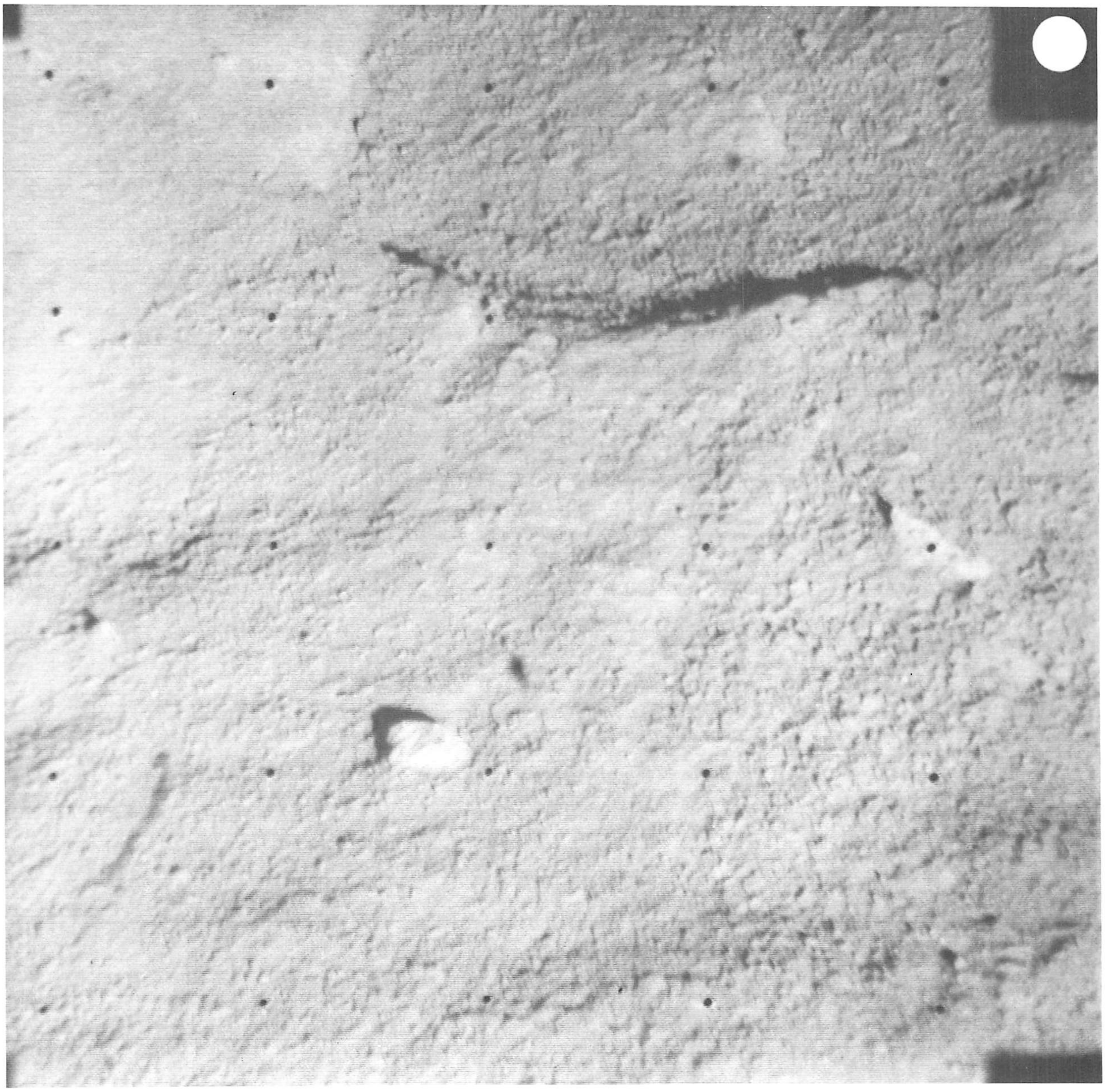
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(118)	**Day 326, 14:21:09**	**42**	**—10**	**4.7**	***f*/10.6**	**N**	**Clear**



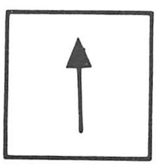


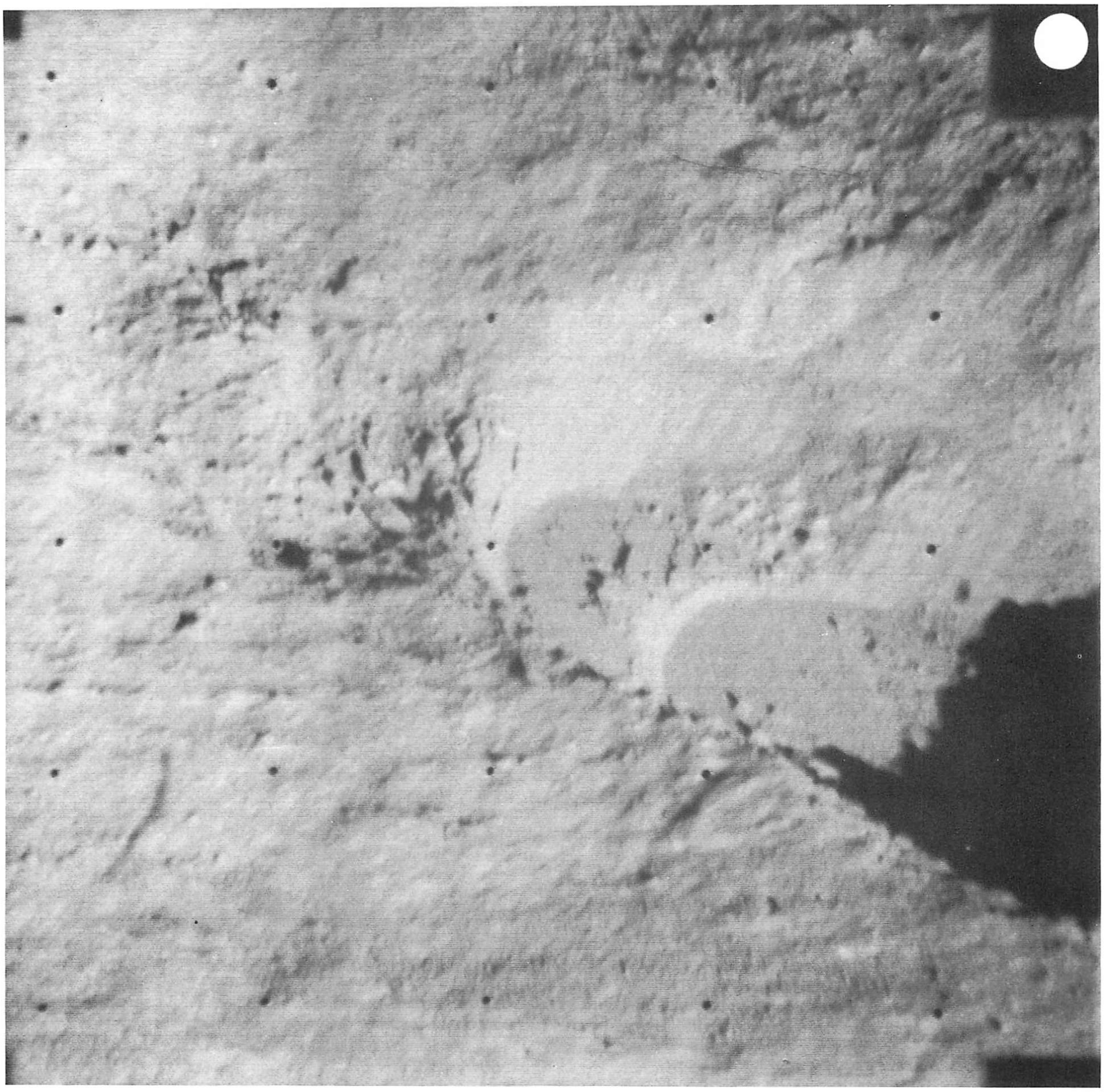
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(119)	**Day 326, 14:21:25**	**9**	**—25**	**2.9**	***f*/10.6**	**N**	**Clear**



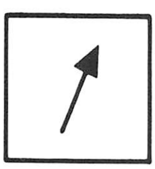


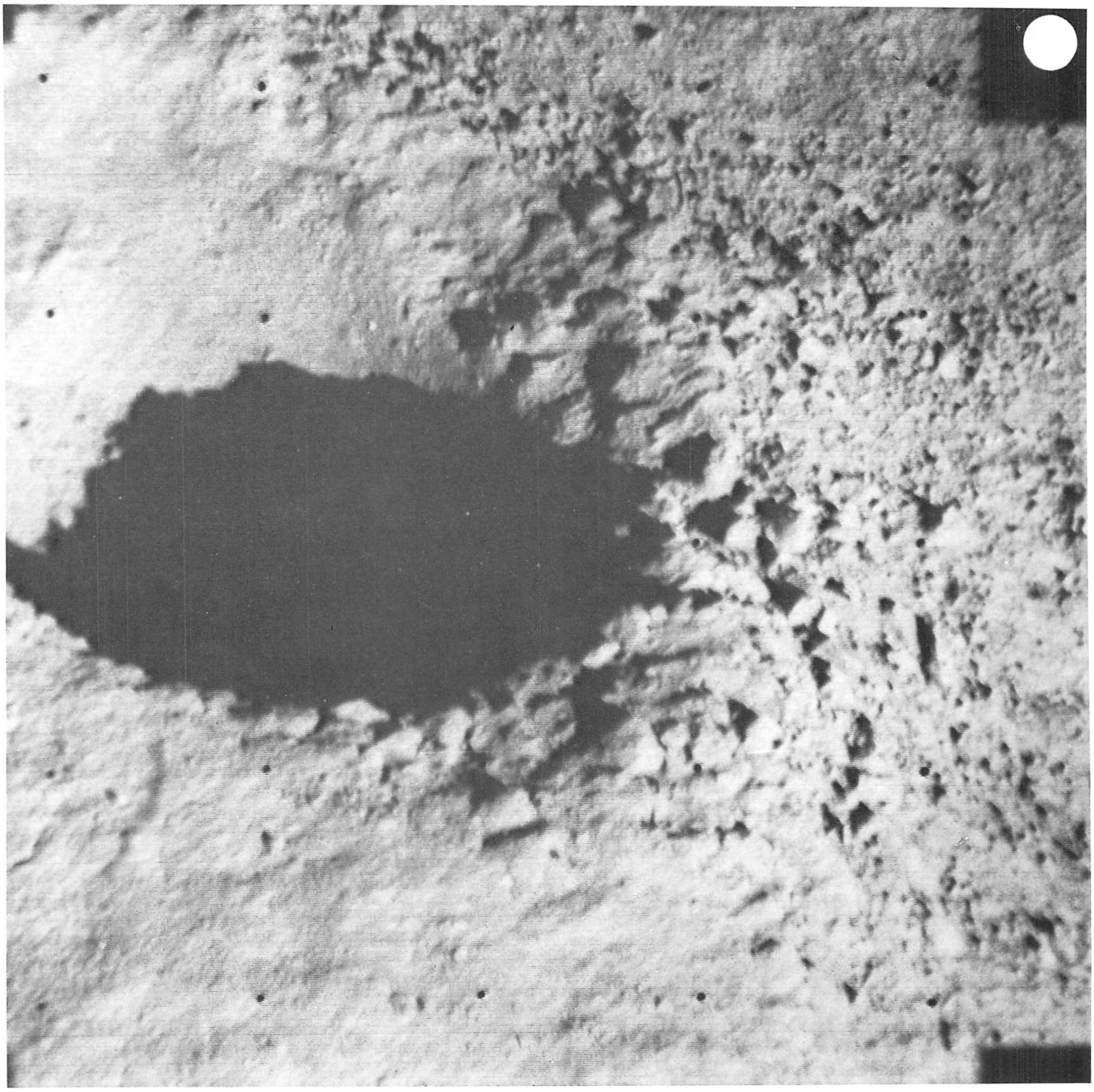
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(120)	**Day 326, 14:21:30**	**12**	**—30**	**2.7**	**f/10.6**	**N**	**Clear**



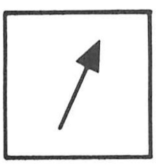


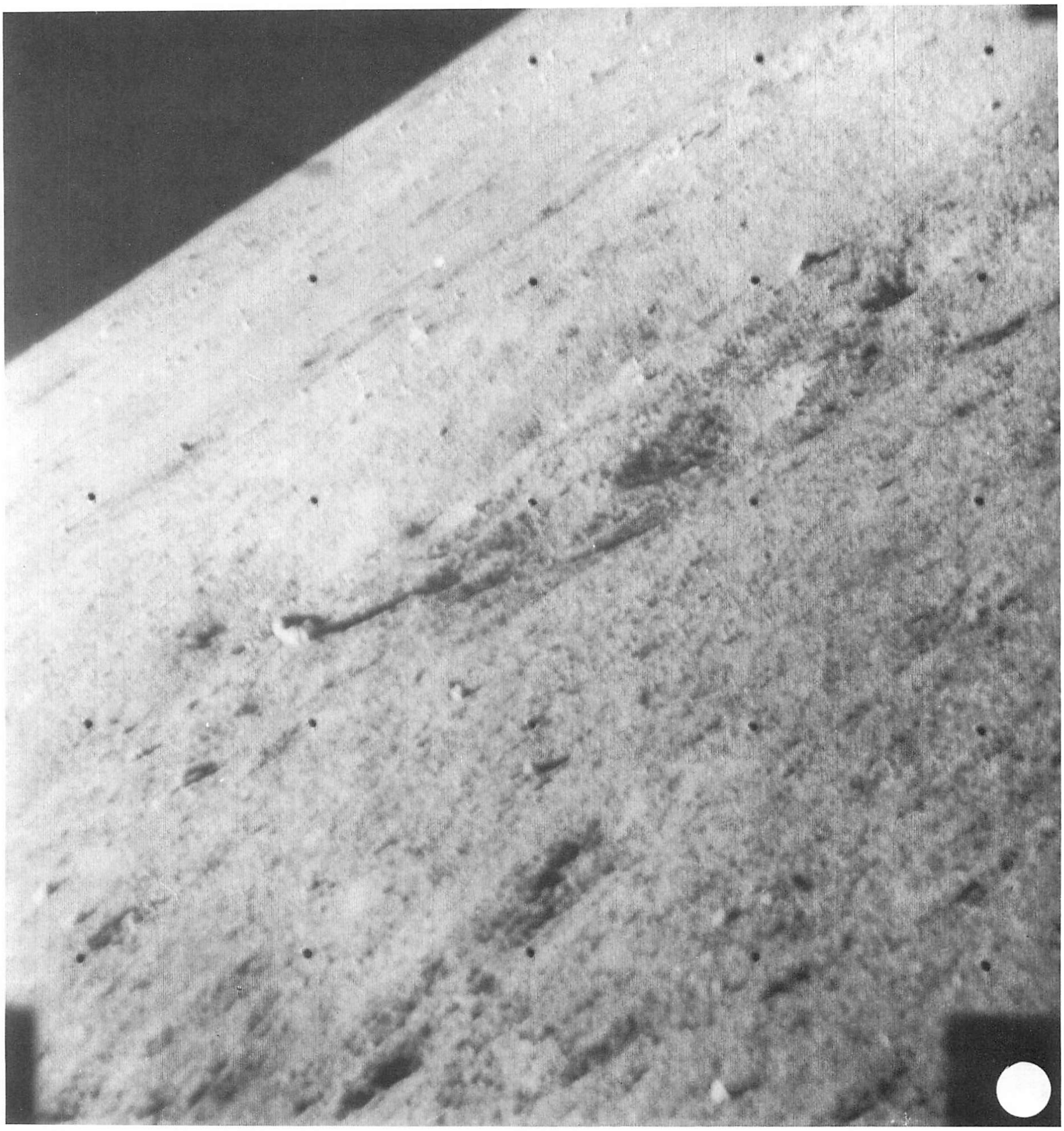
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(121)	Day 326, 14:21:42	−9	−25	3.3	f/10.6	N	Clear



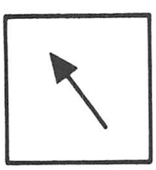


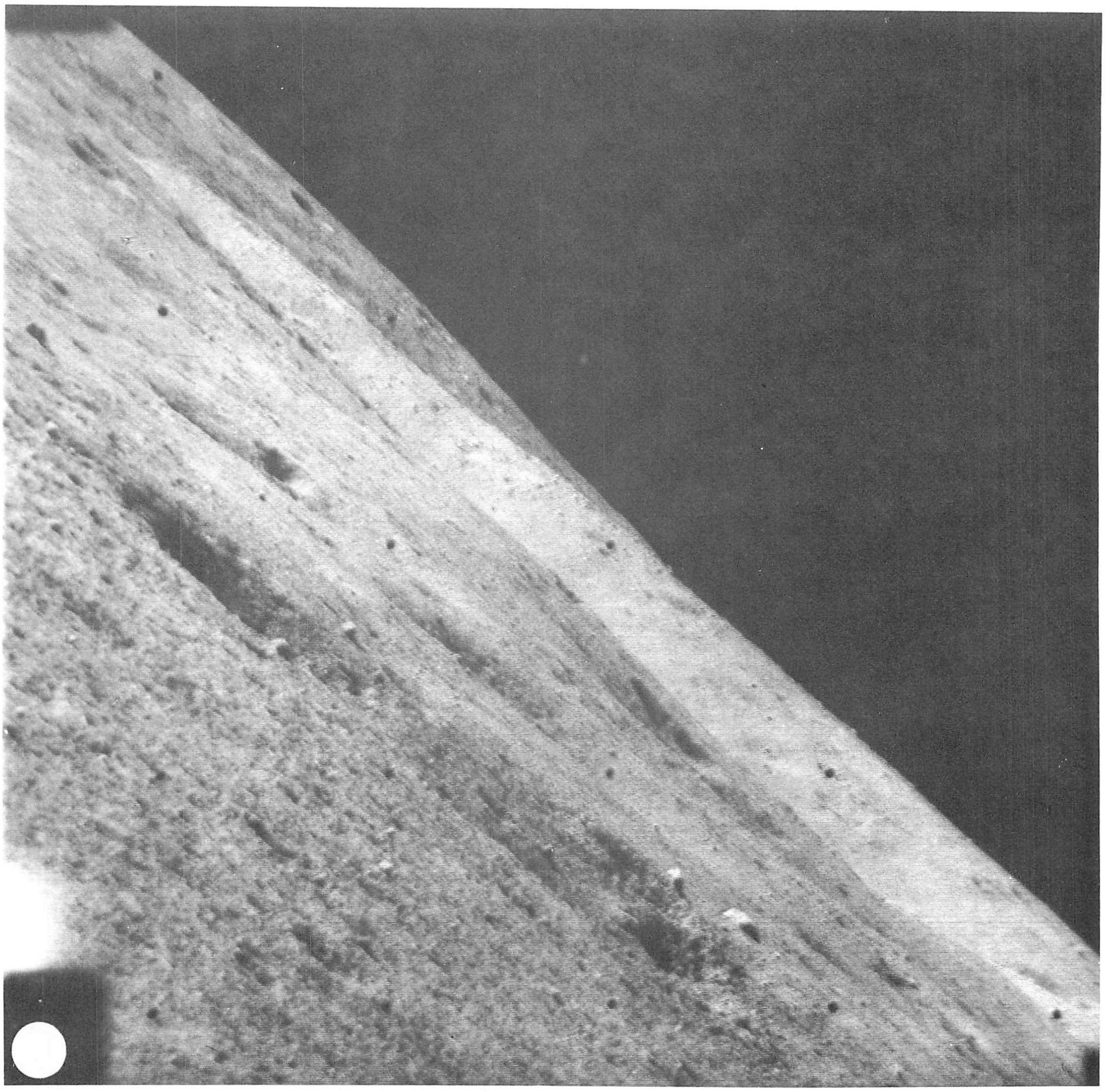
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(122)	**Day 326, 14:21:48**	**—12**	**—25**	**3.3**	**f/10.6**	**N**	**Clear**



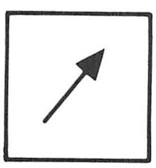


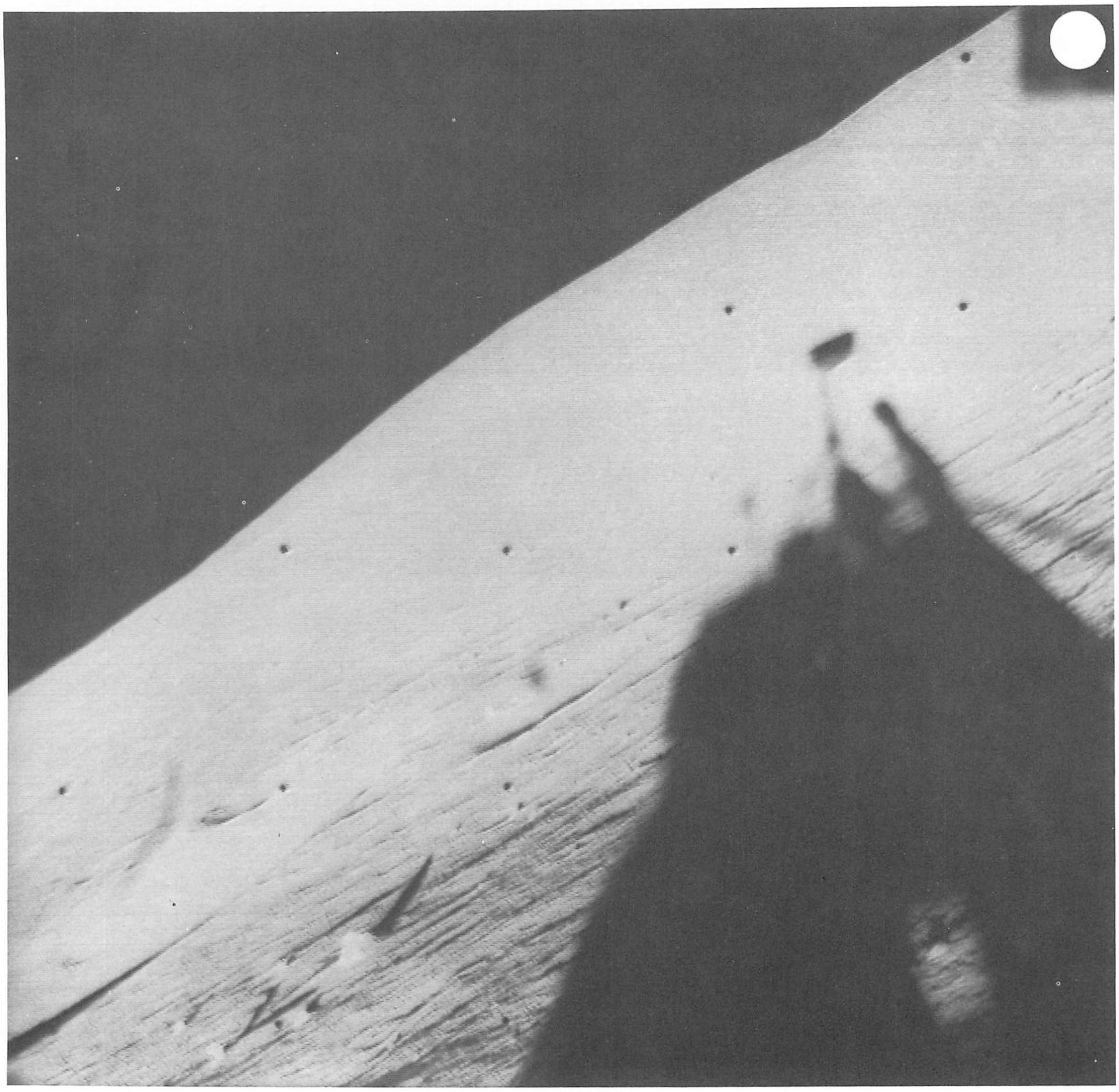
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(123)	**Day 326, 17:21:57**	**117**	**5**	**27.8**	***f*/7.8**	**N**	**Clear**



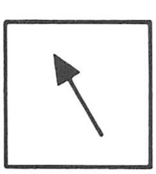


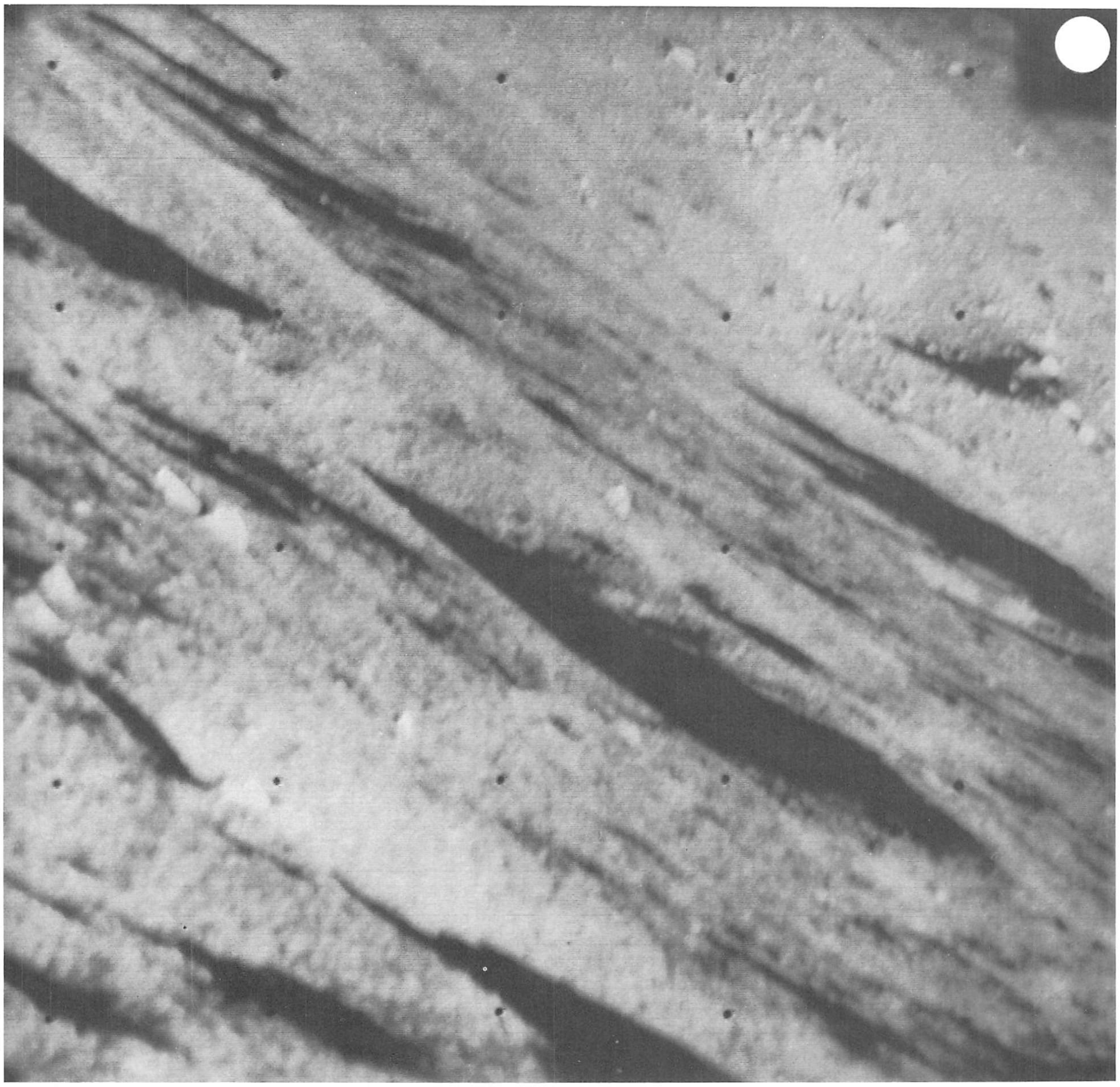
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(124)	**Day 326, 17:41:56**	**129**	**5**	**27.9**	**f/7.8**	**N**	**Clear**



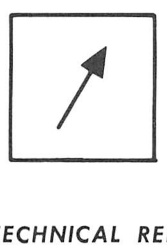


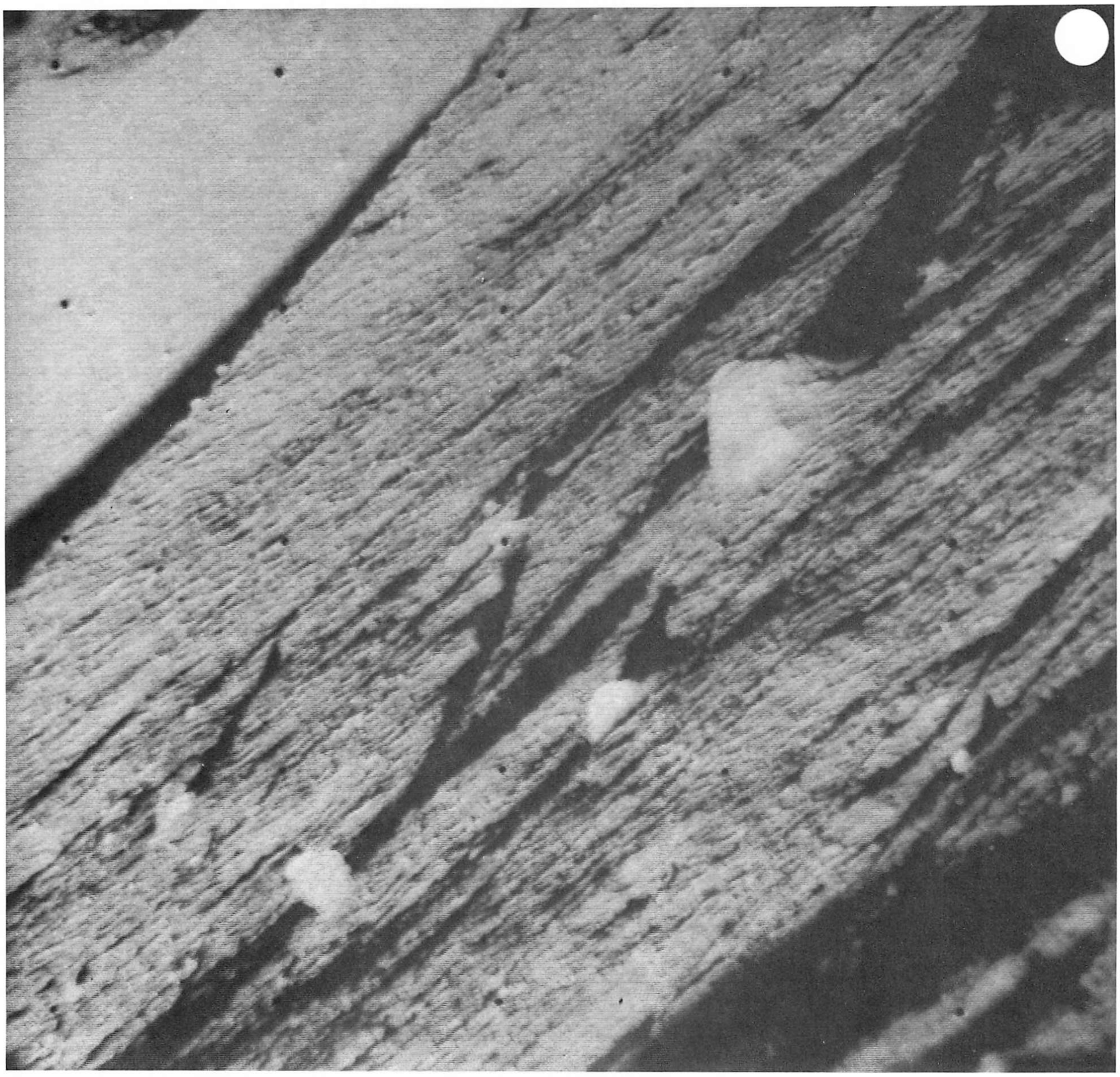
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(125)	**Day 328, 08:04:59**	**36**	**10**	**3.1**	***f*/6.7**	**W**	**Clear**



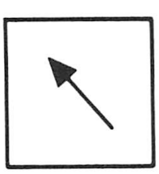


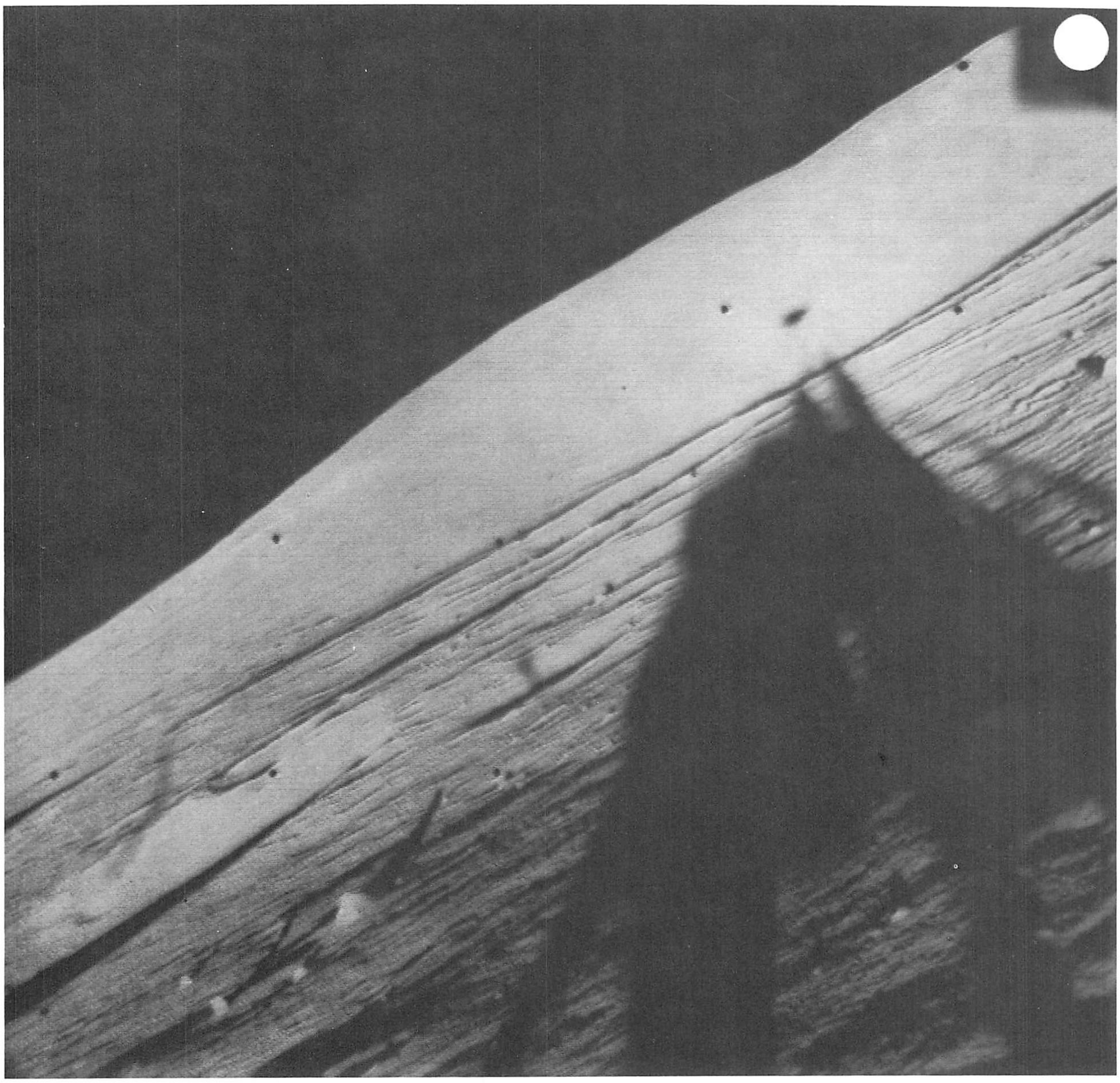
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(126)	**Day 328, 09:12:49**	**—18**	**0**	**28.0**	**f/5.8**	**N**	**Clear**



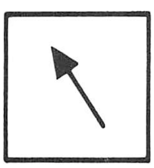


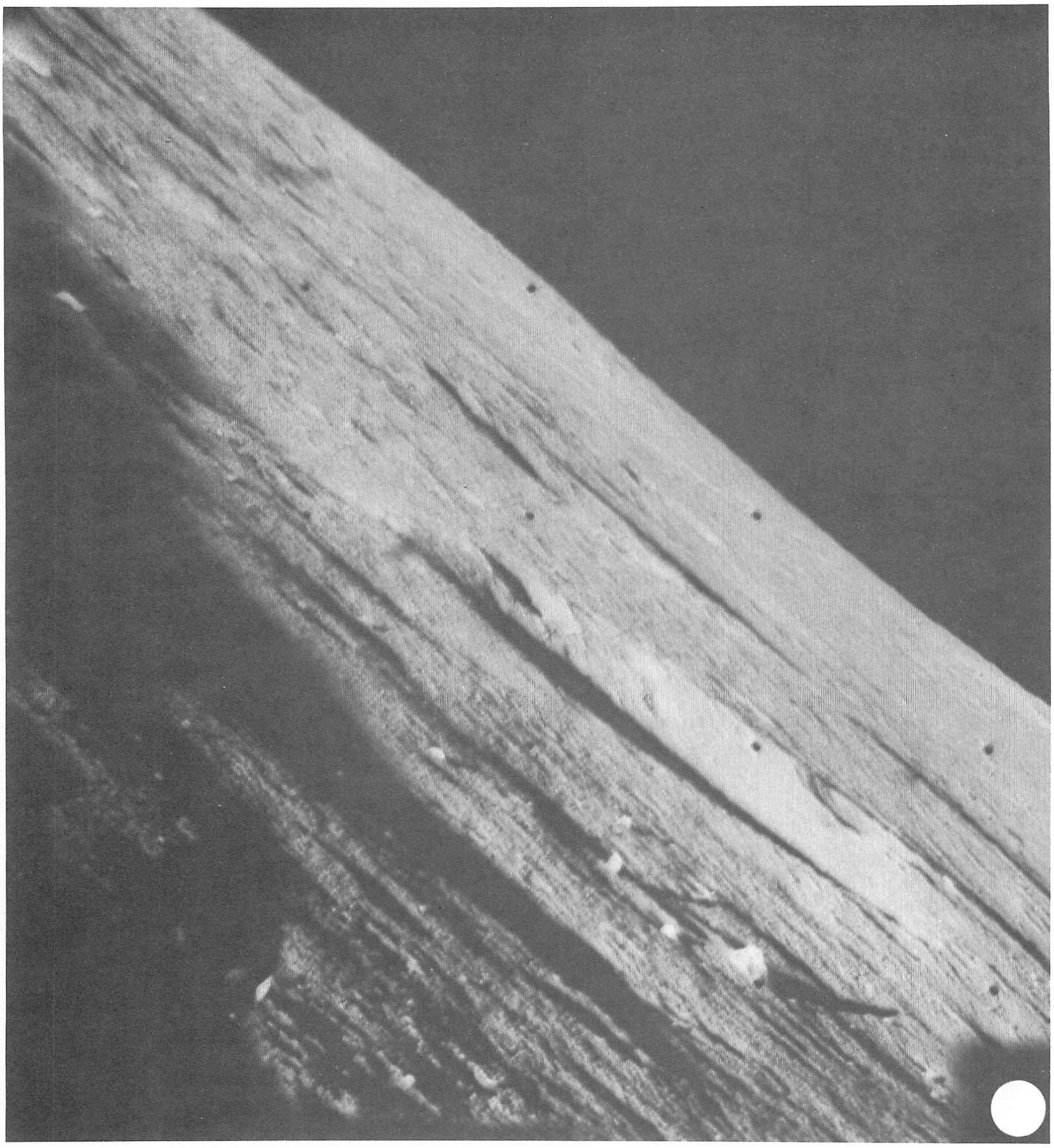
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(127)	**Day 328, 09:53:47**	**45**	**5**	**14.8**	***f*/7.8**	**N**	**Clear**



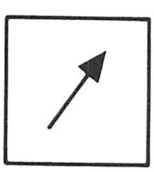


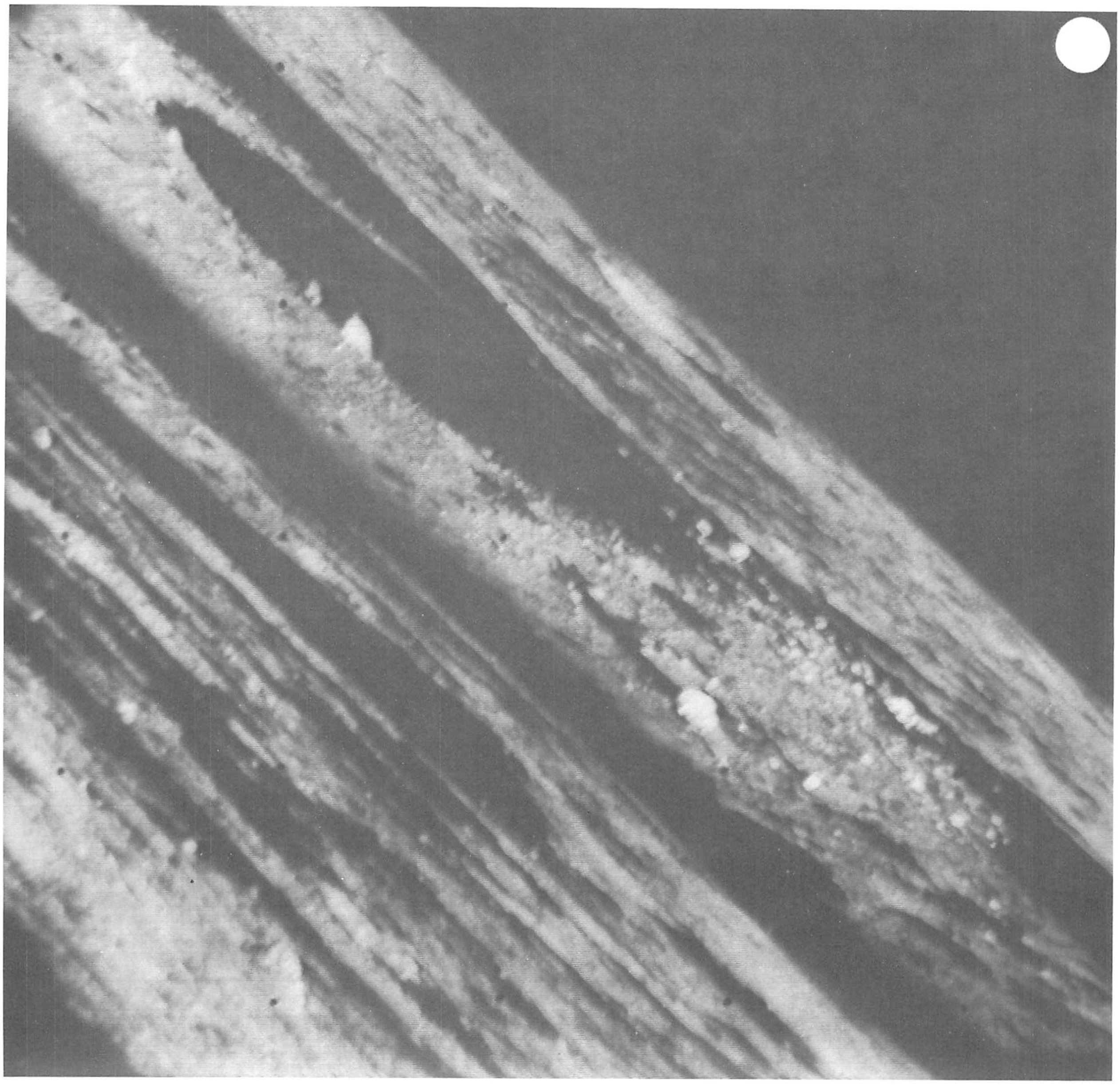
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(128)	**Day 328, 11:14:14**	**36**	**10**	**28.0**	**f/7.8**	**W**	**Clear**



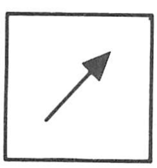


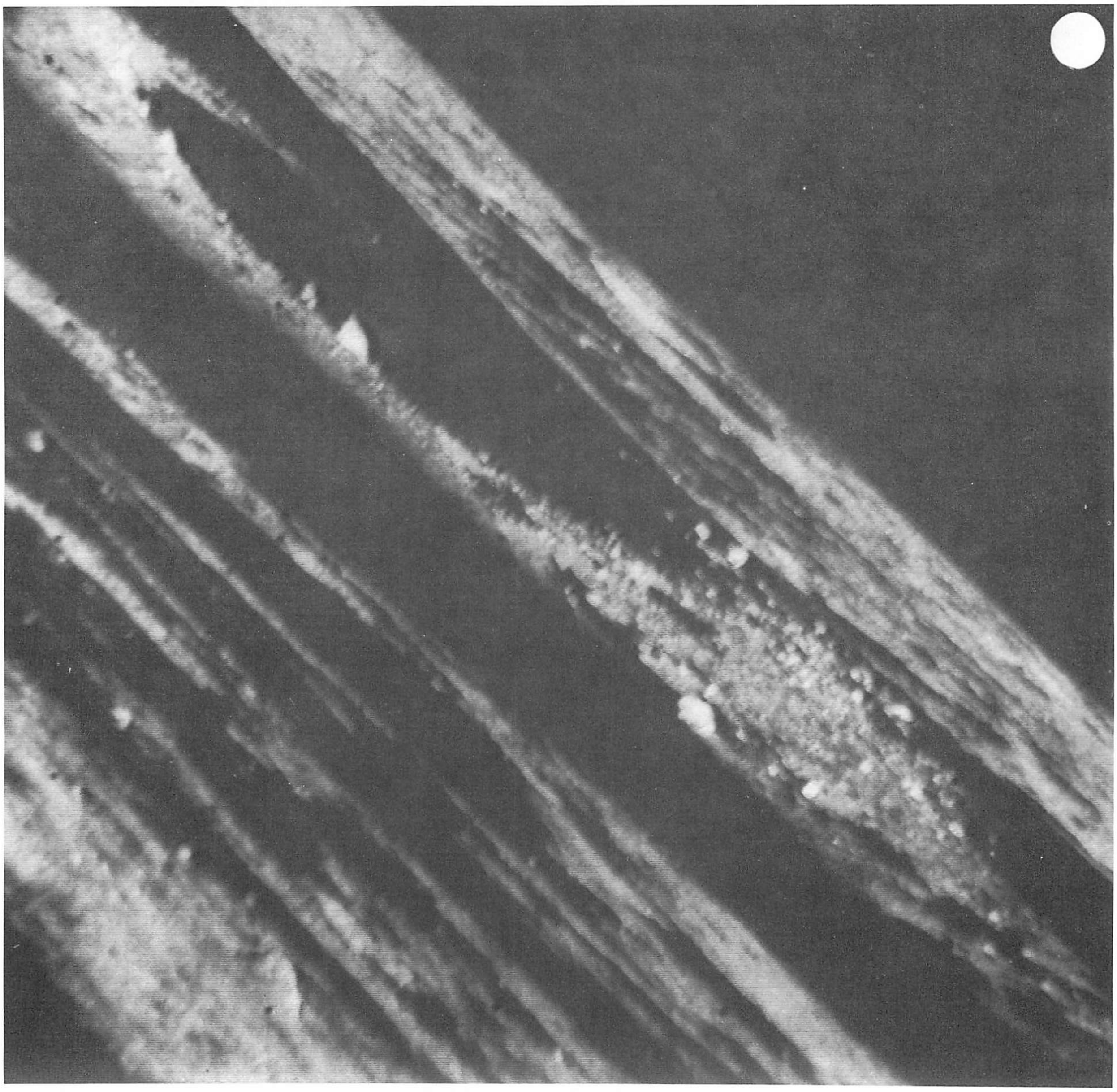
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(129)	**Day 328, 11:14:29**	**54**	**10**	**28.0**	**$f/7.8$**	**W**	**Clear**



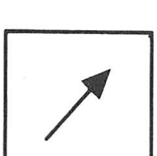


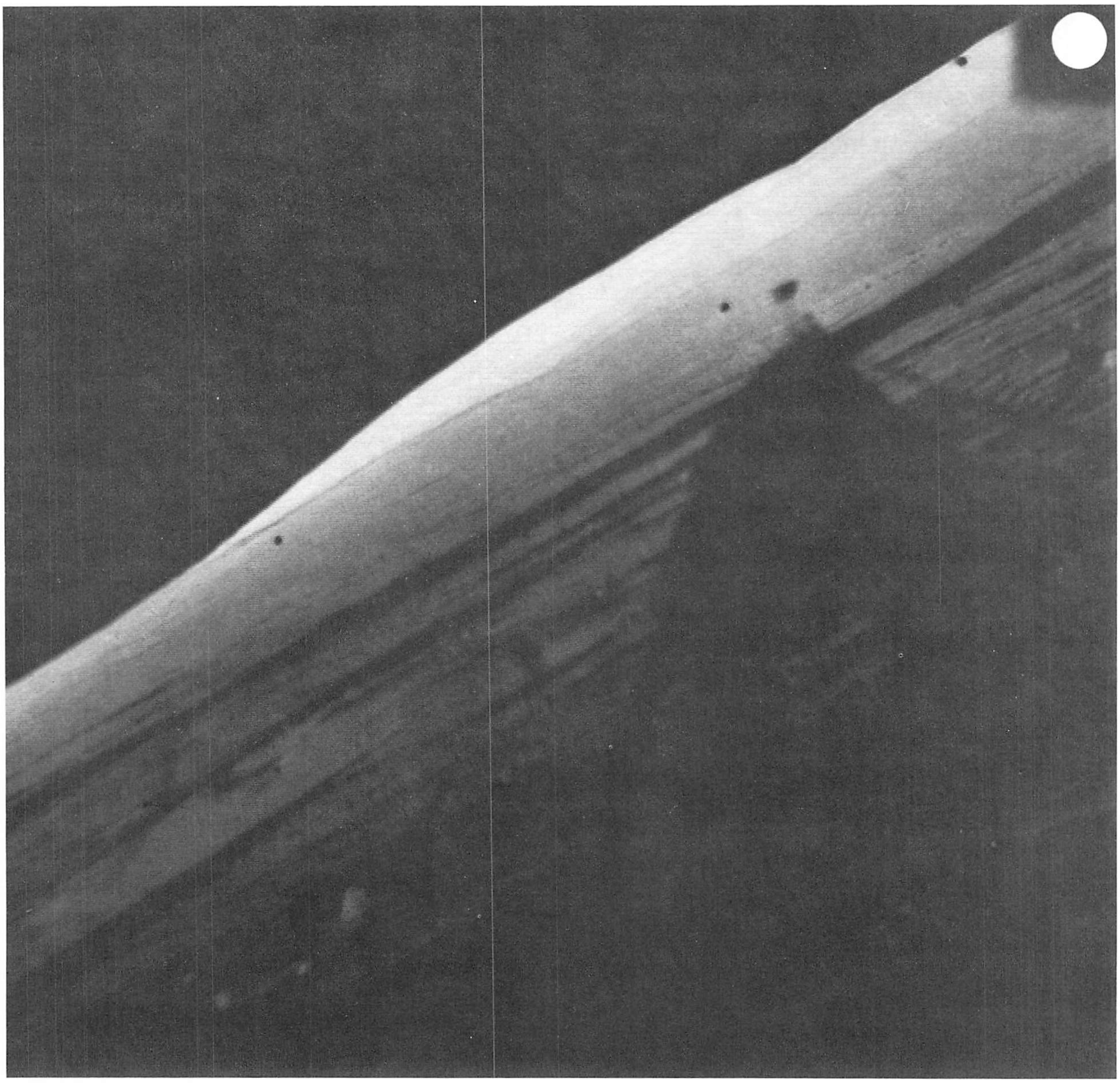
	GMT	Az	El	Focus, m	Iris	Lens	Filter
(130)	**Day 328, 11:47:30**	**—30**	**0**	**28.0**	***f*/5.8**	**N**	**Clear**



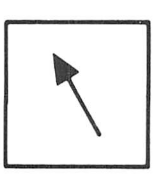


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(131)	**Day 328, 12:49:05**	**—30**	**0**	**28.0**	***f*/5.8**	**N**	**Clear**

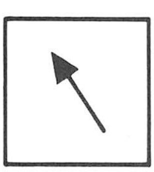


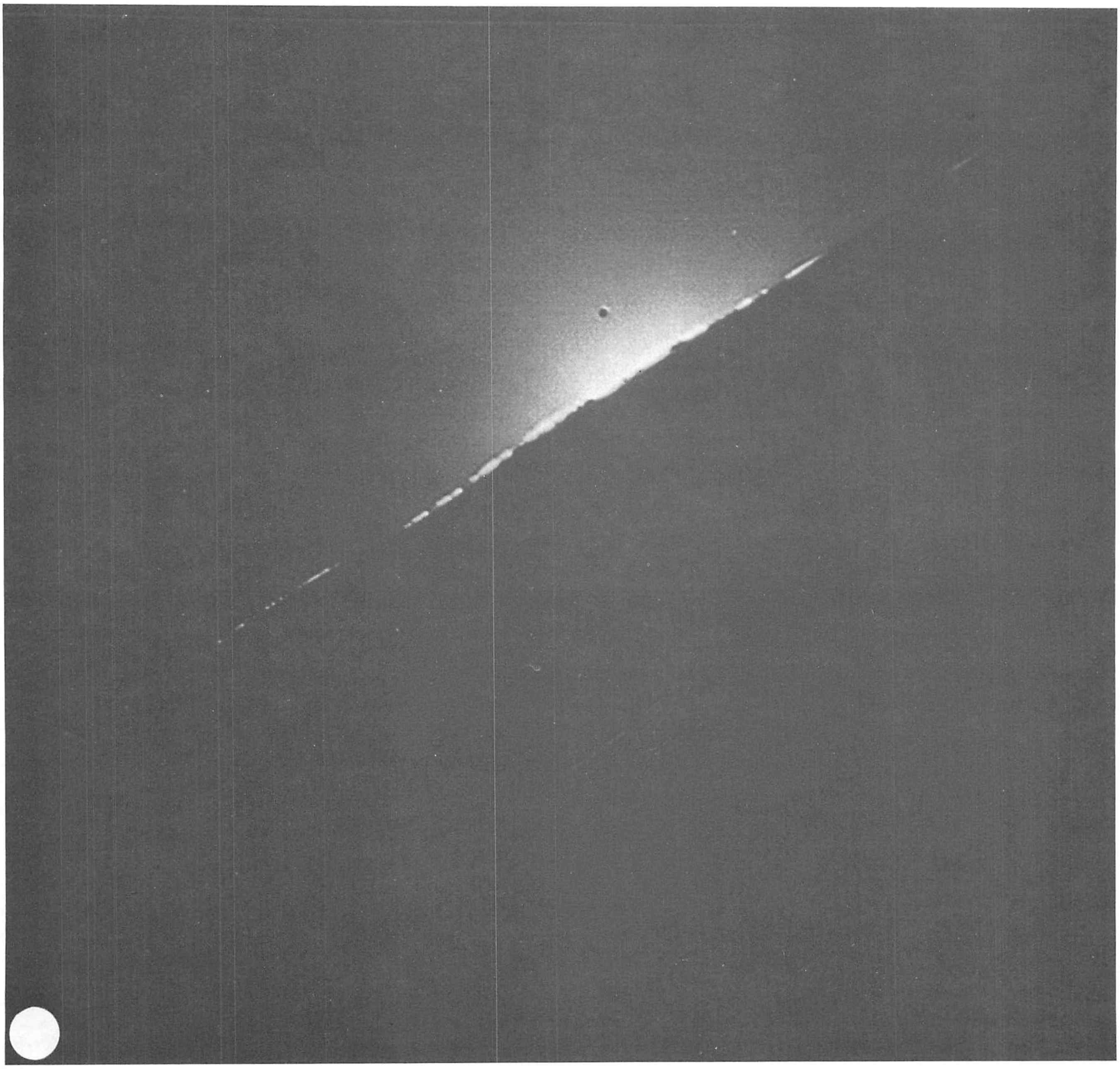


	GMT	Az	El	Focus, m	Iris	Lens	Filter
(132)	**Day 328, 13:18:47**	**36**	**10**	**28.0**	**f/6.7**	**W**	**Clear**

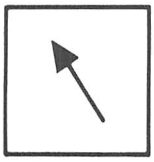


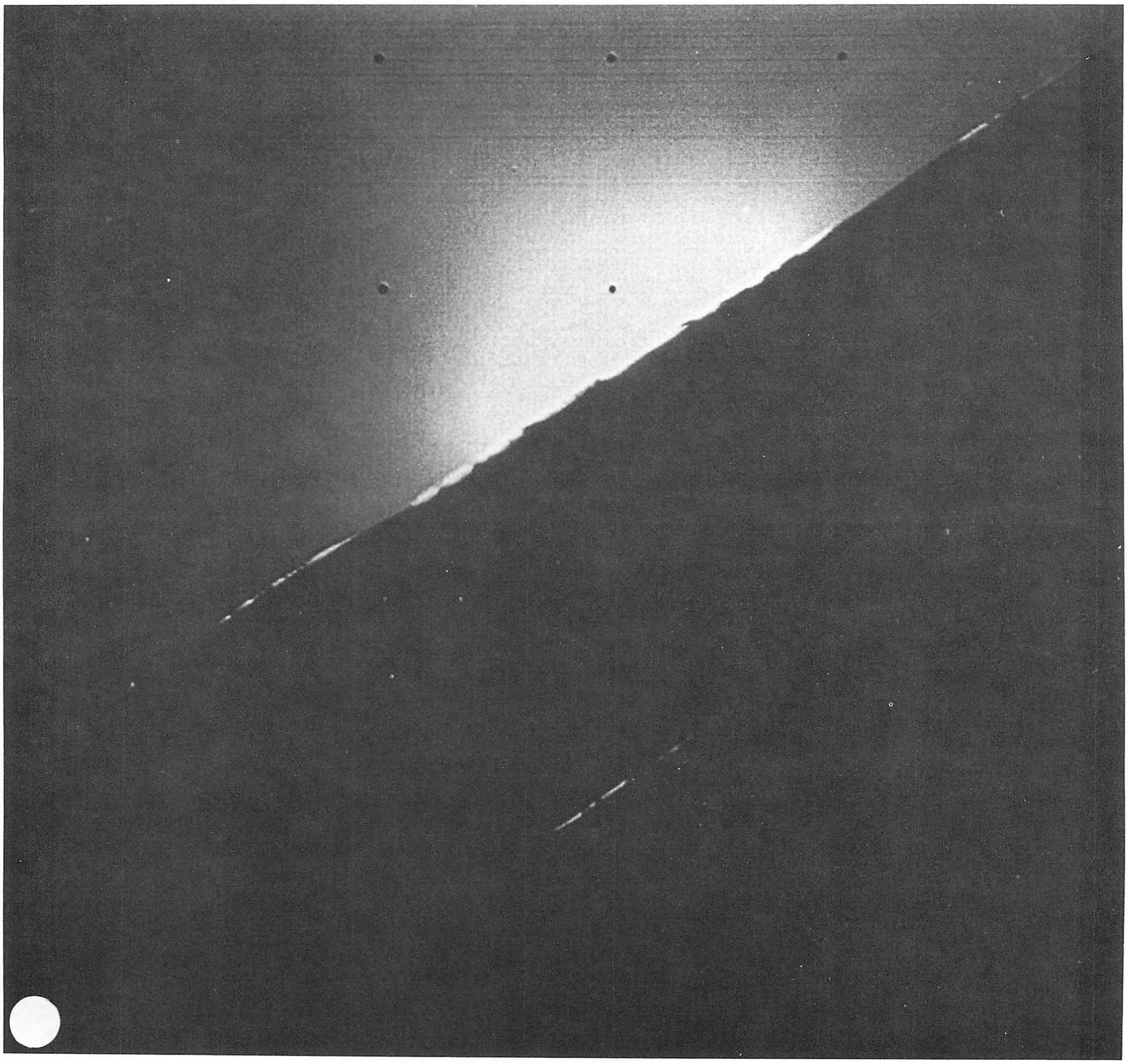
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(133)	**Day 328, 14:15:26**	**—153**	**—10**	**27.8**	***f*/3.8**	**N**	**Clear**	**Processed**



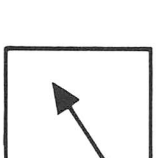


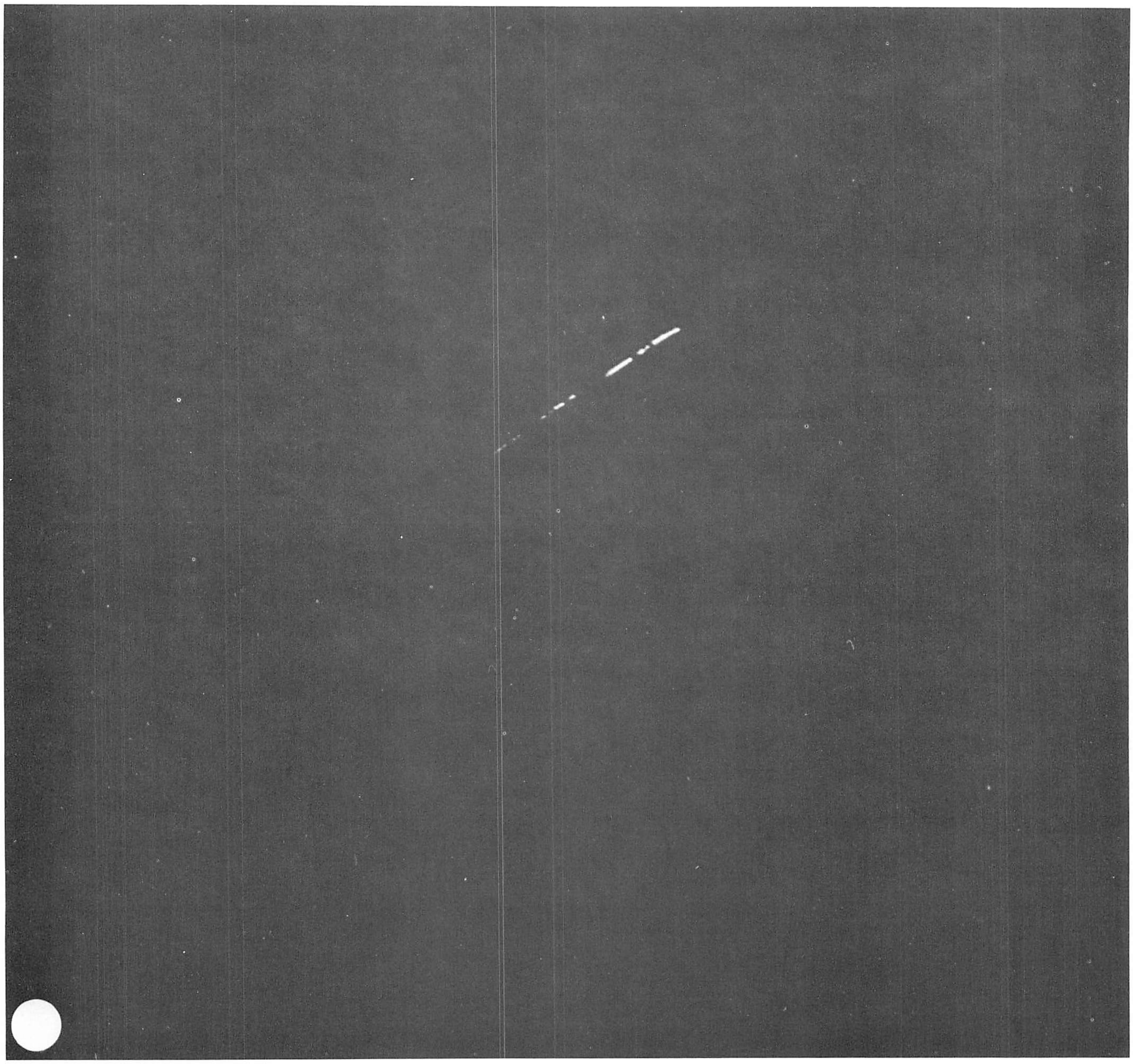
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(134)	**Day 328, 14:21:49**	**—153**	**—10**	**27.8**	***f*/3.8**	**N**	**Clear**	**Processed**



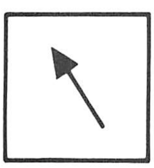


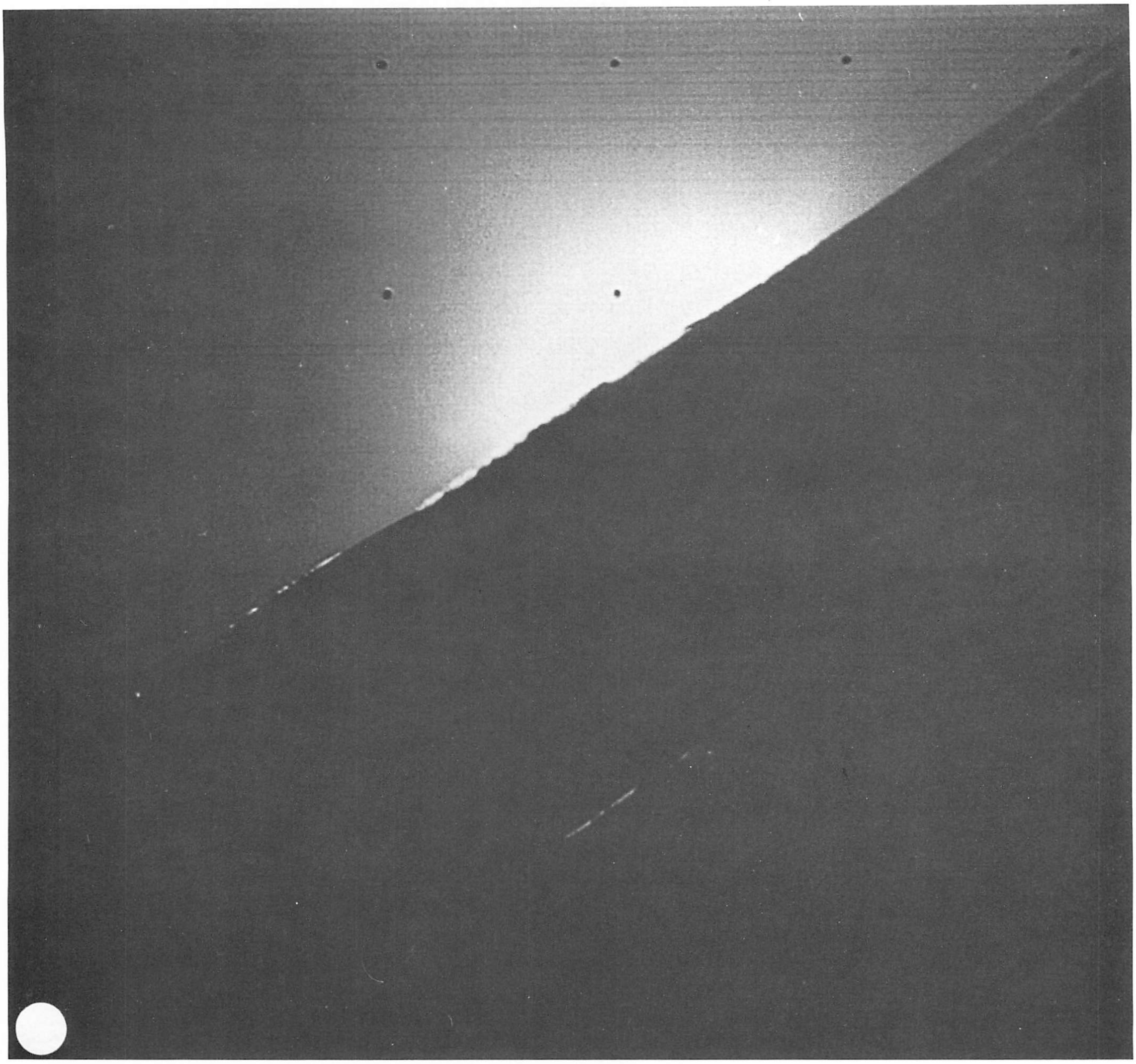
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(135)	**Day 328, 14:25:25**	**−153**	**−10**	**27.8**	**f/3.8**	**N**	**Clear**	**Processed**



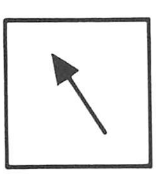


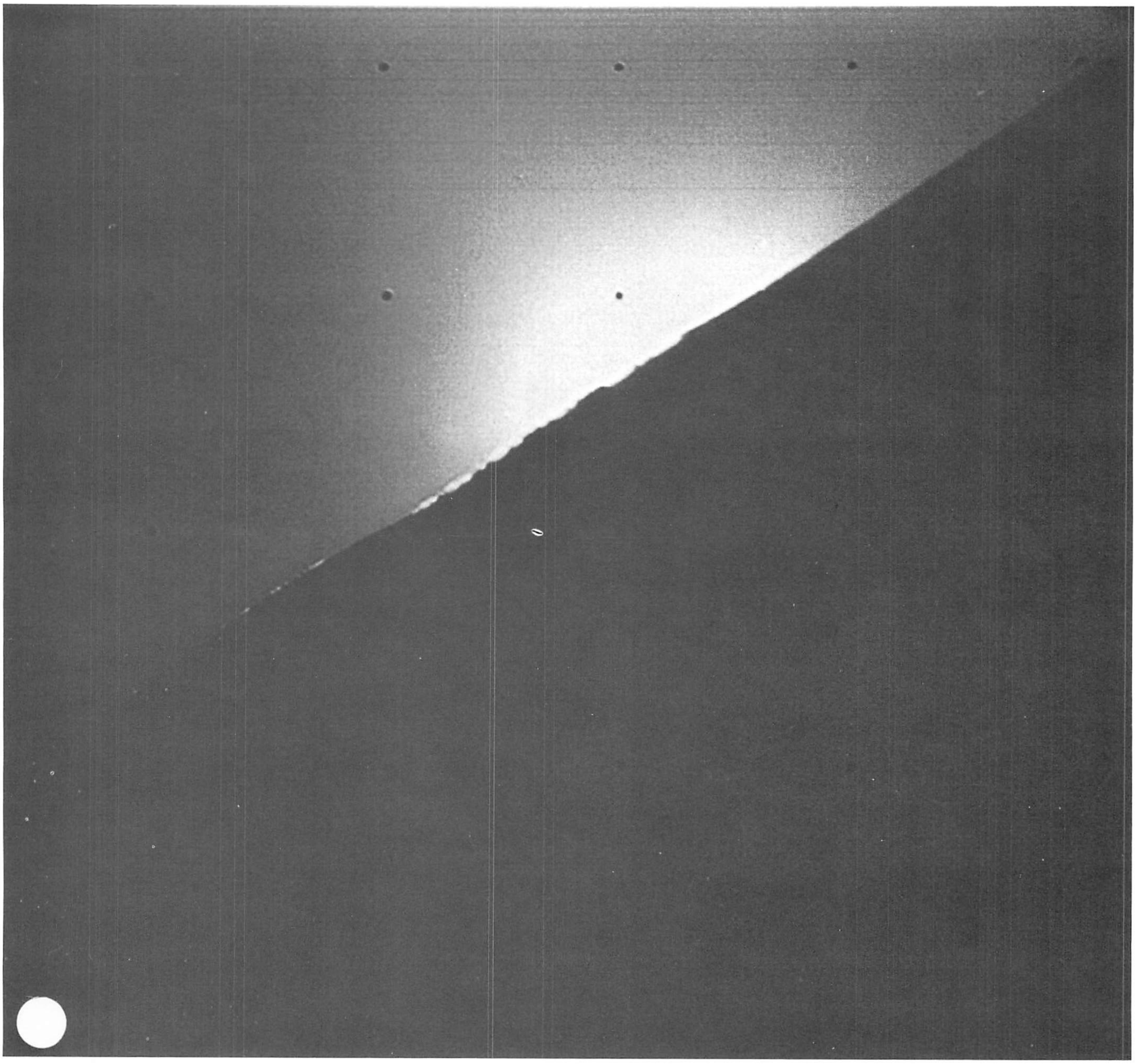
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(136)	**Day 328, 14:36:40**	**—153**	**—10**	**27.8**	***f*/3.8**	**N**	**Clear**	**Processed**



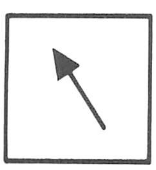


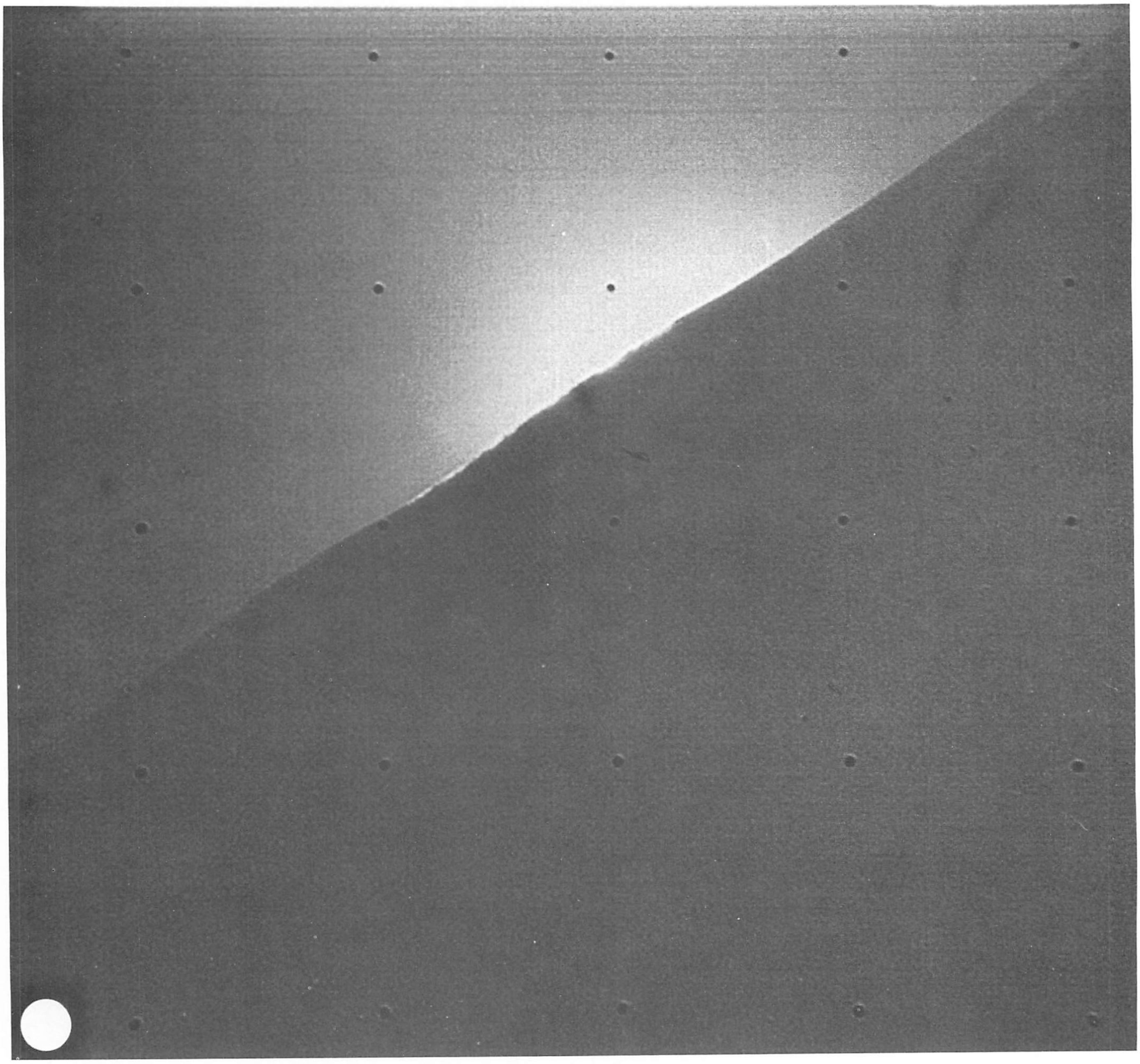
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(137)	Day 328, 14:38:05	—153	—10	28.1	f/3.8	N	Clear	Processed



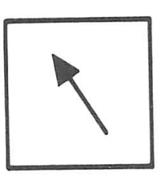


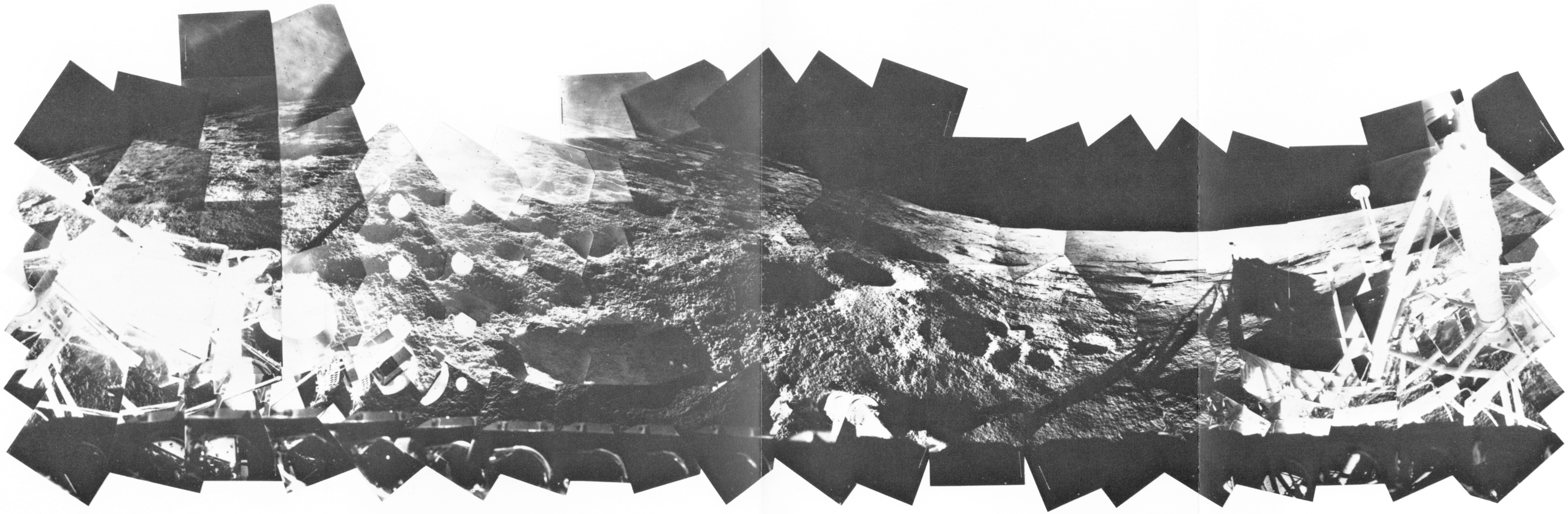
	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(138)	Day 328, 14:42:21	−153	−10	27.8	f/3.8	N	Vertical	Processed



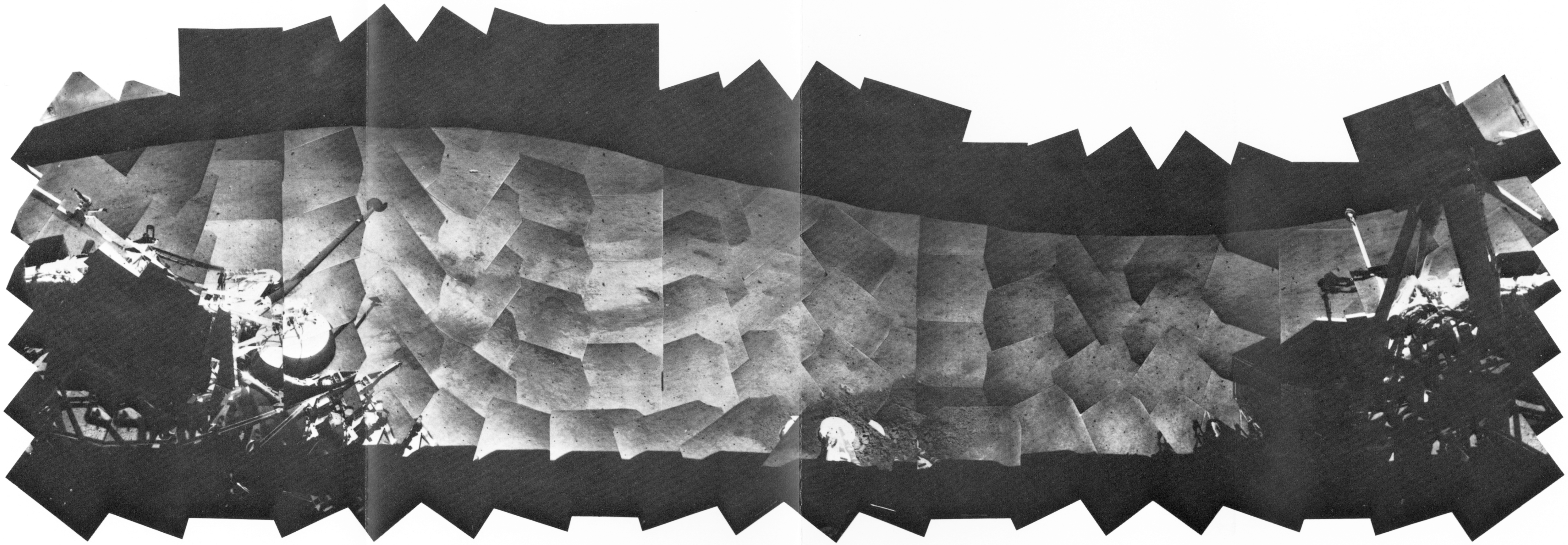


	GMT	Az	El	Focus, m	Iris	Lens	Filter	Remarks
(139)	Day 328, 14:56:02	—153	—10	27.7	f/3.8	N	Clear	Processed

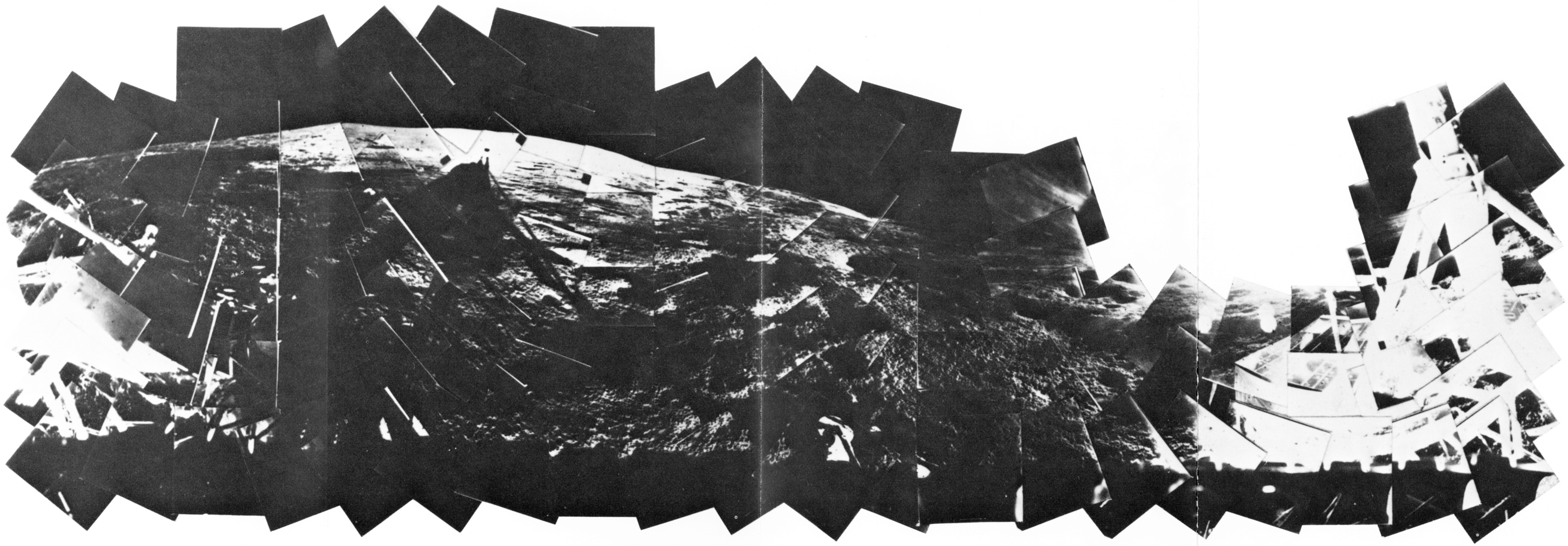




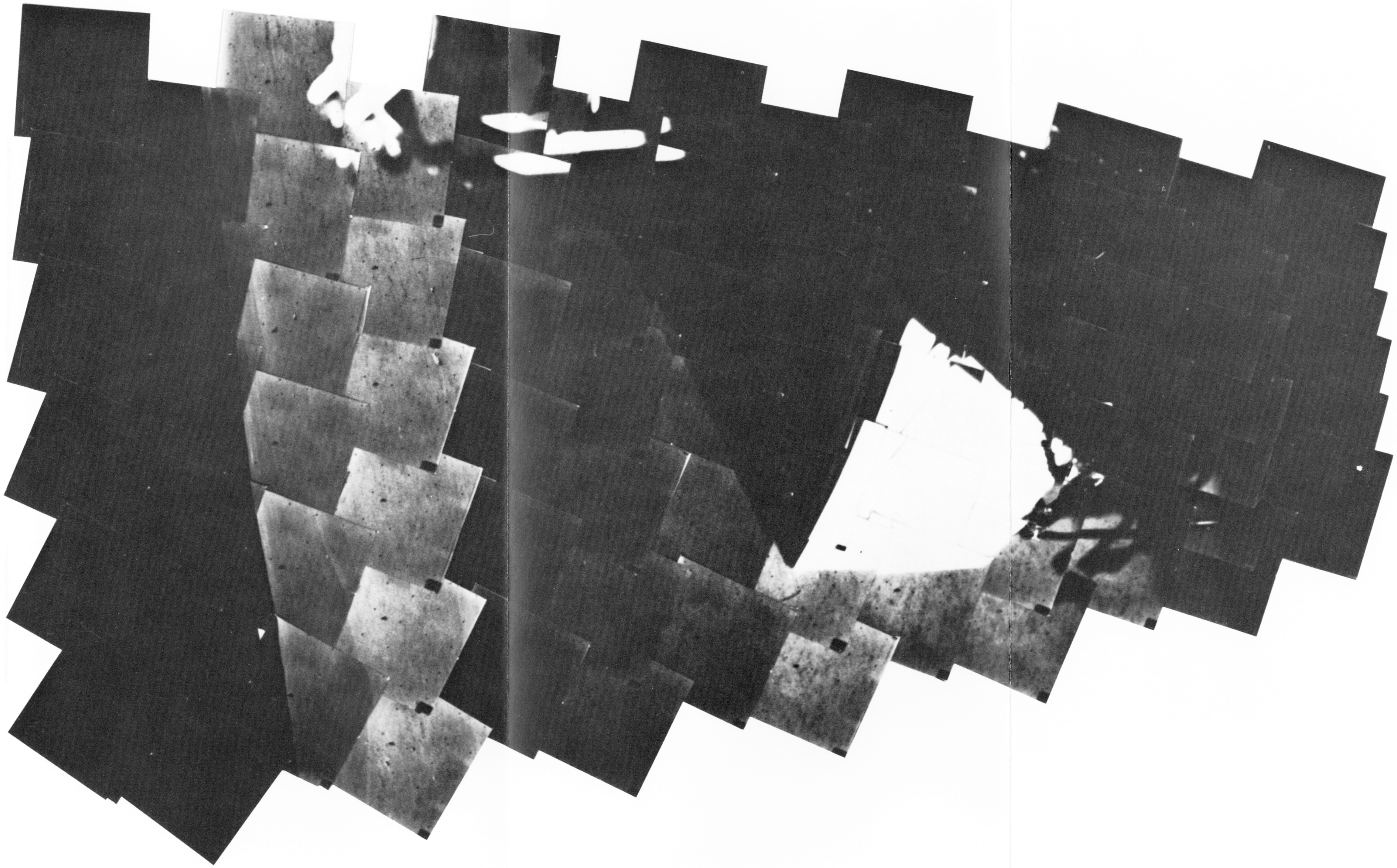
		Azimuth	Lens focal length	Identification
(1)	Day 314	−216 to +126	Wide angle	Catalog No. 6-3-SI; semi-improved mosaic (A.M.)



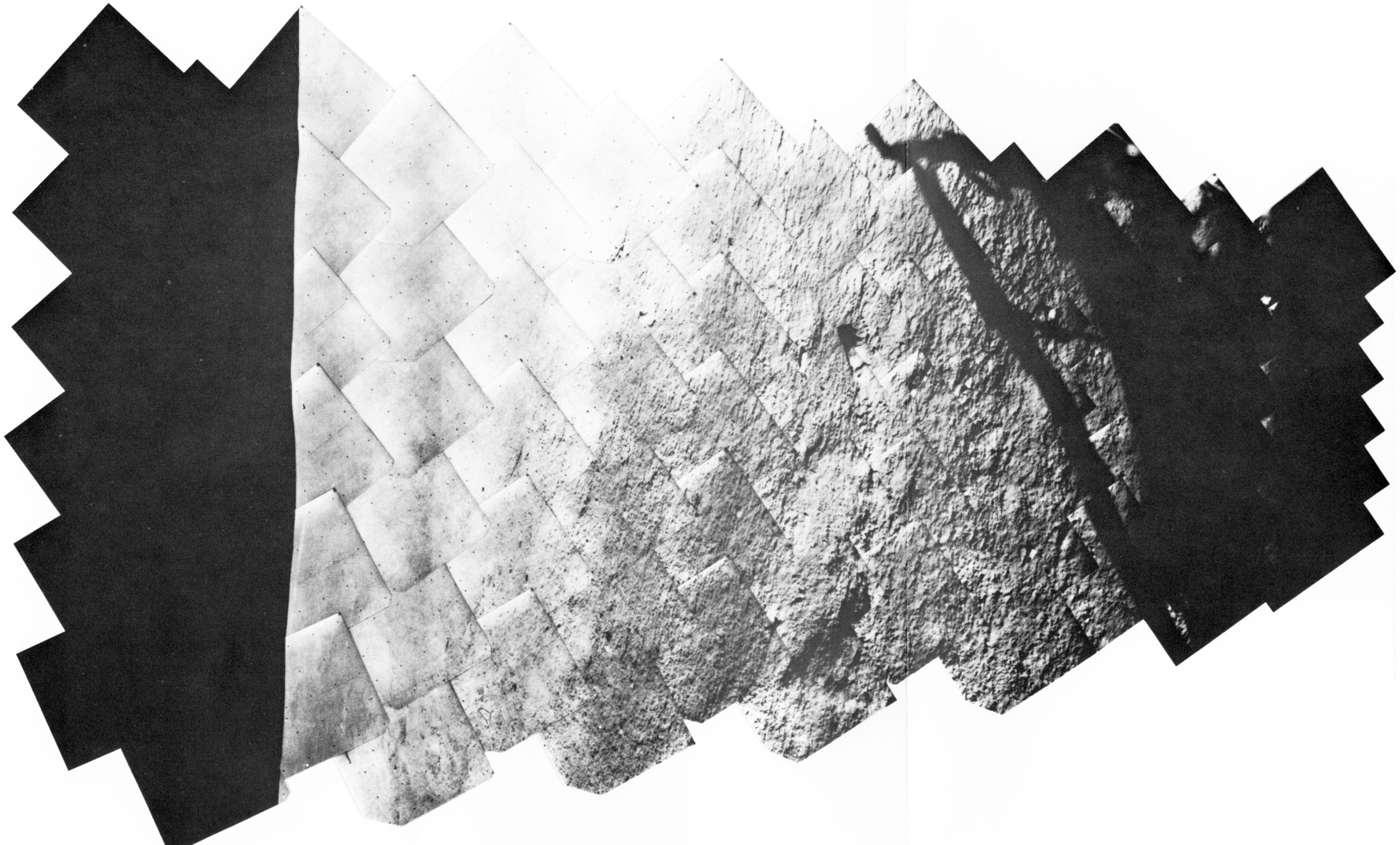
		Azimuth	Lens focal length	Identification
(2)	Day 321	−216 to +126	Wide angle	Catalog No. 6-107-SI; semi-improved mosaic (Noon)



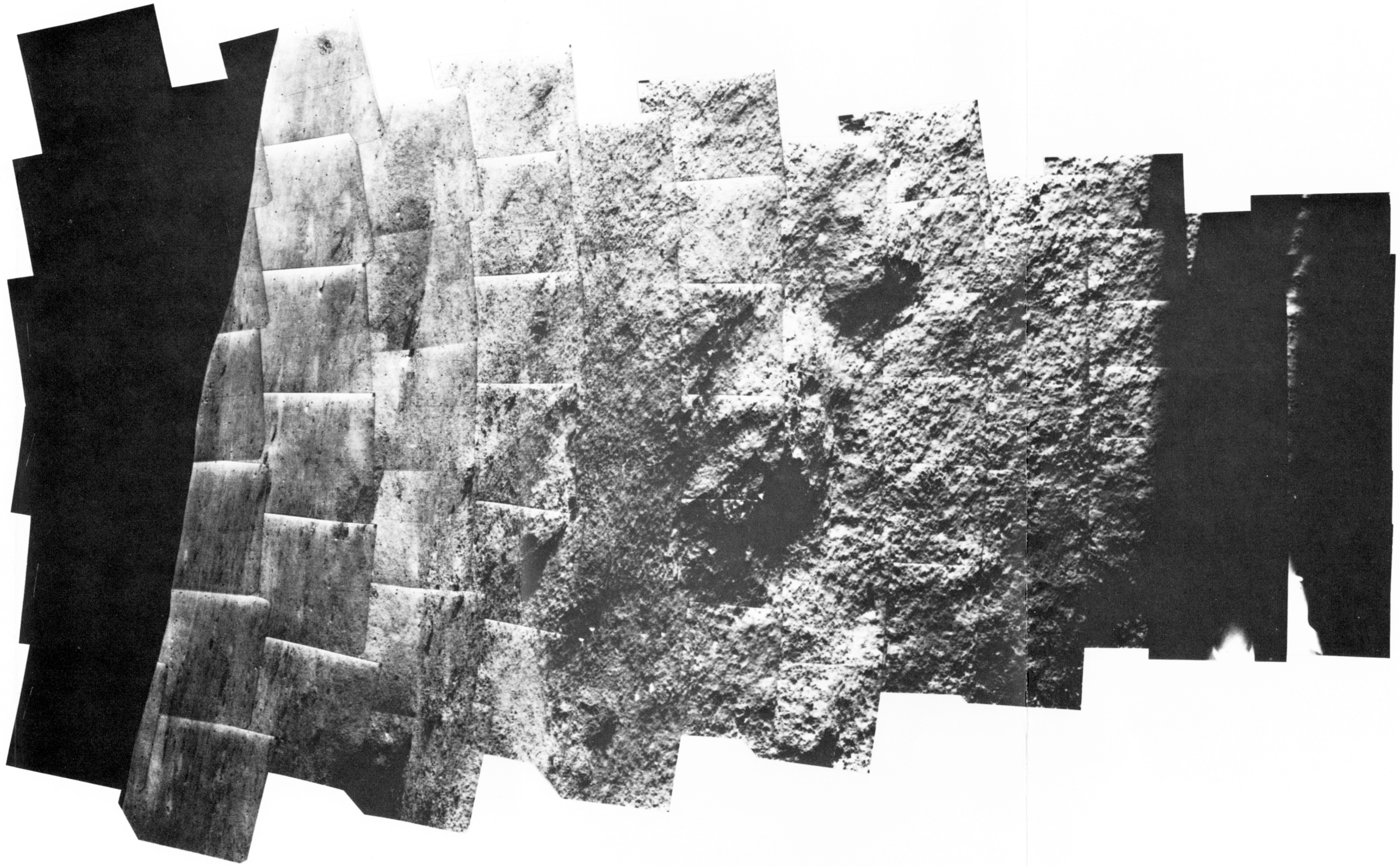
		Azimuth	Lens focal length	Identification
(3)	**Day 328**	**−216 to +126**	**Wide angle**	**Catalog No. 6-194; operations mosaic (P.M.)**



(5)	Azimuth	Lens focal length	Identification
Day 318	—177 to —144	Narrow angle	Catalog No. 6-56; operations mosaic



		Azimuth	Lens focal length	Identification
(6)	Day 315	—141 to —108	Narrow angle	Catalog No. 6-18-SI; semi-improved mosaic



(7)	Azimuth	Lens focal length	Identification
Day 315	−105 to −72	Narrow angle	Catalog No. 6-19-SI; semi-improved mosaic

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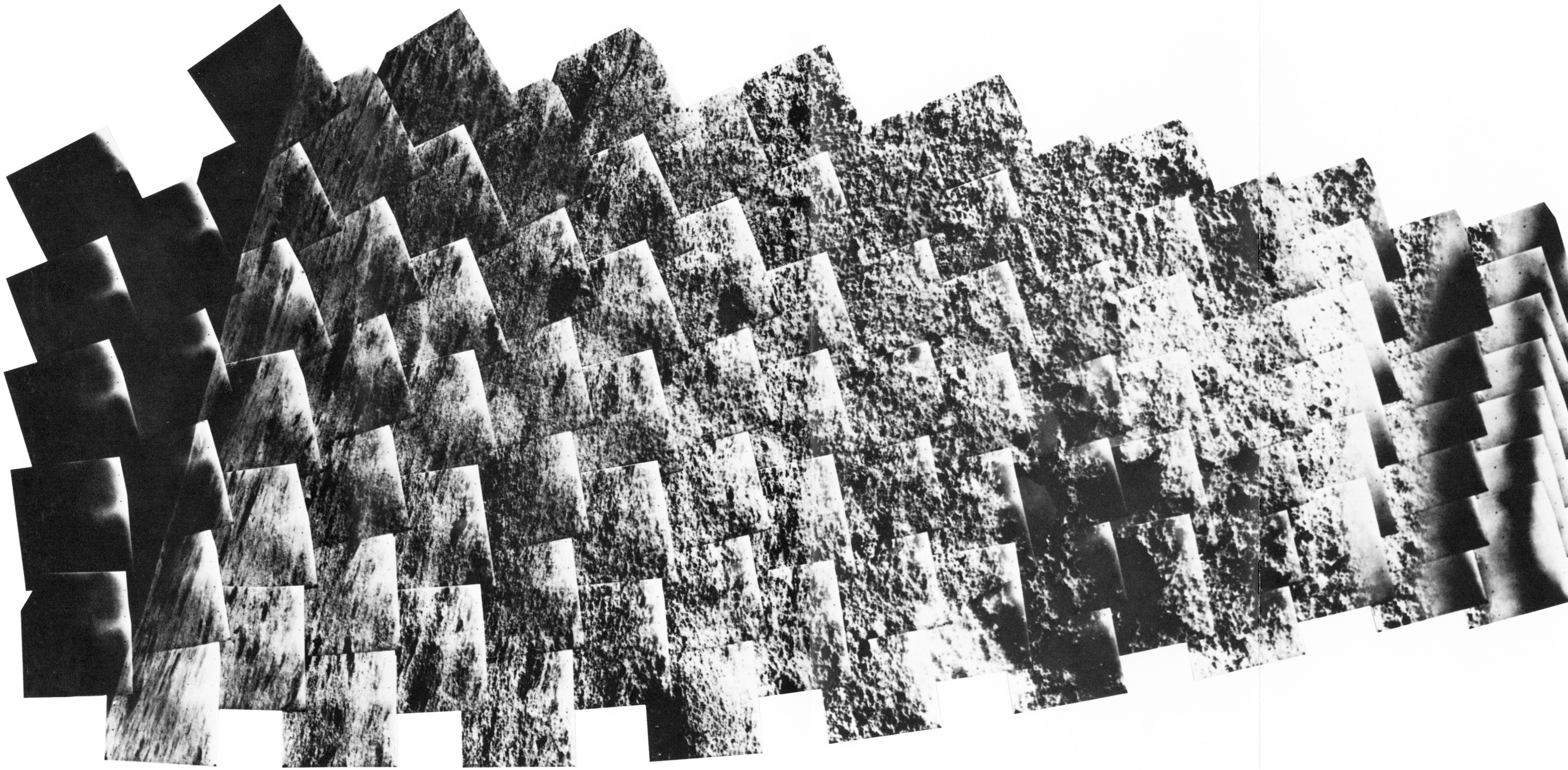
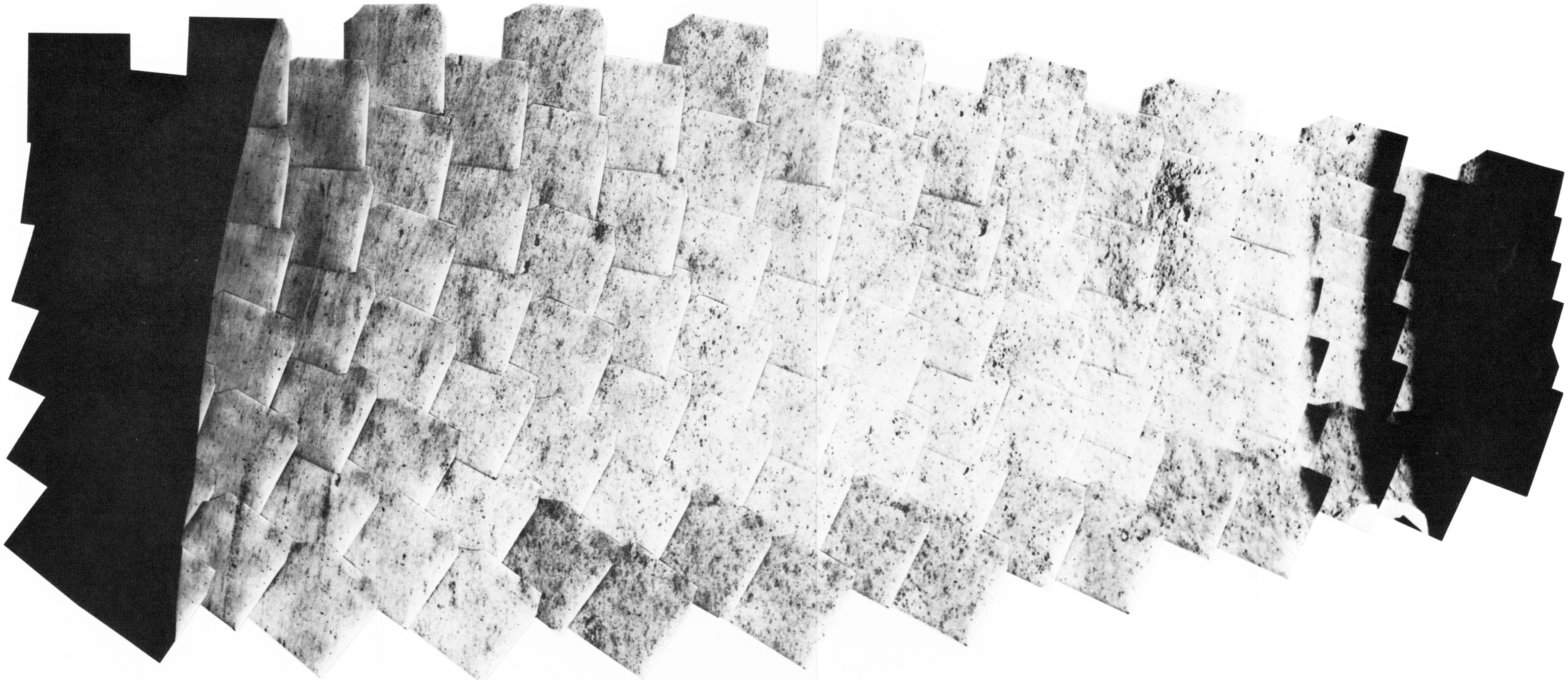
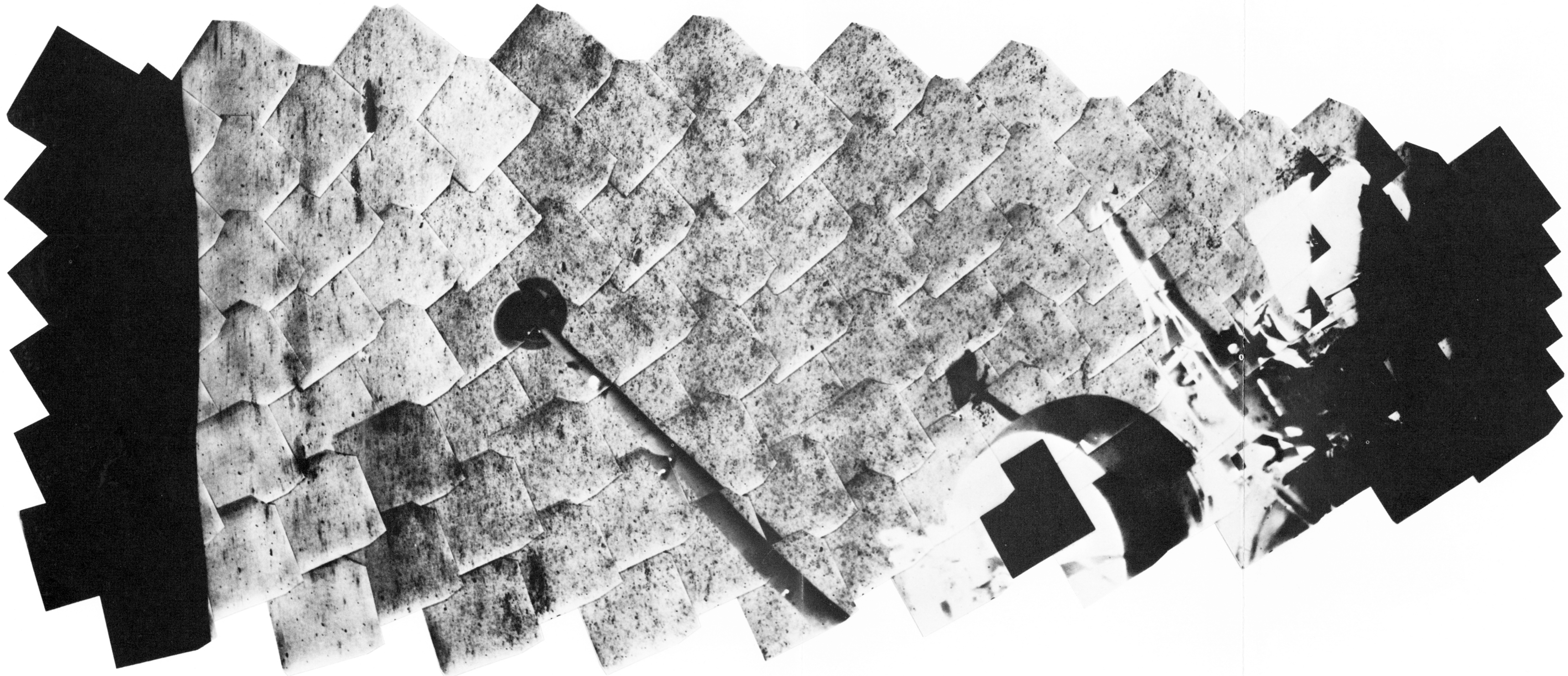


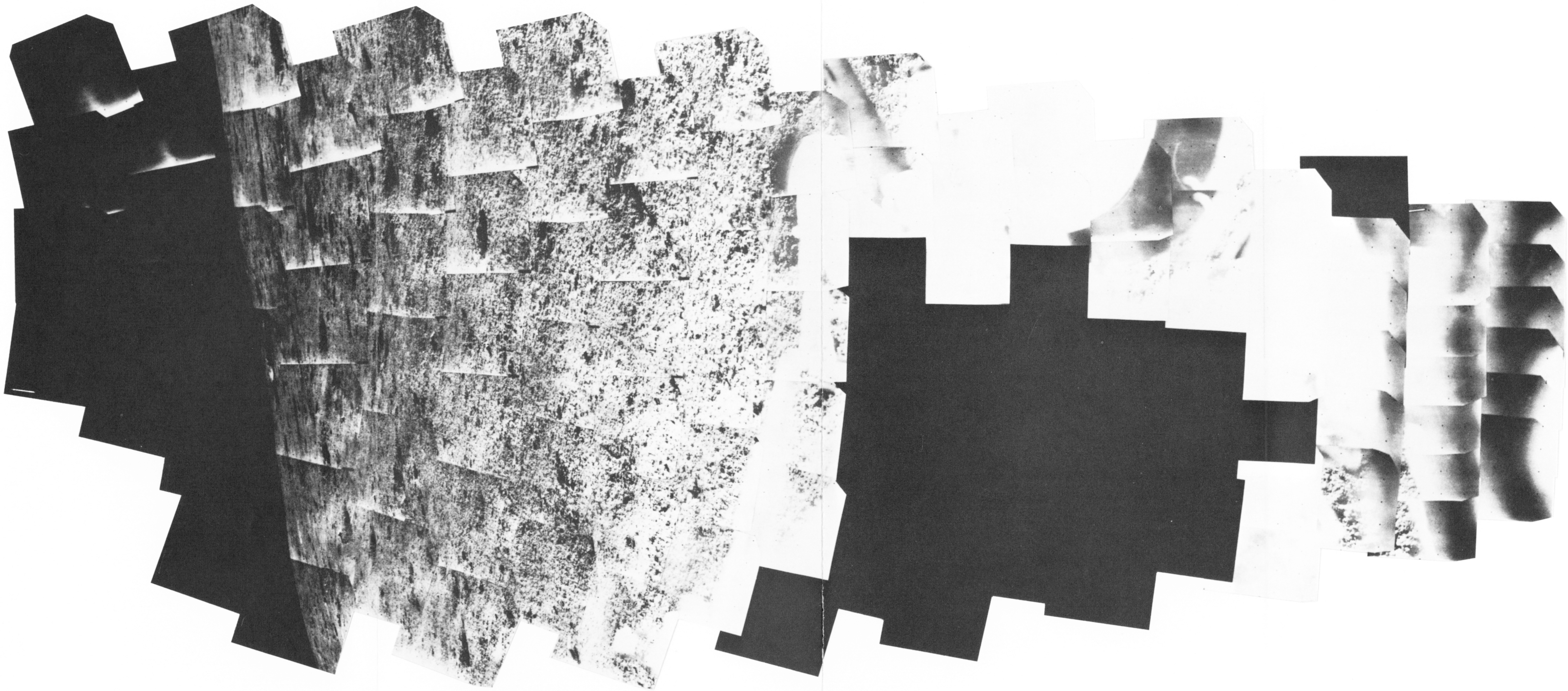
		Azimuth	Lens focal length	Identification
(9)	Day 315	—33 to 0	Narrow angle	Catalog No. 6-14-SI; semi-improved mosaic



(10) Day 319 | Azimuth +3 to +36 | Lens focal length Narrow angle | Identification Catalog No. 6-78-SI; semi-improved mosaic

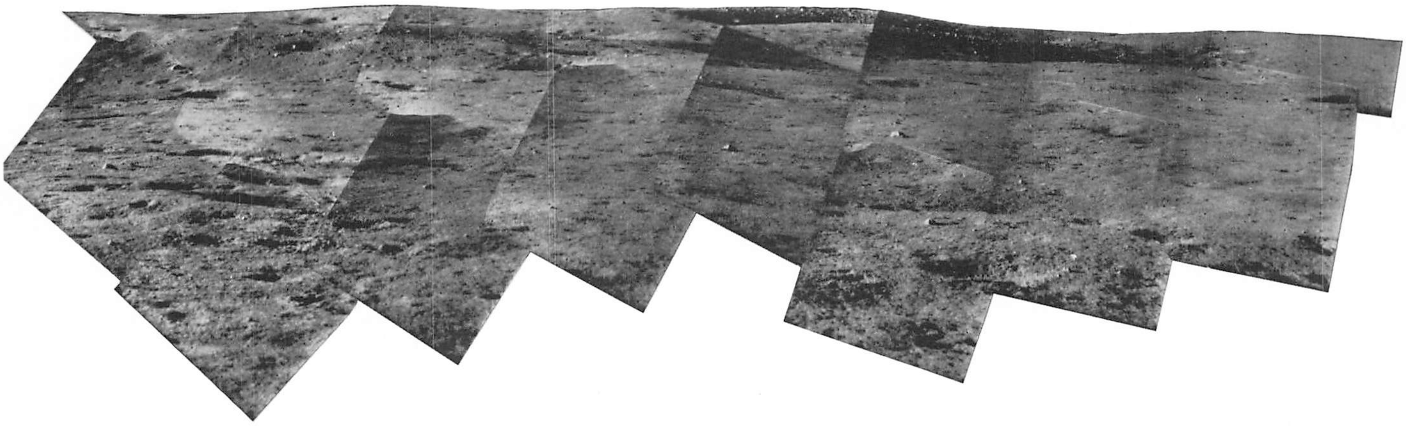


(11) Day 319 | Azimuth +39 to +72 | Lens focal length Narrow angle | Identification Catalog No. 6-79-SI; semi-improved mosaic



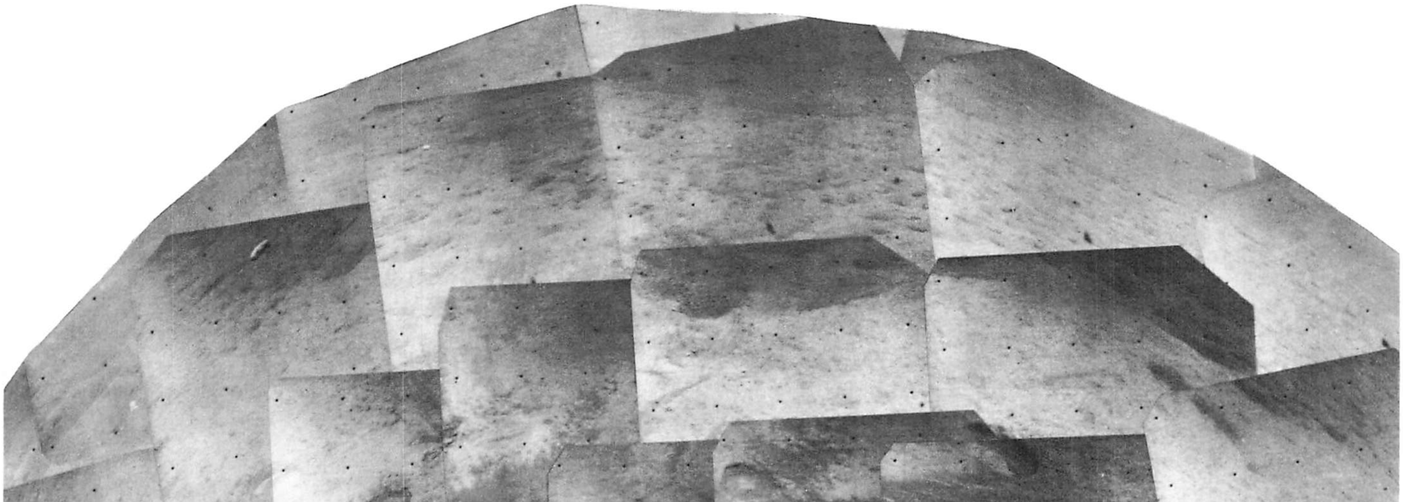
	Azimuth	Lens focal length	Identification
(12) Day 315	+75 to +108	Narrow angle	Catalog No. 6-16-SI; semi-improved mosaic

	Azimuth	Lens focal length	Identification
(13) Day 318	+111 to +126 −231 to −216	Narrow angle	Catalog No. 6-54-SI; semi-improved mosaic; end stop coverage

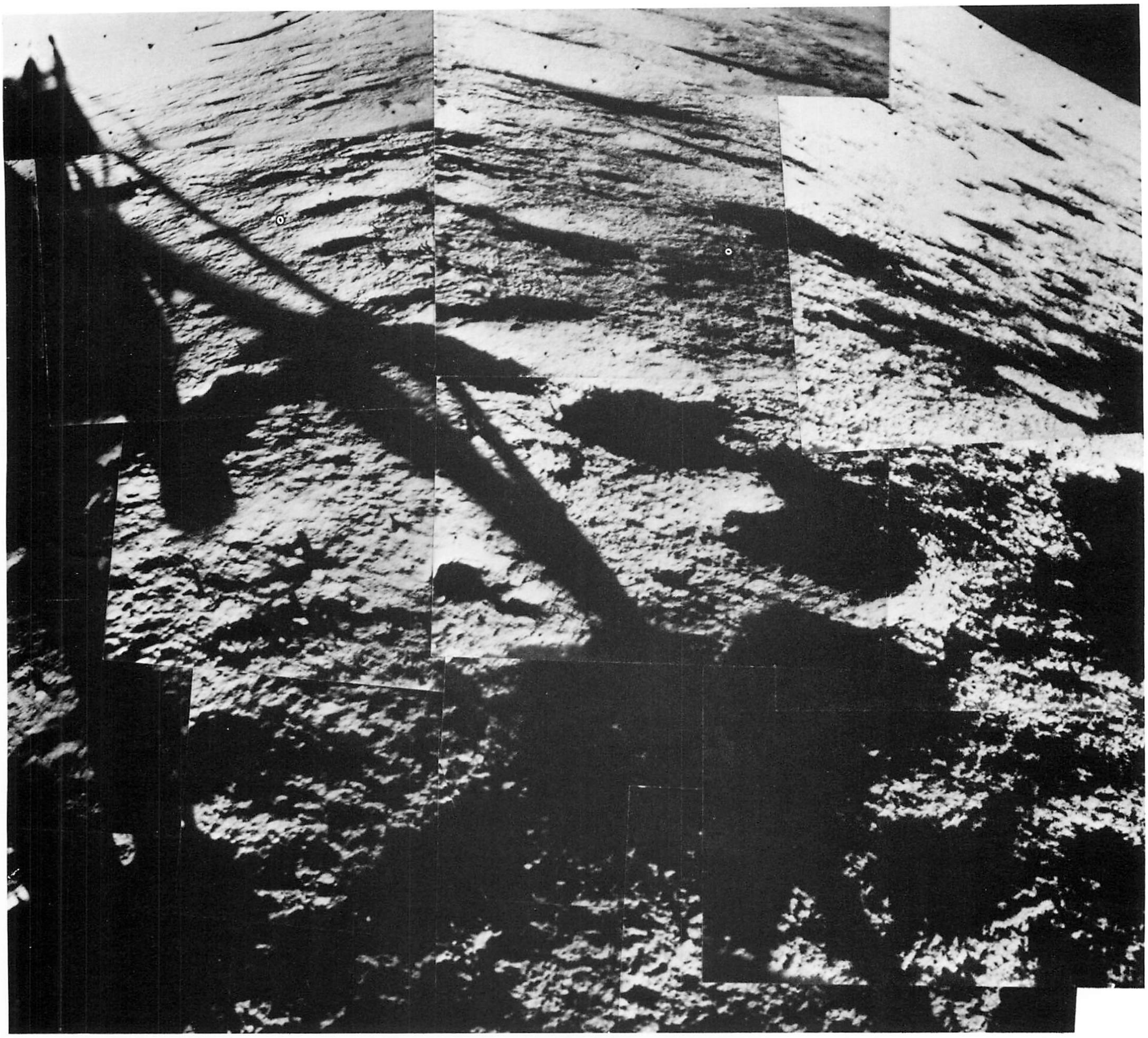


		Azimuth	Lens focal length	Identification
(14)	**Day 315**	**—69 to —33**	**Narrow angle**	**Catalog No. 6-SE-6; southeast horizon (A.M.)**

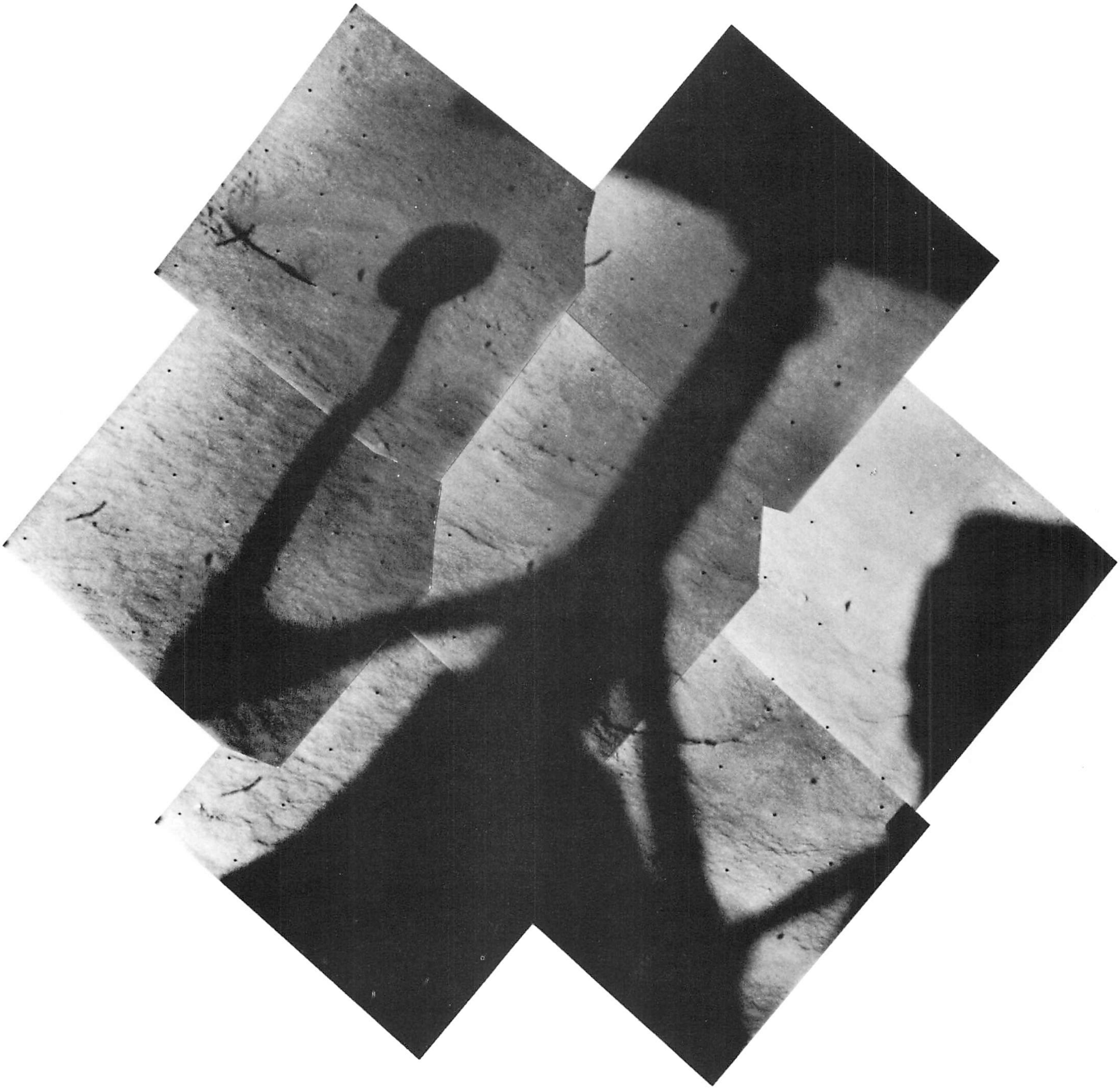
		Azimuth	Lens focal length	Identification
(15)	**Day 321**	**−180 to +126**	**Wide angle**	**Catalog No. 6-SE-9; panorama**



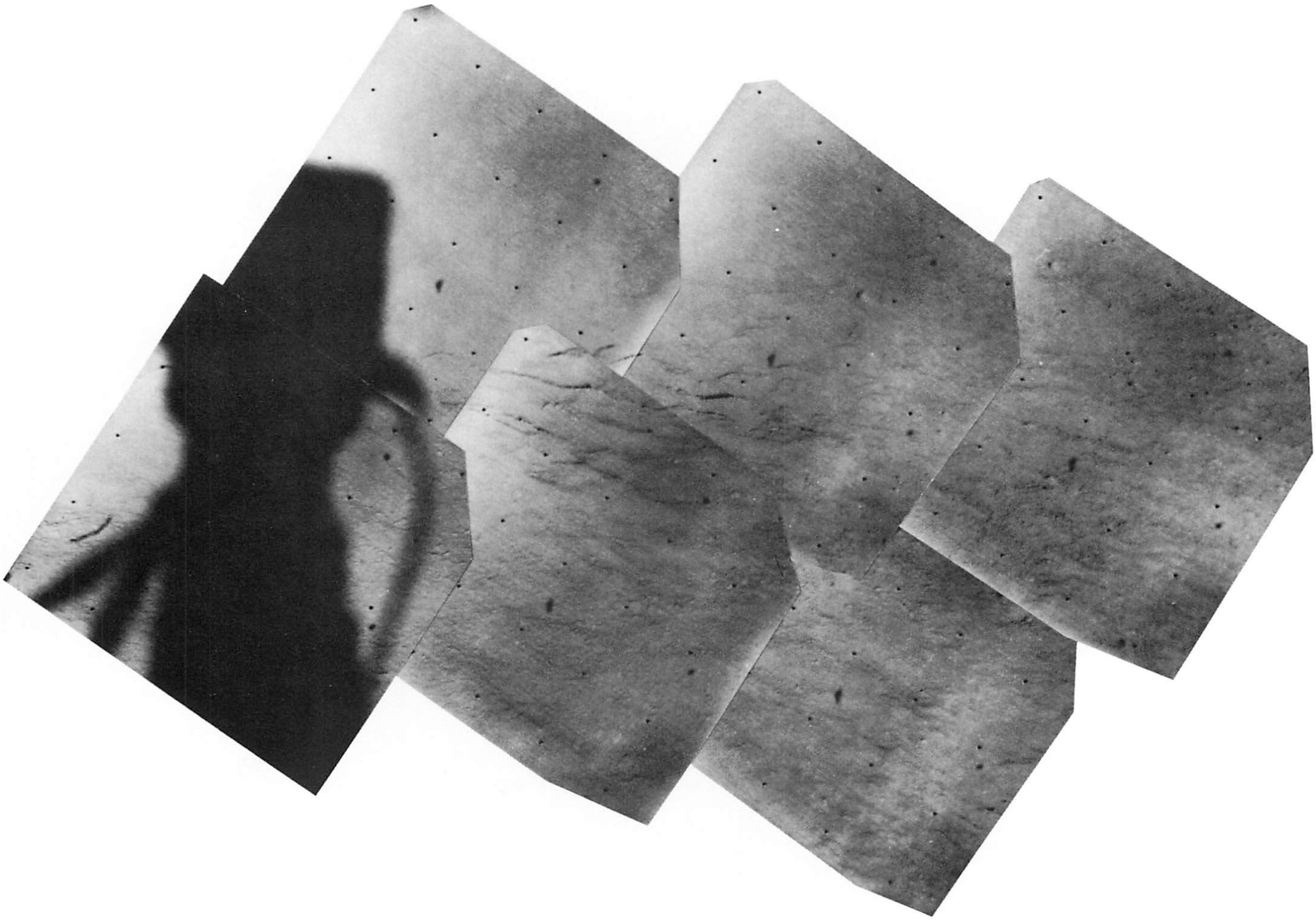
		Azimuth	Lens focal length	Identification
(16)	**Day 321**	**−72 to +36**	**Wide angle**	**Catalog No. 6-SE-9*; pre-hop area**



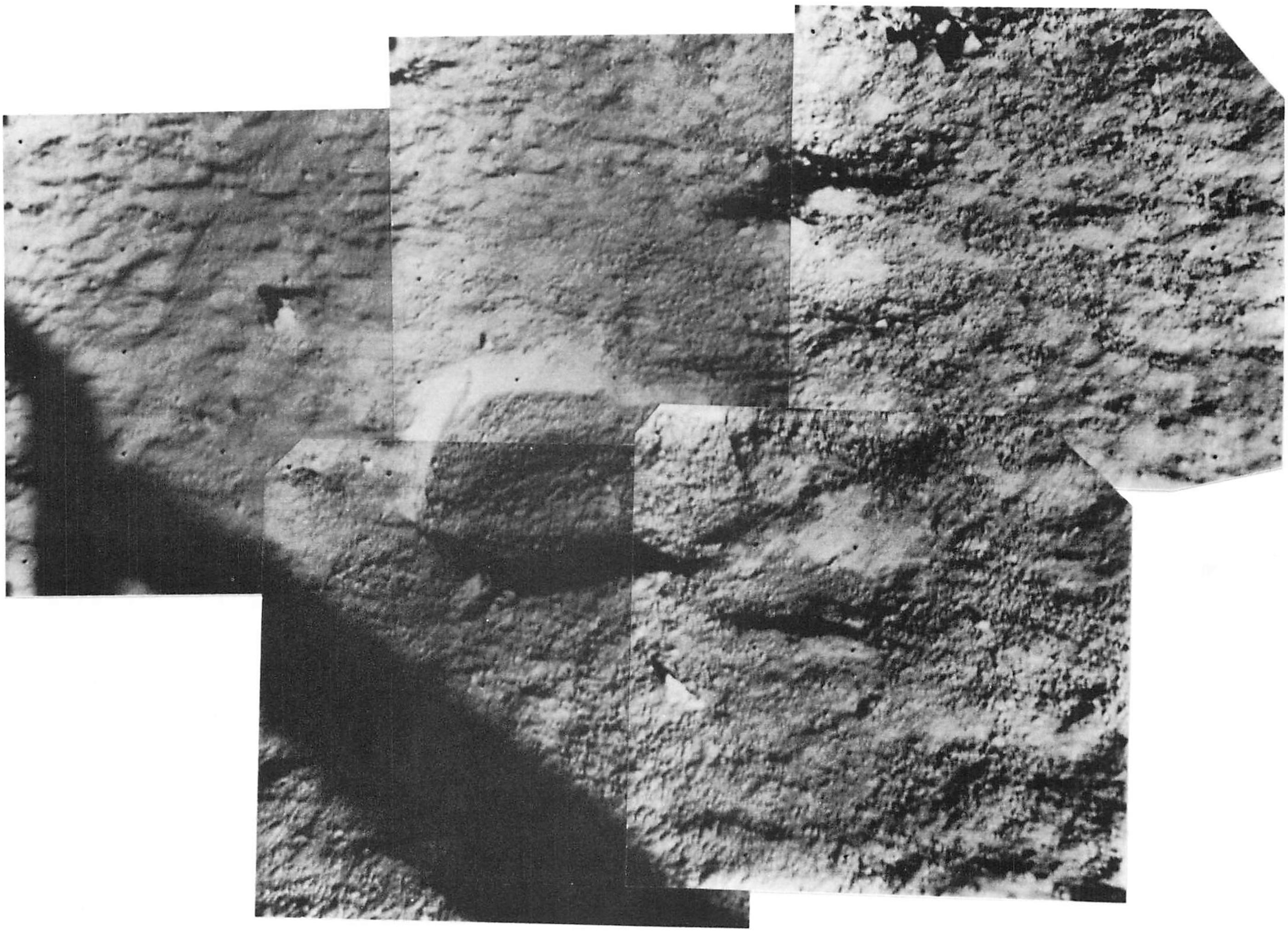
		Azimuth	Lens focal length	Identification
(17)	Day 328	−18 to +36	Wide angle	Catalog No. 6-SE-11*; partial panorama



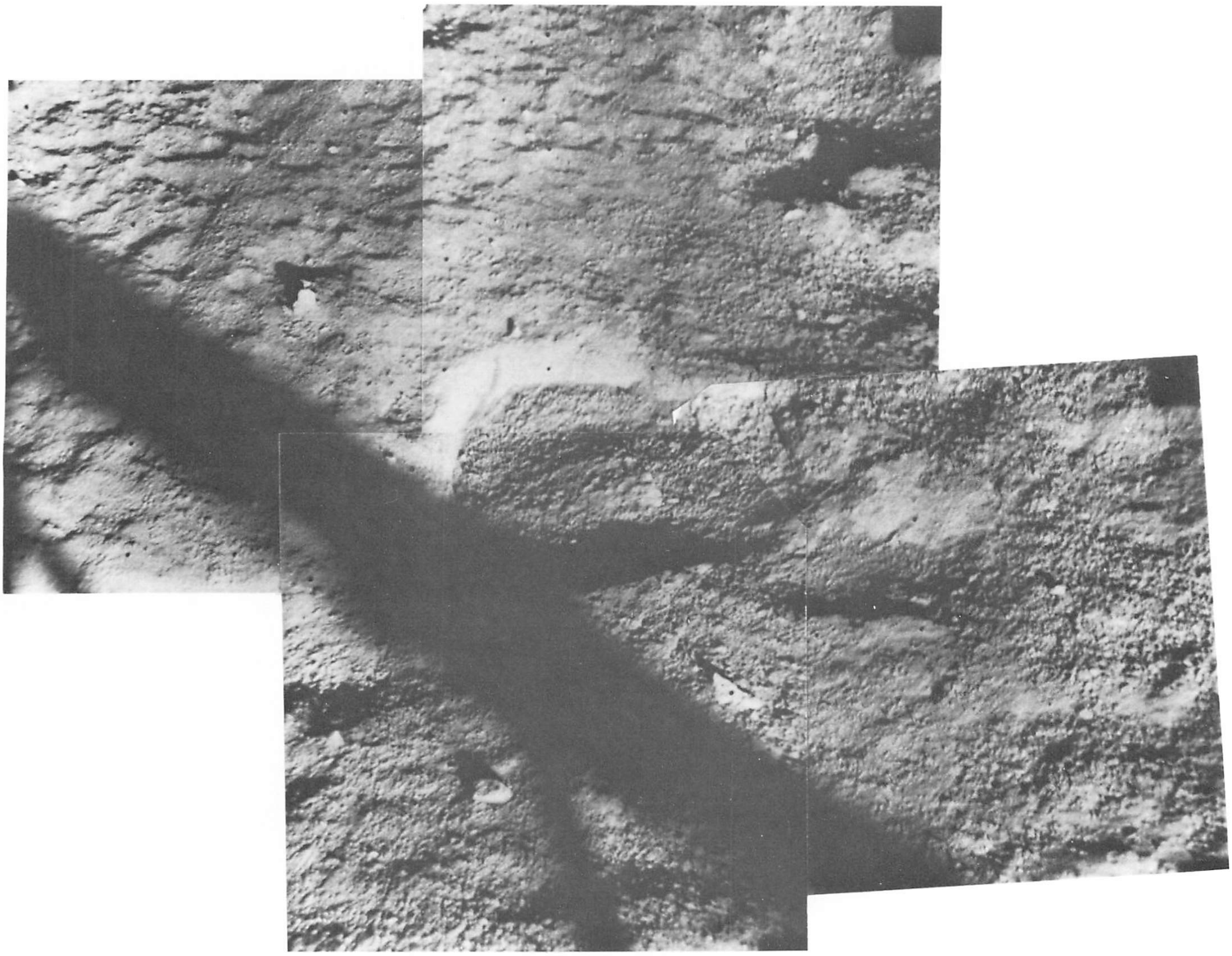
		Azimuth	Lens focal length	Identification
(18)	**Day 326**	**+45 to +33**	**Narrow angle**	**Catalog No. 6-SE-12; block and pad 3 imprint**



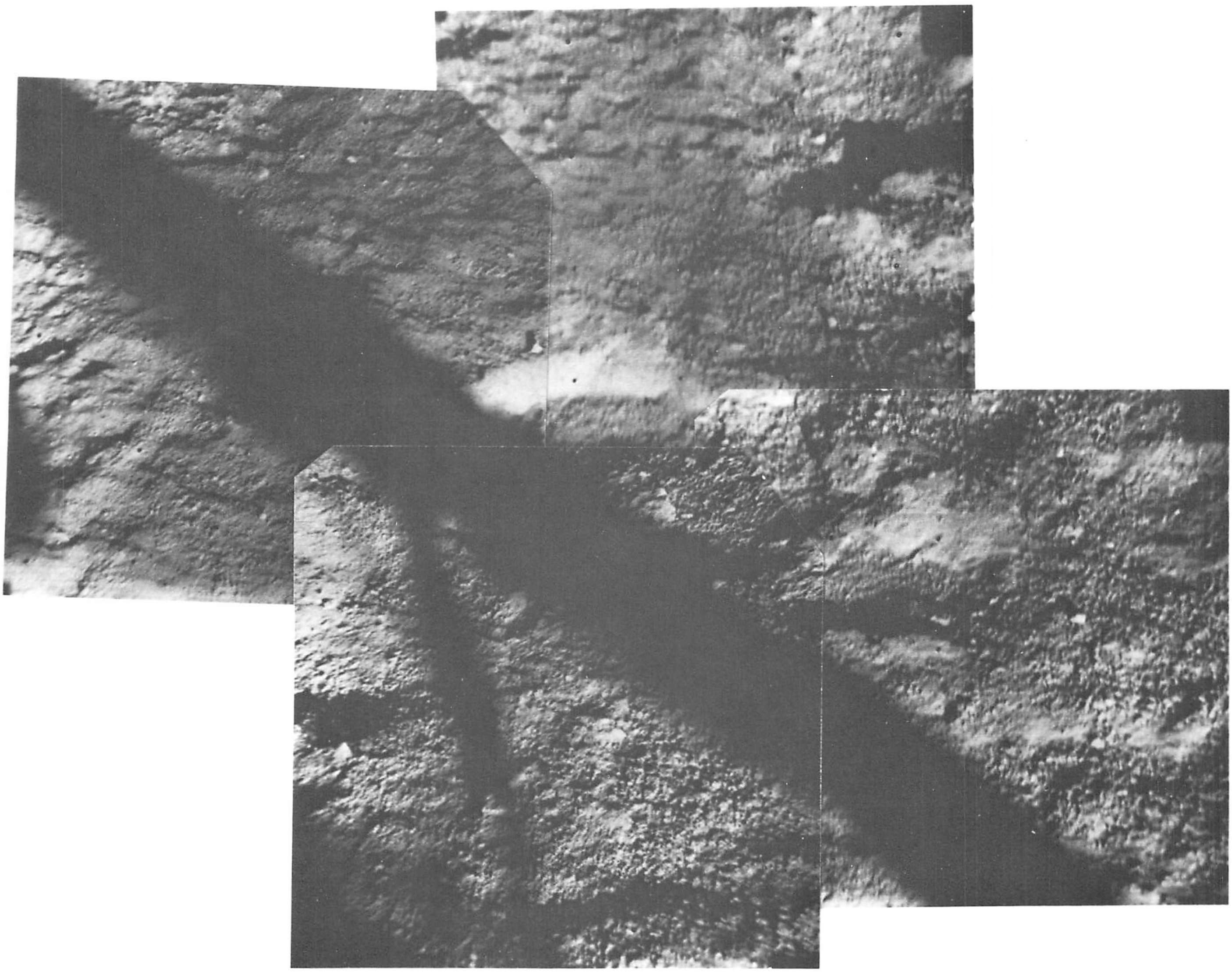
		Azimuth	Lens focal length	Identification
(19)	**Day 326**	**+30 to +15**	**Narrow angle**	**Catalog No. 6-SE-13; camera shadow**



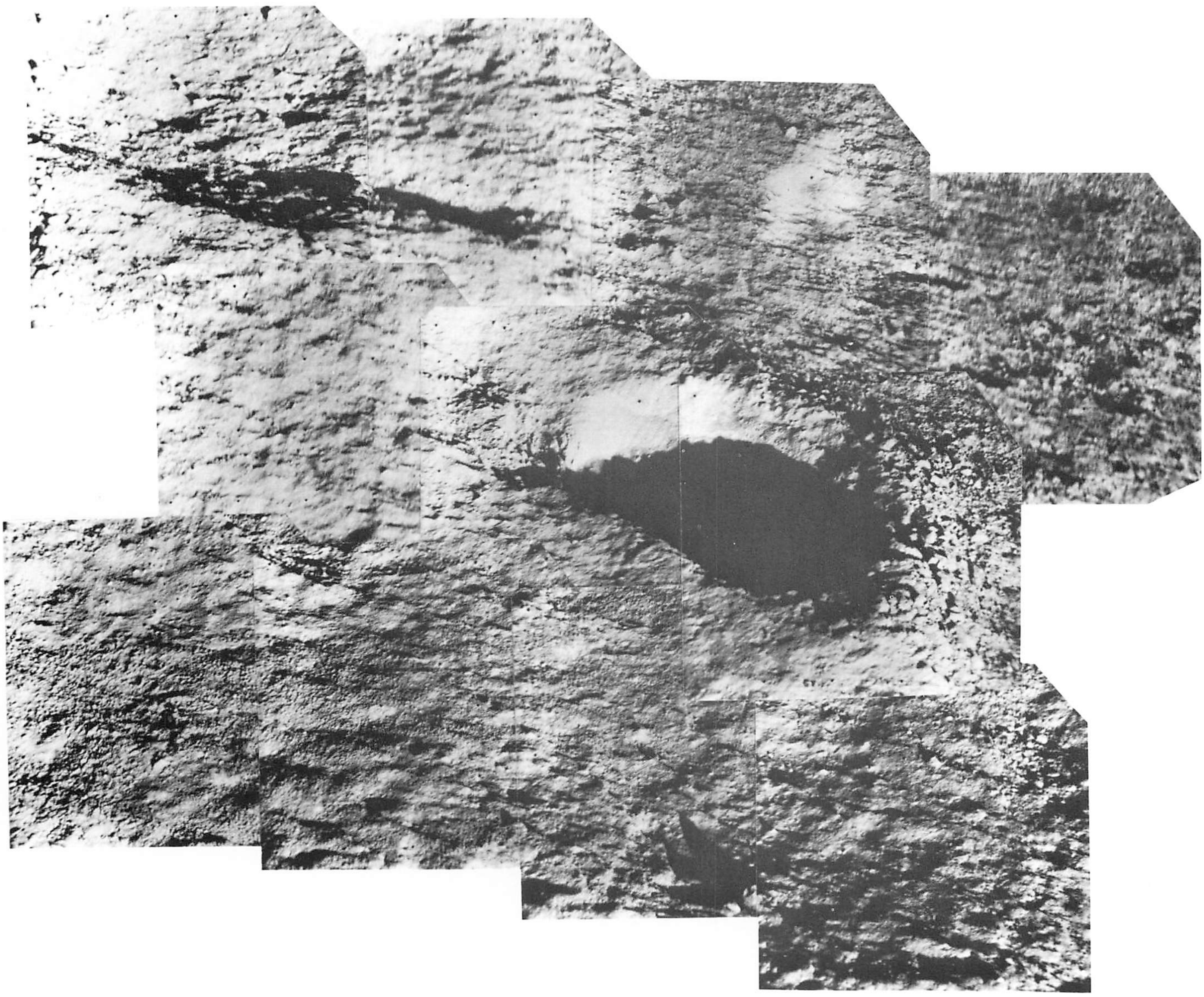
		Azimuth	Lens focal length	Identification
(20)	**Day 327**	**+15 to +3**	**Narrow angle**	**Catalog No. 6-SE-14; block 1 imprint**



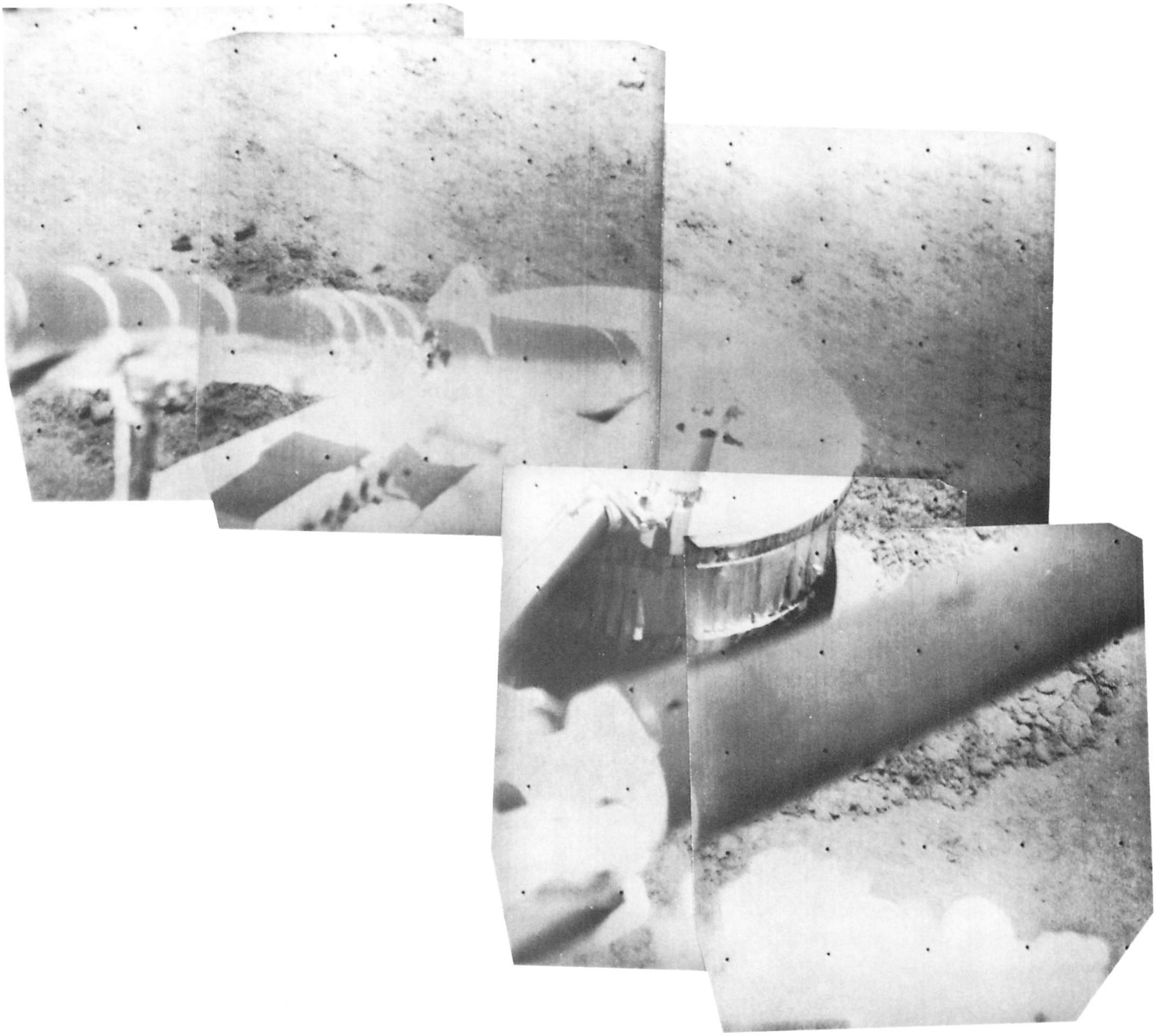
		Azimuth	Lens focal length	Identification
(21)	**Day 327**	**+15 to +6**	**Narrow angle**	**Catalog No. 6-SE-15; block 1 imprint**



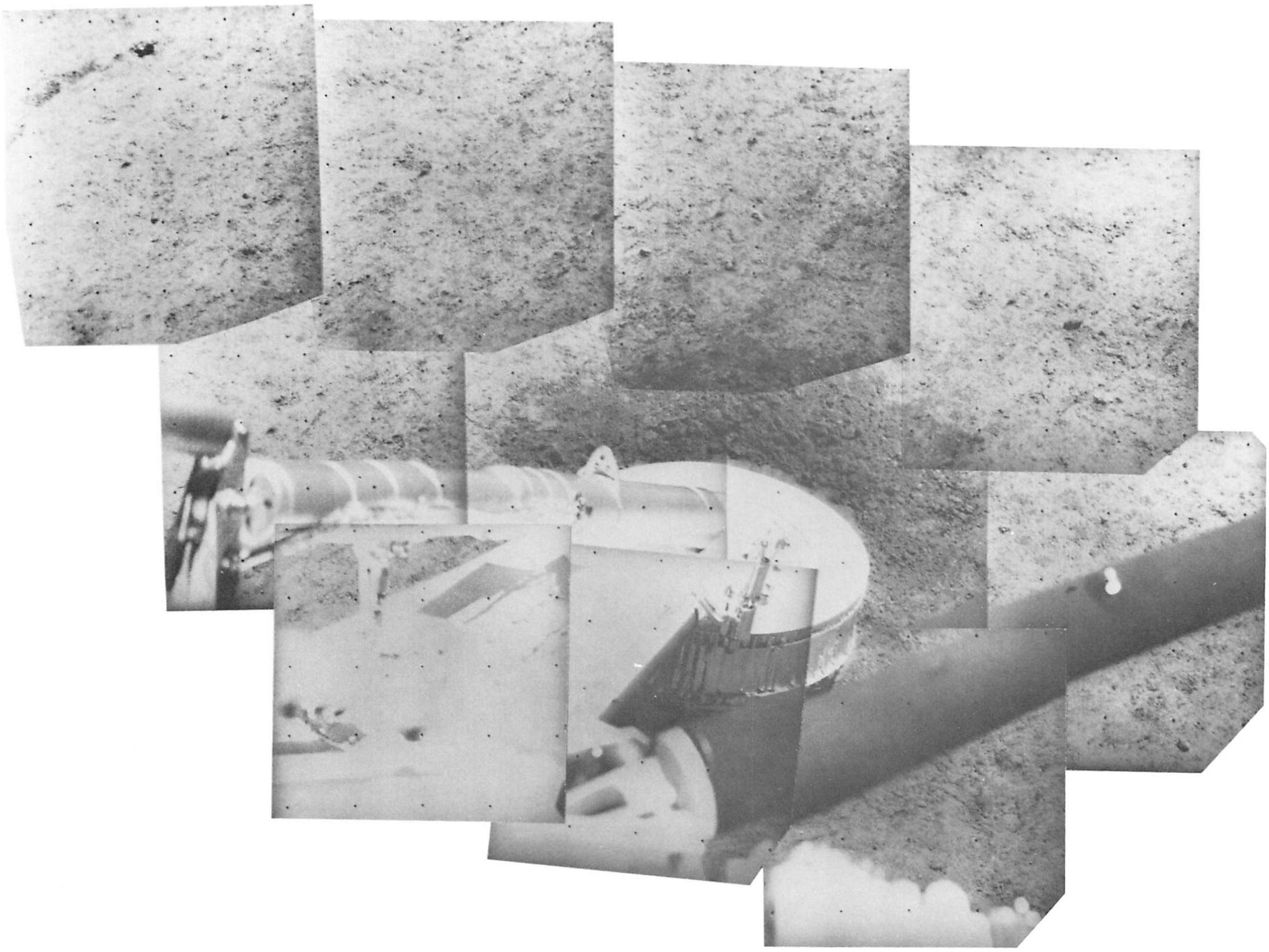
		Azimuth	Lens focal length	Identification
(22)	Day 327	+15 to +6	Narrow angle	Catalog No. 6-SE-16; block 1 imprint



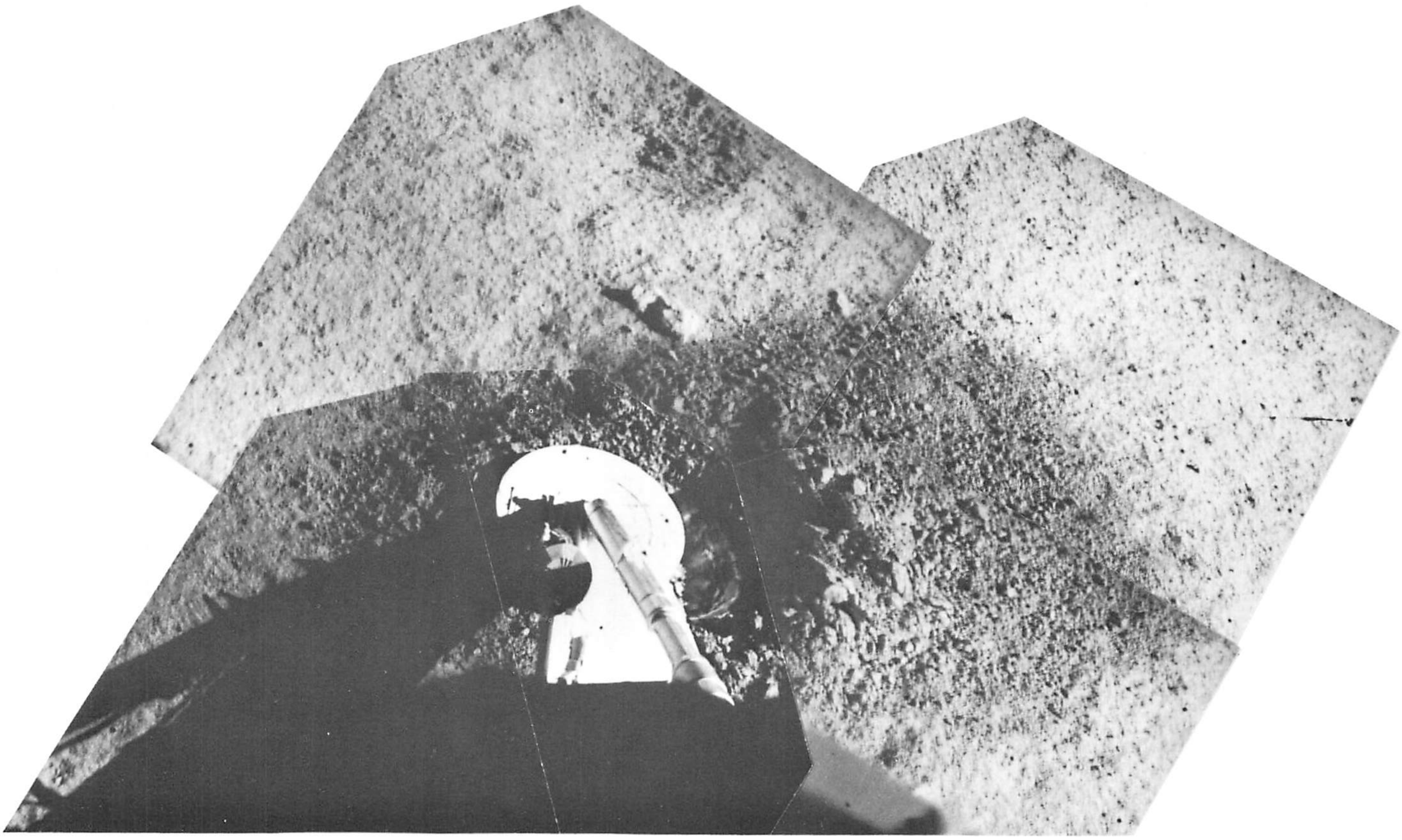
		Azimuth	Lens focal length	Identification
(23)	**Day 327**	**—18 to 0**	**Narrow angle**	**Catalog No. 6-SE-17; pad 2 imprint**



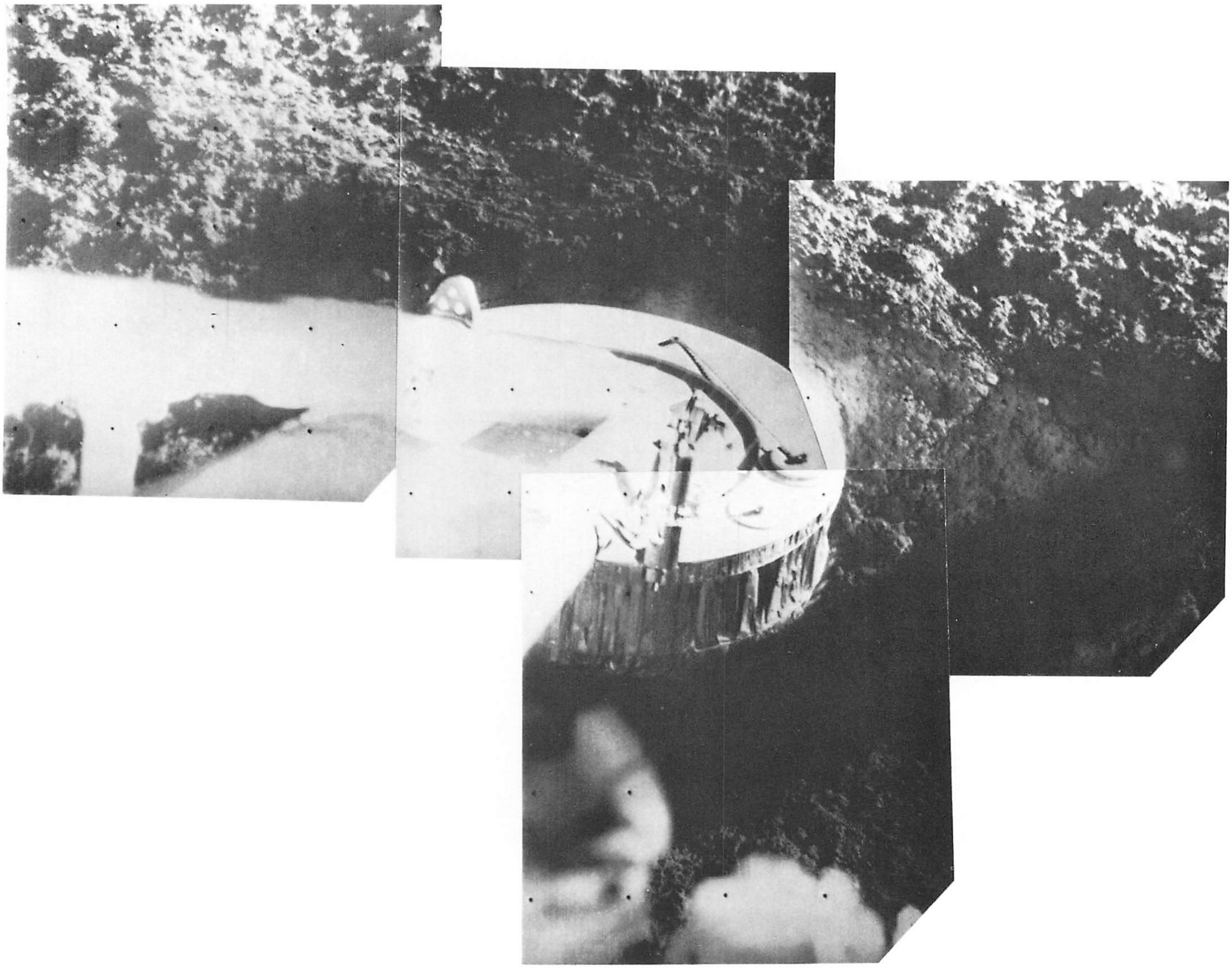
		Azimuth	Lens focal length	Identification
(24)	**Day 321**	**+87 to +75**	**Narrow angle**	**Catalog No. 6-SE-18; pad 3, post-hop**



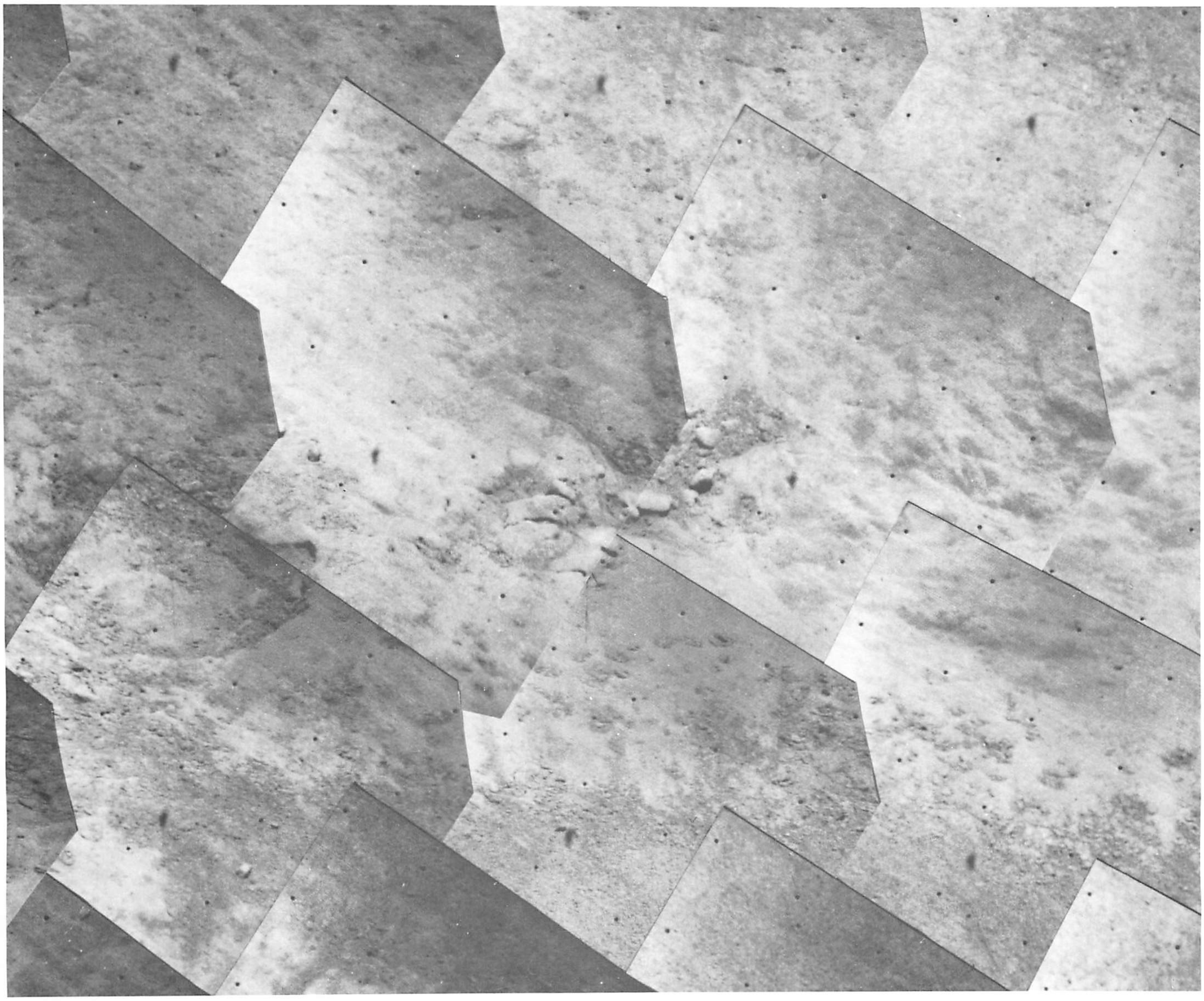
		Azimuth	Lens focal length	Identification
(25)	**Day 319**	**+93 to +69**	**Narrow angle**	**Catalog No. 6-SE-19; pad 3, pre-hop**



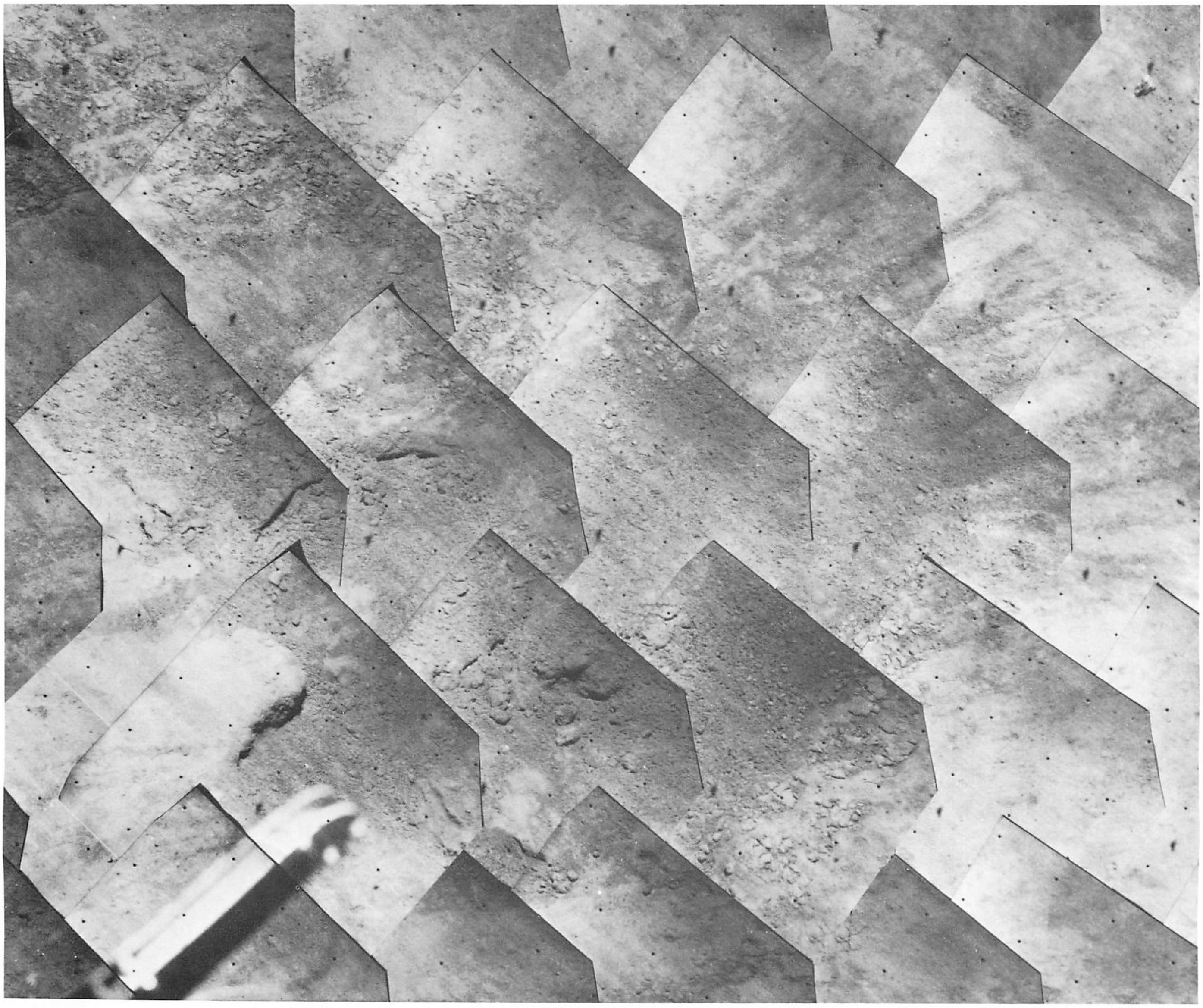
		Azimuth	Lens focal length	Identification
(26)	**Day 326**	**—90 to —36**	**Wide angle**	**Catalog No. 6-SE-20; pad 2, post-hop**



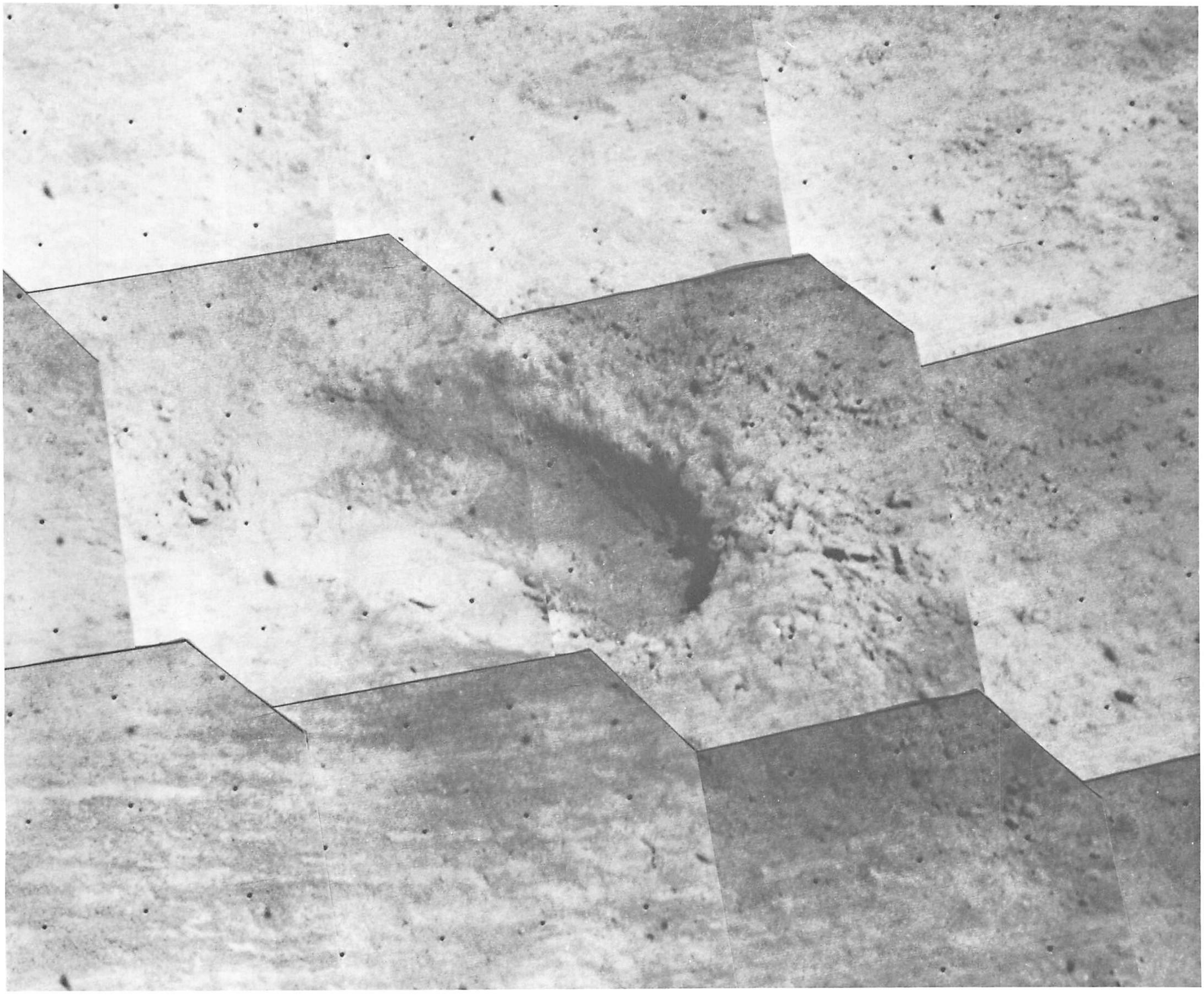
		Azimuth	Lens focal length	Identification
(27)	Day 314	+87 to +75	Narrow angle	Catalog No. 6-SE-21; pad 3, pre-hop



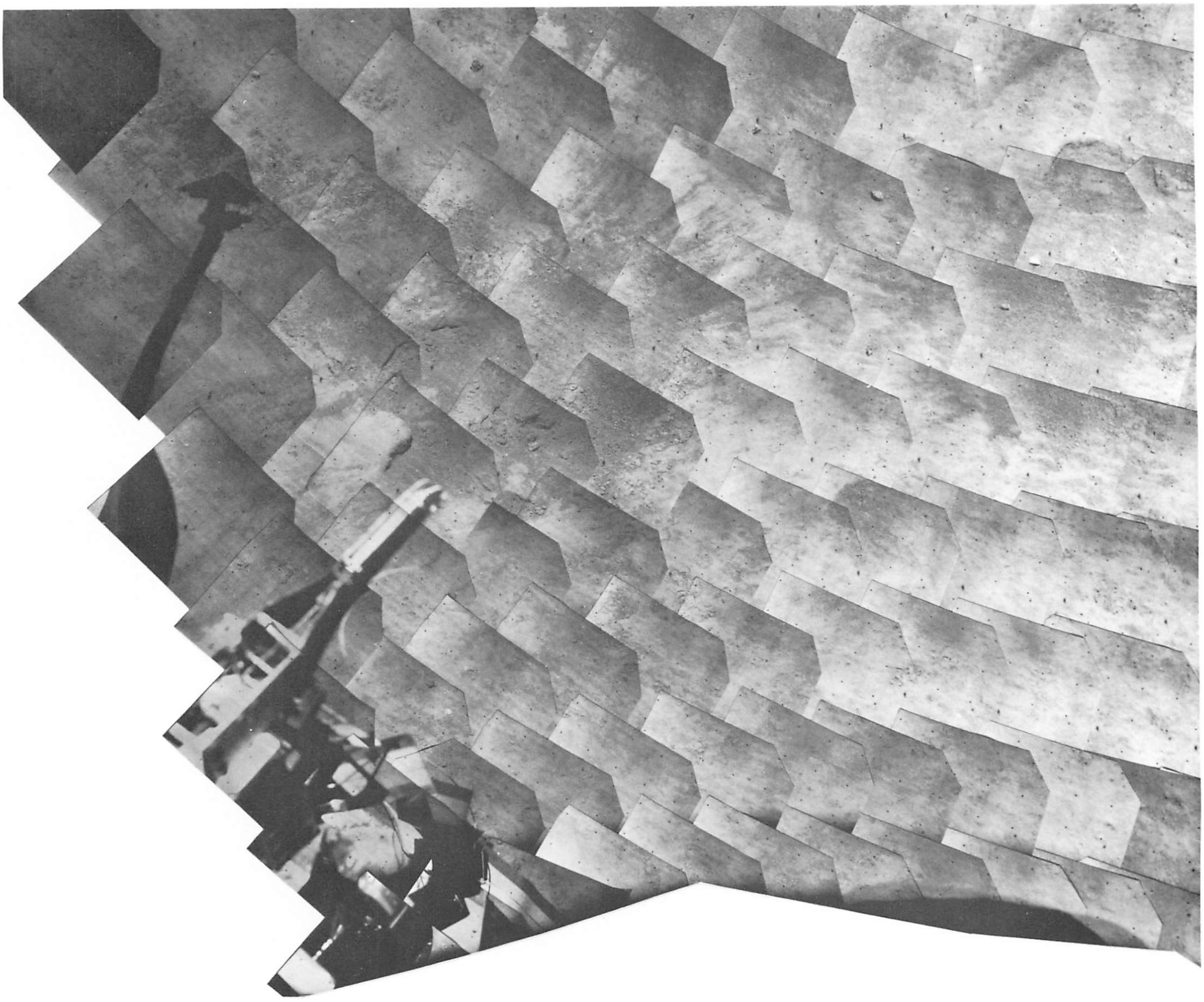
		Azimuth	Lens focal length	Identification
(28)	Day 321/ 322	+21 to +36	Narrow angle	Catalog No. 6-SE-22*; block 2 imprint



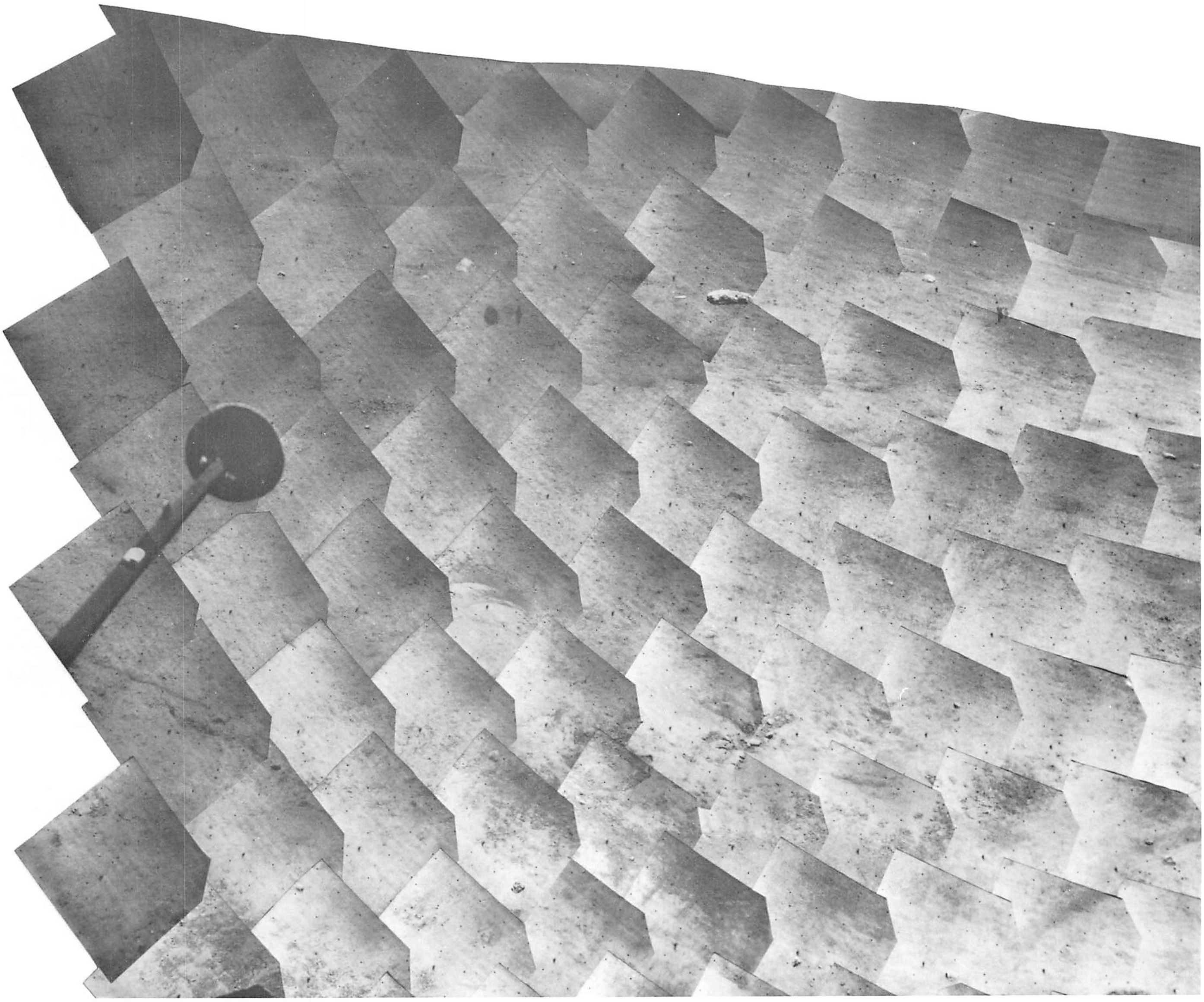
		Azimuth	Lens focal length	Identification
(29)	Day 321	+24 to +48	Narrow angle	Catalog No. 6-SE-22/* block 1 imprint



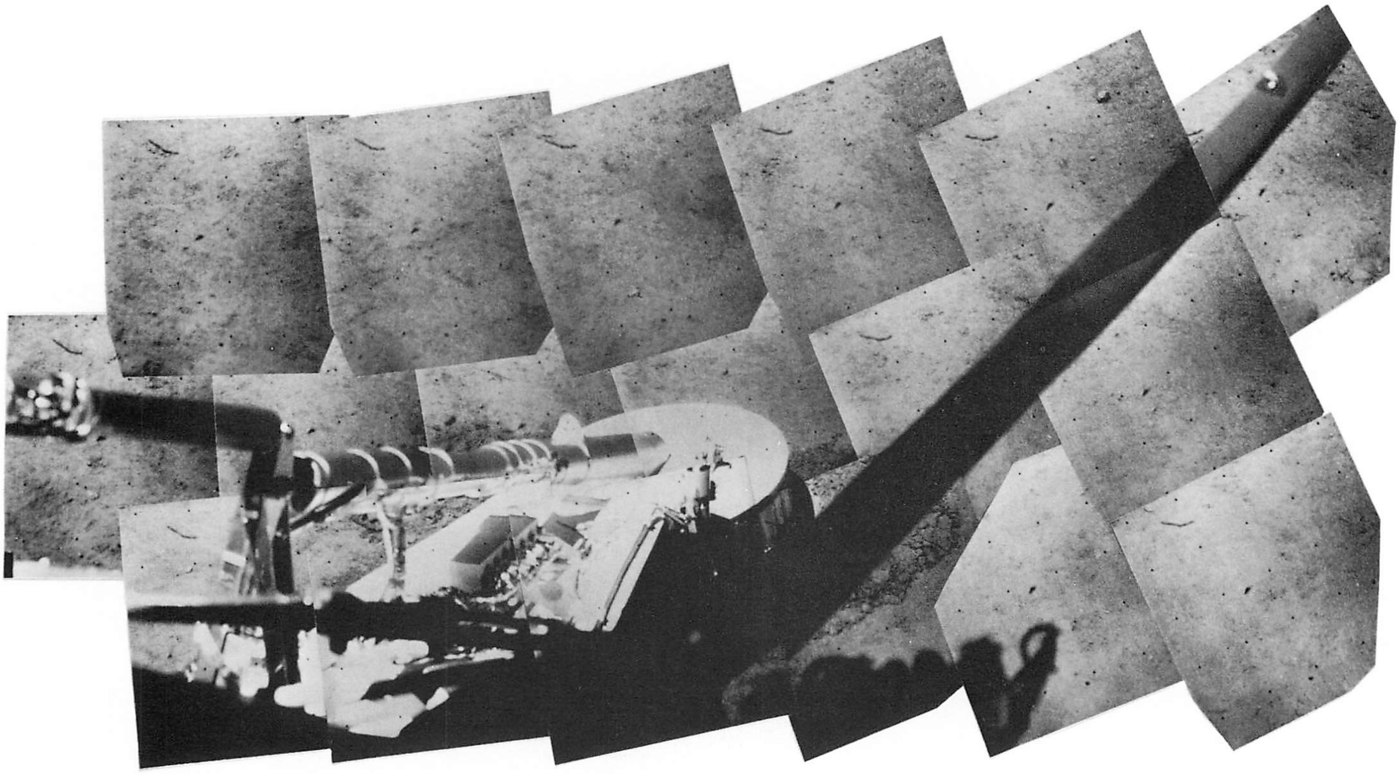
		Azimuth	Lens focal length	Identification
(30)	Day 322	—18 to —9	Narrow angle	Catalog No. 6-SE-22/* pad 2 imprint



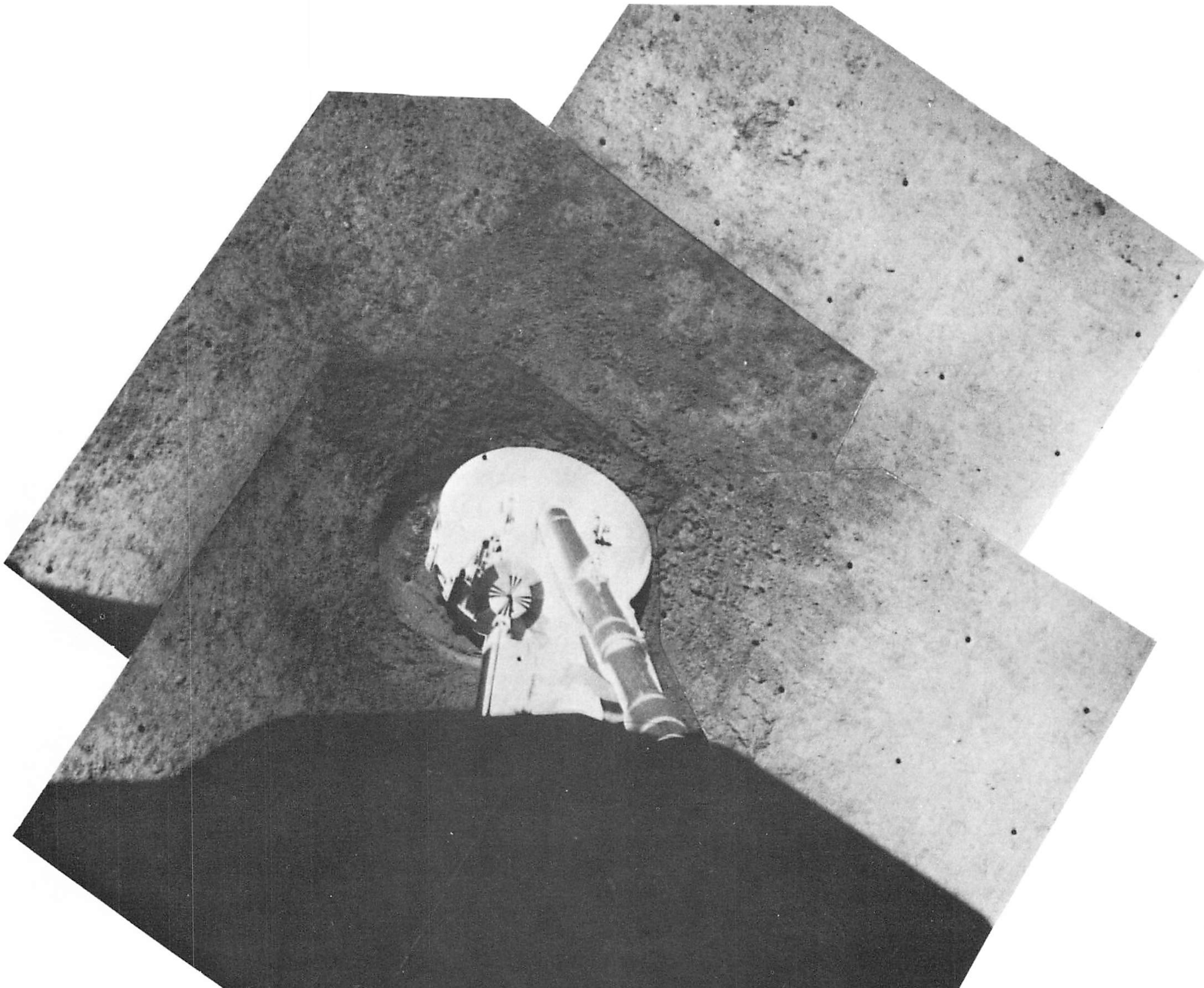
		Azimuth	Lens focal length	Identification
(31)	**Day 321**	**+3 to +57**	**Narrow angle**	**Catalog No. 6-SE-22/* block and vernier engine 1 area**



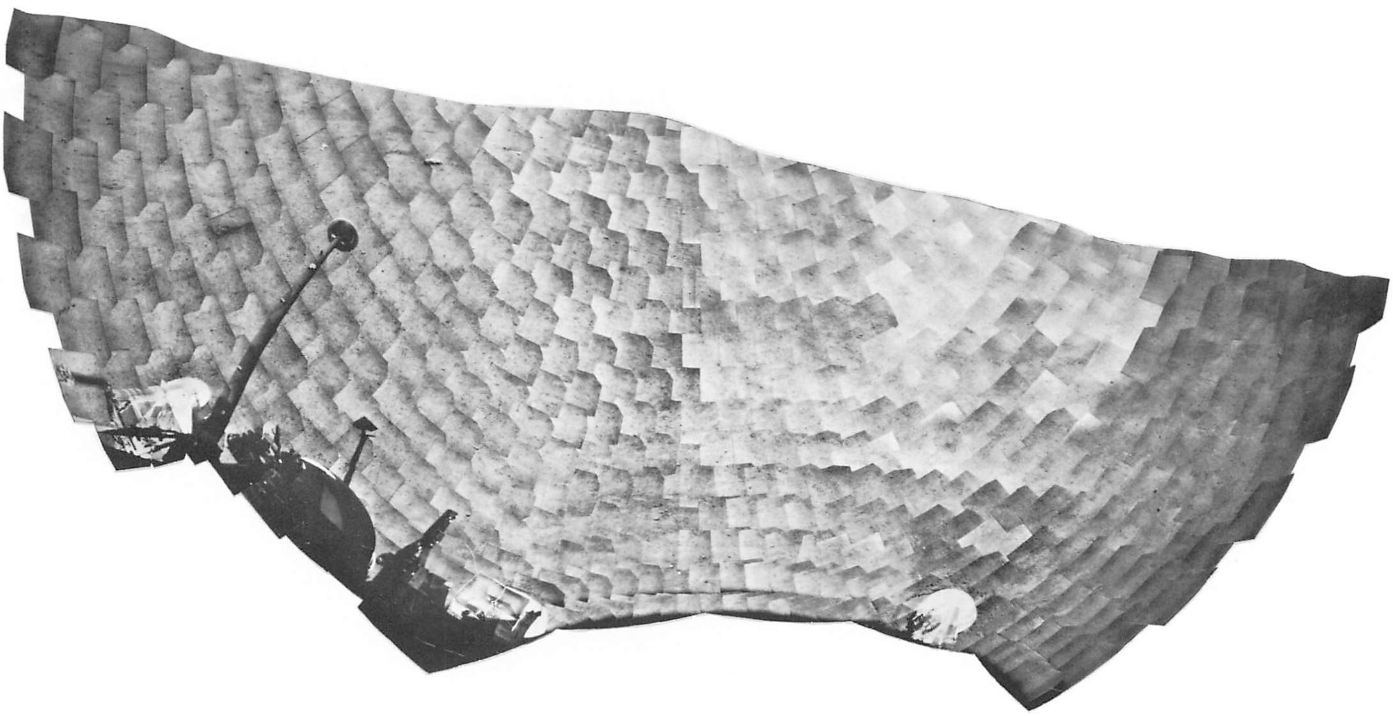
(32)	Day 321	Azimuth 0 to +57	Lens focal length Narrow angle	Identification Catalog No. 6-SE-22*; block, pad, vernier engine 3 area



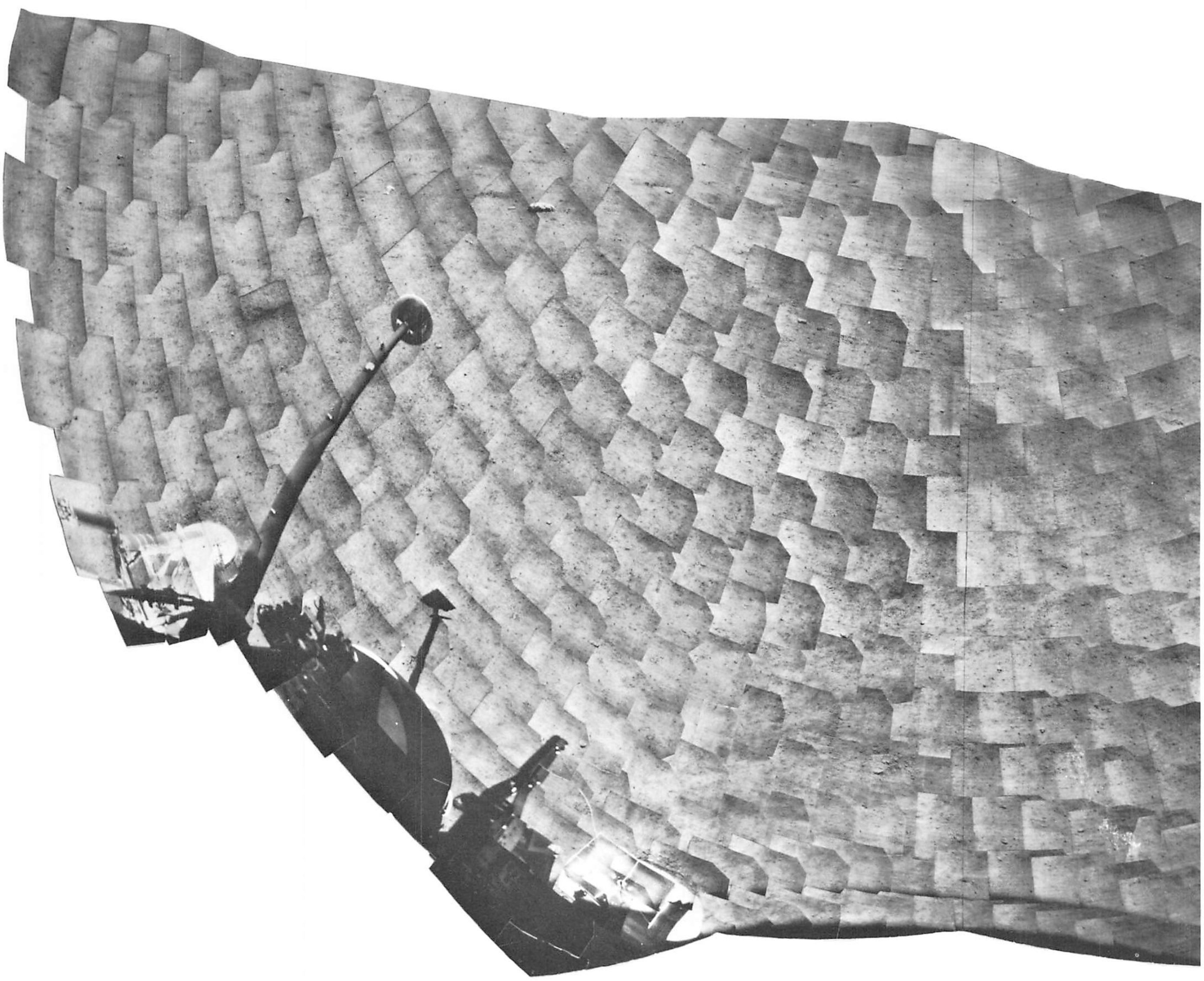
		Azimuth	Lens focal length	Identification
(33)	**Day 322**	**+63 to +93**	**Narrow angle**	**Catalog No. 6-SE-24; pad 3, post-hop**



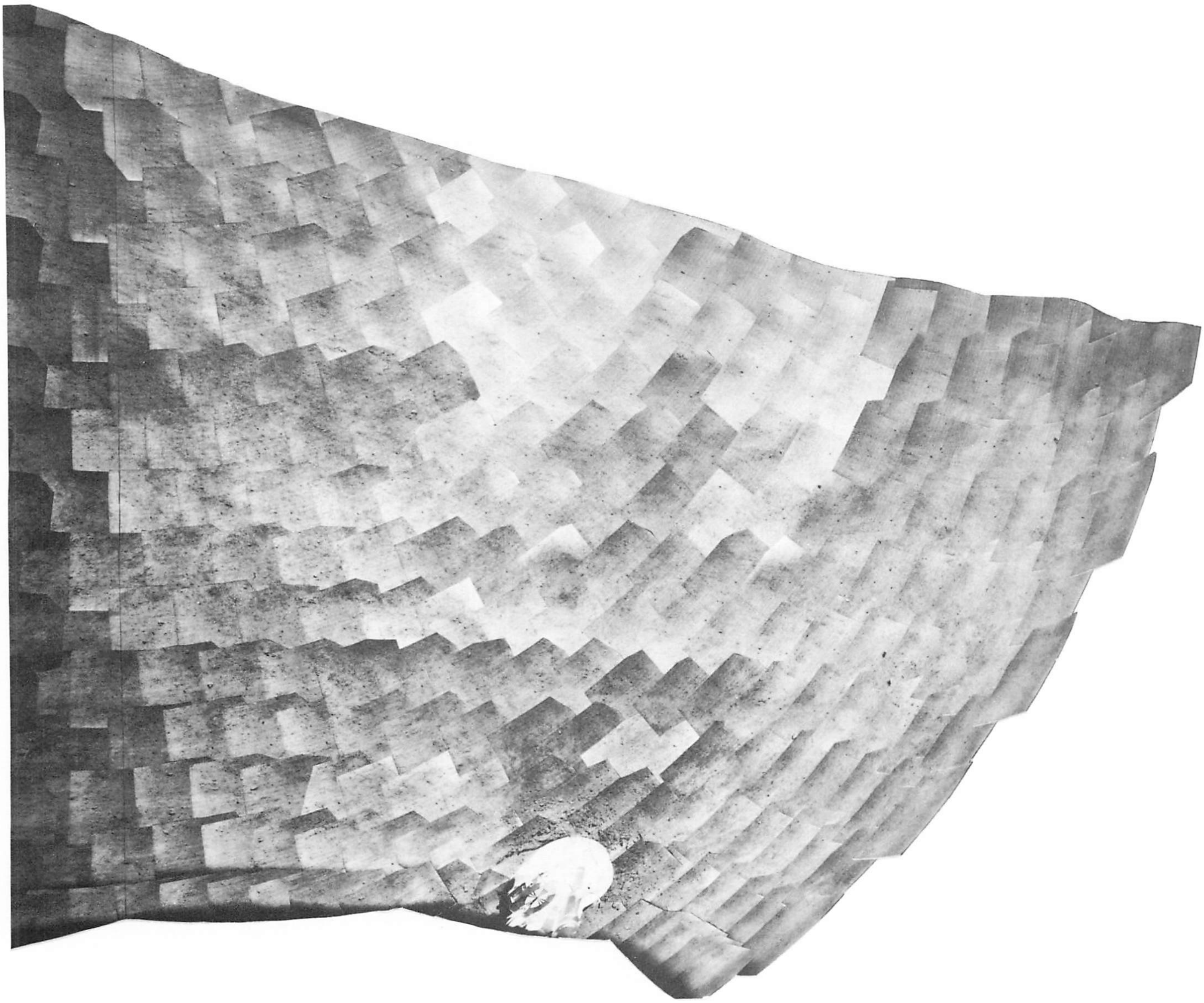
		Azimuth	Lens focal length	Identification
(34)	Day 319	—90 to —51	Wide angle	Catalog No. 6-SE-25; pad 2, pre-hop



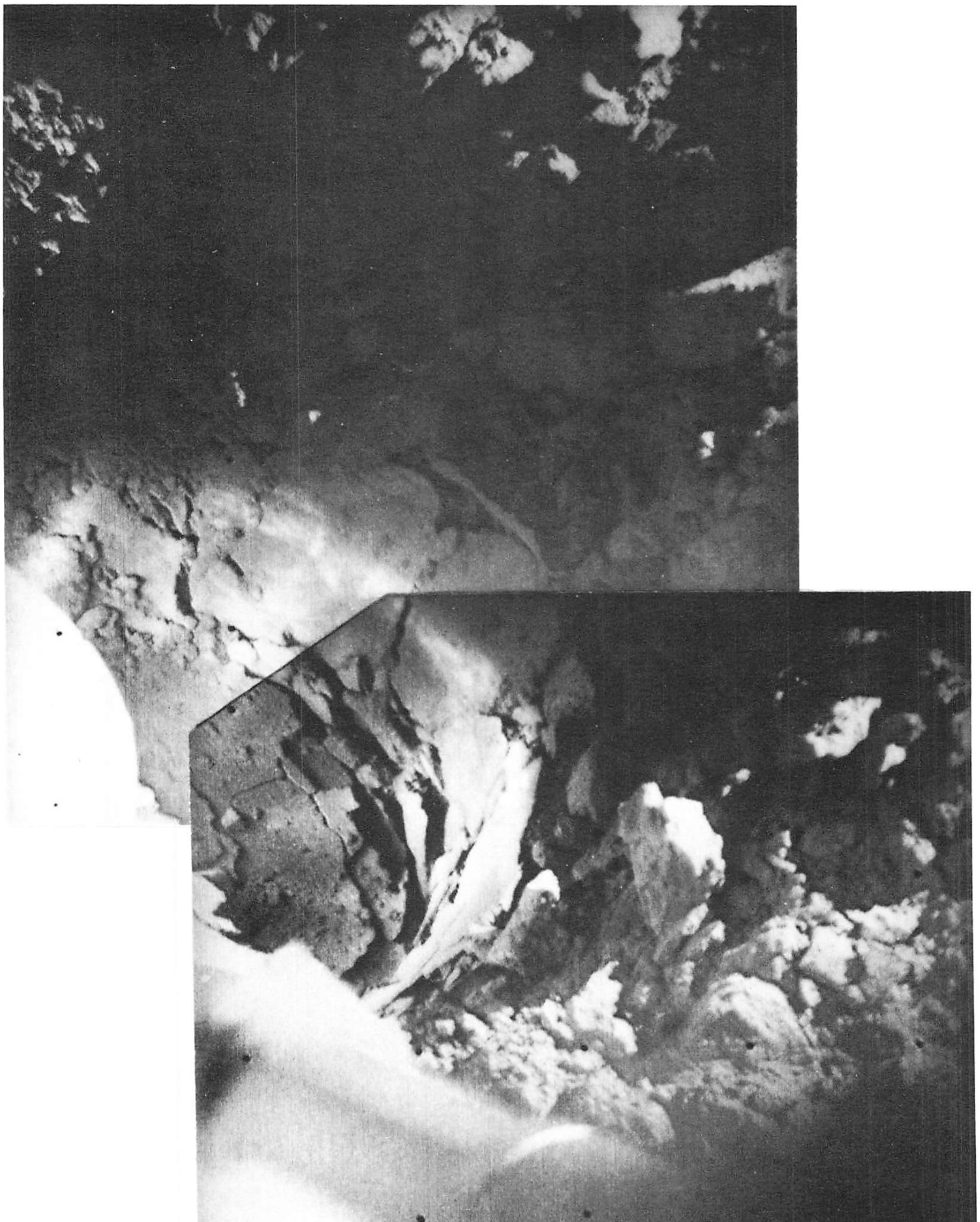
		Azimuth	Lens focal length	Identification
(35)	Day 320	−105 to +60	Narrow angle	Catalog No. 6-SE-26; pre-hop panorama



(36)	Day 320	Azimuth	Lens focal length	Identification
		+60 to −60	Narrow angle	Catalog No. 6-SE-26*; pre-hop panorama



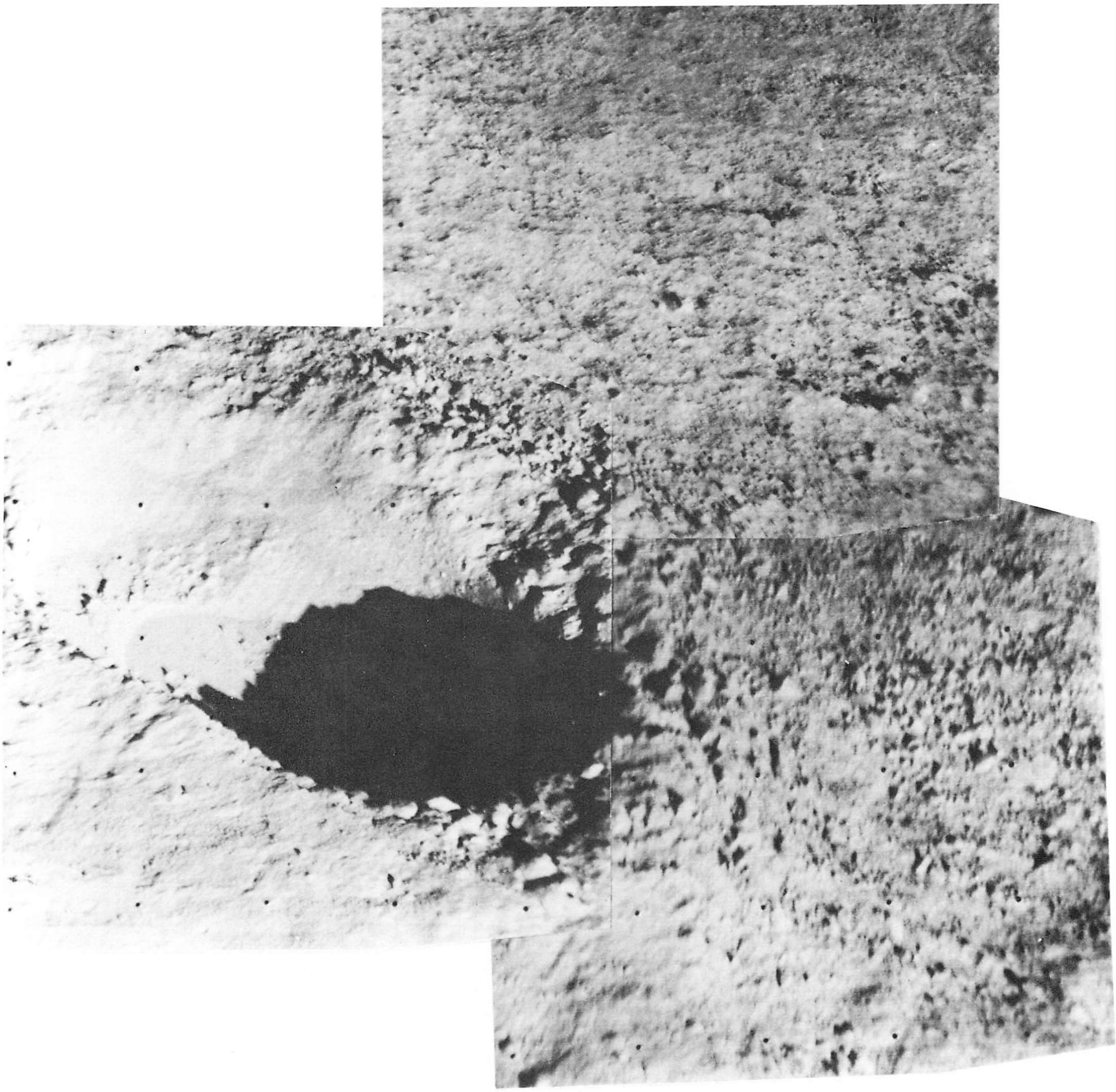
(37)	Day 320	Azimuth	Lens focal length	Identification
		—105 to +15	**Narrow angle**	**Catalog No. 6-SE-26*; pre-hop panorama**



		Azimuth	Lens focal length	Identification
(38)	Day 326	—72	Narrow angle	Catalog No. 6-SE-35; pad 2 imprint

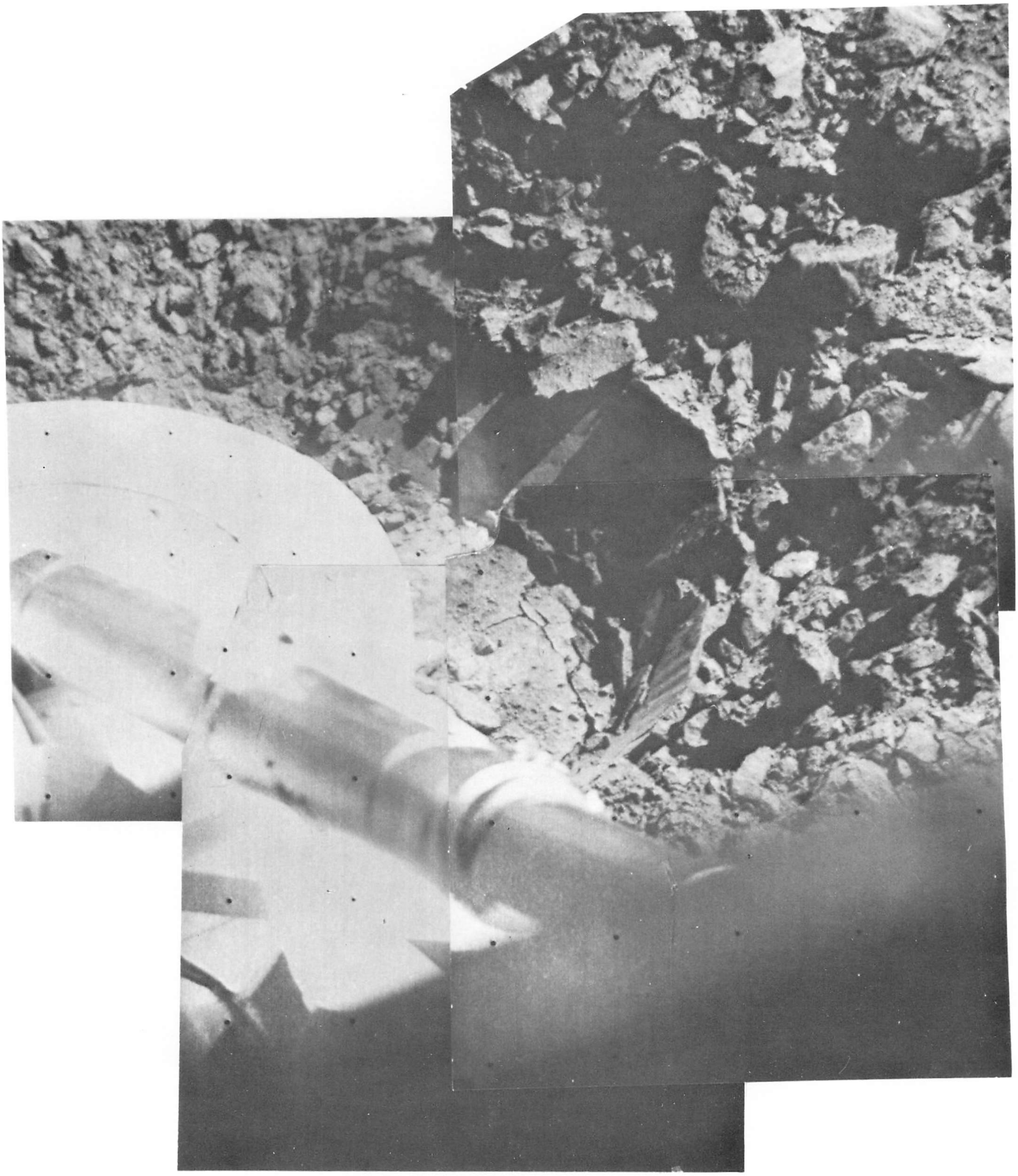
		Azimuth	Lens focal length	Identification
(39)	Day 323	—69 to —66	Narrow angle	Catalog No. 6-SE-37; pad 2, post-hop

		Azimuth	Lens focal length	Identification
(40)	Day 323	—15 to —9	Narrow angle	Catalog No. 6-SE-39; pad 2 imprint, pre-hop

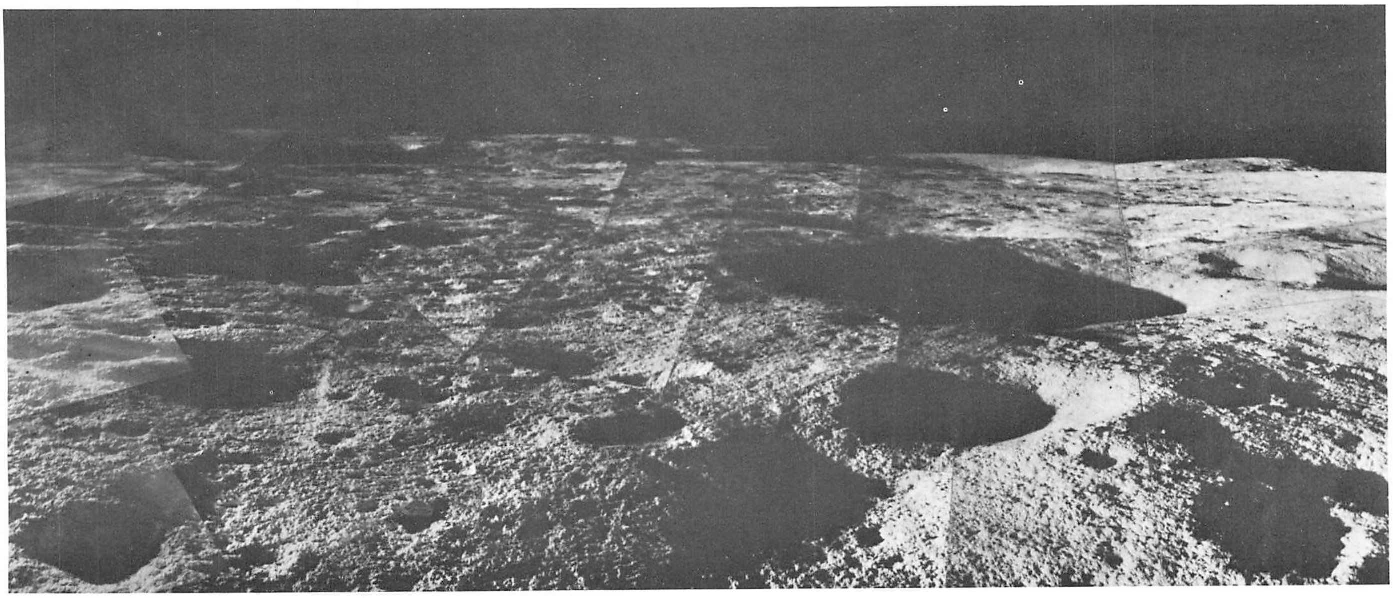


		Azimuth	Lens focal length	Identification
(41)	Day 326	—18 to —12	Narrow angle	Catalog No. 6-SE-40; pad 2 imprint, pre-hop

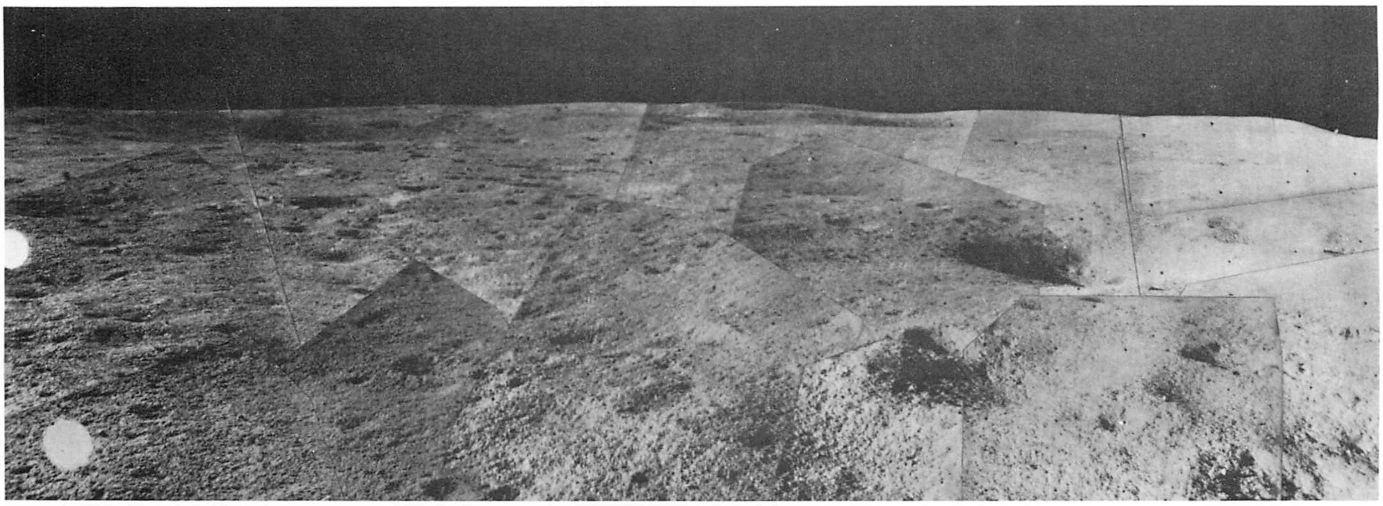
		Azimuth	Lens focal length	Identification
(42)	**Day 321**	**—72 to —63**	**Narrow angle**	**Catalog No. 6-SE-41; pad 2, post-hop**



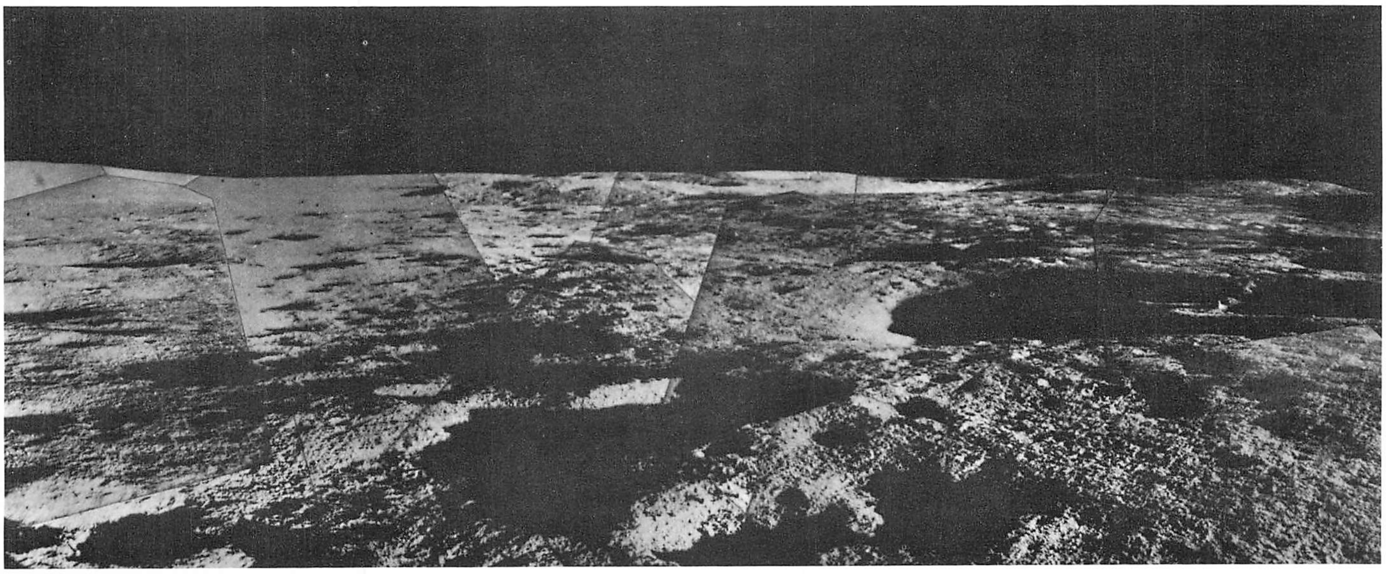
		Azimuth	Lens focal length	Identification
(43)	Day 324	—75 to —63	Narrow angle	Catalog No. 6-SE-42; pad 2, post-hop



		Azimuth	Lens focal length	Identification
(44)	Day 314	—90 to 0	Wide angle	Catalog No. USGS; southeast horizon (A.M.)



		Azimuth	Lens focal length	Identification
(45)	**Day 315**	**—90 to 0**	**Wide angle**	**Catalog No. USGS; southeast horizon (A.M.)**



		Azimuth	Lens focal length	Identification
(46)	Day 328	—90 to 0	Wide angle	Catalog No. USGS; southeast horizon (P.M.)