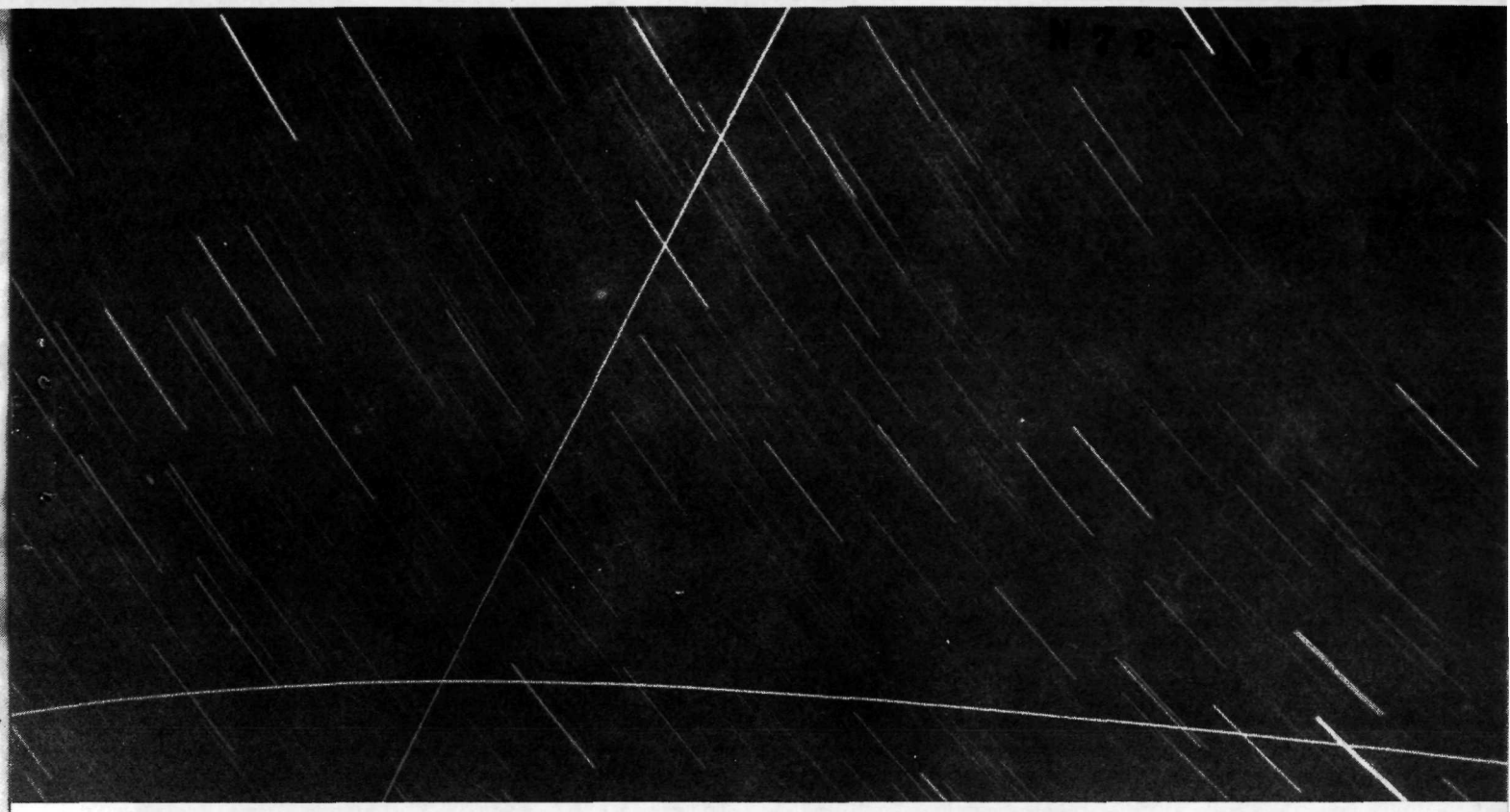

DATA USERS' NOTE

NSSDC 70-06

APOLLO 11 LUNAR PHOTOGRAPHY

(NSSDC ID NO. 69-059A-01)

APRIL 1970

NATIONAL SPACE SCIENCE DATA CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION · GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

DATA USERS' NOTE
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APOLLO 11 LUNAR PHOTOGRAPHY
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PREPARED BY:

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APRIL 1970

FOREWORD

The purposes of this *Data Users' Note* are to announce the availability of the complete set of Apollo 11 pictorial data and to aid an investigator in the selection of Apollo 11 photographs for study. In addition, this *Note* can provide guidance in the interpretation of the photographs. As background information, the *Note* includes brief descriptions of the Apollo 11 mission objectives, photographic equipment, and photographic coverage and quality. The National Space Science Data Center (NSSDC) can provide all forms of photographs described in the section on Format of Available Data.

NSSDC will supply, as resources permit, limited quantities of photographs without charge where they are to be used, first, for specific scientific studies, and, second, for college-level science courses. All requesters should refer to the section on Ordering Procedures for specific ordering instructions. Scientists conducting an investigation that requires photographic data should inform NSSDC of their needs and should identify the nature of their study, their affiliation with a scientific organization, university, or company, and any government contracts they may have for performing the investigation. The Data Center seeks to keep informed of the results of any scientific investigations performed with the use of Apollo photographs. We therefore request that scientists submit reprints of any published papers to the Data Center so that the results of their studies can be made known to other users. It is also requested that in such papers NSSDC be acknowledged as the source of photographic data.

CONTENTS

APOLLO 11 LUNAR PHOTOGRAPHY

INTRODUCTION

Apollo 11 (1969-059A) was launched from Cape Kennedy, Florida, on July 16, 1969, on a 9-day lunar landing mission. The spacecraft attained a near-circular orbit with an apolune of 65 nautical miles and a perilune of 54 nautical miles. Photography during the mission was accomplished from the Apollo 11 command module (CM), which spent 59 hours in lunar orbit; from the lunar module (LM), which landed successfully at 0.67° north latitude and 23.49° east longitude in the southwest part of Mare Tranquillitatis; and by the Apollo 11 astronauts during extravehicular activities (EVA) on the lunar surface. The command module and crew returned to earth on July 24, 1969.

The purpose of this first Apollo lunar landing mission was to open a new field of exploration and scientific research. The success of the mission, as stated by Dr. Thomas Paine of NASA, " . . . . . will lead to a greater understanding of our planet and provide a new insight into the origin and history of the solar system . . . . and subsequent missions will reflect more ambitious scientific objectives . . . . at a variety of lunar sites."

PHOTOGRAPHIC OBJECTIVES

Apollo 11 represented man's first opportunity to directly observe scientific phenomena on the lunar surface. Both the surface and orbital photography of the mission served not only to document man's first lunar landing and the extravehicular activities of the astronauts, but also to identify scientific areas and experiments for study in future missions.

The photographic equipment and materials carried by Apollo 11 were designed specifically: (1) to photograph "targets of opportunity," i.e., scientifically interesting sites, and potential Apollo landing sites as time and circumstances permitted; (2) to obtain photographs of the lunar module and lunar surface activities after LM landing; (3) to obtain vertical and oblique stereo strips of nearside and farside regions of scientific interest; (4) to record mission operational activities; and (5) to obtain documentation for subsequent landing crew training purposes.

PHOTOGRAPHIC EQUIPMENT

Cameras

The camera equipment carried by Apollo 11 consisted of one 70-mm Hasselblad electric camera, two Hasselblad 70-mm lunar surface superwide-angle cameras, one Hasselblad EL data camera, two 16-mm Maurer data acquisition cameras, and one 35-mm lunar surface closeup stereoscopic camera.

70-mm Hasselblad Electric Camera. This camera, which was carried aboard the command module, featured a motor-drive mechanism, powered by two nickel-cadmium batteries, that advanced the film and cocked the shutter whenever the camera was activated. The settings and ranges for equipment on this camera were:

Lens Focal Length:	80 mm	250 mm
Focus:	3 ft to infinity	8.5 ft to infinity
Aperture:	f/2.8 to f/22	f/5.6 to f/45
Shutter Speed:	1 sec to 1/500 sec	1 sec to 1/500 sec
Field of View:	37.9° side, 51.8° diagonal	12.5° side, 17.6° diagonal
Film Magazine Capacity:	200 frames B&W, thin base 160 frames color, thin base 100 frames, standard base	

70-mm Hasselblad Lunar Surface Superwide-Angle Cameras. These cameras, which were carried aboard the lunar module, were operated manually for the shutter and film advance. The settings and ranges for equipment on these cameras were:

Lens Focal Length:	38 mm
Focus:	12 in. to infinity
Shutter Speed:	1 sec to 1/500 sec
Field of View:	71.7° side, 91.1° diagonal

70-mm Hasselblad EL Data Camera. This electrically powered camera, carried on the lunar module, featured semiautomatic operation. It used a 60-mm Biogon lens exclusively. The operating sequence was initiated by squeezing a trigger mounted on the camera handle. A reseau grid was set in front of the image plane to provide photogrammetric information in the analysis of the photography. The camera was bracket-mounted on the front of a LM astronaut's suit. The settings and ranges for equipment on this camera were:

Lens Focal Length:	60-mm Biogon
Focus:	3 ft to infinity
Aperture:	f/5.6 to f/22
Shutter Speed:	1 sec to 1/500 sec
Field of View:	49.2° side, 66° diagonal

16-mm Maurer Data Acquisition Cameras. Apollo 11 carried two Maurer data acquisition cameras, one on the command module and one on the lunar module. The cameras were used primarily to record engineering data and for continuous-sequence terrain photography. The CM camera had lenses of 5-, 10-, 18-, and 75-mm focal lengths; the LM camera was fitted with an 18-mm wide-angle lens. Accessories included a right-angle mirror, a power cable, and a CM boresight window bracket.

The Maurer camera weighed 2.8 pounds with a 130-foot film magazine attached. It had frame rates of 1, 6, and 12 fps automatic and 24 fps semiautomatic at all lens focal lengths, and shutter speeds of 1/60, 1/125, 1/500, and 1/1000 second, again, at all lens focal lengths. Other settings and ranges for equipment on the camera were:

Lens Focal Length:	5 mm	10 mm	18 mm	75 mm
Focus:	fixed from front of lens to infinity	6 in. to infinity	12 in. to infinity	42 in. to infinity
Aperture:	f/2.0 to f/16	T/1.8 to T/22	T/2 to T/22	f/2.5 to f/32
Field of View:	117.5° hor. x 80.2° vert.; 160° diag.	54.9° hor. x 41.1° vert.; 65.2° diag.	32.3° hor. x 23.5° vert.; 39.2° diag.	7.9° hor. x 5.7° vert.; 10° diag.

During lunar surface extravehicular activity, Astronaut Armstrong was filmed by the lunar module pilot with the LM 16-mm camera set at normal or near-normal frame rates (12 and 24 fps); when the camera was operating automatically, a rate of 1 fps was used. The camera was mounted inside the LM looking through the right-hand window. At a film speed of 1 fps, a 130-foot, 16-mm magazine was expended in 87 minutes real time; at the standard rate of 24 fps, the film's running time was 3.6 minutes.

35-mm Lunar Surface Closeup Stereoscopic Camera. This camera, which was carried on the lunar module's Modular Equipment Storage Assembly (MESA), was designed for the highest possible resolution of a 3-inch square area with a flash illumination and fixed distance. Photography was accomplished by holding the camera on a walking stick against the object to be photographed. The camera was powered by four nickel-cadmium batteries that operated the motor drive mechanism and an electronic flash strobe light. The capabilities, settings, and ranges for equipment on this camera were:

Area Photographed:	72 mm x 82.8 mm
Camera Lenses:	diffraction limited to 46.12 mm at f/17 using Kodak M-39 copy lenses focused for object distance of 184.5 mm
Focus:	fixed range
Aperture:	f/22.6 fixed
Film:	30-ft SO-368 – 112 stereo pairs
Surface Particle Identification:	as low as .004 in.

Resolution:	approximately 80 microns
Magnification:	0.33 times
Base-Height Ratio:	0.16 for stereoscopic photos
Stereo Angle:	9° convergent
Cycling Time:	10 sec

Films

The films used throughout the mission were as follows.

SO-368 Film (CEX)

Description:	Ektachrome MS, color reversal, ASA 64; haze filter required
Resolution:	80 lines/mm for 1000:1 test object contrast
Use:	terrain and general photography

SO-168 Film (HCEX and CIN)

Description:	Ektachrome EF, high-speed color reversal, ASA 160 for surface and interior photography; no filter required; HCEX exposed and developed at ASA 160, and CIN exposed and developed at ASA 1000
Resolution:	80 lines/mm for 1000:1 test object contrast
Use:	surface and interior photography at low light levels

3400 Film

Description:	Panatomic-X, black and white, ASA 80
Resolution:	170 lines/mm for 1000:1 test object contrast
Use:	high-resolution terrain photography

Accessories

Accessories for the Apollo 11 photographic equipment included the following.

- The light meter used was an automatic spot meter with a narrow angle of acceptance (limited to 1°). The scales on the meter were automatically rotated to give the correct aperture and shutter speed settings.
- A right-angle mirror was used for bracket-mounted photography on the front of the 18-mm and 75-mm acquisition camera lenses.
- A ring sight – an optical aiming device – was used to correct Newton interference in which light rays interfere in a spherically varying mode.

- Three types of filters were used. (1) A haze filter (Photar 2a), which had a cutoff of 3400 A and less, a transmittance of 100 percent in the visible spectrum, and needed no exposure correction, was used with the SO-368 film with the 80-mm and 250-mm lenses. (2) A red filter, which had a cutoff of 6000 A and less, a transmittance of 90 percent for 6500 A and longer, and an exposure correction of 2.5 stops (added exposure needed), was used with black and white film to reduce atmospheric haze. (3) A polarizing filter was used on the lunar surface superwide-angle camera for the photo geology experiment.

PHOTOGRAPHIC COVERAGE AND QUALITY

The orbital and surface lunar photographs obtained during the Apollo 11 mission were of good quality, resolution, and contrast. There were 1359 frames of 70-mm photography, 58,134 frames of 16-mm photography, and 17 pairs of lunar surface stereoscopic photographs. Although only one near-vertical stereo strip was obtained, good low- and medium-oblique photographs were taken. Photos of Tranquillity Base taken from the lunar module and on the surface were also of good quality.

Although the Apollo 11 coverage included photographs of the earth, only the lunar photographs are described in this *Data Users' Note.* For information on the photographs of the earth, please refer to the section on Ordering Procedures.

The photographic coverage of the command and lunar modules is described in map form in the "Apollo Mission 11 Lunar Photography Indexes," which accompanies this *Data Users' Note.* On the index maps, photographic coverage is depicted on a mercator projection with an approximate scale of 1:7,500,000 at the equator. The index consists of four separate sheets that indicate targets of opportunity shown on 70-mm color film (sheet 1), targets of opportunity shown on 70-mm black and white film (sheets 2 and 3), and sequence photography on 16-mm color film (sheet 4).

An index of all photography taken during the Apollo 11 mission is contained in "Apollo 11 Photography: 70-mm, 16-mm, and 35-mm Frame Index," which also accompanies this *Data Users' Note.* For each 70-mm frame, the index presents information on: (1) the focal length of the camera, (2) the photo scale at the principal point of the frame, (3) the selenographic coordinates at the principal point of the frame, (4) the percentage of forward overlap of the frame, (5) the sun angle (medium, low, high), (6) the quality of the photography, (7) the approximate tilt (minimum and maximum) of the camera, and (8) the direction of tilt. A brief description of each frame also appears in the index.

The index to the 16-mm sequence photography includes information concerning the approximate surface coverage of the photographic sequence and a brief description of principal features shown. A "remarks" column is also included to indicate if the sequence is plotted on the photographic index map.

The pictures taken using the lunar surface closeup stereoscopic camera are described in pages 187-197 of the "Apollo 11 Preliminary Science Report."[1] The referenced document contains a print of each photograph taken and descriptive information about the camera and the quality of the photography.

A summary of the photographic coverage for each film magazine is given in Appendix A. This summary is ordered by film type and size.

FORMAT OF AVAILABLE DATA

The Apollo 11 films on file at NSSDC include direct copies of the original 70-mm, 16-mm, and 35-mm films that are stored at the NASA Manned Spacecraft Center (MSC), Houston, Texas. These films were processed by the MSC Photographic Technology Laboratory and constitute the NSSDC master copies. To satisfy requests for photographs, additional (second-generation) working copies have also been prepared. An indication of the standard formats and sizes of Apollo 11 photography available from NSSDC is given below.

70-mm Photography

Reproductions of complete magazines of 70-mm photography can be obtained either (1) as positive or negative film copies on 70-mm black and white roll film or (2) as positive contact black and white paper prints on 70-mm roll paper. Selected frames of 70-mm photography will be processed as 8- x 10-inch black and white paper prints or as contact black and white positive or negative film copies on 4- x 5-inch film sheets. (Color reproductions in the form of contact positive or negative film copies on 4- x 5-inch film sheets or as 8- x 10-inch prints can be obtained for selected frames. However, the color reproductions will be provided only to those persons performing detailed investigations.)

16-mm Photography

The 16-mm sequence films are available as 16-mm positive or negative color film duplicates. For convenience, the individual 16-mm magazines have been spliced together and are available on two reels. It should be pointed out that this photography is suitable only for scientific investigation. These films normally will be provided on a 3-month loan basis, although in special instances arrangements can be made for permanent retention.

35-mm Photography

Reproductions of the 35-mm stereo photography can be obtained as 35-mm color stereo slides in glass mounts.

ORDERING PROCEDURES

When ordering photographic data, please refer to "Apollo Mission 11 Lunar Photography Indexes" and "Apollo 11 Photography: 70-mm, 16-mm, and 35-mm Frame Index" and indicate:

- Apollo mission number,
- complete frame number(s), e.g., AS11-36-5291,
- form and size of reproduction, e.g., 8 x 10" B&W print or 4 x 5" color positive transparency, and
- other identifying information such as crater or feature names.

The Apollo Lunar Photography Order Form enclosed with this *Note* is provided for the requester's convenience. All parts of the form must be completed to ensure satisfactory request fulfillment. If the photographs are to be used in an ongoing or planned study, this should be indicated in the appropriate place on the form, and some indication of the nature of the study and of whether it is being performed under contract to the government should be given. To assist NSSDC in processing requests for reproductions, please identify all required photography in a single order.

NSSDC will provide reproduction support to individuals and organizations only when the data requested are needed for specific scientific research projects or for use in college-level science courses, in that order. The current policy in satisfying such requests is to furnish limited quantities of reproductions without charge. Nominal charges will be imposed for large orders. When charges are deemed necessary, the requester will be advised of the exact charge and the procedure for making payment before the request is filled. The price list provided on the order form is intended to give the reader an indication of the per item cost of reproductions in the event charges are necessary.

The Apollo 11 pictures may be reviewed at NSSDC. Inquiries about or requests for photographs from U.S. scientists should be addressed to:

National Space Science Data Center
Code 601.4
Goddard Space Flight Center
Greenbelt, Maryland 20771

Telephone: (301) 982-6695

Requests for photographs from researchers outside the U.S.A. should be directed to:

World Data Center A for Rockets and Satellites
Code 601
Goddard Space Flight Center
Greenbelt, Maryland 20771 U.S.A.

The World Data Center A for Rockets and Satellites is now assisting scientists located outside the United States in acquiring space science data held in U.S. national archives. Since January 2, 1969, it has been located contiguous to NSSDC.

Individuals or organizations that wish to obtain Apollo 11 photographic reproductions for purposes other than use in research projects or college-level science courses should address their requests to:

Public Information Division
Code FP
National Aeronautics and Space Administration
Washington, D.C. 20546

Printed materials to satisfy general information requests are also available from this division.

Representative sets of Apollo 11 photographs can be obtained (at cost) as full-color lithographs from:

Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Requests should specify NASA picture sets as follows.

- NASA Picture Set 1, "Apollo – In the Beginning" ($1.25)
- NASA Picture Set 2, "Men of Apollo" ($1.00)
- NASA Picture Set 3, "Eyewitness to Space" ($2.75)
- NASA Picture Set 4, "First Manned Lunar Landing" ($1.75)
- NASA Picture Set 5, "Man on the Moon" ($1.00)

Inquiries or requests regarding pictures of the earth taken during the Apollo 11 mission should be directed to:

Technology Application Center
University of New Mexico
Albuquerque, New Mexico 87106

ACKNOWLEDGMENTS

The Data Center wishes to thank the individuals and organizations responsible for the high-quality photographs and supporting data obtained during the Apollo 11 mission. The mission photography was successfully accomplished by the Apollo 11 crew: Astronauts Neil A. Armstrong, Edwin E. Aldrin, Jr., and Michael Collins.

Arrangements to have the photographs and data available through NSSDC were made with the assistance of the program scientist, Dr. Richard Allenby of NASA Headquarters, and the project scientist, Mr. James Sasser of the Mapping Sciences Laboratory, NASA Manned Spacecraft Center. Copies of the photographs and the supporting documentation were furnished by the MSC Photographic Technology Laboratory and the Mapping Sciences Laboratory, respectively. The lunar index maps were printed by the USAF Aeronautical Chart & Information Center, St. Louis, Missouri, from data provided by the Mapping Sciences Laboratory.

REFERENCE

1. "Apollo 11 Preliminary Science Report," NASA SP-214, pp. I87-197, Oct. 1969.

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"The Role of Optics in the Apollo Program," *Optical Spectra, 3,* No. 5, Sept.-Oct. 1969.

APPENDIX A

Summary of Apollo 11 Photographic Coverage

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APPENDIX A

Summary of Apollo 11 Photographic Coverage

Film Type and Size	Magazine	Frame Numbers	Remarks
SO-368 70 mm Color	N	AS11-36-5291 thru 5432	Most frames are of the translunar phase of the mission, including photos of the earth and capsule interior as well as operational photographs. The last 28 frames of the magazine are of the lunar surface; these photographs are of craters* IX, 204, 205, 207, 211, 216, 217, 220, 275, 282, and 292 and targets of opportunity** 30, 34, 46, and 50.
	V	AS11-44-6540 thru 6696	This magazine contains pictures (80-mm and 250-mm focal lengths) of lunar topography taken before separation of the lunar module and the command module, during separation, during docking, and immediately after transearth insertion (TEI). It also includes pictures taken of the earth several hours prior to splashdown. Targets of opportunity fully or partially covered include 15, 35, 36, 43, 46, 47, 50, 53, 55, 57, 61, and 80. The majority of the photographs are high-angle obliques.
SO-168 70 mm Color	R	AS11-37-5433 thru 5555	This magazine contains photographs taken from the LM with an 80-mm lens. Frames 5433 thru 5448 were taken from orbital altitude, with the CM visible over the lunar surface in frames 5443 thru 5448. The remainder of the frames contain photographs of the lunar surface from the LM at Tranquillity Base. Partial coverage of targets of opportunity 67 and 115 is shown on frames 5436 and 5437.

*These craters are identified on the "Lunar Farside Chart" published in 1967 by the Aeronautical Chart & Information Center. The names on this chart were adopted from the International Astronomical Union (1935, 1961, and 1964).

**The targets of opportunity are identified in the "Apollo Targets of Opportunity Chart – Apollo 11" published July 16, 1969, by the Aeronautical Chart & Information Center. Copies of this chart are available, on a limited basis, from NSSDC.

Film Type and Size	Magazine	Frame Numbers	Remarks
	S	AS11-40-5844 thru 5970	The first three frames of the magazine were taken with a 60-mm lens aboard the LM. The remainder of the magazine was used on the lunar surface at Tranquillity Base. There are a variety of subjects recorded including photos of the astronauts, the LM, and the deployment of the experiment package, plus panoramic photos of the lunar horizon.
Panatomic-X 3400 70 mm B&W	O	AS11-38-5556 thru 5689	This magazine contains photographs taken with a 250-mm lens of the farside of the moon with a short sequence in Mare Fecunditatis and another sequence extending into the nearside terminator. There are several photos of the moon and the earth taken after transearth insertion. Target of opportunity 137 was photographed on frames 5605 thru 5608.
	P	AS11-41-5971 thru 6159	This magazine contains pictures taken from the command module with an 80-mm lens at approximately 60 n.m. orbital altitude. The first 132 frames are sequential high obliques with 90% to 98% forward overlap. The west-looking sequence starts near 140° east longitude at the equator and continues to the nearside lunar terminator at 15° east. Targets of opportunity 34, 67, 80, 84, and 115 were partially imaged; landing site 2 is also covered on this magazine. The next 24 frames used a 250-mm lens for a west-looking oblique sequence starting at 35° east longitude and continuing to the nearside terminator. Targets of opportunity 80 and 132 are partially imaged. The remaining frames are south-looking obliques taken on the farside of the moon with a 250-mm lens. Target of opportunity 15 and crater 208 are included.
	Q	AS11-39-5737 thru 5843	This magazine contains photography of Tranquillity Base with several photos around the landing area. The photographs were taken with the 80-mm lens.

Film Type and Size	Magazine	Frame Numbers	Remarks
	T	AS11-43-6349 thru 6539	These frames of the lunar surface were taken from the command module at approximately 60 n.m. orbital altitude. The first 14 frames are north-looking obliques. The area of coverage begins near 108° east longitude at approximately 5° north latitude and continues to 100° east longitude. The 250-mm focal length lens was used for this photography. Targets of opportunity 53 and 55 were partially imaged. The next 120 frames are northeast-looking oblique sequences, commencing at the farside terminator (160° west longitude) and continuing to an area just south of the Mare Crisium (60° east longitude). The following targets of opportunity were partially imaged: 11, 16, 30, 34, 66, and 67. The remaining 54 frames are west-looking near-vertical photographs taken of the farside of the moon with an 80-mm lens. The area of coverage begins at 170° east longitude at the equator and ends at approximately 110° east longitude, 2.5° north latitude. Targets of opportunity 33 and 46 are partially imaged.
	U	AS11-42-6160 thru 6348	This magazine was taken from the command module while in a near-circular equatorial orbit. Both the 80-mm and 250-mm lenses were used. The magazine contains oblique and near-vertical views of both the nearside and farside of the moon. There are also several photographs of the solar corona. Portions of the following targets of opportunity were photographed: 11, 16a, 33, 43, 46, 66, and 67.
SO-368 35 mm Color Stereo	W	AS11-45-6697 thru 6713	This magazine contains closeup stereo views of surface materials in the vicinity of the lunar landing site.
SO-368 16 mm Color	A	1-3386*	This magazine contains a panoramic view of the earth plus sequences showing intravehicular activity (IVA), the LM, and the docking of the LM and the command service module (CSM).

*Photography of intravehicular activity and of the earth has been edited from the 16-mm film magazines and is not available through NSSDC. This photography can be obtained from NASA's Public Information Division. (See page 8 for address.)

Film Type and Size	Magazine	Frame Numbers	Remarks
	D	1-5554	This magazine contains sequences from 129.5° east longitude to 85° west longitude and of the CSM tracking the LM to maneuver for docking. It also contains farside scenes of craters 282, 206, 207, 202, 192, and 267 and Mare Smythii.
	E	1-5592	This magazine contains high-oblique panoramic photography covering a quarter of the moon. The principal features are Mare Smythii, Mare Crisium, and craters Langrenus and Humbolt.
	F	1-659	These frames contain a high- to low-oblique panoramic sequence of the lunar farside. The principal features are craters 300, 301, 302, 304, and 305.
		660-2886	This sequence contains: low obliques of craters Sabine, Ritter, and Schmidt; near-vertical photography over Dionysius to Godin, Godin B, and Rhaeticus A; low to high obliques of Triesnecker and Agrippa; and low obliques of LLS-3 (the lunar landing sequence for updating of orbit data from the spacecraft), Blagg, Bruce, and continuation into the terminator.
		2887-2976	These frames contain a high- to low-oblique panoramic sequence of the lunar farside. The principal features are craters 212, 213, 214, and 215.
		2977-3075	These frames contain a high- to low-oblique panoramic sequence of lunar farside craters 211, 282, and 283.
		3076-3186	These frames contain a high- to low-oblique panoramic sequence of lunar farside craters 210, 212, and 214.
		3187-4085	These frames contain a low-oblique to near-vertical sequence of lunar farside craters 208, 211, 213, and 282.

Film Type and Size	Magazine	Frame Numbers	Remarks
		4111-4977	These frames show an earthrise high oblique over Mare Smythii with Neper visible.
	M	1-5541*	This magazine contains frames of the earth (sunrise and sunset) and of spacecraft reentry.
SO-168 16 mm Color	B	1-1922*	These frames show intravehicular activity.
	C	1-5612	This sequence shows lunar module undocking.
	G	1-429*	These frames show intravehicular activity.
		430-488	These frames contain a LM sequence of the CSM.
		489-548	These frames show a low-oblique to near-vertical sequence over the craters Taruntius G and H.
		549-1498	These frames show a low-oblique to near-vertical sequence over Maskelyne, Maskelyne B and G, LLS-2, and Moltke.
	H	1-4445	This sequence was taken from the CM during ascent; it shows LLS-2 over Sabine, Schmidt, Godin, and Godin B.
	I	1-70	This sequence shows the LM tracking the CSM.
		71-2398	This sequence shows LM descent. The frames contain a high to low oblique from the LM window in roll maneuver.

*Photography of intravehicular activity and of the earth has been edited from the 16-mm film magazines and is not available through NSSDC. This photography can be obtained from NASA's Public Information Division. (See page 8 for address.)

Film Type and Size	Magazine	Frame Numbers	Remarks
		2399-2636	This sequence shows a LM roll maneuver.
		2637-5565	This sequence is a high to low oblique of the LM landing on the lunar surface.
	J	1-5612	This magazine is the initial sequence of photography from the LM on the lunar surface. It shows the start of extravehicular activity with Astronaut Armstrong going down the LM ladder onto the lunar surface.
	K	1-5610	This sequence shows activities on the lunar surface.
	L	1-1648	This sequence was taken from the LM on the lunar surface after EVA.
		1649-1833	This lunar farside scene sequence, taken from the LM, was overexposed, and the scene is not identifiable.
		1834-2416*	This earthrise sequence was overexposed, and the scene is not identifiable.
		2417-2845	This sequence was taken from the LM while tracking the CSM prior to docking.

*Photography of intravehicular activity and of the earth has been edited from the 16-mm film magazines and is not available through NSSDC. The photography can be obtained from NASA's Public Information Division. (See page 8 for address.)