MSC-02410

REVISION 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO EXPERIMENTS PROGRAM PLAN

JULY 17, 1970

THIS ISSUE SUPERSEDES ISSUE
DATED MAY 11, 1970

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

IN REPLY REFER TO: PG-M151-70

JUL 17 1970

MEMORANDUM TO: Program Plan Distribution List

FROM : PA/Manager, Apollo Spacecraft Program

SUBJECT : Apollo Experiments Program Plan, Revision 1

Attached is the Apollo Experiments Program Plan, Revision 1, dated July 13, 1970. Revision 1 includes the following pages:

Cover Sheet
Attachment A - Page 1
Attachment C - Page 1
Attachment C - Page 2
Attachment D - Page 1
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Attachment F - Page 17
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Additional revisions will be published as required.

James A. McDivitt
Colonel, USAF

Enclosure

PG:JFGoree,Jr.:jmh 7-10-70

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

IN REPLY REFER TO: PG/M51-70

MAY 15 1970

MEMORANDUM TO: Program Plan Distribution List

FROM : PA/Manager, Apollo Spacecraft Program

SUBJECT : Apollo Experiments Program Plan

ACTION

All MSC Apollo Spacecraft Program supporting elements are to implement the requirements of this directive effective with the issuance date and on a continuing basis.

PURPOSE

This directive defines the schedule and hardware planning guidelines and requirements to be used for implementation of the Apollo Lunar Surface and Orbital Science Experiments. This directive reflects the requirements of Apollo Program Directive 4 (APD-4) and the Apollo Spacecraft Program Plan (Lunar Exploration Missions) Revision 1 of March 2, 1970.

SCOPE

In compliance with overall NASA planning for lunar exploration, MSC has developed supporting plans for spacecraft and experiment hardware launch readiness and mission support. These plans are enclosed as attachments and form the Apollo Experiments Program Plan.

Attachment A is a list of hardware assignments, spacecraft deliveries, and APD-4 launch readiness dates that form the integrated baseline for implementation of this directive.

Attachment B is a summary of mission definitions for the Apollo lunar program in accordance with APD-4 and the Apollo Flight Mission Assignments Document.

Attachment C is a matrix of lunar surface experiment mission assignments being implemented or planned by MSC.

Attachment D is a matrix of orbital experiment mission assignments being implemented or planned by MSC.

Attachment E is a summary of lunar surface experiment descriptions and investigator/hardware development assignments.

Attachment F is a summary of orbital experiment descriptions and investigator/hardware development assignments.

Attachment G is a list of controlled milestones for lunar surface experiments under development to support mission assignments.

Attachment H is a milestone plan for lunar surface experiments planned for definition and/or development.

Attachment I is a list of controlled milestones for orbital experiments under development to support mission assignments.

Attachment J is a milestone plan for orbital experiments planned for definition and/or development.

Attachment K is an identification of MSC organizational responsibilities for supporting the lunar surface and orbital experiment definition activity identified in Attachments I and J.

RESPONSIBILITIES

All ASPO division offices and MSC directorates providing support to the ASPO in fulfilling the requirements of this directive are responsible for the timely completion of the controlled milestones under their management responsibility. ASPO division offices and MSC directorates are to notify Mr. Richard S. Johnston, Manager for Experiments and GFE, Apollo Spacecraft Program, immediately whenever a situation exists or is anticipated that will potentially impact established controlled milestones.

Status of this plan will be maintained current and updated based on approved schedule changes. Revisions will be issued as required.

Richard S. Johnston
for James A. McDivitt
Colonel, USAF

Enclosures

PG:JFGoree,Jr.:jmh 4-22-70

APOLLO LUNAR EXPLORATION MISSIONS

EXPERIMENT PROGRAM PLAN

ATTACHMENT	TITLE	PAGES
A	Spacecraft Delivery and Launch Readiness Schedule	
B	Mission Definitions	
C	Lunar Surface Experiments Mission Assignment	
D	Orbital Experiments Mission Assignment	
E	Lunar Surface Experiments Description	
F	Orbital Experiments Description	
G	Lunar Surface Experiments Controlled Milestones	
H	Lunar Surface Experiments Definition Plan	
I	Orbital Experiments Controlled Milestones	
J	Orbital Experiments Definition Plan	
K	Experiment Definition Plan Responsibilities	

APOLLO LUNAR EXPLORATION MISSIONS

SPACECRAFT DELIVERY AND LAUNCH READINESS SCHEDULE

MISSION DESIGNATION	MISSION TYPE	LAUNCH VEHICLE	CSM	CSM DELIVERY	SLA	LM	LM DELIVERY	LAUNCH READINESS WORKING DATE
Apollo 12	H-1	507	108	Mar 28, 1969	15	6	Mar 24, 1969	Nov 14, 1969
Apollo 13	H-2	508	109	Jun 25, 1969	16	7	Jun 27, 1969	Apr 11, 1970
Apollo 14	H-3	509	110	Nov 17, 1969	17	8	Nov 24, 1969	Jan 31, 1971*
Apollo 15	H-4	510	111	Apr 15, 1970	18	9	Jun 16, 1970	Jul 01, 1971*
Apollo 16	J-1	511	112	Nov 20, 1970	19	10	Oct 15, 1970	Under Review
Apollo 17	J-2	512	113	Mar 12, 1971	20	11	Mar 01, 1971	Under Review
Apollo 18	J-3	514	114	Jun 25, 1971	21	12	Jul 01, 1971	Under Review
Apollo 19	J-4	515	115	Oct 13, 1972	22	13	Nov 15, 1971	Under Review

SKYLAB PROGRAM (FOR INFORMATION)

Skylab-1	Workshop Saturn V (AS-513)				Jul 1972
Skylab-2	206	116	Nov 1971	6	Jul 1972
Skylab-3	207	117	Apr 1972	23	Oct 1972
Skylab-4	208	118	Jul 1972	24	Jan 1973
Skylab (Backup)	209	119	Jan 1973	25	Apr 1973

* The dates shown are the earliest lunar exploration launch readiness working dates. The specific launch readiness dates for Apollo 14 through 19 will be adjusted as necessary to accommodate specific lunar landing sites when they are established.

MISSION DEFINITIONS

Mission Types

The planned flight missions of the Apollo Lunar Exploration Program are of three types which differ primarily with respect to spacecraft configuration and purpose. The three are as follows:

Mission Type	CSM Configuration	LM Configuration	Mission Purpose
G	Block II	Standard	First Lunar Landing
H	Block II	Standard	Lunar Surface Science
J	Modified Block II	Modified LM	Lunar Surface and Lunar Orbital Science

The plans for this program include one G-type mission, four H-type missions and four J-type missions. These missions are summarized in table I Additional mission definition details are available in the Apollo Lunar Exploration Program - Program and Mission Definition Document (SPD-9P-052).

MISSION DEFINITIONS

MISSION TYPE			APOLLO LUNAR LANDING	H-SERIES MISSIONS			
			APOLLO 11 (G)	APOLLO 12 (H1)	APOLLO 13 (H2)	APOLLO 14 (H3)	APOLLO 15 (H4)
SUMMARY OF PRIMARY OBJECTIVES			MANNED LUNAR LANDING AND RETURN	SELENOLOGICAL SURVEY AND SAMPLING (MARE) ALSEP DEPLOYMENT POINT LANDING DEVELOPMENT SURFACE EVA ASSESSMENT BOOTSTRAP PHOTO FOR FRA MAURO, DESCARTES	SELENOLOGICAL SURVEY AND SAMPLING SINGLE SITE TARGETING SURFACE EVA ASSESSMENT ALSEP DEPLOYMENT BOOTSTRAP PHOTO FOR CENSORINUS DAVY, DESCARTES	SELENOLOGICAL SURVEY AND SAMPLING (HIGH-LANDS) ALSEP DEPLOYMENT BOOTSTRAP PHOTO FOR HADLEY	SELENOLOGICAL SURVEY AND SAMPLING ALSEP DEPLOYMENT BOOTSTRAP PHOTO FOR DESCARTES
CONFIGURATION	EXTRAVEHICULAR	PRIMARY	← PLSS -6 →				
		BACKUP LSS	← OPS →			← OPS-UMBILICAL (BUDDY SYSTEM) →	
		COMMUNICATION	← STANDARD →				
	PAYLOAD	LUNAR SURFACE	EASEP	ALSEP ARRAY A	ALSEP ARRAY B	ALSEP ARRAY C	ALSEP ARRAY A-2
		LUNAR ORBIT		SEE ATTACHMENT E COMMON PAYLOAD MATRIX PAGE 23 of 38			
MISSION PROFILE	TRANSLUNAR TRAJECTORY TYPE		FREE RETURN	← FREE RETURN OR HYBRID →			
	LM SEPARATION ORBIT ALT (NMI)		← 60 X 60 →		← 60 X 8 →		
	LANDING SITE		APOLLO 2	APOLLO 7	FRA MAURO	LITTROW	DAVY
	LANDING ACCURACY (99% CONF) (KM)		± 6.5 X 2.6	±2.9 X 1.9	← POINT LANDING (<1.0KM) (GOAL) →		
	LUNAR SURFACE STAYTIME (HR)		UP TO 22	UP TO 32	← UP TO 35 →		
	SIM OPERATIONAL TIME (HR)						
EVA	LUNAR SURFACE	NUMBER	1	2	2	2	2
		MAXIMUM RADIUS (KM)	UP TO 0.1	UP TO 0.5	← UP TO 1.3 →		
		DURATION (HR:MIN) (DEP TO REP)	2:40	4:01/3:54	← 4:00 AT 1050 BTU/HR →		
		MAXIMUM MANHOURS	5:20	15:50	← 16:00 →		
	L.O.	SIM DATA RETRIEVAL					

Attachment B
Page 2 of 3

NOTE: LANDING SITES AND PAYLOADS FOR APOLLO 14 THROUGH 19 ARE NOT FIRM AND ARE SHOWN FOR PRELIMINARY PLANNING PURPOSES ONLY.

MISSION DEFINITIONS

MISSION TYPE			J-SERIES MISSIONS				
			APOLLO 16 (J1)	APOLLO 17 (J2)	APOLLO 18 (J3)	APOLLO 19 (J4)	
SUMMARY OF PRIMARY OBJECTIVES			EXTENDED SELENOLOGICAL SURVEY AND SCIENTIFIC ACTIVITIES SURFACE EXPERIMENT DEPLOYMENT LUNAR ORBITAL SCIENCE SURVEY DEMONSTRATE CAPABILITIES OF SIM, LRV, AND MODIFIED LM, CSM, AND EVA EQUIPMENT BOOTSTRAP PHOTO FOR COPERNICUS				
CONFIGURATION	EXTRA VEHICULAR	PRIMARY LSS	-7PLSS				
		BACKUP LSS	OPS-UMBILICAL (BUDDY SYSTEM)				
		COMMUNICATION		STANDARD + LCRU VOICE-DATA-TV RELAY			
	PAYLOAD	LUNAR SURFACE	ROVER AND SCIENCE EQUIPMENT				
		LUNAR ORBIT	SEE ATTACHMENT E COMMON PAYLOAD MATRIX PAGE 30 of 38				
MISSION PROFILE	TRANSLUNAR TRAJECTORY		HYBRID				
	LM SEPARATION ORBIT ALT (N MI)		60 X 8				
	LANDING SITE		COPERNICUS	DESCARTES	MARIUS HILLS	HADLEY	
	LANDING ACCURACY (99% CONF) (KM)		POINT LANDING (1.0KM) (GOAL)				
	LUNAR SURFACE STAYTIME (HR)		UP TO 54				
	SIM OPERATIONAL TIME (HR)		72 (NOMINAL)				
EVA	LUNAR SURFACE	NUMBER	3	3	3	3	
		MAXIMUM RADIUS (KM)	UP TO (7.5M) (1:00 HR SCIENCE ACTIVITY, 4KM/HR TRAVERSE RATE)	UP TO (7.5KM) (1:00 HR SCIENCE ACTIVITY, 5KM/HR TRAVERSE RATE)	UP TO (7.5KM) (1:00 HR SCIENCE ACTIVITY, 5KM/HR TRAVERSE RATE	UP TO (7.5KM) (1:00 HR SCIENCE ACTIVITY, 5KM/HR TRAVERSE RATE)	
		DURATION (HR:MIN) (DEP TO REP)	5:00 AT 1050 BTU/HR				
		MAXIMUM MANHOURS	30:00				
	L.O.	SIM DATA RETRIEVAL	YES				

NOTE: LANDING SITES AND PAYLOADS FOR APOLLO 14 THROUGH 19 ARE NOT FIRM AND ARE SHOWN FOR PRELIMINARY PLANNING PURPOSES ONLY.

LUNAR SURFACE EXPERIMENTS
MISSION ASSIGNMENTS SE-3

	EXPERIMENT	APOLLO 11	12	13	14	15	16	17	18	19	ALSEP	TRAVERSE MET/LRV
S-031	PASSIVE SEISMIC	X	X	X	X	X	X	X	X	X	⊕	
S-033	ACTIVE SEISMIC				X		X				⊕	
S-203	SEISMIC PROFILING							X		X	⊕	⊕
S-034	LUNAR MAGNETOMETER NETWORK		X			X	X		X	X	⊕	
S-198	LUNAR HAND-HELD MAGNETOMETER				X		X		X			⊕
S-035	SOLAR WIND, SPECTROMETER		X			X					⊕	
S-036	SUPRATHERMAL ION DETECTOR		X		X	X					⊕	
S-037	HEAT FLOW			X		X	X	X	X		⊕	
S-038	CHARGE PARTICLE LUNAR ENVIRONMENT			X	X						⊕	
S-058	COLD CATHODE IONIZATION		X	X	X	X					⊕	
S-059	LUNAR GEOLOGY INVESTIGATION	X	X	X	X	X	X	P	P	P		⊕
S-078	LASER RANGING RETRO-REFLECTOR	X			X		X					
S-080	SOLAR WIND COMPOSITION	X	X	X	X							
S-151	COSMIC RAY DETECTOR (HELMETS)	X										
S-201	FAR UV CAMERA/SPECTROSCOPE							X				
S-184	LUNAR SURFACE CLOSE-UP STEREO CAMERA	X	X	X	F	F						⊕

LUNAR SURFACE EXPERIMENTS
MISSION ASSIGNMENTS SE-3 (CONT)

	EXPERIMENT	APOLLO 11	12	13	14	15	16	17	18	19	ALSEP	TRAVERSE MET/LRV
M-515	LUNAR DUST DETECTOR		X	X	X	X					⊕	
S-152	COSMIC RAY DETECTOR ①						X			X		
S-202	LUNAR EJECTA AND METEOROID							X	X		⊕	
S-200	SOIL MECHANICS ②				X	X	X	X				
L-069	TRAVERSE GRAVIMETER								P	P		⊕
S-204	SURFACE ELECT PROPERTIES								X	X		⊕
	MASS SPECTROMETER								P	P	⊕	

X - APPROVED EXPERIMENT

P - PLANNED EXPERIMENT

⊕ - PART OF ALSEP OR TRAVERSE
F - FACILITY EQUIPMENT

① COSMIC RAY DETECTOR IS THE COMBINATION OF THREE PROPOSED EXPERIMENTS INTO A SINGLE EXPERIMENT. THEY ARE LOW ENERGY COSMIC RAY, EFFECT OF LOW ENERGY, AND LOW ENERGY HEAVY COSMIC RAY.

② THIS EXPERIMENT AS PROPOSED BY MSC IS PI EVALUATION OF DATA GATHERED FROM EXISTING SOURCES AND NOT THE DEVELOPMENT OF NEW INSTRUMENTATION AND FLIGHT HARDWARE.

SE-3 INCLUDES APO-195, 199, 201 AND 207

LUNAR ORBITAL EXPERIMENTS
MISSION ASSIGNMENTS

		APOLLO								
		11	12	13	14	15	16	17	18	19
S-158	MULTISPECTRAL PHOTOGRAPHY		X			P				
S-160	GAMMA RAY SPECTROMETER						X	X		
S-161	X-RAY SPECTROMETER						X	X		
S-162	ALPHA PARTICLE SPECTROMETER						X	X		
S-164	S-BAND TRANSPONDER			X	X	X	X	X	X	X
S-165	MASS SPECTROMETER						X	X		
S-167	SOUNDING RADAR (1)									X
S-168	ELECTROMAGNETIC SOUNDER (1)									X
S-169	UV SPECTROMETER								X	X
S-170	DOWNLINK BISTATIC RADAR			(2) X	X	X				
S-171	IR SCANNING RADIOMETER								X	X

LUNAR ORBITAL EXPERIMENTS
MISSION ASSIGNMENTS (CONT)

		APOLLO 11	12	13	14	15	16	17	18	19
SUBSATELLITE							X		X	
S-173	PARTICLES AND FIELDS									
S-174	MAGNETOMETER									
S-164	S-BAND TRANSPONDER									
S-176	CM WINDOW METEOROID				X	X				
S-177	UV PHOTOGRAPHY, EARTH/MOON						X	X		
S-178	GEGENSCHEIN PHOTOGRAPHY			X	X	X				
S-TBD	SOLAR WIND MASS SPECTROGRAPH								P	P
PHOTOGRAPHIC TASKS	18-IN. TOPOGRAPHIC CAMERA			X	X	X				
	24-IN. PANORAMIC CAMERA						X	X	X	X
	3-IN. MAPPING CAMERA						X	X	X	X
	LASER ALTIMETER						X	X	X	X

X - APPROVED EXPERIMENT

P - PLANNED EXPERIMENT

① LUNAR SOUNDER AD HOC STUDY COMMITTEE IS CURRENTLY EVALUATING THE FEASIBILITY OF COMBINING THESE TWO EXPERIMENTS INTO A SINGLE LUNAR SOUNDER EXPERIMENT. FLIGHT ASSIGNMENT IS TO BE DETERMINED..

② VHF DOWNLINK ONLY.

PASSIVE SEISMIC EXPERIMENT

(S-031)

CONTRACTOR

Bendix, Teledyne ESD

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The passive seismic experiment (PSE) is designed to monitor seismic activity, and it affords the opportunity to detect meteoroid impacts and free oscillations. It may also detect surface tilt produced by tadal deformations which result, in part, for periodic variations in the strength and direction of external gravitational fields acting upon the moon and changes in the vertical component of gravitational acceleration.

ACTIVE SEISMIC EXPERIMENT

(S-033)

CONTRACTOR

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The primary function of the active seismic experiment (ASE) is to generate and monitor artificial seismic waves in the 3 to 250 H_z range in the lunar surface and near subsurface. The ASE can also be used to monitor natural seismic waves in the same frequency range. The objective of these functions is to acquire information to enable determination of the physical properties of lunar surface and near subsurface materials.

SEISMIC PROFILING

(S-203)

CONTRACTOR

Bendix

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The primary objective of this experiment is to perform seismic refraction experiments on selected Apollo missions using artificial sources. Seismic velocity-density relations on rocks infer pertinent information on internal structure and composition. This experiment consists of four geophones in a triangular array hardwired to the ALSEP. Deployment of charges would be accomplished by use of the LRV up to a radius of 5KM, and charge weights would vary from 1/8 to 20 pounds. Fire detonation is by command or mechanical clock after astronaut departure.

TRAVERSE

MAGNETOMETER EXPERIMENT

(S-034)

CONTRACTOR

Ames Research Center

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The magnetometer experiment (ME) measures the topology of the interplanetary magnetic field diffused through the moon to determine boundaries of the electromagnetic diffusivity. The experiment will give some indication of inhomogeneities in the lunar interior.

Data acquisition and processing, both sceintific and engineering, proceed continuously in any of the operational configurations selectable by commands from earth.

LUNAR PORTABLE MAGNETOMETER

(S-198)

CONTRACTOR

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The objective of this experiment is to gain further scientific data concerning the lunar magnetic field. The instrument is a simple 3 component flux gate magnetometer that is read by the astronaut to determine magnitude, direction, and gradient of the lunar magnetic field at several points along the traverse.

TRAVERSE

SOLAR WIND EXPERIMENT

(S-035)

CONTRACTOR

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The solar wind experiment (SWE) subsystem will measure energies, densities, incidence angles, and temporal variations of the electron and proton components of the solar wind plasma that strikes the surface of the moon.

The experiment will yeild data that will be utilized to expand the knowledge in the following scientific areas:

a. The existence of solar wind at the lunar surface

b. The general properties of the solar wind

c. The properties of the magnetospheric tail of the earth.

SUPRATHERMAL ION DETECTOR EXPERIMENT

(S-036)

CONTRACTOR

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The purpose of the SIDE is to measure the ionic environment of the moon by detecting the ions resulting from the ultraviolet ionization of the lunar atmosphere and the free streaming and thermalized solar wind. The suprathermal ion detector will measure the flux, number density, velocity, and energy per unit charge of positive ions in the vicinity of the lunar surface. The cold cathode ion gauge will determine the density of any lunar ambient atmosphere, including any temporal variations either of a random character or associated with lunar local time or solar activity. In addition, the rate of loss of contaminants left in the landing area by the astronauts and lunar module (LM) will be measured.

HEAT FLOW EXPERIMENT

(S-037)

CONTRACTOR

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The heat flow experiment (HFE) measures the temperature gradient and the thermal conductivity in the near surface layers of the moon. From these measurements the lunar heat flow can be calculated. The measurements obtained from the experiment enable the average value as well as the direction of the net heat flux to be determined. The knowledge of the lunar heat flux will provide additional information on:

a. A comparison of the radioactive content of the moon's interior and the earth's mantle
b. A thermal history of the moon
c. A lunar temperature versus depth profile
d. The value of thermal parameters in the first three meters of the moon's crust.

When compared with seismic measurements, data from the HFE experiment will provide information on the composition and physical state of the moon's interior. The Apollo lunar surface drill provides the holes for the probes.

SOLAR WIND LOW ENERGY

(CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT)

(S-038)

CONTRACTOR

Bendix

PRINCIPAL INVESTIGATOR

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The charged particle lunar environment experiment (CPLEE) measures the energy distribution, time variations, and direction of proton and electron fluxes at the lunar surface. The results of these measurements will provide information on a variety of particle phenomena.

COLD CATHODE GAUGE EXPERIMENT

(S-058)

CONTRACTOR

University of Texas

PRINCIPAL INVESTIGATOR

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The cold cathode gauge experiment (CCGE) comprises the cold cathode ion gauge (CCIG) and associated electronics. The purpose of the experiment is to measure the density of the lunar atmosphere. The CCGE will determine the density of any lunar ambient atmosphere, including any temporal variations either of a random character or associated with lunar local time or solar activity. In addition, the rate of loss of contaminants left in the landing area by the astronauts and the lunar module (LM) will be measured.

FIELD GEOLOGY EXPERIMENT

(S-059)

CONTRACTOR

MSC Engineering Division (Hand Tools)
MSC, Houston, Texas 77058

AEC (SRC & Contents)
Oak Ridge, Tennessee

Goerz Optical Co. (LGEC)
Pittsburgh, Pa.

Jet Propulsion Laboratory

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Dr. E. Shoemaker (Cal. Tech.) (Apollo 11-13)
Dr. G. A. Swann (USGS) (Apollo 14-15)
Dr. W. R. Muehlberger (U. Texas (Apollo 16-19)

CO-INVESTIGATORS

Apollo 11-13	Apollo 14-15	Apollo 16-19
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Dr. T. Foss (MSC)	Dr. L. Silver (Cal. Tech.)	Dr. R. McGetchin (MIT)
Dr. E. Goodard (U. Mich.)	Dr. M. Hait (USGS)	Dr. S. Titby (U. Ariz.)
Dr. A. Waters (U. Cal.)	Dr. H. Holt (USGS)	Dr. L. Page (USGS)
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LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

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The general objective of the Apollo lunar geology experiment is to gain a better understanding of the materials, processes, and history of the moon and near-earth environment. More specifically, the experiment is oriented toward understanding the nature and origin of the maria, and the processes which have modified the mar surfaces.

TRAVERSE

LASER RANGING RETRO-REFLECTOR

(S-078)

CONTRACTOR

Bendix

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Ext. 3811

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

T. T. White
TM3
Ext. 3816

The laser ranging retro-reflector experiment (LRRR) is designed to precisely measure earth-moon distance over long time periods (up to 10 years). Data obtained will be used to study the exact moon size and orbit, distribution of mass inside the mass, the possibility of a slow secular decrease in the gravitational constant "G," fluctuations in the rotation rate of the earth, wobbling of the earth on its axis, continental drift, and determination of the North Pole with an accuracy of about 15 centimeters.

In proximity of the Lunar Module

SOLAR WIND COMPOSITION EXPERIMENT

(S-080)

CONTRACTOR

N/A

PRINCIPAL INVESTIGATOR

Dr. Johannes Geiss
University of Berne
Berne, Switzerland

EXPERIMENT MANAGER FOR ENGINEERING

J. B. Thomas
EH2
Ext. 3811

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Lopez
TM3
Ext. 2666

The solar wind composition experiment (SWC) is designed to entrap noble gases, such as helium, neon, argon, krypton, and xenon, contained in the solar wind. These data will contribute information on the origin of the solar planetary atmospheres and solar wind dynamics.

COSMIC RAY DETECTOR (HELMET)

(S-151)

CONTRACTOR

General Electric
New York

PRINCIPAL INVESTIGATOR

Dr. Robert L. Fleischer
General Physics Laboratory
G. E. R&D Center
Schenectady, New York

EXPERIMENT MANAGER FOR ENGINEERING

Dr. Robert L. Golden
TG7
Ext. 5171

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Lopez
TM3
Ext. 2666

The cosmic ray detector (helmet) experiment is designed to study the types of particles in the lunar environment. The experiment uses plastic components from the helmets worn by the Apollo 11 crew. Etching of this plastic will reveal penetrations of varying sizes which can be interpreted to reveal the type of particles.

FAR ULTRAVIOLET CAMERA/SPECTROSCOPE

(S-201)

CONTRACTOR

NRL

PRINCIPAL INVESTIGATOR

Dr. T. L. Page
MSC

Dr. Carruthers
NRL

EXPERIMENT MANAGER FOR ENGINEERING

M. L. Curtner
EB4
Ext. 5541

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Lopez
TM3
Ext. 3816

The camera is to obtain lunar surface calibrated photographs in Lyman-Alpha light (1216 angstrom wavelength) of: the geocorona, the Milky Way star clouds, one or two near galaxies, and the Conra cluster of galaxies. This camera is developed for far-UV imagery and will be fitted with a Lyman-Alpha interference filter and with a light tripod.

Planned only

Crew operated

DUST DETECTOR

(M-515)

CONTRACTOR

Bendix

PRINCIPAL INVESTIGATOR

Dr. Brain J. O'Brien
School of Physics
The University of Sydney
Sydney, N.S.W. Australia

EXPERIMENT MANAGER FOR ENGINEERING

D. Gerke
EH3
Ext. 3827

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Miller
TM3
Ext. 2666

The dust detector is designed to monitor dust accumulation on one horizontal and two vertical surfaces. The detection method involved consists of solar cells. The cell output will be degraded as a result of dust accumulation.

COSMIC RAY DETECTOR

(PARTICLES COLLECTOR EXPERIMENT)

(S-152)

CONTRACTOR

General Electric
Schenectady, New York

Washington University
St. Louis, Missouri

University of California
Berkeley, California

PRINCIPAL INVESTIGATOR

Dr. R. L. Fleischer (G. E.)

Dr. R. M. Walker (Washington University)

Dr. P. B. Price (University of California)

EXPERIMENT MANAGER FOR ENGINEERING

James B. Thomas
EH2
Ext. 3811

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Lopez
TM3
Ext. 3816

This experiment is to use high resolution collectors to measure the charge, mass, and energy spectrum of heavy cosmic rays, nuclear particles, and solar wind particles to provide information on cosmic ray sources and stellar nucleosynthesis. Several stacks of LEXAL polycarbonate plastic will be exposed to cosmic rays on the lunar surface and then returned to earth for processing and analysis. Energies, charges, and masses of cosmic rays with atomic number greater than 8 will be determined from these measurements.

LUNAR EJECTA AND METEORITES

CONTRACTOR

Bendix

PRINCIPAL INVESTIGATOR

Dr. Otto Berg
Goddard Space Flight Center

EXPERIMENT MANAGER FOR ENGINEERING

M. Baker
TE5
Ext. 4611

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

W. F. Eichelman
TM3
Ext. 2666

The experiment is to measure long term variations in cosmic dust influx on the lunar surface and to determine radiant, flux density, and speed of particles in neteor streams. These data will substantiate or disprove the measurements by zodiacal light on the low spatial density end and microphone measurements on the high spatial density end.

Uses ALSEP equipment

SOIL MECHANICS INVESTIGATIONS

(S-200)

CONTRACTOR

N/A

PRINCIPAL INVESTIGATOR

Dr. James Mitchell
University of California

CO-INVESTIGATORS

Dr. L. G. Bromwell
MIT

Dr. W. D. Carrier III
MSC

Dr. N. C. Costes
MSFC

Dr. R. F. Scott
California Institue of Technology

EXPERIMENT MANAGER FOR ENGINEERING

Ernest L. Weeks
EH2
Ext. 3811

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Miller
TM3
Ext. 3816

This experiment determines the mechanics properties of the lunar soil at the surface and variations to depths of several meters. Physical characteristics of the lunar soil are necessary to verify existing theories or to form new theories on soil formation for future lunar manned or unmanned operations. Current tools, such as core tubes, penetrometer, scoop, sieve, and trenching tools, will be used by the astronaut. The evaluation by the principal investigator will be accomplished by gathering data from lunar surface activities.

Planned

TRAVERSE: LRV OR MET

LUNAR GRAVITY TRAVERSE

(L-069)

CONTRACTOR

MIT

PRINCIPAL INVESTIGATOR

Dr. C. G. Wing
MIT

EXPERIMENT MANAGER FOR ENGINEERING

M. D. Holley
EG14
Ext. 2391

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

T. T. White
TM3
Ext. 3816

This experiment is to map the local gravity traversed by an LRV during lunar surface operations. Surface gravimetry provides exploratory data on more ridges, edge effects of mascons, craters, rill, thickness variations in regoliths and lava flows, and density variations. The hardware consists of a battery power package attached to the LRV and an automated, thermally controlled gravimeter which records gravity measurements in a core stowage box which is later removed by the astronaut at the LM and returned to earth.

Planned

TRAVERSE - LRV

SURFACE ELECTRICAL PROPERTIES

(S-204)

CONTRACTOR

MIT

PRINCIPAL INVESTIGATOR

Dr. Gene Simmons
MIT

EXPERIMENT MANAGER FOR ENGINEERING

D. Cubley
EE3
Ext. 2555

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

T. T. White
TM3
Ext. 2666

This experiment is to determine layering in the lunar subsurface and to search for water at depth. Radio frequency interferometry equipment operating at 8 selected frequencies from 500 H to 32 MH will be employed to determine layering between a few meters and several kilometers. Layering or the presence of water is determined by phase comparison, using lunar surface restivity, which is essentially transparent to radio frequency energy.

Planned

TRAVERSE - LRV

MASS SPECTROMETER

CONTRACTOR

Bendix

PRINCIPAL INVESTIGATOR

Dr. John Hoffman
University of Texas as Dallas
P.O. Box 30365
Dallas, Texas 75230

EXPERIMENT MANAGER FOR ENGINEERING

James M. Sanders
EH2
Ext. 3811

LUNAR SURFACE EXPERIMENTS OFFICE PROJECT ENGINEER

M. Miller
TM3
Ext. 2666

Experiment is held in abeyance for further definition at this time.

This experiment is to obtain data on the composition of the lunar atmosphere in the mass range 1-160 AMU at the lunar surface. It is to detect transient composition changes dues to man-made sources. The instrument is a magnetic sector field mass spectrometer with a Nier-type thermomic electronic bombardment ion source.

Planned

ALSEP interface

LUNAR MULTISPECTRAL PHOTOGRAPHY

(S-158)

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

Dr. A. F. H. Goetz
Bellcomm, Inc.
Washington, D.C.

CO-INVESTIGATORS

F. C. Billingsly
Jet Propulsion Laboratory
Pasadena, California

T. B. McCord
MIT
Boston, Massachusetts

E. Yost
LIU

EXPERIMENT MANAGER FOR ENGINEERING

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

The objective of the experiment is to obtain colorimetric data simultaneously in three photographic bands (blue, red, and near infrared) which may be used to identify future lunar surface sample areas in Apollo landing zones and as a tool in geological mapping.

GAMMA RAY SPECTROMETER

(S-160)

CONTRACTOR

Jet Propulsion Laboratory
Pasadena, California

PRINCIPAL INVESTIGATOR

Dr. J. R. Arnold
University of California
San Diego, California

EXPERIMENT MANAGER FOR ENGINEERING

E. Stelly
EB7
Ext. 3715

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

L. E. James
TM2
Ext. 4611

The basic objectives of the gamma ray spectrometer experiment are to obtain evidence relating to the origin and evolution of the moon by determining the degree of chemical differentiation the moon has undergone during its development and to obtain astrophysical data on the cosmic X-ray flux.

X-RAY FLUORESCENCE

(S-161)

CONTRACTOR

American Science and Engineering
Cambridge, Massachusetts

PRINCIPAL INVESTIGATOR

Dr. I. Adler
Goddard Space Flight Center
Greenbelt, Maryland

EXPERIMENT MANAGER FOR ENGINEERING

C. J. LeBlanc
EF
Ext. 3768

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

L. E. James
TM2
Ext. 4611

The X-ray fluorescence experiment is to perform a survey of the composition of the lunar surface through X-ray fluorescence measurements from lunar orbit. These data should yield information regarding the nature of the lunar surface materials, a measure of the homogenity of the surface, and, through comparison with the gamma ray experiment data, a comparison of the composition of the surface and subsurface.

ALPHA PARTICLE SPECTROMETER

(S-162)

CONTRACTOR

American Science and Engineering
Cambridge, Massachusetts

PRINCIPAL INVESTIGATOR

Dr. P. Gorenstein
American Science and Engineering
Cambridge, Massachusetts

EXPERIMENT MANAGER FOR ENGINEERING

C. J. LeBlanc
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Ext. 3768

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

L. E. James
TM2
Ext. 4611

The alpha particle experiment is designed to provide basic data on the natural radioactivity of the lunar surface and to determine the gross rate of radon evolution from the moon by observation of longer lived isotope R_N^{222} and search for localized sources of enhanced emission of radon by observing the decay of the shorter lived isotope R_N^{220}.

S-BAND TRANSPONDER

(S-164)

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

W. L. Sjogren
Jet Propulsion Laboratory
Pasadena, California

EXPERIMENT MANAGER FOR ENGINEERING

L. Leopold
EE3
Ext. 2128

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

P. E. Lafferty
TM2
Ext. 4611

During periods in lunar orbit when the spacecraft is unperturbed by maneuvers, thruster firings, or astronaut activity, S-band doppler effects will be measured for use in determining an enhanced gravity field and for identifying lunar gravitational anomalies (mascons).

MASS SPECTROMETER

(S-165)

CONTRACTOR

University of Texas (Dallas)
Dallas, Texas

PRINCIPAL INVESTIGATOR

Dr. J. H. Hoffman
University of Texas (Dallas)
Dallas, Texas

EXPERIMENT MANAGER FOR ENGINEERING

A C. Copeland
EE5
Ext. 2793

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

Vern Dauphin
TM2
Ext. 3638

The primary object of the mass spectrometer experiment is to obtain data relative to the composition of the lunar ambient atmosphere from a lunar orbiting spacecraft.

SOUNDING RADAR

(S-167)

CONTRACTOR

TBD

PRINCIPAL INVESTIGATOR

W. E. Brown, Jr.
Jet Propulsion Laboratory
Pasadena, California

EXPERIMENT MANAGER FOR ENGINEERING

J. R. McCown
EE6
Ext. 7351

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

Vern Dauphin
TM2
Ext. 3638

The sounding radar experiment is designed to determine the surface and subsurface features for selenological studies, determine the absolute location of optically identifiable surface features, and survey relative lunar surface electrical and geometrical properties.

ELECTROMAGNETIC SOUNDER "A"

(S-168)

CONTRACTOR

TBD

PRINCIPAL INVESTIGATOR

Dr. S. H. Ward
University of California
Berkeley, California

EXPERIMENT MANAGER FOR ENGINEERING

W. C. Panter
EE6
Ext. 5561

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

TM2
Ext. 3638

The objectives of the sounding radar experiment are to increase knowledge of the major selenological processes responsible for the character of the lunar surface, understanding of processes of internal evolution and associated surface manifestations and to provide information on mineralogical and chemical composition, interstitial water distribution and density distribution within the lunar interior.

FAR UV SPECTROMETER

(S-169)

CONTRACTOR

TBD

PRINCIPAL INVESTIGATOR

Dr. W. G. Fastie
Johns Hopkins University
Baltimore, Maryland

EXPERIMENT MANAGER FOR ENGINEERING

L. W. McFadin
EB4
Ext. 7421

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

Vern Dauphin
TM2
Ext. 3638

Data obtained from the far UV spectrometer experiment will be used to determine the lunar atmosphere composition and density with a far ultraviolet Ebert spectrometer in the lunar orbiting spacecraft. Evaluation of a permanent atmosphere on the moon and identification of gases released due to manned explorations remaining as a part of the lunar atmosphere will be included.

BISTATIC RADAR

(S-170)

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

H. T. Howard
Stanford University
Palo Alto, California

EXPERIMENT MANAGER FOR ENGINEERING

L. Leopold
EE3
Ext. 2128

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

P. E. Lafferty
TM2
Ext. 4611

The general objective of this experiment is to gather VHF and S-band bistatic radar data on the lunar crust which will enable the determination of the lunar crust Brewster angle and the measurement of the spectral properties of bistatic radar echoes.

IR SCANNING RADIOMETER

(S-171)

CONTRACTOR

TBD

PRINCIPAL INVESTIGATOR

Dr. F. J. Low
Rice University
Houston, Texas

EXPERIMENT MANAGER FOR ENGINEERING

E. Zetka
EB4
Ext. 7421

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

Vern Dauphin
EM2
Ext. 3638

The infrared scanning radiometer experiment is designed to locate, identify, and study anomalous temperature regions on the lunar surface at a high resolution by obtaining a surface temperature map of the un-illuminated portions of the lunar surface. Correlation of these data with other sources will determine lunar surface characteristics.

SUBSATELLITE

(S-173, S-174, & S-164)

CONTRACTOR

TRW
Redondo Beach, California

PRINCIPAL INVESTIGATOR

(1) Dr. K. A. Anderson
University of California
Berkeley, California

(2) Dr. R. J. Coleman, Jr.
University of California
Los Angeles, California

(3) W. L. Sjogren
Jet Propulsion Laboratory
Pasadena, California

EXPERIMENT MANAGER FOR ENGINEERING

J. H. Johnson
EE17
Ext. 5518

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

P. E. Lafferty
TM2
Ext. 4611

The subsatellite is designed to gather data to determine the topology of the magnetotail of the earth, the presence of DC electric fields in the range of 10^{-4} volts per meter, and the direction in which magnetotail plasma is convected. These data will be used to investigate the formation and dynamics of the magnetosphere of the earth and the boundary layer of the solar wind as it flows over the moon. S-band doppler tracking will be performed to provide an enhanced determination of the lunar gravity field.

(1) Particles and Fields - S-173

(2) Magnetometer - S-174

(3) S-Band - S-164

APOLLO WINDOW METEOROID

(S-176)

<u>CONTRACTOR</u>

None (utilizes existing onboard equipment)

<u>PRINCIPAL INVESTIGATOR</u>

R. E. Flaherty
MSC

<u>EXPERIMENT MANAGER FOR ENGINEERING</u>

R. E. Flaherty
TG2
Ext. 6205

<u>LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER</u>

Nat Hardee
TM2
Ext. 4611

The purpose of this experiment is to gain additional knowledge regarding the micrometeoroid environment at distances of one AU. These data will be used to verify engineering design data considered in the development of Apollo spacecraft windows and will be applicable to future design.

UV PHOTOGRAPHY, EARTH/MOON

(S-177)

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

T. Owen
IIT Research Institute
Chicago, Illinois

EXPERIMENT MANAGER FOR ENGINEERING

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

This experiment will obtain UV photography of the earth from lunar distance to determine whether a correlation exists between UV radiation and known earth conditions. In addition, photographs of the lunar surface will be obtained to extend colorimetric data and to search for fluorescence.

GEGENSCHEIN PHOTOGRAPHY

(S-178)

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

L. Dunkelman, GSFC
Greenbelt, Maryland

EXPERIMENT MANAGER FOR ENGINEERING

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

This experiment will determine whether a relationship exists between the gegenschein and Moulton points. The observed light source (gegenschein) may be attributable to a collection of dust particles at the Moulton point. This will provide the first conclusive observational test of the phenomenon.

SOLAR WIND MASS SPECTROMETER

CONTRACTOR

TBD

PRINCIPAL INVESTIGATOR

D. Lind
MSC

EXPERIMENT MANAGER FOR ENGINEERING

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

L. E. James
TM2
Ext. 4611

The objective of the experiment is to make elemental and isotopic abundant measurements in the solar plasma and study changes in abundances over a range of solar conditions. In addition, rates of $^3He^{++}$ and $^4He^{++}$ for comparison with theoretical work on fractionation of material in the solar corona will be studied.

18-INCH TOPOGRAPHIC CAMERA

CONTRACTOR

None (utilizes existing onboard equipment)

PRINCIPAL INVESTIGATOR

EXPERIMENT MANAGER FOR ENGINEERING

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

Photographs will be obtained from the CSM in lunar orbit using the lunar topographic camera, with image motion compensation, of lunar surface areas of prime scientific interest.

24-INCH PANORAMIC CAMERA

CONTRACTOR

ITEK Corporation
Lexington, Massachusetts

PRINCIPAL INVESTIGATOR

Photography Team
F. J. Doyle, USGS
McLean, Virginia

EXPERIMENT MANAGER FOR ENGINEERING

B. H. Mollberg
EE4
Ext. 2497

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

The 24-inch panoramic camera will be used to obtain high-resolution stereo photography (taken from orbital altitude under varying lighting conditions) of landing sites and areas of high scientific interest. The photography will support manned lunar landing missions and general scientific investigations of the moon.

3-INCH MAPPING CAMERA

CONTRACTOR

Fairchild Space and Defense Systems
Syossett, New York

PRINCIPAL INVESTIGATOR

Photography Team
F. J. Doyle, USGS
McLean, Virginia

EXPERIMENT MANAGER FOR ENGINEERING

R. Dickerson
EF
Ext. 3768

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

The 3-inch mapping camera will obtain high quality metric photographs of the moon from lunar orbit in combination with time-correlated stellar photography for geodetic/cartographic control and for satisfying data correlation requirements of other experiments.

LASER ALTIMETER

CONTRACTOR

RCA Corporation
Burlington, Massachusetts

PRINCIPAL INVESTIGATOR

Photography Team
F. J. Doyle, USGS
McLean, Virginia

EXPERIMENT MANAGER FOR ENGINEERING

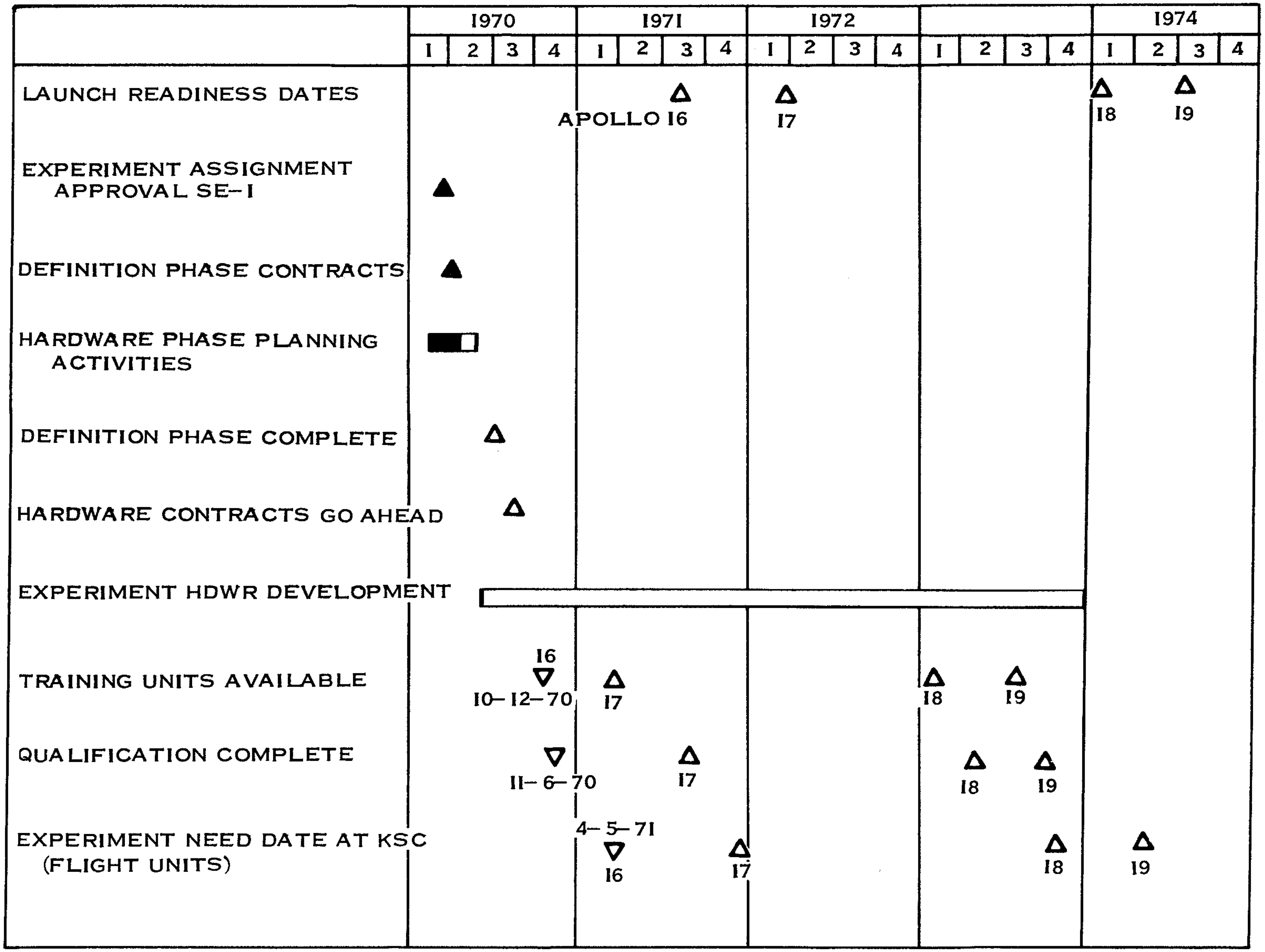
E. B. Walters
EE6
Ext. 5561

LUNAR ORBITAL SCIENCE EXPERIMENTS PROJECT ENGINEER

S. N. Hardee
TM2
Ext. 4611

The general objective of the laser altimeter is to determine the broad variations in the moon's topography, representable by spherical harmonics up through the 18th degree, and to utilize the altitude data to obtain a side factor for the 3-inch metric camera photographs.

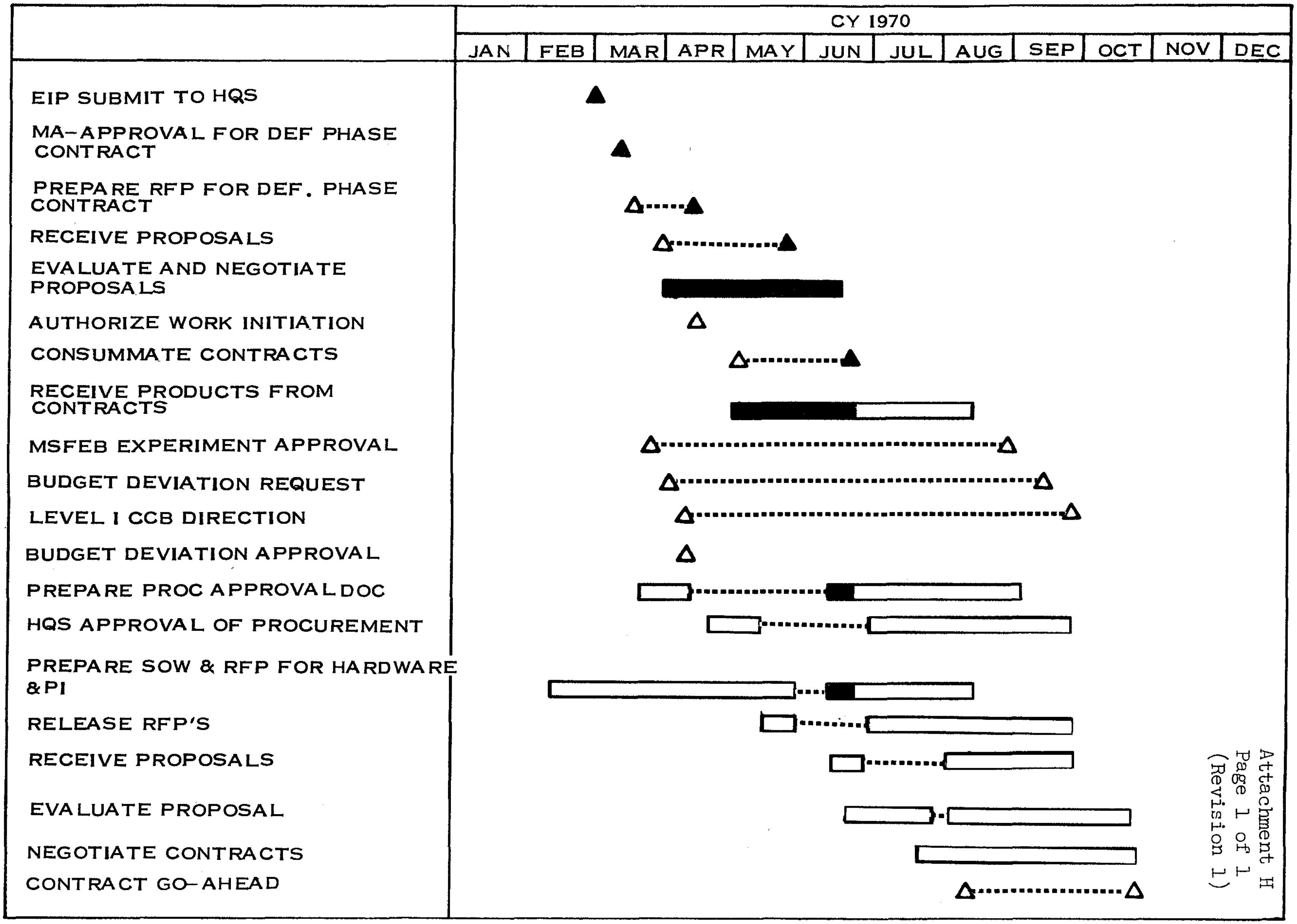
LUNAR SURFACE EXPERIMENTS
PROGRAM PLAN
APOLLO 16-19



Attachment G
Page 1 of 1
(Revision 1)

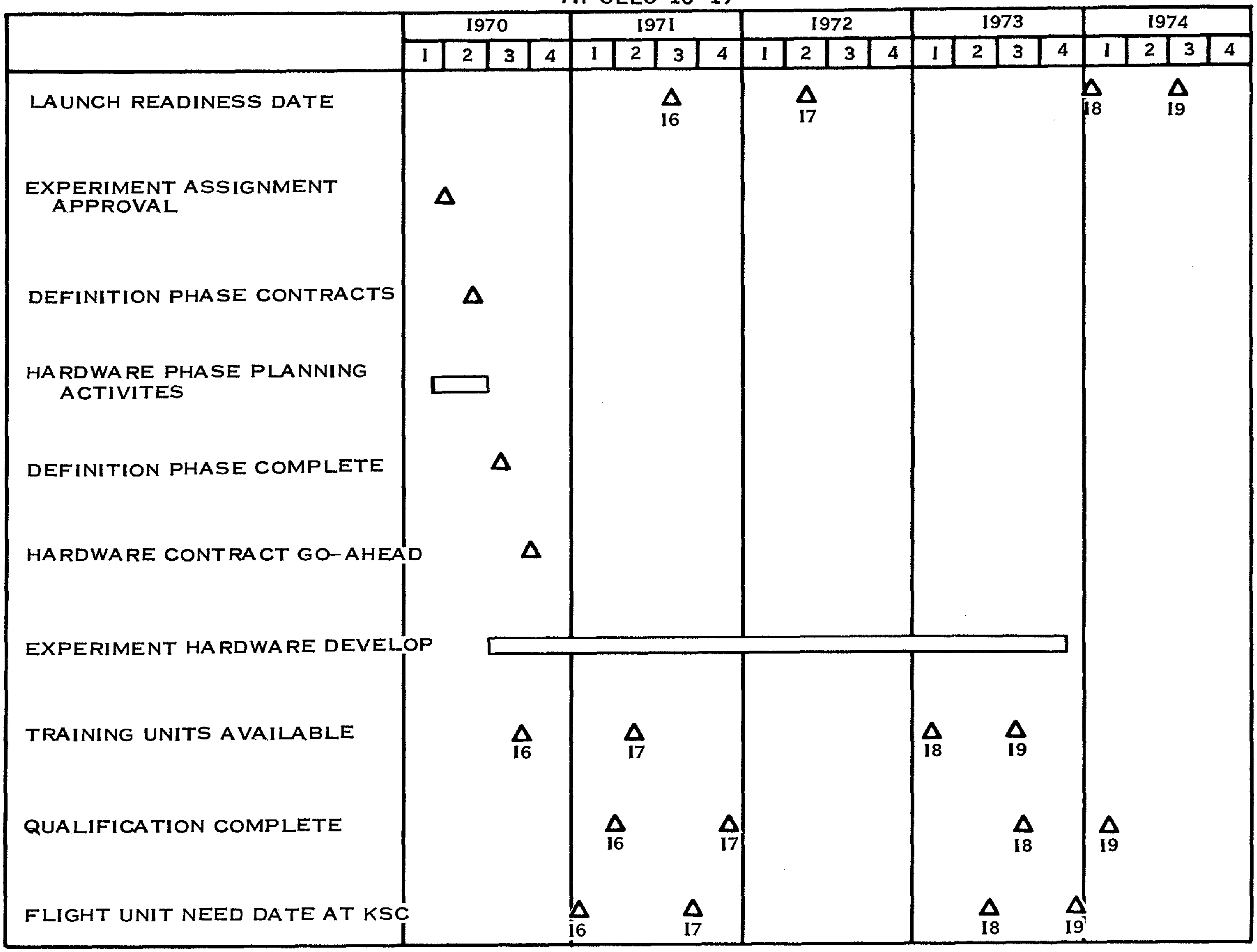
May 1, 1970

LUNAR SURFACE EXPERIMENTS DEFINITION PHASE PROGRAM PLAN



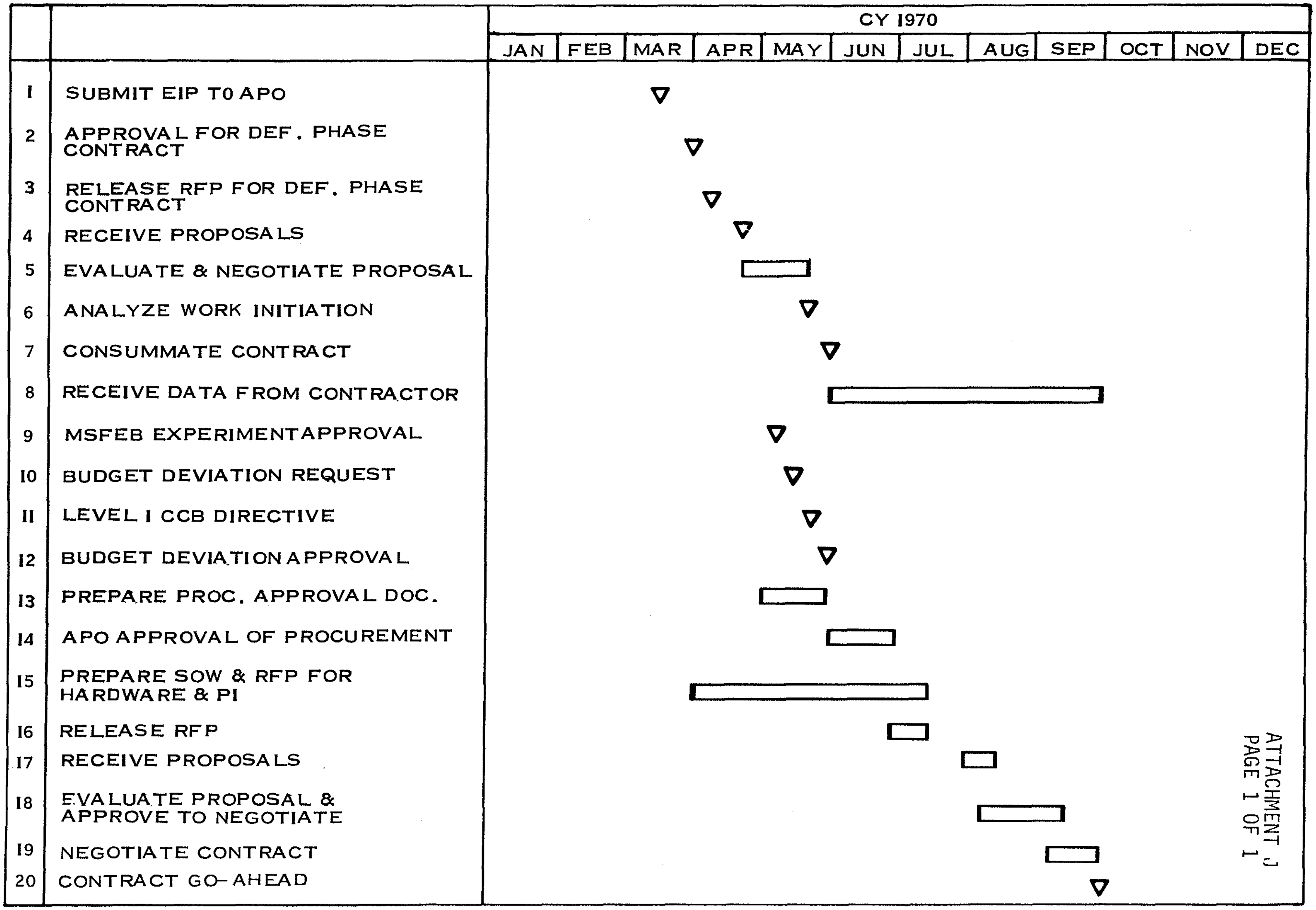
Attachment H
Page 1 of 1
(Revision 1)

LUNAR ORBIT EXPERIMENT
PROGRAM PLAN
APOLLO 16-19



ATTACHMENT I
PAGE 1 OF 1

LUNAR ORBIT EXPERIMENTS
DEFINITION PHASE
PROGRAM PLAN



ATTACHMENT J
PAGE 1 OF 1

General

The overall program management of the lunar exploration program is exercised by the Apollo Program Director through the Apollo Spacecraft Program Manager. The Apollo Spacecraft Program Manager has designated the ASPO Manager for Experiments and GFE to act in his behalf for the general management of the Apollo spacecraft experiments. Science and Applications Director (S&AD) will be responsible for the definition of scientific requirements. including data requirement, for each lunar mission. S&AD will provide these requirements to ASPO for implementation. S&AD will be the primary interface with the principal investigators for the science requirements and assure that the principal investigators support hardware and mission activities. Engineering and Development Directorate (E&D) will be responsible for the development, testing, and delivery of approved experiment hardware and associated systems. ASPO Program Control Division is responsible for the contract engineering function and serves as the interface between the technical and administrative functions of MSC. The Contracting Officer is responsible for administration of hardware contracts and contracts to the experiment scientists and principal investigators. The ASPO Experiments and GFE Project Engineering Office performs the tasks of integrating the experiments with the overall Apollo program.

Detailed Implementation of the Apollo 16 through 19 Definition Phase, Procurement and Planning

The definition phase for the lunar surface experiments is designed to accelerate planning and procurement actions to support hardware developments for Apollo missions 16 through 19. Due to lead time for hardware definition, procurement, and development, it is necessary that MSC initiate definition phase procurement for the following experiments:

Seismic Profiling
Lunar Gravity Traverse
Surface Electrical Properties
Lyman-Alpha Ultraviolet Camera
Lunar Ejecta and Meteoroid
Mass Spectrometry

The definition phase of the lunar orbit experiments is based upon the same considerations as the surface science definition program. Presently, three new orbital experiments are being considered for assignment to Apollo missions 18 and 19, as follows:

Solar Wind Mass Spectrometer
UV Spectrometer
IR Scanning Radiometer

Actions Required

The following actions pertain to milestones in attachments H and J to accomplish the definition phase program. Action numbers correspond to the line entry on the definition phase program plan charts.

Action: Procurement Division and ASPO Program Control Division

Number	
3	Prepare documentation for request for proposals, purchase requests, and noncompetitive justifications for study/definition contracts.
5	After receiving proposals, evaluate and negotiate the investigator and contractor proposals.
6	To expedite principal investigator and contractor products, prepare a Work Initiation Authorization.
7	After negotiation, consummate the firm contracts.
8	Receive and distribute the products from the study contracts.
10	Prepare budget deviation requests as necessary.
13	Prepare the procurement approval document for NASA Headquarters.
15	Review and prepare, as required, Statement of Work and Request for Proposal documents and release.
17	Receive, distribute, and evaluate the proposals submitted for experiment hardware and principal investigator.
19	Expedite negotiations for the hardware contracts.

Action: Science and Applications Directorate, Lunar Missions Office

Number	
1	Review experiment implementation plans.
3	Prepare Statement of Work and noncompetitive justification for new scientists' contracts and extension for principal investigators on contract for planned experiments.
5	Evaluate principal investigator and contract proposals for fulfilling the scientific requirements desired.
8	Monitor principal investigator for the study contract products: a. Experiment Functional and Performance Specification b. Preliminary Operational Criteria and Procedures
15	Prepare Statement of Work for principal investigator.

Number

18 Evaluate principal investigator and contractor proposal.

Action: Engineering and Development Directorate, Lunar Surface Project Office

3 Prepare Statement of Work and noncompetitive justification for contracts to hardware suppliers.

5 Evaluate principal investigator and contractor proposals.

8 Monitor appropriate contractors definition phase contract products to improve further hardware contract go ahead dates. These products are as follows:

a. Conceptual design
b. Integration concept and requirements
c. Program implementation plan and schedules
d. Preliminary hardware technical specification

15 Based on definition phase contract products, prepare hardware development Statement of Work.

18 Evaluate contractor proposals.

Action: Experiments and GFE Project Engineering Office

Project engineering is responsible for the overall coordination and integration of definition phase tasks into the Apollo program within the constraints depicted on the program plan in attachment E. This office will be responsible for integrating all subsequent changes to experiments for the spacecraft program and revising the Apollo Experiment Program Plan accordingly.

AA/R. Gilruth
AB/C. Kraft
AC/G. Abbey
AG/D. Collins
AJ/R. Soens
AP/B. Duff
AP3/H. Gibbons
AP7/E. Horton
BA/P. Whitbeck
BE/E. Young
BF/D. Hendrickson
BG/B. Parker
BG/P. Carroll
BG3/A. Garrison
BG6/R. Kline
BH/J. Kinzler
BL/W. Forrester
BL/R. Underwood
BL/J. Brinkmann
BL6/A. Sea
BM6/Technical Library (2)
BN/W. Gray
BR/R. Connelly
BR5/T. Wilkes (3)
BR9/B. Weinert (4)
CA/D. Gregory
CA/D. Slayton
CA2/K. Schnell
CB/A. Shepard, Jr. (3)
CF/L. Nichols
CF/W. North
CF2/J. Bilodeau
CF831/J. Homer
CF3/C. Woodling (4)
CF22/M. Dement
CF23/L. Allen
CF23/C. Tringali
CF23/M. Howley
CF24/P. Kramer
CF32/H. Kuehnel
CF33/S. Faber
CF34/J. O'Neill
CF72/R. Zedekar
CF131/D. Grimm
CF131/G. Franklin
CFK/R. McCafferty
DA/A. Catterson
DA/C. Berry
DA/H. Hair
DA3/W. Hull
DC/W. Kemmerer
DC4/C. Jernigan
DC7/C. Barnes
DD/W. Hawkins
DD5/J. Humbert (2)
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EA2/R. Gardiner
EA2/W. Bradford
EA2/R. McSheehy
EA5/J. Jones
EA5/J. Demuth
EA6/C. LeBlanc
EA6/E. Jones (6)
EA6/R. Dickerson
EA6/R. Giesecke
EA7/E. Jones
EA8/J. Lee
EA8/R. Burt
EA8/P. Deans
EA8/J. Chauvin
EB/P. Vavra
EB2/R. Moorehead
EB3/M. Franklin
EB4/J. Overton
EB4/R. Puffer
EB5/I. Burtzlaff (2)
EB7/E. Stelly
EB8/A. Campos
EB8/A. Olsen
EB8/R. Munford
EB8/R. Rotramel
EB8/V. Melliff
EB8/F. Eastman
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EC/P. Hurt
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EC/W. Draper
EC/P. Kiehl
EC/R. Smylie
EC/J. Correale
EC4/L. Sullivan (2)
EC6/L. Bell
EC7/M. Radnofsky
EC9/C. Lutz
EC9/F. DeVos
ED8/B. Johnson
ED8/J. Lee
EE/R. Dietz
EE/N. Farmer
EE/R. Fener
EE/D. Hickman
EE/M. Luse
EE2/P. Coan
EE3/J. Dallas (2)
EE3/L. Leopold
EB8/B. Mollberg
EB4/L. McFadin
EB4/E. Zetka
EB7/A. Copeland
EE5/S. Owens
EE6/J. McCown
EE6/W. Panter
EE6/E. Walters
EE11/R. Sawyer
EE13/A. Spivey (2)
EE13/J. Johnson
EG/R. Chilton
EG/C. Frazier
EG5/W. Swingle
EG7/J. Hanaway
EG8/G. Rice
EG8/R. Wilson
EG13/G. Xenakis
EG131/A. Metzger
EH/P. Maloney
EH/A. Carroway
EH/D. Wiseman
EH/D. Gerke
EH/J. Langford
EH/W. LeCroix
EH/E. Weeks
EH/J. Thomas
EH/J. Sanders
EH/M. Baker
EL/J. McLane
EL/W. Petynia
EL3/J. Moore
EL12/B. McGee
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EP/C. Humphries
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EP12/H. White
EP2/N. Townsend
EP4/W. Simmons
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EP5/W. Rice
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EC9/J. McBarron
EG8/S. Swipes
ES12/W. McMullen
ES12/J. Smith
ES12/R. Wren
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ES26/W. Dorland
EW31/G. Miller
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FC9/J. Saultz (2)
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GSF-L/W. Easter
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JA/J. Kratovil
JA/D. Lang
JA12/R. Young
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JC2/L. Damewood
JC34/F. Battersby
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KA/K. Kleinknecht
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KP/W. Wolhart
MAL/L. Scherer (2)
MAL/W. O'Bryant (6)
MAP-7/Col. Webster
MAS/P. Sennewald
MAO/G. Chandler, Jr.
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MLO/W. Evans
NA/L. Menear
NA/W. Bland
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NB/J. Levine
ND/T. Adams
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PB/A. Hobokan
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PC/H. Ash (4)
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