APOLLO LUNAR SCIENCE DATA ARCHIVING REPORT

OF THE

GEOPHYSICAL DATA EVALUATION WORKING GROUP

Submitted By: W. F. Eichelman

Approved By: M. Nafi Toksöz

August 31, 1973

CONTENTS

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SCHEDULE OF EVENTS PRIOR TO THIS REPORT

October 10, 1972	-	Informal meeting of Headquarters, JSC, and NSSDC on status of data submission to NSSDC by PI's, in accordance with contract requirements.
October 16, 1972	-	JSC wrote letters to PI's requesting status and schedule of submission of data to NSSDC.
November 21, 1972	-	Meeting called by A. J. Calio to discuss Apollo data archiving.
February and March 1973	-	JSC personnel met with each PI individually to discuss data processing.
April 13, 1973	-	First meeting of working group
May 24, 1973	-	Second meeting of working group
		Charter written and approved giving working group an official name and responsibility.
		Letters to PI outlining data to be submitted to NSSDC for archiving.
August 2, 1973	-	Third meeting of working group

PREFACE

The Geophysical Data Evaluation Working Group has surveyed the types, quantity, and quality of data produced by the Apollo surface and orbital experiments, reviewed the data processing, and examined the procedures and capabilities of the data centers. On the basis of this study, the group has developed a set of recommendations on the archival and dissemination of these data for the purpose of optimizing their use by the scientific community in investigations directed toward understanding the origin and history of the Moon. This document contains a summary of the study and the specific recommendations.

INTRODUCTION AND GENERAL REQUIREMENTS

The Apollo program has provided, and will continue to provide, a wealth of lunar data. Until recently, these data have been analyzed primarily by the principal investigators in the program, and their teams, under the proprietary rights recognized by NASA. With the completion of the Apollo missions, a program of lunar data analysis and synthesis with a wider scope and broader participation has now been initiated.

The Geophysical Data Evaluation Working Group was chartered to recommend those methods for the lunar data archiving and distribution that would best serve the needs of the scientific community. The charter is reproduced as Appendix D.

With our initial assessment of the problem, it became clear that some critical decisions were needed concerning how, where, and in what form to store the data. We found that it would be neither practical nor desirable in most cases to distribute the raw data from the range tapes. Therefore, we concluded that NASA should store for use by other scientists only data reduced and corrected by the principal investigator, since he best understands the conditions under which these data were acquired and the pertinent details of his instrumentation. In addition, we concluded that some analyzed data should also be stored since, for many studies, such data could be used without further processing. Finally, we agreed that microfilms of reduced data, in some cases only for special events, should also be stored for dissemination, because this form is convenient for inspection by investigators. This multi-

mode archiving of data from each experiment is reflected in the detailed specifications given in Appendix A.

The group surveyed the personnel, procedures, and facilities of the National Space Science Data Center (NSSDC) at Goddard Space Flight Center in considering locations for the data archives. Alternatives were considered. Among these was one in which the principal investigator would assume the responsibility for the storage and distribution of his data. However, due to potential changes of interest, involvement, and institution, this possibility was ruled out and we concluded that the data should be stored at a permanent archiving facility.

A separate Apollo data facility, independent of NSSDC, was then considered. In the final analysis, we concluded that NSSDC could properly serve the needs of the scientific community in this area.

We would emphasize that proper documentation would be an essential part of the archiving process. Without adequate documentation and supporting information (ephemeris, etc.), the stored data would be of limited use. Further, data from complementary experiments (e.g., Lunar Surface Magnetometer and Explorer 35 Magnetometer) should be stored together or cross-referenced.

Different experiments in the Apollo program generate different types and amounts of data. For the limited-data experiments, the storage requirements are established easily. For the experiments which generated or

continue to generate large amounts of data, e.g., PSE, LSM, SIDE, the archiving problem is more severe. Thus, considerable time was spent with each principal investigator discussing data reduction procedures, as outlined in Appendix C.

The group surveyed the physical objects which make up part of the experimental data return (e.g., neutron probe, cosmic ray, etc.). We concluded that these should be stored at the lunar sample curatorial facility.

In developing data archiving plans, we were guided by the principle that the Apollo data constitute a national resource. Present and future studies of the Moon will require these data.

RECOMMENDATIONS

The Geophysical Data Evaluation Working Group makes the following recommendations with regard to the lunar geophysical data from Apollo:

1. The reduced and analyzed data, outlined by experiment in Appendix A, should be archived and distributed by NSSDC.

2. The balance of the data should be maintained by the PI until a mutual agreement is made to transfer those data to NASA. Furthermore, NASA should maintain indefinitely the range tapes at a suitable government facility.

3. The physical objects (cosmic ray detectors, penetrometer drum, etc.) associated with experiments should be stored in the lunar sample curatorial facility.

4. In order to facilitate the scientific investigators' access to Apollo data, auxiliary data libraries should be established. Initially, JSC (or LSI), the West Coast, Boston, and Denver areas should be covered. These facilities should contain copies of the Apollo data microfilms being archived at NSSDC, microfilm viewers, and supporting documentation. The location of these facilities should be well publicized once they are established.

5. In view of the major tasks remaining in the data archiving effort, and the processing and distribution that will be required for the data being received from currently operational experiments, JSC should appoint a data manager to be responsible for the coordination of data acquisition, processing, archiving, and PI activities.

6. A Data User's Handbook should be prepared to familiarize the scientific community and the investigators with the Apollo experiments, available data, archiving status, and acquisition procedures.

7. The NSSDC acquisition staff should be augmented in the area of planetary interiors. Also, NASA Headquarters should establish a procedure to periodically review the NSSDC activities, facilities, and the data status.

8. NSSDC should augment its facilities to accommodate visiting scientists who may wish to use the data at that location.

9. New sets of processed data may be generated under the lunar Data Analysis and Synthesis Program. These data should also be evaluated for archiving at NSSDC.

10. Continuing experiments archival requirement should be reviewed periodically.

DATA USER'S HANDBOOK

INTRODUCTION

- PURPOSE
- SCOPE

EXPERIMENT STATUS

- SURFACE
- ORBITAL

EPHEMERIS PLOTS

- SURFACE
- ORBITAL

DATA ARCHIVAL INFORMATION

- LOCATION
  - NSSDC
  - REGIONAL VIEWING LIBRARIES

CORRELATIVE EXPERIMENTS

EXPERIMENT SECTION

* DESCRIPTION OF EXPERIMENT AND INSTRUMENT CHARACTERISTICS
* DATA HISTORY - OPERATIONAL HISTORY
- DATA SETS AND AVAILABILITY THROUGH NSSDC
  - NOW
  - LATER
- BIBLIOGRAPHY OF KEY PAPERS AND SUMMARY OF KEY RESULTS

* This information shall be supplied by the Principal Investigator.

APPENDIX A

DATA ARCHIVING

The material requested for archiving at NSSDC will consist of the following numbers of digital tapes and microfilms.

Experiment No. and Name		Digital Tapes	Microfilm
S-031	Passive Seismic Experiment	500 @ end of 1973 Plus 300/yr.	45-120 Rolls of Analog
S-033	Active Seismic Experiment	5	Documentation + Plots
S-034	Lunar Surface Magnetometer	220	Documentation + Plots
S-035	Solar Wind Spectrometer	14	Documentation + Plots
S-036	Suprathermal Ion Detector Experiment	550	12 Plots
S-037	Heat Flow Experiment	2/Yr.	Documentation + Plots
S-038	Charged Particle Experiment	50	Documentation + 16 Plots
S-058	Cold Cathode Ionization Gauge Experiment	None	Documentation + Plots
S-059	Lunar Geology Investigation	None	Photographs + Negatives
S-078	Laser Ranging Retro-Reflector Experiment	10	Report
S-151	Cosmic Ray Detector Experiment (Helmets)	None	Report
S-152	Cosmic Ray Detector Experiment (Sheets)	None	Report
S-160	Gamma Ray Spectrometer Experiment	100	Documentation

Experiment No. and Name		Digital Tapes	Microfilm
S-161	X-Ray Fluorescence	2	Maps
S-162	Alpha Particle Spectrometer	4	Maps
S-164	S-Band Transponder	60	Documentation + Plots
S-165	Mass Spectrometer	9	8 Reels
S-169	Far UV Spectrometer	3	TBD
S-170	Bistatic Radar	9	Documentation
S-171	IR Scanning Radiometer	50	TBD
S-173	Particle Shadows/ Boundary Layer	5	35 Reels
S-174	Magnetometer (Subsatellite)	25	Documentation + Plots
S-198	Portable Magnetometer	NONE	Documentation + Plots
S-199	Lunar Gravity Traverse	NONE	Report
S-200	Soil Mechanics	NONE	Report
S-201	Far UV Camera	25	Plots
* S-202	Lunar Ejecta and Meteorites	TBD	TBD
* S-203	Lunar Seismic Profiling Experiment	TBD	TBD
* S-204	Surface Electrical Properties	4	TBD
* S-205	Lunar Atmospheric Composition Experiment	TBD	TBD
* S-207	Lunar Surface Gravimeter	TBD	TBD
* S-209	Lunar Sounder	Film Duplicate	TBD
S-229	Neutron Flux Experiment	NONE	Report

* Apollo 17 Experiment - Data processing and evaluation in process.

EXPERIMENT DATA TO BE ARCHIVED

S-031

PASSIVE SEISMIC EXPERIMENT — Dr. Gary V. Latham

Tapes and Microfilm

a. Copy of JSC tapes sent to PI covering continuous PSE operations at all ALSEP (PSE) locations for one lunation.

b. Compressed time scale. Simultaneously displayed on analog chart. 40 Sample stach plot. All data. (To be microfilmed)

c. Event log vs. time. Duplicate cards to be sent to NSSDC.

d. Event tapes.

e. Compressed time scale. Events only. (To be microfilmed)

f. Tapes of artificial impact events only.

g. Expanded scale analog charts of selected events (including artificial events) to be microfilmed.

Documentation

a. Description of experiment and equipment (Fam. Manual).

b. Data History - Operational History

c. Data Processing Manual

d. Steps required to obtain event tape

e. Photo frame numbers used in analysis

EXPERIMENT DATA TO BE ARCHIVED

S-033

ACTIVE SEISMIC EXPERIMENT — Dr. R. L. Kovach

Tapes and Microfilm

a. Reformatted - Log compressed digital tapes

b. Visual readout for microfilming

Documentation

a. Description of experiment and equipment (Fam. Manual or use Preliminary Science Report for instrument description)

b. Data History - Operational History

c. Program description - Data processing manual (Calibration information)

d. Photo frame numbers used in analysis

EXPERIMENT DATA TO BE ARCHIVED

S-034

LUNAR SURFACE MAGNETOMETER — Dr. Palmer Dyal

Magnetic Tape Data

Decimated (filtered) data. Spectral study selected sets to be sent to NSSDC. Listing of time intervals of processed data to accompany data sent to NSSDC.

Time series of all magnetic field vectors.

Plots and Microfilm

a. 30 and 60 minute time series plot of magnetic field all data.

b. Ephemeris plots and programs.

Documentation

a. Description of experiment and instrument

b. Data History - Operational History

c. Description of computer program.

EXPERIMENT DATA TO BE ARCHIVED

S-035

SOLAR WIND SPECTROMETER — Dr. Conway W. Snyder

Magnetic Tape Data

"PAR" Tape. BCD Format.
15 Parameters per spectrum. 28 Seconds.
5 Months of data per tape.

Plots

Hourly averages (4 bins) (Documentation explains the 4 bins).
Analog plots of data excluding bad points (Bin #2) to be sent to NSSDC for microfilming.

Documentation

a. Description of experiment and instrument.

b. Data History - Operational History

c. Description of computer program

d. Calibration data

EXPERIMENT DATA TO BE ARCHIVED

S-036

SUPRATHERMAL ION DETECTOR — Dr. John W. Freeman

Magnetic Tapes

"IMPACT" Tape - 7-Track; 200 BPI; block format digital tape with zeroes removed. Repack to 800 bpi before sending to NSSDC.
1 Tape every 3 days of operation of each ALSEP/SIDE.
(550 Tapes backlogged when repacked at 800 BPI by Rice.)

Microfilm

Digital readout. Graphic form. (450 Reels of microfilm)

Averaging Program

2-1/2' x 2' Plots; 20-minute averages (12 plots)

Documentation

a. Description of experiment and instrument

b. Data History - Operational History for each SIDE

c. Description of computer program

d. Calibration data

EXPERIMENT DATA TO BE ARCHIVED

S-037

HEAT FLOW EXPERIMENT — Dr. M. G. Langseth

Tapes and Microfilm

Merged output tape from the sorting and converting program.

Documentation

a. Description of experiment and equipment (Fam. Manual)

b. Data History - Operational History

c. Data Processing Manual (Description of computer program and calibration information)

d. Photo frame numbers used in analysis

EXPERIMENT DATA TO BE ARCHIVED

S-038

CHARGED PARTICLE LUNAR ENVIRONMENT — Dr. D. Reasoner

Digital Tapes: Reformatted CPLEE Data Cycle Tapes
(19.2 Seconds Real Time)

Microfilm: 5-Minute average plots (for microfilming)

Documentation:

(1) Description of Instrument
(2) Calibration
(3) Operation History
(4) Data Tape Format
(5) Published Reports

EXPERIMENT DATA TO BE ARCHIVED

S-058

COLD CATHODE ION GAUGE — Dr. F. S. Johnson

Microfilm: 35mm film presenting plots of lunar atmospheric density and gauge temperatures

Documentation:

(1) Program Description

(2) Experiment Description

(3) Calibration, etc.

EXPERIMENT DATA TO BE ARCHIVED

S-152

COSMIC RAY — Dr. R. L. Fleischer

Written report will be sent to NSSDC.

The test sheets must be refrigerated for archiving and will be in storage at JSC lunar sample curatorial facilities.

Photo frame numbers used in analysis.

- NOTE -

Written report should contain a description of experiment and equipment, data history and operational history, and data processing techniques.

EXPERIMENT DATA TO BE ARCHIVED

S-160

GAMMA RAY — Dr. J. R. Arnold

Magnetic Tapes

a. Merged data tapes - Contains total mission Gamma ray data--time sequenced and corrected for instrumentation calibration and boom position.

b. Map tape - Gamma ray data correlated with lunar location.

Microfilm

a. Merged Data Tape Content

b. Mapping Tape Content

Documentation

a. Program Description

Description of computer program(s) which operated upon the JSC provided raw data, ephemeris, and engineering data tapes. The description should explain how instrument calibration and boom position corrections were applied.

b. Instrument Description

Briefly describe the instrument, sensor(s), commands, and operational modes.

c. Large Scale Map (to be microfilmed)

A large scale lunar map showing the experiment coverage and the resultant surface constituent content.

EXPERIMENT DATA TO BE ARCHIVED

S-161

X-RAY FLUORESCENCE — Dr. Isidore Adler

Magnetic Tapes

a. Merged Data Tape - Contains lunar mission phase X-ray data, ephemeris, and housekeeping data--time sequenced and corrected for instrument calibration.

b. Galactic Survey Data Tape - Contains galactic X-ray data during specific pointing periods.

Documentation

a. Program Description

Description of computer program(s) which operates upon the JSC provided raw data, ephemeris, and engineering data tapes. The description should explain how the instrument calibration was applied.

b. Instrument Description

Briefly describe the instrument, sensor, and operational modes.

c. Large Scale Map (for microfilming)

A large scale lunar map showing experiment coverage and resultant surface constituent content.

EXPERIMENT DATA TO BE ARCHIVED

S-162

ALPHA PARTICLE — Dr. P. Gorenstein

Magnetic Tapes

Merged Data Tape - Contains summarized lunar mission raw data; time sequenced and associated instrument housekeeping data. Bad data points have been removed from tape.

Documentation

a. Instrument Description

Brief description of instrument, sensors, operational modes, and calibration source and application. Also, an explanation of:

(1) Gain vs. temperature corrections

(2) Live Time (time to height converter)

b. Large Scale Map (for microfilming)

A large scale lunar map showing experiment coverage and resultant surface characteristics.

EXPERIMENT DATA TO BE ARCHIVED

S-164

S-BAND TRANSPONDER — W. L. Sjogren

Doppler Residual on magnetic tape and microfilm.

Normal points with covariance for subsat.

Report of data results.

Documentation:

a. Description of experiment and instrument

b. Data history - operational history

c. Program description

d. Calibration data, etc.

EXPERIMENT DATA TO BE ARCHIVED

S-165

ORBITAL MASS SPECTROMETER — Dr. John H. Hoffman

Magnetic Tapes

Merged data tape
Data sync; data blocked; time gaps filled with zeroes; ephemeris merged; housekeeping data merged; science data corrected for background.

Documentation

a. Description of experiment and instrument.

b. Data History - Operational History

c. Computer program description

d. Calibration data

e. Ref. of published results

EXPERIMENT DATA TO BE ARCHIVED

S-169

FAR UV SPECTROMETER — Prof. W. E. Fastie

Magnetic Tapes

Merged Data Tape - Contains raw data counts and ephemeris merger in time sequence.

Microfilm

Microfilm of UV spectra plots.

Documentation

a. Program Description

Description of computer program which operates upon the JSC provided raw data and ephemeris tapes. The description should explain how the instrument and sensor calibration data is applied.

b. Instrument Description

Briefly describe the instrument, sensor, and operational modes.

c. Results

Copies of published scientific results.

EXPERIMENT DATA TO BE ARCHIVED

S-170

BISTATIC RADAR — H. T. Howard

Digitized integrated tape, including trajectory data.

Documentation:

(1) Flow of data from collection to plots

(2) Program description

(3) Experiment description

These are contained in Technical Report #3282-1, "Stanford Apollo Bistatic Radar Experiment, National Space Science Data Center, Data Description," dated February 15, 1973.

EXPERIMENT DATA TO BE ARCHIVED

S-171

IR SCANNING RADIOMETER

Dr. Frank Low
Mr. Wendell Mendell

Magnetic Tapes:

1. Merged Data Tape - Contains data points expressed as temperatures time sequenced and merged with spacecraft ephemeris data.

2. Image Tape - Contains the reconstructed lunar surface radiance expressed as a rectilinear array of values from an oblique Mercator's projection centered on the spacecraft ground tract.

3. Thermal Properties Tape - Contains a thermal properties map of the Moon samples uniformly in a map projection as yet undefined.

Documentation:

1. Instrument Description - Brief description of instrument, sensor, operational modes.

2. Program Description - Description of computer program(s) used to produce the merged tapes. The description should explain how calibration data were applied.

3. Magnetic Tape Format Description - Description of merged magnetic tapes format for data user's information.

4. Results - Copies of published scientific results.

EXPERIMENT DATA TO BE ARCHIVED

S-173

PARTICLE SHADOWS/BOUNDARY LAYER — Dr. K. A. Anderson

Magnetic tapes - 2 hr. averages.

Magnetic tapes and microfilm - 10 minute average.

Microfilm - Orbital summaries
(Film to be copied by NSSDC and returned to Berkeley)

Documentation:

a. Time correction procedure

b. Accumulation correction procedure

c. Calibration information

d. Instrument description

e. History of experiment

EXPERIMENT DATA TO BE ARCHIVED

S-174

MAGNETOMETER - SS

Dr. Paul Coleman, Jr.

Magnetic Tape and Microfilm - Cal Com Plots

Documentation:

a. Altitude curves

b. Lat.-Long. position

c. Solar Wind - Geomagnetic Tail Plots

d. Experiment description

e. Equipment description

EXPERIMENT DATA TO BE ARCHIVED

S-198

LUNAR PORTABLE MAGNETOMETER — Dr. Palmer Dyal

Data

a. Listing of all vector data

b. Listing of all traverse site locations where vector field measurements were obtained

Documentation

a. Description of experiment and instrument

b. Data reduction technique using simultaneous data from other lunar surface and orbiting magnetometers

EXPERIMENT DATA TO BE ARCHIVED

S-199

LUNAR GRAVITY TRAVERSE — Dr. M. Talwani

1. Tabulated data and calibrations
2. Written report
3. Photo frame numbers used in analysis

NOTE: Written report should contain a description of experiment and equipment, data history or operational history, and data processing techniques.

EXPERIMENT DATA TO BE ARCHIVED

S-200

SOIL MECHANICS — Dr. James Mitchell

Tables of soil stress (force vs. depth)

Calibration information

Penetrometer traces reproduced to scale

Tables of data removed from drum

List of photos used in analysis

Also, JSC will need handling procedures and storage requirements for the Penetrometer drum which will be stored at JSC curatorial facilities.

EXPERIMENT DATA TO BE ARCHIVED

S-201

FAR UV CAMERA — Dr. G. Carruthers

Second-generation copy negative of flight film.

25 Reels of 9-channel digitized-scan magnetic tape.

Catalog of all far-UV objects detected in 10 fields of the sky.

20 Contour charts of far-UV background, 10 in Lyman alpha (1216 A) light, 10 excluding Lyman alpha (enlarged from 16-mm film exposed in the JSC computer).

Articles on Earth's upper atmosphere and geocorona.

Articles on lunar atmosphere and interplanetary medium.

Articles on nebulae and galaxies.

Final report on other data obtained.

EXPERIMENT DATA TO BE ARCHIVED

S-202

LUNAR EJECTA AND METEORITES — Dr. Otto E. Berg

Tapes and Microfilm:

a. Event tapes, Disc, or Cards

b. Microfilm of all changes - tabulation from baseline

Documentation:

a. Description of experiment and equipment (Fam. Manual)

b. Data history - operational history

c. Data Processing Manual
(Description of computer program and calibration info.)

d. Steps required to obtain event tapes.

e. Photo frame numbers used in analysis.

EXPERIMENT DATA TO BE ARCHIVED

S-204

SURFACE ELECTRICAL PROPERTIES — Dr. M. G. Simmons

Tapes and Microfilm:

a. Production of multiplexed digital tape
(1108 Compatible digital tape)

b. Production of demultiplexed digital tape
(Product tape - 1108 compatible digital tape
demuxed data and microfilm plots)

Documentation:

a. Description of experiment and equipment (Fam. Manual)

b. Data history - operational history

c. Data processing manual
(Description of computer program and calibration information)

d. Photo frame numbers used in analysis

EXPERIMENT DATA TO BE ARCHIVED

S-205

LUNAR ATMOSPHERIC COMPOSITION EXPERIMENT
(Lunar Surface Mass Spectrometer)

Dr. John H. Hoffman

Magnetic Tapes

Mass Peak Summary

Microfilm

Plots of peak summaries to be microfilmed at NSSDC.

Documentation

a. Description of experiment and instrument

b. Data History - Operational History

c. Description of computer program

d. Calibration data

e. Ref. of published results

EXPERIMENT DATA TO BE ARCHIVED

S-207

LUNAR SURFACE GRAVIMETER — Dr. Joseph Weber

Tapes and Microfilm:

Event Data Tape

Free Modes Spectra

Documentation:

a. Description of experiment and equipment (Fam. Manual)

b. Data History - Operational History

c. Data Processing Manual
(Description of computer program and calibration data)

d. Photo frame numbers used in analysis

EXPERIMENT DATA TO BE ARCHIVED

S-209

Lunar Sounder — Dr. R. J. Phillips

Magnetic Tape: NONE

Microfilm:

a. Radar Images
b. Holographic Radar Images
c. Digital File of Radar Imagery
d. Lunar Profile Data
e. Ambient Noise Level

Film:

a. Signal Film Duplication
b. Sounder Recorder Film
c. Enhanced Data Film

Documentation:

a. Instrument Description - Briefly describe the instrument and operational modes.
b. Descriptive Documentation of:
   (1) Signal Film
   (2) Sounder Recorder Film
   (3) Photo and Holographic Radar Imagery
   (4) Lunar Profile Data
   (5) Ambient Noise Measurement
c. Results - Copies of published experiment results.

EXPERIMENT DATA TO BE ARCHIVED

S-229

NEUTRON FLUX — Dr. D. S. Burnett

Science reports will be presented to NSSDC for storage.

The experiment specimen requires refrigeration for storage and will be stored at the JSC curatorial facility in Houston. The JSC will need handling procedures and storage requirements and limitations, prepared by the PI.

EXPERIMENT DATA TO BE ARCHIVED

DOPPLER NAVIGATION — Mr. W. R. Wollenhaupt

Magnetic Tapes:

a. Raw Spacecraft Doppler Data - time sequenced.

b. Raw Spacecraft Attitude - time sequenced.

c. Raw Laser Altimeter - time sequenced.

d. Raw P&FS Doppler Data - time sequenced.

Microfilm:

Orbital Plots - Spacecraft & P&FS

Documentation:

a. Magnetic Tapes Format Description

b. Programs for operating upon raw JSC data tapes

c. Orbital Plot Description

d. Equipment Description

APPENDIX B

APOLLO PROGRAM

LUNAR SURFACE EQUIPMENT STATUS

August 1, 1973

TABLE OF CONTENTS

APOLLO LUNAR SURFACE EQUIPMENT STATUS

1.0 INTRODUCTION

Scientific data gathering equipment and related communications and power equipment were deployed on the lunar surface by the crew on each of the six Apollo lunar landing missions from July 20, 1969, (Apollo 11 mission) through December 11, 1972, (Apollo 17 mission). This report covers the performance of the deployed equipment which was designed to continue to provide data after the return of the crew to Earth.

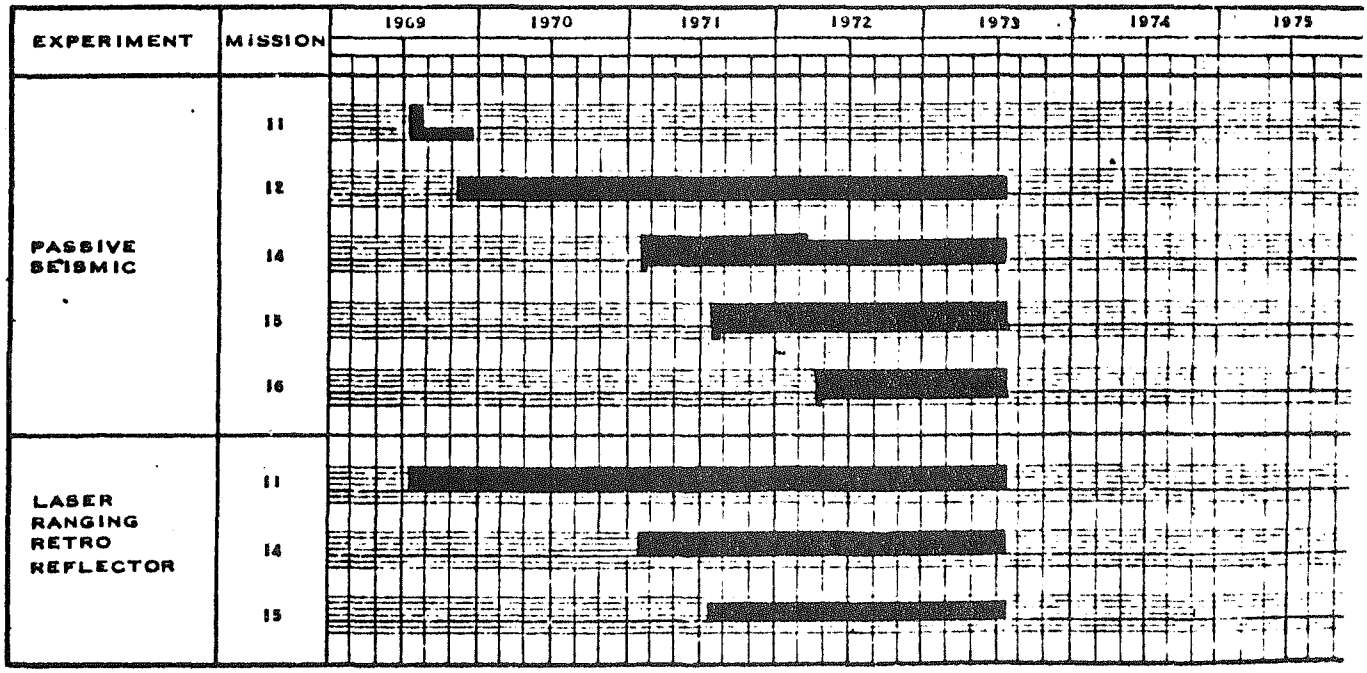
The report is divided into three sections, section one being the Introduction. The second section is an overall summary in the form of a graphic presentation of the time history of the percent of full capability of the instruments from the time of deployment on the lunar surface, with a gross indication of when changes occurred. The third section includes a brief word status of each instrument in a listing which is grouped by experiment, so that the status for each of the experiments on each applicable mission can be seen at a glance.

APOLLO LUNAR SURFACE EQUIPMENT STATUS

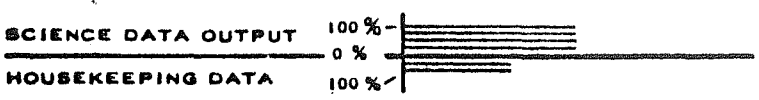
2.0 OVERALL SUMMARY

MISSION	LAUNCH DATE	LUNAR SURFACE DATA		
		START	END	
			UPLINK	DOWNLINK
11	Jul. 16, 1969	Jul. 21, 1969	Aug. 25, 1969	Dec. 14, 1969
12	Nov. 14, 1969	Nov. 19, 1969		
14	Jan. 31, 1971	Feb. 5, 1971		
15	Jul. 26, 1971	Jul. 31, 1971		
16	Apr. 16, 1972	Apr. 21, 1972		
17	Dec. 7, 1972	Dec. 11, 1972		

TIME – HISTORY PROPORTION OF FULL CAPABILITY OF INSTRUMENT

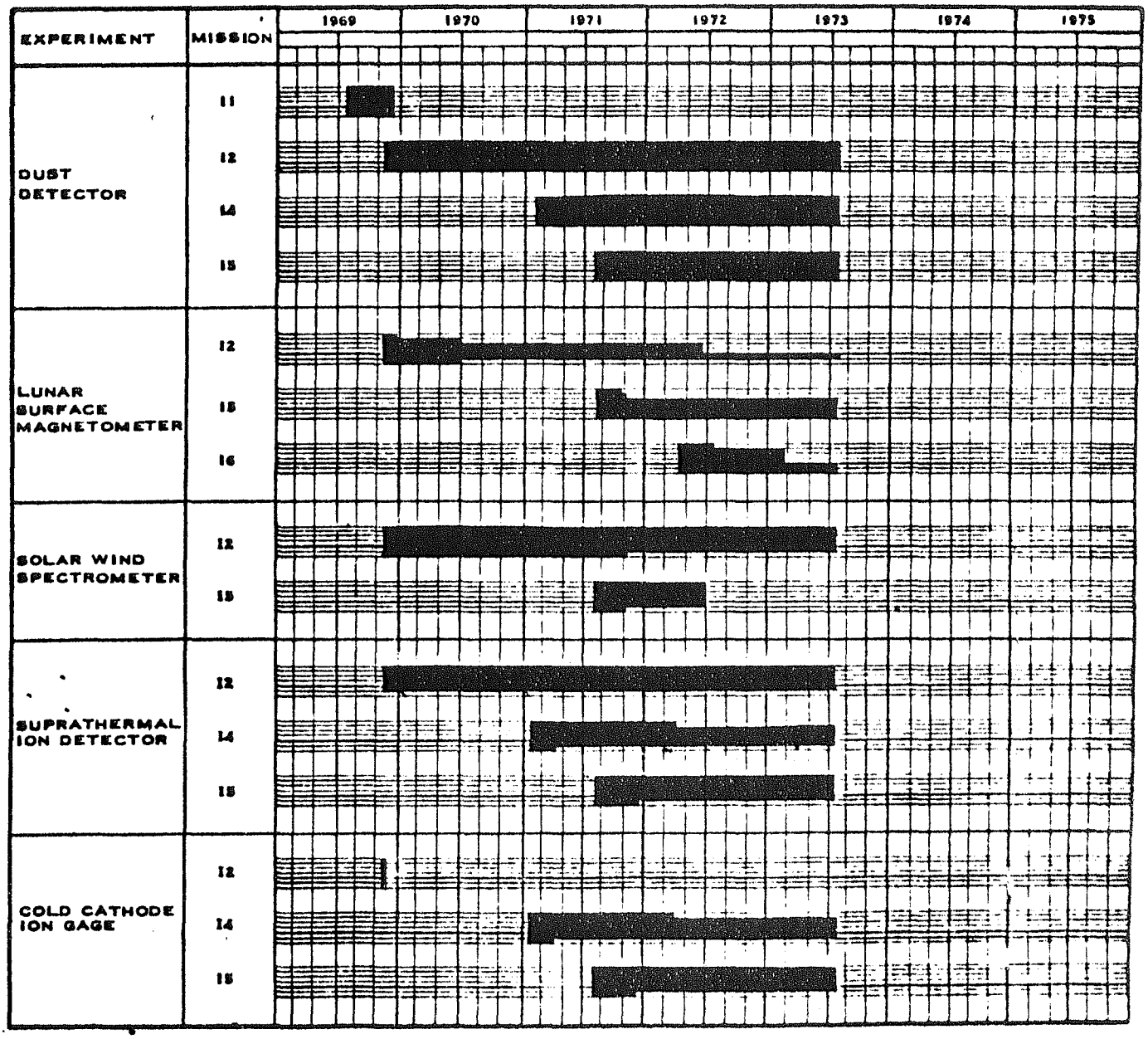


LEGEND :



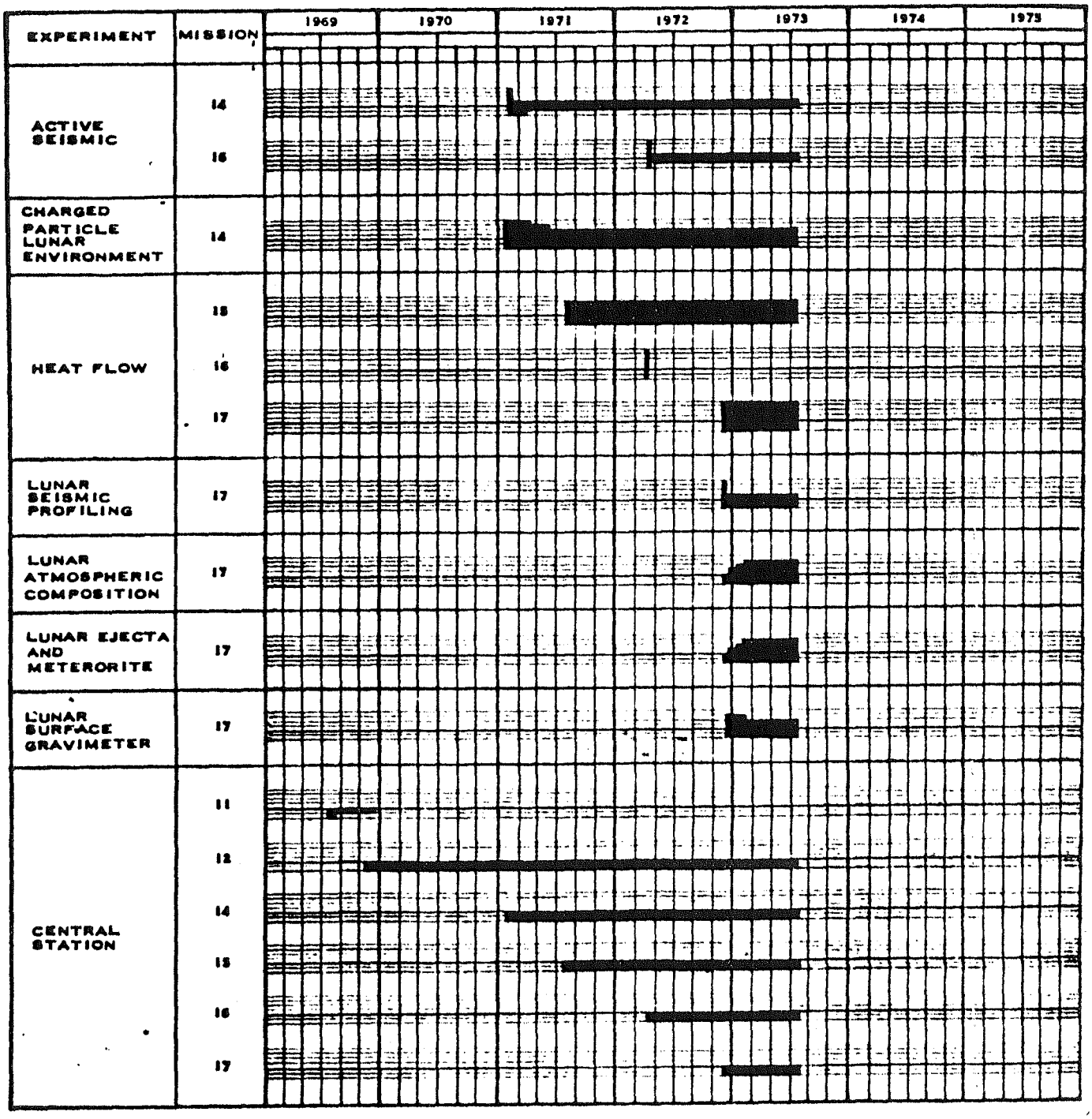
APOLLO LUNAR SURFACE EQUIPMENT STATUS

2.0 OVERALL SUMMARY



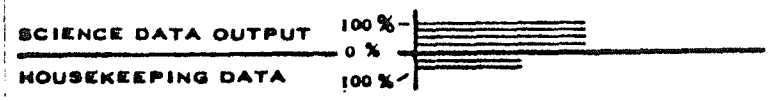
APOLLO LUNAR SURFACE EQUIPMENT STATUS

2.0 OVERALL SUMMARY



Note: All central station data is considered housekeeping rather than science data.

LEGEND :



APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
PSE	SPZ AXIS MALFUNCTIONED SINCE DEPLOYMENT. Z DRIVE MOTOR REQUIRED @ NIGHT FOR THERMAL CONTROL SINCE 2/1/70.	LPY AXIS OCCASIONALLY DIFFICULT TO LEVEL. LPZ AXIS INOPERATIVE SINCE 11/17/72.	FULL OPERATION	LPX, LPY, & LPZ AXES OCCASIONALLY DIFFICULT TO LEVEL.	N/A
ASE	N/A	MORTARS NOT FIRED. HBR FOR 30 MIN/WK ABOVE -60°C. #3 GEOPHONE NOISY SINCE 3/26/71, DATA RECOVERABLE.	N/A	LAUNCHED 3 MORTARS. HBR 30 MIN/WK. PITCH SENSOR AND ROLL SENSOR FAILED 5/23/72.	N/A
LSM	DATA INTERMITTENT STARTING 12/11/69. DATA STATIC SINCE 6/4/72. FLIP CAL CMD WAS DISCONTINUED 6/14/72.	N/A	NO FLIP CAL CMD ABOVE 62°C. Y-AXIS FLIP CAL FAILED 8/30/71. Y-AXIS DATA STATIC SINCE 9/20/72.	SCIENCE DATA INTERMITTENT SINCE 2/15/73.	N/A
SWS	INTERMITTENT MODULATION DROP IN PROTON ENERGY LEVELS 13 AND 14 SINCE 11/5/71.	N/A	IN STANDBY SINCE 6/30/72, TM OUT OF SYNC & EXCESSIVE POWER DRAIN. PERIODIC CHECKING FOR POSSIBLE RECOVERY.	N/A	N/A

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(CONTINUED)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
SIDE	CYCLIC COMMANDING REQUIRED BECAUSE OF HIGH VOLTAGE ARCING ABOVE 55°C.	LOSS OF SOME ENGINEERING DATA BECAUSE OF FAILURE OF POSITIVE PART OF A/D CONVERTER ON 4/5/71. LUNAR NIGHT OPERATION ONLY BECAUSE OF ANOMALOUS STANDBY OPERATIONS SINCE 3/29/73.	FULL OPERATION	N/A	N/A
HFE	N/A	N/A	TEMP REF 2 OFFSCALE HIGH SINCE 8/7/71. USING TEMP REF 1. PROBES NOT TO FULL DEPTH INTENDED.	INOPERATIVE: ELECTRICAL CABLE BROKEN DURING DEPLOYMENT.	FULL OPERATION THERMAL ACCURACY BEING EVALUATED.
CCIG	FAILED 14 HRS AFTER TURN ON, 11/20/69.	FULL OPERATION UNTIL 3/29/72. LUNAR NIGHT OPERATION SINCE THEN AS DICTATED BY SIDE.	FULL OPERATION	N/A	N/A

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(CONTINUED)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
LEAM	N/A	N/A	N/A	N/A	THERMAL PROBLEM: INCREASING TEMPERATURE 5°F INCREMENTS EACH LUNATION. FULL OPERATION ABOUT 70% OF LUNATION.
LSPE	N/A	N/A	N/A	N/A	HBR 30 MIN/WK
LACE	N/A	N/A	N/A	N/A	THERMAL PROBLEM, 125°F TURN OFF. NOISE ON ALL MASS DATA CHANNELS, DATA RECOVERABLE. EXPERIENCED MODE CHANGES BEING CONTROLLED BY PROCEDURES.
LSG	N/A	N/A	N/A	N/A	SENSOR BEAM CANNOT BE STABILIZED IN THE NULL POSITION. SEISMIC HIGH GAIN, POST AMPLIFIER GAIN STEP 11, INTEGRATOR SHORTED MODE, BIAS OUT.

APOLLO LUNAR SURFACE EQUIPMENT STATUS
3.0 INSTRUMENT STATUS
(CONCLUDED)

	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
CPLEE	N/A	ANALYZER B FAILED 4/8/71. ANALYZER A INTERMITTENT OPERATIONS SINCE 6/6/71.	N/A	N/A	N/A
C/S	FULL OPERATION WITH XMTR B & PROCESSOR Y. (12-HOUR TIMER FAILED ON 2/16/70.)	FULL OPERATION WITH XMTR A & PROCESSOR Y. (12-HOUR TIMER FAILED ON 2/17/71.) ANTENNA SEATING PROBLEMS DURING DEPLOYMENT AFFECTS SIGNAL STRENGTH.	FULL OPERATION	FULL OPERATION WITH XMTR B & PROCESSOR Y.	FULL OPERATION
DTREM	FULL OPERATION	FULL OPERATION	FULL OPERATION	N/A	N/A

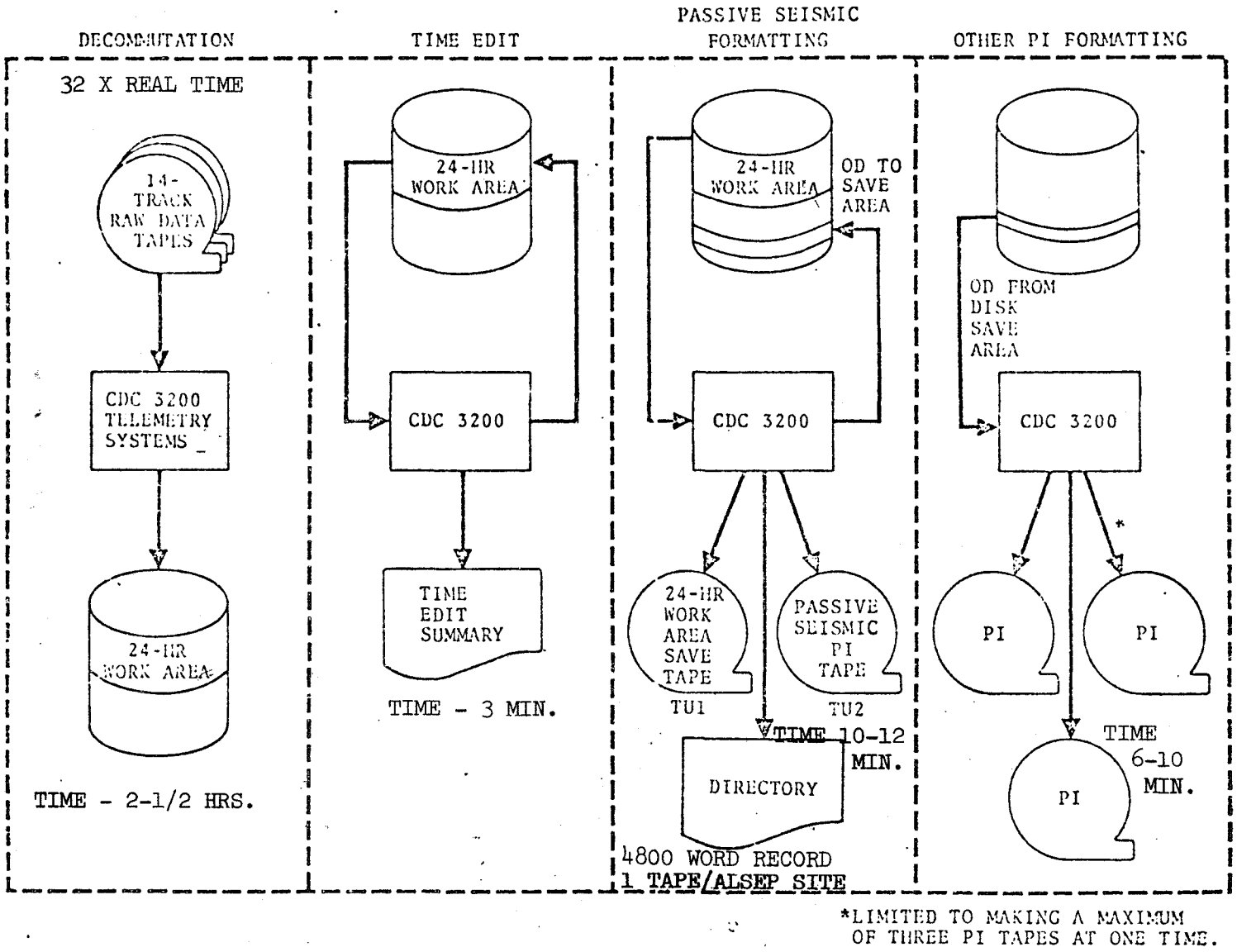
	APOLLO 11 ALSEP	APOLLO 12 ALSEP	APOLLO 14 ALSEP	APOLLO 15 ALSEP	APOLLO 16 ALSEP	APOLLO 17 ALSEP
LR^3	FULL OPERATION	N/A	FULL OPERATION	FULL OPERATION	N/A	N/A

SUMMARY OF APOLLO INSTRUMENTS

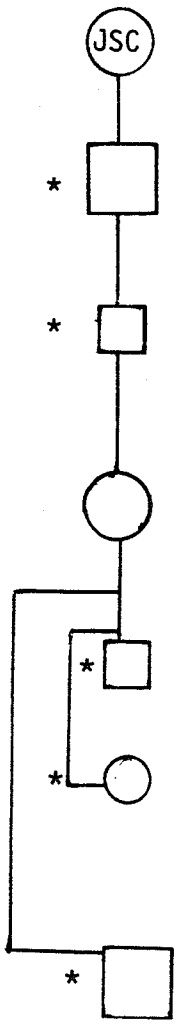
(DATA PROCESSING ONLY)

5-1-73

APPENDIX C



– ALSEP data processing flow chart.



DECISION AS TO ARCHIVING COPY OF THIS TAPE TO BE MADE MAY 24 MEETING.

COMPRESSED TIME SCALE. SIMULTANEOUSLY DISPLAYED ON ANALOG CHART. (45 ROLLS. 120'/ROLL)
40 SAMPLE STACH PLOT. ALL DATA. (23 ROLLS YEAR 1971. 22 ROLLS YEAR 1972)
(30" CALCOM PLOT) NSSDC TO NOTIFY IF THESE CAN BE HANDLED FOR MICROFILMING.

EVENT LOG VS. TIME (STATION BULLETIN)
DUPLICATE CARDS TO BE SENT TO NSSDC.

EVENT TAPE (DISPOSITION TO BE DETERMINED AT MAY 24 MEETING.) 234 TAPES ON HAND.
(128 TAPES YEAR 1971, 106 TAPES YEAR 1972) RATE OF INCREASE 300-400/YR.

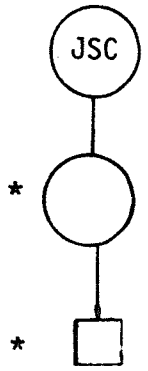
COMPRESSED TIME SCALE – EVENTS ONLY - TO BE MICROFILMED. (180 FT.)

TAPE OF ARTIFICIAL EVENTS ONLY. (23 TAPES)

EXPANDED SCALE ANALOG CHARTS OF SELECTED EVENTS (INCLUDE ARTIFICIAL EVENTS).
600 PLAYOUTS (SINGLE EVENTS) 1' X 4' - 2400 SQ. FT. FOR MICROFILMING)

PHOTOS OF PSE DEPLOYED (PHOTO NUMBERS)

S-033 ACTIVE SEISMIC EXPERIMENT DR. R. L. KOVACH



REFORMATTED - LOG COMPRESSED DIGITAL TAPE IBM COMPATIBLE (15 & 16)
TOTAL OF 3 TAPES NON-IBM COMPATIBLE (17)

VISUAL READOUT FOR MICROFILMING

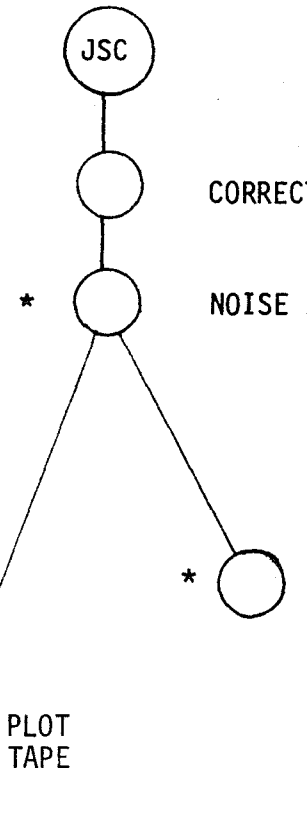
DOCUMENTATION:

(1) USE PRELIMINARY SCIENCE REPORT FOR INSTRUMENT DESCRIPTION.
(2) USE GEOTECH CALIBRATION DATA PACK
(3) PROGRAM DESCRIPTION

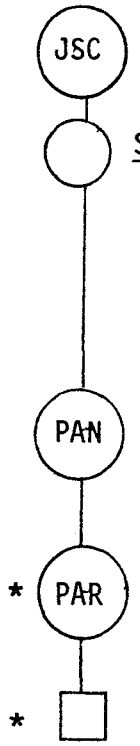
* LONG-TERM STORAGE WITH DOCUMENTATION

S-034 LUNAR SURFACE MAGNETOMETER DR. PALMER DYAL

CORRELATED DATA PLOTS TO BE SENT TO NSSDC FOR MICROFILMING. (9600 SHEETS)



* LONG-TERM STORAGE WITH DOCUMENTATION



3 DAYS RAW DATA PER TAPE - STRIPPED FROM STDN STATION

SNYC TAPE 72 HRS/TAPE

STACK - MERGED 1/2 LUNATION/TAPE

PRELIMINARY ANALYSIS - CALIBRATIONS APPLIED - 1/2 LUNATION/TAPE

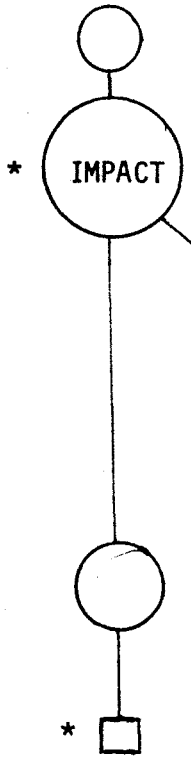
* (15 PARAMETERS/SPECTRUM)(BCD)(28 SEC.) 5 MONTHS/TAPE

* HOURLY AVERAGES (4 BINS) DOCUMENTATION EXPLAINS THE 4 BINS.
ANALOG PLOTS OF DATA EXCLUDING BAD POINTS (BIN #2) TO NSSDC FOR MICROFILMING.

DOCUMENTATION:
(1) CALIBRATION
(2) PROGRAM DESCRIPTION
(3) EQUIPMENT DESCRIPTION

1971 MATERIAL SENT TO NSSDC APRIL 1973.
1972 MATERIAL SCHEDULED FOR NSSDC JULY 1973.

* LONG-TERM STORAGE WITH DOCUMENTATION



STDN ANALOG TAPE

* IMPACT — JSC - 7 TRACK 200 bpi BLOCK FORMAT DIGITAL TAPE WITH ZEROS REMOVED.
1 TAPE/3 DAYS OF OPERATION/ALSEP (550 TAPE BACKLOG WHEN PACKED TO 800 bpi BY RICE)

DELAY DECISION ON HANDLING TO MAY 24 MEETING.

* MICROFILM {DIGITAL READOUT / GRAPHIC FORM}

(450 REELS OF MICROFILM)

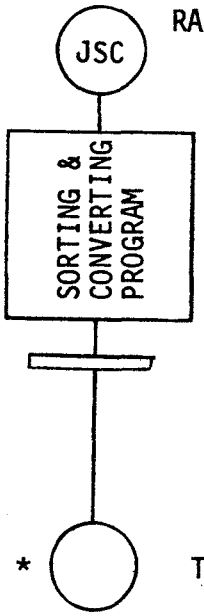
EDITED TAPE. REFORMAT WITH SOME FLAGS ADDED

* AVERAGING PROGRAM (PLOTS 2-1/2' X 2' - 20 MIN. AVERAGES)(12 PLOTS)
COPY TO BE SENT TO NSSDC.

DOCUMENTATION:
(1) CALIBRATION INFORMATION
(2) EQUIPMENT DESCRIPTION
(3) PROGRAM DESCRIPTION

MATERIAL READY FOR SHIPMENT TO NSSDC

* LONG-TERM STORAGE WITH DOCUMENTATION



RAW DATA FROM STDN STATION TAPES - 2/LUNATION (STORED. NOT USED AS WORKING TAPE)

DATA IS SORTED TO GET IN TIME SEQUENCE, CALIBRATION.

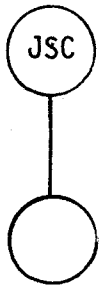
DISC IS USED FOR INPUT TO ANALYSIS PROGRAMMING.
(INCLUDES CALIBRATION AND DATA IS IN TEMPERATURE UNITS.)

TAPE FOR NSSDC - 2 7-INCH REELS/YEAR

DOCUMENTATION:
(1) DESCRIPTION OF COMPUTER PROGRAM AND CALIBRATION INFO.
(2) LIST OF PHOTOS, BY FRAME NUMBER, OF INTEREST TO HFE.
(3) CALIBRATION INFORMATION.

* LONG-TERM STORAGE WITH DOCUMENTATION

S-038 CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT DR. D. REASONER



REFORMATTED INTO CPLEE DATA CYCLES OF 19.2 SECONDS, REAL TIME, EACH (50-60 TAPES)

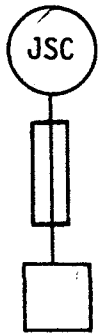
5 MIN AVE PLOTS FOR MICROFILMING (11" X 14" SHEETS - 16 SHEETS)

DOCUMENTATION:
(1) DESCRIPTION OF INSTRUMENT
(2) CALIBRATION
(3) OPERATIONAL HISTORY
(4) DATA TAPE FORMAT
(5) PUBLISHED REPORTS

30 TAPES AT NSSDC
REMAINING 30 TAPES SCHEDULED FOR JULY 1973

* LONG-TERM STORAGE WITH DOCUMENTATION

S-058 COLD CATHODE ION GAUGE DR. F. S. JOHNSON



PLOT PROGRAM

35mm FILM PRESENTING PLOTS OF LUNAR ATMOSPHERIC DENSITY AND GAUGE TEMPERATURE.

EACH FRAME COVERS ≈ 15 HOURS OF TIME.

APOLLO 14 & 15 DATA AT NSSDC THROUGH DECEMBER 1972

DOCUMENTATION:

(1) PROGRAM DESCRIPTION
(2) EXPERIMENT DESCRIPTION

1971 & 1972 DATA AT NSSDC.

1. CATALOG OF PICTURES TAKEN ON THE LUNAR SURFACE DURING EACH OF THE APOLLO MISSIONS

2. DOCUMENTATION AND ENVIRONMENT OF THE APOLLO SAMPLES

3. TRAVERSE INFORMATION - TRACK

4. USGS PUBLICATIONS

5. CORRELATION OF PAN AND ORBITER

S-078 LASER RANGING RETRO-REFLECTOR DR. J. E. FALLER

PREPRINTS

REPORTS

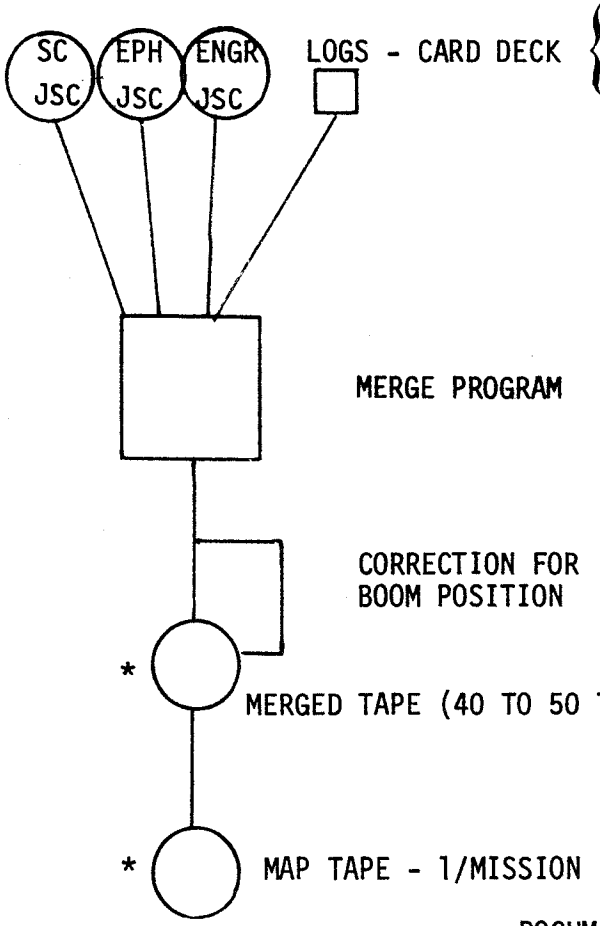
HEADQUARTERS TO PLACE REQUIREMENT ON
LASER REFLECTOR TEAM.

(SPECIMEN WILL BE IN STORAGE IN JSC CURATORIAL FACILITIES.)

WRITTEN REPORT WILL BE SENT TO NSSDC.

(THE TEST SHEETS MUST BE REFRIGERATED FOR ARCHIVING.)

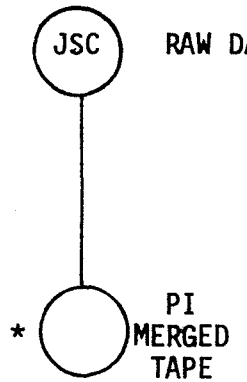
(TEST SHEETS WILL BE IN STORAGE AT JSC CURATORIAL FACILITIES.)



DATA SCHEDULED TO NSSDC
IN MID-1974

DOCUMENTATION:
(1) PROGRAM DESCRIPTION
(2) INSTRUMENT DESCRIPTION

* LONG-TERM STORAGE WITH DOCUMENTATION



ONE REEL @ 1600 BPL - X-RAY, EPHEMERIS & HOUSEKEEPING DATA MERGED IN TIME SEQUENCE.

THE TAPE WILL BE ACCOMPANIED BY SOFTWARE AND COMPLETE DOCUMENTATION.

APOLLO 15 DATA IS IN NSSDC AND DOCUMENTATION SCHEDULED FOR APRIL 15, 1973.

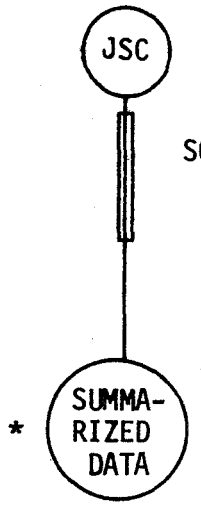
APOLLO 16 DATA AND DOCUMENTATION SHEDULED TO BE PRESENTED BY JULY 1973.

X-RAY AND ALPHA WILL PUBLISH A COMBINED REPORT ON ENGINEERING INFORMATION.

GALACTIC TAPE SHOULD BE MERGED BY APRIL 17, 1973.

PUBLISHED REPORT.

LARGE SCALE MAPS.



SORTING PROGRAM - REMOVING BAD DATA POINT WHICH HAS BEEN FLAG ON JSC TAPE. PLACES DATA INTO TIME SEQUENCE. ALSO REMOVES DATA WHICH ARE BAD BECAUSE OF BAD HOUSEKEEPING DATA.

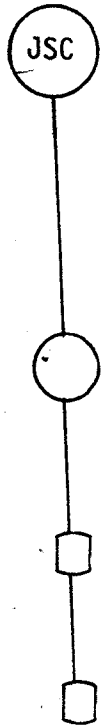
* TWO TAPES/MISSION - STILL RAW DATA COUNTS.

DISC FOR FURTHER PROCESS FOR ANALYSIS

DOCUMENTATION:
(1) GAIN VS. TEMP. CORRECTIONS
(2) LIVE TIME (TIME TO HEIGHT CONVERTER)(THC)
(3) EXPLANATION OF THC
(4) CALIBRATION SOURCE
(5) O&H MANUAL

DATA NOW IN NSSDC

* LONG-TERM STORAGE WITH DOCUMENTATION



RAW DOPPLER DATA FROM TRACKING STATION

SS #1 - 50 TAPES
SS #2 - 4 OR 5 TAPES
CSM - 3 TAPES/MISSION

DOPPLER RESIDUAL

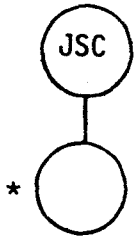
CSM - 2 TAPES/MISSION - ALSO MICROFILM
SS - 5 TAPES - ALSO MICROFILM

DATA RESULTS IN REPORT

NORMAL POINTS WITH COVARIANCE - 1 TAPE - SUBSAT ONLY

DOCUMENTATION

MATERIAL IN PREPARATION FOR NSSDC

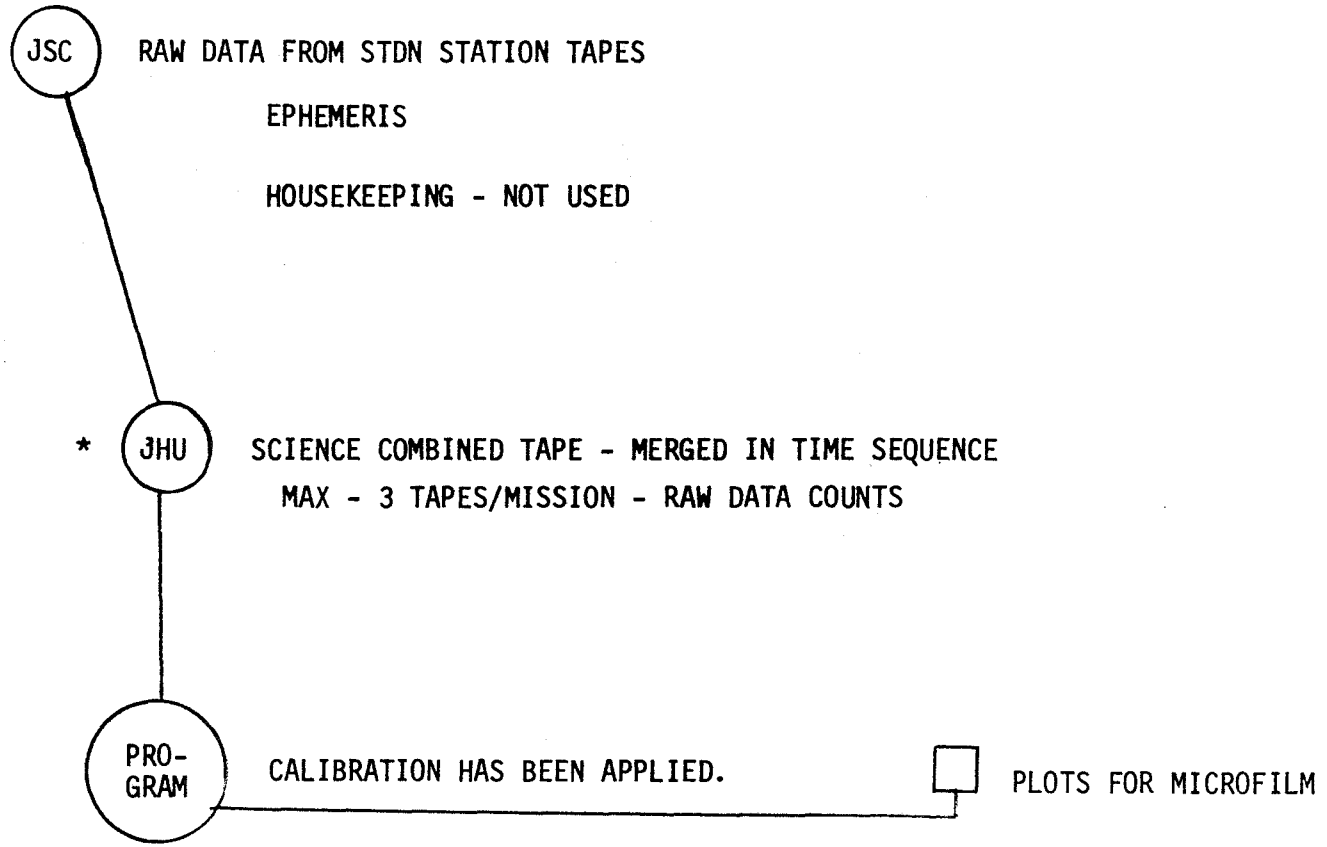


DATA SYNC, DATA BLOCKED, TIME GAPS FILLED WITH ZEROS, EPHEMERIS MERGED, HOUSEKEEPING DATA MERGED, AND SCIENCE DATA CORRECTED FOR BACKGROUND.

9 TAPES 8 MICROFILM

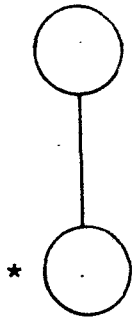
DOCUMENTATION:

(1) DATA PACK
(2) CALIBRATION
(3) DESCRIPTION OF PROGRAM USED IN IDENTIFYING PEAKS



DOCUMENTATION WILL INCLUDE:
(1) CAL. PROCEDURES AND RESULTS
(2) INFLIGHT CAL. MONITORING
(3) EQUIPMENT DESCRIPTION
(4) COMPUTER PROGRAM DESCRIPTION
(5) INSTRUMENT OPERATION & ATTITUDES
(6) PUBLISHED SCIENTIFIC RESULTS

* LONG-TERM STORAGE WITH DOCUMENTATION



RAW DATA IS IN ANALOG - RECORDED BY STANFORD

* DIGITIZED TAPE (9 TOTAL) INTEGRATED TAPE INCLUDES TRAJECTORY DATA.

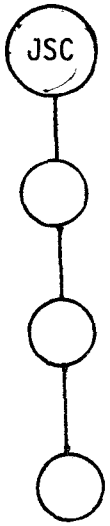
DOCUMENTATION:

(1) FLOW DIAGRAM OF DATA SHOWING COLLECTION (ANALOG) PROCESSING STEPS THROUGH TO PLOTS.

MATERIAL SCHEDULED TO NSSDC APRIL 1973

* LONG-TERM STORAGE WITH DOCUMENTATION

S-171 IR SCANNING RADIOMETER DR. FRANK LOW



MERGED TAPE. EPHEMERIS AND CALIBRATION. 30 TAPES (ALSO MICROFILM)

IMAGE RECONSTRUCTION TAPE - 10 TO 15 TAPES (ALSO MICROFILM)

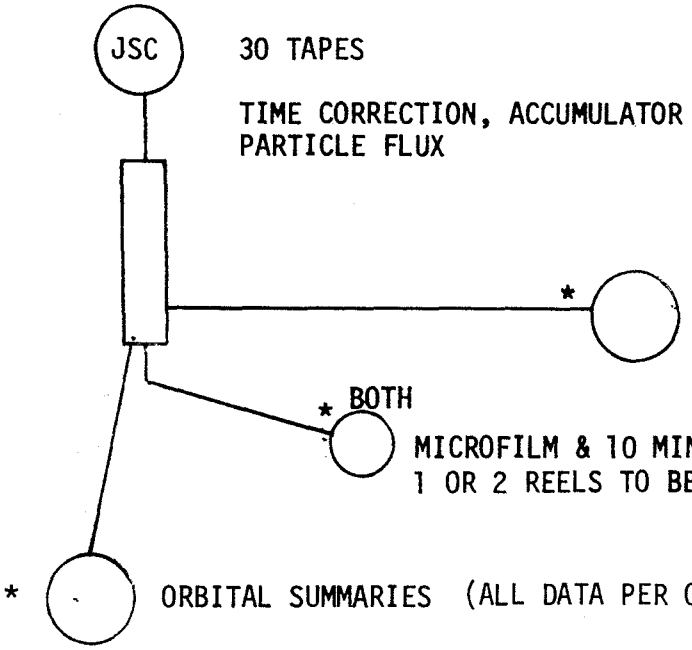
THERMAL PROPERTY MAP TAPE - 2 OR 3 TAPES (MAPS)

DOCUMENTATION:

(1) CALIBRATION

(2) EQUIPMENT DESCRIPTION

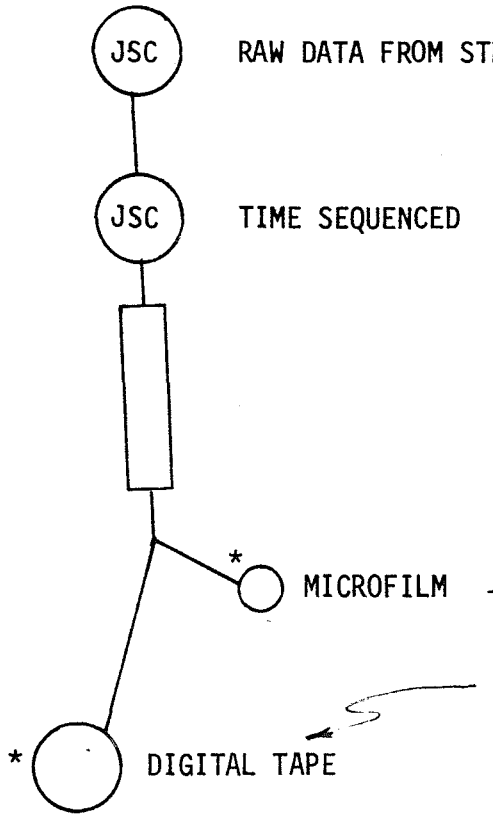
TENTATIVE SCHEDULE TO NSSDC JANUARY 1974



DOCUMENTATION:
(1) TIME CORRECTION PROCEDURE
(2) ACCUMULATION CORRECTION PROCEDURE
(3) CALIBRATION INFORMATION
(4) INSTRUMENT DESCRIPTION
(5) HISTORY OF EXPERIMENT

UCLA WILL INCLUDE FIELD OF VIEW DATA.

* LONG-TERM STORAGE WITH DOCUMENTATION



CAL COM PLOTS - 100 ORBITS/TAPE
25 TOTAL TAPES

DOCUMENTATION:
(1) ALTITUDE CURVES
(2) LAT.-LONG. POSITION
(3) SOLAR WIND-GEOMAGNETIC TAIL PLOTS
(4) EXPERIMENT & EQUIPMENT DESCRIPTION

SCHEDULED TO NSSDC DECEMBER 1973

TABULATED DATA

MANUFACTURER'S REPORT FOR CALIBRATION

FINAL SCIENCE REPORT

LISTING OF SURFACE PHOTOS AT EACH STATION

TABLES OF SOIL STRESS (FORCE VS. DEPTH)

CALIBRATION INFORMATION

PENETROMETER TRACES REPRODUCED TO SCALE

TABLES OF DATA REMOVED FROM DRUM

THE DRUM IS STORED BY PI AT BERKELEY.

LIST OF PHOTOS USED IN ANALYSIS.

MATERIAL IN NSSDC

SECOND GENERATION NEGATIVE OF FLIGHT FILM - JANUARY 1973

25 REELS OF 9-CHANNEL DIGITIZED-SCAN MAGNETIC TAPE - APRIL 1973

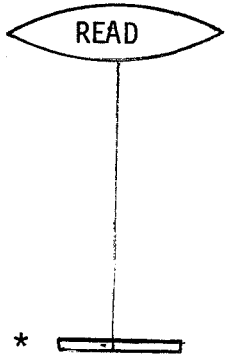
CATALOG OF ALL FAR UV OBJECTS DETECTED IN 10 FIELDS OF THE SKY - MAY 1973

20 CONTOUR CHARTS - MAY 1973

PUBLISHED ARTICLES - JUNE-DECEMBER 1973

JSC RAW DATA FROM STDN STATION TAPES

COMPLETE READING OF THE TAPES FOR DEFINITION OF IMPACT

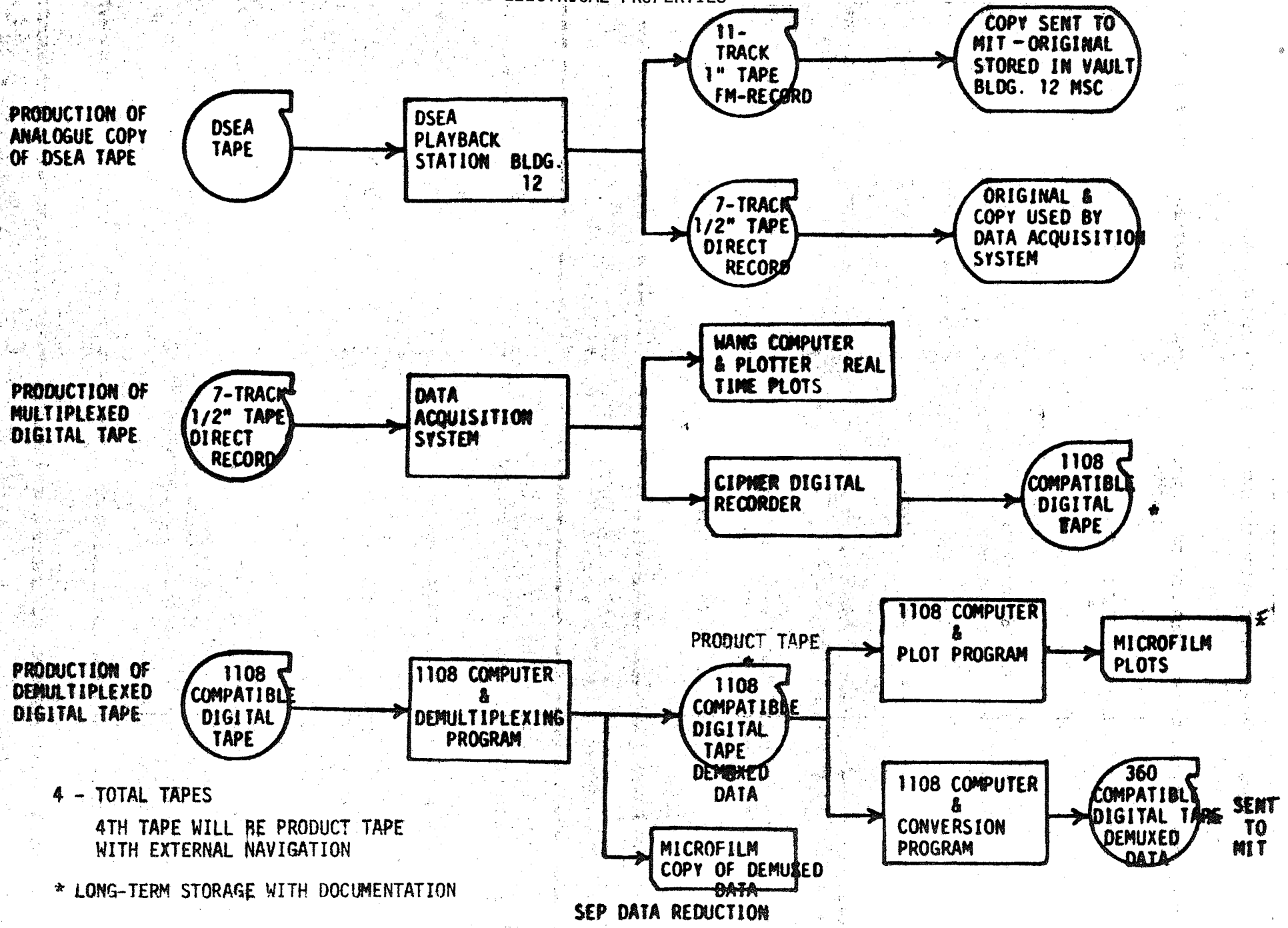


* M MICROFILM OF ALL CHANGES-TABULATION-FROM BASELINE

* EVENT TAPE, DISC, OR CARDS *

NO SCHEDULE OF DELIVERY TO NSSDC

* LONG-TERM STORAGE WITH DOCUMENTATION



4 - TOTAL TAPES

4TH TAPE WILL BE PRODUCT TAPE WITH EXTERNAL NAVIGATION

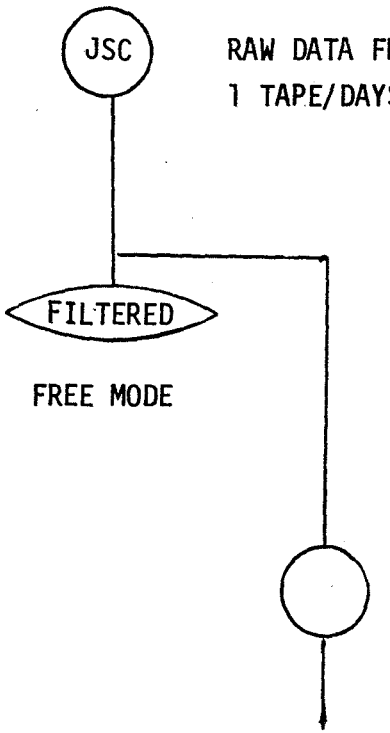
* LONG-TERM STORAGE WITH DOCUMENTATION

JSC

PEAK SUMMARY TAPE

PLOTS OF PEAK SUMMARIES FOR MICROFILMING

DOCUMENTATION



RAW DATA FROM STDN STATION TAPES
1 TAPE/DAYS DATA (1500 FT)

SEISMIC - STILL RAW DATA

POWER SPECTRUM

HAVING PROBLEMS PROCESSING DATA. ACTION DEFERRED.

NO DELIVERY SCHEDULE

S-209 LUNAR SOUNDER DR. R. PHILLIPS

(JSC) RAW DATA FROM STDN STATION TAPES

FILM FROM SOUNDER RECORDER (STORED AT JSC.)

* DUPLICATION OF SIGNAL FILM

RADAR IMAGES IN PHOTO FORM

HOLOGRAPHIC RADAR IMAGES

DIGITAL FILE OF RADAR IMAGERY

LUNAR PROFILE DATA

AMBIENT NOISE MEASUREMENT

TENTATIVE SCHEDULE TO NSSDC 12/73 TO 6/74.

* LONG-TERM STORAGE WITH DOCUMENTATION

SCIENCE REPORT

(STORAGE OF SPECIMEN REQUIRES REFRIGERATION.)

(SPECIMEN TO BE STORED AT JSC CURATORIAL FACILITIES.)

RAW DOPPLER - TIME SEQUENCED - 3 TO 5 TAPES/MISSION

RAW ATTITUDE - TIME SEQUENCED - 2 TO 3 TAPES/MISSION

RAW LASER ALTIMETER - TIME SEQUENCED - 1 TO 2 TAPES TOTAL

P&FS

RAW DOPPLER DATA - TIME SEQUENCED - 800 TAPES

ORBITAL PLOTS WITH DOCUMENTATION

TENTATIVE DELIVERY TO NSSDC:

STARTING JULY 1973, COMPLETED DECEMBER 1973.
THIS DOES NOT INCLUDE ALL OF APOLLO 15 P&FS IF STILL OPERATING.

GENERAL INFORMATION

MICROFILM OF VOICE TRANSCRIPTS/EACH MISSION

LISTING OF REF. AND/OR PUBLICATIONS

LAYOUT FOR EACH ALSEP

LISTING OF ACTUAL SUNRISE AND SUNSET AT EACH ALSEP SITE

MATRIX OF COORDINATE TRANSFORMATIONS

PHOTO PAN OF EACH ALSEP SITE

APPENDIX D

8/16/73

CHARTER OF THE

GEOPHYSICAL DATA EVALUATION WORKING GROUP

OFFICE OF PRIME RESPONSIBILITY: NASA JOHNSON SPACE CENTER
DIRECTOR OF SCIENCE AND APPLICATIONS

PURPOSE

The Apollo lunar program has provided, and will continue to provide, a wealth of lunar science data. To assist in the effective archiving and dissemination of these data, the Geophysical Data Evaluation Working Group is established.

The Geophysical Data Evaluation Working Group is to provide scientific advice to the Director of Science and Applications, Johnson Space Center, for:

a. Data storage and retrieval plans to facilitate dissemination of information and data to the science community for continued studies.

b. Technical assessment of operating lunar experiments with respect to relevance in understanding the Moon or critical lunar problems.

c. Assistance in related matters to S&AD on request.

ORGANIZATION

The Geophysical Data Evaluation Working Group shall consist of a Chairman, the Director of Science and Applications; a Vice-Chairman who shall be a non-NASA scientist, well versed in science data management; and voting and ex-officio members.

Voting members of the Geophysical Data Evaluation Working Group shall represent the lunar science disciplines. Appointment of voting members shall require the concurrence of the Director of Science and Applications. Duration of membership in the Geophysical Data Evaluation Working Group shall be a function of the specific tasks to which the group addresses itself and shall be determined by the Chairman.

Ex-officio members shall be appointed by the Chairman as required.

Institutions and individuals with interest in lunar science shall be encouraged to attend meetings and to participate in Geophysical Data Evaluation Working Group activities.

RESPONSIBILITIES

The Geophysical Data Evaluation Working Group shall be responsible for providing written recommendations to S&AD and reviewing the effectiveness of the resulting activities. Recommendations shall be made on the following:

a. Format and content of data to be archived from lunar experiments.

b. Schedules and priorities for data processing and storage to support NASA data analysis programs.

c. Procedures for storage and retrieval of all published and unpublished lunar science results.

d. Format and content of a "Data User's Handbook" for interested scientists and potential data users.

e. Plans to maintain safe and controlled storage of original science data.

f. Cataloging of collected science data and location of data.

The Geophysical Data Evaluation Working Group shall assist S&AD in monitoring and assessing the operational status and effectiveness of each ALSEP and subsatellite and its constituent experiment in determining operational procedures which will maximize the science return.

The Geophysical Data Evaluation Working Group shall assist S&AD in preparing recommendations for NASA Headquarters on evaluating the impact of scientific proposals for the utilization of lunar data, alternatives, and relative priorities.

The Science and Applications Directorate shall utilize the technical skills of the Geophysical Data Evaluation Working Group in determining the impact and advisability of S&AD recommendations to NASA Headquarters.

REPORTS

The results of the Geophysical Data Evaluation Working Group meetings shall be reported as minutes signed by the Chairman. These minutes shall be distributed to:

a. All Geophysical Data Evaluation Working Group members

b. Director, JSC (AA)

c. Flight Operations Directorate, Assistant Director for Computation and Flight Support (FA12)

d. Lunar Programs Office (SM), Office of Space Science, NASA Headquarters

e. National Space Science Data Center

APPROVED: Anthony J. Calio

Anthony J. Calio
Director of Science and Applications

GUIDELINES FOR SUBMITTING DATA TO THE NATIONAL SPACE SCIENCE DATA CENTER

January 1970

1. General Philosophy

The mission of the National Space Science Data Center (NSSDC) is to provide the means for further analysis and dissemination of space science data beyond that provided by the analyses, presentations, and publications of the principal investigators (primary experimenters) and their co-workers. Consequently, NSSDC is responsible for the acquisition, organization, storage, retrieval, announcement, and dissemination of the scientific data obtained from satellites, sounding rockets, probes, high-altitude aircraft, and stratospheric balloons.

In general there are two forms of data which NSSDC attempts to collect. Reduced data records, which are usually prepared by a compaction, editing, and merging operation performed by the principal investigator, form the primary data base. Data in this form contain all the basic usable information obtained from the experiment and include the instrument responses measured as functions of time along with appropriate position, attitude, and equipment performance information necessary to analyze the data in an independent fashion. It is felt that temperature, voltage, dead time, gain change, and other similar corrections to the instrument responses should be done by the principal investigator. It is also desirable to eliminate unusable noisy data and periods of questionable instrument performance. Since time averaging on the ground generally reduces the basic temporal resolution of the experiment, it is not normally desired to acquire averaged data in place of the original measurements. Hopefully, by preserving the maximum amount of useful information, other investigators can make the proper interpretation of the instrument responses for their specific purposes.

These reduced data records provide the base from which other studies in depth concerning related experiments on the same satellite, on other satellites or probes, and on ground-based correlative data can be performed by various scientists to increase our understanding of the basic phenomena.

A second form of data that are desired are those final analyzed data which the principal investigator designates as the best to display the scientific results of his experiment. This form may include charts, graphs, photographs, and tables which are the results of data processing and analysis techniques employed by the investigator. Examples of these appear in his published works but the total number are usually too large to be published in their entirety. In many cases data in this form are the most useful and appropriate as inputs to other studies.

III. Schedule for Acquisition of Data

Normally the acquisition of these data will be made after the completion of the prime analysis period, i.e., that period where the investigator can have exclusive use and control over the availability of the data. For satellite experiments this prime analysis phase is longer than for experiments performed on other vehicles. The nominal time interval for NASA-funded investigators is 2 years after launch for the first 6 months of data with each succeeding 6 month block following at half-year intervals. Delays in this schedule can result from difficulties encountered in the spacecraft operation, orbit determination, or data processing lines. The data obtained from experiments sponsored by other agencies or groups will be acquired on a schedule consistent with agreements between the experimenters and their funding agents and by direct agreements with NSSDC. If the investigator desires to deposit his data at an earlier time, NSSDC will be pleased to comply.

IV. Preliminary Planning

Because of the wide variety of experiments conducted in space science, the specific formats of the collected data will vary. For those data sets where data processing has been completed, a selection will be made from what is available by consultation between the principal investigator and a member of the NSSDC Data Acquisition staff. For future experiments it is hoped that contact between the Data Center and the investigators can be established during the formulation of the prime data analysis plan. In this way NSSDC can identify at which phase of the data processing operation the information should be retained for eventual transfer. If it is convenient, data can be deposited but withheld from general availability until the principal investigator releases it. In the case of a NASA-funded principal investigator whose contract calls for depositing the data in the Data Center, his prime analysis plan including the submission portion should be coordinated with NSSDC.

V. Physical Configuration of Data

NSSDC can accept machine-sensible digital data as they exist in the tape files of the principal investigator. However, because of computer hardware and system software limitations, it can be extremely difficult to machine process certain tapes because of physical record size, number of bits per computer word, packing of separate pieces of information into a single word, and other tape packing techniques. In order to eliminate unnecessary processing or development of specialized software to handle each unique situation at NSSDC, it may be possible to generate tapes at the principal investigator's facility in formats which are more compatible for digital data exchange. Since NSSDC will supply the tapes for the transfer of digital data, the use of the minimum number of tapes need not be a dominant constraint. It is more important to have the overall transfer operation be economically efficient. These details will be worked out for each individual case between the NSSDC Acquisition and Automatic Data Processing staffs and the appropriate people at the principal investigator's facility several months before the transfer of data.

In order to conserve storage space, most data presented in graphs, charts, tables, and other hard copy will normally be microfilmed. Because of the microfilming process, color coding of lines or symbols should be avoided. To insure good reproduction, the original should be used. If the experimenter wishes to retain the original, it will be returned after microfilming. In the event the original cannot be made available, Data Center personnel should be contacted to help select the best reproducible copy for NSSDC operations. In the case of microfilm or photographic copy, the closest generation to the original should be provided as the working copy. If the original is supplied for archival at NSSDC, the working copy can be produced from the original. Since individual sections of a data set may be requested, adequate labeling of all items will permit proper acknowledgement.

V. Documentation

The conversion of the detector or instrument measurement to a physically meaningful quantity normally involves a calculation in which the calibrated instrument response and some of the details of the phenomena being measured are utilized. In some cases assumptions about the phenomena must be made in order to perform these calculations. It is vitally important that the calibration curves, data, or calculations that give the quantitative description of the instrument characteristics be provided. These are necessary for future users to properly interpret the measurements in view of the understanding of the phenomena at that time. In many cases this and other important information appear in published articles, preprints, or internal reports. However, where information is lacking, it is expected that the principal investigator will furnish adequate documentation covering:

1. Description of the instrument or measuring device

2. Discussion of any important or unusual developments which occurred during the course of the experiment which may affect the interpretation of the data

3. Details of instrument calibrations and the results

4. References to the published results of the experiment and other pertinent bibliographic material

A Data User's Note will be produced by NSSDC personnel from all the information supplied which will describe the reduced data available at the Data Center for the particular investigation. This document will be sent to the principal investigator for review before it is issued. The total documentation and bibliographic material will form the supporting information supplied to future users by NSSDC.

VI. Concluding Remarks

These Guidelines should be used to form the basis for determining how data should be prepared for submission to NSSDC. In those cases where the investigator is bound by contract to deposit his data, his data analysis budget should reflect an awareness of the Guidelines.

The effectiveness of NSSDC in performing its service to the space science community will depend upon the communication and working relationships established with each principal investigator and his co-workers. The entire staff at the Data Center will be happy to clarify any questions that arise and to assist each experimenter in submitting his data. Furthermore, it is hoped the various experimenters will avail themselves of the services which NSSDC offers to all members of the space science community.

Distribution:

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