NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO 14

FINAL

LUNAR SURFACE PROCEDURES

PREPARED BY

LUNAR SURFACE OPERATIONS OFFICE
MISSION OPERATIONS BRANCH
FLIGHT CREW SUPPORT DIVISION

MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

DECEMBER 31, 1970

FINAL EDITION
APOLLO 14

LUNAR SURFACE PROCEDURES

DECEMBER 31, 1970

APPROVED BY: R. G. Zedekar
R. G. Zedekar
Chief, Lunar Surface Operations Office

H A Kuehnel
H. A. Kuehnel
Chief, Mission Operations Branch

C H Woodling
C. H. Woodling
Assistant Chief For Crew Training

W J North
W. J. North
Chief, Flight Crew Support Division

Donald K. Slayton
Director of Flight Crew Operations

APOLLO 14

LUNAR SURFACE PROCEDURES

(FINAL EDITION)

PREFACE

This document has been prepared by the Flight Crew Support Division, Flight Crew Operations Directorate, Manned Spacecraft Center, Houston, Texas and by General Electric, Apollo Systems, Houston Programs. The information contained within this document represents the Lunar Surface Procedures for Apollo 14, Mission H-3, the fourth manned lunar landing mission.

R. H. Nute
R. H. Nute
Lunar Surface Operation's Office

R V Blevins
R. V. Blevins
General Electric Co.

R. J. Koppa
R. J. Koppa
General Electric Co.

CONTENTS

TABLES

FIGURES

SECTION 1.0

INTRODUCTION

1.0 INTRODUCTION

The Apollo 14 Lunar Surface Procedures is used to document the planning for lunar surface EVA operations on Mission H-3, to describe the crew equipment interfaces, and to document the manner in which lunar surface mission requirements are planned to be implemented.

The nominal plan is for a set of two two-man EVA periods during the planned 33.5 hour stay time of the LM vehicle on the lunar surface. Each EVA is planned for four and one-fourth hours activity beginning with depressurization of the LM and ending with repressurization. Several alternative orders of operations will be included in this document, to cover off-nominal cases, such as higher-than-anticipated workloads and thus shorter PLSS time to consumables redline, difficulties in placement or deployment of experiments resulting in time lost, and malfunction of an EMU before EVA which occasions a single-man EVA contingency.

EMU operations and procedures (including contingency) are not covered in this document.

Detailed photographic and TV camera operations are covered in Reference (6), but are integrated herein in a summary manner.

This document includes both timeline and detailed timeline procedures data. Timelines are essentially task flow analyses along a time base, showing the points of interaction between the two crewmen. The detailed procedures simply list, in sequence of performance, the steps required to carry out each of the tasks identified in the timeline. It is in the detailed procedures that the crew/equipment interfaces are revealed. Both timelines and detailed procedures present the CDR's and the LMP's tasks side-by-side so that no confusion will exist as to which crewman is doing what, or how the two cooperate in the operations on the lunar surface.

The procedures herein are responsive to the Mission Requirements for SA509/CSM-110/LM-8 H-3 Type Mission (Reference 2) currently in effect as of the date of this document.

SECTION 2.0

MISSION PLAN

2.0 MISSION DESCRIPTION

The following information is from the "Mission Requirements, SA-509/CSM-110/LM-8, H-3 Type Mission, Lunar Landing," dated June 9, 1970, and its approved revisions.

2.1 Mission Objectives

The primary mission objectives have been assigned to this mission by the Office of Manned Space Flight (OMSF) in the Apollo Flight Mission Assignments Directive. The objectives are:

1) Perform selenological inspection, survey and sampling of materials in a preselected region of the Fra Mauro formation.
2) Deploy and activate ALSEP (Apollo Lunar Surface Experiment Packages)
3) Develop man's capability to work in the lunar environment.
4) Obtain photographs of candidate exploration sites.

The following lunar surface experiments have been assigned to this mission by OMSF:

1) S-059 Lunar Field Geology
2) S-031 Passive Seismic Experiment
3) S-033 Active Seismic Experiment
4) S-036 Suprathermal Ion Detector Experiment
5) S-038 Charged Particle Lunar Environment Experiment
6) S-058 Cold Cathode Ion Gauge Experiment
7) M-515 Lunar Dust Detector Experiment
8) S-078 Laser Ranging Retro-Reflector
9) S-080 Solar Wind Composition
10) S-198 Portable Magnetometer
11) S-200 Soil Mechanics

Experiments 2 through 7 are part of the ALSEP IV package. Detailed objectives have been derived from the OMSF-assigned primary objectives, placed in order of priority, and detailed to the extend necessary for mission planning. All of the detailed objectives are in support of the primary mission objectives with the exception of secondary objectives Modular Equipment Transporter Evaluation.

A secondary objective is a scientific, engineering or operational objective which would provide significant data or experience, but which is not necessary to the accomplishment of a primary objective.

Experiments are detailed and assigned priority only in the event that they require crew action or otherwise impact the mission timeline.

2.2 Lunar Surface Priorities

The detailed lunar surface objectives and experiments are listed below in their order of priority. These priorities should be used for realtime mission planning.

Mission Priority	Lunar Surface Priority	Detailed Objectives and Experiments
1	1	Contingency Sample Collection
2	2	Apollo Lunar Surface Experiment Packages (ALSEP)
3	3	Selected Sample Collection
4	4	Lunar Field Geology
7	5	Laser Ranging Retro-Reflector
8	6	Soil Mechanics
9	7	Portable Magnetometer
11	8	Modular Equipment Transporter Evaluation
17	9	Solar Wind Composition
18	10	Thermal Coating Degradation
19	11	EVA Communication System Performance

2.3 EVA Requirements

The stay time on the lunar surface is open ended and the planned maximum will not exceed 50 hours. After checkout of the LM to assess its launch capability the LM will be depressurized to allow egress to the surface. The nominal plan will provide for two periods of approximately 4-1/4 hours each for simultaneous EVA by both astronauts. The radius of operations is constrained to be within the limits imposed by the capability of the Buddy SLSS/oxygen purge system. The planned lunar surface activities will include the following major items:

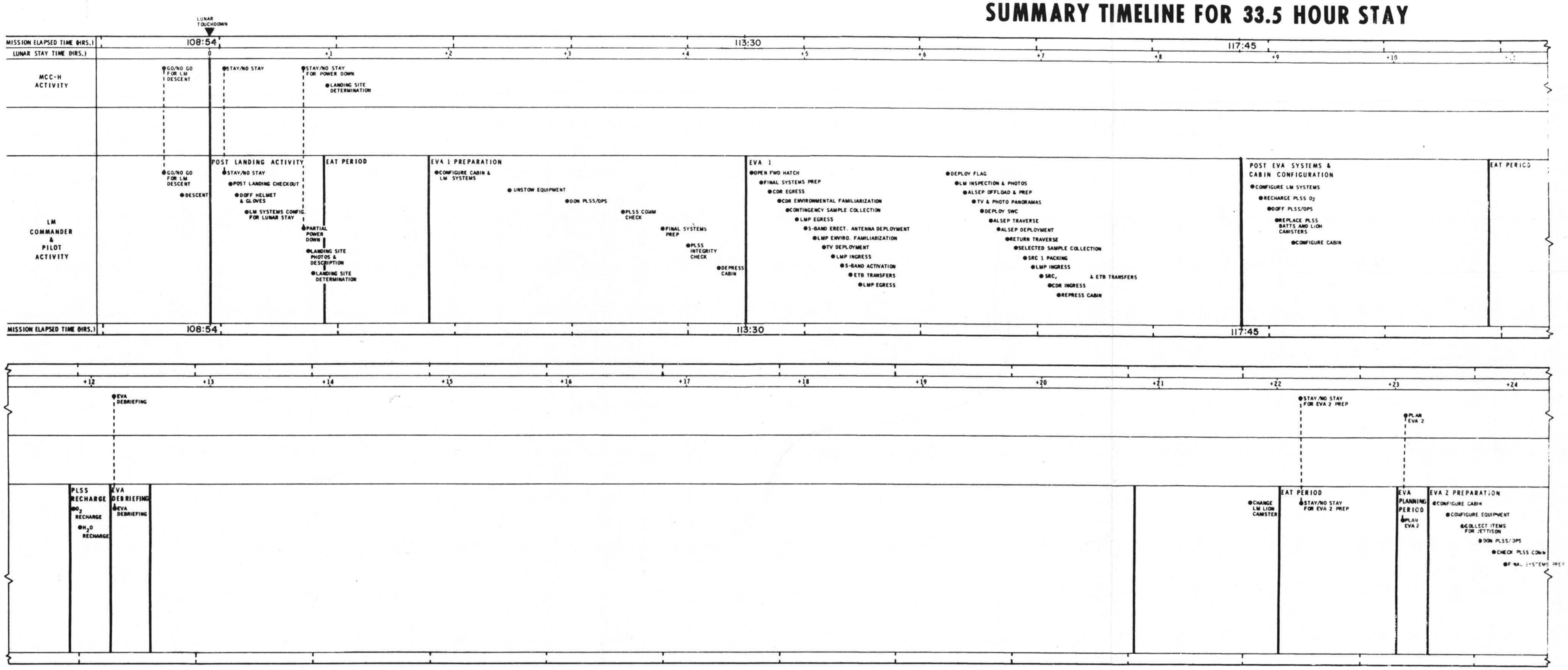
1) Contingency sample collection
2) Placing erectable S-band antenna in operation in the first EVA period (as early as feasible in the case in which 210-foot antenna is not available)
3) LM inspection
4) ALSEP deployment
5) Laser Ranging Retro-Reflector experiment (S-078)
6) Selected sample collection
7) Lunar field geology (S-059)
8) Lunar soil mechanics
9) Portable Magnetometer experiment (S-198)
10) Modular equipment transport evaluation
11) Solar Wind Composition experiment (S-080)

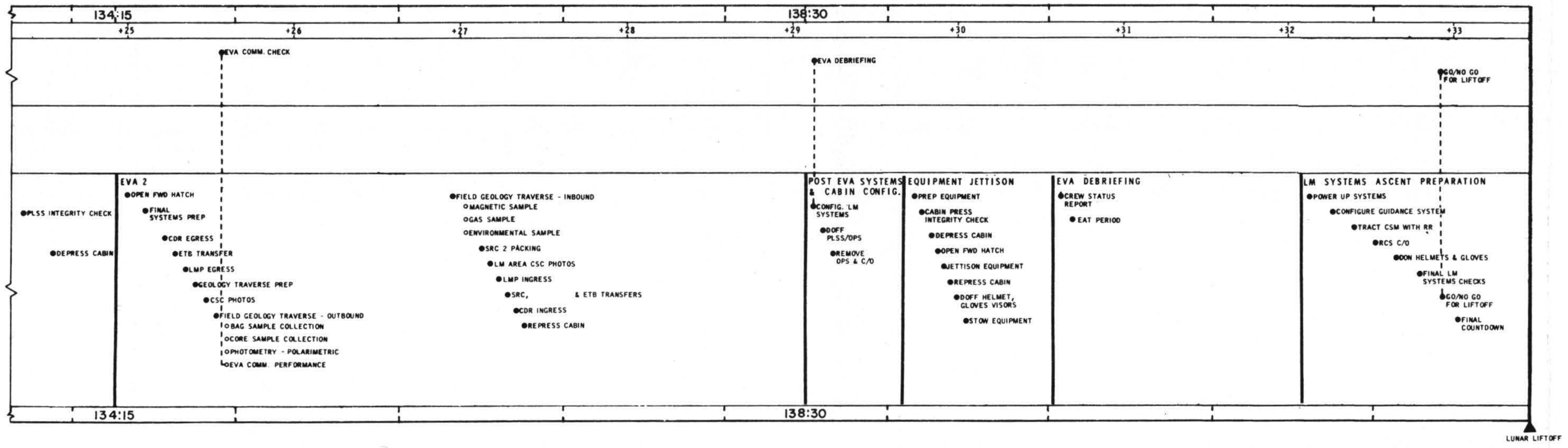
Television Transmission will be provided as early as practicable during the EVA period, and photography will be employed throughout the EVA to document the activities and observations.

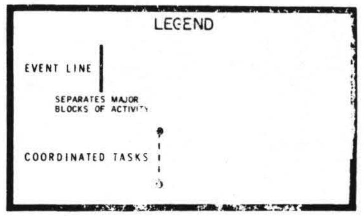
2.4 Site Description

The Fra Mauro landing site lies in an elongated valley bordered by ridges trending north to south. These ridges are the Fra Mauro formation and are thought to be ejecta from the Imbrium Basin, some 500 kilometers to the north. Although the area around the landing site is likely mantled by post-Imbrium event volcanic action, several large craters are thought to have penetrated this mantle and to have excavated Fra Mauro material, for example, Cone and Sun rise craters. (See fig 3.6-2.) The scientific objectives of this site are to sample both material from Fra Mauro and material from the overlying mantle. The expectation is that the Fra Mauro material will be older than the samples returned by Apollo 11 and 12. A petrofabric analysis should confirm or deny the theory that Fra Mauro is Inbrium ejecta. Analysis of the mantle material may yield a clearer picture of the moon's period of active volcanism. These ages may be comparable to the ages of the Apollo 11 and 12 mare ages.

APOLLO 14 LUNAR SURFACE ACTIVITY SUMMARY TIMELINE FOR 33.5 HOUR STAY







REV. A DEC. '70

NAME	INITIAL	ORIGIN	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS
R KOPPA		GE	APOLLO 14 LUNAR SURFACE ACTIVITY SUMMARY TIMELINE FOR 33.5 HOUR STAY FIGURE 2.5-1
DR. C HENDRICKS		GE	PREPARED BY GENERAL ELECTRIC BASIC AUG '70

2.5 Lunar Surface Activity for 33.5 Hour Stay

The nominal plan is for the Commander and the Lunar Module Pilot to remain on the lunar surface for approximately 33.5 hours. A summary timeline for the lunar surface stay is presented in Fig. 2.5-1. Immediately after landing on the lunar surface, the crew will perform post landing LM systems integrity checks to establish lunar stay capability. Upon establishing stay capability, the crew will verbally describe the landing site and, with MSFN assistance, determine their exact landing site location. This period of time will also be used to make any real-time changes to EVA 1, should any landing site errors, local surface anomalies, or other off nominal conditions impact planned EVA 1 procedures. A short eat period precedes EVA preparations which includes LM systems and cabin equipment configuration for EVA conditions. PLSS/OPS donning and checkout consume the last hour prior to EVA 1, which commences with depressurization of the LM cabin approximately 4 hours after lunar touchdown. A detailed discussion of EVA 1 is contained in section 3.1.1.

Upon completion of EVA 1, the crew will configure the LM systems for pressurized operation, doff their helmets, gloves and PLSS/OPS' and settle down to make the LM home for approximately the next 14 hours. An hour eat period is followed by recharging the PLSS consumables (batteries, LiOH canister, O_2 and H_2O), preparing them for use during EVA 2. The crew debriefing of their EVA 1 experiences follows. During this time, the crew will further discuss EVA 1 findings with Houston, as well as surface conditions that affect EVA 2 planning. Houston will utilize this data to finalize EVA 2 planning and discuss any changes with the crew after their 9.5 hour rest/sleep period. The crew will eat following the rest period and then finalize their EVA 2 plans with Houston. The EVA preparation activity prior to EVA 2 is very similar to EVA 1, including collecting items for jettison. EVA 2 commences with cabin depressurization at approximately 24 hours after lunar touchdown. A detailed discussion of EVA 2 is contained in section 3.1.2.

Upon completion of EVA 2, the crew will connect up to the LM ECS, doff their PLSS/OPS' and prepare to jettison their now excess gear. Table 2.5-1 lists the gear left on the lunar surface. After their equipment jettison and cabin repressurization, the crew will stow and secure all loose equipment preparatory to lunar liftoff. An hour EVA 2 debriefing and eat period will precede the prelaunch LM systems checkout. This systems checkout will conclude with guidance system configuration for liftoff. The crewmen will don their helmets and gloves at T-30 minutes in the countdown and perform final LM system checks. Lunar liftoff will occur no more than 35 hours after touchdown, concluding the lunar surface activity for the fourth manned lunar landing mission, and third lunar landing.

TABLE 2.5-1: LOOSE EQUIPMENT LEFT ON LUNAR SURFACE

1. Jettisoned During EVA 1: (In a Jettison Bag)
   B/SLSS Bag
   Surface Sequence Camera Bag
   2-OPS Pallets
   3-Armrests

2. Discarded On Lunar Surface During EVA 1
   Misc. Pip Pins and Fastenings
   Thermal Covers and Top Cap S-Band Antenna
   Thermal Blanket On MET
   TV Camera Bracket
   ALSEP RTG Dome Removal Tool and Fuel Transfer Tool
   PSE Girdle
   ALSEP Subpallet
   LR^3 Dust Cover
   Penetrometer (Geophone Cable Anchor)
   35 Bag Dispenser Hold Down
   Thumper (ASE Subsystem)
   SRC Packing & Skirt

3. Operational Equipment Deployed and Left On EVA 1
   Flag
   TV Camera (color and B&W)
   S-Band Erectable Antenna
   ALSEP: PSE, SIDE/CCIG,CPLEE,ASE
   LR^3

4. Jettisoned During EVA 2
   In Disposal Container:
   2-PLSS Batteries
   2-PLSS LiOH Cartridges
   2-Hammocks
   2-Feedwater Collection Bags
   1-Scale

   In Jettison Bag
   1-LM ECS LiOH Cartridge and Bracket
   Food Waste Bags
   Urine Bags

TABLE 2.5-1: LOOSE EQUIPMENT LEFT ON LUNAR SURFACE (CONT)

5. Discarded On Lunar Surface, EVA 2
   Hand Tool Carrier
   Modular Equipment Transporter
   Lunar Portable Magnetometer (LPM)
   LPM Pallet
   SWC Pole
   6-Core Tube Bits

   16mm Data Camera, with Battery, Handle
   Close-up Stereo Camera
   70mm Data Camera, with Bracket, Handle, Trigger
   Lunar Hand Tools
   Lunar Equipment Conveyor (LEC)

6. Jettisoned After EVA 2
   In Disposal Container:
   2 pr. Lunar Boots
   2 RCU's
   Scale
   Armrest
   2 yo-yo's
   PLSS Condensate Container
   2 PLSS's

7. After Launch
   1 LM Descent Stage

SECTION 3.0

NOMINAL LUNAR EVA

3.0 NOMINAL LUNAR SURFACE EVA

3.1 EVA General Description

The nominal plan is for the two LM crewmen to spend nine hours or more out on the lunar surface in their EMU, or 18 man hours of EVA time. This is divided into two periods of four and one-fourth hours each, separated by a housekeeping, sleep, and nourishment period of about fourteen hours. The nominal landing configuration for the LM is with the ladder on the +Z landing gear down sun, or facing generally west.

Figure 3.1-1 is the nominal EVA 1 summary timeline. It assumes that the Goldstone or Parks (Australia) 210-ft dish antennas are not available for air-ground communications throughout all of EVA 1. This situation requires that the erectable S-Band antenna be deployed and activated as early as feasible in EVA 1 so as to provide optimum television, voice, and data transmission.

Figure 3.2-6 is the nominal EVA 2 summary timeline. EVA 1 is briefly described in paragraph 3.1.1, EVA 2 in paragraph 3.1.2.

3.1.1 EVA 1

The first lunar excursion on Apollo 14 begins with the crew's depressurizing the LM ascent stage cabin. The commander (CDR) egresses first. He faces the rear of the cabin, drops to his knees, backs out the forward hatch (opened and held out of the way by the LM Pilot (LMP)), and assumes a nearly prone position outside the cabin on the LM platform. The CDR then receives from the LMP a bag of expendable items and tosses it toward the -Y strut. The CDR is handed the lunar equipment conveyor (LEC) by the LMP. The CDR drops the end of this long web belt on the lunar surface. He next removes a cover bag from the MESA release loop and trips MESA release, which permits this stowage unit to ratchet to an angle of 120° to the vertical side of LM descent stage quad IV. The CDR then descends the ladder to the lunar surface and spends a few minutes becoming accustomed to the lunar environment and its dynamics, noting the characteristics of the soil, appearance of the LM, and commenting on his initial impressions of the landing site, especially that part not visible from the vantage point of the ascent stage interior. The TV camera in the MESA covers some of this sequence.

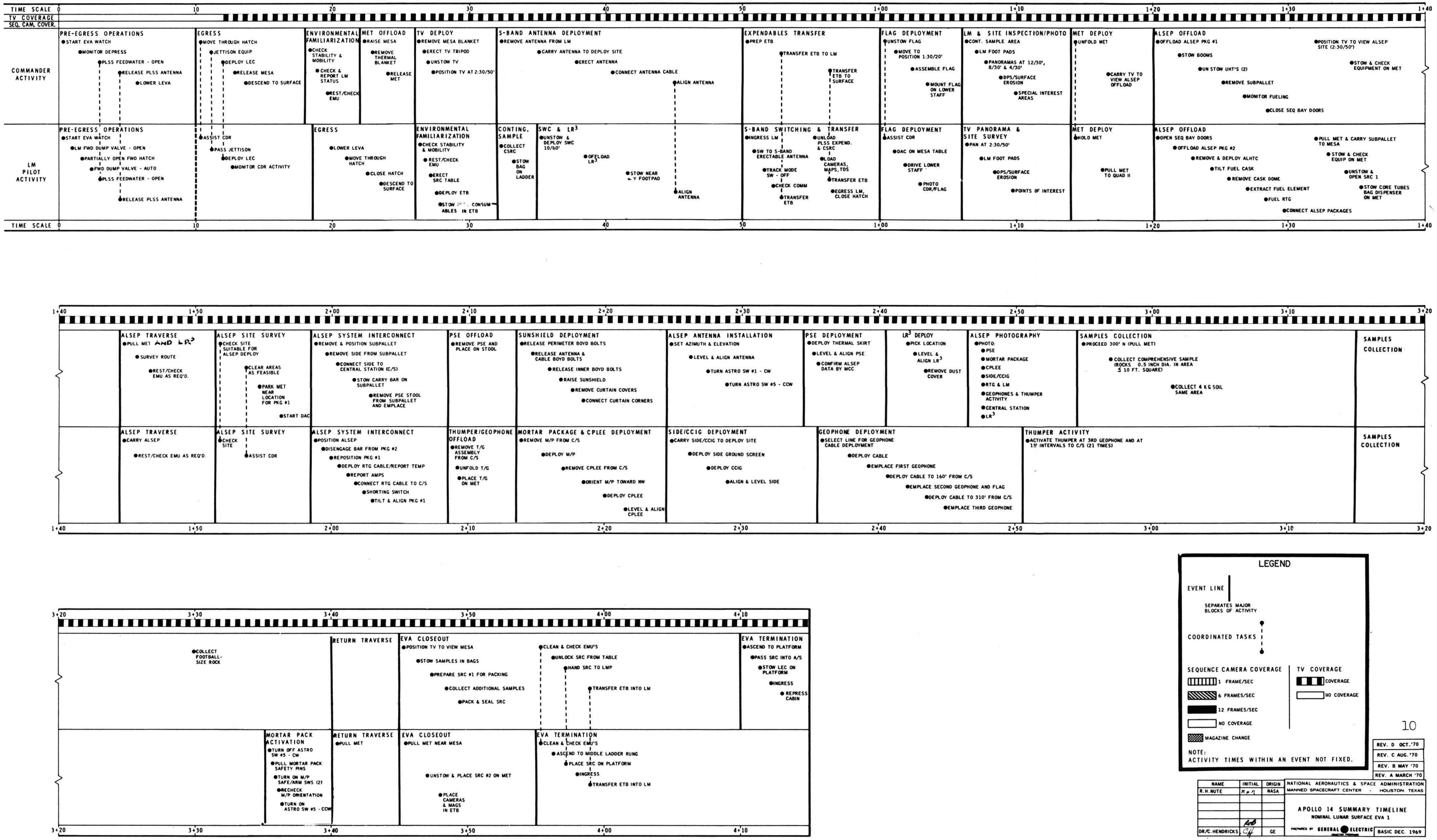
Next, the LMP egresses the ascent stage. He carefully closes the cabin hatch on the LEC and descends to the surface, with aid from the CDR. The LMP then goes through a similar acclimatization procedure to that performed by the CDR.

The CDR proceeds to the MESA and raises it sufficiently to offload the Modular Equipment Transporter (MET), the rickshaw-like cart which will be used for the first time on Apollo 14. The CDR removes some thermal protective material, and pulls two lanyards to release the MET from underneath the MESA. (See fig. 3.1-2.) He stows the MET, which is still folded into a compact package, on one of the sunlit footpads of the LM.

The CDR next lowers the MESA to its working height, and removes the MESA thermal blanket. The LMP unfolds and locks into place the MESA SRC (Sample Return Container) table. (See fig. 3.1-3.) He hangs the

APOLLO 14 SUMMARY TIMELINE

LUNAR SURFACE NOMINAL EVA 1



REV. D OCT.'70
REV. C AUG.'70
REV. B MAY '70
REV. A MARCH '70

NAME	INITIAL	ORIGIN
R.H.NUTE	RHN	NASA
	RWB	
DR/C.HENDRICKS	CH	GE

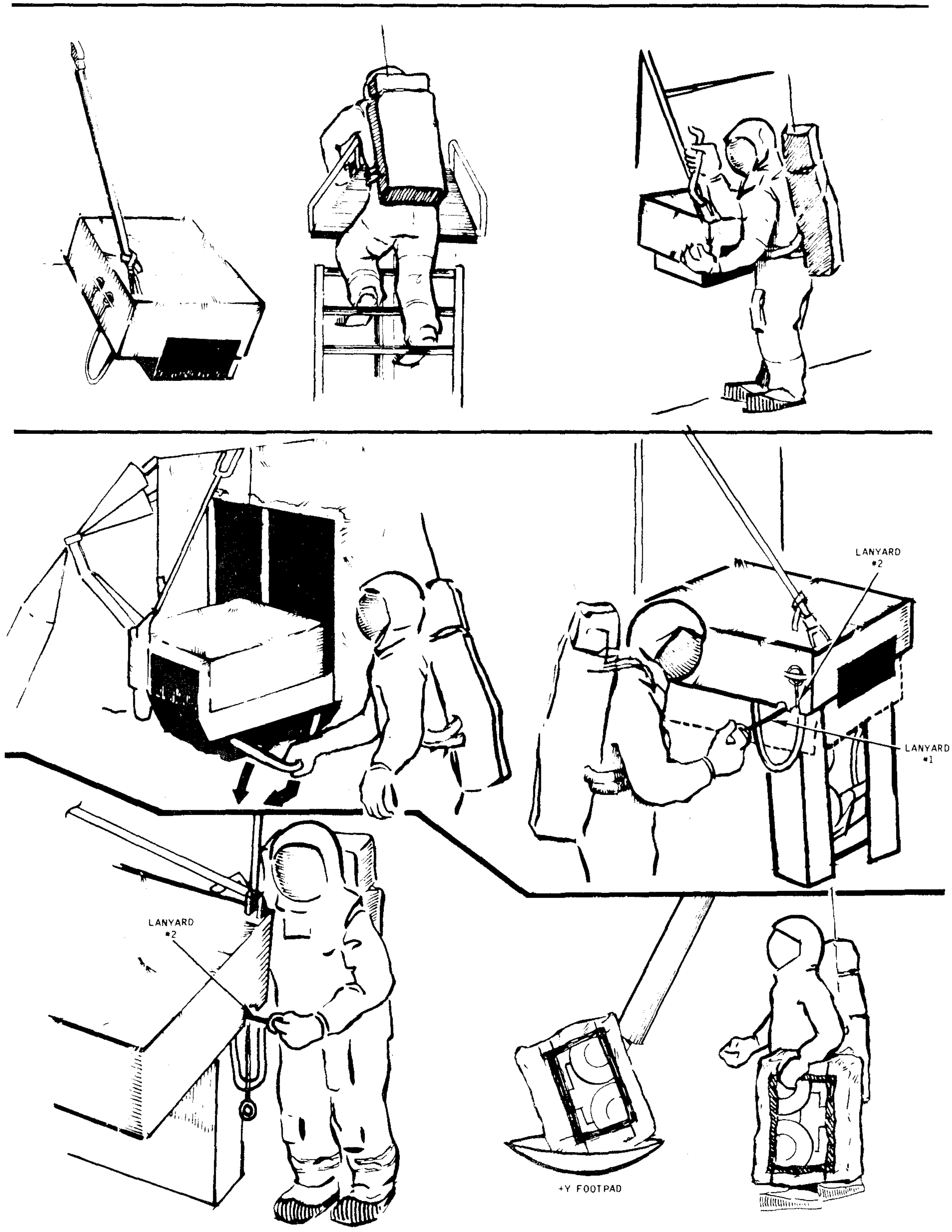
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER · HOUSTON, TEXAS

APOLLO 14 SUMMARY TIMELINE
NOMINAL LUNAR SURFACE EVA 1

PREPARED BY GENERAL ELECTRIC HOUSTON PROGRAMS
BASIC DEC. 1969

FIGURE 3.1-1

FIGURE 3.1-2 - MET PROCEDURES ILLUSTRATIONS



Equipment Transfer Bag (ETB) from the SRC table (the ETB is stowed under the SRC table at launch). This bag has two extra weigh bags and a 100-ft safety tether stowed in it. These items are interim stowed on the MESA for later use. Their place is taken by two Lithium Hydroxide (LiOH) canisters, which are PLSS expendables for use of EVA 2.

The CDR has been unstowing and erecting the TV tripod from its stowage place on the MESA during this period. He then removes the color TV camera from its box-like bracket on the top surface of the MESA, over the stowed sample return containers. (See fig. 3.1-3.) The LMP assists him by deploying the 100 ft TV cable from the MESA while the CDR walks out to a point 60 ft from the LM off the +Y strut (See fig. 3.1-4), with the TV camera, reset for off-MESA use, mounted on the tripod.

The LMP next task is to collect the contingency sample. The collector is a simple bag on a long collapsible handle which he stowed in his utility pocket before egress. By scooping the surface material with the collector a sample is collected, and the bag detached and stowed on the ladder and later in the ETB. This sample is insurance that, should a contingency arise forcing crew ingress and launch, at least some sample return will result from the landing.

Meanwhile the CDR has unstowed and begun the deployment of the S-Band erectable antenna.* The antenna is positioned as shown in figure 3.1-4. The CDR calls upon the LMP to steady the antenna when he reaches the first alignment procedure. The antenna is connected to the LM electronics via a 30-ft cable stowed in the MESA.

During this period the LMP deploys the Solar Wind Composition experiment, which consists of a foil shade mounted on a telescoping aluminum pole. The pole is stuck in the ground some 60 ft or more from the LM and in full sun light (off the -Y strut). He also removes the Laser Ranging Retro-reflector (LR3) from its stowage place on the LM and places it near the +Z footpad in readiness for the ALSEP traverse.

As soon as the S-Band antenna is erected and aligned, the LMP reenters the ascent stage,* moves the antenna switch on the communication panel to "lunar stay" and monitors the Signal Strength display. If necessary, the CDR may be requested to experiment a little with the antenna alignment to improve aiming. The LMP also disables the steerable antenna on the LM ascent stage by selecting "off" on the track mode switch.

The CDR closes the ETB flap, moves to the ladder area and retrieves the LEC. The LEC has two spaced hooks on it which he attaches to the ETB. Carrying the ETB, the CDR moves to a position about 20 ft from the LM proper and pays out LEC webbing as the LMP inside the ascent stage tugs the ETB up into the cabin. The LEC belt passes over a small pulley hooked to an overhead handhold in the ascent stage interior.

*This procedure may not be required if 210-ft dish available, on both EVA.

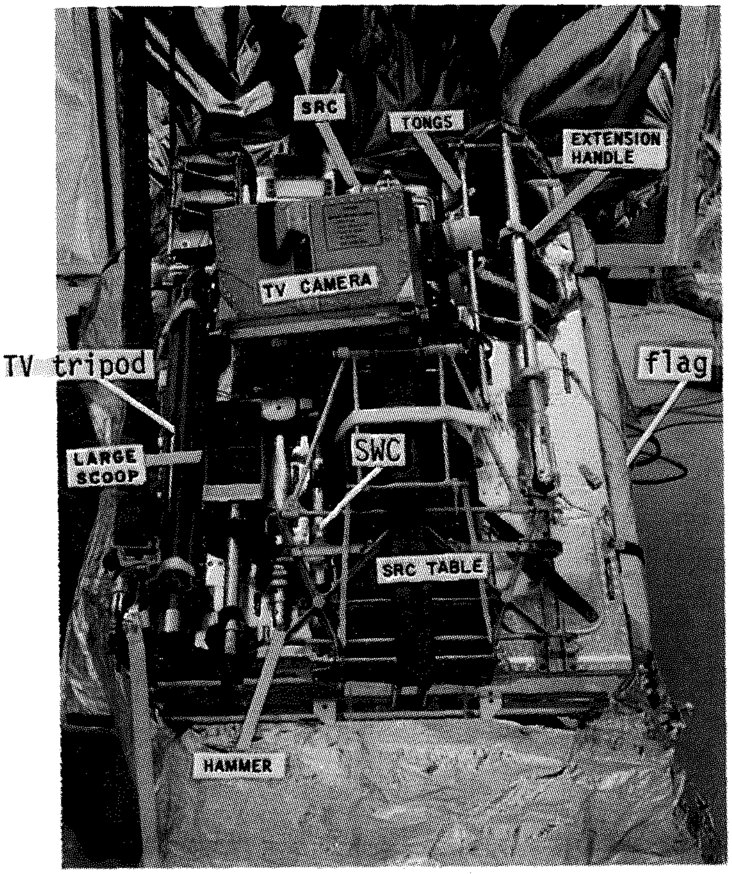


FIGURE 3.1-3 MESA STOWAGE

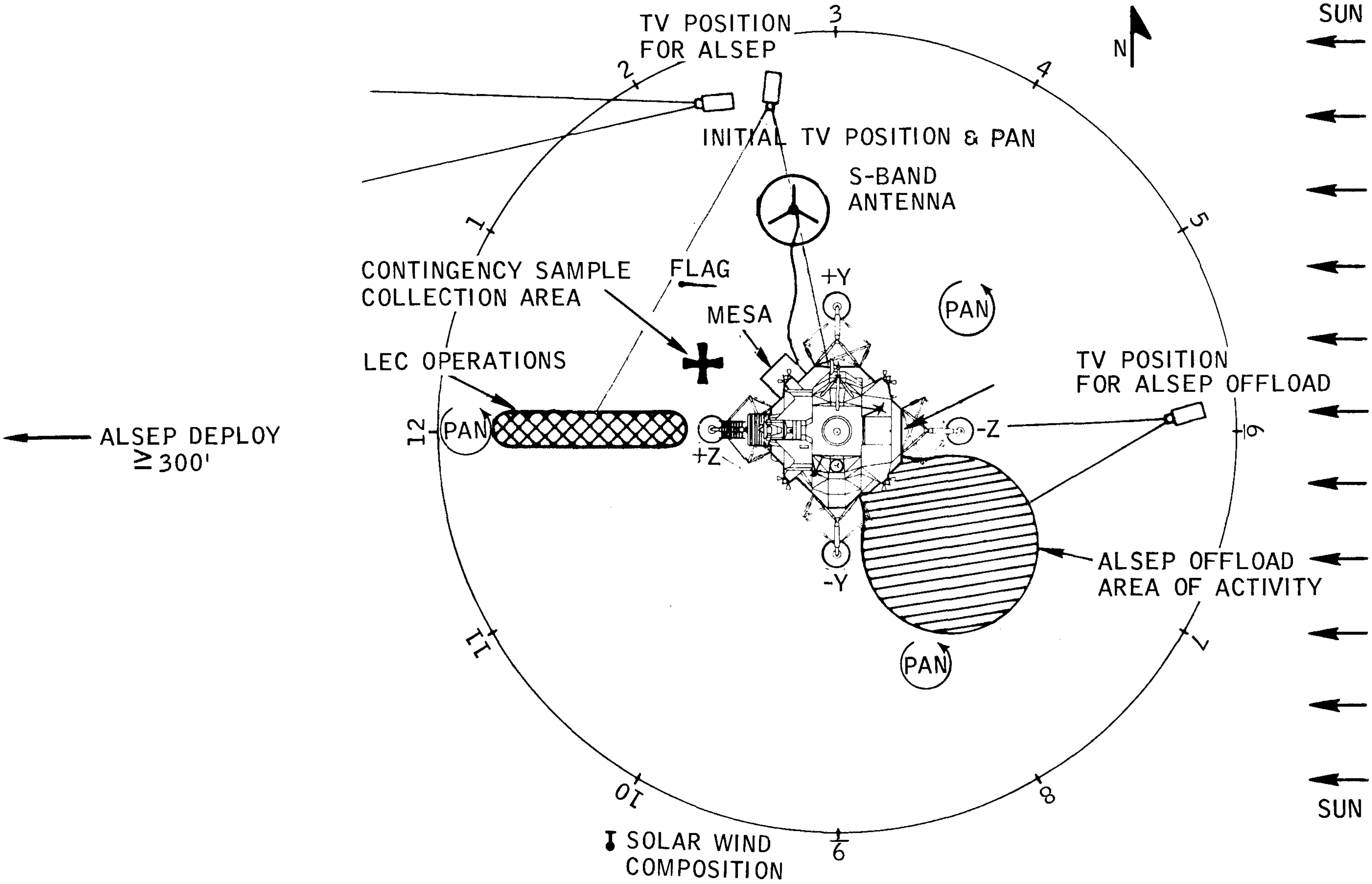


FIGURE 3.1-4 PROBABLE AREAS FOR NEAR LM LUNAR SURFACE ACTIVITIES

The LMP offloads the LiOH Canisters and contingency sample, and loads the ETB with the 16mm surface data acquisition (DAC) camera, both the 70mm electric data camreas; two extra 16mm magazines, a traverse map, and the thermal Degradation Sample (to be used on EVA 2) and the B & W TV.

He keeps tension on the LEC while the CDR hauls the ETB back down to the lunar surface. He re-hangs the ETB on the SRC table, this time to the side, and takes out one of the two cameras, The CDR uses the camera to photograph the egress of the LMP, and for his preliminary photography.

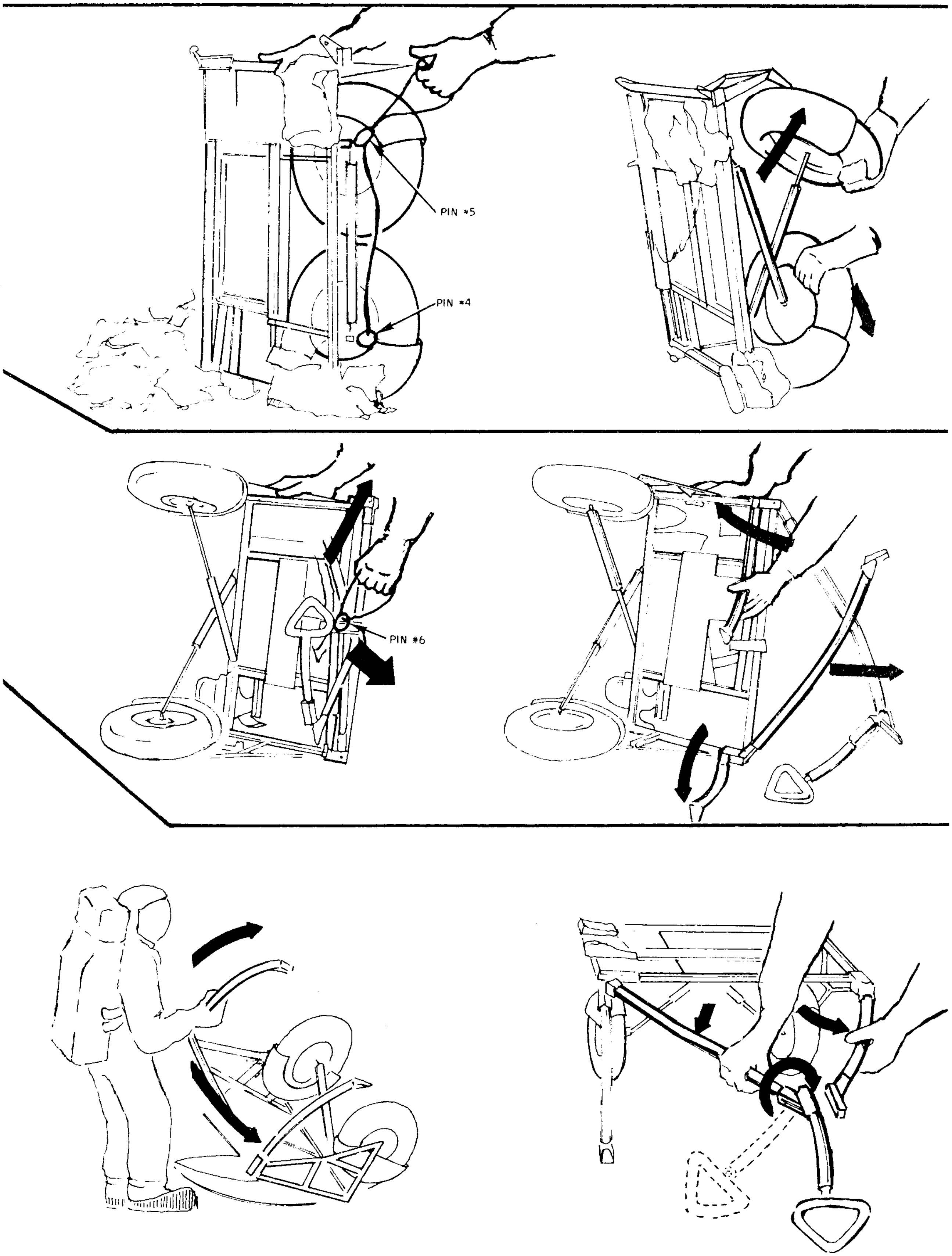
The LMP exits the cabin in the same manner as before, swings the hatch to, and rejoins his crewmate on the lunar surface. The CDR and the LMP then proceed to deploy the national flag from its stowage place on the side of the MESA. It is placed in the lunar soil 20 ft away and down sun. The data acquisition camera is placed on the SRC table and turned on to film this sequence.

The CDR then takes a walk around the LM, inspecting it, reporting on local terrain and landing effects. He photographs significant parts of the LM, including engine bell clearance, DPS cratering, pad dig-in and other such subjects. He also takes the three photographic panoramas. The positions for all these panoramas are shown in figure 3.1-4.

The LMP uses this time to take a TV panorama. He describes the scene and explains details during the panorama. The planned location for the TV panorama is also shown in figure 3.1-4.

The next procedure for both men is MET deployment. This sequence is shown in figure 3.1-5. The MET is loaded with camera supplies after it is unfoleded. It is then pulled around to the Scientific Equipment (SEQ) bay vicinity, on Qud II of the descent stage. The CDR repositions the TV camera around the side of the LM to view events at the SEQ bay, while the LMP pulls the MET.

FIGURE 3.1-5 MET DEPLOYMENT



As soon as the LMP reaches the SEQ bay, he manipulates the lanyards to open the doors. The CDR steps up to unload the first Apollo Lunar Surface Experiment Packages (ALSEP) package, deploying a boom with a ratchet lowering device to facilitate the unloading. The LMP similarly unloads the second ALSEP package, and the CDR pushes the booms back into the bay. The LMP removes and expands the hand tool carrier from package 2, places it on the MET, and deposits the dome and duel capsule handling tools from package 2 on the MET.

The CDR assembles what will become the ALSEP antenna mast but now acts as a carrying bar, and attaches it to a socket on the underside of package 1.

The CDR then tilts the package to be ready for fuel capsule emplacement in the Radioisotope Thermoelectric Generator (RTG).

The LMP pulls a lanyard to tilt the RTG fuel capsule cask mounted on the side of the SEQ bay, removes the top with a special Dome Removal Tool, and, using a second tool, the Fuel Transfer Tool, withdraws the hot radioactive (plutonium 238) capsule, and places it in the RTG. Withdrawing the fuel transfer tool locks the capsule in place. Finally, he moves package 2 over to package 1 and assembles the bar-bell like ALSEP carrying configuration by attach package 2 to the free end of the carry bar.

The CDR, during this period, closes the SEQ bay doors and repositions the TV camera once again, this time to view the ALSEP deployment site.

Both men return to the MESA; the LMP pulls the MET and the CDR places the B & W TV camera on the +Y footpad. At the MESA, the crew completes the load up of tools and equipment onto the MET preparatory to their traverse, including the closeup stereo camera.

The crew then moves out to the ALSEP deployment site, the LMP carrying the ALSEP packages, the CDR the LR3 and pulling the MET behind him.

Upon reaching the proposed ALSEP deployment site, the crewmen survey it for adequacy while they rest from the traverse. If local features are unsuitable for ALSEP placement, then the crew will seek another location, perhaps further away from the LM but still in the line of sight of the TV camera. If this is not possible, and time/expendables permit, one of the crewmen can return to the LM and repoint the camera at the final deployment site.

The 16mm lunar surface data acquisition camera, mounted on a short staff on the hand tool carrier, is enabled at 6 frames per second to record ALSEP deployment.

After placing the ALSEP packages in their approximate final orientation, the LMP connects the RTG to the central station. He releases a dummy load across the plug, after accomplishing system interconnect, by pressing a button. Then the subpallet that contains the Passive Seismic Experiment Stool and the Suprathermal Ion Detector Experiment (SIDE) and Cold Cathode Ion Gauge Experiment (CCIG) is removed and placed to one side. The RTG package is positioned flat on the lunar surface but the central station package remains handle-up with the carry bar still attached.

The RTG cable reel, as are all of the other components of the ALSEP system, is released by manipulating a Universal Hand Tool (UHT). This is a special long-handled allen wrench which doubles as a handling tool by engaging special sockets on the ALSEP components with a trigger-release ball device on a shank extending out from the hex wrench. The UHT engages "boyd bolt" quick-release fasteners, which come free with a 70° counterclockwise UHT motion combined with simultaneous depression of the tool which pushes down a release plunger inside the boyd bolt.

Physical appearance and functions of the following ALSEP experiments are given in figure 3.4-1.

The CDR, using a UHT, releases the Suprathermal Ion Detector Experiment (SIDE) from the subpallet, deploys its legs, and temporarily places the experiment on the surface while he connects its cable to the central station. The carry bar is detached from package 1 and stowed on the subpallet. The LMP then tilts package 1 to flat on the surface, levels, and aligns it. The CDR next removes the 3-legged Passive Seismic Experiment (PSE) stool, takes it 10 ft away from the Central station package, packs the surface material down and gouges a small thermal relief hole over which he places the stool. He then releases the PSE from the central station, places this unit on the stool, but does not deploy the thermal shield at this time.

The LMP offloads the Thumper/Geophone package, first verifying that switch No. 5 on the central station is full clockwise (this is the Active Seismic Experiment (ASE) safe/enable switch) or in "safe" position.

The thumper/geophone faintly resembles a mine detector. It has two reels, one at the top which stows the connector cable to the central station, one at the bottom which contains a set of three geophones with sufficient cable to deploy these along a straight line at distances of 10, 160, and 310 ft from the central station. The geophones are anchored in the surface by short spikes as they are unreeled from the thumper/geophone assembly. The thumper/geophone is interim placed on the MET.

The LMP next deploys the Mortar Package part of the Active Seismic Experiment. This is a bag containing four rocket grenades which will be remotely fired by earth command long after the crew leaves the moon. The Mortar package is on a tripod-type base, much like a military mortar. It is pointed northwest of the ALSEP site.

The LMP removes the Charged Particle Lunar Environment Experiment (CPLEE) from the central station just prior to the CDR releasing all of the boyd bolts that restrain the central station sun shield. The CPLEE is deployed 10 ft from the Central Station. This unit is placed along an E-W line, aligned by means of the UHT shadow on alignment marks on top of the experiment, and bubble leveled.

The CDR raises the central station sunshield into its fully deployed configuration, and then places the carry bar into a special shoe on the side of the central station to serve as a mast for the ALSEP antenna. He gets the antenna aiming mechanism or "gimbal" from the subpallet, takes off its cover and places it on the mast. The antenna and cable are stowed on the top of the sunshield of the central station. The helical antenna is placed on the gimbal, aligned, leveled, and set in azimuth/elevation as predetermined by the landing site. Then the CDR releases the ALSEP hold-off circuit by turning astronaut Switch No. 1 CW and switch No. 5 (Safe/Enable) to the enable position CCW which places the ASE in standby.

The LMP has meanwhile deployed the SIDE. This atmosphere sensor goes 55 feet NE of the central station. It consists of two distinct units, the SIDE proper, which is placed on a special ground screen, and a Cold Cathode Ion Gauge (CCIG) which is connected to the SIDE with a short cable. These two units are aligned, and the SIDE is bubble leveled.

The CDR next ALSEP deployment task is to complete PSE setup by deploying the sombrero-like thermal shield. The shield's unfolding reveals the bubble level and sun compass which the CDR uses as reference for leveling and alignment. The PSE alignment is reported to Houston (MCC).

While the PSE thermal shield is being deployed and the experiment is being aligned and leveled, the LMP has been occupied in placing the geophones for the ASE. To do this, he assembles the cable anchor to the extension handle. He drives this unit (essentially a stake) into the ground through a special retaining loop fastened to the geophone - central station cable. This anchoring prevents the LMP inadvertently dragging the central station with him while deploying the geophones. While the LMP walks along unreeling the geophones (and the return wire to the central station), the CDR commences to deploy the LR3 100 ft West of ALSEP and align it to present values for optimum back reflection to earth. He photographs the ALSEP experiments and the LR3, then proceeds NE 300 or more ft to collect the Comprehensive Sample. This sample consists of demarking a small area up to perhaps 10 ft square, photographing it, and then collecting as many rocks as possible that are on or in the surface. The rocks are to be greater than 0.5 in. across. These rocks go in one weigh bag. Then the CDR scoops approximately 9 lb (4 Kg) of soil from the same area.

Meanwhile, the LMP has been placing the geophones into the surface with a short spike attached to each, at intervals determined by the placement of the geophones on their cable. Before the LMP is ready to start the thumping activity, MCC via ground command will have commanded ASE operation and data processor to the high bit rate mode.

The LMP confirms with MCC that the ASE is "go" after the third and final geophone is deployed. Confirmation secured, the LMP walks back to the central station, pausing every 15 ft (starting at the geophone 310 ft from the central station) to detonate an Apollo Standard Initiator (ASI) change within the thumper. The ASI drives a flat plate down against the surface to provide an energy pulse for the geophones to pick up. The thumper is actuated by turning, holding, then pressing an arm-fire switch on the side of the assembly. Refer to reference 5 for details and safety provisions of the thumper firing circuit. The LMP fires a total of 21 ASI.

The final ALSEP procedure is readying the mortar package of the ASE. To do this, the ASE safety switch (no. 5) is turned to "Safe," the safety rods which hold the grenades fast are pulled, and the two safety switches are actuated to permit the arm/fire circuits to function. (This procedure is delayed until after the geology traverse)

Having completed ALSEP operations the crew follows a circuituous path bback to the LM. The sites or "stations" at which they pause to collect documented samples depends upon the time left for the EVA after ALSEP deployment, i.e., on PLSS expendables and crewmen fatigue. Alternative traverses on EVA 1 as a function of time are given in Section 3.6, EVA 1 traverse.

As time permits, samples will be collected in a prescribed mannner: the CDR photographs the prospective sample cross-sun (the gnomon near the sample) with his 70-mm camera at a distance of 10 ft. He takes two photos, separated by a foot or more (leaning or side-stepping to provide the separation) to provide a stereo pair for later photogrammetric analysis. The LMP, either before or after sample collection, takes a photo at a distance of 15 ft or so, as cross sun as possible, with the gnomon in the field of view and a prominent landmark and/or the horizon included The camera is focussed at 74 ft to provide sample localization information. The LMP also takes a down-sun photo at 10 ft of the prospective sample to furnish photometric information. The sample is collected, using tongs, the small scoop, or by hand, by either crewman. The sample is then bagged if bagging is appropriate, the bag number is reported to MCC, and the sample is deposited in a weigh bag on the MET. The sample sequence is concluded by the CDR taking a final after-sample picture of the sample location at 7 ft, cross-sun. The gnomon stays put during the entire sequence to serve as an invariant reference. The closeup stereo camera is freely used as needed during the sample sequence to document <u>in situ</u> sample characteristics, e.g., fillets, track patterns, fine structure, or line/contrast differences unlikely to survive sampling procedures.

When the crew reaches the LM, the TV is repositioned to view the MESA and ladder region, and the lens is reset as necessary to provide a good picture.

All samples are stowed by the CDR in a weigh bag preparatory to stowing in the SRC. He seals the organic control sample in the SRC. The samples, plus some additional samples taken from around the LM are packed in the SRC. A protective cover in the interior is removed, the SRC is sealed, and readied for transfer into the ascent stage.

The LMP removes the empty TV bracket from the MESA, offloads the second SRC and places it on the MET in the sun, with the S-Band Antenna Stowage Cover over it for thermal protection.

All magazines and the 70-mm cameras are placed in the ETB, ready for transfer into the cabin. The 16-mm camera is placed on the MET.

The LMP then is brushed off by the CDR, who in turn is dusted by the LMP. This completed, the LMP ascends to the upper part of the ladder, the CDR hands him the SRC which the LMP places on the platform. He opens the hatch, moves through it, and readies the LEC. The CDR attaches the ETB to the LEC, and the LMP tugs it into the cabin.

The CDR then ascends the ladder, hands the SRC into the LMP inside the ascent stage, and receives the "pulley" end of the LEC, which he loops around the platform rail. The CDR then ingresses the cabin. The LMP begins repressurization as the CDR closes the hatch to end the first EVA.

3.1.2 EVA 2

The second EVA begins with cabin depressurization, and the LMP opening the hatch in a similar fashion as EVA 1. Once again, the CDR egresses first. As he reaches the platform in front of the hatch, the LMP hands him a jettison bag filled with expendables and surplus equipment. The CDR flings the bag toward the -Y strut, well out of the way of ensuing operations. He then unwraps the LEC from the platform rail and hands it to the LMP who hooks the LEC pulley to the overhead handhold, ready for transfer operations. The CDR then descends the ladder to the surface.

While the CDR is descending to the surface, the LMP prepares the ETB. This bag has two 70-mm cameras plus spare magazines for the 70-mm and 16-mm cameras. In addition, the ETB contains the Buddy/SLSS, and traverse map that the crew will use to guide their second EVA. If the LM landing has been nominal, a pre-flight-prepared map is available to support the lunar field geology traverse. If the landing has not been close to the nominal or planned landing spot, the crew has prepared this map from their map package between the two EVA.

The ETB is rapidly transferred down to the surface, and hung by the CDR from the SRC table, as it was on EVA 1. The LMP then egresses the ascent stage, pulls the hatch door to, and descends to the surface.

Preparation for the long-range traverse begins. The two crewmen load the MET with all the equipment they will require, cameras, hand tools, the trenching shovel, collection bags, core tubes, and special sample containers. The latter items are taken from the second SRC which was left between EVA under a thermal blanket (the discarded LM stowage erectable/antenna blanket) on the MET. The SRC is transferred to the SRC table on the MESA and opened.

The loaded MET is then rolled around to the Scientific Equipment (SEQ) Bay of the LM, to receive the Lunar Portable Magnetometer (LPM). This experiment is towed on its own special pallet on the SEQ Bay. It consists of three subunits, the tripod, the sensor head, and the electronics/display. The latter two are connected by a 50-ft cable on a reel. These items go into special stowage places on the MET (See fig. 3.5-1.) and the stowage pallet is discarded. The LPM electronics is turned on to allow warm up and stabilization.

The LMP is the LPM specialist on Apollo 14. He moves to the first geological site, east of the LM. (See Traverse Map, fig. 3.6-2.)* The LMP reaches the first site, parks the MET. The sensor is unstowed from the MET (the Sensor is already affixed to the tripod) and deployed 35 ft from the MET. The sensor head is aligned and leveled with orientation such that no. 1 is read facing down sun. After a short pause (approx. 60 sec) the orthogonal X,Y, and Z or evident contacts, and of the top most

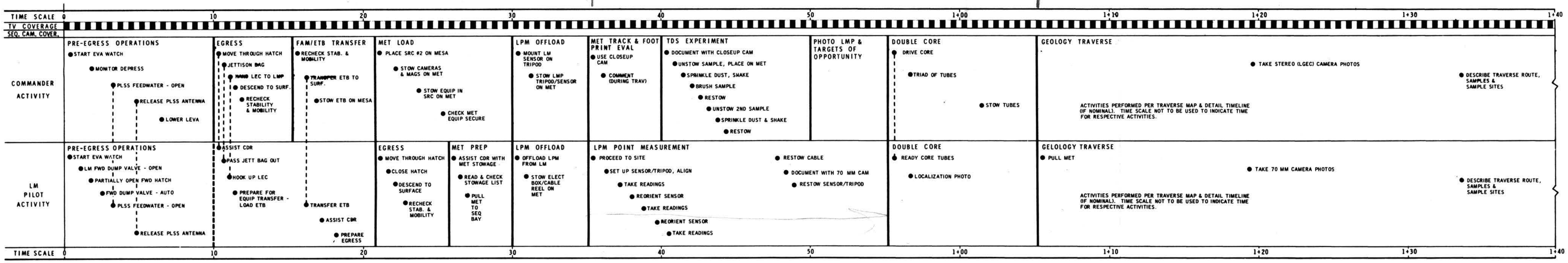
---

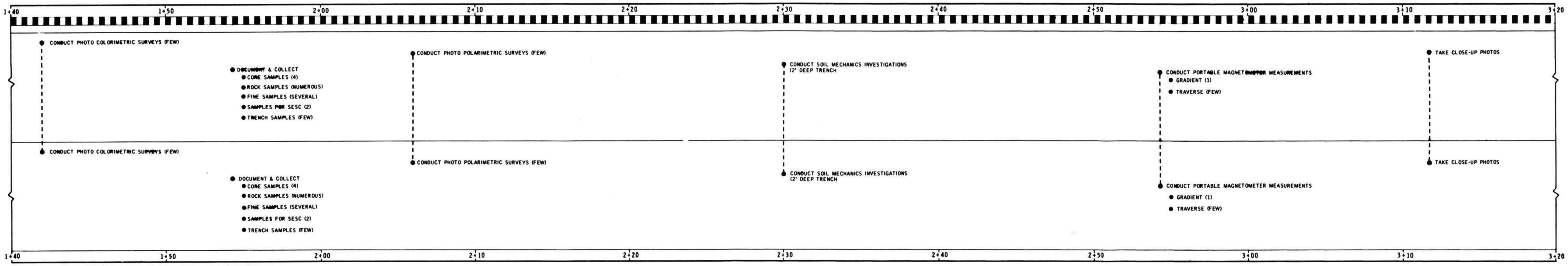
*This discussion of the second EVA assumes a nominal landing. The modified traverse, in the event of an off-nominal landing, the amended traverse would have the same activities at sites, but the order and direction might be different.

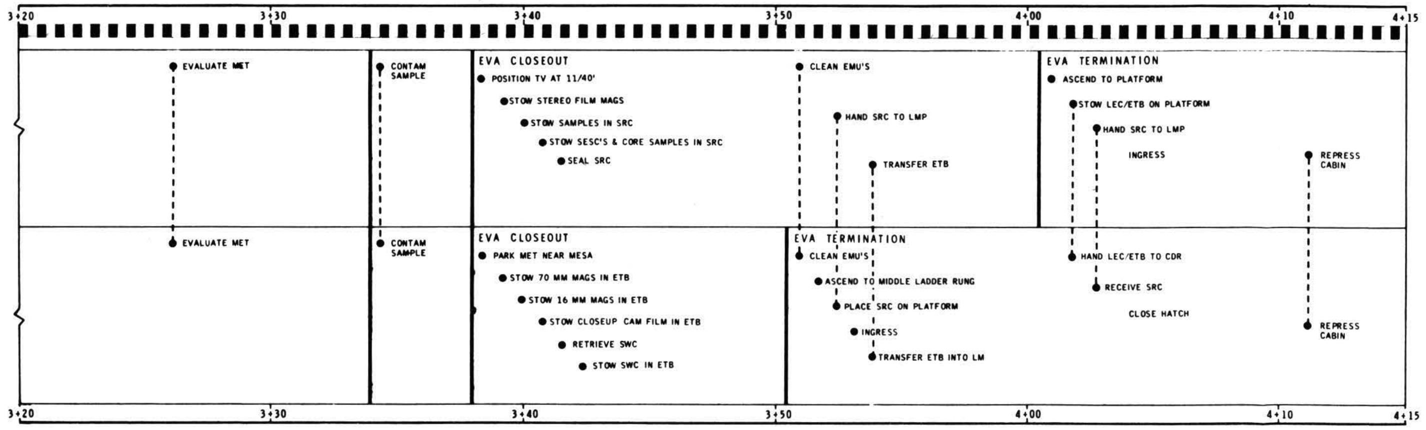
APOLLO 14 SUMMARY TIMELINE

LUNAR SURFACE NOMINAL EVA 2

a







LEGEND

EVENT LINE │
SEPARATES MAJOR BLOCKS OF ACTIVITY

COORDINATED TASKS ●┆●

SEQUENCE CAMERA COVERAGE
- ▥ 1 FRAME/SEC
- ▨ 6 FRAMES/SEC
- ■ 12 FRAMES/SEC
- ☐ NO COVERAGE
- ▩ MAGAZINE CHANGE

TV COVERAGE
- ▚ COVERAGE
- ☐ NO COVERAGE

NOTE:
ACTIVITY TIMES WITHIN AN EVENT NOT FIXED.

REV. A AUG. 1 '70

NAME	INITIAL	ORIGIN	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS
R.J.KOPPA		LS00	APOLLO 14 SUMMARY TIMELINE NOMINAL LUNAR SURFACE EVA 2
DR/W.NOAH		GE	PREPARED BY GENERAL ELECTRIC HOUSTON PROGRAMS · BASIC MARCH 1970

FIGURE 3.1-6

readings of magnetic field strength are read off 3 times on the three-dial display unit. The pause is required to permit a stable reading to be achieved. This procedure is followed by similar readings in two other orientations of the sensor head, to complete the "point" measurement sequence.

Meanwhile, the CDR has been busy doing the Thermal Degradation Sample Evaluation. Two small Thermal Degradation Sample carriers are unstowed from the MET. The CDR opens each in turn, and their before-degradation condition is photographed with the Closeup Camera. The sample carriers are placed on the SRC table on the MET. Then the CDR dusts the samples on the carrier with lunar material scooped with the small scoop. The CDR shakes off the dust; close-up pictures are again made, following which the CDR brushes off the dust, and retakes photos of the samples. The first carrier is stowed, and the procedure is followed with the second sample carrier, except no brushing is accomplished. This experiment is expected to yield material data to aid in the selection of radiator surfaces on the Lunar Roving Vehicle (LRV) and other advanced lunar operational equipment.

While he is doing this, the LMP completes his measurements of magnetic field strength with the LPM, and restows the sensor/tripod assembly on the MET. The cable connecting the electronics and the sensor is re-reeled.

The first geological site is notable for being on the floor of the Fra Mauro area, and is assumed to be covered with post-Imbrium volcanic material. A double core sample is collected by the crewmen at this spot to gather data on this assumption.

The core sample is made in a prescribed manner, as are all documented samples. The core tube(s) are identified to MCC by number and order where multiple core samples are made. Following this, the crewman attaches the core tube(s) to the extension handle, inserts it into the ground and holds it in position while the other crewman drives the tube into the ground with the hammer. The hammer blows serve to push the sample into the tube, and they also serve as a "dither" mechanism near the surface. The vibration/shock of the hammer blows tends to move the material up the tube without caking and consequent minimization of sample depth. The crewman not driving the sample takes a cross-sun photographic stereo pair of the core tube(s) in the ground.

When the tube is at maximum depth in the surface, the LMP steps to a cross-sun position at about 15 feet, focusses his 70mm data camera for 74 feet, and takes a picture which comprises the tube in the ground, the gnomon nearby, and a distant landmark (a crater, hill, the LM itself, a large rock) or the horizon. This shot, used throughout documented sampling, is the "localization" photo. Its purpose is to provide the data that permits later analysis to precisely determine where the sample was made in the traverse area.

One of the crewmen withdraws the tube or tubes from the surface after the localization photo is made. Comment is made on the difficulty of driving and of removing the tubes. The core tubes are first capped and then detached from the extension handle. If more than one was used, they are unscrewed and the end is re-installed, and the tubes capped. The tube(s) are then stowed in the hand tool carrier for ultimate stowage in the SRC for the return trip from the moon.

During the geology traverse the LMP usually pulls the MET, while the CDR walks along carrying the small scoop on the extension handle in one hand and the gnomon in the other. For long traverses, he may place one or both of these items on the MET. Both men carry tongs secured to their retractable tethers (yo-yos). The CDR generally has the 70mm Data Camera mounted on a bracket on his chest-located EMU remote control unit (RCU). The LMP has his Data Camera on his RCU. The 16mm lunar surface movie camera rides on a short staff on the hand tool carrier, which, in turn, is secured to the MET. This camera is actuated at will by either crewman to record actual traverse at 1 frame per second, sampling operations at 6 fps, and some selected crew operations at 12 or 24 fps.

Various kinds of sampling and experimental operations are performed at each of the designated sites. As much as possible, these are specified by traverse planners, the lunar field geology and soil mechanics principal investigators and their associates. Each combination of standard tasks are categorized under a group label, and this label is given by each geological site or station on the traverse. The crew's cuff check list carries the table of tasks by group. The symbology is mnemonic in utilizing the initial letter of each variety of site task in making up the labels. The code is as follows: S = documented sample; D = site description; P = photo panorama; C = core sample. A numeral following the code refers to the number of core tubes to be used.

The preliminary traverse planning map reproduced in Fig. 3.6-2 shows each geologic station marked with the recommended task group label. This traverse is reflected in the summary timeline and the detail procedures in Section 3.2.2. The task groups are supplemented as time and crew observations permit or suggest by additional samples, incidental photography, and extra tasks such as trenching and large rock collection. Detail procedures for each kind of task designated in the foregoing table are appended to the detail procedural timeline of Section 3.2.2.

SINGLE SAMPLES

Single samples or samples in close enough proximity to permit a single set of photographs to document their collection are gathered in the following prescribed manner. Either one of the crewmen, but usually the CDR places the gnomon down-sun of the prospective sample such that the leg which carries several anodized white bands on it points at the sample, and the photometric chart secured to the legs of the gnomon is visible to both cameras. The LMP parks the MET and goes to an up-sun position ten feet away to take the before-sample documentation shot. This photo yields both sample information and photometric information. The CDR assumes a cross-sun position and takes a stereo pair with the 70mm data camera. The LMP readies a small collection bag if such is appropriate for the sample, reports its number to Houston, and holds it for the CDR. The CDR picks up the sample with scoop or tongs and drops it in the bag. If no bag is used, he either hands the sample to the LMP or drops it himself into the weigh bag on the MET. The sample location is then photographed by the CDR cross-sun.

Finally, the LMP steps back to 15 feet, refocusses to 74 feet to take the localization picture as already described. During all of these photos and sampling procedures the gnomon provides the single reference point, by being untouched during the operation. After the last picture is made, the gnomon is picked up by the CDR, and the crewmen proceed to the next sample or next task.

PHOTO POLARIMETRIC SURVEY

There are two parts to this survey, close-up photography which involves sampling, and distant photography. The close-up procedure required the crewmen to select an area strewn with a quantity of rocks or boulders of varying sizes. On Apollo 14 it is anticipated that such an array might be found near the most prominent feature, Cone crater, in its ejecta blanket. The CDR takes up a position precisely cross-sun, i.e., phase angle 90 degrees, and takes three photos with the data camera, the special polarizing filter is installed on the camera for these pictures. The filter has three positions - Left, Center, Right, which yield photos with polarization angles 45 and 90 degrees disparate.

The LMP takes a down-sun picture with his 70mm data camera just as he would do for any documented sample. The CDR having finished his cross-sun picture, moves to a phase angle of 110 degrees, or down-sun of the clump of rocks being surveyed to shoot another set of photos just as before. He moves again to 130 degrees and takes a third set to complete the close-up photo polarimetric survey. The rocks which have been thus photographed (at least four or five of them) are then collected in the usual manner, with a final after-shot taken down-sun by the LMP to pin down the rocks that have been collected. The after-shot can also be done cross-sun if more convenient to the LMP. If no other pictures, such as a photographic panorama, are made in the vicinity to localize the rock clump, the LMP should make a localization photo in the prescribed manner as well.

Distant or far photo polarimetric surveys are made by the CDR only. He attempts to take up a cross-sun position relative to a large rock, a rille wall, crater wall (especially the inner wall, as in Cone Crater, where a distant polarimetric survey is highly desirable) or similar feature forty or more feet away. He takes photos with differential filter settings, just as before, then moves thirty degrees or so down-sun for more photos.

The polarimetric survey data will provide insight into surface material/texture effects on sunlight which may permit surface characteristics to be determined for areas (e.g. floors of inaccessible craters) too remote for photography to yield texture information due to resolution limits.

SOIL MECHANICS-DEEP TRENCH

A major part of the Soil Mechanics experiment on Apollo 14 is the digging and study of a deep (up to 2 feet) trench in the lunar surface. This is accomplished far from the LM at a station designated as "outpost." The trench is dug by manipulating the trenching tool, like a hoe, scraping the soil up and either toward or away from the crewman doing the digging to form a small declevity in the shape of a tire rut ten degrees off the sun line-of-sight. Alternatively, the deep trench is dug by using the trenching tool configured (it is adjustable) as a shovel. The crew documents the area to be dug just before commencing operations just as though a single sample were about to be taken. The trench is then undertaken by the CDR, while the LMP makes a second LPM measurement. If digging is a difficult task, or time-consuming, the crewmen may trade jobs during the course of making the trench. When the trench is finished, it is about four feet long, 18 inches wide, with sloping walls, and nearly two feet deep at the lowest part. The crew readjusts their cameras to provide good exposure for the inside of the trench (while accepting an over-exposure for the areas outside the trench). Only in this way can detail inside the shadowed areas of the trench be ascertained.

The CDR takes a stereo picture from each side of the trench, hence cross-sun of the interior, while the LMP stands down-sun of the trench on its edge to act as a sun reflector. The LMP takes an up-sun shot into the trench, and the CDR steps to down-sun to photo the trench. He also steps in the fill material pile, one of the requirements of the soil mechanics experiment, and the resulting footprint is documented by the LMP. The print in the fresh fill material yields soil deformation, cohesion, and other structure information.

Following this photographic documentation of the deep trench declevity, the crew takes some closeup stereo pictures of the bottom of the trench, plus any other structures of interest within or around the trench. Then samples are taken, starting from the bottom of the trench. The first sample is collected into a special container, the Special Environmental Sample Container, which is a can-like device with its own seal capability. This sample is thus contained in a mini-SRC, and will be used for delicate analysis for detection of organic substances on the moon. Representative samples are made in the customary manner of the sides, any discontinuities in structure, material in the trench. Where required (because the crew is uncertain that the before-sampling photo documentation of the trench took in the prospective sample) before-sample pictures are made in the prescribed way. An after-sample photo is shot with one of the 70-mm cameras after each sample, as a minimum.

In the event that other trenches are dug in the sides of fillets, craters, or on the face of possible contacts, the procedure is basically the same as above, but simplified (unless the trench is very deep) to the set of photos required for single samples. The bootprint is not required.

SPECIAL SAMPLES

The Special Environmental Sample has already been discussed above. The Gas Analysis Sample is specified as two or more rocks, dissimilar if possible, glass spatters would be desirable. The rocks should be on the surface, and distant from the LM. A container is provided.

The Magnetic Sample consists of several small rocks on the surface, one crystalline, one a breccia, placed in a special high-mu metal container covered with Teflon. All of these samples are carefully documented as single samples by the crew. The gas and Magnetic Samples are collected if time permits.

As the crew approaches Cone Crater on their traverse, the slope and roughness of the terrain is expected to increase to the point that the MET may well impede progress up to the rim. In that case, the MET will be temporarily abandoned for pickup on the way down from Cone Crater. The crew has supplementary collection bags secured to their LM restraint fittings, and will take the hand tool carrier if they leave the MET.

During the course of the traverse, observations of the crew may well lead to revision of the recommendations of the lunar science support team and thus different tasks at the stations of the traverse, or even the designation of stations. If expendables are short, the nominal plan is to drop the task complement at stations and simply describe them on the return traverse. Grab samples may be taken if time permits at stations which are by-passed. The traverse distance would not be shortened if EVA time became limited, if such conditions were ascertained after the climb to Cone Crater. As the traverse map (fig. 3.6-2) shows, the nominal traverse is close to being a direct line back to LM.

The crew returns to the vicinity of the LM at approximately 3 hr and 30 min into EVA 2.

The final sample to be collected is the contamination sample. This is taken under the Quad III side of the LM as close to the engine bell as possible. Its purpose is to study the level and kinds of DPS contaminates, and form a baseline. The sample consists of fine material scooped from the surface and placed in a small sample can, the SESC, which is then sealed. The sample site is documented and the sample is placed in the ETB for later stowage.

EVA closeout now begins. The 70-mm cameras, magazines, the 16-mm camera magazines (the camera itself is left on the surface), and the closeup camera film cassette are all placed in the ETB by the LMP. The SRC is filled with all the documented samples that it can hold, with a bias toward the bagged samples. Some of the larger rocks may have to be placed in a weigh bag and placed in the ETB for separate stowage in the ascent stage. The Special Environmental and Gas Samples are stowed in the SRC, as well as the six core tubes. The magnetic sample goes in the ETB. The CDR does most of this work, while the LMP takes down the Solar Wind Composition (SWC) metal foil. The foil is rolled up and stowed in a special bag. The bag also goes in the ETB. ETB loading may be such as to necessitate two transfers of equipment and samples to the ascent stage. The CDR closes and seals the SRC, readying it for transfer into the cabin.

The two crewmen then dust themselves off with the MESA brush, and the LMP ascends the ladder. On his way up, the CDR hands up the SRC for interim placement on the platform. The LMP enters the cabin, and readies the LEC for ETB transfer. The ETB is hauled up and inside the ascent stage, whereupon the LMP unpacks it and temporarily stows its contents. The CDR then ascends the ladder, receives and jettisons the LEC, passes the SRC into the cabin to the LMP, who stows it on the engine cover. The CDR completes his EVA with ingress into the cabin, the hatch is closed and repressurization commences.

3.2 Detailed EVA Timeline Procedures

3.2.1 EVA 1

The detailed timeline procedures for EVA 1 are shown on the following vertical format pages. The crew cuff checklist pages which correspond approximately to the timeline are given on the left-hand facing sheets for both the CDR and LMP. A column is also devoted to the Voice Data Plan, which lists the required information for the crew to relate to MCC-H, and essential operations communication with the crew.

EVA 1

CDR

PLSS TO LM H20 TRANSFER

Torso Tiedown - Loosen as reqd
PLSS Pump - OFF
Disconnect PLSS H20
Connect LM H20
CB(16) ECS: LCG Pump - CLOSE

LM TO PLSS H20 TRANSFER

CB(16) ECS: LCG Pump - OPEN
Disconnect LM H20
Connect PLSS H20
PLSS Pump - ON
Torso Tiedown - Tighten as reqd

10-31-70

CODE

(1) MANDATORY REQUIREMENT FOR DATA AT TIME OR EVENT DESIGNATED

(2) DATA MAY BE DEFERRED UNTIL LATER IN EVA OR DEBRIEFING

0+00 (1) CDR/LMP EVA WATCH START - MARK

LMP

PLSS TO LM H20 TRANSFER

Torso Tiedown - Loosen as reqd
PLSS Pump - OFF
Disconnect PLSS H20
Connect LM H20
CB(16) ECS: LCG Pump - CLOSE

LM TO PLSS H20 TRANSFER

CB(16) ECS: LCG Pump - OPEN
Disconnect LM H20
Connect PLSS H20
PLSS Pump - ON
Torso Tiedown - tighten as reqd

10-31-70

0+10

FINAL
DECEMBER 1970
APOLLO 14
MISSION H-3

NOMINAL TIMELINE

LUNAR SURFACE EVA 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
PRE-EGRESS OPERATIONS	114 + 19 0+00	PRE-EGRESS OPERATIONS		PRE-EGRESS OPERATIONS	PRE-EGRESS OPERATIONS
START EVA WATCH		START EVA WATCH (CALL "MARK")			
		NOTE: DETAILED PROCEDURES ARE PRESENTED IN "LUNAR SURFACE CHECKLIST", "EQUIPMENT PREP EVA 1" SECTION			
OPEN HATCH	114 +26 0+10 114 +29	EGRESS			

CDR-1

12-11-70

CDR - EVA-1

EGRESS

EGRESS,FAM,MET

0+10 Jett bag ←→ [hand out
Deploy LEC ←→ [assist
Pull safety-deploy [TV CB
MESA
Descend
Ascent check [egress & fam

0+18 Discuss mobility & stability
LM check & rpt

0+22 Adjust MESA for MET offload
Remove MET blanket door
Release MET-stow on +Y footpad

LMP-1

12-11-70

LMP - EVA 1

MONITOR

ASSIST, MONITOR

0+10 Assist [egress
CB(16) COMM: TV - CLOSE
Jett bags to A1
Pass LEC to A1
70mm Cam to mid-step

Monitor & photo A1
in shadow: DC(f5.6,125,X)
LDAC(f2.8,60,6fps)
in sun: DC(f11,250,X)
LDAC(f8,250,6fps)

0+16 LM & EMU check
CB & VOX sense check
Confirm 'GO' 2 man EVA

EGRESS

LMP-1

10-31-70

EGRESS,CSRC,SWC

0+18 Close hatch & descend
Ascent check [MET
Stability & mobility

0+28 Deploy SRC table
Unstow ETB-offload bags
Load 2 LiOH cans in ETB
Deploy TV cable

[S-Band
0+32 Remove CSRC from pocket
Take sample (stow on ladder)

0+10

(2) CDR - JETTISON BAG

(1) MCC - "GO" FOR 2 MAN EVA

(2) CDR - STABILITY & MOBILITY DISCUSSION

CDR - LM CHECK

LMP - STABILITY & MOBILITY DISCUSSION

CDR/LMP - EMU CHECK

81%

Min Cooling

(2) CDR - MET OFFLOAD - EASE OF OPERATION

(1) CDR - VERIFY TV LENS COVERED

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
Assist CDR	114+29 0+10	Move through hatch			EGRESS
Check CB(16) comm: TV-CLOSE Place 70mm Cam (RHSSC) on mid step					
Pass jett bags to CDR		Jettison bags			
Pass LEC to CDR		Deploy LEC			
		Descend ladder to deploy MESA			
	114 30 +4 114 34	Deploy MESA			
Perform final LM & EMU check Verify CB config & VOX sens		Descend to footpad Step to surface			
Confirm "GO" for 2-man	36	ENVIRONMENTAL FAM. Check & discuss stability & mobility			ENVIRONMENTAL FAM.
LMP EGRESS	114+36+1			EGRESS	
Move thru hatch	114 +35				
	114 0+20 39	Check LM and terrain			
Descend to footpad					
		MET OFFLOAD Raise MESA			MET OFFLOAD
Ascent check		Remove MET thermal blanket door			
Step to surface	+37 +6 +43	Release MET from MESA			
ENVIRONMENTAL FAM Check & discuss stability & mobility		Stow MET on +Y footpad		ENVIRONMENTAL FAM	
		Adjust MESA, if necessary			
		Unfold MESA thermal blanket			
Erect SRC table		Unstow and erect TV tripod			
Attach ETB to SRC table Stow weigh bags on MESA		Set TV lens to f-22 Cover lens with cap			
	0+30 114+49				

0+30 MCC -
TV CAM - ZOOM 30 FOCUS ∞

S-BAND

CDR-1

TV,S-BAND

0+26 Adjust MESA
Open MESA blanket
Erect TV tripod
Cover lens-Set f22 [ETB
Mount TV camera [TV cable
Position 2:30/50' (NO UPSUN)

0+31 Offload S-Band ant [CSC
& carry to 3/20'
Orient wrt Earth [SWC
Deploy mast & legs
Steady leg-deploy dish [LR^3
*CAUT: WATCH PLSS ANT/DISH
Align ant [RF cable & assist

10-31-70

(1) LMP - REPORT SWC DEPLOY

0+40

LMP-1

SWC

SWC, LR^3, INGRESS

0+37 Unstow SWC(MESA)
Extend shaft
Unroll foil shade
Mount & place in sun 10/60'

0+42 Offload LR^3 to +Z footpad

Get S-Band RF cable
Assist A1 [S-Band

0+49 Ingress LM
SW: S-Band - LUNAR STAY
Track Mode - OFF
Check comm

10-31-70

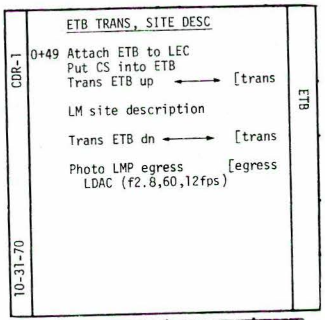
	CDR	LMP
O_2		
FLAGS		
PRESS		
COOL		

0+50 (1) CDR/LMP - EMU CHECK

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
Stow in ETB: -LiOH Cans (2)	114+49 0+30	Unstow and mount TV on tripod			
Deploy TV cable	+50	+2 Carry TV to 2:30/50' Position TV to view MESA & ladder areas 48			
CS COLLECTION		S-BAND ANTENNA DEPLOYMENT		CS COLLECTION	S-BAND ANTENNA DEPLOYMENT
Remove CSRC from pocket & deploy handle	+10 114+42	Remove S-Band Erectable Antenna from LM			
Collect sample	+53	Assisted on SB			
Detach sample bag		Carry antenna to deploy site 3/20'			
Stow sample on ladder		Place antenna on surface Orient ant - arrow toward earth			
SWC DEPLOYMENT Unstow SWC	54 +3	Remove top cap & foam spacer		SWC DEPLOYMENT	
Q on penetration Not passed Extend staff Unroll foil shade	57	Deploy 2 mast sections Extend legs			
	.114+59 0+40	Check antenna orientation Deploy legs			
Place SWC in sun (10/60')		Remove & discard cover			
OFFLOAD LR^3 Remove LR^3 thermal shield		Lift antenna on to legs Push legs into surface		OFFLOAD LR^3	
Offload LR^3 from LM		Remove and discard lift bar & rib protector			
		Unstow trigger Deploy reflector Unstow and attach cable			
Stow near +Z footpad		Rough align antenna			
ASSIST CDR S-BAND ALIGN Deploy & connect S-band RF cable		Fine align antenna		ASSIST CDR S-BAND ALIGN	
S-BAND SWITCHING	115 09 0+50				


CDR-1

ETB TRANS, SITE DESC

0+49 Attach ETB to LEC
Put CS into ETB
Trans ETB up ←→ [trans

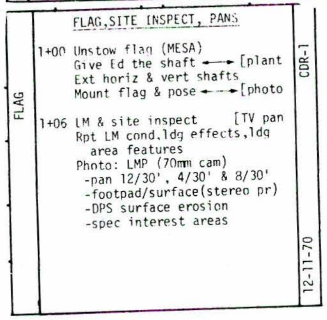
LM site description

Trans ETB dn ←→ [trans

Photo LMP egress [egress
LDAC (f2.8,60,12fps)

10-31-70

ETB


FLAG

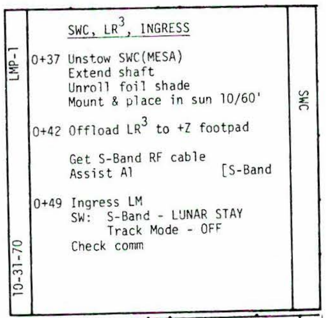
FLAG,SITE INSPECT, PANS

1+00 Unstow flag (MESA)
Give Ed the shaft ←→ [plant
Ext horiz & vert shafts
Mount flag & pose ←→ [photo

1+06 LM & site inspect [TV pan
Rpt LM cond,ldg effects,ldg
area features
Photo: LMP (70mm cam)
-pan 12/30', 4/30' & 8/30'
-footpad/surface(stereo pr)
-DPS surface erosion
-spec interest areas

CDR-1

12-11-70


LMP-1

SWC, LR^3, INGRESS

0+37 Unstow SWC(MESA)
Extend shaft
Unroll foil shade
Mount & place in sun 10/60'

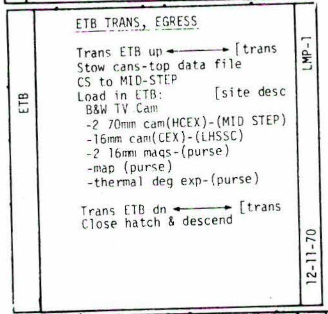
0+42 Offload LR^3 to +Z footpad

Get S-Band RF cable
Assist Al [S-Band

0+49 Ingress LM
SW: S-Band - LUNAR STAY
Track Mode - OFF
Check comm

10-31-70

SWC


ETB

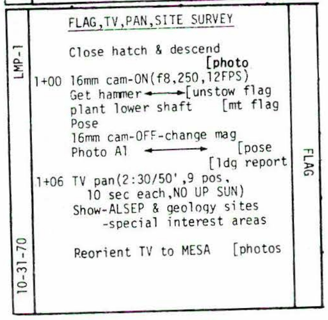
ETB TRANS, EGRESS

Trans ETB up ←→ [trans
Stow cans-top data file
CS to MID-STEP
Load in ETB: [site desc
B&W TV Cam
-2 70mm cam(HCEX)-(MID STEP)
-16mm cam(CEX)-(LHSSC)
-2 16mm mags-(purse)
-map (purse)
-thermal deg exp-(purse)

Trans ETB dn ←→ [trans
Close hatch & descend

LMP-1

12-11-70


LMP-1

FLAG,TV,PAN,SITE SURVEY

Close hatch & descend
[photo
1+00 16mm cam-ON(f8,250,12FPS)
Get hammer ←→ [unstow flag
plant lower shaft [mt flag
Pose
16mm cam-OFF-change mag
Photo Al ←→ [pose
[ldg report
1+06 TV pan(2:30/50',9 pos,
10 sec each,NO UP SUN)
Show-ALSEP & geology sites
-special interest areas

Reorient TV to MESA [photos

10-31-70

FLAG

0+50

(1) LMP - MARK TO SWITCH ANTENNAS

(1) CDR - RPT LDAC MAG FOR
LMP EGRESS
RPT START __________ (cc)
RPT STOP __________
(12 FPS = 8 MIN. CAP)

1+00

(1) LMP - RPT LDAC START __________
(12 FPS)

(1) LMP - RPT 70mm MAG/EXP
______/______
(1) LMP - RPT LDAC STOP
MAG CHANGE FROM____TO____
(1) CDR - LM STATUS
ATTITUDE, GRND CLEARANCE
(1) FOOTPAD/SURFACE INTERACTION
PENETRATION, SKIDDING
DPS EXHAUST EFFECTS, CLEARANCE
(EITHER)COATING, DUST SHIELDING
OF LM COMPONENTS
LUNAR SOIL CONDITIONS
& TERRAIN FEATURES

1+10

MCC - TV CAM ZOOM 25 FOR PAN

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	114 06 +3				
Ascend ladder	115 +09 0+50	Stow CS in ETB		S-BAND SWITCHING	
Ingress LM -					
SW: S-Band - LUNAR STAY Track Mode - OFF		Close ETB top flap Attach LEC to ETB			
Check Comm Transfer ETB into LM		Transfer ETB into LM			
Remove & stow ETB contents -LiOH cans to ASC eng cover		LM & Site inspection			
Stow in ETB: 2 70mm cam, 16mm cam, 2 mags, map, Thermal Degradation Samples B&W TV Camera					
Trans ETB to surface		Transfer ETB to surface			
Move through hatch Close hatch Descend to surface		Attach ETB to MESA			
	115 + 18	Photo LMP Egress 16mm cam or 70mm cam	■		
	115 1+00 19				
FLAG DEPLOYMENT Remove hammer from MESA		FLAG DEPLOYMENT Pull 2 stowage pip pins & remove flag from MESA		FLAG DEPLOYMENT	FLAG DEPLOYMENT
Place 16mm Cam on SRC table to view flag site, turn camera on (f,250,∞) 12fps		Carry flag to deploy site (1:30/20') Hand lower shaft to LMP	■		
Assist CDR		Extend horiz shaft out & up Extend vert shaft			
Obtain 70mm camera from SRC Table & photo CDR/flag Turn 16mm camera off		Insert upper shaft into lower Receive 70mm Cam from LMP Photo LMP/flag			
TV PAN & SITE SURVEY Move to TV		LM & SITE INSPECTION/PHOTO Move CCW around LM inspecting & reporting on LM condition, landing effects, & terrain features in landing area		TV PAN & SITE SURVEY	LM & SITE INSPECTION/PHOTO
Take TV panorama (2:30/50')		Photo: (70mm camera) Pans at 12/30',8/30',4/30' DPS/surface erosion special interest areas			
	115 1+10 29				

115+21 Contingency Sample Description for Debrief

E1K4

CDR-1

10-31-70

MET DEPLOY,ALSEP OFFLOAD

1+15 Unfold MET wheels, legs,hndls [assist
Cover lens & pos TV 6/30' to view SEQ Bay [pos MET

1+21 Move to SEQ bay [doors
Pkg 1 out,clear ⟷ [pkg 2
Stow booms
UHT'S off

1+25 Mate mast-attach to pkg 1
Tip pkg 2 for fuel ⟷

MET

MET

MET DEPLOY,ALSEP OFFLOAD

1+15 Assist A1 w/MET deploy
Load 70mm on MET
Pos MET for ALSEP offload [TV

1+20 Open SEQ Bay doors (white)
Pkg 2 out [pkg 1
Remove HTC(5 pins) & deploy (4 pins)
Mount on MET
Assemble cam staff

LMP-1

10-31-70

LMP-1

10-31-70

RTG FUEL,MET LOAD

1+27 Tilt fuel cask [pos pkg 2 DRT & FTT
Remove dome-read temp label-REPORT [DRT & FTT
Remove element-fuel RTG read temp label-REPORT
Make barbell [SEQ doors

1+36 MET to MESA (tail in)
Discard TV bracket
2nd 70mm cam on MET
Unstow & open SRC 1 [check stowage
Stow on MET:
 -3 weigh bags
 -core tube cap assy & 2 SESC (seal organic sample)
 -closeup cam, large scoop
Hand hammer & gnomon to A1

RTG

1+10

MCC - TV CAM ZOOM 50 (MESA)

LMP - REPORT 70mm EXP.#______

(2) CDR/LMP - COMMENT ON MET DEPLOY

(1) CDR - VERIFY TV CAPPED

(1) CDR/LMP - EMU CHECK

1+20

MCC - TV CAM ZOOM 40 (ALSEP OFFLOAD)

	CDR	LMP
O_2		55
FLAGS		
PRESS		
COOL		Lo

1+30

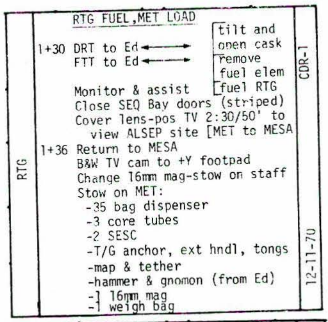
MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	115 1+10 29				
Show proposed ALSEP & geology Sites & special interest areas					
Position TV to view MESA	115 +43 -10	Place 70mm cam on SRC table			
MET DEPLOY Lift MET and hold for CDR to unfold wheels and handles	115 38	**MET DEPLOY** Unfold MET wheels and handles		MET DEPLOY	MET DEPLOY
Load 70mm Cam (LMP) on MET					
Pull MET to Quad II, near SEQ Bay	115 + 49 -10	Carry TV to 6/30' position to view ALSEP offload			
ALSEP OFFLOAD	115 1+20 39	**ALSEP OFFLOAD**		ALSEP OFFLOAD	ALSEP OFFLOAD
Open SEQ Bay doors					
		Offload ALSEP Pkg #1 Disconnect lanyards & boom cable Move Pkg #1 clear			
Offload ALSEP Pkg #2					
Disconnect lanyards & boom cable		Stow booms			
Position Pkg #2 for RTG fueling					
Remove & expand ALHTC, place on MET		Remove UHT'S, stow on pkgs			
		Remove & assemble Carry Bar Attach Carry Bar to Pkg #1			
Assemble & position Cam Staff					
Remove DRT & FTT place on MET		Check DRT & FTT removed, Tip Pkg #2 & position for fueling			
Reposition Pkg #2 if necessary					
Tilt fuel cask	1+30 115+49	Take 70mm photos if time permits			

E1K5

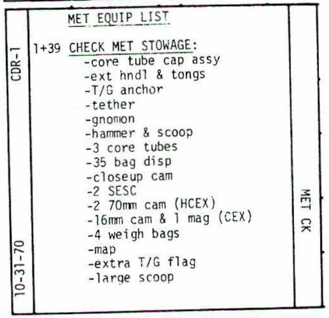
11



RTG CDR-1 12-11-70

RTG FUEL,MET LOAD

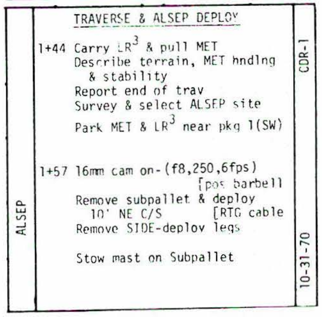
1+30 DRT to Ed ←→ [tilt and open cask
FTT to Ed ←→ [remove fuel elem
Monitor & assist [fuel RTG
Close SEQ Bay doors (striped)
Cover lens-pos TV 2:30/50' to
view ALSEP site [MET to MESA
1+36 Return to MESA
B&W TV cam to +Y footpad
Change 16mm mag-stow on staff
Stow on MET:
-35 bag dispenser
-3 core tubes
-2 SESC
-T/G anchor, ext hndl, tongs
-map & tether
-hammer & gnomon (from Ed)
-1 16mm mag
-1 weigh bag



CDR-1 10-31-70 MET CK

MET EQUIP LIST

1+39 CHECK MET STOWAGE:
-core tube cap assy
-ext hndl & tongs
-T/G anchor
-tether
-gnomon
-hammer & scoop
-3 core tubes
-35 bag disp
-closeup cam
-2 SESC
-2 70mm cam (HCEX)
-16mm cam & 1 mag (CEX)
-4 weigh bags
-map
-extra T/G flag
-large scoop



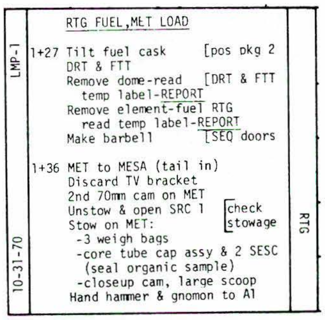
ALSEP CDR-1 10-31-70

TRAVERSE & ALSEP DEPLOY

1+44 Carry LR^3 & pull MET
Describe terrain, MET hndlng
& stability
Report end of trav
Survey & select ALSEP site
Park MET & LR^3 near pkg 1(SW)

1+57 16mm cam on-(f8,250,6fps)
[pos barbell
Remove subpallet & deploy
10' NE C/S [RTG cable
Remove SIDE-deploy legs

Stow mast on Subpallet



LMP-1 10-31-70 RTG

RTG FUEL,MET LOAD

1+27 Tilt fuel cask [pos pkg 2
DRT & FTT
Remove dome-read [DRT & FTT
temp label-REPORT
Remove element-fuel RTG
read temp label-REPORT
Make barbell [SEQ doors

1+36 MET to MESA (tail in)
Discard TV bracket
2nd 70mm cam on MET
Unstow & open SRC 1 [check
Stow on MET: stowage
-3 weigh bags
-core tube cap assy & 2 SESC
(seal organic sample)
-closeup cam, large scoop
Hand hammer & gnomon to Al

1+30

(1) LMP - REPORT DOME REMOVAL
TOOL TEMP LABEL
READING________°F

No Temp Ind. in block

(1) LMP - REPORT RTG FUELING______

(1) LMP - REPORT FTT TEMP LABEL
READING____________°F

(1) CDR - VERIFY TV CAPPED

MCC - TV CAM ZOOM 150 (ALSEP SITE)

(1) LMP - REPORT 2nd (CDR) 70mm
MAG/EXP____________

1+40

(1) LMP
INITIAL CLOSE UP CAM FRAME # _____

(1) CDR/LMP - EMU CHECK

(1) CDR/LMP - COMMENT ON MET
BEHAVIOR OF DUST
THROWN UP, TRACK
DEPTH

1+50

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	115 1+30 49	Pass DRT to LMP			
Remove dome, read temp label & report		Pass FTT to LMP			
Engage & check FTT					
Withdraw fuel element Fuel RTG - REPORT		Monitor fueling Close seq bay doors			
Disengage FTT, read temp label & report		Carry TV to 2:30/50' position to view ALSEP deploy site			
Rotate Pkg #2, & position near pkg 1, connect to carry bar Pull MET to MESA		Return to MESA Place B&W TV Camera (ETB) on +Y footpad			
Discard TV Bracket Put 70mm Cam on MET Take 70mm Cam from ETB, Stow on MET Place 16mm Cam on Staff Unstow & open SRC 1		Change 16mm mag-hand to LMP			
	116+20				
Stow on MET: Weigh Bags Core tube Cap Assy Seal Organic Sample Unstow Closeup Stereo Camera Extend handle & skirt and place on MET	115 1+40 59	Stow on MET: 35 Bag Dispenser 3 Core Tubes on MET Unstow thumper/Geophone Anchor - place on MET Map & 100 ft Tether 6			
Turn Closeup Camera on	116+28 -28				
ALSEP TRAVERSE Carry ALSEP	116 03 1+44	ALSEP TRAVERSE Carry LR^3, pull MET		ALSEP TRAVERSE	ALSEP TRAVERSE
Rest as required		Rest as required enroute to ALSEP deploy site 9 min			
	1+50 116 09				

52
126
26

11
26
37

E1K6

CDR-1

PSE,SUNSHIELD,ALSEP ANT

2+06 [Short SW

2+08 Deploy stool 10' NW C/S
Interim deploy PSE [T/G
arrow West-Remove girdle
Turn 16mm cam-off-change mag
if empty

2+14 Check C/S level & [M/P-CPLEE
free of cables
Release 16 perimeter boyd
bolts
Free RF cable-check corners
Release inner boyd bolts
Connect curtain corners
Get C/S boyd bolts

10-31-70

PSE

LMP-1

ALSEP TRAV,RTG,T/G

1+44 Get, carry ALSEP assy to ←→
site-pos barbell-RTG upsun

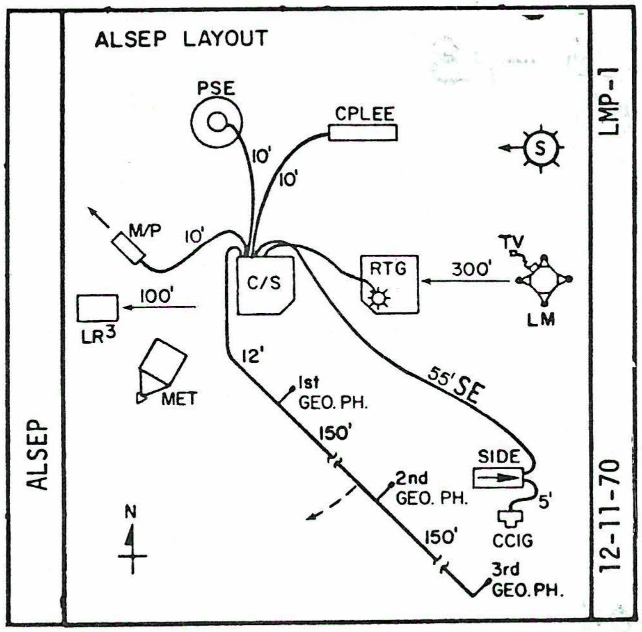
2+00 Disc pkg 2 [MET
Pos pkg 1 10' West [SIDE
Tilt pkg 2, remove cable
Report amps & connect cable
Get - connect SIDE conn

2+06 DEPRESS SHORT SW [conn
Tilt & align pkg 1 [SIDE
Rel SIDE cable conn
Tether UHT

2+09 Verify RH sw #5-CW [PSE
Rel T/G & deploy-12 slack
Stow on MET

10-31-70

ALSEP



1+50

(1) CDR/LMP - EMU CHECK

	CDR	LMP
O_2		
FLAGS		
PRESS		
COOL		

(1) CDR - REPORT TRAVERSE COMPLETE

(1) CDR - REPORT 16mm CAMERA START__________
(6 FPS = 16 MIN)

2+00

(1) CDR - REPORT SIDE CONNECT

(1) LMP - REPORT CABLE REEL TEMP LABEL________°F

(1) LMP - REPORT AMPS BEFORE PRESSING SWITCH______
(6-8 amp Nominal)

(1) LMP - REPORT AMPS AFTER PRESSING SWITCH______
(0 Nominal)

(1) CDR - REPORT PSE EMPLACE

2+10 (1) LMP - VERIFY SW 5 CW (SAFE)_____

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

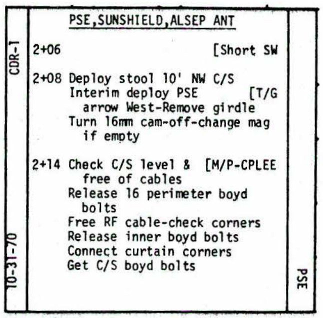
LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	116 1+50 09				
	9 min	Report completion of traverse			
ALSEP SITE SURVEY Survey site		ALSEP SITE SURVEY Survey site to determine if suitable for ALSEP deploy		ALSEP SITE SURVEY	ALSEP SITE SURVEY
Place barbell, RTG upsun	ALSEP Deploy	Deposit LR3 on surface			
Assist CDR		Clear or pack areas as required for Pkgs 1 & 2			
		Park MET near location for Pkg 1			
Disengage bar from Pkg 2 Reposition Pkg 1 and bar		16mm camera-on (f8,250,6fps)	▮		
Disengage bar from Pkg #2	1:03	ALSEP SYSTEM INTERCONNECT Remove subpallet & place approx. 10 feet NE of C/S	▮		ALSEP SYSTEM INTERCONNECT
Reposition Pkg #1 and bar 10 feet WEST of Pkg 2	116 52 -32		▮		
Tilt Pkg #2	116 2+00 19 30 ext 116 49	Release SIDE Boyd Bolts Lift SIDE from subpallet Remove SIDE cable reel Boyd Bolt & cable reel	▮		
Release RTG cable Boyd Bolts	116		▮		
CAUT: READ TEMP LABEL - DO NOT TOUCH WITH GLOVE IF ALL DOTS ARE BLACK-REPORT		Deploy legs and place SIDE on surface near subpallet Fold dust cover back Remove carry bar/ant mast from Pkg #1 & stow on subpallet	▮		
Deploy cable, discard reel Verify short SW not depressed REPORT AMPS & connect cable Depress shorting switch Check shorting SW AMPS zero Remove SIDE connector from cable cradle on subpallet		Remove PSE stool from subpallet, move to PSE site	▮		
Connect side connector to C/S Tilt & align Pkg #1 (C/S) Remove dust cover Pull side connect release pin	-5	Pack surface for PSE stool 10'NW & gouge hole in center Place stool on surface	▮		
THUMPER/GEOPHONE OFFLOAD Verify switch #5 in CW position Release thumper/geophone (T/G) Boyd Bolt	117 2+10 04	PSE OFFLOAD Release PSE Boyd Bolts Use UHT to remove PSE from C/S	▮		

116 44 29
30
116 59

-35

10P

E1K7



CDR-1

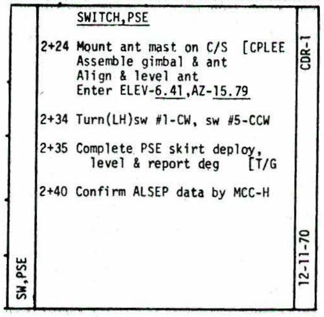
PSE,SUNSHIELD,ALSEP ANT

2+06 [Short SW

2+08 Deploy stool 10' NW C/S
Interim deploy PSE [T/G
arrow West-Remove girdle
Turn 16mm cam-off-change mag
if empty

2+14 Check C/S level & [M/P-CPLEE
free of cables
Release 16 perimeter boyd
bolts
Free RF cable-check corners
Release inner boyd bolts
Connect curtain corners
Get C/S boyd bolts

10-31-70 PSE



SWITCH,PSE

CDR-1

2+24 Mount ant mast on C/S [CPLEE
Assemble gimbal & ant
Align & level ant
Enter ELEV-6.41,AZ-15.79

2+34 Turn(LH)sw #1-CW, sw #5-CCW

2+35 Complete PSE skirt deploy,
level & report deg [T/G

2+40 Confirm ALSEP data by MCC-H

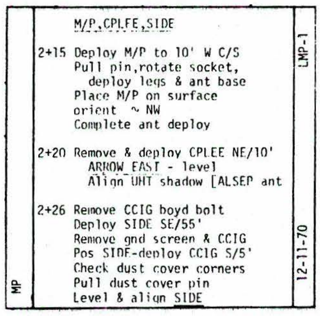
SW,PSE 12-11-70

2+10

(1) CDR - REPORT MCC-CALL STOP
16mm CAMERA________
CHANGE MAG
FROM______TO___________
16MM CAMERA
START___________
(6 fps - 16 min)

(1) LMP - REPORT M/P DEPLOYMENT

2+20



M/P,CPLEE,SIDE

LMP-1

2+15 Deploy M/P to 10' W C/S
Pull pin,rotate socket,
deploy legs & ant base
Place M/P on surface
orient ~ NW
Complete ant deploy

2+20 Remove & deploy CPLEE NE/10'
ARROW EAST - level
Align UHT shadow [ALSEP ant

2+26 Remove CCIG boyd bolt
Deploy SIDE SE/55'
Remove gnd screen & CCIG
Pos SIDE-deploy CCIG S/5'
Check dust cover corners
Pull dust cover pin
Level & align SIDE

MP 12-11-70

(1) CDR - REPORT C/S ERECTED
LMP - REPORT CPLEE DEPLOYMENT

LMP CDR
375 55%
43%
min

(1) CDR - REPORT MCC-CALL STOP
16mm CAMERA________
CHANGE MAG
FROM______TO___________
16MM CAMERA
START___________
(6 fps - 16 min)

(1) LMP - REPORT CCIG EMPLACED

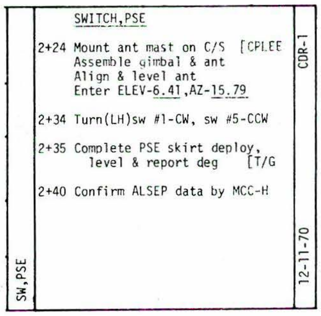
2+30

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	116 2+10 29	Carry PSE to leveling stool	■	THUMPER/GEOPHONE OFFLOAD	PSE OFFLOAD
Remove T/G Assembly from C/S	Deploy ALSEP				
Remove T/G from restraining Arm/Plate Assembly		Remove PSE girdle pin			
		Emplace PSE on stool(arrow west) Remove & discard PSE girdle			
Unfold T/G assembly, place on MET					
-2		16mm camera off & change mag			
MORTAR PACKAGE DEPLOYMENT Remove Mortar Package (M/P) from C/S	117 07	SUNSHIELD DEPLOYMENT Check sunshield (C/S) free of cables and other equipment		MORTAR PACKAGE DEPLOYMENT	SUNSHIELD DEPLOYMENT
Carry M/P to deploy site 10' W of C/S	117 05 1+05	Start front center & release sunshield Boyd Bolts CW-			
Remove carry socket pip pin		Unstow antenna cable			
Deploy two M/P legs		Release back Boyd Bolts			
Partially deploy M/P antenna					
Orient M/P toward NW		Release remaining perimeter Boyd Bolts			
Complete M/P antenna deployment	116 2+20 39 + 30 117 09				
CPLEE DEPLOYMENT Release three Boyd Bolts Remove CPLEE from C/S	117+10 -1	Restrain sunshield & release three center Boyd Bolts		CPLEE DEPLOYMENT	
Remove & discard carry socket pull pin		Control sunshield deployment use manual assist, if reqd, to raise sunshield			
	117+13	Remove & discard curtain covers & connect curtain corners	⑤		
	117 13	Recheck C/S level & aligned			
Place CPLEE on surface 10' NE of C/S Align & level CPLEE		ALSEP ANTENNA INSTALLATION Release antenna gimbal Boyd Bolts & lift gimbal from subpallet			ALSEP ANTENNA INSTALLATION
SIDE/CCIG DEPLOYMENT Release CCIG Boyd Bolt Engage UHT in SIDE carry socket		Retrieve antenna mast from subpallet		SIDE/CCIG DEPLOYMENT	
Carry SIDE to deployment site approximately 55' SE of C/S Remove & deploy SIDE Ground Screen		Install mast on C/S Remove gimbal housing cover			
Remove CCIG Place SIDE on ground screen		Install gimbal (aiming mechanism) on mast			
	2+30	Remove & discard gimbal housing			

14

116 49
30 min ext
117+19



SW,PSE

SWITCH,PSE

2+24 Mount ant mast on C/S [CPLEE
Assemble gimbal & ant
Align & level ant
Enter ELEV-6.41,AZ-15.79

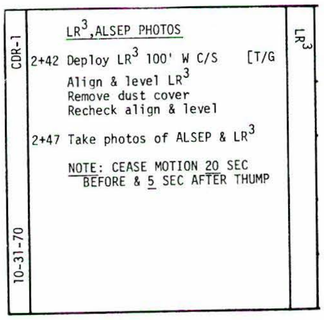
2+34 Turn(LH)sw #1-CW, sw #5-CCW

2+35 Complete PSE skirt deploy, level & report deg [T/G

2+40 Confirm ALSEP data by MCC-H

CDR-1

12-11-70



CDR-1

LR^3,ALSEP PHOTOS

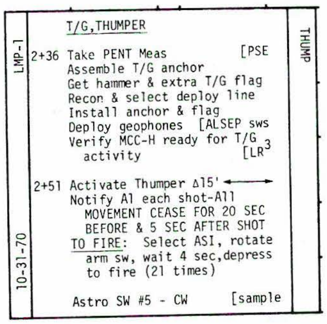
2+42 Deploy LR^3 100' W C/S [T/G
Align & level LR^3
Remove dust cover
Recheck align & level

2+47 Take photos of ALSEP & LR^3

NOTE: CEASE MOTION 20 SEC BEFORE & 5 SEC AFTER THUMP

10-31-70

LR^3



LMP-1

T/G,THUMPER

2+36 Take PENT Meas [PSE
Assemble T/G anchor
Get hammer & extra T/G flag
Recon & select deploy line
Install anchor & flag
Deploy geophones [ALSEP sws
Verify MCC-H ready for T/G activity [LR^3

2+51 Activate Thumper Δ15' ←——→
Notify A1 each shot-All MOVEMENT CEASE FOR 20 SEC BEFORE & 5 SEC AFTER SHOT
TO FIRE: Select ASI, rotate arm sw, wait 4 sec,depress to fire (21 times)

Astro SW #5 - CW [sample

10-31-70

THUMP

2+30

(1) CDR - REPORT ANTENNA SETTING
ELEV ______ AZ ______

(1) CDR - NOTIFY MCC FOR
SW 1 ACTUATE TO CW ____
(HOLDOFF RELEASE)

(8 MIN DELAY BEFORE
STARTING THUMPER)
REPORT SW 5 CCW (ARMED) ____

(1) LMP - REPORT SIDE LEVEL &
ALIGNMENT

(1) LMP - REPORT PENETROMETER
MEASUREMENTS

(1) CDR - REPORT PSE LEVELED &
ALIGNED GIVE ALIGNMENT
FROM COMPASS

2+40

(1) CDR - REPORT OR MCC CALL:
STOP 16MM CAM

(1) CDR - CONFIRM XMTR TURN-ON
AND DATA RECEIVED BY
GROUND

MCC - REPORT "GO" FOR THUMPER
ACTIVITY

(1) CDR - REPORT LR^3 SHADOW
ALIGNMENT & LEVEL
CONFIRM DUST COVER
REMOVED ____
REPORT 70MM MAG/EXP #____

(1) CDR/LMP - EMU CHECK

	CDR	LMP
O_2		
FLAGS		
PRESS		
COOL		

2+50

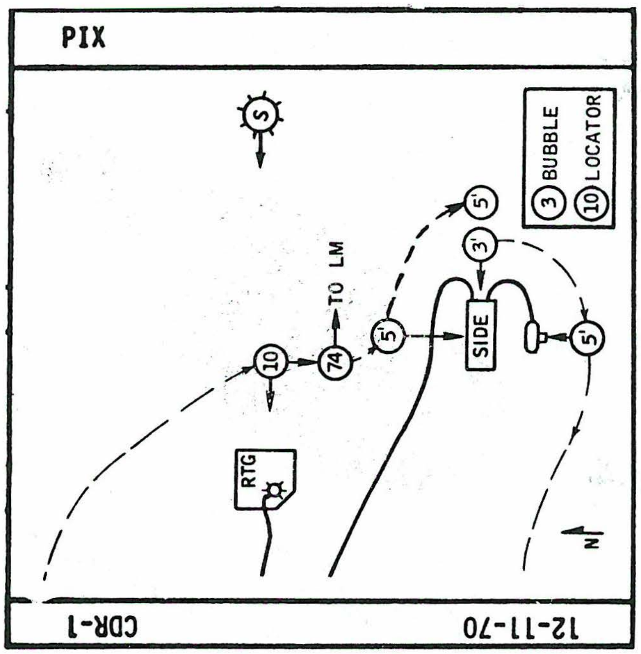
MISSION: APOLLO 14, H-3
EVA: 1

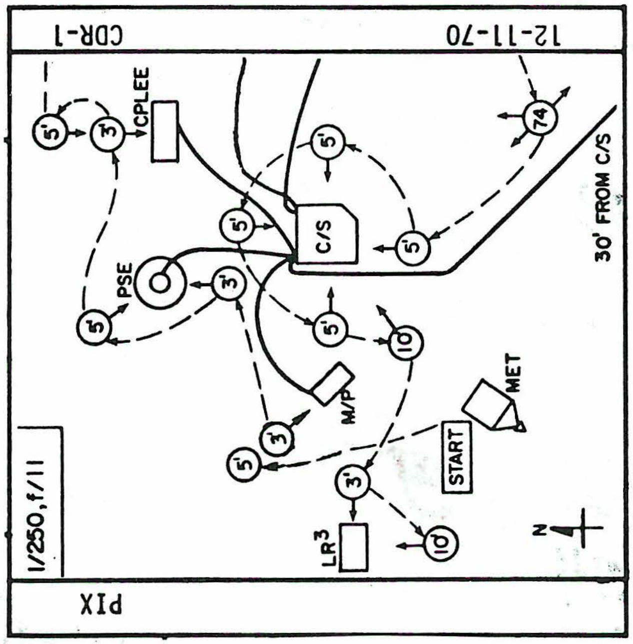
DATE: Dec. 31, 1970

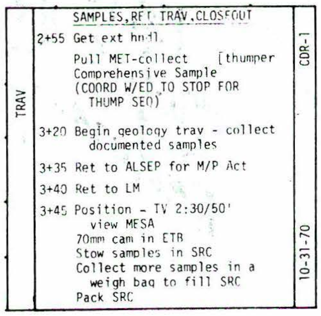
LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
Remove dust cover	117 +19 2+30				
		Install antenna on gimbal			
Implace & orient CCIG Check dust cover corners (free if reqd) Pull dust cover release pin Align & level SIDE		Check C/S level & alignment Align antenna Level antenna Enter ELEVATION 6.41 Enter AZIMUTH 15.79 Recheck aligned & leveled			
Report level & alignment	117 +25	Turn SW #1-CW, SW #5-CCW			
−1	117 24	PSE DEPLOYMENT			PSE DEPLOYMENT
Penetrome GEOPHONE DEPLOYMENT Assemble T/G anchor, T/G flag and ext handle. Take penetrometer rdg. Remove hammer from MET Recon & select deploy line SE of C/S	−5	Use UHT to deploy thermal shroud due to PLSS$_2$ consumables		GEOPHONE DEPLOYMENT	
Place T/G cable anchor in loop		Level PSE			
Retrieve thumper/geophone from MET	117 2+40 29	Report level & alignment			
		Confirm ALSEP data by MCC			
Walk to SE of C/S along deployment line					
		Deploy LR^3 100' W C/S			
Deploy Geophone Cable 10' SE emplace first Geophone					
Deploy Geophone Cable to 160' SE of C/S	117 ~~39~~ 43	−9 Level and align LR^3			
	117 34	Remove dust cover			
Emplace second Geophone & Marker Flag	JJ-6	ALSEP PHOTOGRAPHY Remove 70mm camera from MET			ALSEP PHOTOGRAPHY
Deploy Geophone Cable to 310' SE of C/S		Photo PSE Ask exp twice to Reduce Photos			
Emplace third Geophone Check Geophone Cable line		Photo Mortar Package			
	117 ~~52~~ 52	Photo CPLEE			
Confirm "ready" for thumper activity with MCC	117 2+50 39	−13			

5
26
31

E1K9







TRAV

SAMPLES,RET TRAV,CLOSEOUT

2+55 Get ext hndl

Pull MET-collect [thumper
Comprehensive Sample
(COORD W/ED TO STOP FOR THUMP SEQ)

3+20 Begin geology trav - collect documented samples

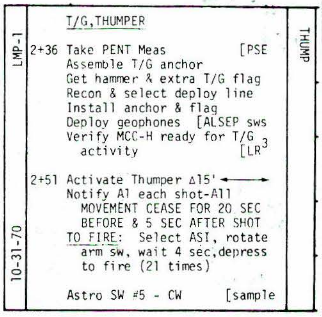
3+35 Ret to ALSEP for M/P Act

3+40 Ret to LM

3+45 Position - TV 2:30/50' view MESA
70mm cam in ETB
Stow samples in SRC
Collect more samples in a weigh bag to fill SRC
Pack SRC

CDR-1

10-31-70



LMP-1

T/G,THUMPER

2+36 Take PENT Meas [PSE
Assemble T/G anchor
Get hammer & extra T/G flag
Recon & select deploy line
Install anchor & flag
Deploy geophones [ALSEP sws
Verify MCC-H ready for T/G activity [LR^3

2+51 Activate Thumper Δ15' ←→
Notify Al each shot-All MOVEMENT CEASE FOR 20 SEC BEFORE & 5 SEC AFTER SHOT
TO FIRE: Select ASI, rotate arm sw, wait 4 sec,depress to fire (21 times)

Astro SW #5 - CW [sample

THUMP

10-31-70

2+50

MCC - GIVE GO FOR EACH THUMPER FIRING WHEN SEISMIC DATA IS QUIET; PROCEED WHEN DATA TAKE FOR EACH FIRING IS COMPLETE - NOMINAL 20 SEC BEFORE, 5 SEC AFTER.

(1) CDR - REPORT 70mm EXP#________

(1) THUMPER ACTIVATIONS

(0) 16 10 (1) __ __ (2) __ __
(4) __ __ (5) __ __ (6) __ __
(7) __ __ (8) __ __ (9) __ __
(10) __ __ (11) __ __ (12) __ __
(13) __ __ (14) __ __ (15) __ __
(16) __ __ (17) __ __ (18) __ __
(19) __ __ (20) __ __ (21) __ __

3+00

MCC - REPORT EVA EXTENSION FROM MCC WHEN GRANTED

3+10

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
117 -8	47 117 2+50 39 Deploy ALSEP				
THUMPER ACTIVITY Activate Thumper near third Geophone and at 15' intervals along cable back to C/S (total 21 times) Advise CDR of impending activations		Photo SIDE/CCIG Photo RTG & LM Photo Geophones & Thumper activity Photo C/S Pull MET		THUMPER ACTIVITY	
NOTE: Remain still, do not walk for 20 seconds before & 5 seconds after each thumper activation. Photograph & collect several sample.		Photo LR^3			
14	02	SAMPLES COLLECTION Pull MET to comprehensive sample area Collect comprehensive sample Ro			SAMPLES COLLECTION
	117 3+00 49				
47 24 18+[illegible]1	15 Min	Collect 4Kg soil sample			
	117 3+10 59				

E1K10

TRAV

SAMPLES,RET TRAV,CLOSEOUT

2+55 Get ext hndl

Pull MET-collect [thumper
Comprehensive Sample
(COORD W/ED TO STOP FOR
THUMP SEQ)

3+20 Begin geology trav - collect documented samples

3+35 Ret to ALSEP for M/P Act

3+40 Ret to LM

3+45 Position - TV 2:30/50'
view MESA
70mm cam in ETB
Stow samples in SRC
Collect more samples in a weigh bag to fill SRC
Pack SRC

CDR-1

10-31-70

3+10

(1) CDR/LMP - EMU CHECK

	CDR	LMP
O_2		
FLAGS		
PRESS		
COOL		

(1) LMP - REPORT ASTRO SW 5 CW (SAFE)___

(1) CDR/LMP - FRAME NO. RPT.
70mm CAMS
CDR________
LMP________

(1) CDR/LMP - DESCRIBE SAMPLES COLLECTED, RPT.
BAG NOS.______

DISCUSS LOCATIONS, DISPOSITION, REASON SAMPLES TAKEN, UNUSUAL FEATURES

3+20

(1) CDR/LMP - REPORT CLOSEUP CAMERA USAGE: ORIENTATION, FRAME NOS.

ORIENT	FRAME

3+30

J. BATES nn Arbor, Michigan

Date 11 February 1971 Letter No. 975-1936

To R. Miley

From C. Murtaugh

ubject Nominal vs Actual ALSEP-4 Deployment Time

The following tabulation was prepared in response to remarks that the ALSEP-4 deployment was slower than predicted, and impacted the EVA-1 time-line. In fact, the table shows that the total of 35 minutes slippage was due to the following: 15 minutes ALSEP, 14 minutes MET, and 6 minutes traverse plus site selection.

	Nominal Time		Actual Time		Slip		
	EVA Time	Increment	GMT	Increment	minutes	GET	
Open Hatch						114+19	
Open SEQ Bay Door	1+20		16:12			115+49	-10
		0:20		0:19	-01		
ALSEP OFF Load						116+20	-11
Start MET Loading	1+40		16:31			116+26	-2
		0:04		0:18	+14		
Start Traverse	1+44		16:49				
		0:~~08~~ 09		0:14	+06		
Start ALSEP Deploy						~~116+38~~	-3
Complete Traverse	1+52		17:03				
		0:58		1:06	+08 (1)		
Start ALSEP Deploy						116+38	
Start Thumping Activity	2+50		18:09				
		0:25		0:33	+08 (2)		-29
"AlSEP Alotted -		1+03		1+32			
Complete ALSEP/Start Geology	3+15		18:42			118+10	
TOTAL		1:55		2:30	+35		

Notes:
(1) SIDE Boyd Bolt blocked by compacted dust
(2) ASE Thumper misfire problems
3 SIDE/CCGE
4 PhotoS

Clyde Murtaugh
Clyde Murtaugh

CM:mlr

cc: P. Curry
ALSEP Managers
D. Fithian
J. McDowell
J. McNaughton
R. Redick
L. Marrus
H. Wilson
A. Micocci
R. Mercer
J. Harris

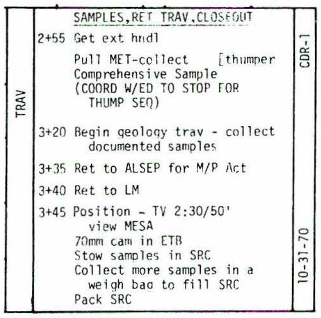
MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	117 3+10 59	Comprehensive Sample 15 Min			
should finish at 118 +11					
Astro SW #5 - CW					
Geology traverse to Doublet	118 04	Geology Traverse to Doublet			
	02				
NOTE: Length of traverse is dependent on time of EVA extension		Documented Sample Collection football size rock Sta (U)			
		Doublet			
	118 3+20 09	Sta U, V + W (a) (b) Only one Sta (c) Forget Doublet			
	15 Min	2 meters dia 1/3 way back to LM JJ 40 end 15 Rocks Same fines			
	18 3+30 19				

E1K11

CREW EVA CUFF CHECKLIST


TRAV

SAMPLES,RET TRAV,CLOSEOUT

2+55 Get ext hndl

Pull MET-collect [thumper
Comprehensive Sample
(COORD W/ED TO STOP FOR
THUMP SEQ)

3+20 Begin geology trav - collect
documented samples

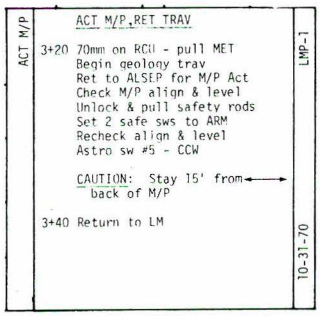
3+35 Ret to ALSEP for M/P Act

3+40 Ret to LM

3+45 Position - TV 2:30/50'
view MESA
70mm cam in ETB
Stow samples in SRC
Collect more samples in a
weigh bag to fill SRC
Pack SRC

CDR-1

10-31-70


ACT M/P

ACT M/P,RET TRAV

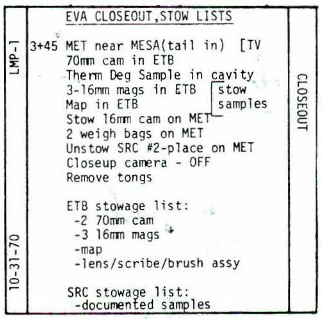
3+20 70mm on RCU - pull MET
Begin geology trav
Ret to ALSEP for M/P Act
Check M/P align & level
Unlock & pull safety rods
Set 2 safe sws to ARM
Recheck align & level
Astro sw #5 - CCW

CAUTION: Stay 15' from ←→
back of M/P

3+40 Return to LM

LMP-1

10-31-70


LMP-1

EVA CLOSEOUT,STOW LISTS

3+45 MET near MESA(tail in) [TV
70mm cam in ETB
Therm Deg Sample in cavity
3-16mm mags in ETB [stow
Map in ETB samples
Stow 16mm cam on MET
2 weigh bags on MET
Unstow SRC #2-place on MET
Closeup camera - OFF
Remove tongs

ETB stowage list:
-2 70mm cam
-3 16mm mags
-map
-lens/scribe/brush assy

SRC stowage list:
-documented samples

10-31-70

CLOSEOUT

VOICE DATA

3+30

FRAME NO. REPORT -
70MM CAMS
CDR________
LMP________

(1) CDR/LMP - DESCRIBE SAMPLES COLLECTED, REPORT BAG NOS. _ _ _ _
DISCUSS LOCATIONS, DISPOSITION, REASON SAMPLES TAKEN, UNUSUAL FEATURES

(1) CDR/LMP - REPORT CLOSEUP CAMERA USAGE: ORIENTATION, FRAME NOS.

ORIENT	FRAME

(1) LMP - REPORT FINAL-M/P ORIENTATION

3+40

(1) LMP - CONFIRM SW #5 CCW (ARMED)_____

(1) CDR/LMP - REPORT WHEN IN VICINITY OF LM

(1) CDR/LMP - REPORT FINAL FRAME #S ON 70MM CAM
CDR__________
LMP__________

3+50

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
RETURN TRAVERSE Retrieve 70mm cam from CDR Pull MET on traverse back to LM, select sample areas & samples. Photo samples with 70mm camera	3+30	15 Min in Doublet Area RETURN TRAVERSE Start traverse back to LM Select sample areas & collect samples. Football size 2/3 way back to LM 2 Mini Footballs in ETB		RETURN TRAVERSE	RETURN TRAVERSE
MORTAR PACK ACTIVATION Unlock safety rods Use UHT to hold Mortar Pack, pull safety rods Check M/P alignment Turn on two M/P SAFE/ARM SWS Recheck M/P orientation Turn on Astro SW #5 (CCW) Remove T/G cable anchor Place UHT on MET		14 Min in		MORTAR PACK ACTIVATION	
	118 3+40 29	DD 16MM unused			
EVA CLOSEOUT Pull MET near MESA Stow 70mm camera in ETB Stow thermal degradation samples in LGEC cavity Stow 16mm mags in ETB Stow 16mm camera on MET Remove 2 weigh bags from MESA & place on MET	118 34 118 34	= EVA CLOSEOUT Position TV to view MESA and ladder areas Stow 70mm Camera in ETB Stow documented samples in SRC #1 including 4 Kg bag of material		EVA CLOSEOUT	EVA CLOSEOUT
	118 3+50 39				

E1K12

CDR-1

SRC & ETB STOWAGE

SRC stowage:
-organic cont sample
-comprehensive sample
-documented samples
-addtl samples as reqd

Remove skirt-seal SRC

ETB stowage list
-2 70mm cam
-3 16mm mags
-map
-lens/scribe/brush

10-31-70

SRC/ETB

EVA CLOSEOUT & TERM

CDR-1

INGRESS

4+00 Clean & check EMU's(TONGS OFF)

Hand SRC to LMP [on ladder
Park MET in sun @ 45°(11/20')
[ingress
Cover SRC 2 with S-Band cover

Trans ETB up ⟷ [trans

Ascend to LM porch
Stow LEC ⟷ [LEC to Al
Hand SRC to Ed ⟷

4+11 Ingress

4+13 Repress

10-31-70

LMP-1

EVA CLOSEOUT,STOW LISTS

CLOSEOUT

3+45 MET near MESA (tail in) [TV
70mm cam in ETB
Therm Deg Sample in cavity
3-16mm mags in ETB [stow
Map in ETB [samples
stow 16mm cam on MET
2 weigh bags on MET
Unstow SRC #2-place on MET
Closeup camera - OFF
Remove tongs

ETB stowage list:
-2 70mm cam
-3 16mm mags
-map
-lens/scribe/brush

SRC stowage list:
-documented samples

10-31-70

ETB

EVA TERM,ETB TRANS

LMP-1

4+00 Clean & check EMU's
Ascend to mid-ladder
Place SRC on porch [hand-up
Ingress

Trans ETB up-stow ⟷ [trans
RH eng cover
Check LM systems

[ascent

Pass LEC to Al ⟷ [stow
Rec SRC from Al-stow
LH eng cover, end up

4+11 Assist Al [ingress

4+13 Repress

D-31-70

3+50

	CDR	LMP
O_2		
FLAGS		
PRESS		
COOL		

(2) LMP - REPORT CLOSEUP CAM OFF

4+00 (1) CDR/LMP - EMU CHECK

(1) CDR - CONFIRM COVER ON SRC AND MET AT 45°

(1) MCC - REQUEST CDR TO CAP TV IF REQUIRED

4+10

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	3+50				
		Collect additional samples to fill SRC #1 (put in bag separated from documented samples)			
		2ft D crater 130°-40' of LM Bag #1 in weigh bag Filling SRC			
		Close bag & place in SRC			
Unstow & place SRC #2 on MET		70MM Camera in ETB			
Turn closeup camera OFF		Pack, remove skirt, and seal SRC #1			
Remove tongs, place on tool carrier	4+00	Clean and check EMU's & remove tongs, place in pouch			
EVA TERMINATION Clean & check EMU's				EVA TERMINATION	
Ascend to middle ladder rung					
Place SRC on platform		Hand SRC #1 to LMP			
Ingress		Park MET in sun at 45 degree angle to sunline			
		Cover SRC & cameras with S-Band antenna thermal cover			
Trans ETB into LM, stow on LM ascent engine cover		Trans ETB into LM			
	4+10				

CREW EVA CUFF CHECKLIST

VOICE DATA

INGRESS

EVA CLOSEOUT & TERM

4+00 Clean & check EMU's(TONGS OFF)

Hand SRC to LMP [on ladder
Park MET in sun @ 45°(11/20')
[ingress
Cover SRC 2 with S-Band
cover

Trans ETB up ←→ [trans

Ascend to LM porch
Stow LEC ←→ [LEC to A1
Hand SRC to Ed ←→

4+11 Ingress

4+13 Repress

CDR-1

10-31-70

4+10

(1) CDR - REPORT HATCH CLOSURE &
REPRESS INITIATED

ETB

EVA TERM,ETB TRANS

4+00 Clean & check EMU's
Ascend to mid-ladder
Place SRC on porch [hand-up
Ingress

Trans ETB up-stow ←→ [trans
RH eng cover
Check LM systems

[ascent

Pass LEC to A1 ←→ [stow
Rec SRC from A1-stow
LH eng cover, end up

4+11 Assist A1 [ingress

4+13 Repress

LMP-1

10-31-70

MISSION: APOLLO 14, H-3
EVA: 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION	
				LMP	CDR
Pass LEC to CDR	4+10	Stow LEC on platform Pass SRC into A/S			
Receive & stow SRC on left side ascent engine cover, end up		Ingress *			
Assist CDR		Close hatch			
		Repressurize cabin			
END EVA 1		*From this point on, procedures governed by "LUNAR SURFACE CHECKLIST"			END EVA 1
	4+20				
	4+30				

3.2.2 EVA 2

The detailed timeline procedures for EVA 2 are shown on the following vertical format sheets, with the corresponding crew cuff checklist pages facing. The Voice Data Plan is also included on the facing page.

Detail sampling and related procedures during the traverse are in Section 3.2.3, with those pages of the cuff checklist which serve as a guide for the crew while doing these procedures.

CDR

10-31-70

DISTANCE ESTIMATION

If LM top to pad:

Wide as Earth - 620 ft.

Eclipsed by thumb - 350 ft.
(arm's length)

If LM cluster to cluster:

Wide as Earth - 350 ft.

Eclipsed by thumb - 200 ft.
(arm's length)

If Ascent Stage - top to interface:

Wide as Earth - 280 ft.

Eclipsed by thumb - 160 ft.
(arm's length)

DIST

EVA 2

CODE

(1) MANDATORY REQUIREMENT FOR DATA AT TIME OR EVENT DESIGNATED

(2) DATA MAY BE DEFERRED UNTIL LATER IN EVA OR DEBRIEFING

NOTE

SUN ANGLE ≈ 23° AT START OF EVA 2

(1) CDR/LMP - EVA WATCH START - MARK

NOMINAL TIMELINE

LUNAR SURFACE EVA 2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
PRE-EGRESS OPERATIONS	131 0+00 48	PRE-EGRESS OPERATIONS		PRE-EGRESS OPERATIONS	PRE-EGRESS OPERATIONS
START EVA WATCH		START EVA WATCH (CALL "MARK")			
		NOTE: DETAILED PROCEDURES ARE PRESENTED IN "LUNAR SURFACE CHECKLIST," "EQUIPMENT PREP EVA 2" SECTION			
	35 min				
OPEN HATCH	131 0+10 58	EGRESS			

```
CDR-2                CDR - EVA 2                          EGRESS

           EGRESS, FAM, MET LOAD
      0+10 Jett bag ◄────────►        [hand out
           Pass LEC to Ed ◄───►       [hook up
           Descend

      0+16 Re-fam                     [load ETB
           Trans ETB dn ◄────────►    [trans

      0+21 MET near MESA (head in)
           SRC to MESA-secure & open
           Stow on MET:
            -2 weigh bags w/hooks (HTC)
            -MSSC (ACC pouch)
            -35 Bag Dispenser (HTC)
            -3 core tubes & cap assy
           Leave SESC in SRC
           Seal Organic Sample
           Stow SWC bag on MESA
10-31-70
```

```
MET        MET STOWAGE CHECK
TRAV
           -BSLSS                     [MET load     CDR-2
      0+26 -ext hndl & 2 tongs
           -2 core cap assys          *(1)
           -tether & gnomon
           -hammer
           -small scoop
           -6 core tubes              *(3)
           -1 35 bag dispenser        *(1)
           -trench tool               *
           -16mm cam & 2mags(CEX)     *(3)
           -2 SESC, MSSC              *(1)
           -2 70mm cam & 1 mag(HBW)*(3)
           -closeup cam (turn on)
           -6 weigh bags(2 in HTC)    *(2)
           -MESA brush                *
           -TDS                       *(2)
           -Polar Filter (acc pouch)
           -map                                     10-31-70
```

```
LMP-2                LMP - EVA 2                          ETB

           ETB TRANS

      0+10 Assist A1                  [egress
           Hand jett bag to A1 ◄────►
           Hook up LEC ◄────────►[hand in

      0+15 Check ETB
            -2 70mm cam (HBW)
            -70mm mag (HBW)
            -3 16mm mags (CEX)
            -map
            -BSLSS
            -Polar Filter

      0+18 Trans ETB dn ◄────────►[trans
           Verify CB config & VOX sens
                                      [MET load
10-31-70
```

```
MET        MET LOAD,LPM
A&B   0+21 Move thru hatch & close                  LMP-2
           Descend & re-fam   [open SRC
      0+26 Stow on MET:
            -2 70mm cam (HBW)
            -70mm mag (HBW)
            -3 16mm mags (CEX)-1 on cam
            -16mm cam on staff
            -map (in HTC)
            -trench tool
            -MESA brush
            -TDS (acc pouch)
            -polar filter (acc pouch)
            -BSLSS
           MET to SEQ bay
      0+30 Remove LPM pallet to MET
           Sensor & tripod to A1 [assist
           Stow elec & reel on MET
           Read & Report temp labels
           Turn elec ON - uncage meters             10-31-70
```

0+10

(1) MCC - REQUEST CDR TO UNCAP TV IF REQUIRED

22° Sun angle

15' Astro shadow
50' LM

(1)

0+30

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
Assist CDR	0+10 131+58	Move through hatch			EGRESS
Hand jettison bag to CDR		Jettison bag (if necessary)			
Receive and hook up LEC		Pass LEC to LMP			
		Descend to surface			
Load ETB: (unless already done) -70mm cam & 1 mag (HBW) 2 -3 16mm mags (CEX)					
-Traverse Map -BSLSS -Polar Filter		FAM/ETB TRANSFER Recheck stability and mobility			FAM/ETB TRANSFER
Assist CDR		Transfer ETB to surface			
Prepare for egress: verify CB configuration & VOX sensitivity		Stow ETB on MESA			
	0+20 132+08 132 01 +7				
EGRESS Move through hatch		MET LOAD Move MET near MESA Place & secure SRC 2 on MESA		EGRESS	MET LOAD
Close hatch		Open SRC Stow SRC equipment on MET: -2 weigh bags with hooks -SESC -35 bag dispenser -3 core tubes and cap assy -Magnetic Sample Container			
Recheck mobility and stability		Seal Organic Sample			
MET LOAD ASSIST Stow cameras & maps on MET -70mm Cam & 1 mag 2 Cams -16mm Cam & 2 mags	35mm	SWC Bag on MESA Check MET stowage list (on Cuff Ck List)		MET LOAD ASSIST	
Stow BSLSS under HTC Stow map in HTC pouch Stow trenching tool on MET Stow MESA brush in HTC Stow Thermal Degradation Bag in pouch Pull MET to SEQ Bay	0+30 132+18				

16MM FF storage
16MM-HH
70MM ~~HH~~ MET Storage

E2K2

CDR-2

TRAVERSE

0+30 Go to SEQ Bay [pos MET
Sensor on tripod (#1) remove pallet
Stow assy on MET [stow elec

0+35 Report start of trav & take
photo of LM (@ 200 ft)

TRAV
MET

10-31-70

A
B

STATION A - 25 min

1. TDS-mate scoop & ext hndl
   Ready MESA brush
   Unstow TDS & unbag
   Take closeup photo 1 side
   Sprinkle dust on sample
   Shake TDS
   Closeup photo both sides
   Brush off sample
   Close-up photo both sides
   Fold TDS & re-bag
   Unstow 2nd TDS
   Sprinkle dust on sample
   Shake TDS
   Closeup photo both sides
   Fold TDS & re-bag
   Ed-LPM

CDR-2

10-31-70

LMP-2

LPM, BEGIN TRAV

0+35 Pull MET-begin trav
(opt) 16mm cam,on f5.5,500,6FPS]

STATION A - 25 min

1. Deploy LPM for point meas
   Photo tripod-tether tongs
   After 60 sec read meters
   (X,Y,Z) 3X
   Repeat meas for pos 2 & 3
   Rewind cable & stow LPM
   Al-TDS & MET track photos
2. Ed-take pan
   Al-Describe site
3. Take samples & dbl core

STATION B - 7 min

1. Pan
2. Samples

A&B
MET

10-31-70

0+30

CHECK TV FOV BEFORE STARTING OF TRAVERSE

(1) CDR - REPORT

START TRAVERSE ____:____:____

(1) CDR - REPORT CLOSEUP CAMERA ORIENTATION & FRAME NO. COMMENT ON TRACK DEPTH, MECHANICAL CHARACTERISTICS, BOTH MET AND SELF

ORIENT	FRAME
____	____
____	____
____	____
____	____

0+40

(1) CDR - REPORT REACHING STATION A

____:____:____

(1) CDR - REPORT CLOSEUP CAMERA FRAME NOS.

TDS S/N		TDS S/N	
____	305	____	____
	____		____
	____		

(1) LMP - X, Y, Z READINGS (3 TIMES)

	1	2	3	SW
X	9.6	9.6	9.6	Hi
Y	4.2	3.8	3.7	____
Z	7.3	6.7	6.5	____

0+50

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
MAGNETOMETER OFFLOAD	132 0+30 18	MAGNETOMETER OFFLOAD		MAGNETOMETER OFFLOAD	MAGNETOMETER OFFLOAD
Offload Lunar Portable Magnetometer (LPM) pallet from LM Unstow & hand tripod & sensor to CDR Stow cable reel on MET Report LPM temp. Stow electronics on MET Uncage meters & turn on electronics		Move to SEQ Bay Receive LPM tripod & sensor from LMP, mount sensor on tripod Stow tripod/sensor on MET MET TRACK & FOOTPRINT EVALUATION Place 70mm Cam on RCU Pick up closeup camera			
Discard pallet	1 132 23				
TRAVERSE BEGINS Go to Station A (1300 Ft) Rate: 4 fps	132 25 −2	TRAVERSE BEGINS Go to Station A ~~(1300 Ft)~~ ~~Photo MET tracks with both cams~~ ~~Comment on track depth, mechanical characteristics~~ REPORT CLOSEUP CAM ORIENT, FRAMES	■	TRAVERSE BEGINS	TRAVERSE BEGINS
REST	0+40	Comment on prints, depth, mechanical characteristics			
STATION A	132 28 132 34 −6	STATION A			
LPM POINT MEASUREMENT 35 Unstow cable reel Unstow sensor/tripod Move sensor to site 35 ft away Erect tripod, check sensor orientation (#1, facing downsun) Align & level sensor/tripod Move to MET (electronics) Photo tripod/sensor (localization shot--pick up landmark) Report X,Y,Z readings (repeat 3 times) Return to sensor		TDS EXPERIMENT 37 Assemble small scoop & Ext. Hndl Take out MESA brush & TDS bag Take out 1st TDS 2 ~~lay~~ flat on MET table Take closeup cam shot, 1 side Sprinkle dust on sample & shake off excess Take closeup cam shot, both sides Brush off sample with MESA brush (get as clean as possible) Take closeup cam shot, both sides Fold sample and rebag Take out 2nd TDS, lay flat on MET - Sprinkle & shake Take Closeup Cam shot, both sides 31 Fold sample and rebag. Stow in HTC pouch		STATION A LPM POINT MEASUREMENT	STATION A TDS EXPERIMENT
Reorient sensor to #2 position	0+50 132 + 38				

E2K3

CDR-2

2. A1-MET track & footprint eval & photos
3. A1-site description
   Ed-pan
4. Take samples & dbl core

Station B - 7 min
1. Pan
2. Samples

10-31-70

B
A

LMP-2

LPM, BEGIN TRAV

0+35 Pull MET-begin trav
(opt) 16mm cam,on(f8,500,6FPS)

STATION A - 25 min
1. Deploy LPM for point meas
   Photo tripod-tether tongs
   After 60 sec read meters
   (X,Y,Z) 3X
   Repeat meas for pos 2 & 3
   Rewind cable & stow LPM
   A1-TDS & MET track photos
2. Ed-take pan
   A1-Describe site
3. Take samples & dbl core

STATION B - 7 min
1. Pan
2. Samples

10-31-70

A&B
MET

0+50

(1) LMP - REPORT X, Y, Z
READINGS (3 TIMES)

	1	2	3	SW
X	1.1	1.1	1.1	Hi
Y	3.7	4.0	3.9	
Z	4.0	3.7	3.6	

(1) LMP - REPORT X, Y, Z
READINGS (3 TIMES)

X	1.0	1.0	1.0	Hi
Y	8.0	8.1	8.1	
Z	6.6	6.6	6.65	

(1) LMP - REPORT TUBE NUMBERS
AND ORDER
INSERTION FORCE

TOP_____ BOTTOM_____

(1) CDR - COMMENT ON SOIL
CHARACTERISTICS WHILE
DRIVING TUBES

1+00

(1) LMP - COMMENT ON TUBE WITHDRAWAL
REPORT CONDITION OF BIT IF HARD
OBJECT ENCOUNTERED

(1) CDR - (IF TAKE CLOSEUP CAM) REPORT
FRAME NO. AND ORIENT

_____ _____

(1) CDR/LMP - EMU CHECK: REPORT
FRAME NOS. 70MM CAM ___ ___

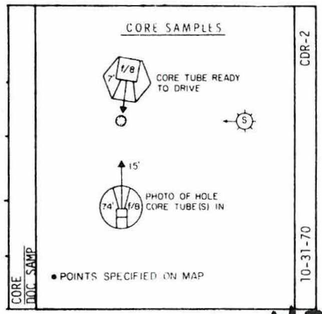
(1) CDR/LMP - GIVE MARK WHEN TRAVERSE
COMMENCES: ESTIMATE AND
REPORT RATE OF TRAVEL,DESCRIBE
GAIT

1+10

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
Recheck sensor aligned & leveled	0+50 132 38	Photo Panorama Site Description			
Return to MET					
Report X,Y,Z readings (repeat 3 times)		Collect Sample(s)			
Return to sensor Reorient sensor to #3 position		Note: CDR omits down-sun "before" photo			
Recheck aligned and leveled					
Return to MET					
Report X,Y,Z readings (repeat 3 times)	Sta @ 27m				
Stow sensor/tripod on MET Rewind cable, stow on MET					
21 Min For LPM					



• POINTS SPECIFIED ON MAP

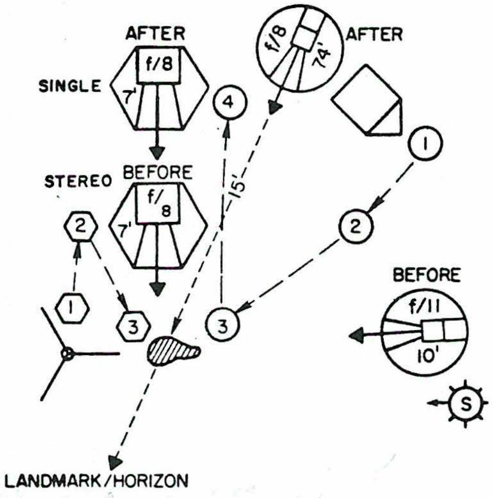
LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
DOUBLE CORE Assemble tubes	1+00 48	DOUBLE CORE {#3 Top #2 bottom Place gnomon Ready hammer		No Tab DOUBLE CORE	DOUBLE CORE
Hold upright on surface					
		Take Stereo pr XSUN, f:8, 7ft Drive tubes into surface with hammer blows			
Photo tubes in ground & horizon or landmark XSUN f:8, 15 ft, focus 74 ft		Stow hammer Tubes 7 + 8			
		Stow or hold gnomon			
Remove tubes, disassemble, cap & stow tubes in HTC Report tube numbers & order		Assist as required Take closeup cam picture of hole (options)			
Tether tongs - start 16mm cam 1 fps @ 1/500	133+06 (−11)				
Pull MET	55	GIVE MARK WHEN STARTING			
GO TO STATION B (700 ft)		GO TO STATION B (700 ft)		GO TO STATION B	GO TO STATION B
Assumed rate: 4 fps	03	Assumed rate: 4 fps			1408
	1+10 132+58				

E2K4

CDR-2

10-31-70

SINGLE SAMPLE



DOC SAMP
CORE

CDR-2

10-31-70

GENERAL TRAV INFO

Report:-time to each site
-movement & direction
-location wrt LM
-photos beside nominal
-sample bag numbers
-core tube numbers

SPECIAL PHOTOS
MET eval:
-Wheel track & footprint in LM area
-Wheel track & footprint if sinkage is 2-3 & $\geq$4 inches

-Motion on various surfaces & dust cloud eval
DAC(f8, 1/250,24 fps)
-Closeup cam photo of wheel track & footprint

TRAV INFO
F&G

1+10 CDR/LMP - GIVE MARK ON REACHING STATION
(1) CDR/LMP - SITE DESCRIPTION
SAMPLE DESCRIPTION

(1) CDR - REPORT SAMPLE BAG NOS.

____

____

____

____

____

____

____

____

____

____

____

____

1+20 (1) CDR - REPORT REACHING BEND AREA
(1) CDR/LMP - EMU CHECK, REPORT FRAME
NOS. 70MM CAMERAS ______ ______

(2) - CDR/LMP - REPORT ON TERRAIN
ROUGHNESS

NOTE: IF IMPOSSIBLE TO PULL MET

CARRY - EXT HANDLE
SMALL SCOOP
2 TONGS
GNOMON
2 70MM CAMERAS
POLAR FILTER
WEIGH BAGS WITH CLIPS
(FLAT BAGS)

1+30

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES		EVA TIME		CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	133		14	−16			
STATION B Photo panorama Site description Sample collection	132	1+10	58	STATION B ~~GIVE MARK~~ ON REACHING STATION SAMPLE COLLECTION No apparent contact		STATION B	STATION B
	133		18	−15			
	133		05				
GO TO BEND AREA (700 FT) Assumed rate 4 fps	133		08	GO TO BEND AREA (700 FT) Assumed rate 4 fps	▮	GO TO BEND AREA	GO TO BEND AREA
BEND AREA Photo pan		1+20		BEND AREA Site Description		BEND AREA	BEND AREA
GO TO N SIDE, STA D (800 FT) Assumed rate 2 fps				GO TO N SIDE, STA D (800 FT) Assumed rate 2 fps	▮	GO TO N SIDE, STA D	GO TO N SIDE, STA D
REST				REST	▮		
	133	1+30	18				

07 Sta B

020 Sta or Cone Rim

E2K5

CONE
D&E

CONE CRATER - 30 min

1. Pan on arrival
2. Collect rocks & soil on rim
   Look for contacts-sample each side-sample rock trails
3. If time do polar near-far
4. If time do far polar >100 ft from 1st then discard filter, reset cam 1/250
5. Go SE around rim
6. Take 24fps movie: (1 mag)
   - Kick boulders into crater
   - Crew walk around & pose
   - Pan cam to W and LM
7. Do EVA Comm - Al behind big boulder, Ed document

CDR-2

10-31-70

CDR-2

10-31-70

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

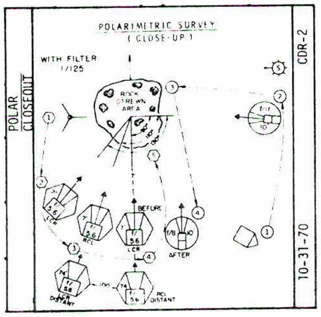
STATION D - FLANK - 7 min

Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8 LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

D&E
CONE



1+30

(2) CDR/LMP - REPORT ON TERRAIN ROUGHNESS

(2) CDR/LMP - REPORT ON GRADE CHANGES, ROUGHNESS GRADIENTS

(1) CDR/LMP - EMU CHECK
FRAME NOS. 70MM
CAMERAS

1+40

(1) CDR/LMP - REPORT BAG NOS.

1+50

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

133 18

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
STATION D	1+30	STATION D Flank 30-40			
REST		REST 10			
GO TO CONE CRATER RIM (800 FT) Assumed rate: (2 fps) 1/2 fps	20 to Rim	GO TO CONE CRATER RIM (800 FT) Assumed rate: 2 fps		GO TO CONE CRATER RIM	GO TO CONE CRATER RIM
REST		REST Head 30-40			
CONE CRATER RIM		CONE CRATER RIM		CONE CRATER RIM	CONE CRATER RIM
Photo pan C'		Site Description			
Sample Collection	1+40 30 minutes	Sample Collection			
Proceed to S Side of Cone rim		Proceed to S Side of Cone rim			
taking samples		taking samples			

133+28
+30 ext.
133+58

Note: Perform Polarimetric Survey (HD)
(15 minutes)

1+38

1+50

134 08

1+50

(1) CDR/LMP - REPORT FRAME NOS.
70MM CAMERAS

(1) CDR - DESCRIBE BOULDER TRACKS,
SAMPLES TAKEN
(IF PERFORMED)

(1) CDR - POLARIMETRIC SURVEY
DESCRIPTION

FILTER ORDERS

	CLOSEUP	DISTANT
90		
110		
130		

(1) CDR - REPORT WHEN BOULDERS
ROLLED

2+00

(1) CDR - MARK & COUNT UP
FOR EVA COMM

(1) CDR - REPORT LEAVING CONE

2+10

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	134 1+50 08				
Sample boulder tracks (Use closeup Cam)		Sample boulder tracks			
Note: Take 2nd Set distant polarimetric photos 100 ft or more from 1st Set. Then remove & discard Polar Filter - Reset Cam 1/250 (HD)					
Take 16mm movie @ 24 FPS-- Crew movement, boulders rolling		Roll Boulders into crater	█		
Take movies west to LM & sunrise crater			█		
	2+00				
EVA COMM EVALUATION		EVAL COMM EVALUATION		EVA COMM EVALUATION	EVA COMM EVALUATION
		Go behind Large boulder so no line of sight to LM Count up while proceeding behind boulder			
Document CDR position WRT LM & Boulder with partial pan as required					
Final Photo Panorama		Site Description			
GO TO STATION D (850 FT)		GO TO STATION D (850 FT) C-1		GO TO STATION D	GO TO STATION D 2+08
Assumed rate: 2 fps		Assumed rate: 2 fps			
	2+10				

30 min at cone

15 min extension would be added here

134 28

CDR-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK - 7 min

Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

D&E CONE

2+10

(1) CDR - NOTIFY MCC WHEN RESTING

(1) CDR - REPORT REACHING STATION D

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES-
REPORT SAMPLE BAG NOS.

______

2+20 ______

______

______

______

______

______

(1) CDR - REPORT LEAVING STA. D

(1) CDR - NOTIFY MCC WHEN RESTING

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS.
70MM CAMERAS ______ ______

2+30

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
134	2+10	28			
		07			
REST		REST			
Note: If possible collect some rocks & soil along patch to D - radial sample					
STATION D		STATION D		STATION D	STATION D
Photo Panorama Sample Collection		Site Description Sample Collection			
		Sta D 08			
	2+20				
Go to Station E (1050 ft) Assumed rate: 2 fps		Go to Station E (1050 ft) Assumed rate: 2 fps		Go to Station E	GO to Station E
REST		REST			
	2+30				

E2K8

134+48

LMP-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK 7 min

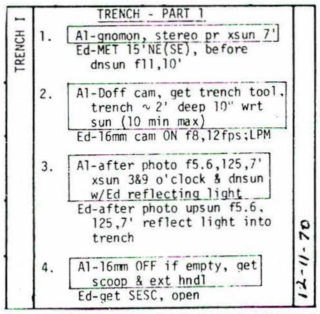
Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

D&E CONE

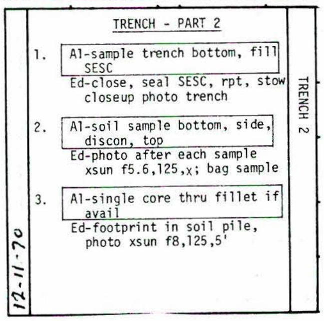


TRENCH I

TRENCH - PART 1

1. Al-gnomon, stereo pr xsun 7'
   Ed-MET 15'NE(SE), before dnsun f11,10'
2. Al-Doff cam, get trench tool, trench ~ 2' deep 10" wrt sun (10 min max)
   Ed-16mm cam ON f8,12fps;LPM
3. Al-after photo f5.6,125,7' xsun 3&9 o'clock & dnsun w/Ed reflecting light
   Ed-after photo upsun f5.6, 125,7' reflect light into trench
4. Al-16mm OFF if empty, get scoop & ext hndl
   Ed-get SESC, open

12-11-70



TRENCH 2

TRENCH - PART 2

1. Al-sample trench bottom, fill SESC
   Ed-close, seal SESC, rpt, stow closeup photo trench
2. Al-soil sample bottom, side, discon, top
   Ed-photo after each sample xsun f5.6,125,x; bag sample
3. Al-single core thru fillet if avail
   Ed-footprint in soil pile, photo xsun f8,125,5'

12-11-70

2+30

(1) CDR - REPORT REACHING STATION E

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS.
70MM CAMERAS ______ ______

(1) CDR/LMP - SITE DESCRIPTION

(1) LMP - VERIFY 16MM CAM RUNNING

(1) CDR - COMMENT ON SOIL BEHAVIOR, EASE OF DIGGING, DIRECTION AND AMOUNT OF DUST FLYUP, HARD OBJECTS ENCOUNTERED, LAYERING IN MATERIAL AS DEPTH INCREASES

2+40

(1) LMP - REPORT X, Y, Z READINGS (3 TIMES)

				SW
X	____	____	____	____
Y	____	____	____	____
Z	____	____	____	____

(1) LMP - VERIFY 16MM CAM STOP

(1) CDR - REPORT SESC COLLECTION _____

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN, REPORT BAG NOS.

2+50

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+30				
	11				
STATION E		STATION E			
Train 16mm cam on prospective trench site; turn on (6 FPS)		SOIL MECHANICS "Deep Trench"	▮	STATION E LPM MEASUREMENT (single)	STATION E SOIL MECHANICS
LPM MEASUREMENT (single) Unstow cable reel Unstow sensor/tripod		Assemble trenching tool to extension handle Dig trench, 10° off downsun	▮		
Move sensor to site 35 ft away			▮		
Erect tripod, check sensor orient, #3 facing downsun			▮		
Align & level sensor/tripod	25 min		▮		
Move to MET (electronics)			▮		
Photo tripod/sensor(localization shot)	2+40		▮		
Report X,Y,Z readings (repeat 3 times) IF NOT DISCARDED Return to sensor and pick up Stow sensor/tripod on MET Rewind cable, stow on MET	STA E		▮		
Go to downsun position, edge of trench (act as reflector) Take upsun shot, trench interior		Take stereo prs both sides & downsun of trench interior	▮		
Take stereo pr footprint Photo bottom of trench with close-up camera		Make bootprint in fill	▮		
Special Environmental Sample (fines from bottom of trench)		Special Environmental Sample (fines from bottom of trench)	▮		
Sample sides, top, discontinuities		Sample sides, top, discontinuities			
	2+50				

E2K9

F&G
TRAV INFO

CDR-2

STATION F - WEIRD - 17 min

1. Pan - Superimposed craters
2. Samples
3. Triple core
4. If time - 7-radial Sample

STATION G - TRIPLET - 7 min

1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

10-31-70

2+50

(1) CDR - REPORT LEAVING STATION E

3+00

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS. ____ ____

(1) CDR - REPORT REACHING STATION F

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN,
REPORT BAG NOS.

3+10

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+50				
Note: If 5 minutes ahead or extension to EVA, take a single core sample					
	Sta E 25 min				
Photo panorama					
GO TO STATION F (1050 FT)		GO TO STATION F (1050 FT)		GO TO STATION F	GO TO STATION F
	3+00				
Assumed rate: 4 fps	Traverse 06	Assumed rate: 4 fps			
REST		REST			
STATION F Photo Panorama		STATION F Site Description		STATION F	STATION F
Sample Collection	Sta F 15	Sample Collection			
	3+10				

F&G
CORE

STATION F - WEIRD - 17 min
1. Pan - superimposed craters?
2. Samples
3. Triple core
4. If time - 7 radial Sample

STATION G - TRIPLET - 7 min
1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

LMP-2

10-31-70

(HD) LPM MEASUREMENT

				SW
X				
Y				
Z				

(HD) GASC ________
SESC ________

3+10

(1) LMP - REPORT NOS AND
ORDER OF TUBES
EFFORT REQUIRED TO
EMPLACE IN SURFACE

TOP____MIDDLE_____ BOTTOM_____

(1) CDR - COMMENT ON EFFORT,
METHOD OF DRIVING
TUBES INTO SURFACE

(1) LMP - COMMENT ON BIT
ABRASION
REPORT IF 3RD TUBE
HAS ANY CORE IN IT

(1) CDR/LMP - CSC - FRAME_____ ORIENT_____

MCC - IF NOT, INSTRUCT LMP
TO SALVAGE A BIT AND
RESTORE TO EMPTY TUBE
FOR POTENTIAL USE

3+20

(1) CDR - REPORT LEAVING STA F,
ARRIVAL STA G

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS _____ _____

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES
REPORT BAG NOS

____

____

____

____

(1) CDR - REPORT LEAVING STATION G

3+30

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
TRIPLE CORE SAMPLE	3+10	TRIPLE CORE SAMPLE		TRIPLE CORE SAMPLE	TRIPLE CORE SAMPLE
Note: If 14 min. ahead or extension to EVA, perform DIAMETRIC SAMPLE: 7 rock/soil samples across a crater and ejecta blanket, with 2 partial pans to document					
	Site E move 15 min	No 1 Core Tube as Single on Aborted 3 Core			
Place bit in sample bag		If extension of time - Go to G-1			
GO TO G (500 FT) Assumed rate: 4 fps	3+20 Traverse 02	GO TO G (500 FT) Assumed rate: 4 fps		GO TO G	GO TO G
STATION G		STATION G or G-1			
Photo Panorama 134	51	Site Description		STATION G	STATION G
Sample Collection Fill weigh bags		Sample Collection Fill weigh bags			
Note: For each 5 minutes over nominal EVA time (1) collect Gas Sample (2) Make 3rd LPM measurement (discard electronics; read tempilabel after measurement) (3) Collect Magnetic Sample (4) Collect extra football-size rock					
GO TO LM (775 FT) Assumed rate: 4 fps	3+30	GO TO LM (775 FT) Assumed rate: 4 fps		GO TO LM	GO TO LM

3+20
2 08
1+12
+32

E2K11

CDR-2

10-31-70

CONTAM SAMPLE, CLOSEOUT

[MET to MESA

3+34 Small scoop, ext hndl, [SESC
gnomon, sample under
Quad III-into SESC [close
(photo before/after)
Discard scoop-keep ext hndl

Stow in ETB: [ETB load
- 70mm mag
- TDS
- MSSC
- map
- weigh bags (as reqd)

Stow in SRC: (stowage list)
- 2 SESC's
- 6 core tubes (if used)
- documented samples (in weigh bag)
- extra samples (fill SRC)

CLOSEOUT POLAR

CLOSE

CONTAM SAMPLE, CLOSEOUT

3+34 MET Near MESA(tails in)
Get SESC(in SRC) & open
Photo sample area
under Quad III(In sun)
Close SESC-stow in ETB

Stow in ETB: [ETB & SRC load
- 1 70mm cam
- 1 70mm mag
- 3 16mm mags
- close-up cam film(adv film 3X & remove cassette)
- SWC(Get SWC, bag & seal)
- extra sample stowage bags

ETB Stowage list:
- contam sample
- 1 70mm cam
- 2 70mm mags

LMP-2

10-31-70

3+30 (1) CDR - REPORT LEAVING STATION G

(1) CDR - REPORT REACHING VICINITY OF LM

(1) CDR/LMP - EMU CHECK

3+40

(1) LMP - REPORT RETRIEVAL SWC

3+50

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	3+30				
AT LM		AT LM			
Contaminated Sample Collection Park MET at MESA, take Contam Samp SESC		Contaminated Sample Collection Connect small scoop/ext handle		Contaminated Sample Collection	Contaminated Sample Collection
Take 70mm Cam Shot Dn Sun		Move to Quad III with gnomon Place under Quad Take Stereo pr XSUN			
Open Contam SESC		Collect sample (fines) from under Quad III Place sample in SESC			
Close & Seal SESC - Stow in ETB		Photo XSUN sample location			
EVA CLOSEOUT Remove 70mm Cam and Stow in ETB	3+40	EVA CLOSEOUT Remove 70mm Cam, Advance 3 times, remove mag. Stow mag in ETB		EVA CLOSEOUT	EVA CLOSEOUT
Stow spare mag (70mm) in ETB					
Remove mag from 16mm Cam Stow 3 16mm mags in ETB		Open SRC 2 Stow 6 core tubes in SRC			
Check-all mags in ETB					
Retrieve SWC foil		Stow bagged documented samples in 1 weigh bag			
Stow SWC in bag, put bag in ETB					
		Stow bag in SRC Stow SESC & GASC in SRC			
Assist CDR	3+50	Stow other samples (if any) collected on traverse in			

E2K12

SRC

SRC CLOSE

Remove skirt-close & seal SRC

ETB stowage list:
- -contam sample
- -1 70mm cam
- -2 70mm mags
- -3 16mm mags
- -close-up cam film
- -SWC
- -TDS
- -MSSC
- -map
- -weigh bags (as reqd)
- -extra sample stowage bags

CDR-2

10-31-70

CDR-2

10-31-70

3+58 Discard tongs
Clean & check EMU's [ascent
SRC to ED [on porch
[ingress
Trans ETB up [trans

Check LM Dock Light [turn on

4+06 Ascend to porch
Discard LEC [LEC to A1
SRC to ED
Ingress

4+13 Repress

ASCENT

LMP-2

10-31-70

ETB & SRC STOWAGE CHECK

- -3 16mm mags
- -close-up cam film
- -SWC
- -TDS
- -MSSC
- -map
- -weigh bags(as reqd)
- -extra sample stowage bags

SRC stowage list:
- -2 SESC
- -6 core tubes (if used)
- -documented samples(in weigh bag)
- -extra samples (fill SRC)

ETB/SRC

TERM

EVA TERM

Discard tongs
Clean & check EMU
Ascend mid-ladder
SRC to porch [SRC to Ed

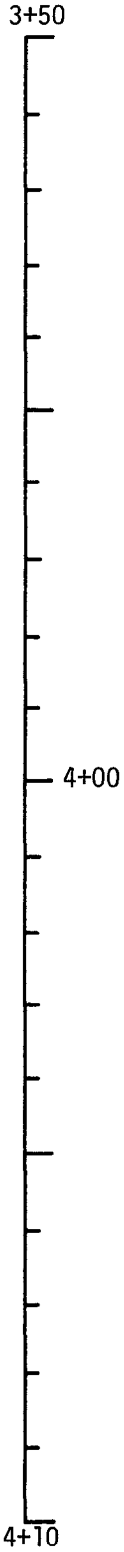
4+00 ingress

Trans ETB up (Rh eng cov)
CB(16) LTG TRACK - Close
SW: EXTERIOR LTG - TRACK
[observe
SW: EXTERIOR LTG - OFF
CB(16) LTG TRACK - Open
Hand LEC to A1 [discard
Receive SRC [hand in
ASSIST A1 [ingress

4+13 Repress

LMP-2

10-31-70



MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: 2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	3+50	SRC if space avail; otherwise in ETB in weigh bags			
EVA TERMINATION Obtain EMU brush (MESA brush)		Remove Skirt		EVA TERMINATION	
Discard tongs		Close and Seal SCR			
		Stow weigh bag of fines in ETB			
		Discard tongs			
Clean EMU's		Clean EMU's			
Ascent to middle ladder rung		Hand SRC to LMP			
Place SRC on platform					
Ingress	4+00			Ingress	
Re-rig LEC for transfer		Ready ETB for transfer (Recheck contents)			
Transfer ETB into LM		Transfer ETB into LM			
Place ETB on ascent engine cover		EVA TERMINATION			EVA TERMINATION
Check EMU & LM Systems		Ascent to platform			
Pass LEC to CDR		Discard LEC			
		Pass SRC into LM			
Receive SRC, place on ascent engine cover	4+10				

E2K13

4+10

(1) CDR - REPORT CABIN HATCH
CLOSED AND REPRESS
INITIATED

MISSION: APOLLO 14, H-3
EVA: 2

DATE: Dec. 31, 1970

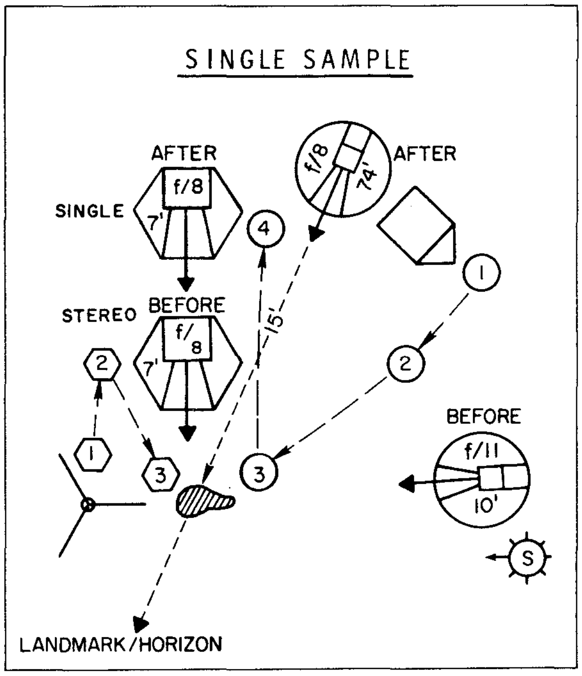
LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION	
				LMP	CDR
	4+10				
Assist CDR		Ingress *			Ingress
		Close hatch Repressurize cabin			
END EVA 2				END EVA 2	
	4+20				

*From this point on procedures governed by "LUNAR SURFACE CHECKLIST"

E2K14

3.2.3 Sampling and Related Procedures

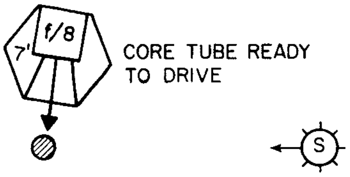
The detailed timeline procedures for each of the several prescribed types of sampling and survey for the Lunar Field Geology and Soil Mechanics objectives are given on the following format sheets, together with the cuff checklist pages which serve as the crew's guide for these procedures.


SINGLE SAMPLE
AFTER
f/8
SINGLE
7'
4
f/8
7.4'
AFTER
1
STEREO
BEFORE
f/8
7'
15'
2
2
BEFORE
f/11
1
3
3
10'
S
LANDMARK/HORIZON

SINGLE SAMPLE DOCUMENTATION

LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
DESCRIBE SAMPLE	0	DESCRIBE SAMPLE & PLACE GNOMON DOWN SUN			
TAKE DOWN SUN PHOTO AT F:11, 10 FT.		TAKE STEREO PR, X SUN AT f:8, 7 FT			
PREPARE SAMPLE BAG (IF RQD) REPORT NUMBER		COLLECT SAMPLE (SCOOP, TONGS)			
SEAL BAG - DROP IN WEIGH BAG		TAKE X SUN PHOTO f:8, 7 FT			
TAKE X SUN PHOTO f:8, 15 FT, FOCUS 74, INCLUDE LANDMARK					
NOTE: THIS PHOTO MAY BE MADE PRIOR TO SAMPLE COLLECTION		PICK UP GNOMON			
PROCEED TO NEXT SAMPLE		PROCEED TO NEXT SAMPLE			
	5				

CORE SAMPLES



CORE TUBE READY
TO DRIVE

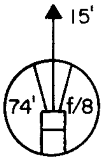


PHOTO OF HOLE
CORE TUBE(S) IN

● POINTS SPECIFIED ON MAP

MISSION: 14 DATE: DECEMBER 31, 1970
EVA:

CORE SAMPLE (DOUBLE)

LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ CAM	TASK FUNCTION	
				LMP	CDR
PARK MET	0	PLACE GNOMON NEARBY			
ASSEMBLE CORE TUBES - PULL PIN REMOVE END OF ONE, REMOVE BIT OF OTHER AND STOW. ATTACH, COMBINATION ON EXTENSION HANDLE. REPORT NUMBERS AND ORDER OF TUBES		REMOVE HAMMER FROM HTC			
HOLD UPRIGHT ON SURFACE		(STEREO PR X SUN f8,7 FT) DRIVE TUBES INTO SURFACE			
		COMMENT ON TASK DIFFICULTY, CHANGES IN MATERIAL CHARACTERISTICS WITH DEPTH			
PHOTO TUBE & HORIZON X SUN, f:8, 15 FT 74 FT FOCUS		STOW HAMMER			
REMOVE CORE TUBES FROM SURFACE REMOVE BIT, CAP TUBE. DETACH LOWER TUBE FROM UPPER, RESTORE END TO LOWER, CAP UPPER. STOW LOWER TUBE HTC DETACH EXTENSION HANDLE. STOW UPPER TUBE HTC. STOW EXT. HANDLE	5	ASSIST LMP [HD] TAKE CSC OF HOLE			
GET MET		PICK UP GNOMON			
PROCEED TO NEXT SAMPLE		PROCEED TO NEXT SAMPLE			

MISSION: 14
EVA:

DATE: DECEMBER 31, 1970

CORE SAMPLE (SINGLE)

LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
PARK MET	0	PLACE GNOMON NEARBY			
ASSEMBLE CORE TUBE/EXT. HANDLE - REPORT NUMBER HOLD UPRIGHT ON SURFACE		REMOVE HAMMER FROM HTC			
		(STEREO PR X SUN, f8, 7 FT) DRIVE TUBE INTO SURFACE			
		COMMENT ON TASK DIFFICULTY, CHANGES IN MATERIAL CHARACTERISTICS WITH DEPTH			
PHOTO TUBE & HORIZON X SUN, f:8, 15 FT (74 FT FOCUS)		STOW HAMMER			
REMOVE CORE TUBE FROM SURFACE		[HD] TAKE CSC OF HOLE			
REMOVE BIT AND CAP TUBE					
REMOVE EXT. HANDLE AND STOW TUBE IN HTC STOW EXT. HANDLE GET MET		PICK UP GNOMON			
PROCEED TO NEXT SAMPLE	5	PROCEED TO NEXT SAMPLE			

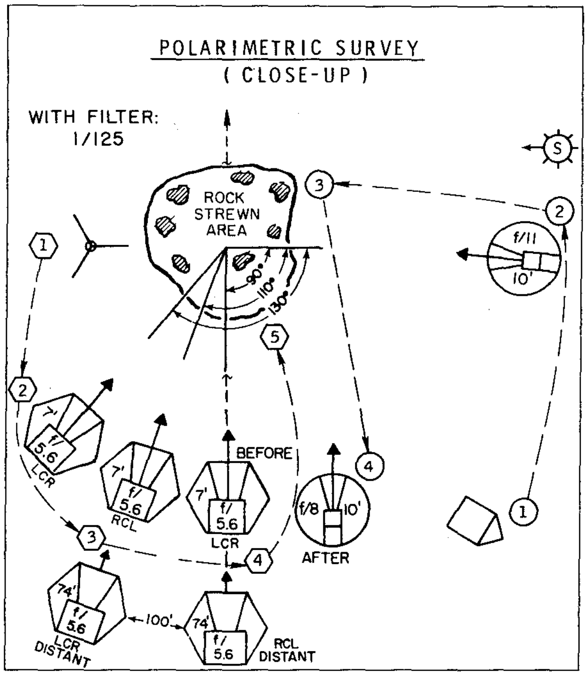
MISSION: APOLLO 14, H-3
EVA: 2

CORE SAMPLE (TRIPLE)

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
ASSEMBLE CORE TUBES- PULL PIN, REMOVE ENDS OF 2, REMOVE BIT OF 1 or 2, ATTACH TO OTHER, REMOVE BIT OF 3RD TUBE, ATTACH TO STRING,* ATTACH EXT. HANDLE. REPORT NO. & ORDER OF TUBES	0	DETACH SHOVEL FROM EXT. HANDLE; STOW SHOVEL			
		REMOVE HAMMER FROM HTC			
HOLD UPRIGHT		(Stereo pr XSUN, f8, 7 FT) DRIVE TUBES INTO SUBSTRATE			
		COMMET ON TASK DIFFICULTY, CHANGES IN MAT'L WITH DEPTH			
PHOTO CORE TUBES IN PLACE X SUN, f:8, 7 FT					
REMOVE CORE TUBES FROM SUBSTRATE		STOW HAMMER ON MET ASSIST LMP			
REMOVE BIT & CAP. BAG BIT		PREPARE BAG FOR BIT			
DETACH LOWEST TUBE, RESTORE END & STOW. CAP MIDDLE TUBE, DETACH MIDDLE TUBE, RESTORE END & STOW. CAP UPPER TUBE**	5				
DETACH UPPER TUBE FROM EXT. HANDLE & STOW TUBE					
STOW EXT. HANDLE		[HD] TAKE CSC PICTURE OF CORE HOLE			
*CREWMEN MAY ELECT TO DRIVE 2 TUBES, THEN ADD 3RD AFTER 1ST 2 IN GROUND					
**UNLESS EMPTY. IF EMPTY, RESTORE BIT AND USE LATER FOR SINGLE CORE SAMPLE	10				

E2K15


POLARIMETRIC SURVEY
(CLOSE-UP)
WITH FILTER:
1/125
S
ROCK
STREWN
AREA
90°
110°
130°
1
2
3
4
5
2
3
1
2
3
4
f/11
10'
7'
f/
5.6
LCR
7'
f/
5.6
RCL
BEFORE
7'
f/
5.6
LCR
f/8
10'
AFTER
74'
f/
5.6
LCR
DISTANT
100'
74'
f/
5.6
RCL
DISTANT

MISSION: 14
EVA:

DATE: DECEMBER 31, 1970

PHOTO POLARIMETRIC SURVEY (CLOSE UP)

LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	0	AT CLUMP OF ROCKS			
PHOTO ROCKS DOWN SUN f:11, 10 FT		PLACE GNOMON IN CLUMP INSTALL POLAR FILTER ON CAMERA			
		RESET f/5.6, 1/125 GO TO X SUN (90°)			
		TAKE 3 PHOTOS: (REPORT FILTER POS) f/5.6, 7 FT FILTER L* f/5.6, 7 FT FILTER CENTER f/5.6, 7 FT FILTER R			
		GO TO 110° FROM SUN			
DESCRIBE AREA & SAMPLES		TAKE 3 PHOTOS: (REPORT FILTER POS) f/5.6, 7 FT FILTER R* f/5.6, 7 FT FILTER CENTER f/5.6, 7 FT FILTER L			
		GO TO 130° FROM SUN			
		TAKE 3 PHOTOS: (REPORT FILTER POS) f/5.6, 7 FT FILTER L*			
READY TOOLS, ETC.	5	f/5.6, 7 FT FILTER CENTER f/5.6, 7 FT FILTER R			
COLLECT SAMPLES & STOW		COLLECT SAMPLES			
PHOTO AREA DOWN SUN f:11, 10 FT					
		PICK UP GNOMON (AFTER DISTANT PHOTOS)			
		REMOVE & DISCARD POLAR FILTER			
		RESET CAMERA 1/250			
	10				

*FILTER POSITIONS IN ANY ORDER, BUT MUST REPORT TO MCC.

NOTE: THIS PROCEDURE VIRTUALLY IDENTICAL TO APOLLO 13

MISSION: 14
EVA: PHOTO POLARIMETRIC SURVEY (DISTANT)

DATE: DECEMBER 31, 1970

LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	0	MOVE TO ∼ X SUN OF DISTANT AREA INSTALL POLAR FILTER ON CAMERA, RESET f5.6, 1/125 TAKE 3 PHOTOS: f/5.6, 74 FT, FILTER L* f/5.6, 74 FT, FILTER CENTER f/5.6, 74 FT, FILTER R REPORT FILTER POSITIONS GO TO ∼20° FROM 1st POSITION, DOWN SUN			
	5	TAKE 3 PHOTOS: f/5.6, 74 FT, FILTER R* f/5.6, 74 FT, FILTER CENTER f/5.6, 74 FT, FILTER L (AFTER ALL POLARIMETRIC SHOTS) REMOVE & DISCARD POLAR FILTER RESET CAMERA 1/250			
*FILTER POSITIONS IN ANY ORDER, BUT MUST REPORT TO MCC.					
	10				

TRENCH - PART 1

1. Al-gnomon, stereo pr xsun 7'
   Ed-MET 16'NE(SE), before dnsun f11,10'

2. Al-Doff cam, get trench tool, trench ~ 2' deep 10° wrt sun (10 min max)
   Ed-16mm cam ON f8,12FPS;LPM

3. Al-after photo f5.6,125,7' xsun 3&9 o'clock & dnsun w/Ed reflecting light
   Ed-after photo upsun f5.6, 125,7' reflect light into trench

4. Al-16mm OFF if empty, get scoop & ext hndl
   Ed-get SESC, open

TRENCH - PART 2

1. Al-sample trench bottom, fill SESC
   Ed-close, seal SESC, rpt, stow closeup photo trench

2. Al-soil sample bottom, side, discon, top
   Ed-photo after each sample xsun f5.6,125,x; bag sample

3. Al-single core thru fillet if avail
   Ed-footprint in soil pile, photo xsun f8,125,5'

MISSION: 14
EVA:

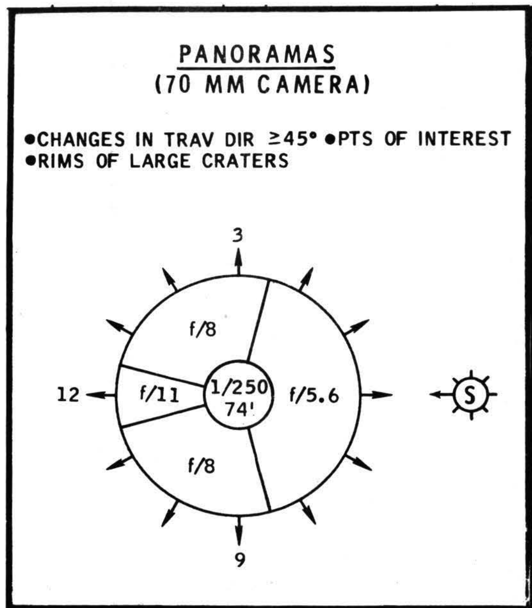
DATE: DECEMBER 31, 1970

DEEP TRENCH (SOIL MECHANICS)

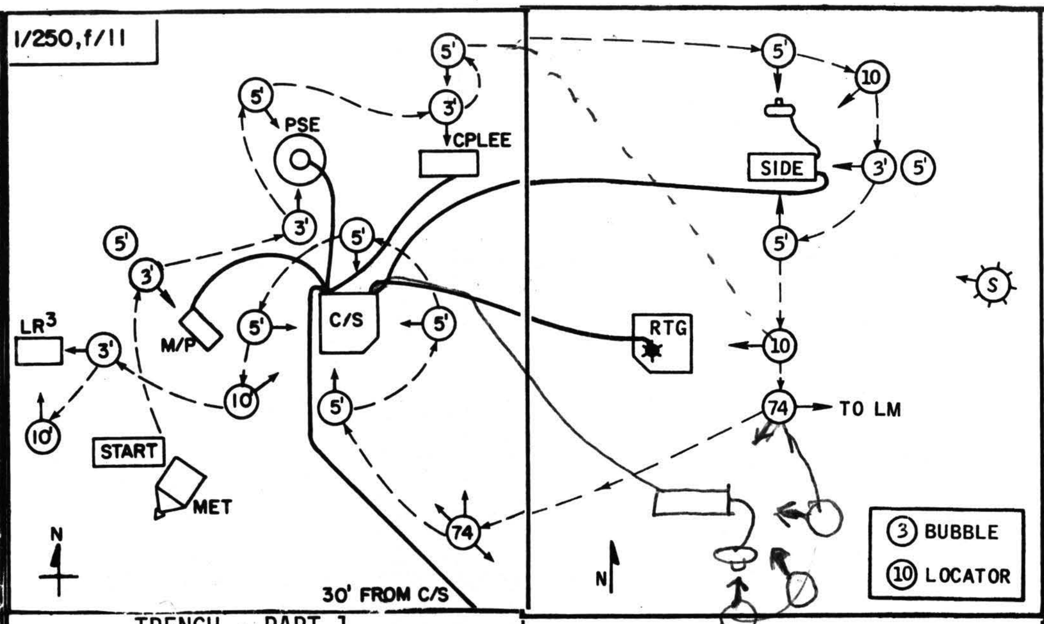
LMP ACTIVITIES 70MM CAMERA	EVA TIME	CDR ACTIVITIES 70MM CAMERA	SEQ CAM.	TASK FUNCTION	
				LMP	CDR
PARK MET		PLACE GNOMON NEARBY UPSUN			
PHOTO SITE DOWN SUN f:11, 10 FT ACTIVATE 16MM CAMERA TO FILM CDR		TAKE STEREO PR X SUN f/8, 7 FT			
		ASSEMBLE SHOVEL & ADJUST DIG 10° OFF DOWN SUN			
		(TRENCH TO BE 8" DEPTH MINIMUM)			
STOP 16MM CAMERA STAND DOWN SUN AT EDGE OF TRENCH (ACT AS REFLECTOR)		FINISH DIGGING PLACE SHOVEL ON MET			
PHOTO UPSUN INTO TRENCH f:5.6, 7 FT, 1/125 SEC		TAKE STEREO PR BOTH SIDES f5.6, 7 FT PHOTO DWN SUN f5.6, 7 FT			
PHOTO BOTTOM OF TRENCH WITH CLOSE-UP CAMERA					
PHOTO FOOTPRINT X SUN f/11, 7 FT		FOOTPRINT IN FILL			
	TAKE DOCUMENTED SAMPLES BOTTOM TO TOP - 1ST SAMPLE SESC FROM BOTTOM SAMPLE FILL, SIDES, DISCONTINUITIES				
	10	NOTE: 70MM CAMERA SPEED SETTING AFTER TRENCH DUG 1/125 SECOND.			

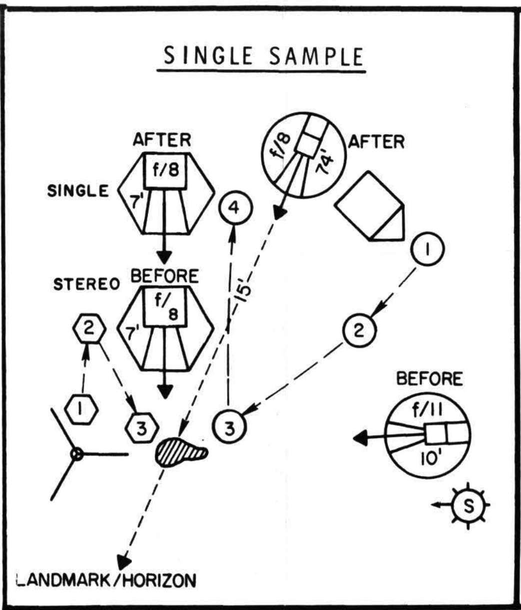
3.3 Photography Data

Figure 3.3-1 summarizes the various kinds of photographic routines the crew goes through in the course of their lunar surface operations. The illustrations are taken from the crew's cuff check list.

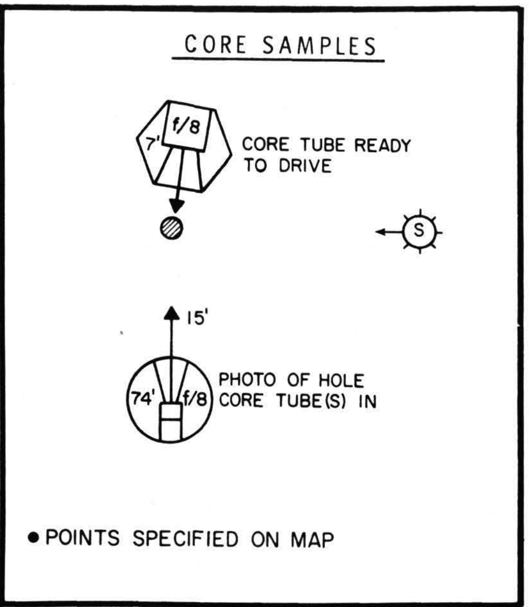


PANORAMAS
(70 MM CAMERA)

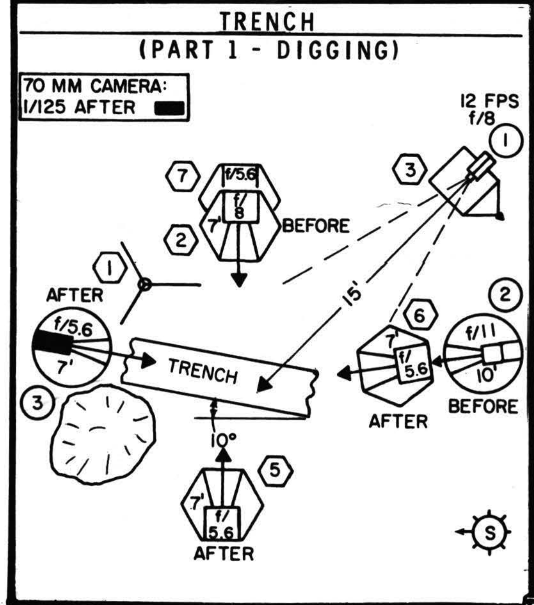




SINGLE SAMPLE



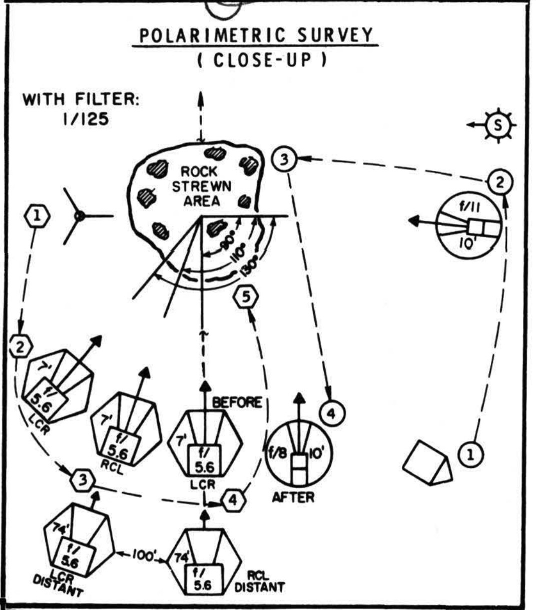
CORE SAMPLES



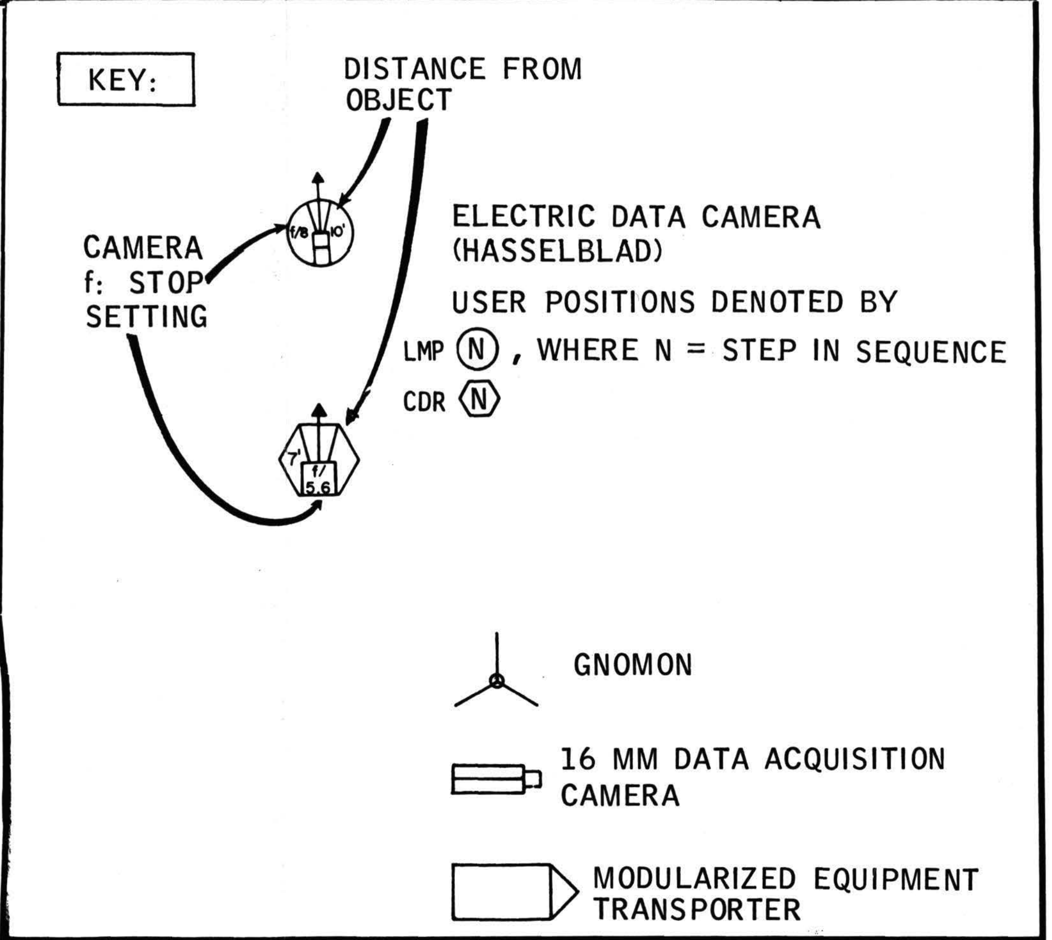
TRENCH
(PART 1 - DIGGING)

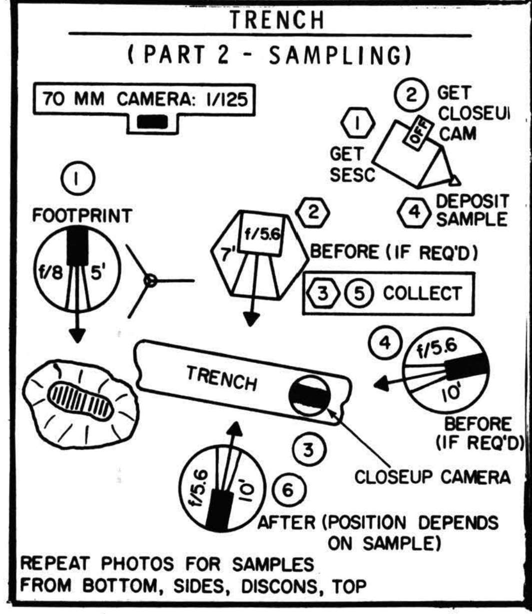
TRENCH - PART 1

1. Al-gnomon, stereo pr xsun 7'
   Ed-MET 15'NE(SE), before dnsun f11,10'
2. Al-Doff cam, get trench tool, trench ~ 2' deep 10° wrt sun (10 min max)
   Ed-16mm cam ON f8,12fps;LPM
3. Al-after photo f5.6,125,7' xsun 3&9 o'clock & dnsun w/Ed reflecting light
   Ed-after photo upsun f5.6, 125,7' reflect light into trench
4. Al-16mm OFF if empty, get scoop & ext hndl
   Ed-get SESC, open



POLARIMETRIC SURVEY
(CLOSE-UP)





TRENCH
(PART 2 - SAMPLING)

TRENCH - PART 2

1. Al-sample trench bottom, fill SESC
   Ed-close, seal SESC, rpt, stow closeup photo trench
2. Al-soil sample bottom, side, discon, top
   Ed-photo after each sample xsun f5.6,125,x; bag sample
3. Al-single core thru fillet if avail
   Ed-footprint in soil pile, photo xsun f8,125,5'

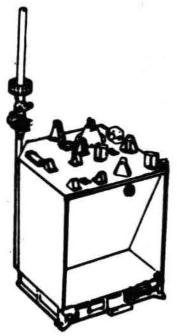
FIGURE 3.3-1

APOLLO 14
LUNAR SURFACE PHOTOGRAPHY
DATA

3.4 ALSEP Deployment and Equipment Data

The following illustration, Figure 3.4-1, summarizes pertinent ALSEP lunar surface deployment data. Figure 3.4-2 provides information on the Lunar Portable Magnetometer.

1. CENTRAL STATION

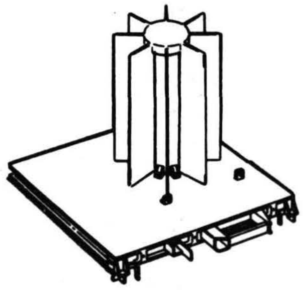


The Central Station is deployed due West or East of LM, preferably West. It must not be deployed in shadow of LM. It is leveled to 5° of vertical as noted by astronaut on bubble level. It is aligned to ±5° of East-West by astronaut using partial compass rose. Closed or curtained sides of Central Station must face East-West.

ALSEP Antenna - The antenna is attached to the ALSEP central station and the antenna must be leveled to 0.50° and aligned on an East-West line to ± 0.50°. Allowable alignment errors:

Scale Setting: 0.25°, Shadow Align: 0.70°
Leveling: 0.50°, Overall Mean: 1.16°

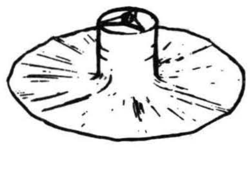
2. RADIOISOTOPE THERMOELECTRIC GENERATOR (RTG)



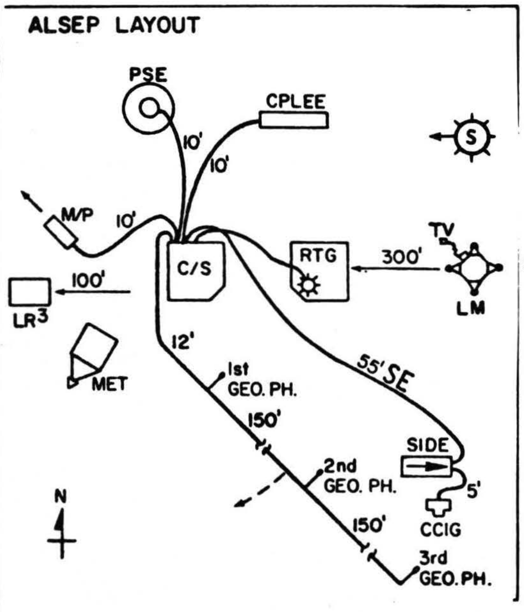
RTG is placed 9 to 12 ft. from and ±20° East or West of Central Station as visually determined by astronaut to minimize thermal load on Central Station.

RTG requires maximum view of space to maximize heat radiation. Astronaut will read ammeter on shorting switch box, connect RTG to Central Station, actuate switch.

3. PASSIVE SEISMIC EXPERIMENT (PSE)



The PSE is deployed 8 to 9 ft. from and Northwest of Central Station as visually determined by astronaut. It must be out of field-of-view of Central Station radiator. It is leveled to 5° of vertical as noted by astronaut on bubble level. Initial alignment is to ±20° of East, before opening PSE shroud. Final alignment will be reported after thermal shroud deployment. The astronaut will give gnomon shadow reading on compass rose, to allow known PSE alignment to 5° accuracy.



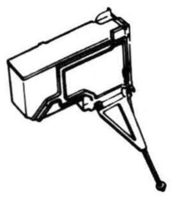
4. CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT (CPLEE)

The CPLEE is deployed 9 to 10 ft. North of the Central Station.Bottom of experiment should not touch the lunar surface. It must be leveled to within 2.5° of vertical using bubble level. It must be aligned to within ±2° of East-West sun line. Astronaut will align so that arrow on top of unit points East, then report, within ±1°, the reading of the shadow of the handling tool on the partial compass rose.

FIGURE 3.4-1

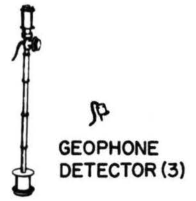
APOLLO LUNAR SURFACE EXPERIMENTS DATA

5. ACTIVE SEISMIC EXPERIMENT (ASE)



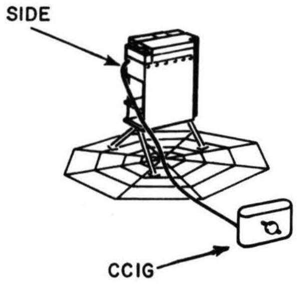
The ASE consists of two major subsystems:

MORTAR BOX ASSEMBLY deployed; bubble leveled to (5°) and aligned by the astronaut as shown NW of Central Station 10 ft. away. Contains 4 grenades remotely fired by ground control 1 year after crew returns to earth. Astronaut readies by removing safety rod and actuating safety switches to remove short across arm/fire circuits.



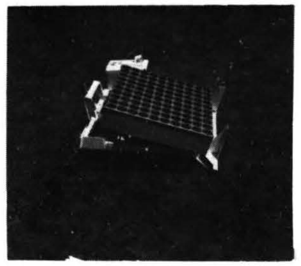
THUMPER/GEOPHONE ASSEMBLY - Astronaut unfolds thumper and walks SE unreeling geophone line. Geophones emplaced at 10, 160, and 310 ft. from Central Station. Alignment of phones along line ±3° ref. to Mortar Box and Flag at 160' geophone, each leveled to 7°. Astronaut returns to Central Station along geophone line firing thumper charge every 15 ft. to excite geophones (21 charges in all). The mortar box-geophone line may vary in direction from NW - SE to N-S depending on site and terrain.

6. SUPRATHERMAL ION DETECTOR EXPERIMENT (SIDE)



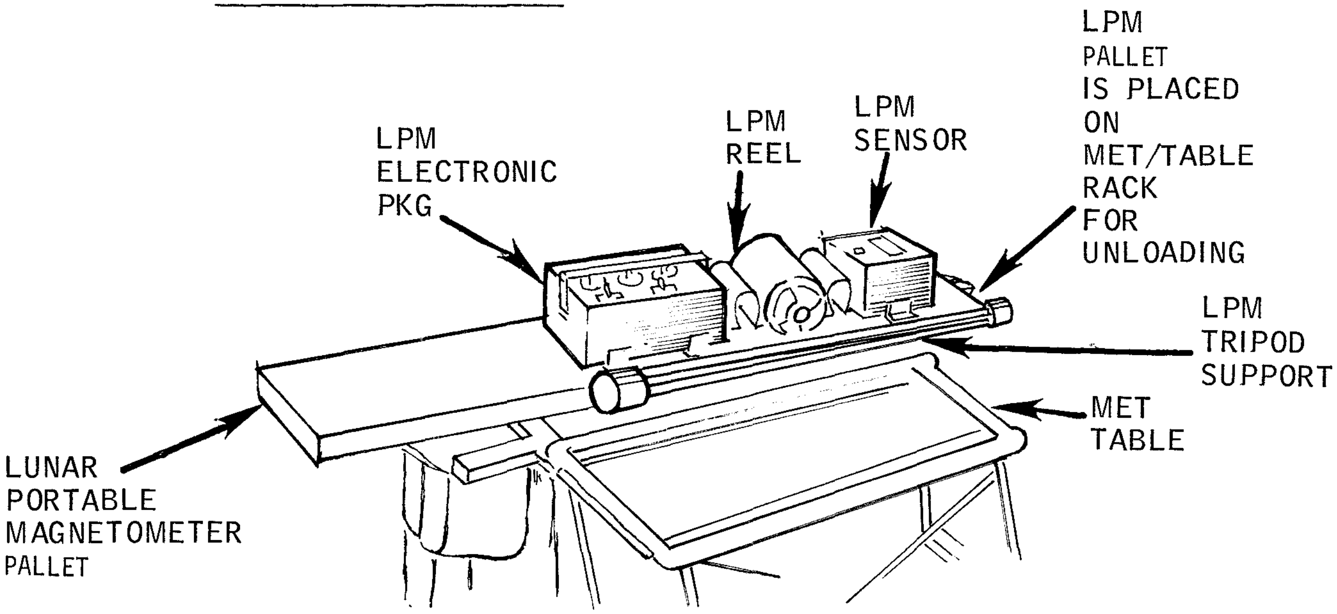
The SIDE incorporates a Cold Cathode Ion Gauge (CCIG). The experiments are deployed 55 ft. SE, SIDE on a ground screen within 5° of vertical, ± 5° of E using bubble level and UHT shadow, detectors away from subearth point.

7. LASER RANGING RETRO-REFLECTOR (LR^3)



The LR^3 is a deployable array of 100 quartz reflectors aligned by astronaut to reflect laser beams aimed from earth. Pallet is deployed 100 ft W of ALSEP, bubble-leveled and gnomon aligned to 3°, then array is positioned to preset angle. This experiment is completely passive.

PRIOR TO DEPLOYMENT



DEPLOYED AND READY FOR USE - 250 OR MORE FEET FROM LM FOR POINT MEASUREMENT

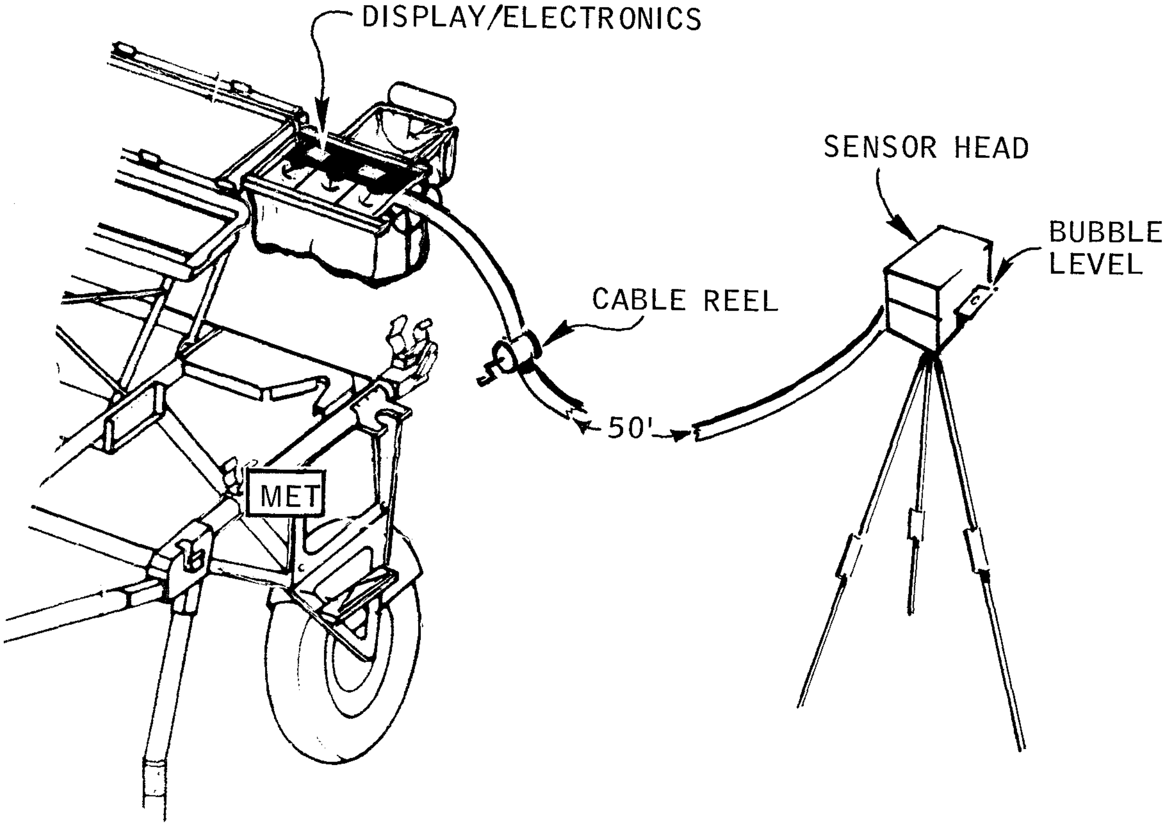
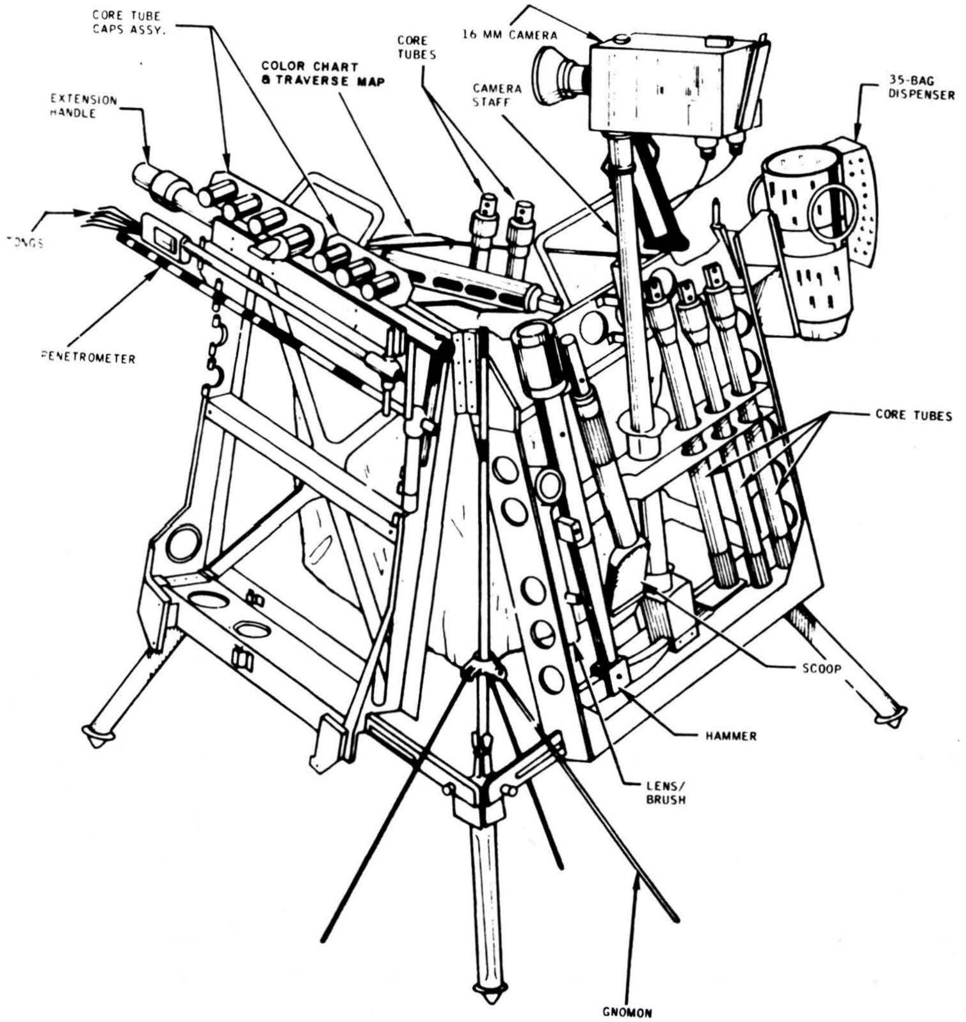


FIG. 3.4-2 LUNAR PORTABLE MAGNETOMETER

3.5 Geology Equipment and Data

The following illustration summarizes lunar surface geology equipment that supports the astronaut's field geology activities. Figure 3.5-2 give additional lunar geology data such as SRC contents, and sample types.



APOLLO LUNAR HAND TOOL CARRIER (ALHT)
MET TRAVERSE CONFIGURATION

MOBILE EQUIPMENT TRANSPORTER

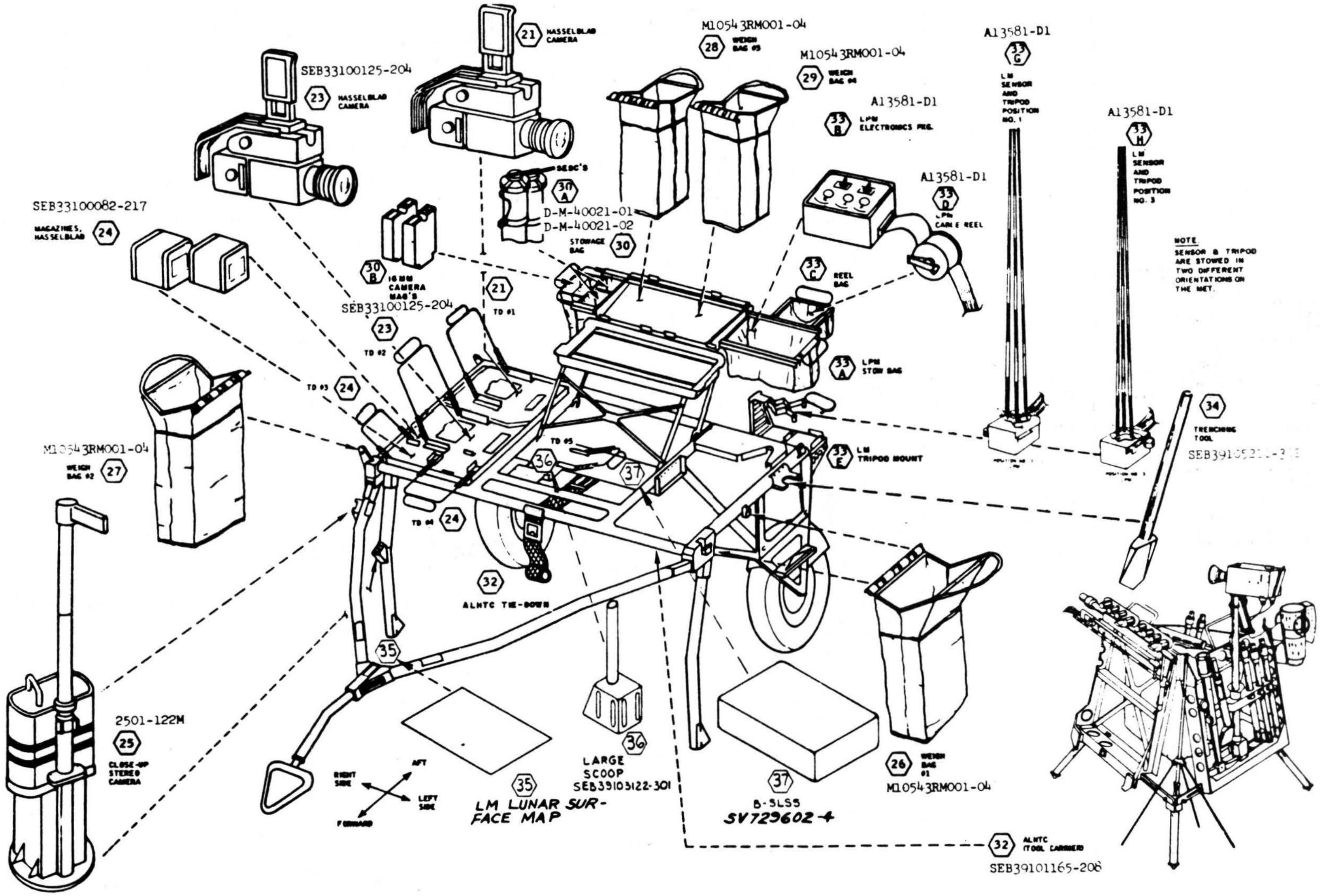


FIGURE 3.5-1 GEOLOGY EQUIPMENT - ALHT AND MET

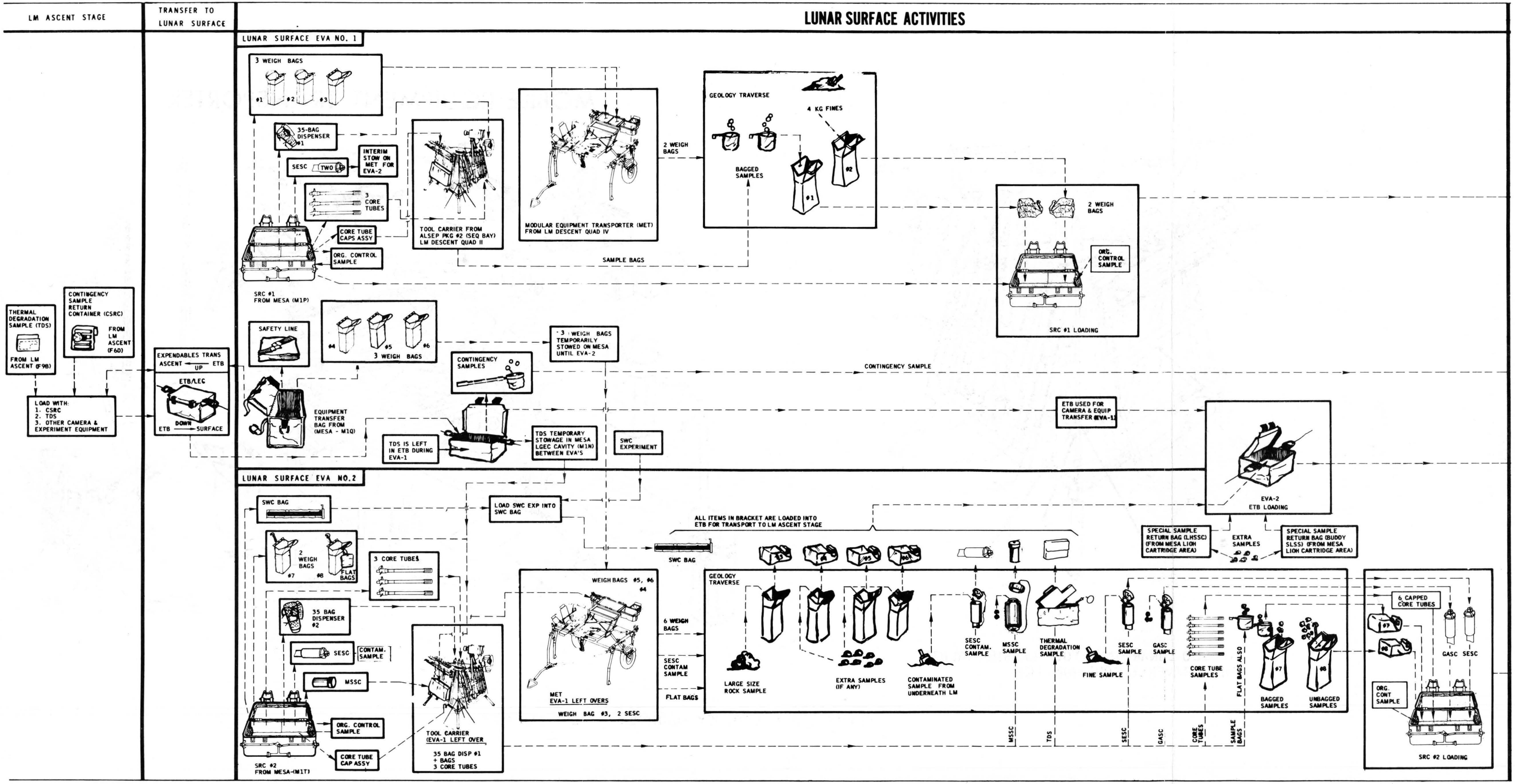
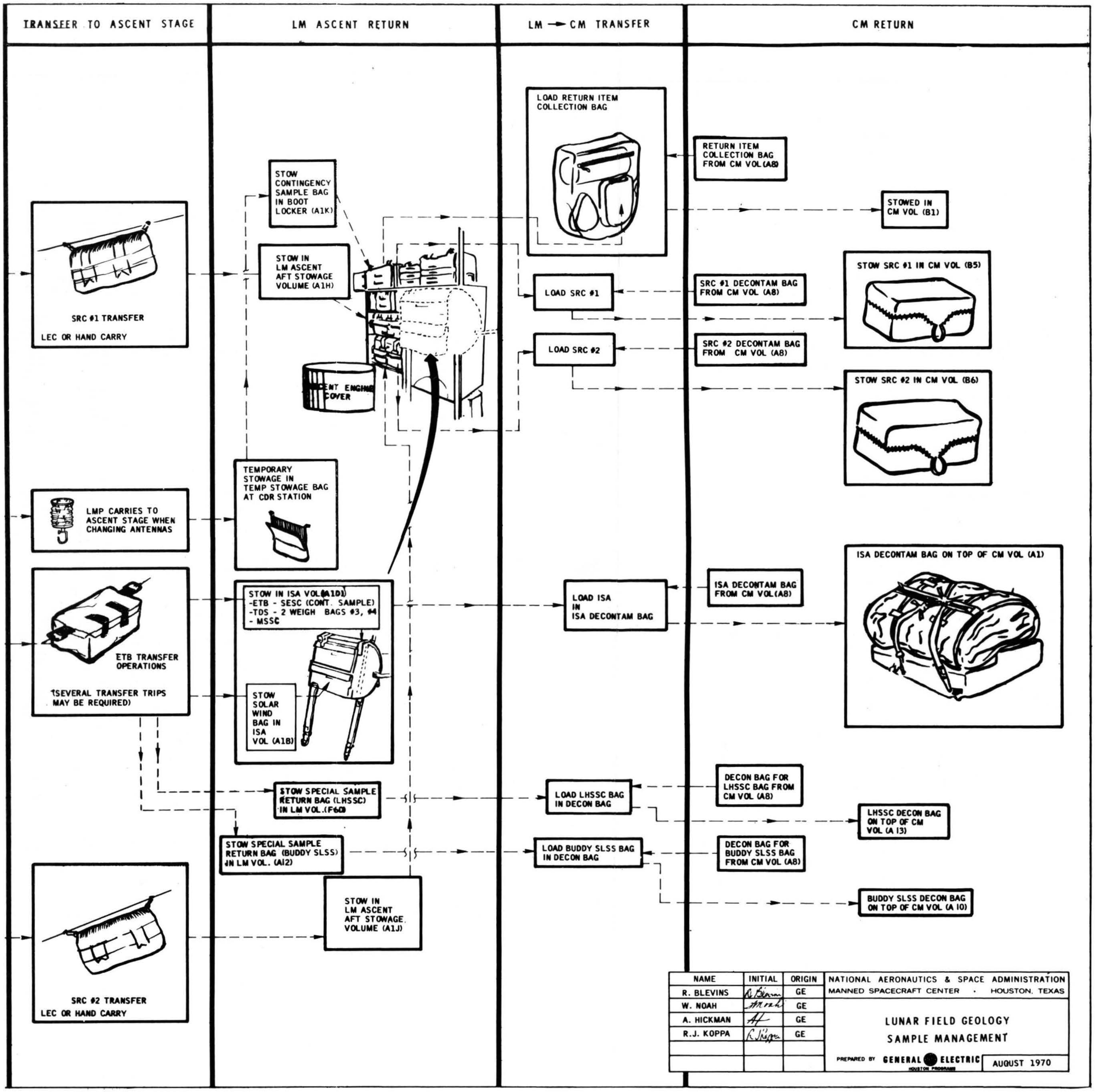

LM ASCENT STAGE
TRANSFER TO LUNAR SURFACE
LUNAR SURFACE ACTIVITIES
LUNAR SURFACE EVA NO. 1
3 WEIGH BAGS
#1
#2
#3
35-BAG DISPENSER #1
SESC
TWO
INTERIM STOW ON MET FOR EVA-2
3 CORE TUBES
CORE TUBE CAPS ASSY
ORG. CONTROL SAMPLE
TOOL CARRIER FROM ALSEP PKG #2 (SEQ BAY) LM DESCENT QUAD II
MODULAR EQUIPMENT TRANSPORTER (MET) FROM LM DESCENT QUAD IV
2 WEIGH BAGS
GEOLOGY TRAVERSE
4 KG FINES
BAGGED SAMPLES
#1
#2
SAMPLE BAGS
2 WEIGH BAGS
ORG. CONTROL SAMPLE
SRC #1 LOADING
SRC #1 FROM MESA (M1P)
THERMAL DEGRADATION SAMPLE (TDS)
FROM LM ASCENT (F9B)
CONTINGENCY SAMPLE RETURN CONTAINER (CSRC)
FROM LM ASCENT (F6D)
LOAD WITH: 1. CSRC 2. TDS 3. OTHER CAMERA & EXPERIMENT EQUIPMENT
EXPENDABLES TRANS
ASCENT
UP
ETB
ETB/LEC
ETB
DOWN
SURFACE
SAFETY LINE
#4
#5
#6
3 WEIGH BAGS
3 WEIGH BAGS TEMPORARILY STOWED ON MESA UNTIL EVA-2
CONTINGENCY SAMPLES
CONTINGENCY SAMPLE
EQUIPMENT TRANSFER BAG FROM (MESA - M1Q)
TDS IS LEFT IN ETB DURING EVA-1
TDS TEMPORARY STOWAGE IN MESA LGEC CAVITY (M1N) BETWEEN EVA'S
SWC EXPERIMENT
ETB USED FOR CAMERA & EQUIP TRANSFER (EVA-1)
EVA-2 ETB LOADING
LUNAR SURFACE EVA NO. 2
SWC BAG
LOAD SWC EXP INTO SWC BAG
2 WEIGH BAGS
#7
#8
FLAT BAGS
3 CORE TUBES
35 BAG DISPENSER #2
SESC
CONTAM. SAMPLE
MSSC
ORG. CONTROL SAMPLE
CORE TUBE CAP ASSY
SRC #2 FROM MESA-(M1T)
TOOL CARRIER (EVA-1 LEFT OVER
35 BAG DISP #1 + BAGS 3 CORE TUBES
WEIGH BAGS #5, #6 #4
MET EVA-1 LEFT OVERS
WEIGH BAG #3, 2 SESC
6 WEIGH BAGS
SESC CONTAM SAMPLE
FLAT BAGS
ALL ITEMS IN BRACKET ARE LOADED INTO ETB FOR TRANSPORT TO LM ASCENT STAGE
SWC BAG
GEOLOGY TRAVERSE
LARGE SIZE ROCK SAMPLE
EXTRA SAMPLES (IF ANY)
CONTAMINATED SAMPLE FROM UNDERNEATH LM
SESC CONTAM. SAMPLE
MSSC SAMPLE
THERMAL DEGRADATION SAMPLE
FINE SAMPLE
SESC SAMPLE
GASC SAMPLE
CORE TUBE SAMPLES
FLAT BAGS ALSO
BAGGED SAMPLES
UNBAGGED SAMPLES
#7
#8
SPECIAL SAMPLE RETURN BAG (LHSSC) (FROM MESA LIOH CARTRIDGE AREA)
EXTRA SAMPLES
SPECIAL SAMPLE RETURN BAG (BUDDY SLSS) (FROM MESA LIOH CARTRIDGE AREA)
6 CAPPED CORE TUBES
GASC
SESC
ORG. CONT SAMPLE
SRC #2 LOADING
MSSC
TDS
SESC
GASC
CORE TUBES
SAMPLE BAGS

FIGURE 3.5-2



NAME	INITIAL	ORIGIN
R. BLEVINS	R. Blevins	GE
W. NOAH	W. Noah	GE
A. HICKMAN	AH	GE
R.J. KOPPA	R. Koppa	GE

NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER · HOUSTON, TEXAS

LUNAR FIELD GEOLOGY
SAMPLE MANAGEMENT

PREPARED BY GENERAL ELECTRIC
HOUSTON PROGRAMS

AUGUST 1970

FIGURE 3.5-2

3.6 EVA Traverses

The following illustrations depict a preliminary version of the ALSEP deployment and the traverse to other locations in the event of EVA 1 extension, for the Fra Mauro area. Each map has on the facing page tabular data which is printed on the back of the flight version of the map. These are observational and sampling guidelines provided by the Principal Investigators for the Lunar Field Geology experiment.

FIG 3.6-1
LANDING SITE 1, EVA 1 [GEOLOGICAL MAP]

STATION	TASKS	ADDITIONAL INFORMATION
A	• ALSEP deployment • Do cuff checklist	•On thinning edge of ejecta blanket from older (1) crater
CS	• Comprehensive sample	
U Doublet (Intersection of N and S)	• Description • Documented sample • "Football" size rock • Pan	•Rim intersection of large older (1) crater and younger (3) crater
V Doublet (N)	• Description • Documented sample	•On rim of (1) crater - crater may penetrate through regolith into underlying Smooth unit •Patterned ground may be well developed on crater rim
W Doublet (S)	• Documented sample	•On rim of younger (3) crater Intermediate exposure age--penetrates through older crater ejecta
	GENERAL FEATURES	TASKS
	• Solder-like glass blebs • Patterned ground • Changes in block and fragment angularity • Fragments in or near elongate or secondary craters • Proportion of microbreccia to crystalline rock types • Boulder tracks and slope relations • Rock fillets	•Document and sample as appropriate

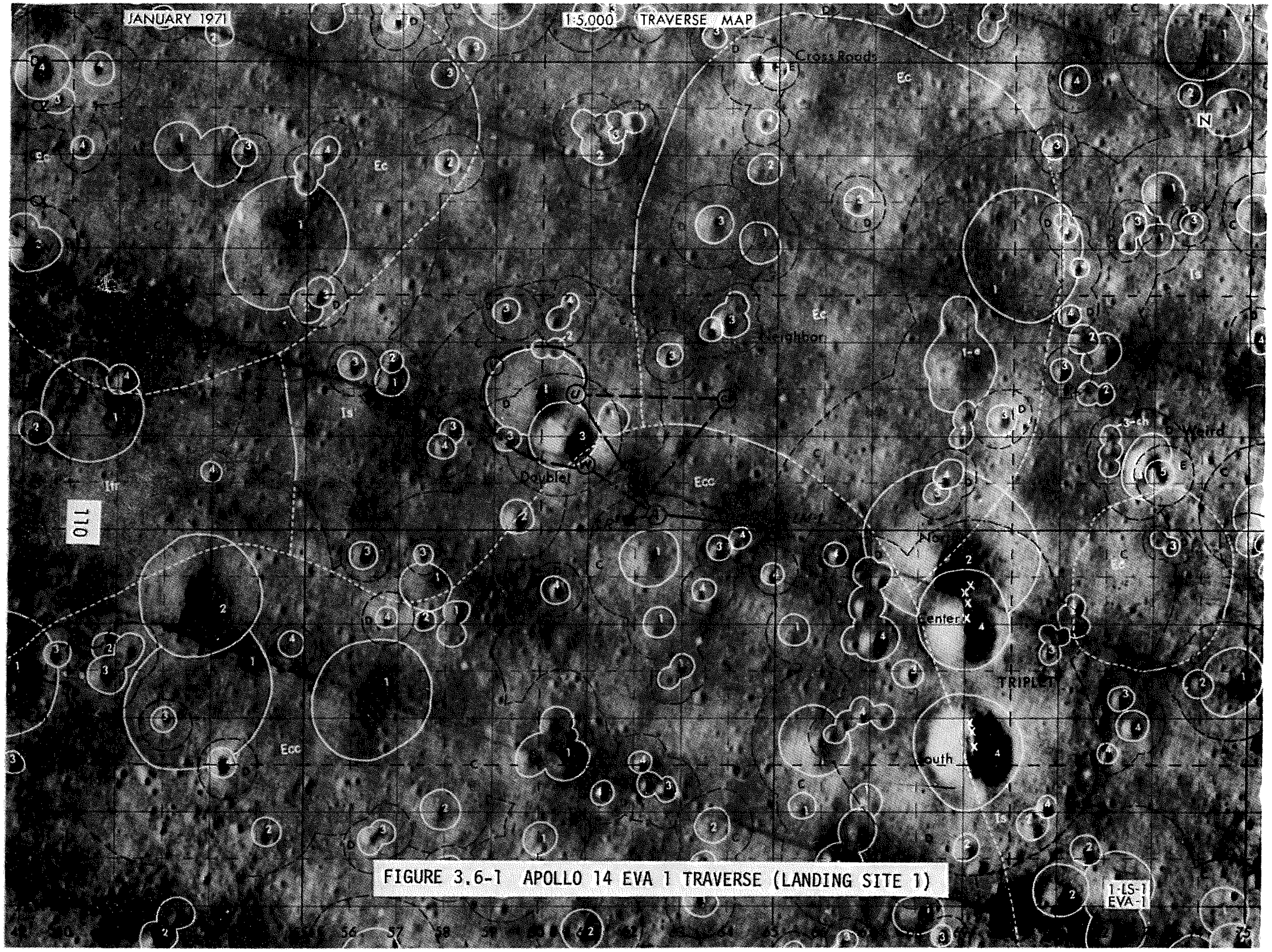


FIGURE 3.6-1 APOLLO 14 EVA 1 TRAVERSE (LANDING SITE 1)

FIG 3.6-1A
LANDING SITE 2, EVA 1 [GEOLOGICAL MAP]

STATION	TASKS	ADDITIONAL INFORMATION
A	• Do cuff checklist • Deploy ALSEP • Comprehensive sample	
h.	• Documented sample • Pan	• #4 crater may excavate material from Smooth unit beneath regolith
i.	• Documented sample	• #1 crater may excavate material from Ridgey unit beneath regolith
j.	• Documented sample Football size rock	• Cluster of moderately young (#2) and (#3) craters

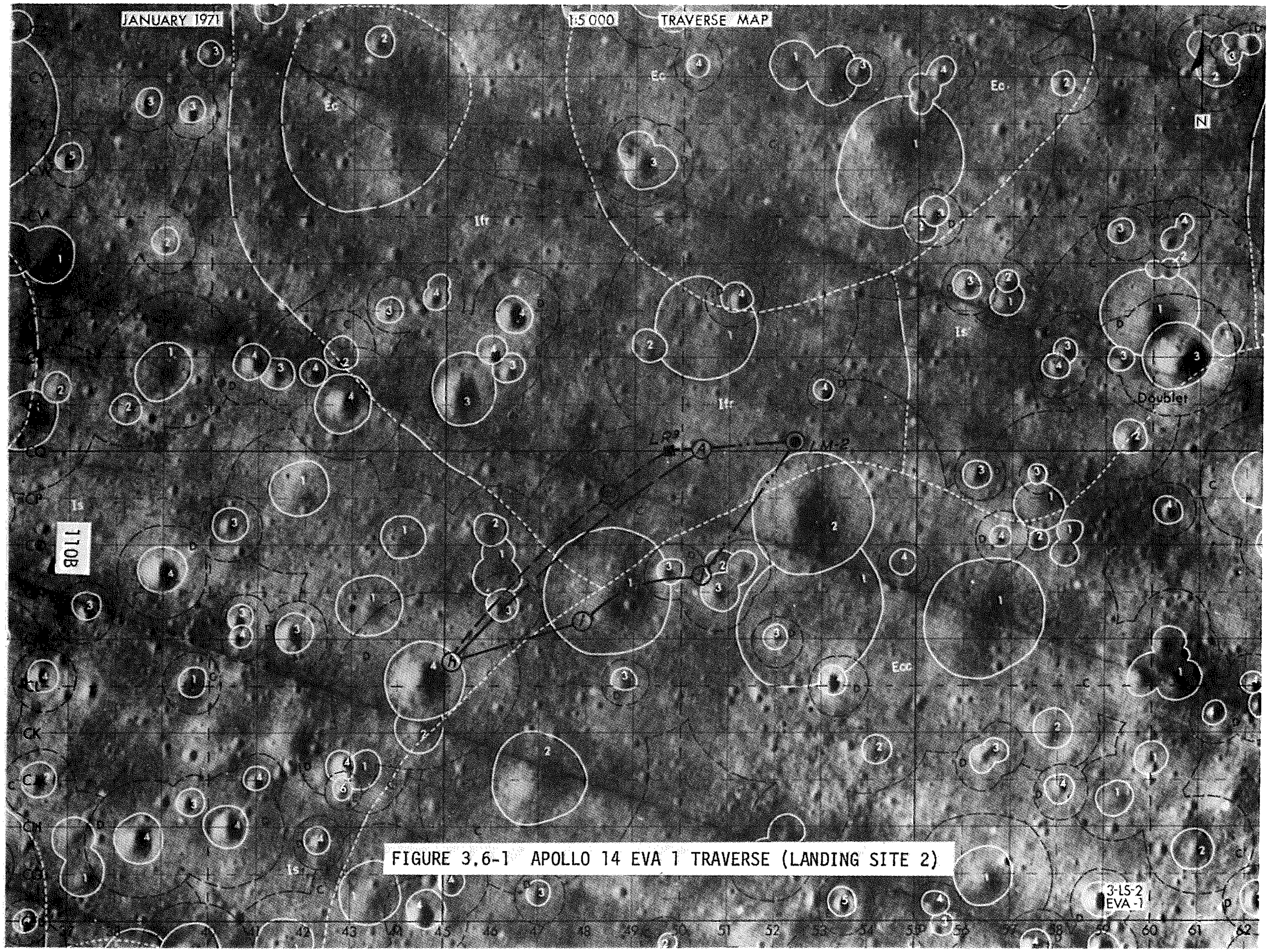


FIGURE 3.6-1 APOLLO 14 EVA 1 TRAVERSE (LANDING SITE 2)

FIG 3.6-1B
LANDING SITE 3, EVA 1 [GEOLOGICAL MAP]

STATION	TASKS	ADDITIONAL INFORMATION
A	•Deploy ALSEP •Comprehensive sample •Do cuff checklist	
y.	•Documented sample •Pan	•Small (#3) crater superimposed on rim of very large subdued (#1) crater (#3) crater may reexcavate ejecta from large (#1) crater which may have penetrated Fra Mauro material
z.	•Documented sample •"Football" size rock	•Sharp (#4) crater penetrating into smooth unit. 165 m to East is possible contact of Smooth unit with hummocky Fra Mauro Ridgey material

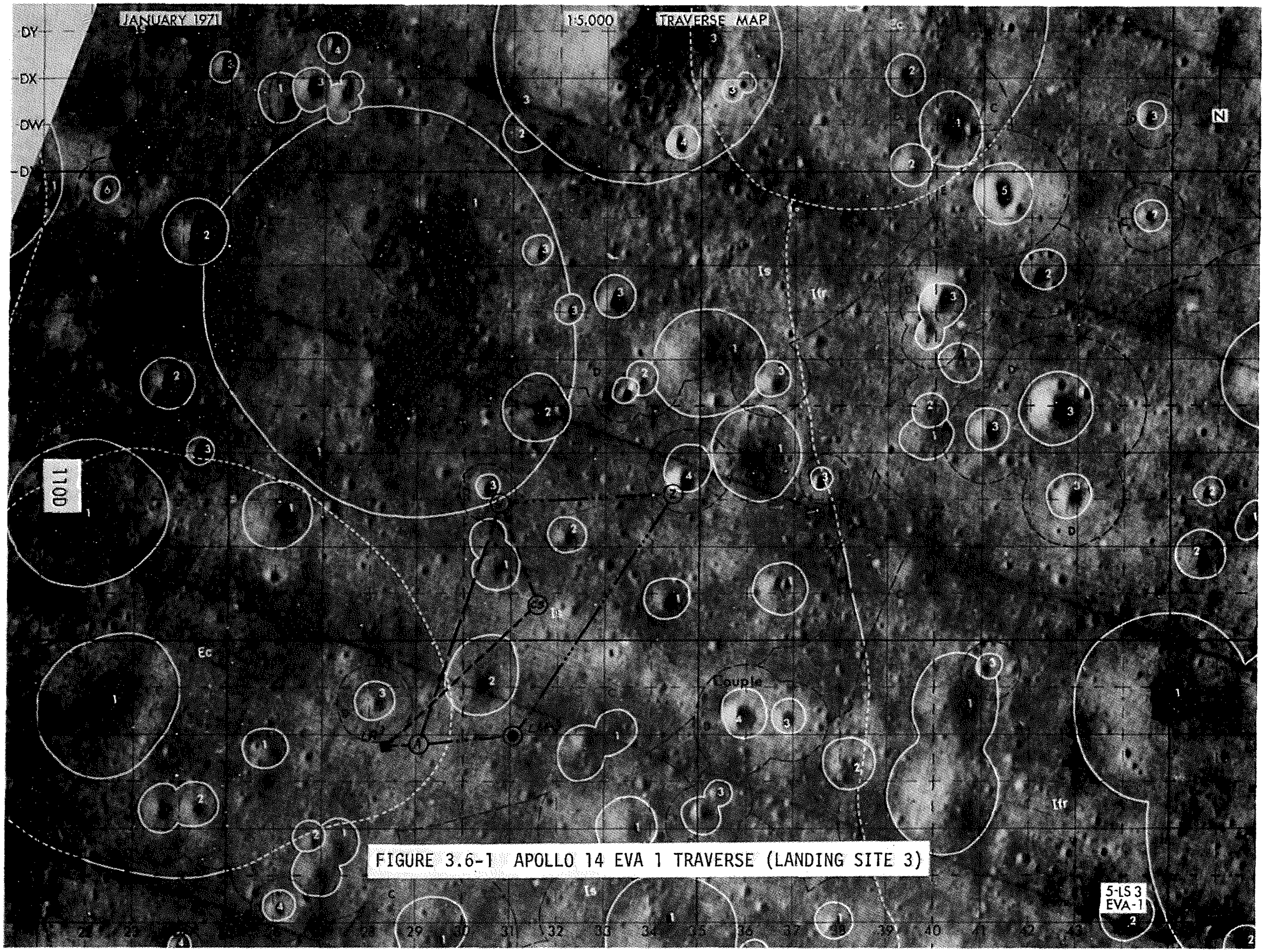


FIGURE 3.6-1 APOLLO 14 EVA 1 TRAVERSE (LANDING SITE 3)

FIG 3.6-2
LANDING SITE 1, EVA 2 [GEOLOGICAL MAP]

STATION	CDR	TASKS Coordinated	LMP	ADDITIONAL INFORMATION
a.	•TDS •MET Track Photos •Describe Surface	•Double Core (M) •Describe Surface •Documented Sample	•LPM Point (M) •Pan	•Ejecta from (1) crater on Smooth unit •Smooth unit to be compared with Ridgey unit next station •Next traverse crosses contact between Smooth and Ridgey units
b.	•Pan	•Documented Sample •Compare with Surface at a.		•Patterned ground in Ridgey unit •Comparison of Ridgey unit and Smooth unit
c. Cone Rim	•Polarimetric Surveys	•Collect rock & soil samples •Roll boulder, take 24 fps movie, crew movement, pan west, pan crater •Describe, photo boulders •EVA Comm	•Two pans on rim ≥ 300 ft baseline	•Large boulders may be from Fra Mauro •Contacts may be visible in crater wall •Panoramas with wide-base stereo
c.-d.	Watch for radial variations in materials			
d. Flank	·Description, contrast rock types, sizes, with Cone	•Documented Sample	•Pan	•(4) crater may penetrate Cone ejecta
e.	•Describe Surface	•Trench - do cuff checklist •Documented Sample •Single Core (HD)	•LPM (M) •Pan	•(4) crater near buried contact •Crater may penetrate either Ridgey or Smooth unit
f. Weird	•Describe Surface	•Triple Core (M) •Documented Sample •Radial/diametric samples at a 10 ft crater	•Pan	•(3) crater may penetrate into Smooth unit materials •Elongate shape of (3) crater may reflect structure or composite of multiple crater
g. Triplet	•Pan •Description	•Gas Sample (HD) •MSSC (HD) •Fillet Sample (HD) •Football-size rock (HD)	•LPM (HD)	•Large (2) crater may penetrate into underlying Smooth unit, either Fra Mauro breccia or younger volcanic rock •Largest crater samples in Smooth unit •Patterned ground may be well developed on rim and interior walls of large (2) crater
g.-1 (S)		ALTERNATE PART G •Documented Sample •Pan		•Bedrock may be exposed in (4) crater walls and floor and represented in ejecta
g.-2 (N)		•Documented Sample		•Blocks from large (2) crater (Triplet north) may have well developed fillets •Look for patterned ground

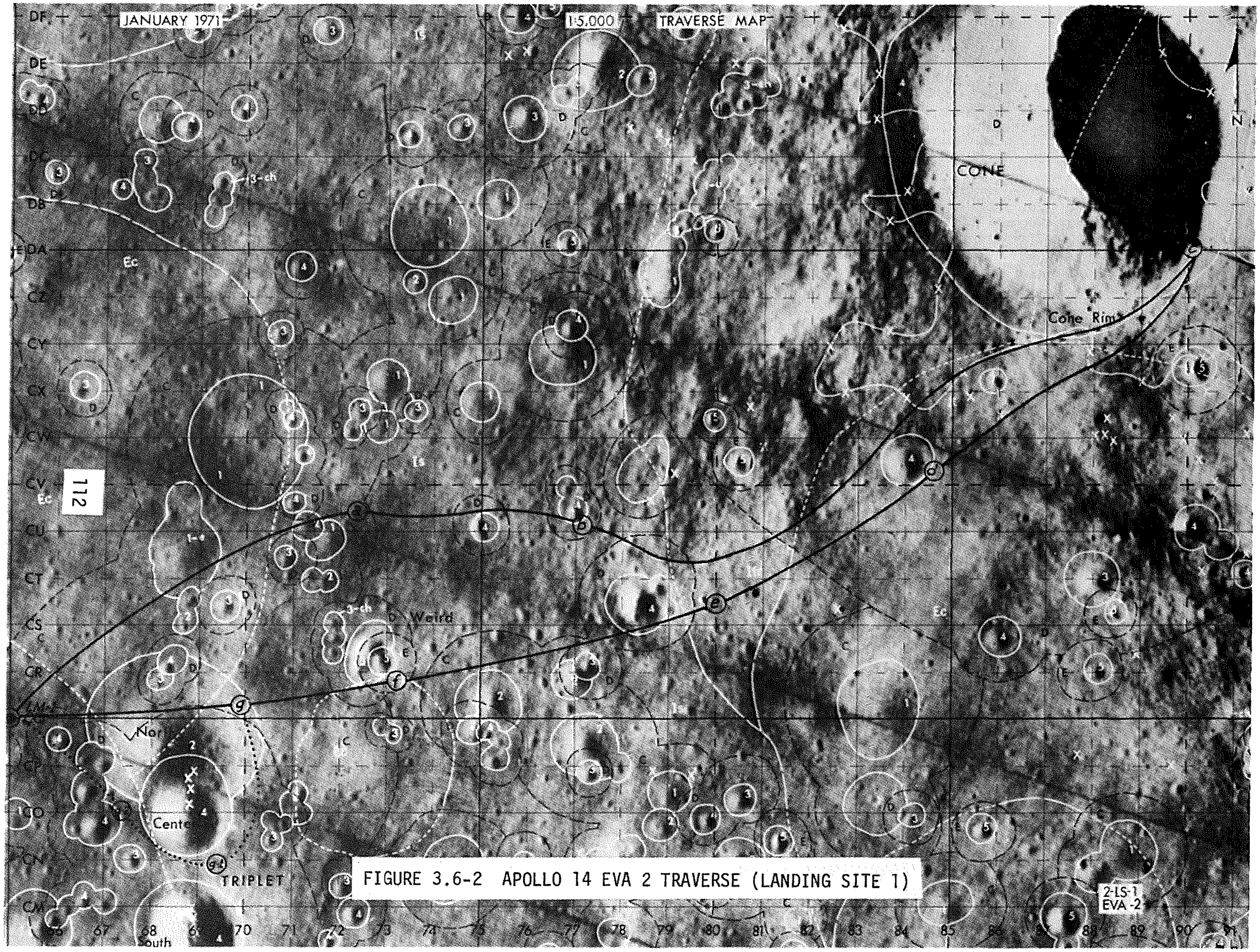


FIGURE 3.6-2 APOLLO 14 EVA 2 TRAVERSE (LANDING SITE 1)

FIG 3.6-2A
LANDING SITE 2, EVA 2 [GEOLOGICAL]

	TASKS			
STATION	CDR	COORDINATED	LMP	ADDITIONAL INFORMATION
k.	• TDS • MET Track Photos • Describe Surface	• Double Core (M) • Describe Surface • Documented Sample	• LPM Point (M) • Pan	• Small younger (#4) crater in Ridgey unit on margin of older (#1) crater. May sample blanket of deeper ejecta • Good opportunity to observe possible pat-patterned ground on irregular ridge slopes
k-m	• Observations on character of patterned ground relative to slope			
m.	• Pan	• Documented sample • Compare with Surface at k.		• Small (#4) crater in cluster of (#4) craters which may cut through ejecta blanket of Star crater
n. Star Rim	• Polarimetric Surveys	• Collect rock & soil samples • Roll boulder, take 24 fps movie, crew movement, pan South, pan crater • Describe, photo boulders • EVA Comm	Two pans on rim ≥ 300 ft baseline	• Rim of major deep older crater superimposed on approximate location of contact between Ridgey unit and Smooth unit • Possible sample site of Fra Mauro materials • Ejecta may be different on east rim of crater than on west rim due to superposition of crater on Ridgey-Smooth unit contact
n-o	• Look for changes in patterned ground toward center of crater			
o. Star Center	• Description, contrast rock types, sizes, with Star rim (n)	• Documented Sample	• Pan	• Fresh young crater (#6) in bottom of major older crater (Star) which may penetrate to Fra Mauro
o-p	• Look for surface changes that may be related to approximate contact between Ridgey (west) and Smooth (east) units			
p.	• Describe Surface	• Trench - do cuff checklist • Documented Sample • Single Core (HD)	• LPM (M) • Pan	• Well defined (#4) crater on rim of Star crater with younger ejecta blanket overlying older regolith of Smooth unit • Material may be different from that at Star center or Star rim
q. Halfway	• Describe Surface	• Triple Core (M) • Documented Sample • Radial/diametric samples at a 10 m crater	• Pan	• Prominent younger (#4) crater well out into Smooth unit • May provide good sample of excavated Smooth unit • Take core from 50 m crater ejecta blanket
q-r	• Observe possible changes in patterned ground; fillet development			
r. Doublet	• Pan • Description, patterned ground	• Gas Sample (HD) • MSSC (HD) • Fillet Sample (HD) • Documented Sample • Single core through large fillet	• LPM (HD)	• Superimposed craters in Smooth unit • Possible deep sample of Smooth unit • Next leg of traverse may cross contact between Ridgey and Smooth units

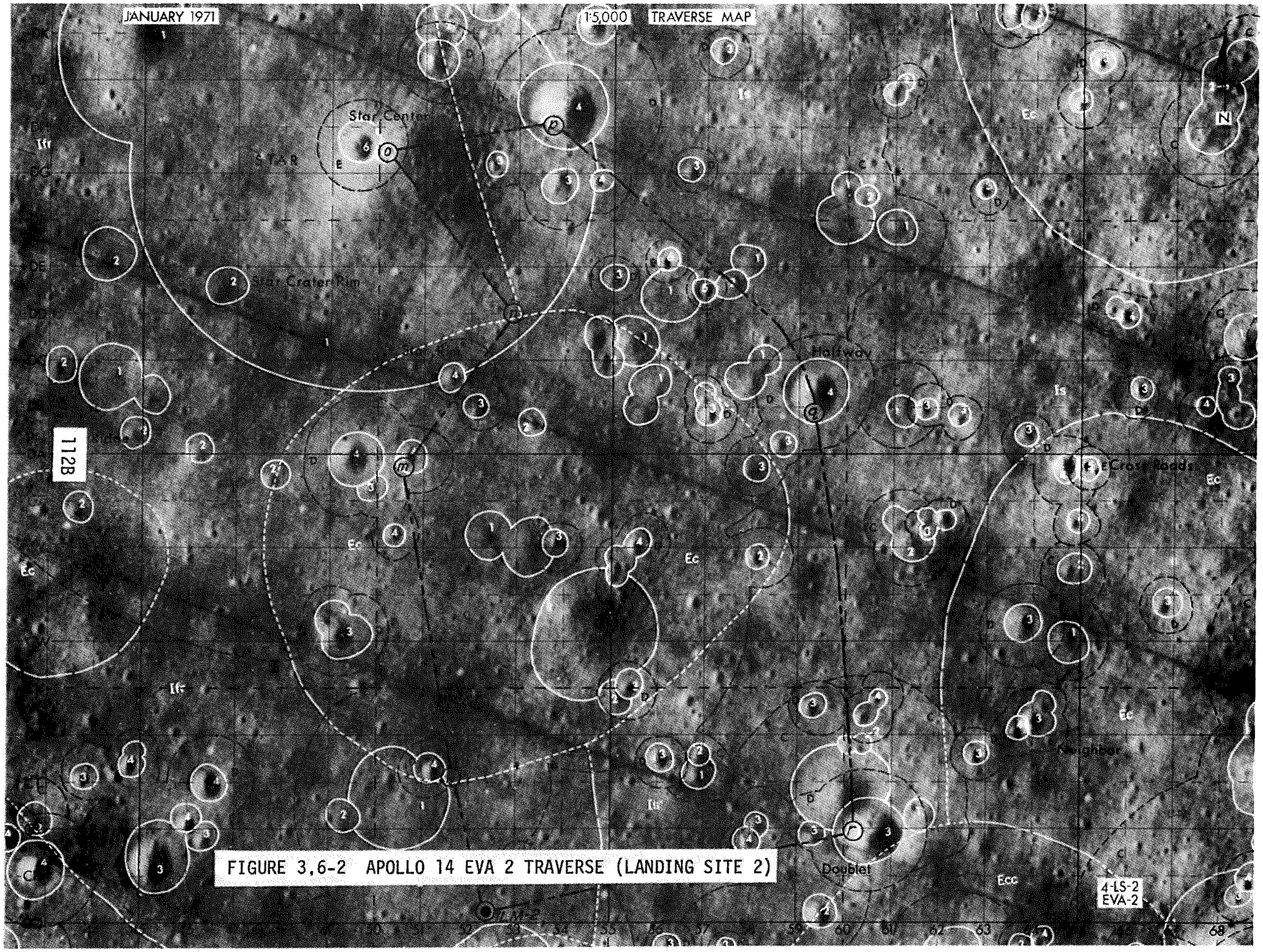


FIGURE 3.6-2 APOLLO 14 EVA 2 TRAVERSE (LANDING SITE 2)

FIG 3.6-2B
LANDING SITE 3, EVA 2 [GEOLOGICAL MAP]

STATION	TASKS			ADDITIONAL INFORMATION
	CDR	COORDINATED	LMP	
a.	•TDS •MET Track Photos •Describe Surface	•Double Core (M) •Describe Surface •Documented Sample	•LPM Point (M) •Pan	• Subdued older (#1) crater in Smooth unit; may have excavated Smooth unit materials from depth • Patterned ground may be well developed on rim; fillets
b.	•Pan	•Documented sample •Compare with Surface at a.		• Prominent (#3) crater in Smooth unit
b-c	•Watch for radial variations in materials toward Sunrise •Watch for changes in patterned ground; fillets			• Blocks ejected from Sunrise should reflect stratigraphy penetrated by crater; Fra Mauro material may be present near rim
c. Sunrise Rim	•Polarimetric Surveys	•Collect rock & soil samples •Roll boulder, take 24 fps movie, crew movement, pan east, pan crater •Describe, photo boulders •EVA Comm	•Two pans on rim ≥ 300 ft baseline	• Blocky rim of large fresh (#4) crater--penetrates about 50 m into and possibly below Smooth unit--may have excavated Fra Mauro material • Small fresh (#4) crater superimposed onto Sunrise rim east of station; should be good sampling locality for smaller blocks
c.-d.	•Watch for radial variations in materials			
d.	•Description, contrast rock types, sizes, with Sunrise	•Documented Sample	•Pan •LPM	• Moderately young (#3) crater penetrating into Sunrise ejecta
d-e	•Watch for radial variations in materials; sample			
e.	•Describe Surface	•Trench - do cuff checklist •Documented Sample •Single Core (HD)	•LPM (M) •Pan	• Small fresh (#4) crater penetrating into Smooth unit at contact with Sunrise ejecta limit • Samples may include Sunrise ejecta and Smooth unit materials
f.	•Describe Surface	•Triple Core (M) •Documented Sample •Radial/diametric samples at a 10 m crater	•Pan	• Two subdued (#2) craters penetrating into Smooth unit; small very sharp 6 m crater superimposed on east wall of westernmost (#2) crater • 6 m crater should be good sampling locality
g.	•Pan •Description patterned ground	•Gas Sample (HD) •MSSC (HD) •Fillet Sample (HD) •Single core through large rock fillet (HD)		• Overlapping ejecta from two (#1) craters and one smaller (#2) crater; (#2) crater penetrates ejecta from older (#1) craters • All craters may sample Smooth unit

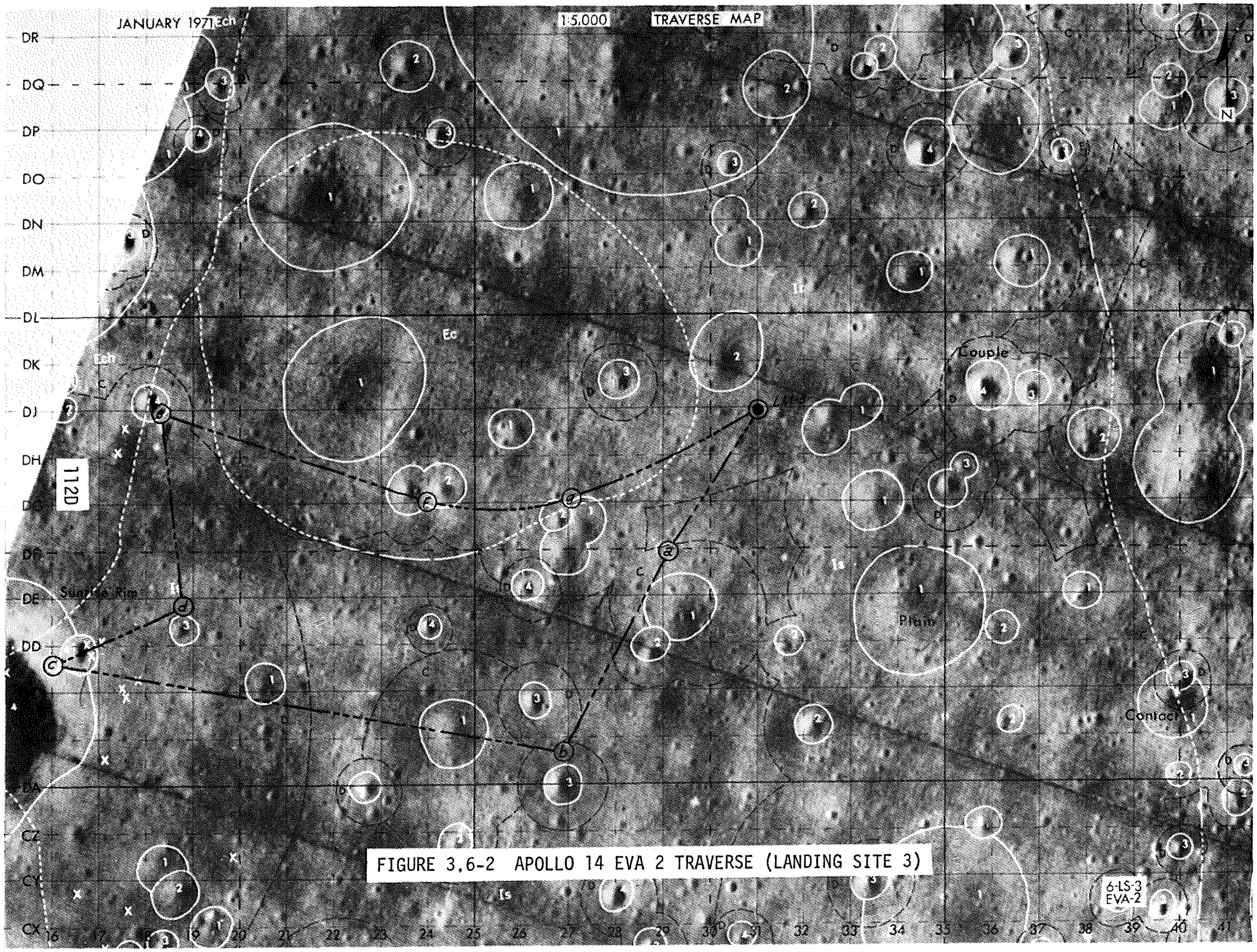


FIGURE 3.6-2 APOLLO 14 EVA 2 TRAVERSE (LANDING SITE 3)

SECTION 4.0

CONTINGENT PLANS

4.0 CONTINGENT PLANS

4.1 General Description

In lunar manned operations, it is expected that the EVA timeline will vary a small amount due to the new environment as well as small changes that occur in equipment operation. If the activity timeline or equipment operation changes sufficiently that the flexibility of the timeline or equipment cannot compensate to accomplish the planned activities, a contingency plan must be used to continue the EVA.

This section is devoted to pre-mission variations in EVA timeline and contingency EVA planning. The procedures to resolve unexpected equipment operation or malfunction are found in detail in Reference 7.

Since it is not possible to define specific plans for every possible contingency, real time resolution of problems and timeline planning must be depended on during the mission using a pre-mission developed timeline guide. The exception to this rule is predefined possible contingencies in which time is too short to respond to a problem and continue through the EVA expediently. The pre-mission timelines provided in this section that could fall in this category are; one man-EVA 1, one man-EVA 2, minimum time EVA and EVA termination timelines used in conjunction with the off-nominal EVA planning data of Section 4.3. It is expected that the guidelines provided under these categories will provide a base from which the mission EVA timelines may be modified as required to conduct the EVA's effectively.

4.1.1 EVA 1-One Man

The possibility always exists that only one Extravehicular Mobility Unit is operable to support EVA--that the PLSS, OPS, EVCS, or some other system of the EMU precludes lunar surface operations for both men. One crewman must remain on LM ECS umbilicals while the other performs what is otherwise a nominal 4-hour 15-minute (or even more) EVA. Another possibility is that some subsystem of the LM has degraded sufficiently that continuous monitoring and manual intervention is required to maintain system integrity. Any of these situations occasions a full-time one-man EVA on the lunar surface.

The contingency EVA 1--One man timeline (see figure 4-1) permits complete deployment of ALSEP and all its experiments, but limited thumper operation for the Active Seismic Experiment. Selected sample collection is preserved with ALSEP deployment as the major objectives of this one-man EVA.

Another task which is eliminated from this one-man EVA 1 is erection of the S-band Erectable Antenna. The rationale here is that antenna erection on Apollo 12 was found to require two crewmen. Using the LM steerable antenna, the television transmission and PLSS data TM would be satisfactory for the primary TV coverage, which is at the beginning of EVA 1. Television usage is less important during ALSEP deployment, since this is done at a distance of 300 ft or more from the LM. Since EVA 2's traverse is in an easterly direction from the nominal landing site, the TV is of little use for most of EVA 2, for the camera cannot be pointed within 45 degrees of the sun. In any case, signal degradation without the erectable antenna and using the MSFN 85 ft antennas is not considered to be so serious that a fairly satisfactory picture cannot be obtained. For all these reasons, the 15 minute task of putting up the S-band antenna is dropped from the contingency EVA 1.

Note, too, that SRC 1 is not used on EVA 1. This SRC will play a role in EVA 2, however. If an extension were given on EVA 1 sufficient to gather a large number of samples, then real-time consideration would be given to packing these in SRC 1.

Some photography is curtailed, all the sequence camera work on the lunar surface, detail ALSEP photography (unless time permits) and LM inspection and photography are cut from EVA 1.

The LMP is occupied taking sequence camera and 70mm still photographs of the CDR as he goes about his EVA tasks. The LMP also performs the important function of reading the lunar surface checklist contingency procedures to the CDR as required, and perhaps verbally assisting the CDR in those tasks which are normally assigned to the LMP for the two-man EVA 1.

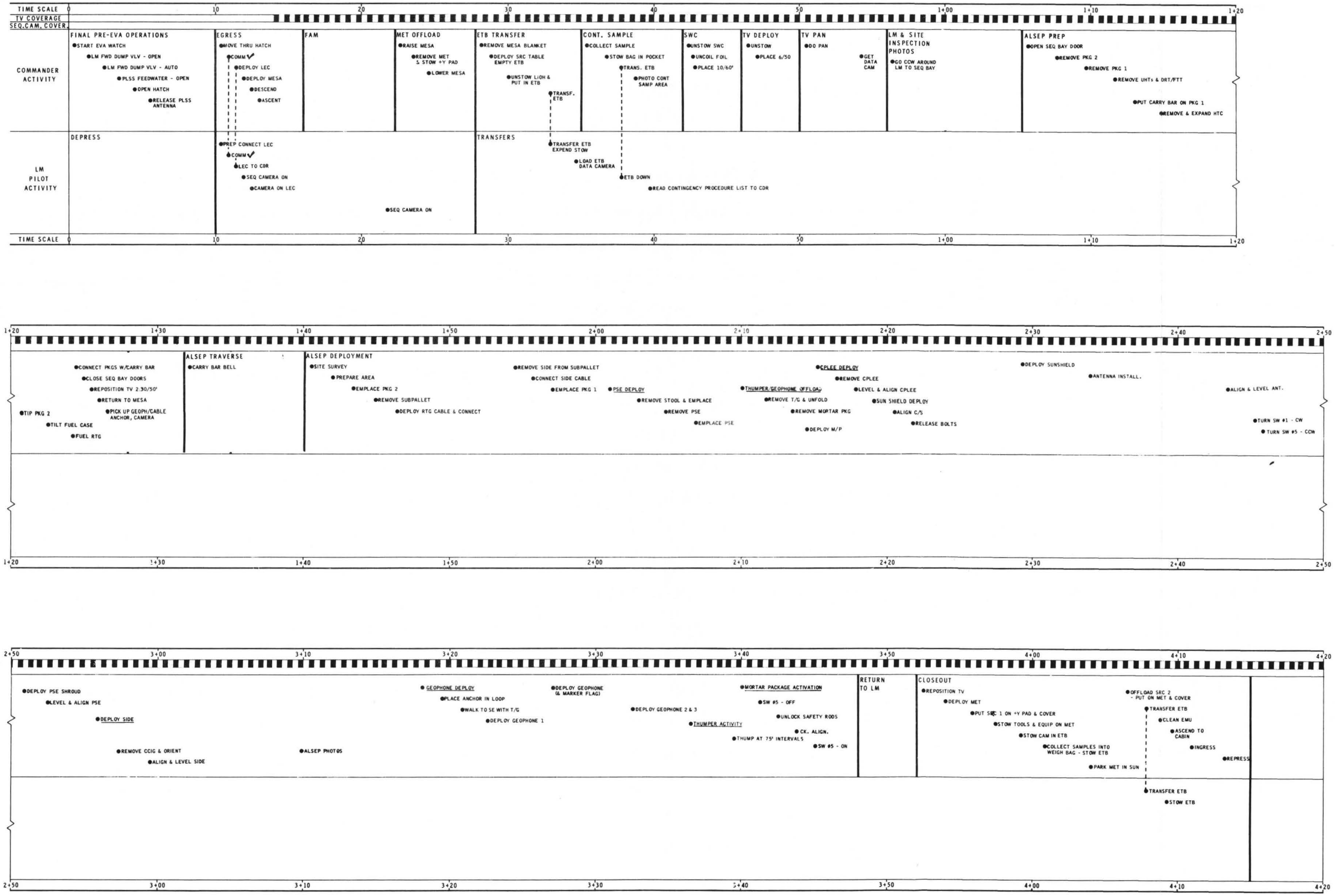
4.1.2 EVA 2-One Man

This timeline, like EVA 1-One Man, assumes that only one crewman may egress the LM but he may spend the full time of four or more hours. The other crewman is confined to the ascent stage because an EMU subsystem is not working properly, or the LM requires a continuous monitoring. In the latter case, it should be noted, the crewman could be using a fully operative EMU, and hence be available at least for a short period, depending upon the gravity of the LM malfunction, for an emergency or difficulty that the EVA crewman might have.

The summary timeline for the contingency one-man full EVA 2 is given in Figure 4.1-2. A rather extensive geology traverse could be performed, with no major objectives curtailed. The crewman would probably not traverse as far from the LM as would be the case for a two-man traverse. Revision of the traverse map would probably be made prior to egress, with a set of recommendations from the Science Support Room to facilitate such revision. He must also, of course, make all of the documenting photographs. No attempt is made to carry the Close-up Stereo Camera, although some use of it around the LM might be made. As in EVA 1, the movie camera is not carried.

APOLLO 14 SUMMARY TIMELINE

CONTINGENCY EVA 1
ONE-MAN, 4 HRS. 15 MIN.



REVISION A 12-31-70

LEGEND

EVENT LINE │ SEPARATES MAJOR BLOCKS OF ACTIVITY

COORDINATED TASKS ┆

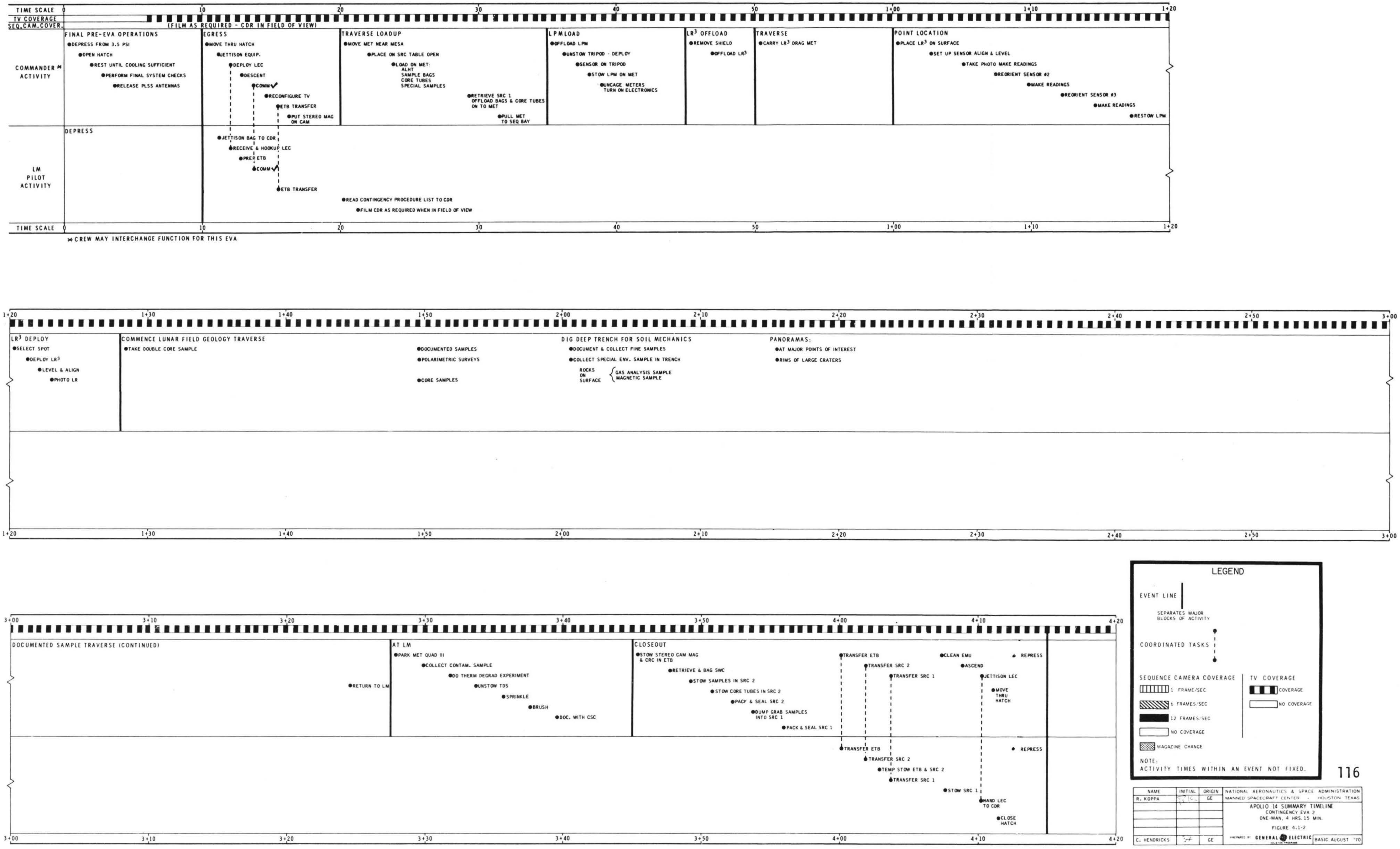
SEQUENCE CAMERA COVERAGE
- ▥ 1 FRAME/SEC
- ▧ 6 FRAMES/SEC
- ■ 12 FRAMES/SEC
- □ NO COVERAGE
- ▩ MAGAZINE CHANGE

TV COVERAGE
- ▮▯▮ COVERAGE
- □ NO COVERAGE

NOTE:
ACTIVITY TIMES WITHIN AN EVENT NOT FIXED.

NAME	INITIAL	ORIGIN	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER · HOUSTON, TEXAS
R. KOPPA	TCK	GE	APOLLO 14 SUMMARY TIMELINE CONTINGENCY EVA 1 ONE-MAN, 4HRS. 15 MIN. FIGURE 4.1-1
C. HENDRICKS	CH	GE	PREPARED BY GENERAL ELECTRIC HOUSTON PROGRAMS · BASIC AUGUST '70

APOLLO 14 SUMMARY TIMELINE
CONTINGENCY EVA 2
ONE-MAN, 4 HRS. 15 MIN.



NAME	INITIAL	ORIGIN	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON TEXAS
R. KOPPA	RK	GE	APOLLO 14 SUMMARY TIMELINE CONTINGENCY EVA 2 ONE-MAN, 4 HRS. 15 MIN. FIGURE 4.1-2
C. HENDRICKS	CH	GE	PREPARED BY GENERAL ELECTRIC HOUSTON PROGRAMS — BASIC AUGUST '70

SRC 2 is utilized just as it is for a two-man EVA 2, to contain the documented samples. SRC 1 is also utilized to contain overflow from SRC 2 and for quasi-selected samples from the vicinity of the LM, if EVA 1 was a one-man EVA.

Either the CDR or the LMP could perform the EVA 2 one-man contingency case. As in EVA 1, the crewman inside the LM takes still and motion pictures of the EVA crewman and reads procedures as required.

4.1.3 Contingent EVA 1 - Minimum Time, One Man

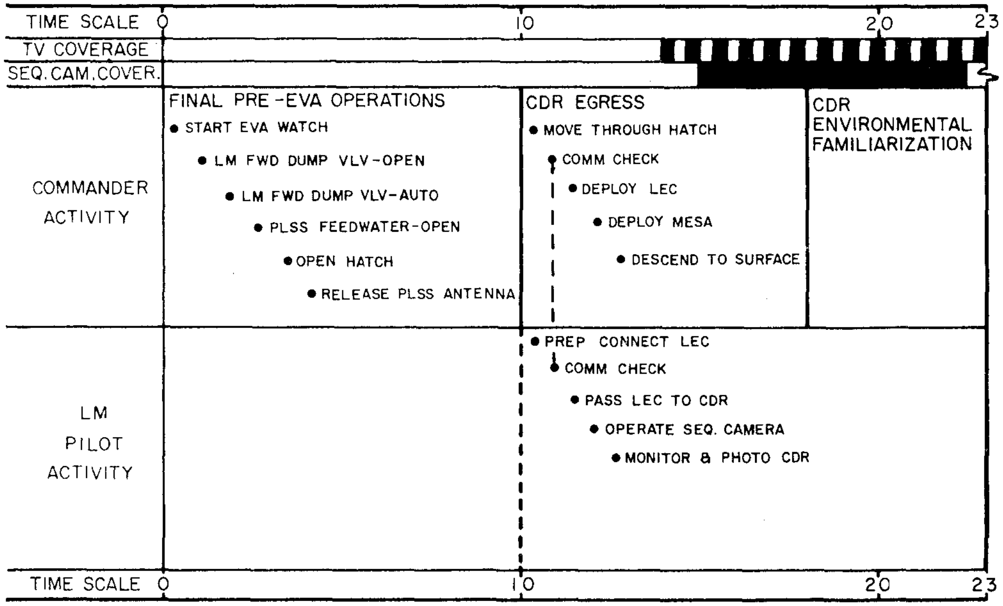
For various reasons, on a lunar landing mission, only a very limited time may be available to accomplish one EVA. For such a situation, the choice of objectives are, first, those with the highest priority and, secondly, those which can be accomplished in a short period of time and do not require the accomplishment of a previous task. The timeline (See Figure 4.1-3) presented here, referred to as the Contingent EVA 1 Minimum-Time, One-Man EVA, fits the above guidelines by providing for the implementation of the highest priority and basic objective of documenting the character of the landing site. This is done by collecting a surface sample (contingency sample) and describing as well as photographing the lunar surface texture and topography.

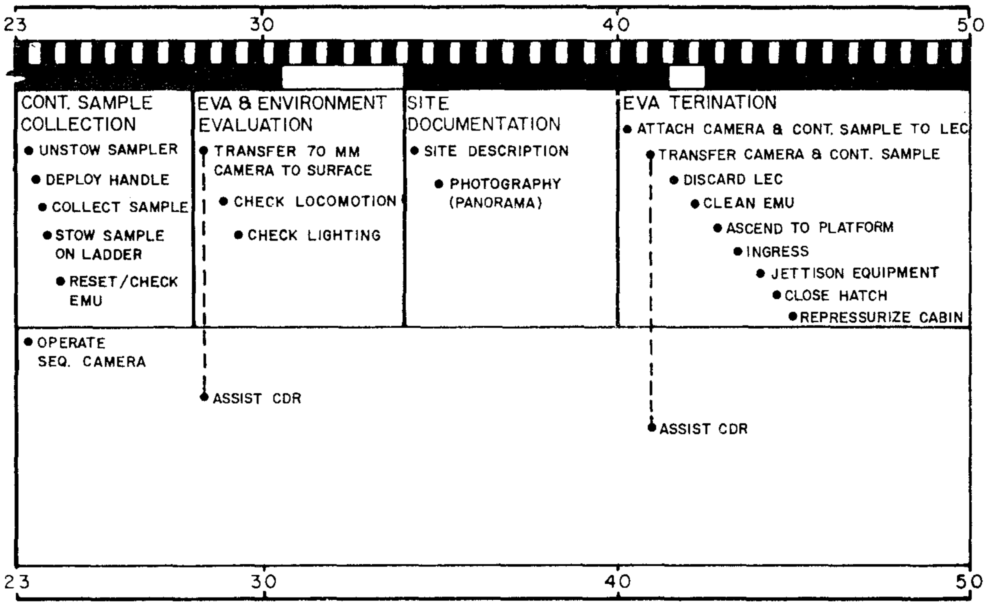
In this contingent EVA, for the environmental familiarization, the crewman will spend only enough time to assure himself that he can safely proceed with the EVA. After the contingency sample collection he will continue to become more adapted to the new environment as he conducts a limited EVA evaluation. Primarily, this EVA evaluation will involve a brief investigation to determine his general capabilities or limitations for conducting EVA tasks within the lunar environment. Photographs taken during this evaluation will be a postflight aid to the crewman's recall and the documentation of this activity. A limited site description, with very brief comments and several documentary photographs, can be made of the surface to the horizon. To conclude the surface activity, the crewman will take a photographic panorama and possibly a few additional photographs of documentary value.

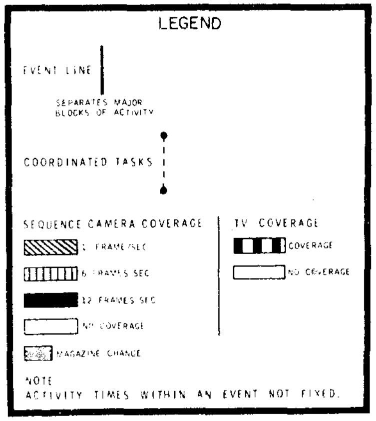
In conclusion, it should be mentioned that the crewman's surface activity will be confined mainly to an area where he can be monitored by the crewman inside the LM. Practically all of the activity can be documented with the sequence camera, and, if the communications capability exists, with the TV.

APOLLO 14 SUMMARY TIMELINE

CONTINGENT EVA
MINIMUM TIME, ONE MAN







NAME	INITIAL	ORIGIN	NATIONAL AERONAUTICS & SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS
R. KOPPA	RK	CE	APOLLO 13 SUMMARY TIMELINE CONTINGENT EVA I MINIMUM TIME, ONE MAN
CHECKED BY	CLH	CE	FIG. 4.1-3

4.2 Detailed EVA Timeline Procedures

4.2.1 EVA 1-One Man

The following pages present step by step timeline procedures for EVA 1 in a format similar to that the crew would use from their Lunar Surface Checklist.

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	0+00	DEPRESS CABIN FROM 3.5 PSI			
		NOTE: DETAILED PROCEDURES ARE PRESENTED IN "LUNAR SURFACE CHECKLIST" "EQUIPMENT PREP EVA 1" SECTION			
		OPEN HATCH			
	0+10				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	0+10	MOVE THRU HATCH			
PASS LEC TO CDR		DEPLOY LEC			
PASS JETTISON BAG OUT CHECK CB(16) COMM: TV-CLOSE		JETTISON BAG DESCEND LADDER TO DEPLOY MESA			
		DEPLOY MESA			
MONITOR & PHOTOGRAPH EVA CREWMAN USING DC OR LDAC		DESCEND TO FOOTPAD			
SHADOW: DC (f5.6, 1/250) LDAC(f2.8, 1/60FPS)		STEP TO SURFACE			
SUN: DC (f11, 1/250) LDAC(f8, 1/250, 6FPS)					
		CHECK & DISCUSS STABILITY & MOBILITY			
	0+20				
		CHECK LM AND TERRAIN			
		MET OFFLOAD			
		RAISE MESA			
		REMOVE THERMAL BLANKET DOOR			
		RELEASE MET FROM MESA			
		STOW MET ON +Y FOOTPAD			
		ETB TRANSFERS ADJUST MESA IF NECESSARY			
		UNFOLD MESA THERMAL BLANKET			
		ERECT SRC TABLE			
	0+30				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	0+30				
		ATTACH ETB TO SRC TABLE. STOW WEIGH BAGS ON MESA. DISCARD TETHER			
		UNSTOW & PACK LiOH CANS IN ETB			
		ATTACH LEC TO ETB			
TRANSFER ETB INTO LM		TRANS ETB INTO LM			
REMOVE ETB CONTENTS		<u>CS COLLECTION</u> REMOVE CSRC FROM POCKET & DEPLOY HANDLE			
STOW IN ETB 70mm CAMERA 16mm CAMERA					
		COLLECT SAMPLE			
		DETACH SAMPLE BAG STOW SAMPLE IN POCKET			
TRANSFER ETB TO SURFACE		TRANSFER ETB TO SURFACE			
	0+40	ATTACH ETB TO MESA			
		<u>SWC DEPLOYMENT</u> UNSTOW SWC			
		EXTEND STAFF			
		UNROLL FOIL SHADE			
		PLACE SWC IN SUN (10/60')			
		<u>TV DEPLOY</u>			
		UNSTOW AND ERECT TV TRIPOD SET TV LENS TO f22 COVER LENS WITH CAP UNSTOW AND MOUNT TV ON TRIPOD			
	0+50	CARRY TV TO 6:00/50'			

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	0+50				
		TAKE TV PAN			
		LM & SITE INSPECTION/PHOTO			
		OBTAIN 70MM CAMERA			
		MOVE CCW AROUND LM INSPECTING & REPORTING ON LM CONDITION, & TERRAIN FEATURES IN AREA			
		PHOTO - LM FOOTPADS/SURFACE (STEREO) PANS AT 8/30', 4/30', 12/30'			
	1+00				
		ALSEP OFFLOAD			
		OPEN SEQ BAY DOORS			
		OFFLOAD ALSEP PKG #1			
		DISCONNECT LANYARDS & BOOM CABLE MOVE PKG #1 CLEAR			
		OFFLOAD PKG #2			
		DISCONNECT LANYARDS & BOOM CABLE			
	1+10				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	1+10				
		STOW BOOMS			
		REMOVE UHT'S. STOW ON PKGS			
		REMOVE & ASSEMBLE CARRY BAR ATTACH TO PKG #1			
		REMOVE & EXPAND HTC			
		PLACE NEAR -Y STRUT			
		REMOVE DRT & FTT AND TIP PKG #2 & POSITION FOR FUELING			
		TILT FUEL CASK			
		REMOVE DOME			
	1+20	READ TEMP LABEL & REPORT			
		ENGAGE & CHECK FTT WITHDRAW FUEL ELEMENT			
		FUEL RTG - <u>REPORT</u>			
		DISENGAGE FTT, READ TEMP LABEL & REPORT			
		ROTATE PKG #2 & POSITION NEAR PKG #1 - CONNECT TO CARRY BAR			
		CLOSE SEQ BAY DOORS			
		CARRY TV TO 2:30/50' POSITION TO VIEW ALSEP DEPLOY SITE (FULL ZOOM)			
		RETURN TO MESA & RETRIEVE GEOPHONE ANCHOR			
	1+30				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	1+30	STOW ANCHOR ON TETHER			
		ATTACH 70MM CAMERA TO RCU BRACKET			
		ALSEP TRAVERSE			
		CARRY ALSEP			
	1+40	ALSEP SITE SURVEY			
		SURVEY SITE TO DETERMINE IF SUITABLE FOR ALSEP DEPLOY			
		CLEAR OR PACK AREAS AS REQUIRED FOR PKG'S 1 & 2			
		ALSEP SYSTEM INTERCONNECT			
		POSITION ALSEP FOR DEPLOYMENT			
		DISENGAGE BAR FROM PKG #2			
		REPOSITION PKG #1 AND BAR 10 FEET WEST OF PKG 2			
		TILT PKG #2			
		REMOVE SUBPALLET & PLACE APPROX 10 FEET NE OF C/S			
	1+50				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	1+50	RELEASE RTG CABLE BOYD BOLTS CAUT: READ TEMP LABEL - DO NOT TOUCH WITH GLOVE IF ALL DOTS ARE BLACK-REPORT			
		DEPLOY CABLE, DISCARD REEL			
		REPORT AMPS & CONNECT CABLE			
		DEPRESS SHORTING SWITCH, CHECK SHORTING SW AMPS ZERO			
		REMOVE SIDE CONNECTOR FROM CABLE CRADLE ON SUBPALLET			
		CONNECT SIDE CONNECTOR TO C/S			
		REMOVE CARRY BAR/ANT MAST FROM PKG #1 & STOW ON SUB-PALLET			
		TILT & ALIGN PKG #1			
		PULL SIDE CONNECT RELEASE PIN			
	2+00	PSE OFFLOAD			
		RELEASE PSE BOYD BOLTS			
		USE UHT TO REMOVE PSE FROM C/S			
		CARRY PSE TO LEVELING STOOL			
		REMOVE PSE GIRDLE PIN			
		EMPLACE PSE ON STOOL(ARROW WEST)			
		REMOVE & DISCARD PSE GIRDLE			
		MORTAR PACKAGE DEPLOYMENT			
		REMOVE MORTAR PACKAGE FROM C/S			
		CARRY M/P TO DEPLOY SITE 10' NW OF C/S			
		REMOVE CARRY SOCKET PIP PIN			
	2+10				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION	
				LMP	CDR
	2+10				
		DEPLOY TWO M/P LEGS			
		PARTIALLY DEPLOY M/P ANTENNA			
		ORIENT M/P TOWARD NW			
		COMPLETE M/P ANTENNA DEPLOYMENT			
		CPLEE DEPLOYMENT			
		RELEASE THREE BOYD BOLTS			
		REMOVE CPLEE FROM C/S			
		REMOVE & DISCARD CARRY SOCKET PULL PIN			
		PLACE CPLEE ON SURFACE 10' N OF C/S			
	2+20				
		ALIGN & LEVEL CPLEE			
		SUNSHIELD DEPLOYMENT			
		CHECK C/S FREE OF CABLES AND OTHER EQUIPMENT			
		START FRONT CENTER & RELEASE SUNSHIELD BOYD BOLTS CW			
		UNSTOW ANTENNA CABLE			
		RELEASE BACK BOYD BOLTS			
		RELEASE REMAINING PERIMETER BOYD BOLTS			
	2+30				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	2+30				
		RESTRAIN SUNSHIELD & RELEASE THREE CENTER BOYD BOLTS			
		CONTROL SUNSHIELD DEPLOYMENT			
		USE MANUAL ASSIST IF REQ'D TO RAISE SUNSHIELD			
		REMOVE & DISCARD CURTAIN COVERS & CONNECT CURTAIN CORNERS			
		RECHECK C/S LEVEL & ALIGN			
		ALSEP ANTENNA INSTALLATION			
		RELEASE ANTENNA GIMBAL BOYD BOLTS & LIFT GIMBAL FROM SUBPALLET			
		RETRIEVE ANTENNA MAST FROM SUBPALLET INSTALL MAST ON C/S			
	2+40	REMOVE GIMBAL HOUSING COVER			
		INSTALL GIMBAL (AIMING MECHANISM) ON MAST			
		REMOVE & DISCARD GIMBAL HOUSING			
		INSTALL ANTENNA ON GIMBAL			
		CHECK C/S LEVEL & ALIGNMENT LEVEL ANTENNA ALIGN ANTENNA ENTER ELEVATION ENTER AZIMUTH RECHECK ALIGNMENT & LEVEL			
		TURN SW #1 - CW, SW #5 CCW			
	2+50				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+50				
		PSE DEPLOYMENT			
		USE UHT TO DEPLOY THERMAL SHROUD			
		LEVEL PSE			
		REPORT LEVEL & ALIGNMENT			
		CONFIRM ALSEP DATA BY MCC-H			
		SIDE CCIG DEPLOYMENT			
		LIFT SIDE FROM SUBPALLET			
		DEPLOY LEGS			
		CARRY SIDE TO DEPLOYMENT SITE			
	3+00	APPROXIMATELY 55' SE OF C/S			
		PLACE SIDE ON SURFACE RELEASE CCIG BOYD BOLT			
		REMOVE & EMPLACE SIDE GROUND SCREEN			
		LIFT SIDE & REMOVE CCIG PLACE SIDE ON GROUND SCREEN			
		IMPLACE & ORIENT CCIG			
		PULL DUST COVER RELEASE PIN			
		ALIGN & LEVEL SIDE			
		REPORT LEVEL & ALIGNMENT			
	3+10				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	3+10				
		ALSEP PHOTOS			
		PHOTO PSE			
		PHOTO MORTAR PACKAGE			
		PHOTO CPLEE			
		PHOTO SIDE/CCIG			
		PHOTO RTG & LM			
		PHOTO C/S			
		GEOPHONE DEPLOYMENT			
		SELECT DEPLOY LINE SE OF C/S			
	3+20				
		PLACE T/G CABLE ANCHOR IN LOOP			
		RETRIEVE THUMPER/GEOPHONE			
		WALK TO SE OF C/S ALONG DEPLOYMENT LINE			
		DEPLOY GEOPHONE CABLE 10' SE EMPLACE FIRST GEOPHONE			
		DEPLOY GEOPHONE TO 160' SE OF C/S			
		EMPLACE SECOND GEOPHONE & MARKER FLAG			
	3+30				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	3+30				
		DEPLOY GEOPHONE CABLE TO 310' SE OF C/S			
		EMPLACE THIRD GEOPHONE			
		CHECK GEOPHONE CABLE LINE			
		CONFIRM "READY" FOR THUMPER ACTIVITY WITH MCC-H			
		<u>THUMPER ACTIVITY</u>			
		ACTIVATE THUMPER NEAR THIRD GEOPHONE AND AT 75' INTERVALS ALONG CABLE (4 THUMPS)			
		REMAIN STILL 20 SECONDS BEFORE 5 SECONDS AFTER			
	3+40	<u>MORTAR PACK ACTIVATION</u>			
		TURN OFF (CW) SE #5			
		UNLOCK SAFETY RODS			
		USE UHT TO HOLD MORTAR PACK, PULL SAFETY RODS			
		CHECK M/P ALIGNMENT			
		TURN ON TWO M/P SAFE/ARM SWS			
		RECHECK M/P ORIENTATION			
		TURN ON SW #5 (CCW) - REPORT			
		START TRAVERSE BACK TO LM			
	3+50				

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION	
				LMP	CDR
	3+50				
		DEPLOY MET			
		UNFOLD MET WHEELS AND HANDLES			
		PLACE MET NEAR MESA			
		UNSTOW SRC #1 FROM MESA			
		PLACE SRC #1 ON +Y FOOTPAD IN SHADOW (LID DN-SUN)			
		COVER WITH MET BLANKET			
		STOW ON MET - WEIGH BAGS HTC, GNOMON, STEREO CAM, HAMMER, CLOSE UP CAMERA, UHT			
		STOW IN ETB - 70MM CAMERA 16MM MAGS			
	4+00				
		COLLECT SAMPLES TO FILL WEIGH BAG			
		PLACE WEIGH BAG IN ETB			
		PLACE SRC #2 & EXT HANDLE & SCOOP ON MET			
		PARK MET IN SUN AT 45 DEGREE ANGLE TO SUNLINE			
		COVER SRC CAMERAS WITH S-BAND ANTENNA THERMAL COVER			
TRANSFER ETB		TRANS ETB INTO LM			
TEMP STOW ON ASC ENG COVER		CLEAN EMU			
		MOVE TO FOOTPAD			
	4+10				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 1

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				L M P	C D R
	4+10	ASCEND TO PLATFORM			
		STOW LEC ON PLATFORM			
		INGRESS *			
		JETTISON MALFUNCTION EQUIPMENT WHICH IS NO-GO FOR EVA ALSO B&W TV IF REQUIRED			
		REPRESSURIZE CABIN			
	4+20				

*FRom this point on, procedures governed by "LUNAR SURFACE CHECKLIST"

4.2.2 EVA 2-One Man

The following pages present step by step timeline procedures for EVA 2 in a format similar to that the crew would use from their Lunar Surface Checklist.

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	0+00	DEPRESS CABIN FROM 3.5 psi			
		NOTE: DETAILED PROCEDURES ARE PRESENTED IN "LUNAR SURFACE CHECKLIST" "EQUIPMENT PREP EVA 2" SECTION			
		OPEN HATCH			
	0+10				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	0+10	EGRESS			
ASSIST EVA CREWMAN EGRESS		MOVE THRU HATCH			
PASS EQUIPMENT TO EVA CREWMAN		JETTISON MALFUNCTION EQUIPMENT WHICH IS NO-GO FOR EVA & JETT BAG			
HOOKUP LEC					
LOAD ETB 70MM CAM & Spare Mag MAP BSLSS		HAND LEC TO LMP DEPLOY LEC			
COMM CHECK		COMM CHECK RECONFIGURE TV FOR EVA II			
ATTACH ETB TO LEC					
ASSIST ETB TRANSFER		TRANSFER ETB DOWN			
PHOTO EVA CREWMAN AS ABLE					
READ THIS PROCEDURE TO EVA CREWMAN AS REQUIRED		STOW ETB ON MESA			
		Put 70MM Cam on RCU JETTISON BSLSS			
	0+20	MOVE MET NEAR MESA			
		PLACE & SECURE SRC ON MESA			
		OPEN SRC 2			
		STOW SRC EQUIP ON MET -SESC & GASC -2 WEIGH BAGS (WITH HOOKS) -35 BAG DISPENSER -3 CORE TUBES & CAP ASSY -MAGNETIC SAMP. CONT. SEAL ORGANIC SAMPLE PUT SWC BAG ON MESA 70mm CAM & 1 MAG			
		MAP IN HTC POUCH GNOMON, EXT HANDLE, HAMMER ON HTC TRENCHING TOOL ON MET			
		STOW MESA BRUSH IN HTC			
	0+30				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	0+30				
		STOW TDS IN POUCH			
		RETRIEVE SRC #1 FROM +Y FOOTPAD PLACE ON MET TABLE OPEN SRC 1 STOW ON MET: -2 WEIGH BAGS -3 CORE TUBES & CAP ASSY PLACE SRC 1 OUT OF WAY ON GND			
		PULL MET TO SEQ BAY			
		OFFLOAD LPM PALLET			
		UNSTOW TRIPOD & DEPLOY			
		PLACE SENSOR ON TRIPOD STOW CABLE REEL ON MET			
	0+40	STOW TRIPOD/SENSOR ON MET			
		STOW ELECTRONICS ON MET			
		UNCAGE METERS & TURN ON ELECTRONICS			
		DISCARD PALLET			
		MOVE TO LR^3			
		REMOVE LR^3 THERMAL SHIELD			
		OFFLOAD LR^3 FROM LM			
	0+50				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	0+50	CARRY LR^3, PICK UP MET			
		TRAVERSE TO LPM POINT LOCATION			
	1+00	PLACE LR^3 ON SURFACE			
		<u>LPM POINT MEASUREMENT</u> UNSTOW CABLE REEL UNSTOW SENSOR/TRIPOD			
		MOVE SENSOR TO SITE 35' AWAY			
		ERECT TRIPOD, CHECK SENSOR ORIENTATION (#1, FACING DN SUN)			
		ALIGN & LEVEL SENSOR/TRIPOD			
		MOVE TO MET (ELECTRONICS)			
		PHOTO TRIPOD/SENSOR (LOCALIZATION SHOT)			
		REPORT X,Y,Z READINGS(3 TIMES)			
		RETURN TO SENSOR			
	1+10				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	1+10				
		REORIENT SENSOR TO #2			
		RECHECK ALIGNED & LEVELED			
		RETURN TO MET			
		REPORT X,Y,Z READINGS (3 TIMES)			
		RETURN TO SENSOR REORIENT SENSOR TO #3			
		RECHECK ALIGNED & LEVELED			
		RETURN TO MET			
		REPORT X,Y,Z READINGS (3 TIMES)			
		STOW SENSOR/TRIPOD ON MET			
		REWIND CABLE, STOW ON MET			
		LR^3 DEPLOY			
	1+20				
		MOVE LR^3 TO SUITABLE SPOT			
		DEPLOY LR^3			
		LEVEL & ALIGN LR^3			
		REMOVE DUST COVER			
		PHOTO LR^3 - 3' TO 5' SHOWING BUBBLE/GNOM			
		LOCALIZATION SHOT F:8 SUN 15 FT FOCUS 74' (LANDMARK)			
	1+30				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	1+30	COMMENCE LUNAR FIELD GEOLOGY TRAVERSE			
		TAKE CORE SAMPLE (DOUBLE)			
		NEAR LR^3 - PLACE GNOMON			
		ASSEMBLE TUBES			
		REPORT NO's & ORDER			
		READY HAMMER			
		DRIVE TUBES INTO SURFACE			
		COMMENT ON DIFFICULTY SOIL CHARACTERISTICS			
		STEP BACK, TAKE SINGLE XSUN [f8, 15 ft]			
		REMOVE TUBES, DISASSEMBLE, CAP & STOW TUBES			
		RESTOW EQUIP & GNOMON			
		PULL MET			
	1+40				

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
		TRAVERSE CONTINUES NOTE: STATIONS AND DISTANCES FOR 1-MAN EVA 2 WILL BE DETERMINED BETWEEN EVA'S AND MAY DIFFER FROM NOMINAL. LPM ADD'L MEASUREMENTS WILL BE REDESIGNATED. SAMPLING/SURVEY PROCEDURAL DIFFERENCES: SINGLE DOCUMENTED SAMPLE: NO DOWN SUN SHOT AFTER SAMPLE: TAKE XSUN AT 15', FOCUS 15' [SINGLE] CORE SAMPLE: XSUN [SINGLE] AT 15 FT WITH TUBES DRIVEN IN SURFACE DEEP TRENCH: ON ALL 4 SIDES: STEREO PRS AFTER ALL SAMPLES TAKEN: [SINGLE] POLARIMETRIC SURVEY (CLOSE UP) AFTER SHOT [SINGLE] XSUN, 15 FT			
	3+45				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	3+25				
		RETURN TO LM CONTAMINATED SAMPLE			
		PARK MET NEAR QUAD III			
		CONNECT SMALL SCOOP & EXT HANDLE			
		OPEN CONTAM. SESC & PLACE ON TABLE			
		PLACE GNOMON AT SAMPLE SITE UNDER QUAD III TAKE TRIAD XSUN			
		COLLECT SAMPLE FINES AND PLACE IN SESC			
	3+35				
		CLOSE SESC & TEMP STOW PULL MET TO MESA TDS TAKE OUT TDS #1 PLACE ON MET TABLE TAKE CSC PHOTO, ONE SIDE SPRINKLE FINE MAT'L ON TDS, SHAKE OFF TAKE CSC PHOTO, BOTH SIDES (TDS ON TABLE, ALL PHOTOS) BRUSH OFF TDS			
		TAKE CSC PHOTO BOTH SIDES FOLD TDS, PLACE IN BAG. TAKE OUT OTHER TDS SPRINKLE FINE MAT'L SHAKE OFF, PLACE ON TABLE			
		TAKE CSC PHOTO, BOTH SIDES FOLD TDS, PLACE IN BAG STOW BAG IN ETB EVA CLOSEOUT			
	3+45				

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE-MAN FULL TIME EVA 2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	3+45				
		RETRIEVE SWC FOIL			
		STOW SWC IN BAG, PLACE BAG IN ETB			
		STOW ALL INDIVIDUALLY BAGGED DOCUMENTED SAMPLES IN 1 WEIGH BAG. STOW IN SRC			
		STOW OTHER SAMPLES (IF ANY) COLLECTED DURING TRAVERSE IN SRC			
	3+55	(USE 2ND WEIGH BAG)			
		STOW CORE TUBES IN SRC			
		PACK & SEAL SRC			
		NOTE: LMP PHOTO THIS			
		SCOOP UP 10 LBS. FINES IN WEIGH BAG & STOW			
		ETB OR SRC 1 (IF SRC 1 USED)			
		GRAB ROCKS, ETC. AROUND LM & PACK SRC 1			
		SEAL SRC 1			
	4+05				

MISSION: APOLLO 14, H-3
EVA: ONE-MAN FULL TIME EVA 2

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	4+05				
PULL ETB INTO A/S		TRANSFER ETB			
STOW ON ASC. ENG. COVER					
PULL SRC 2 INTO A/S STOW ON ASC. ENG. COVER		TRANSFER SRC 2			
PULL SRC 1 INTO A/S		TRANSFER SRC 1 (IF USED)			
		MOVE TO FOOTPAD & ASCEND TO PLATFORM			
HAND LEC TO EVA CREWMAN		DISCARD LEC			
ASSIST EVA CREWMAN		INGRESS *			
		JETTISON B&W TV IF REQUIRED			
CLOSE HATCH		REPRESSURIZE CABIN			
	4+15				

*From this point on, procedures governed by "LUNAR SURFACE CHECKLIST"

4.2.3 Detailed procedure-Minimum Time One-Man

The following pages present step-by-step timeline procedures for a minimum time--one-man EVA. The format on the following pages is similar to that the crew would use from their Lunar Surface Checklist.

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE MAN - MINIMUM TIME

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
	0+00	CHECK CABIN PRESSURE "ZERO" - OPEN HATCH, FEED WATER ON			
		NOTE: DETAIL PROCEDURES ARE PRESENTED IN "LUNAR SURFACE CHECKLIST"; "EQUIPMENT PREP EVA 1" SECTION			
	0+10	MOVE THRU HATCH			

1MEK1

MISSION: APOLLO 14, H-3
EVA: ONE MAN - MINIMUM TIME

DATE: Dec. 31, 1970

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	0+10	MOVE THROUGH HATCH			
PREPARE LEC		CHECK INGRESS PROCEDURES			
PASS LEC TO EVA CREWMAN		DEPLOY LEC			
PHOTOGRAPH EVA CREWMAN		DESCEND TO LADDER DEPLOY MESA			
SEQ CAM ON		DESCEND TO FOOTPAD			
NOTE: MONITOR & PHOTOGRAPH EVA CREWMAN USING 70MM READ PROCEDURES TO EVA CREWMAN		CHECK ASCENT PROCEDURES			
		STEP TO SURFACE			
		CHECK & DISCUSS MOBILITY & STABILITY			
	0+20				
		REPORT LM STATUS			
CHANGE SEQ CAM MAG SEQ CAM ON		UNSTOW CSRC & DEPLOY HANDLE			
		COLLECT SAMPLE			
		REMOVE SAMPLE FROM CSRC			
ATTACH 70MM CAMERA TO LEC		HANG SAMPLE ON LADDER			
ASSIST EVA CREWMAN		REST/CHECK EMU			
		TRANSFER 70MM CAMERA TO SURFACE			
		ATTACH 70MM CAMERA TO EMU			
	0+30				

1MEK2

MISSION: APOLLO 14, H-3 DATE: Dec. 31, 1970
EVA: ONE MAN - MINIMUM TIME

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	0+30				
		CHECK SURFACE LOCOMOTION CAPABILITY			
CHANGE SEQ CAM MAG					
SEQ CAM ON		DESCRIBE LANDING SITE			
		OBTAIN +Z PANORAMA			
	0+40				
ASSIST CHANGE SEQ CAM MAG		ATTACH 70MM CAMERA AND CONTINGENCY SAMPLE TO LEC			
SEQ CAM ON		TRANSFER 70MM CAMERA AND CONTINGENCY SAMPLE INTO LM			
REMOVE 70MM CAMERA AND CONTINGENCY SAMPLE FROM LEC		CLEAN EMU			
		PULL LEC FROM LM & DISCARD ASCEND LADDER			
		INGRESS *			
		JETTISON MALFUNCTION EQUIPMENT WHICH IS NO-GO FOR EVA			
		JETTISON BAG AND B&W TV IF REQUIRED			
	0+50				

*From this point on, procedures governed by "LUNAR SURFACE CHECKLIST"

1MEK3

4.3 Off Nominal EVA Planning

4.3.1 The following charts define guidelines for off nominal EVA planning. Consideration was given to priorities as listed in Mission Requirements H-3 Type Mission and crew operation constraints.

Ahead or behind of the timeline is defined as the difference between the remaining PSLSS time and the nominal time for the remaining planned EVA tasks.

Tasks which have not been performed on EVA #1 and are to be accomplished on EVA #2 will change the planned tasks for EVA #2. A traverse to Cone crater is considered to be second priority to completion of the ALSEP deployment.

4.3.2 Off Nominal Closeout Procedures

Pages 151 through 152 present rapid closeout procedures for EVA 1 and EVA 2. The EVA #1 and EVA #2 rapid closeout procedures would be used only if a contingency situation exist which would force the crew to ingress the LM faster than the nominal 30-35 minutes.

Figure 4.3-1: EVA NO. 1 OFF-NOMINAL PLANNING (CONTINUED)

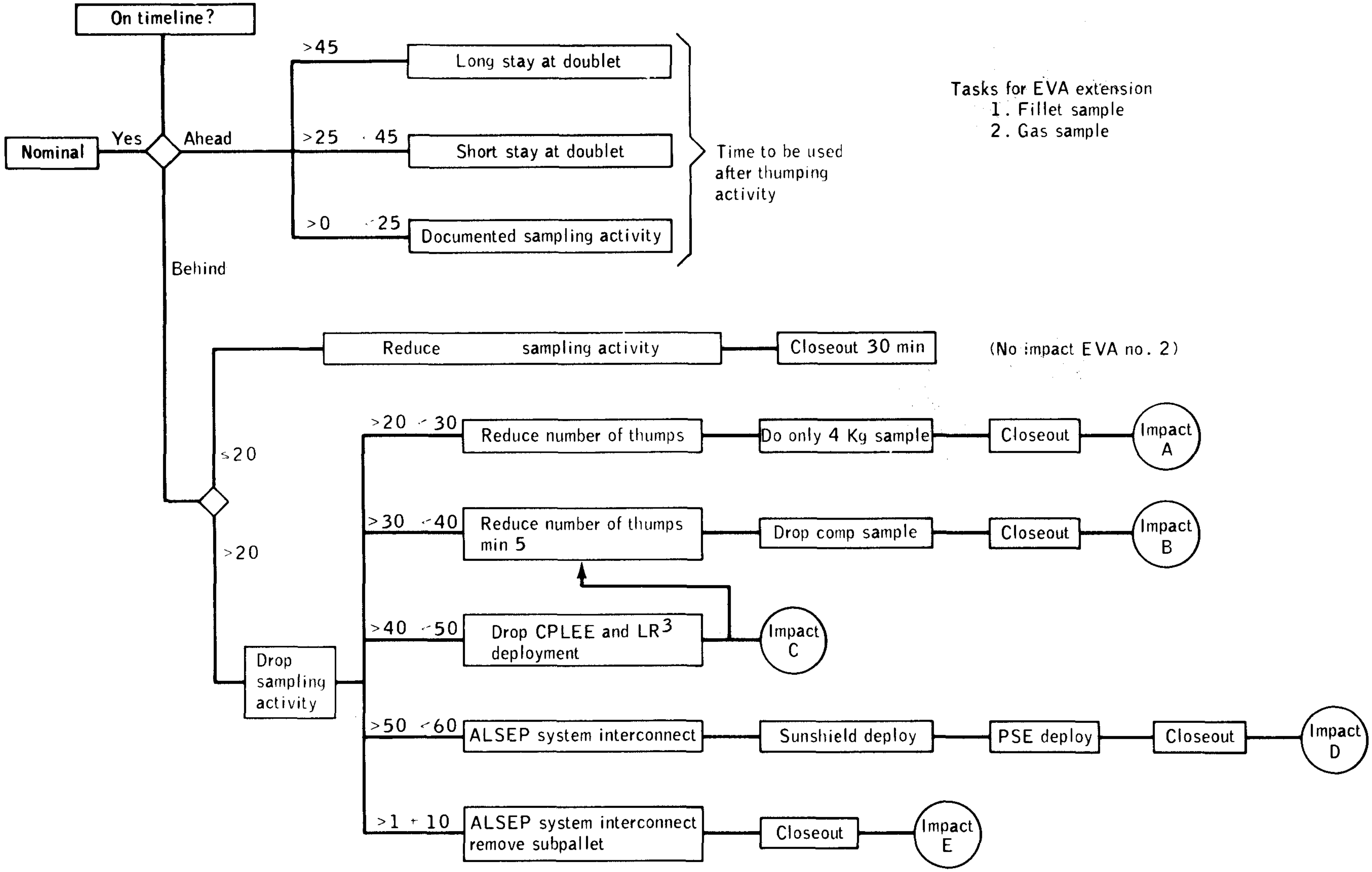
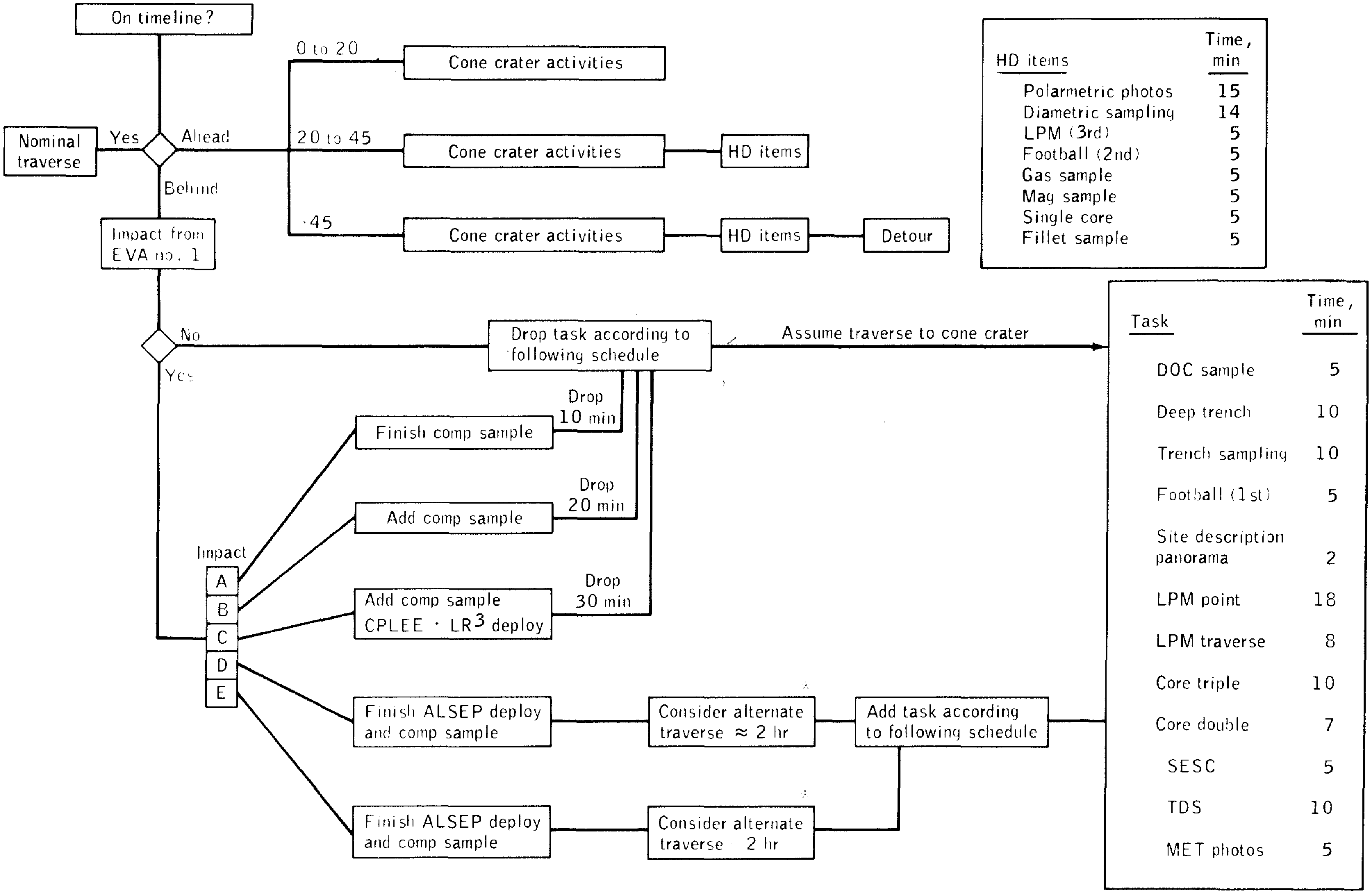


Figure 4.3-1: EVA NO. 2 OFF-NOMINAL PLANNING (CONCLUDED)



HD items	Time, min
Polarmetric photos	15
Diametric sampling	14
LPM (3rd)	5
Football (2nd)	5
Gas sample	5
Mag sample	5
Single core	5
Fillet sample	5

Task	Time, min
DOC sample	5
Deep trench	10
Trench sampling	10
Football (1st)	5
Site description panorama	2
LPM point	18
LPM traverse	8
Core triple	10
Core double	7
SESC	5
TDS	10
MET photos	5

MISSION: 14, H-3 DATE: DEC 31, 1970
EVA: OFF-NOMINAL RAPID CLOSEOUT EVA #1

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION	
				LMP	CDR
PULL MET NEAR MESA	0	MOVE TO MESA AREA			
STOW IN ETB 70MM CAMERA 16MM CAMERA 2-16MM MAGS		STOW IN ETB 70MM CAMERA FULL WEIGH BAGS			
CLEAN EMU		CLEAN EMU			
REMOVE TONGS, PLACE IN POUCH		REMOVE TONGS, PLACE IN POUCH			
INGRESS		PLACE SRC #1 ON +Y FOOTPAD			
		UNSTOW & PLACE SRC #2 ON MET			
TRANS ETB INTO LM, STOW ON LM ASCENT COVER	10	TRANS ETB INTO LM			
		PARK MET IN SUN AT 45° TO SUNLINE COVER SRC ON MET WITH S-BAND COVER			
PASS LEC TO CDR		ASCEND TO PLATFORM HANG UP LEC			
		INGRESS			
CLOSE HATCH					
REPRESS		REPRESS			
END EVA	20	END EVA			

MISSION: 14, H-3

DATE: DEC 31, 1970

EVA: OFF-NOMINAL RAPID CLOSEOUT EVA #2

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
PULL MET NEAR MESA	0	MOVE TO MESA AREA			
STOW IN ETB 70MM MAG 16MM CAMERA 2-16MM MAGS		STOW IN ETB 70MM CAMERA 70MM MAG FULL WEIGH BAGS			
CLEAN EMU REMOVE TONGS,		CLEAN EMU REMOVE TONGS			
INGRESS					
		RETRIEVE SWC FOIL STOW IN ETB			
	10				
TRANS ETB INTO LM, STOW ON LM ASCENT COVER		TRANS ETB INTO LM			
		ASCEND TO PLATFORM			
PASS LEC TO CDR		DISCARD LEC INGRESS			
CLOSE HATCH					
REPRESS		REPRESS			
END EVA	20	END EVA			

THIS PAGE IS INTENTIONALLY BLANK

SECTION 5.0

APPENDIX

5.1 ABBREVIATIONS

ASE	Active Seismic Experiment
ALHT	Apollo Lunar Handtool(s)
ALHTC	Apollo Lunar Hand Tool Carrier
ALSEP	Apollo Lunar Surface Experiments Package
A/S	Ascent Stage
CCIG	Cold Cathode Ion Gauge
CCW	Counterclockwise
CDR	Commander
CM	Command Module
CPLEE	Charge Particle Lunar Environment Experiment
CSRC	Contingency Sample (Return Container)
CSC	Lunar Surface Close-up Camera
CSM	Command and Service Modules
CW	Clockwise
DD	Dust Detector (Experiment)
DPS	Descent Propulsion System
DRT	Dome Removal Tool
D/S	Descent Stage
ECS	Enviromental Control System
EMU	Extravehicular Mobility Unit
ETB	Equipment Transfer Bag
EVA	Extravehicular Activity
FPS	Frame Rate (Sequence Camera)
FTT	Fuel Transfer Tool
ITMG	Integrated Thermal-Meteroid Garment
LEC	Lunar Equipment Conveyor
LHSSC	Left Hand Side Stowage Compartment
LM	Lunar Module
LMP	Lunar Module Pilot
LPM	Lunar Portable Magnetometer
LRL	Lunar Receiving Laboratory
LRRR (LR^3)	Laser Ranging Retro-Reflector
MCC-H	Mission Control Center - Houston
MESA	Modularized Equipment Stowage Assembly (Descent Stage)
MET	Modularized Equipment Transporter
MSFN	Manned Spaceflight Network
OPS	Oxygen Purge System
PLSS	Portable Life Support System
PSE	Passive Seismic Experiment
RCS	Reaction Control System
RTG	Radioisotope Thermoelectric Generator
S/C	Spacecraft
SEQ	Scientific Equipment (Bay) (Descent Stage)
SIDE	Suprathermal Ion Detector Experiment
SRC	Sample Return Container
SWC	Solar Wind Composition (Experiment S-080)
TV	Television
UHT	Universal Handling Tool

5.2 Lunar Surface Operational Constraints

5.2.1 Introduction

The lunar surface operational constraints presented in this section are restricted to the flight crew operational constraints which are concerned with lunar surface extravehicular activity. The constraints presented here are further restricted to the lunar surface EVA constraints for the third Lunar landing mission. Excluded are spacecraft constraints except where those constraints have a direct bearing on the crew members during the EVA operations.

By definition, a lunar surface constraint is any limitation imposed on lunar equipment design, operational procedure or sequence, etc. due to an equipment, human or environmental characteristic.

5.2.2 Constraint Classification

The constraints are divided into five different categories. The activity or equipment being constrained determines the category of the constraint. The constraints which fall into two or more categories are classified as GENERAL.

Each constraint is also identified according to the impact on the mission that a violation of the constraint would produce. Only the direct results of the constraint violation are considered in determining the violation classification. Multiple malfunctions and the different possible contingencies are not considered. The constraints violation classification is enclosed in parentheses following the constraint.

5.2.2.1 Constraint Categories

Mission Operations:

Constraints on mission operations that are necessary due to considerations of a lunar surface activity.

Lunar Surface Operations:

Constraints on lunar surface operations that are necessary due to equipment design and/or the lunar environment.

Equipment Operation:

Constraints on equipment operation that are necessary due to the equipment design.

General:

Constraints that apply to two or more phases of the Apollo lunar landing mission.

5.2.2.2 Violation Classification

Critical:

A constraint that is necessary to prevent a compromise of mission safety. A violation of a critical constraint would jeopardize the safety of the crew or equipment essential to the completion of the mission.

Major:

A constraint that is necessary to prevent the compromise of the mission requirement.

Minor:

A constraint that cannot be classified as CRITICAL or MAJOR but is necessary to optimize lunar surface activities.

5.2.3 Lunar Surface Operations Constraints

Spacecraft Attitude:

Lunar surface EVA operations will not be conducted when the angle of the LM X-axis with the local gravity vector exceeds 15°. This attitude may arise from the combination of all factors such as asymetric compression of the landing gear struts and terrain conditions. (CRITICAL) (Provisional, documentation to substantiate is unavailable)

Landing Site Slope:

The maximum topographical slope on which lunar surface EVA operations will be conducted will be that which the astronaut can safely negotiate unassisted. This is presently established as 15°. (CRITICAL) (Reference: Unpublished report of test "Crewman Capability Investigation", by Dr. D. L. Lind, Astronaut, Partial Gravity Simulator, Building 5, MSC, November 8, 1968).

LM Forward (+Z) Hatch Operations:

The forward hatch may be left fully open during the EVA (up to 3 hours) provided: (CRITICAL) (GAEC LM Engineering Memorandum LMO-510-1201, April 24, 1969)

1) The cabin temperature, GF 1641T, must be between 60°F and 90°F at the beginning of the EVA,

2) The sun vector is outside a 65° cone about the +Z axis.

Otherwise, the limit is:

1) 15 minutes for hatch fully open or

2) For the duration of the EVA provided the door is no more than 3 inches from the closed position, using the door snubber device for control.

Forward Contamination Control:

Fecal bags and other human wastes will be processed with a disinfectant and double-bagged prior to jettisoning. It is preferred that these be returned to earth by transferring to the CSM. As alternatives the wastes will be stowed in the descent stage if possible. Otherwise, it will be left on the lunar surface. (MINOR)

Extravehicular Communications System:

The first crewman to the lunar surface will operate in the relay mode. For two-man EVA operations the dual mode is nominal. (MAJOR) (Reference: NASA, Land, C.K., "Performance Analysis of The Extravehicular Communication System," MSC Internal Note EB-R-68-14, May 16, 1969).

The fully unstowed PLSS antenna physically interferes with the S-band erectable antenna reflector during alignment operations. (MAJOR) (Reference: Slight, J. B., "S-band Erectable Antenna/EMU Physical Interference Test, "Memorandum EC 64-111, July 20, 1967).

OPS Metabolic Capability:

The maximum heat removal of the Oxygen Purge System (OPS) is about 950 BTU/HR average over the period in which the man is storing 300 BTU. The heat removal capacity of the OPS is 475 BTU's. (CRITICAL). (Reference: Zieglschmid, J. F. M.D.; Results Eighth Lunar Surface Operations Planning Meeting; June 7, 1968).

LiOH Cannister

The LiOH Cartridge of the PLSS can be stored at temperatures within the limits of Fig. 4.5-29 of Apollo Operations Handbook, Vol. IV, EMU Data Book,Amend. 18 (7/3/69). LiOH efficiency is reduced if these limits are not reached or exceeded. The cartridge should not be exposed to an ambient pressure of less than 0.5 psia for more than 15 minutes (cartridge as stowed is sealed to the spacecraft environment. Exposure to ambient pressures less than 0.5 psia causes the water in the LiOH to vaporize which limits its use time in the EMU to 60 minutes maximum. (CRITICAL)

SEQ Bay

The Scientific Equipment Bay doors must be closed after the ALSEP is removed from the bay in order to maintain LM thermal control. (CRITICAL) (Reference: Discussion Between: GAEC Engineers and Lunar Surface Operations Office Engineers; July 25, 1967).

PLSS Battery

The PLSS battery and LiOH canister must be replaced subsequent to the first EVA and prior to the second EVA. (CRITICAL) (Reference: CF32-9M-276; Lunar Surface Operations Office; Twentieth Lunar Surface Operations Planning Meeting, September 12, 1969).

5.2.4 Equipment Operation Constraints

Still Camera (Hasselblad):

Film Environment - The film magazine should not be exposed to vacuum conditions for periods in excess of 5 hours. The film temperature must be maintained in the range of 50-100°F. (MAJOR)

Sequence (Data Acquisition) Camera:

Magazine Temperature - The film magazine limits 130°F as indicated by temperature gage on side of magazine (MAJOR) (Ref: NASA R. Gerlach in Minutes Third Meeting Lunar Surface Operations Planning Meeting, 1/19/68).

Color Television Camera

1. Optical Line-of-Sight must not be pointed within 45° of the sun, nor should it be pointed at low light level areas with high contrast bright zones for long time periods. (MAJOR)

NOTE: Camera setting under these conditions (not to exceed 30 minutes) lens aperture f:22, zoom 25mm, focus infinity, ALC switch on AVERAGE.

2. Bright scenes or with crewmen in picture for long periods require camera to be reset to PEAK on ALC switch. (MAJOR)

3. Lens cap should be used when moving camera to another location. (MAJOR)

4. Color TV camera should not be placed in the shade if not operating, but may be in shade for not longer than one hour if camera is operating. (MAJOR)

5. Camera case should be kept as free from dirt as possible. (MAJOR)

NOTE: No time constraint on operation in sunlight if case is clean.

(Reference: Memorandum from Manager, Apollo Spacecraft Program to Director, Flight Crew Operations, PD7/M166-70 dated April 1, 1970 "Color TV Operating Constraints".)

6. Camera warmup time is ≤ 1 minute under temperature limits anticipated for Apollo missions.

(Reference: Telecon P. Coan office/EE2 to Lunar Surface Operations Office CF72, July 8, 1970.)

S-Band Erectable Antenna:

1. Line of Sight: The antenna requires unobstructed line of sight of the earth, free of any blockage of spacecraft elements, of terrain. (CRITICAL) (Reference: NASA, S. Kelley, Minutes Second Lunar Surface Operations Planning Meeting, January 1, 1968; also applies to items 2 and 3 below.)

2. Antenna Stability: The maximum equivalent pitch down reflector angle for tripod stability is 60°. This includes the actual pitch of the reflector to account for site location,ccorrection for earth-moon undulations and terrain slope. The tripod design limit to terrain slope which can be manually compensated by tripod adjustment is 5°. (CRITICAL)

3. Cable Length: The antenna cable length outside the MESA is 30 feet. However, the usable length is determined after allowance is made to permit surplus of cable on surface to avoid pull on the antenna. The effective radius to deploy the antenna is then approximately 20 feet. (MINOR)

Apollo Lunar Surface Experiments Package (ALSEP) (See ref. 3 and 9)

The ALSEP will be deployed a minimum of 300 feet from the LM on the Z-axis. The 300 foot minimum distance to the emplacement area is due to the necessity of ALSEP deployment out of the LM acent blast area. The walk to the deployment area is timed to prevent excess RTG warmup and thereby avoid thermal problems for the crewman. (MAJOR) (Reference: Weatherred, C. J.; Bendix Aerospace Systems Division; Letter - BX P. O. 1726-68-970-1918, May 8, 1968.)

1. ALSEP Hold Points
   The following list of hold points is provided. The sequence of the ALSEP deployment may be stopped after the completion of any one of the hold points, to be continued at some later time by going to the next series of tasks. (MAJOR) (Reference: Clayton, J. F.; Bendix Aerospace; Letter October 27, 1967.)

   1a) Remove Packages #1 and #2; close SEQ bay door; emplace ALSEP packages with experiments in and facing the sun.

   1b) Tilt fuel cask; dome not removed.

   1c) Tilt fuel cask; remove dome, do not defuel.

   1d) Fuel RTG; carry ALSEP to deployment site; remove ALHT (if necessary) and subpallet from Package no. 2; carry Package no. 1 to implace site (do not deploy); interconnect RTG cable (do not actuate shorting switch).

   1e) Deploy Package No. 1 as well as Package No. 2; release and remove experiments; raise sunshield; deploy experiments (IF DESIRED).

   1f) Deploy experiments and complete ALSEP tasks. A hold point exists after each experiment is deployed.

2. ALSEP Deployment
   The ALSEP is deployed a minimum of 300 feet from the LM. The individual experiment constraints are as follows: (The Central Station/Package No. 1 is used as a reference with an imaginary clock superimposed on its top so that 12 o'clock falls on the back of the package). (MAJOR)

2a) RTG

PARAMETER	CONSTRAINT
Separation Between RTG and Central Station	9 to 12 ft. Limited by 13 ft cable. Hot RTG should be away from Central Station to avoid contact with astronaut, and to provide maximum heat radiation to free space.
RTG Orientation from Central Station	±20° East or West of Central Station as visually determined by astronaut to minimize thermal load on Central Station.
RTG Deployment Site	Horizontal site. Pallet must be horizontal ±10°, as visually determined by astronaut. No mechanical provisions for astronaut to level RTG. Astronaut will avoid craters and slopes which impede dissipation of heat from RTG.
RTG Alignment	No critical constraints. Astronaut will align so as to favor RTG cable exit toward Central Station.
Interrelation	Nominal Current Readings:

Time after fueling	Short Circuit Current
10 min.	4-6 amps
20 min.	5-7 amps
30 min.	6-8 amps
>35 min.	7-8 amps

2b) ALSEP Central Station

PARAMETER	CONSTRAINT
Central Station-to-LM Separation	300 to 1000 ft. This distance is required to keep ALSEP out of the LM ascent debris blast area.
Central Station Orientation from LM	Due West or East of LM, preferably West. Must not be deployed in shadow of LM.
Central Station Deployment Site	Approximately horizontal, as visually determined by astronaut to provide stable base for antenna. Astronaut must avoid craters and slopes which would degrade thermal control of unit.
Central Station Leveling	5° of vertical as noted by astronaut on bubble level. Leveling procedure interacts with alignment procedure.
Central Station Alignment	±5° of East-West as aligned by astronaut using partial compass rose. Alignment affects thermal control capability of Central Station. Closed or curtained sides of Central Station must face East-West.
Interrelation	Central Station, as with most ALSEP subsystems, requires clear field-of-view for both thermal control and scientific data reasons. Central Station must not be shaded from the sun on the lunar surface prior to deployment. ALSEP design allows deployment when sun angle is between 5 and 45 degrees. ALSEP may be removed from LM when bottom of SEQ Bay is from 18 to 60 in. from lunar surface and with a 15 degree tilt in any direction.

Central Station Antenna

PARAMETER	CONSTRAINT
Site Selection	Attached to Central Station
Antenna Leveling	±0.5° of vertical. Astronaut will use bubble level to adjust. Level adjustment interacts with alignment.
Antenna Alignment	±0.5° of East-West line, with reference to sun line. Astronaut will use sun dial to align.
Antenna Azimuth Setting	Astronaut will set dial to value indicated on Cuff Checklist for landing site chosen.
Antenna Elevation Setting	Astronaut will set dial to value indicated on Cuff Checklist for landing site chosen.

2c. SIDE/CCIG

PARAMETER	CONSTRAINT
SIDE/CCIG - Central Station Separation	50 to 60 feet from Central Station, limited by 60-foot cable, SE of central station.
SIDE orientation from Central Station	Box parallel to Central Station, S side as visually determined by crew
CCIG orientation from Central Station	Orifice must point away from Central Station
SIDE/CCIG Deployment Site	Approximately level spot. Unobstructed view in front of orifice. SIDE placed on screen, CCIG off screen.
SIDE leveling	±5° of level by use of bubble reference
SIDE alignment	±5° of E-W line, with arrow toward subearth point (e).
CCIG alignment	±20° of N-S line
Special Requirements	CCIG onifice must point away from all man-made objects (±90°) CCGE and SIDE must be separated by 3.5 to 4 feet.

2d) PSE

PARAMETER	CONSTRAINT
PSE-to-Central Station Separation	8 to 9 ft. Limited by 10 ft cable, 8 ft minimum separation due to thermal heat from RTG.
PSE Orientation from Central Station	Due East or West of Central Station as visually determined by astronaut. Must be out of field-of-view of Central Station radiator. Opposite side of RTG.
PSE Deployment Site	Approximately level spot.
PSE Leveling	Must be coarse leveled by astronaut within ±5 degrees of vertical. Five degrees is the limit of the automatic, fine-leveling gimbal system.
PSE Alignment	Astronaut must rough align within ±20 degrees of lunar East, before opening PSE shroud, by pointing arrow on the sensor girdle towards the sun. Fine alignment will be performed by the astronaut after removing girdle and spreading the thermal shroud. Astronaut will read and record, to the nearest degree, the intersection of the shadow of the gnomon on the compass rose. Final azimuth alignment must be known within ±5 degrees accuracy with reference to lunar North or South.
Interrelation	PSE must be no less than 10 ft from other units to minimize pickup of stray vibrations by PSE.

2e) CPLEE

PARAMETER	CONSTRAINT
CPLEE-to-Central Station Separation	9 to 10 ft, limited by 11 ft cable.
CPLEE Orientation from Central Station	Generally NE of Central Station. Minimum 10 ft, preferably 20 ft from RTG. Must avoid field-of-view of Central Station radiator. Orientation visually determined by astronaut.
CPLEE Deployment Site	Approximately level area, free of gross surface irregularities and rocks or boulders. Bottom of experiment should not touch the surface.
CPLEE Leveling	Within ±2.5 degrees of vertical. Astronaut will level the CPLEE using bubble level. Leveling interacts with alignment.
CPLEE Alignment	Within ±2 degrees of East-West sun line. Astronaut will align so that arrow on top of unit points East, then report, within +1 degree, the reading of the shadow of the handling tool on the partial compass rose.
Interrelation	Radioactive contaminants caused by other ALSEP Subsystems must be less than 0.1 count per second in all channels of CPLEE.

2f. ASE

PARAMETER	CONSTRAINT
Geophone-Distances from Central Station	12±2 ft to 1st Geophone 150±1.5 ft to 2nd Geophone 300±3 ft to 3rd Geophone
Geophone - orientation from Central Station	Opposite side from Mortar Package
Geophone - deployment site	Generally level
Geophone - leveling	±7° of level and visually determined by crew*
Geophone - alignment of cable	±3° from straight line as judged by crew based on flag indicators on Mortar Package, and No. 2 geophone along direction NE-SW to N-S.
Mortar Package - Distance from Central Station	10±1 feet, limited by 11-foot cable
Mortar Package - deployment site	Generally level, with no obstacles down range of grenade line of flight
Mortar Package - leveling	±5° of level, as determined by crew using bubble.
Mortar Package - alignment of box	±3° from geophone deployment line, such that line-of-flight of grenades will be extension of line of deployment of geophones
Mortar Package - Special Requirements	Exhaust of grenades must not impinge on any ALSEP experiment or Central Station. Box must be set up to preclude such impingement

*Very critical to successful operation, as geophone data loss occurs at a tilt of 15° or more.

5.3 ALSEP AND SCIENTIFIC EQUIPMENT PROCEDURES

5.3.1 Detailed Nominal Deployment Procedures for ALSEP

The following sequences are included:

SEQ Bay Door Opening

ALSEP Package Unloading

SEQ Bay Door Closing

Radioisotope Thermoelectric Generator (RTG)

Fuel Capsule Unloading

LR^3 Offload

LR^3 Deploy

RTG Power Cable Deployment and Hookup

Suprathermal Ion Detection Experiment (SIDE) Deployment

Passive Seismic Experiment (PSE) Deployment

Thumper/Geophone Removal

Mortar Package Deployment

Charged Particle Lunar Environment (CPLEE) Deployment

ALSEP Antenna Erection and Aiming

Central Station Activation

Geophone Deployment

Thumping Activity

Activation of Mortar Package

SEQ BAY DOOR OPENING

1. Remove thermal cover from door lanyard (R side of door)
2. Remove lower Velcro strap and grasp lanyard
3. Back away to position clear of door
4. Pull white part of lanyard to raise door
5. Verify door fully open and folded up over SEQ Bay
6. Verify lanyard untangled and temporarily stow on LM strut
7. Secure doors with Velcro strap if Quad II is low

ALSEP PACKAGE UNLOADING

1. Remove boom lanyard from package handle
2. Move to position 10 ft from package and in front of it
3. Pull white portion of boom lanyard until package unlocks and boom pulls package out to full extension (package will swing free of LM at back edge) of boom
4. By discrete pulls on black and white striped portion of lanyard, lower package to surface (assist package if required to achieve handle up position)
5. Release white portion of boom lanyard from base of package
6. Pull pip pin to free hockey stick
7. Release small lanyard from velcro on handle
8. Move package clear
9. Pull black and white striped portion of lanyard to retract boom

SEQ BAY DOOR CLOSING

1. Tuck hockey sticks, lanyards and cables inside SEQ Bay or out of way
2. Retrieve door lanyard from LM strut

3. Move to position clear of door

4. Pull black and white striped portion of lanyard until door is closed

5. Toss lanyard under LM

RADIOISOTOPE THERMOELECTRIC GENERATOR (RTG) FUEL CAPSULE UNLOADING

1. Remove cask rotation lanyard from inside of Protective Door

2. Holding fabric part of lanyard rotate cask to near-horizontal position such that cask dome is within easy reach (first pull release pins)

3. Pull cask lanyard out of way

4. Receive Dome Removal Tool (DRT) from other Crewman

5. Insert DRT in Dome

6. Remove Dome and discard Dome with tool under LM

7. Receive Fuel Transfer Tool from other Crewman

8. Insert FTT into fuel capsule head

9. Rotate tool handle to engage capsule and release capsule from cask

10. Withdraw tool and capsule from cask

11. Move to Package No. 2 (other Crewman will have rotated it to loading position)

12. Insert capsule into RTG

13. Release tool (FTT) by counterrotating tool handle

14. Discard FTT under LM

LR^3 OFFLOAD

1. Walk to Quad No. 1

2. Pull handle and remove thermal shield

3. Pull lanyard to release LR^3 bracket from LM
4. Slide LR^3 assembly out from LM and place on Lunar surface
5. Pull two pins to release carry handle from bracket
6. Discard carry handle under LM
7. Remove restraining pull pin on handle and then twist handle CW to release LR^3 from bracket
8. Place LR^3 near +Z foot pad

LR^3 DEPLOY

1. Carry to deploy site 100' W from ALSEP site
2. Pull pin to deploy leg
3. Deploy leg-verify locked position
4. Tilt LR^3 and rest on surface using UHT
5. Align using shadow bar
6. Level using Bubble level
7. Remove dust cover
8. Check align and level

RTG POWER CABLE DEPLOYMENT AND HOOKUP

1. Use UHT to release 3 Boyd bolts on RTG Cable Reel
2. Engage UHT in RTG Cable Reel carry socket
3. Using UHT, remove RTG Cable Reel from Package No. 2 and proceed to Package No. 1 (Power cable will deploy as you walk)
4. Remove shorting switch pull pin and discard
5. Grasp shorting switch assembly
6. Disengage UHT from RTG Power Cable Reel and discard reel

7. Report ammeter reading
8. Remove central station dust cover and discard
9. Mate power cable to central station and check indicator
10. Mate SIDE Connector (receive from other Crewman)
11. Depress shorting switch
12. Release SIDE cable connector
13. Tether UHT

SIDE DEPLOYMENT

1. Use UHT to release four Boyd bolts and verify SIDE and Boyd bolt release
2. Remove left front Boyd bolt cap
3. Engage UHT in carry socket and lift SIDE off C/S
4. Remove SIDE cable reel by pulling out and deploy some cable
5. Pull lanyard No. 1 and verify leg deployment
6. Other Crewman connects SIDE to C/S
7. Remove CCIG Boyd bolt
8. Walk to a site 55' NE of C/S to deploy SIDE
9. Remove ground screen and CCIG
10. Position SIDE on ground screen and deploy CCIG N 5'
11. Check dust cover corners
12. Pull lanyard No. 2 to remove dust cover pull pin
13. Level and align

PASSIVE SEISMIC EXPERIMENT DEPLOYMENT (PSE)

1. Use UHT to remove Boyd bolt on PSE Stool

2. Use UHT to remove PSE Stool from Subpallet
3. Grasp Stool
4. Proceed 10 feet N of Package No. 1 and place PSE Stool on surface
5. Use UHT and release 4 Boyd bolts on PSE
6. Use UHT to remove PSE from Package No. 1
7. Transport PSE to PSE Stool using UHT. Hover PSE over Stool and align arrow West, place PSE on stool, remove girdle and discard
8. Align then remove UHT
9. Use UHT to deploy skirt
10. Use UHT to level PSE with Bubble level as reference. Report alignment using sun compass

T/G REMOVAL

1. Verify Astronaut Switch No. 5 - CW
2. Release Boyd bolt on T/G restraining arm with UHT
3. Grasp T/G restraining arm with one hand and grasp lower end of T/G with other hand and remove from plate assembly - discard plate assembly
4. Unfold T/G, position and lock sleeves
5. Walk to MET reeling off 12' of cable and stow T/G on MET

DEPLOY MORTAR PACKAGE (M/P)

1. Place UHT in carry socket
2. Grasp UHT and pull M/P pull ring to remove socket pin and deploy first support leg
3. Manually rotate UHT socket
4. Unfold second M/P support leg and lock both legs in extended position

5. Grasp forward end of M/P antenna, free antenna from spring clips and erect first section

6. Place M/P on surface West of central station and orient Northwest

7. Deploy other three sections of antenna

CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT (CPLEE) DEPLOYMENT

1. Use UHT to release 3 Boyd bolts on CPLEE

2. Use UHT to remove CPLEE from Package No. 1

3. Remove carry socket rotation pull pin and discard

4. Transport CPLEE 10 feet NE of Package No. 1 and place CPLEE on surface

5. Level CPLEE, using Bubble level

6. Align CPLEE, using shadow cast on dust cover (Arrow East)

ALSEP ANTENNA ERECTION & AIMING

1. Retrieve antenna mast (carry handle) from Subpallet

2. Remove aiming mechanism housing from Subpallet

3. Return to Package No. 1

4. Install antenna mast on Package No. 1

5. Install aiming mechanism on antenna mast

6. Grasp antenna and install on aiming mechanism

7. Remove aiming mechanism housing and packaging and discard

8. Adjust leveling knobs, using Bubble level

9. Observe sun compass, adjust alignment knob

10. Enter azimuth

11. Enter elevation

12. Recheck level

CENTRAL STATION ACTIVATION

1. Use UHT to turn on Astronaut Switch No. 1 and Switch No. 5

2. Receive confirmation of good RF and data transmission if required

   SW. (2) turns on central power
   SW. (3) turns exp. (seq) to operate
   SW. (4) high bit rate data

GEOPHONE DEPLOY

1. From the MET obtain EXT handle and achor and mate

2. Clip T/G flag on EXT handle pick up hammer from HTC

3. Select deployment line and hammer anchor through power cable and geophone cable loops

4. Proceed to deploy cable to 1st geophone

5. Remove geophone spring clip

6. Remove geophone

7. Push into surface with foot and check alignment

8. Reel off 150' of cable and watch for flag on cable then watch for end of cable

9. Repeat Steps 5 thru 7

10. Reel off 150' of cable and watch for flag on cable then watch for end of cable

11. Repeat Steps 5 thru 7

THUMPING ACTIVITY

1. Confirm MCC-H ready for thumping activity

2. Notify A1 each shot - All motion cease for 20 sec before, and 5 sec after each shot

3. Select ASI - call number to MCC

4. Rotate arm SW, wait 4 sec, depress to fire

5. Repeat until 21 ASI's are fired

6. Turn Astronaut Switch No. 5 - CW

ACTIVATION OF M/P

1. Walk to M/P and verify other Crewman is not in front of M/P

2. Engage UHT in latch on safety pin and rotate 90° CW

3. Try to remove UHT without changing the M/P alignment, if not leave in and continue

4. Retrieve safety pin lanyard and pull to remove safety pin

5. Use UHT and rotate two safe/arm switches full clockwise

6. Recheck alignment and level

7. Walk to C/S and use UHT to turn Astronaut Switch No. 5 - CCW

8. Walk away from C/S and stay at least 15' from back of M/P

5.3.2 Scientific and Operational Equipment Procedures

The following sequences are included:

Contingency Sample Collection

Expendables Unstowage

Flag Deployment

Lunar Portable Magnetometer (LPM) Offload

LPM Point Measurement

LPM Traverse Measurement

LPM Traverse Measurement - Final

MESA Blanket Removal

MET Offload

MET Deploy

S-Band Unstowage and Deployment

Solar Wind Composition (SWC) Deployment

TV Deployment

CONTINGENCY SAMPLE COLLECTION

1. Remove contingency sampler from pocket
2. Discard Velcro retention strap
3. Assemble handle and secure cable in slot at end of handle
4. Extend bag using tab on bottom of bag
5. Take sample
6. Stow intact sampler and soil on LM strut

EXPENDABLES UNSTOWAGE

1. Unfold SRC Table, push down until clips engage on lower edge of MESA
2. Secure SRC Table level front and back with Velcro strap
3. Unfold and hang ETB on side of SRC Table
4. Pull pins on LiOH canister retainers, remove canisters
5. Place canisters in ETB
6. Leave flap on ETB open
7. Other Crewman will place CS in ETB then close flap before transferring

FLAG DEPLOYMENT

1. Pull flag stowage pip pin
2. Lift the flag from its stowage
3. Walk to the deployment site. Push the lower section of the flag staff into the surface
4. Remove the hammer from stowage by releasing the two tie-down snap straps and lifting the hammer from its MESA stowage location
5. Using the hammer drive the lower section of the flag staff into the surface

6. Deploy the horizontal shaft by first extending then rotating the shaft so it is perpendicular to the flag staff

7. After the lower section has been driven into the surface, insert the upper section of the flag staff into the lower section

LUNAR PORTABLE MAGNETOMETER (LPM) OFFLOAD

1. Both Crewman walk to SEQ Bay

2. Open thermal shield by removing bottom part of the shield and by pulling loop at bottom and separating the velcro

3. Grasp LPM pallet handle and pull lanyard to release pallet

4. Walk to MET and place pallet on back of MET - other Crewman will close thermal shield

5. Pull snap straps and remove tripod from pallet and hand to other Crewman

6. Release sensor head from pallet and hand to other crewman

7. Release cable reel from pallet and stow on MET

8. Other Crewman will then mount sensor head on tripod (#1 on top) and stow assembly on MET

9. Release electronics box from pallet and report box temperature

10. Stow electronics box on MET

11. Uncage meters and turn on electronics

12. Discard pallet under LM

LPM POINT MEASUREMENT

1. Walk to measurement site

2. Unstow cable reel and drop to surface

3. Unstow sensor/tripod

4. Walk about 35' from MET with sensor/tripod and deploy cable until white mark on cable is visible

5. Erect tripod and orient sensor such that #1 is facing down sun
6. Align and level sensor/tripod using Bubble level and walk back to MET
7. Report to MCC when back at the MET
8. Retrieve 70mm camera from MET and photo sensor/tripod with horizon in view - tether tongs
9. MCC will notify crewman when to report meter readings - 60 secs at MET
10. Report meter readings X, Y, Z; X, Y, Z AND X, Y, Z
11. Return to sensor/tripod and reorient sensor such that #2 is facing down sun
12. Repeat steps 6,7,9, and 10
13. Return to sensor/tripod and reorient sensor such that #3 is facing down sun
14. Repeat steps 6, 7, 9, and 10
15. Return to sensor/tripod and pick up and stow on MET
16. Pick up cable reel with tongs and rewind cable and stow on MET

LPM TRAVERSE MEASUREMENT

1. Walk to measurement site
2. Unstow cable reel and drop to surface
3. Unstow sensor/tripod
4. Walk about 35' from MET with sensor/tripod and deploy cable until white mark on cable is visible
5. Return to sensor/tripod and reorient sensor such that #3 is facing down sun
6. Align and level sensor/tripod using Bubble level and walk back to MET

7. Report to MCC when back at the MET

8. Retrieve 70mm camera from MET and photo sensor/tripod with horizon in view - tether tongs

9. MCC will notify crewman when to report meter readings - 60 secs at MET

10. Report meter readings, X, Y, Z; X, Y, Z AND X, Y, Z

11. Return to sensor/tripod and pick up and stow on MET

12. Pick up cable reel with tongs and rewind cable and stow on MET

LPM TRAVERSE MEASUREMENT (FINAL)

1. Walk to measurement

2. Unstow cable reel and drop to surface

3. Unstow sensor/tripod

4. Walk about 35' from MET with sensor/tripod and deploy cable until white mark on cable is visible

5. Return to sensor/tripod and reorient sensor such that #3 is facing down sun

6. Align and level sensor/tripod using Bubble level and walk back to MET

7. Report to MCC when back at the MET

8. Retrieve 70mm camera from MET and photo sensor/tripod with horizon in view

9. MCC will notify crewman when to report meter readings - 60 secs at MET

10. Report meter readings X, Y, Z; X, Y, Z AND X, Y, Z

11. Remove electronics box, read temperature labels, and discard box

MESA BLANKET REMOVAL

1. Unwrap Velcro strap from around TV lens

2. Pull up lower left edge of blanket

3. Ease blanket up over TV camera and let fall on R side of MESA

4. Pull back L side of blanket under MESA restraint strap and let fall on L side

5. Verify all side orifices on MESA clear of blanket

MET OFFLOAD

1. Adjust MESA to allow MET to swing down

2. Pull lanyard (right hand side of MESA) to remove outer thermal shield - discard

3. Pull lanyard No. 1 to allow MET to swing down

4. Pull lanyard No. 2 to release MET from MESA

5. Carry MET to +Y strut and place on foot pad

MET DEPLOY

1. Retrieve MET from +Y footpad and walk to a position in the field of view of the TV camera

2. Grasp MET and hold upright - wheels outward

3. Pull lanyard (2 pins) to release wheels and unfold and lock wheels one at a time

4. Pull lanyard (1 pin) to release legs and handle

5. Deploy legs

6. Place MET in upright (normal) position

7. Assemble handle and remove stowage bracket

8. Pull lanyard to release table and pull table up into locked position

9. Push down LPM tripod holder to locked position

S-BAND ANTENNA UNSTOWAGE AND DEPLOYMENT

1. Walk to Quad #1
2. Remove thermal shield
3. Remove Velcro straps and pull 2 pip pins at base of antenna
4. Grasp antenna by deployment bar and lift handle
5. Pull antenna out and down to clear LM
6. Unfold lift handle
7. Carry antenna by deployment bar to errection site (20 ft. from LM, clear view of Earth)
8. Place antenna vertically on surface, handle down, orientation arrow on top pointing toward Earth
9. Release 3 leg clamps
10. Depress (1 at a time) the 3 leg tips out of the top cap
11. Discard top cap and foam liner away from LM
12. Grasp antenna horn top plate and raise first section of antenna feed support
13. Verify 1st section locked in detent CAUTION DO NOT TOUCH HELIX ELEMENT
14. Extend 2nd antenna feed support section in same manner as 1st
15. Verify 2nd section fully extended and locked in detent
16. Extend antenna legs by pushing up on 2 loops on ends of legs. Extend to proper paint ring (determined by astronaut height and reach capability) and lock down clamps
17. Verify antenna toward Earth by arrow on rib support
18. Move to right by the deployment bar
19. Pull each of the 3 velcro straps loose-legs will fall to surface. Discard thermal cover.

20. Using both hands, lift antenna vertically from surface until the handle underneath can be grasped

21. Continue to lift antenna until tripod detents engage and antenna is stable on 3 legs

22. Pull pip pin from bottom of deployment bar

23. Pull bar down and discard

24. Implant each leg in surface

25. Remove rib tip protector (it will slide down one of the legs to surface)

26. Uncoil reflector release cable from around antenna

27. Hold cable taut and in straight line to plunger

28. Remove trigger guard pin (discard pin)

29. Grasp antenna leg with free hand-position at arm's length from leg

30. Duck and squeeze release trigger to deploy dish

31. Walk to Left side, MESA

32. Release antenna cable connector by pulling Velcro tab and snap free

33. Pass cable connector under MESA retaining strap

34. Holding connector, walk back to left of antenna until cable is completely unwound from MESA (black and white strip visible)

35. Walk to antenna

36. Mate 2 connector parts, turn cable part clockwise (as viewed from cable end)

37. Move to crank location and unstow

38. Uncoil crank by passing it around and behind base

39. Rough align antenna in pitch (CCW-down)

40. Rough align in azimuth (pull out on crank to shift gears)

41. Press legs into surface

42. Check alignment by sighting along mast

43. Check alignment by using alignment sight

44. Fine align using crank as required

    IN = PITCH

    OUT = AZIMUTH

SOLAR WIND COMPOSITION (SWC) DEPLOYMENT

1. Release the two SWC tie-down snap straps and lift the SWC from the MESA

2. Carry the SWC to the deployment site 60 feet from the LM in Quad I

3. Extend each section of staff until it locks. (red band should be visible) Apply a compressing force to each section to check sections locked

4. Extend shade cylinder and rotate toward red side of pivot point, i.e., red to red

5. Extend foil shade and hook to lower portion of staff

6. Press staff into surface with foil normal to sun (side marked SUN to SUN)

TV DEPLOYMENT

1. Release two snap tie-down straps

2. Lift the tripod from the MESA

3. Deploy the tripod legs and extend the center shaft

4. Set the tripod on the surface near the MESA

5. Release the cable connector snap tie-down strap

6. Release lens tie-down snap straps

7. Release the end snap on the camera tie-down snap strap

8. Using pip pin cable, pull the two top pip pins to open the camera stowage container

9. Open and rotate the top half of the camera stowage container forward and down

10. Reset lens and put on lens cap

11. Deploy the TV camera handle

12. Lift the camera from the stowage container and lift the TV cable free of the MESA

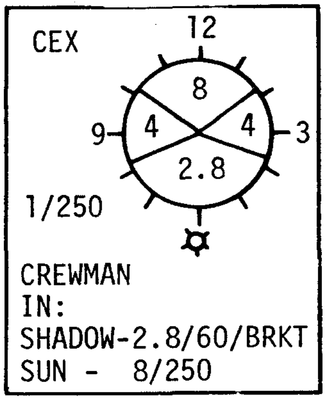
13. Insert the TV camera handle in the adapter ring on top of the TV tripod and tighten the ring

14. Pull the TV cable from its stowage cavity on the right side of the MESA. (other crewmember)

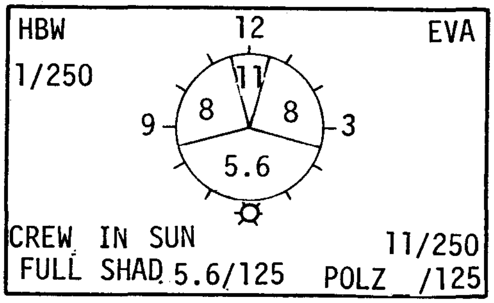
15. Carry the TV to 2:30/50 position

5.4 Equipment Decals

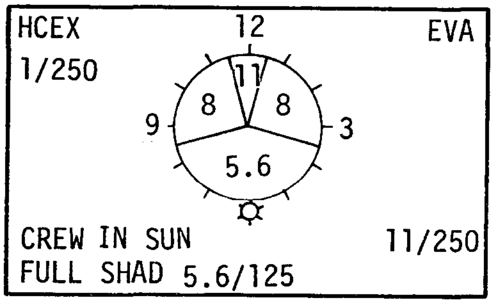
Fig. 5.4-1 presents the equipment decals which the crew utilizes during their operations on the Lunar Surface.



16 mm Data Acquisition Camera Magazine Decals



Black and White Magazine



Color Magazine

70 mm Data Camera Magazine Decals

3}
REMOVE BAR
REMOVE RIB/PROTECTOR
FREE LANYARD/TRIGGER
GRASP LEG AND DEPLOY
ATTACH CABLE
POINT ANTENNA
COMM CHECK

1}
GROSS POINTING
UNLOCK LEGS
REMOVE PLATE/PAD

2}
LOCK INNER MAST
LOCK OUTER MAST
EXTEND & LOCK LEGS
ALIGN
DEPLOY LEGS
REMOVE THERMAL COVER
LIFT ANTENNA

S-BAND ERECTABLE ANTENNA DECALS
(Order of Use Shown by Number)

CAUTION
BEFORE MOVING CAMERA
•LENS AT f 44
•FOCAL LENGTH 25 mm
•FOCUS TO INFINITY
•ALC TO PEAK
CAP OVER LENS

TV CAMERA BRACKET
DECAL
(ON MESA)

FIGURE 5.4-1 : EQUIPMENT DECALS

5.5 References

(1) Office of Manned Space Flight: Apollo Flight Mission Assignments, Document M-D MA5000-11, SE010-000-1; 11 July 1969

(2) Systems Engineering Division, Apollo Spacecraft Program Office: Mission Requirements. AS-509/CSM-110/LM-8, H-3 Type Mission. Lunar Landing SPD9-R-056, MSC, 9 June 1970

(3) ALSEP Familiarization Course Handout The Bendix Corp., Aerospace Systems Division, 1 May 1970

(4) Flight Crew Support Division, FCOD: Apollo 14 Timeline, AS-509/CSM-110/LM-8 (Not issued as of date of this document)

(5) Lunar Surface Project Office: Flight System Familiarization Manual The Bendix Corp., Aerospace Systems Division, 1 August 1967 (Revised 15 April, 1969)

(6) Flight Crew Support Division, FCOD: Photographic and TV Procedures, Apollo 14 (Scheduled date 1 October 1970)

(7) Lunar Missions Office, S & AD: Scientific Experiments and Equipment Contingency Procedures, Mission H-3/Apollo 14 Preliminary dated July 1970

(8) Contingency Procedures, ALSEP Flight #4 the Bendix Corporation, Aerospace Systems Division, ATM 923, Jan. 1971.

(9) Lunar Surface Project Office, E&D; and Lunar Missions Office, S&AD: Deployment, Leveling, and Alignment Criteria for Apollo 14 Experiments Document conveyed by memo EH4/10-19/M158 dated November 3, 1970.

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
MAGNETOMETER OFFLOAD	0+30	MAGNETOMETER OFFLOAD			
Offload Lunar Portable Magnetometer (LPM) pallet from LM		Move to SEQ Bay			
Unstow & hand tripod & sensor to CDR Stow cable reel on MET Report LPM temp. Stow electronics on MET		Receive LPM tripod & sensor from LMP, mount sensor on tripod Stow tripod/sensor on MET			
Uncage meters & turn on electronics		MET TRACK & FOOTPRINT EVALUATION Place 70mm Cam on RCU Pick up closeup camera			
Discard pallet					
TRAVERSE BEGINS Go to Station K (490 ft) Rate: 4 fps		TRAVERSE BEGINS STA. K (490 FT) Photo MET tracks with both cams Commet on track depth, mechanical characteristics REPORT CLOSEUP CAM ORIENT,FRAMES			
STATION K		STATION K			
LPM POINT MEASUREMENT Unstow cable reel Unstow sensor/tripod		TDS EXPERIMENT Assemble small scoop & Ext. Hndl Take out MESA brush & TDS bag			
Move sensor to site 35 ft away	0+40	Take out 1st TDS, lay flat on MET table Take closeup cam shot, 1 side			
Erect tripod, check sensor orientation (#1, facing downsun)		Sprinkle dust on sample & shake off excess Take closeup cam shot,both sides			
Align & level sensor/tripod					
Move to MET (electronics)		Brush off sample with MESA brush (get as clean as possible) Take closeup cam shot,both sides Fold sample and rebag			
Photo tripod/sensor (localization shot--pick up landmark)		Take out 2nd TDS, lay flat on MET - Sprinkle & shake			
Report X,Y,Z readings(repeat 3 times) Return to sensor		Take Closeup Cam shot,both sides Fold sample and rebag. Stow in HTC pouch			
Reorient sensor to #2 position Recheck sensor aligned & leveled		Photo Panorama Site Description			
Return to MET					
Report X,Y,Z readings (repeat 3 times		Collect Sample(s)			
	0+50				

CDR-2

2. A1-MET track & footprint eval & photos
3. A1-site description
   Ed-pan
4. Take samples & dbl core

Station B - 7 min

1. Pan
2. Samples

B
A

10-31-70

LMP-2

LPM, BEGIN TRAV

0+35 Pull MET-begin trav
(opt) 16mm cam,on(f8,500,6FPS)

STATION A - 25 min

1. Deploy LPM for point meas
   Photo tripod-tether tongs
   After 60 sec read meters (X,Y,Z) 3X
   Repeat meas for pos 2 & 3
   Rewind cable & stow LPM
   A1-TDS & MET track photos
2. Ed-take pan
   A1-Describe site
3. Take samples & dbl core

STATION B - 7 min

1. Pan
2. Samples

A&B
MET

10-31-70

0+50

(1) LMP - REPORT X, Y, Z READINGS (3 TIMES)

	1	2	3	SW
X				
Y				
Z				

(1) LMP - REPORT X, Y, Z READINGS (3 TIMES)

X				
Y				
Z				

(1) LMP - REPORT TUBE NUMBERS AND ORDER
INSERTION FORCE

TOP ____ BOTTOM ____

(1) CDR - COMMENT ON SOIL CHARACTERISTICS WHILE DRIVING TUBES

1+00

(1) LMP - COMMENT ON TUBE WITHDRAWAL
REPORT CONDITION OF BIT IF HARD OBJECT ENCOUNTERED

(1) CDR - (IF TAKE CLOSEUP CAM) REPORT FRAME NO. AND ORIENT

_____ _____

(1) CDR/LMP - EMU CHECK: REPORT FRAME NOS. 70MM CAM ___ ___

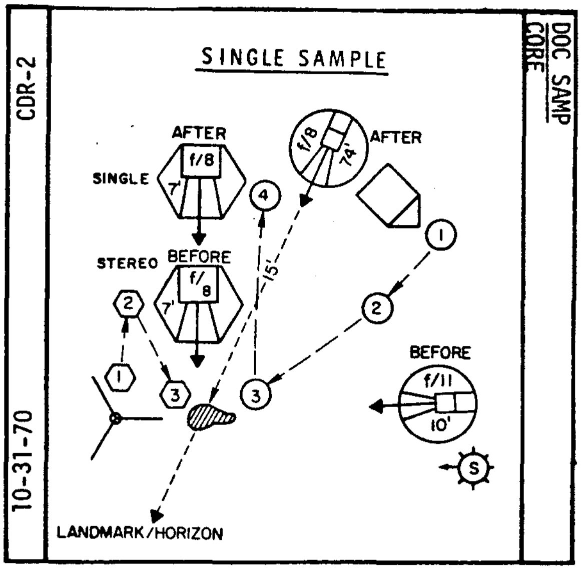
(1) CDR/LMP - GIVE MARK WHEN TRAVERSE COMMENCES: ESTIMATE AND REPORT RATE OF TRAVEL,DESCRIBE GAIT

1+10

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	0+50				
Return to sensor Reorient sensor to #3 position		Note: CDR omits down-sun "before" photo			
Recheck aligned and leveled					
Return to MET					
Report X,Y,Z readings (repeat 3 times)					
Stow sensor/tripod on MET Rewind cable, stow on MET					
DOUBLE CORE Assemble tubes		DOUBLE CORE Place gnomon Ready hammer			
Hold upright on surface		Take Stereo pr XSUN, f:8, 7ft Drive tubes into surface with hammer blows			
Photo tubes in ground & horizon or landmark XSUN f:8, 15 ft, focus 74 ft	1+00	Stow hammer			
		Stow or hold gnomon			
Remove tubes, disassemble, cap & stow tubes in HTC Report tube numbers & order		Assist as required Take closeup cam picture of hole (options)			
Tether tongs - start 16mm cam 1 fps @ 1/500					
Pull MET		GIVE MARK WHEN STARTING			
GO TO STATION M (1080 ft) Assumed rate: 4 fps		GO TO STATION M (1080 ft) Assumed rate: 4 fps			
REST		REST			
	1+10				



CDR-2

10-31-70

GENERAL TRAV INFO

Report:-time to each site
-movement & direction
-location wrt LM
-photos beside nominal
-sample bag numbers
-core tube numbers

SPECIAL PHOTOS

MET eval:
-Wheel track & footprint in LM area
-Wheel track & footprint if sinkage is 2-3 & ≥ 4 inches

-Motion on various surfaces & dust cloud eval DAC(f8, 1/250,24 fps)
-Closeup cam photo of wheel track & footprint

TRAV INFO
F&G

1+10

CDR/LMP - GIVE MARK ON REACHING STATION
(1) CDR/LMP - SITE DESCRIPTION
SAMPLE DESCRIPTION

(1) CDR - REPORT SAMPLE BAG NOS.

1+20
(1) CDR - REPORT REACHING STAR RIM
(1) CDR/LMP - EMU CHECK, REPORT FRAME NOS. 70MM CAMERAS ___ ___

(2) CDR/LMP - REPORT ON TERRAIN ROUGHNESS

(1) CDR/LMP - REPORT BAG NOS.

1+30

MISSION: APOLLO 14, H-3 DATE: 1-11-71
EVA: 2 (LANDING SITE 2)

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
STATION M Photo panorama	1+10	STATION M GIVE MARK ON REACHING STATION			
Site description Sample collection					
		Sample Collection			
GO TO STAR RIM (STA. N) (660 ft)		GO TO STAR RIM (STA. N) (660 ft)			
Assumed rate: 4 fps		Assumed rate: 4 fps			
STAR RIM		STAR RIM			
	1+20				
Photo pan		Site Description			
Sample Collection		Sample Collection			
Proceed to S Side of Star Rim		Proceed to S Side of Star Rim			
taking samples		taking samples			
		Note: Perform Polarimetric Survey (HD) [15 min.]			
	1+30				

1+30

CONE D&E

CDR-2

CONE CRATER - 30 min

1. Pan on arrival
2. Collect rocks & soil on rim
   Look for contacts-sample each side-sample rock trails
3. If time do polar near-far
4. If time do far polar >100 ft from 1st then discard filter, reset cam 1/250
5. Go SE around rim
6. Take 24fps movie: (1 mag)
   - Kick boulders into crater
   - Crew walk around & pose
   - Pan cam to W and LM
7. Do EVA Comm - Al behind big boulder, Ed document

10-31-70

CDR-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK - 7 min

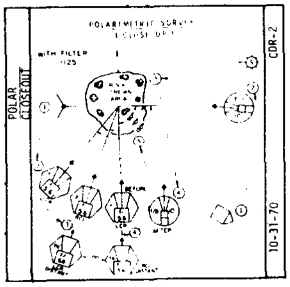
Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

CONE D&E



(1) CDR - DESCRIBE BOULDER TRACKS, SAMPLES TAKEN
(IF PERFORMED)

(1) CDR - POLARIMETRIC SURVEY DESCRIPTION

FILTER ORDERS

	CLOSEUP	DISTANT
90		
110		
130		

(1) CDR - REPORT WHEN BOULDERS ROLLED

(1) CDR/LMP - EMU CHECK
FRAME NOS. 70MM CAMERAS

1+40

(1) CDR - MARK & COUNT UP FOR EVA COMM
(1) CDR/LMP - REPORT BAG NOS.

____

____

____

____

____

____

1+50

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	1+30				
Sample boulder tracks (Use closeup Cam)		Sample boulder tracks			
Note: Take 2nd Set distant polarimetric photos 100 ft or more from 1st Set. Then remove & discard Polar Filter - Reset Cam 1/250 (HD)					
Take 16mm movie @ 24 fps-- Crew movement, boulders rolling		Roll Boulders into crater			
Take movies of LM					
	1+40				
EVA COMM EVALUATION		EVA COMM EVALUATION			
Document CDR position WRT LM & Boulder with partial pan as required		Go behind Large boulder so no line of sight to LM Count up while proceeding behind boulder			
Final Photo Panorama		Site Description			
GO TO STATION 0 (740 FT) Assumed rate: 2 fps		GO TO STATION 0 (740 FT) Assumed rate: 2 fps			
	1+50				

VOICE DATA

1+50

(1) CDR/LMP - REPORT FRAME NOS.
70MM CAMERAS

(1) CDR - REPORT REACHING
STATION

(1) CDR/LMP - REPORT BAG NOS.

____

____

____

____

____

2+00 ________

____

____

(1) CDR - REPORT LEAVING STATION

(1) CDR REPORT REACHING STATION

2+10

MISSION: APOLLO 14, H-3 DATE: 1-11-71
EVA: 2 (LANDING SITE 2)

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	1+50				
REST		REST			
STATION O (STAR CENTER)		STATION O (STAR CENTER)			
Photo Panorama		Site Description			
Sample Collection		Sample Collection			
	2+00				
GO TO STATION P (580 ft)		GO TO STATION P (580 ft)			
Assumed rate: 2 fps		Assumed rate: 2 fps			
REST		REST			
STATION P		STATION P			
	2+10				

2+10

CDR-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK - 7 min
Pan & Samples

STATION E - 25 min
1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. *If time* take single core thru fillet

10-31-70

D&E CONE

(1) CDR - REPORT REACHING STATION E

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS.
70MM CAMERAS ____ ____

(1) CDR/LMP - SITE DESCRIPTION

(1) LMP - VERIFY 16MM CAM RUNNING

(1) CDR - COMMENT ON SOIL BEHAVIOR, EASE OF DIGGING, DIRECTION AND AMOUNT OF DUST FLYUP, HARD OBJECTS ENCOUNTERED, LAYERING IN MATERIAL AS DEPTH INCREASES

2+20

(1) LMP - REPORT X, Y, Z READINGS (3 TIMES)

				SW
X	____	____	____	____
Y	____	____	____	____
Z	____	____	____	____

(1) LMP - VERIFY 16MM CAM STOP

(1) CDR - REPORT SESC COLLECTION ____

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN, REPORT BAG NOS.

2+30

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
STATION P	2+10	STATION P			
Train 16mm cam on prospective trench site; turn on (6 FPS) LPM MEASUREMENT (single) Unstow cable reel Unstow sensor/tripod		SOIL MECHANICS "Deep Trench" Assemble trenching tool to extension handle Dig trench, 10° off downsun			
Move sensor to site 35 ft away					
Erect tripod, check sensor orient, #3 facing downsun					
Align & level sensor/tripod					
Move to MET (electronics)					
Photo tripod/sensor(localization shot) Report X,Y,Z readings (repeat 3 times) IF NOT DISCARDED Return to sensor and pick up Stow sensor/tripod on MET Rewind cable, stow on MET					
	2+20				
Go to downsun position, edge of trench (act as reflector) Take upsun shot, trench interior		Take stereo prs both sides & downsun of trench interior			
Take stereo pr footprint Photo bottom of trench with close-up camera		Make bootprint in fill			
Special Environmental Sample (fines from bottom of trench)		Special Environmental Sample (fines from bottom of trench)			
Sample sides, top, discontinuities		Sample sides, top, discontinuities			

Note: If 5 minutes ahead or extension to EVA, take a single core sample (HD)

2+30

LMP-2

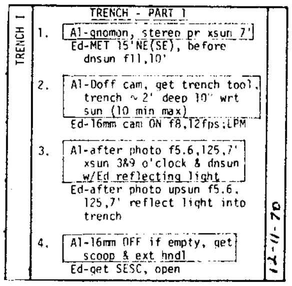
8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK 7 min
Pan & Samples

STATION E - 25 min
1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8 LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

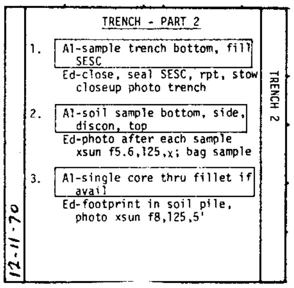
D&E CONE


TRENCH I

TRENCH - PART 1

1. Al-gnomon, stereo pr xsun 7'
   Ed-MET 15'NE(SE), before dnsun f11,10'
2. Al-Doff cam, get trench tool, trench ~ 2' deep 10" wrt sun (10 min max)
   Ed-16mm cam ON f8,12fps;LPM
3. Al-after photo f5.6,125,7' xsun 3&9 o'clock & dnsun w/Ed reflecting light
   Ed-after photo upsun f5.6, 125,7' reflect light into trench
4. Al-16mm OFF if empty, get scoop & ext hndl
   Ed-get SESC, open

12-11-70


TRENCH - PART 2

1. Al-sample trench bottom, fill SESC
   Ed-close, seal SESC, rpt, stow closeup photo trench
2. Al-soil sample bottom, side, discon, top
   Ed-photo after each sample xsun f5.6,125,x; bag sample
3. Al-single core thru fillet if avail
   Ed-footprint in soil pile, photo xsun f8,125,5'

TRENCH 2

12-11-70

2+30

______
______
______
______
______
______
______
______

(1) CDR - REPORT LEAVING STATION

2+40

(1) CDR - REPORT REACHING STATION

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS. ___ ___

(1) CDR - REPORT REACHING STATION

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN,
REPORT BAG NOS.

______
______
______
______
______

2+50

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+30				
Photo panorama					
GO TO STATION Q (HALFWAY) (1400 ft)		GO TO STATION Q (HALFWAY) (1400 ft)			
Assumed rate: 4 fps		Assumed rate: 4 fps			
REST		REST			
	2+40				
STATION Q (HALFWAY)		STATION Q (HALFWAY)			
Photo panorama		Site Description			
Sample collection		Sample collection			
Triple core sample		Triple core sample			
	2+50				

F&G
TRAV INFO

CDR-2

STATION F - WEIRD - 17 min

1. Pan - Superimposed craters
2. Samples
3. Triple core
4. If time - 7-radial Sample

STATION G - TRIPLET - 7 min

1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

10-31-70

(HD) LPM MEASUREMENT SW

X ____ ____ ____ ____

Y ____ ____ ____ ____

Z ____ ____ ____ ____

(HD) GASC ______

SESC ______

2+50

(1) LMP - REPORT NOS AND
ORDER OF TUBES
EFFORT REQUIRED TO
EMPLACE IN SURFACE

TOP ______ MIDDLE ______ BOTTOM ______

(1) CDR - COMMENT ON EFFORT,
METHOD OF DRIVING
TUBES INTO SURFACE

(1) LMP - COMMENT ON BIT ABRASION
REPORT IF 3RD TUBE HAS
ANY CORE IN IT

(1) CDR/LMP - CSC - FRAME ___ ORIENT
MCC - IF NOT, INSTRUCT LMP TO SALVAGE
A BIT AND RESTORE TO EMPTY TUBE
FOR POTENTIAL USE

(1) CDR - REPORT LEAVING STATION

3+00

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS ___ ___

(1) CDR - REPORT REACHING STATION

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES
REPORT BAG NOS

____

____

____

____

(1) CDR - REPORT LEAVING STATION

3+10

MISSION: APOLLO 14, H-3 DATE: 1-11-71
EVA: 2 (LANDING SITE 2)

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+50				
Note: If 14 min. ahead or extension to EVA, perform DIAMETRIC SAMPLE: 7 rock/soil samples across a crater and ejecta blanket, with 2 partial pans to document.					
GO TO STATION R (DOUBLET) (1470 ft) Assumed rate: 4 fps		GO TO STATION R (DOUBLET) (1470 ft)			
	3+00				
STATION R (DOUBLET)		STATION R (DOUBLET)			
Photo Panorama		Site Description			
Sample Collection Fill weigh bags		Sample Collection Fill weigh bags			
Note: For each 5 minutes over nominal EVA time (1) collect Gas Sample (2) Make 3rd LPM measurement (discard electronics; read tempilabel after measurement) (3) Collect Magnetic Sample (4) Single core thru large fillet.					
	3+10				

3+10

F&G
CORE

STATION F - WEIRD - 17 min

1. Pan - superimposed craters?
2. Samples
3. Triple core
4. If time - 7 radial Sample

STATION G - TRIPLET - 7 min

1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

LMP-2

10-31-70

3+20

3+30

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 2)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
Return to LM (1300 ft)	3+10	Return to LM (1300 ft)			
Note: Excess time for landing site 2 over landing site 1 approximately 20 min.					
	3+20				
	3+30				

3+30

CDR-2

CONTAM SAMPLE, CLOSEOUT

[MET to MESA
3+34 Small scoop, ext hndl, [SESC
gnomon, sample under
Quad III-into SESC [close
(photo before/after)
Discard scoop-keep ext hndl

Stow in ETB: [ETB load
- -70mm mag
- -TDS
- -MSSC
- -map
- -weigh bags (as reqd)

Stow in SRC: (stowage list)
- -2 SESC's
- -6 core tubes (if used)
- -documented samples (in weigh bag)
- -extra samples (fill SRC)

10-31-70

CLOSEOUT POLAR

(1) CDR - REPORT REACHING VICINITY OF LM

(1) CDR/LMP - EMU CHECK

3+40

CLOSE

CONTAM SAMPLE, CLOSEOUT

3+34 MET Near MESA(tails in)
Get SESC(in SRC) & open
Photo sample area
under Quad III(In sun)
Close SESC-stow in ETB

Stow in ETB: [ETB & SRC load
- -1 70mm cam
- -1 70mm mag
- -3 16mm mags
- -close-up cam film(adv film 3X & remove cassette)
- -SWC(Get SWC, bag & seal)
- -extra sample stowage bags

ETB Stowage list:
- -contam sample
- -1 70mm cam
- -2 70mm mags

LMP-2

10-31-70

(1) LMP - REPORT RETRIEVAL SWC

3+50

LANDING SITE 3

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
MAGNETOMETER OFFLOAD	0+30	MAGNETOMETER OFFLOAD			
Offload Lunar Portable Magnetometer (LPM) pallet from LM		Move to SEQ Bay			
Unstow & hand tripod & sensor to CDR		Receive LPM tripod & sensor from LMP, mount sensor on tripod			
Stow cable reel on MET					
Report LPM temp.		Stow tripod/sensor on MET			
Stow electronics on MET					
		MET TRACK & FOOTPRINT EVALUATION			
Uncage meters & turn on electronics		Place 70mm Cam on RCU Pick up closeup camera			
Discard pallet					
TRAVERSE BEGINS		TRAVERSE BEGINS			
Go to Station A (575 Ft)		Go to Station A (575 Ft)			
Rate: 4 fps		Comment on track depth, mechanical characteristics			
		REPORT CLOSEUP CAM ORIENT,FRAMES			
STATION A		STATION A			
LPM POINT MEASUREMENT		TDS EXPERIMENT			
		Assemble small scoop & Ext. Hndl			
Unstow cable reel		Take out MESA brush & TDS bag			
Unstow sensor/tripod	0+40				
Move sensor to site 35 ft away		Take out 1st TDS, lay flat on MET table			
Erect tripod, check sensor orientation (#1, facing downsun)		Take closeup cam shot, 1 side Sprinkle dust on sample & shake off excess			
		Take closeup cam shot,both sides			
Align & level sensor/tripod					
		Brush off sample with MESA brush (get as clean as possible)			
Move to MET (electronics)		Take closeup cam shot,both sides			
		Fold sample and rebag			
Photo tripod/sensor (localization shot--pick up landmark)		Take out 2nd TDS, lay flat on MET - Sprinkle & shake			
Report X,Y,Z readings(repeat 3 times)		Take Closeup Cam shot,both sides Fold sample and rebag. Stow in HTC pouch			
Return to sensor					
Recheck sensor aligned & leveled		Photo Panorama Site Description			
Return to MET					
Report X,Y,Z readings (repeat 3 times)		Collect Sample(s)			
	0+50				

CDR-2

2. Al-MET track & footprint eval & photos
3. Al-site description
   Ed-pan
4. Take samples & dbl core

Station B - 7 min
1. Pan
2. Samples

B
A

10-31-70

LMP-2

LPM, BEGIN TRAV

0+35 Pull MET-begin trav
(opt) 16mm cam,on(f8,500,6FPS)

STATION A - 25 min
1. Deploy LPM for point meas
   Photo tripod-tether tongs
   After 60 sec read meters
   (X,Y,Z) 3X
   Repeat meas for pos 2 & 3
   Rewind cable & stow LPM
   Al-TDS & MET track photos
2. Ed-take pan
   Al-Describe site
3. Take samples & dbl core

STATION B - 7 min
1. Pan
2. Samples

A&B
MET

10-31-70

0+50

(1) LMP - REPORT X, Y, Z
READINGS (3 TIMES)

	1	2	3	SW
X	____	____	____	____
Y	____	____	____	____
Z	____	____	____	____

(1) LMP - REPORT X, Y, Z
READINGS (3 TIMES)

X	____	____	____	____
Y	____	____	____	____
Z	____	____	____	____

(1) LMP - REPORT TUBE NUMBERS
AND ORDER
INSERTION FORCE
TOP ____ BOTTOM ____

(1) CDR - COMMENT ON SOIL
CHARACTERISTICS WHILE
DRIVING TUBES

1+00

(1) LMP - COMMENT ON TUBE WITHDRAWAL
REPORT CONDITION OF BIT IF HARD
OBJECT ENCOUNTERED

(1) CDR - (IF TAKE CLOSEUP CAM) REPORT
FRAME NO. AND ORIENT

____ ____

(1) CDR/LMP - EMU CHECK: REPORT
FRAME NOS. 70MM CAM ___ ___

(1) CDR/LMP - GIVE MARK WHEN TRAVERSE
COMMENCES: ESTIMATE AND
REPORT RATE OF TRAVEL,DESCRIBE
GAIT

(1) CDR/LMP - GIVE MARK ON REACHING STATION

(1) CDR/LMP - SITE DESCRIPTION
SAMPLE DESCRIPTION

1+10

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

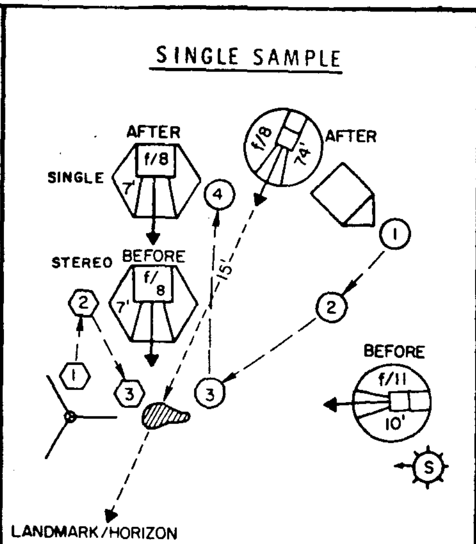
LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	0+50				
Return to sensor Reorient sensor to #3 position		Note: CDR omits down-sun "before" photo			
Recheck aligned and leveled					
Return to MET					
Report X,Y,Z readings (repeat 3 times)					
Stow sensor/tripod on MET Rewind cable, stow on MET					
DOUBLE CORE Assemble tubes		DOUBLE CORE Place gnomon Ready hammer			
Hold upright on surface		Take Stereo pr XSUN, f:8, 7ft Drive tubes into surface with hammer blows			
Photo tubes in ground & horizon or landmark XSUN f:8, 15 ft, focus 74 ft	1+00	Stow hammer			
Remove tubes, disassemble, cap & stow tubes in HTC Report tube numbers & order		Stow or hold gnomon Assist as required Take closeup cam picture of hole (options)			
Tether tongs - start 16mm cam 1 fps @ 1/500					
Pull MET		GIVE MARK WHEN STARTING			
GO TO STATION b (820 ft) Assumed rate: 4 fps		GO TO STATION b (820 ft) Assumed rate: 4 fps			
STATION b		STATION b			
Photo panorama Site description Sample collection	1+10	GIVE MARK ON REACHING STATION Sample collection			

CDR-2

10-31-70

DOC SAMP CORE

SINGLE SAMPLE



CDR-2

10-31-70

TRAV INFO F&G

GENERAL TRAV INFO

Report:-time to each site
-movement & direction
-location wrt LM
-photos beside nominal
-sample bag numbers
-core tube numbers

SPECIAL PHOTOS
MET eval:
-Wheel track & footprint in LM area
-Wheel track & footprint if sinkage is 2-3 & ≥4 inches

-Motion on various surfaces & dust cloud eval DAC(f8, 1/250,24 fps)
-Closeup cam photo of wheel track & footprint

1+10

(1) CDR - REPORT SAMPLE BAG NOS.

____

____

____

____

____

(1) CDR/LMP - GIVE MARK WHEN TRAVERSE COMMENCES

1+20

(1) CDR/LMP - EMU CHECK, REPORT FRAME NOS. 70MM CAMERAS ___ ___

(1) CDR/LMP - GIVE MARK ON REACHING STATION

(1) CDR/LMP - SITE DESCRIPTION
SAMPLE DESCRIPTION

(1) CDR - REPORT SAMPLE BAG NOS.

____

____

____

____

____

1+30

MISSION: APOLLO 14, H-3

EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	1+10				
GO TO STATION C (1800 FT) Assumed rate: 4 fps		GO TO STATION C (1800 FT) Assumed rate: 4 fps			
REST		REST			
	1+20				
STATION C		STATION C			
Photo pan		Site Description			
Sample Collection		Sample Collection			
Proceed to S Side of Sunrise rim		Proceed to S Side of Sunrise rim			
	1+30				

1+30

CONE D&E

CONE CRATER - 30 min

1. Pan on arrival
2. Collect rocks & soil on rim
   Look for contacts-sample each side-sample rock trails
3. If time do polar near-far
4. If time do far polar >100 ft from 1st then discard filter, reset cam 1/250
5. Go SE around rim
6. Take 24fps movie: (1 mag)
   - Kick boulders into crater
   - Crew walk around & pose
   - Pan cam to W and LM
7. Do EVA Comm - Al behind big boulder, Ed document

CDR-2

10-31-70

CDR-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK - 7 min

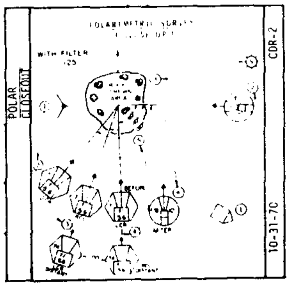
Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8 LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

D&E CONE



(1) CDR - DESCRIBE BOULDER TRACKS, SAMPLES TAKEN (IF PERFORMED)

(1) CDR - POLARIMETRIC SURVEY DESCRIPTION

FILTER ORDERS

CLOSEUP	DISTANT
90	
110	
130	

(1) CDR - REPORT WHEN BOULDERS ROLLED

1+40

(1) CDR/LMP - EMU CHECK
FRAME NOS. 70MM CAMERAS

(1) CDR - MARK & COUNT UP FOR EVA COMM

1+50

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
taking samples	1+30	taking samples			

Note: Perform Polarimetric Survey (HD)
(15 minutes)

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
Sample boulder tracks (Use closeup Cam)		Sample boulder tracks			

Note: Take 2nd Set distant polarimetric photos 100 ft or more from 1st Set. Then remove & discard Polar Filter - Reset Cam 1/250 (HD)

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ. CAM.	TASK FUNCTION LMP	TASK FUNCTION CDR
Take 16mm movie @ 24 FPS-- Crew movement, boulders rolling		Roll Boulders into crater			
Take movies of LM					
EVA COMM EVALUATION		EVA COMM EVALUATION			
		Go behind Large boulder so no line of sight of LM Count up while proceeding behind boulder			
Document CDR position WRT LM & Boulder with partial pan as required					
	1+50				

VOICE DATA

1+50

(1) CDR/LMP - REPORT FRAME NOS.
70MM CAMERAS

(1) CDR - REPORT LEAVING STATION

(1) CDR - REPORT REACHING STATION

(1) CDR/LMP - REPORT SAMPLE BAG NOS.

____

____

____

____

2+00 ________

____

____

____

(1) CDR - REPORT LEAVING STATION

(1) CDR - REPORT REACHING STATION

2+10

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
	1+50				
Final Photo Panorama		Site Description			
GO TO STATION d (500 FT) Assumed rate: 4 fps STATION d		GO TO STATION d (500 FT) Assumed rate: 4 fps STATION d			
Photo panorama Sample collection		Site description Sample collection			
	2+00				
GO TO STATION e (660 FT) Assumed rate: 4 fps STATION e		GO TO STATION e (660 FT) Assumed rate: 4 fps STATION e			
Train 16mm cam on prospective trench site; turn on (6 FPS) LPM MEASUREMENT (single) Unstow cable reel Unstow sensor/tripod Move sensor to site 35 ft away Erect tripod, check sensor orient, #3 facing downsun		SOIL MECHANICS "Deep Trench" Assemble trenching tool to extension handle Dig trench, 10° off downsun			
	2+10				

CDR-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK - 7 min
Pan & Samples

STATION E - 25 min
1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

D&E CONE

2+10

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS.
70MM CAMERAS ____ ____

(1) CDR/LMP - SITE DESCRIPTION

(1) LMP - VERIFY 16MM CAM RUNNING

(1) CDR - COMMENT ON SOIL BEHAVIOR, EASE OF DIGGING, DIRECTION AND AMOUNT OF DUST FLYUP, HARD OBJECTS ENCOUNTERED, LAYERING IN MATERIAL AS DEPTH INCREASES

2+20

(1) LMP - REPORT X, Y, Z READINGS (3 TIMES)
SW

X ____ ____ ____ ____

Y ____ ____ ____ ____

Z ____ ____ ____ ____

(1) LMP - VERIFY 16MM CAM STOP

(1) CDR - REPORT SESC COLLECTION ____

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN, REPORT BAG NOS.

2+30

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+10				
Erect tripod, check sensor orient, #3 facing downsun					
Align & level sensor/tripod					
Move to MET (electronics)					
Photo tripod/sensor(localization shot)					
Report X,Y,Z readings (repeat 3 times) IF NOT DISCARDED					
Return to sensor and pick up Stow sensor/tripod on MET Rewind cable, stow on MET					
Go to downsun position, edge of trench (act as reflector) Take upsun shot, trench interior		Take stereo prs both sides & downsun of trench interior			
Take stereo pr footprint Photo bottom of trench with close-up camera		Make bootprint in fill			
Special Environmental Sample (fines from bottom of trench)		Special Environmental Sample (fines from bottom of trench)			
	2+20				
Sample sides, top, discontinuities		Sample sides, top, discontinuities			
	2+30				

Note: If 5 minutes ahead or extension to EVA, take a single core sample

LMP-2

8. Pan at S end of rim walk
9. Grab some rocks for radial sample on way to Sta. D

STATION D - FLANK 7 min

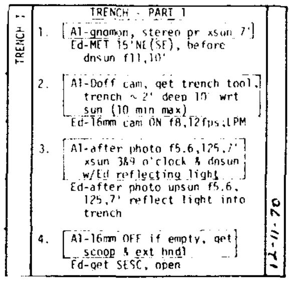
Pan & Samples

STATION E - 25 min

1. Al-Dig Trench I & take pan
   Ed-Trench before shot
   Set up 16mm cam 12fps f/8
   LPM
2. Take after photos Trench I
3. Do Trench II, SESC from bottom then bottom, sides, discons, top
4. Ed-footprint & photo
5. If time take single core thru fillet

10-31-70

D&E CONE

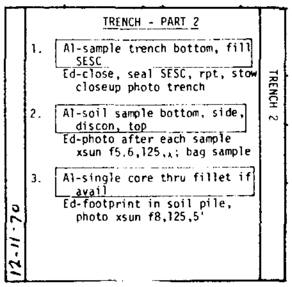


TRENCH 1

TRENCH - PART 1

1. Al-gnomon, stereo pr xsun 7'
   Ed-MET 15'NE(SE), before dnsun f11,10'
2. Al-Doff cam, get trench tool, trench ~ 2' deep 10' wrt sun (10 min max)
   Ed-16mm cam ON f8,12fps;LPM
3. Al-after photo f5.6,125,7' xsun 3&9 o'clock & dnsun w/Ed reflecting light
   Ed-after photo upsun f5.6, 125,7' reflect light into trench
4. Al-16mm OFF if empty, get scoop & ext hndl
   Ed-get SESC, open

12-11-70



TRENCH - PART 2

1. Al-sample trench bottom, fill SESC
   Ed-close, seal SESC, rpt, stow closeup photo trench
2. Al-soil sample bottom, side, discon, top
   Ed-photo after each sample xsun f5.6,125,x; bag sample
3. Al-single core thru fillet if avail
   Ed-footprint in soil pile, photo xsun f8,125,5'

TRENCH 2

12-11-70

2+30

(1) CDR - REPORT LEAVING STATION

(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS. ____ ____

(1) CDR - REPORT REACHING STATION

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES TAKEN,
REPORT BAG NOS.

2+40

____

____

____

____

____

(1) LMP - REPORT NOS AND
ORDER OF TUBES
EFFORT REQUIRED TO
EMPLACE IN SURFACE

TOP ___ MIDDLE ___ BOTTOM ___

(1) CDR - COMMENT ON EFFORT,
METHOD OF DRIVING
TUBES INTO SURFACE

2+50

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+30				
Photo panorama					
GO TO STATION f (1000 FT)		GO TO STATION f (1000 FT)			
Assumed rate: 4 fps		Assumed rate: 4 fps			
REST		REST			
STATION f Photo Panorama		STATION f Site Description			
	2+40				
Sample Collection		Sample Collection			
TRIPLE CORE SAMPLE		TRIPLE CORE SAMPLE			

Note: If 14 min. ahead or extension to EVA, perform DIAMETRIC SAMPLE: 7 rock/soil samples across a crater and ejecta blanket, with 2 partial pans to document

2+50

F&G TRAV INFO

CDR-2

STATION F - WEIRD - 17 min
1. Pan - Superimposed craters
2. Samples
3. Triple core
4. If time - 7-radial Sample

STATION G - TRIPLET - 7 min
1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

10-31-70

(HD) LPM MEASUREMENT SW

X ____ ____ ____ ____

Y ____ ____ ____ ____

Z ____ ____ ____ ____

(HD) GASC ______
SESC ______

2+50

(1) LMP - COMMENT ON BIT
ABRASION
REPORT IF 3RD TUBE
HAS ANY CORE IN IT

(1) CDR/LMP - CSC - FRAME ___ ORIENT ___

MCC - IF NOT, INSTRUCT LMP
TO SALVAGE A BIT AND
RESTORE TO EMPTY TUBE
FOR POTENTIAL USE

(1) CDR - REPORT LEAVING STATION
(1) CDR - REPORT ARRIVAL AT STATION
(1) CDR/LMP - EMU CHECK
REPORT FRAME NOS ____ ____

(1) CDR/LMP - SITE DESCRIPTION

(1) CDR/LMP - DESCRIBE SAMPLES
REPORT BAG NOS

____

3+00 ________

____

____

____

____

____

____

(1) CDR - REPORT LEAVING STATION

3+10

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION LMP	TASK FUNCTION CDR
	2+50				
Place bit in sample bag					
GO TO g (570 FT)		GO TO g (570 FT)			
Assumed rate: 4 fps		Assumed rate: 4 fps			
STATION G		STATION G			
Photo Panorama		Site Description			
Sample Collection Fill weigh bags		Sample Collection Fill weigh bags			
Note: For each 5 minutes over nominal EVA time (1) collect Gas Sample (2) Make 3rd LPM measurement (discard electronics; read tempilabel after measurment) (3) Collect Magnetic Sample (4) Single core thru large rock fillet.					
GO TO LM (740 FT) Assumed rate: 4 fps		GO TO LM (740 FT) Assumed rate: 4 fps			
	3+10				

3+10

F&G
CORE

STATION F - WEIRD - 17 min

1. Pan - superimposed craters?
2. Samples
3. Triple core
4. If time - 7 radial Sample

STATION G - TRIPLET - 7 min

1. Pan & Samples
2. If time-GAS,MAG,LPM,FOOTBALL

LMP-2

10-31-70

3+20

3+30

MISSION: APOLLO 14, H-3
EVA: 2 (LANDING SITE 3)

DATE: 1-11-71

LMP ACTIVITIES	EVA TIME	CDR ACTIVITIES	SEQ CAM	TASK FUNCTION	
				LMP	CDR
Return to LM	3+10	Return to LM			
	Note: Excess time for landing site 3 over landing site 1 approximately 26 minutes.				
	3+20				
	3+30				

3+30

CDR-2

10-31-70

CONTAM SAMPLE, CLOSEOUT

[MET to MESA

3+34 Small scoop, ext hndl, [SESC
gnomon, sample under
Quad III-into SESC [close
(photo before/after)
Discard scoop-keep ext hndl

Stow in ETB: [ETB load
- -70mm mag
- -TDS
- -MSSC
- -map
- -weigh bags (as reqd)

Stow in SRC: (stowage list)
- -2 SESC's
- -6 core tubes (if used)
- -documented samples (in weigh bag)
- -extra samples (fill SRC)

CLOSEOUT
POLAR

(1) CDR - REPORT REACHING VICINITY OF LM

(1) CDR/LMP - EMU CHECK

3+40

CLOSE

CONTAM SAMPLE, CLOSEOUT

3+34 MET Near MESA(tails in)
Get SESC(in SRC) & open
Photo sample area
under Quad III(In sun)
Close SESC-stow in ETB

Stow in ETB: [ETB &
SRC load
- -1 70mm cam
- -1 70mm mag
- -3 16mm mags
- -close-up cam film(adv film 3X & remove cassette)
- -SWC(Get SWC, bag & seal)
- -extra sample stowage bags

ETB Stowage list:
- -contam sample
- -1 70mm cam
- -2 70mm mags

LMP-2

10-31-70

(1) LMP - REPORT RETRIEVAL SWC

3+50

APOLLO 14 LUNAR SURFACE PROCEDURES (FINAL)
DECEMBER 31, 1970

AB/C. C. Kraft
AP3/J. McLeaish (400)
AP3/M. Reim (10)
BL/J. R. Brinkmann
BL2/T. F. Brahm
BL4/R. W. Underwood
BN4/W. W. Wilson
CA/D. K. Slayton
CB/T. P. Stafford (15)
CF/W. J. North
CF131/D. F. Grimm
G. C. Franklin
C. Perner
CF14/J. W. Bilodeau
CF15/C. H. Woodling
CF21/M. E. Dement
CF23/D. R. Brooks
D. J. Hudson
R. A. Moses
CF31/L. D. Allen
CF33/S. Faber
CF34/D. Ballard
E. Hoskins
A. McCracken
CF52/D. C. Schultz
J. H. Covington
L. V. Ramon
S. Millican
A. F. Smith
CF53/T. C. Barrows
V. C. Hammersley
R. Foster
CF62/T. W. Holloway
T. Lindsey
E. Pippert
C. Stough
CF64/J. B. Cotter
T. A. Guillory
G. M. Colton
L. J. Riche'
CF71/H. A. Kuehnel
R. G. Zedekar
C. Klabosh
J. A. Taylor
J. M. Bremer
CF71/R. H. Gerlach
J. H. Ragan
J. W. McKee
R. Nute
G. Laski
W. N. Teague
J. J. Van Bockel
J. H. Roberts
DA/C. A. Berry
DA2/W. R. Carpentier
DB4/D. Miller
DD/W. R. Hawkins
F. Humbert
J. F. Zieglschmid
EA/M. A. Faget
EA2/J. W. Chamberlin
EA8/P. Deans
EB3/J. B. McCaulley
EC/R. E. Smylie
EC3/J. W. Colburn
EC6/L. E. Bell
H. J. McMann
R. M. Bernardin
EC9/C. C. Lutz
R. Grafe
J. W. McBarron
H. L. Stutesman
F. A. McAllister
J. L. Gibson
R. Spann
F. DeVos
EE/R. S. Sawyer
L. E. Packham
EE2/P. P. Coan
T. Hopkins (RCA)
EE3/E. L. Chicoine
D. S. Eggers
J. S. Kelley
EE12/R. E. Thompson
EE13/M. G. Kingsley
R. H. Dietz
EH/H. Greider
J. Harris
R. Cox
J. Sanders

EH/E. Weeks
D. Wiseman
A. Carraway
EW/R. L. Bond
FA/S. A. Sjoberg
R. G. Rose
FC/J. W. Roach
M. F. Brooks
M. L. Windler
G. Lunney
G. Griffin
M. Frank
FC2/C. H. Harlan
W. E. Platt
G. A. Pennington
H. C. Johnson
J. M. Leeper
L. Pavlow
W. E. Platt
G. G. Scott
T. L. Strebe
D. Nicolson
H. Weyer
FC4/Hannigan (7)
C. Hopkins
W. Bates (2)
FC6/H. G. Miller
C. B. Shelley
R. Myers
FC9/J. Saultz
J. Cooper
D. Toups
T. Newton
J. Moser
B. L. Sharpe
FC93/F. Mabley
FM/J. P. Mayer
H. W. Tindall
FM5/H. D. Beck
FM7/M. L. Alexander
FS4/Lyn Crooms
HA/J. P. Loftus
PA/J. A. McDivitt
O. G. Morris
R. Johnston
R. Kubicki
PG/J. Goodman
PD4/J. Sevier
PD7/J. Peacock
S. Blackmer
PD9/J. Craig
PE/D. M. Corcoran
PE5/J. J. Turner
PE6/W. C. Fischer
PT3/E. P. Gammon
TA/A. J. Calio
G. Simmons
TD4/W. Stephenson
TF/F. W. Pearce, Jr.
TH2/M. C. McEwen
R. L. Jones
U. Claton
J. Lindsey
TH3/J. Dietrich
TH4/W. D. Carrier (3)
TJ/J. H. Sasser
TL3/W. A. Parhan
TL11/B. Erb (2)
TM/M. Miller
J. Zarcaro (12)
P. Chapman
TM2/R. Baldwin
E. Crum
F. Herbert
TN/D. Strangway
P. W. Gast
SA/J. C. French (3)
SF/D. D. Greenwell
ZS5/W. C. Remini (2)

NASA Headquarters:
MAL/D. A. Beattie
Capt. C. M. Lee
MAL/E. M. Davin
MAO/E. W. Land
D. E. Beck
J. Holcomb
MAS/P. Benjamin
N. Hinners
V. Hamza
D. G. Estberg
D. D. Lloyd
MAL/R. J. Allenby
P. F. Sennewald
M. Yates
MAL/W. O'Bryant

Center of Astrogeology
U. S. Geological Survey
601 East Cedar Avenue
Flagstaff, Arizona 86001
M. H. Hait
G. Swann
H. Holt
G. G. Schaber
R. L. Sutton
N. G. Bailey
R. Hatson
J. Strobell

Marshall Space Flight Center
R-SSL-N/Dr. N. C. Costes
PM-MO-I/D. Strimling (2)
S&E - AERO-YR/O. Vaughn

Bendix Systems Division
Ann Arbor, Michigan
R. Redick

Grumman Aircraft Engineering Corp.
Crew Systems
Bethpage, L. I., N. Y.
D. Shield
H. Wolf
S. Meiselman
B. O'Neil
B. Kram
G. Kingsley
E. A. Manaker
R. Escobar (2)
H. Richmond (GAC-MSC)
L. Gran

TRW - Building H-3
C. E. Wilkins
TRW - Building H-2
N. C. Stewart
R. T. Cliffe
E. Kells
R. Jefferies
E. Aldrich
G. E. Teveldahl

Kennedy Space Center
AA-AVO-2/ E.J. Popovick
BA-1/J. King (100)
GAEC/G. Dowling

General Electric Co.
P. O. Box 2500
Daytona Beach, Florida 32015
A. S. Lyman/DBO-2
W. Atwell/MAR

General Electric/Houston
J. E. Crane
J. Power
J. T. Waggoner
E. E. Young
R. Koppa
T. O. Montgomery
A. B. Thompson
J. G. Olmsted
R. Blevins
W. Buckels
A. Adorjan
A. Mitchell
R. Westerheid
C. Richardson
J. Bryant
M. Todd
A. E. Barnes
L. W. Warzecha
J. Fernandez
R. Murdock

Boeing Co./Houston/DD
L. Nelson
F. W. Hovey

Boeing Company
Apollo TIE Library
P. 01 Box 1079
Washington D. C. 20013

Boeing Company
HA-04/B. Chamblee
HA58/J. V. Powers
M. Van Slyke
HA74/R. B. McMurdo (2)

Philco-Ford
M/C D100B
C. W. Abbitt

Ornl/C. A. Hahas
P. O. Box X
Oak Ridge, Tenn 37830

Bendix Systems Div.
Robert Miley (2)
R. Mercer
A. Micocci
TDX Bldg 399

Leon T. Silver
Division of Geological Sciences
California Institute of Technology
Pasadena, Califormia

FC60/NR Downey/M. Chase

Paul J. Colman, Jr.
Dept of Planetary & Space Sciences
UCLA 90024

Frederich J. Doyle
Topographic Division
USGS
1340 Chanbridge Road
Mc Lean, Virginia 22101

Palmer Dyal/N204-4
Ames Research Center, NASA
Moffett Field

R. L. Kovach
Department of Geophysics
Stanford University 94035

Ian MacGregor
Department of Geology
University of California
Davis 95616

Robert O. Pepin
School of Physics and Astronomy
University of Minnesota
Minneapolis, Minnesota 55455

J. K. Mitchell
1240 Davis Hall
Department of Civil Engineering
University of California
Berkeley, California 94726

W. R. Muehlberger
Geology Department
University of Texas
Austin, Texas 78712