



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO 15

FINAL

LUNAR SURFACE TELEVISION
OPERATIONS PLAN

JULY 5, 1971

PREPARED BY

APOLLO COMMUNICATION SYSTEMS SECTION
FLIGHT CONTROL OPERATIONS BRANCH
FLIGHT CONTROL DIVISION

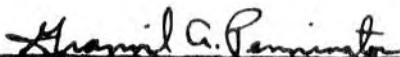


MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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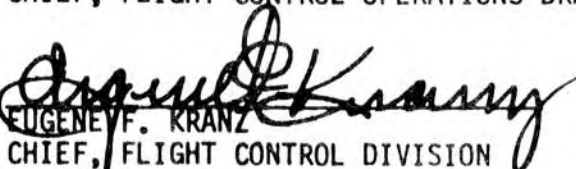
SUBMITTED BY:



GRANVIL A. PENNINGTON
APOLLO COMMUNICATIONS SYSTEMS SECTION


EDWARD I. FENDELL
HEAD, APOLLO COMMUNICATIONS SYSTEMS
SECTION


CHARLES S. HARLAN
CHIEF, FLIGHT CONTROL OPERATIONS BRANCH

APPROVED BY:


EUGENE F. KRANZ
CHIEF, FLIGHT CONTROL DIVISION


SIGURD A. SJOBERG
DIRECTOR OF FLIGHT OPERATIONS

CONCURRED BY:


JAMES A. MCDIVITT
MANAGER, APOLLO SPACECRAFT PROGRAM


ANTHONY J. BALLO
DIRECTOR, SCIENCE AND APPLICATIONS


DONALD K. SLAYTON
DIRECTOR, FLIGHT CREW OPERATIONS

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PREFACE

This document has been prepared by the Apollo Communication Systems Section, Flight Control Operations Branch, Flight Control Division, Manned Spacecraft Center, Houston, Texas. The information contained within this document represents Lunar Surface Television requirements and planned operations for Apollo 15, Mission J-1 as of July 5, 1971.

Any questions or comments concerning this document should be directed to FC2/G. A. Pennington, Flight Control Operations Branch, Apollo Communications Systems Section, at area code 713, 483-2267.

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The Apollo 15 Final Lunar Surface Television Operations Plan was the document prepared for use during the Apollo 15 lunar stay. It provides reference material for those who need additional information about the operation of the Lunar Rover color television camera during Apollo 15. It was published on July 5, 1971, by Manned Spacecraft Center. The original document was provided by Dick Nafzger, who was the Manned Space Flight Network television engineer at Goddard Space Flight Center during the Apollo missions.

This PDF version was produced by [Bill Wood](#). The original pages were scanned with an Epson Expression 10000XL, using Silverfast AI Studio, to produce high quality 300 pixel per inch, 48-bit images, for further processing. Each page image was straightened and cleaned up in Photoshop CS3 prior to producing 150 pixel-per-inch EPS page images. Adobe Acrobat 8 Professional was used to add the bookmarks before the final PDF edition was produced.

LUNAR SURFACE TELEVISION OPERATIONS PLAN

I. INTRODUCTION

The Apollo 15 Lunar Surface Television Operations Plan is used to document the Lunar Surface TV operations plan, to provide detailed TV operating procedures, and to document all Lunar Surface TV requirements to be implemented.

This document includes detailed timeline procedures and operational TV requirements. Timelines are essentially task flow analysis along a time base showing the points of interaction between the two crewmen and MCC, and simply list, in sequence of performance, the steps required to carry out each of the tasks. It is in the detailed timeline procedures that the MCC/Crew/Equipment interfaces are revealed. The tasks of the CDR, LMP, and MCC are presented side-by-side so that no confusion will exist as to which party is doing what, or how the three cooperate in the television operations on the lunar surface.

II. REQUIREMENTS AND PRIORITIES

The lunar surface television requirements as documented in this publication, are considered as highly desirable and not mandatory. The television coverage does not supersede or delete in any way the photographic requirements specified in the Mission Requirements Document (MRD). The following

comprises a detailed list of the Lunar Surface television viewing requirements for the Apollo 15 mission.

A. Requirements for Individual ALSEP Experiments

1. Experiments

- a. Passive Seismic (PSE)
- b. Lunar Surface Magnetometer (LSM)
- c. Suprathermal Ion Detector (SIDE)
- d. Cold Cathode Gauge (CCGE)
- e. Solar Wind Spectrometer (SWE)
- f. Heat Flow (HFE)
- g. Central Station (CS)

2. General Requirements

- a. Monitor ALSEP off loading, RTG Fuel cask removal and RTG fueling.
- b. Pan area from lock to lock ($+170^{\circ}$ to -170°) prior to ALSEP deployment operations and after all experiments are deployed.
- c. Attempt to relate each experiment with an identifiable nearfield object (such as another experiment).
- d. Obtain a medium angle view of each experiment during and after emplacement.
- e. Observe general activity around each experiment.

3. Specific Requirements

- a. Central Station:
 - (1) Obtain a panoramic view of the deployed ALSEP in relation to the CS.
 - (2) Obtain a narrow angle view of the antenna, antenna gimbal, and interface between the antenna gimbal and antenna mast.

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- b. Passive Seismic Experiment:
Obtain a close-up view of the PSE thermal shroud contact with the lunar surface (to determine if gaps exist).
- c. Lunar Surface Magnetometer:
 - (1) Obtain a close-up view of the LSM sensor heads and tripod after deployment.
 - (2) Obtain a view of the LSM cable after deployment.
- d. Suprathermal Ion Detector/Cold Cathode Gauge:
 - (1) Obtain a close-up view showing relationship of SIDE to CCGE.
 - (2) Monitor deployment to determine stability of SIDE during deployment of SIDE and CCIG.
- e. Solar Wind Spectrometer:
None except per the General Requirements section.
- f. Heat Flow Experiment:
 - (1) Observe at close-up range, as much of the probe hole drilling operations as possible.
 - (2) During drilling, observe deviation of drill from vertical position.
 - (3) Observe insertion of probes in holes and deployment of cables and electronics package.

B. Non-ALSEP Experiments

1. Experiments

- a. Laser Ranging Retro Reflector (LR³)
- b. Soil Mechanics Experiment

- c. Lunar Field Geology Experiment - LM
- d. Field Geology - LRV
- e. Other

2. Requirements

a. LR³:

- (1) Pan the deployment area from lock to lock (+170° to -170°).
- (2) Obtain a close-up view during and after emplacement.
- (3) Relate the LR³ with an identifiable object such as ALSEP deployment site.

b. Soil Mechanics:

- (1) View the core tube sampling operation and penetrometer tests at each core tube site.
- (2) View the trenching operation and penetrometer test.
- (3) View of rover wheel tracks, where possible.

c. Field Geology - Lunar Module:

- (1) Pan 360° with horizon near top of frame and widest field of view.
- (2) Sight on LM with maximum and minimum zoom positions to permit scale calibrations on MCC SSR D/TV monitors for later traverse measurements from LRV.

d. Field Geology on LRV:

- (1) 360° pan at all stops, wide angle, horizon near top of frame. This should not be a

continuous pan, but a pan-stop, etc. Stops should be 2-4 seconds long (for Polaroid camera photos) and pans should have a minimum of 10° overlap.

- (2) On request from the Public Affairs Officer or Experiments Officer, zoom from wide angle to telescopic view at sampling localities or local landmarks as defined from the 360° pan.
- (3) During traverse, look at LRV tracks, fenders, and wheels, at each science stop if surface conditions deem necessary; such as excessive dust, or extreme differences in wheel penetration (determined by astronaut).
- (4) During traverse stop, zoom from wide angle to telescopic view of Lunar Module, previous stops and future stops.

e. Other Requirements:

- (1) Establish a grid and calibration scheme for range and bearing determinations.
- (2) View LRV deployment and equipment stowage on the LRV.
- (3) View LRV operation during checkout period (especially observe braking).

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- (4) View ALSEP offloading from LM and deployment in the field.
- (5) View equipment jettison from LM after 3rd EVA.
- (6) View LM descent stage and ALSEP after 3rd EVA. Details to be defined later.
- (7) View LM ascent.
- (8) Color survey of lunar terrain in eastern sunlight, high sun angle on August 3-5, 1971.
- (9) View LM impact.
- (10) If sufficient power is available and no thermal problems are encountered, view solar eclipse at 13:24 p.m. CDT on August 6, 1971.
- (11) Color survey of the lunar terrain in western sunlight on August 7, 8, 1971.

III. OPERATIONAL AND EQUIPMENT CONSTRAINTS

- A. The Lunar Communications Relay Unit (LCRU) will operate in the voice/data mode only with the LRV moving. The S-Band low-gain antenna and a MSFN 85-foot dish are required for the moving modes. No television can be transmitted in these modes.
- B. The LRV must be stopped for transmission of television due to S-Band antenna pointing.

Television requires the high-gain antenna and an 85-foot or 210-foot dish. (See page 15, Figure III-1 for 210 foot site coverage).

- C. The crewman must dismount the LRV to operate any LCRU controls (modes, power, telemetry monitor) or to deploy or adjust the high-gain antenna.
- D. The Extra Vehicular Suit Communications (EVCS) can be operated line-of-sight to the LCRU within 500 meters with no degradation in VOICE or data. Degraded but usable voice and data may be obtained to a range of 800 meters.
- E. The delay in transmission of video to MCC from the lunar surface is approximately 1.8 seconds.
- F. The amount of time from the execution of Ground Commanded Television Assembly (GCTA) commands until video response at MCC is 3.7 seconds maximum. (i.e. when TV is received by Honeysuckle Creek, Australia and transmitted to MCC via satellite).

IV. TELEVISION MODES

A. General

The Color Television Camera (CTV) has several different modes of operation. At the beginning of Lunar Surface operations, the CTV is mounted on the MESA and video is transmitted via the LM - 100 foot cable and S-Band system

to the MSFN. This is the same configuration of the television camera as used on previous missions. Shortly after MESA deploy and the first video is transmitted from the MESA, the crew will mount the CTV on a tripod to view LRV (Lunar Rover) deploy and MESA off-loading. The MCC has no command capability while the CTV is connected to the LM via the 100-foot video cable.

After the Lunar Communication Relay Unit (LCRU) and Television Control Unit (TCU) are offloaded and mounted on the LRV, the CTV is turned off, disconnected from LM power, and mounted on the TCU (ref figure IV-1). After LCRU mode checks are made the CTV will be activated in the LCRU "TV RMT" mode. From this point on, video will be transmitted to the MSFN via the LCRU.

B. Specific Modes

The "TV RMT" and "FM/TV" modes of the LCRU are used for transmission of television. The "FM/TV" mode downlinks 1.25 MHz voice, PLSS data, LCRU data and video to the MSFN on S-Band. Control of the Ground Command Television Assembly is exercised manually by the crew or by ground command from the MCC in this mode.

The "FM/TV" mode will be used for nominal television operations during the traverses.

The "TV RMT" mode of the LCRU has the same capabilities as the "FM/TV" mode but has the additional capability to turn off the LCRU 1.25 MHZ VOICE/DATA subcarrier and power down the LCRU FM/PM transmitter. Due to the capability to turn off the 1.25 MH_z VOICE/DATA subcarrier, the "TV RMT" mode can downlink video only with an increase in video quality. The "TV RMT" mode will be used to view ALSEP deploy and activities within the VHF range of the LM where additional television quality is desired and LCRU voice and data are not needed. The capability to turn off the LCRU FM transmitter will be used post-EVA 3 to save power for further CTV operations.

V. INCO INTERFACES AND PROCEDURES

The Instrumentation and Communication System Officer (INCO) is responsible for ground commanding the GCTA and implementation of the Lunar Surface Television Requirements. During real time mission operations, the INCO will receive additional inputs on operation of the GCTA from the Experiments Officer (EO), TV Support Bldg. 440, and the Flight Director. In addition, the Public Affairs Officer (PAO) will make inputs to the Flight Director who will pass the coordinated input to INCO. The EO is responsible for taking

inputs from the lunar field geology Principal Investigators (PI) and relaying them to INCO. The type of inputs expected in real time operations are as follows:

- a. Narrow-Angle Targets of Opportunity (NATO) of specific geological formations viewed during the wide-angle panorama (WAP) at the beginning of a traverse stop.
- b. Certain crew activity not scheduled for television coverage.

VI. SPECIFIC INCO PROCEDURES

- A. Wide-Angle Panorama (WAP) - The WAP will occur when the LCRU/GCTA is switched to the "FM/TV" mode at the beginning of each traverse stop. It will consist of 14 discrete pans of 24° each with stops after each pan of 4 seconds duration. The minimum time to accomplish a WAP is approximately 168 seconds. The WAP will start from $+170^\circ$ and end at the opposite stop. The starting point is determined by the position of the CTV at the time of activation.
- B. Narrow-Angle Target of Opportunity (NATO) - The NATO is accomplished by centering the desired object in the television picture with the zoom at minimum (12.5 mm). The centering may require combinations of pan and tilt. When the object is centered in the field-of-view (FOV) of the CTV, the CTV will be zoomed in to the maximum zoom position (75 mm).

- C. Medium-Angle View (MAV) - The MAV is accomplished by positioning the object/area to be viewed in the center of the television picture with the zoom at medium (~30 mm). The MAV will be used when the area around an object is of interest for determining placement or general activity.
- D. Typical Traverse Stop Activation - After the CDR dismounts the LRV, he will switch the LCRU to the "FM/TV" mode, which applies power to the GCTA, and point the LCRU High Gain Antenna (HGA) to earth. In addition, if this is a stop within LM VHF range and the LCRU was not previously powered up, the CDR would be required to place the LCRU power switch to "INT".
- E. Use of the LCRU "TV RMT" mode - The LCRU "TV RMT" mode will be used during ALSEP deploy and around the LM where voice and data need not be transmitted from the LCRU. The "TV RMT" mode will be used instead of the "FM/TV" mode when the capability of being able to turn off the LCRU 1.25 MHz VOICE/DATA SUBCARRIER and improve the television picture quality is desirable. Additionally, the "TM RMT" mode will be used for viewing LM ascent.

For the LM ascent command sequence to work the LRV/LCRU/GCTA must be positioned 180° from the LM Ascent Launch Azimuth at 328 feet from the LM. Nominally the LRV will be driven along the derived bearing until the

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odometer clicks .1 km (328 feet). The crewman will then point the LRV on a bearing of 255°. The LCRU will be activated on "EXT" power in the "TV RMT" mode and the LCRU HGA pointed toward the earth.

The MCC will then command the CTV so it is pointing at the LM. If it is impossible to position the LRV as required due to a large crater, rock, etc., the LRV will be positioned to the north of the proposed site. The new position will require azimuth correction commands to be added to the ascent command sequence. The nominal ascent command sequence is defined in the detailed timeline, Section IX, page 45.

- F. Use of LRV Power - The LCRU has the capability to use LRV power in addition to the LCRU internal battery. This capability will be used for coverage of LM ascent and it will also provide additional power to increase LCRU/GCTA post-ascent operations time. To use LRV power the LCRU power switch is placed to "EXT" and the LRV power Aux circuit breaker is closed.

- G. CTV Traverse Stowage - Prior to departure from the Lunar Module or a science stop, the CTV will be positioned by ground command or manually by the crew to $\pm 170^\circ$ in Azimuth and -45° in elevation. This CTV position is desirable from an operational and thermal standpoint. Operationally the stowed position will save time in positioning the CTV for a Wide Angle Panorama and also provide a known reference for determination of bearing of the crew or an object from the LRV.

VII.

A. GCTA REMOTE COMMAND CONTROL

<u>COMMAND</u>	<u>FUNCTION</u>
* PAN RIGHT	DRIVES CTV TO RIGHT AT 3°/SECOND
* PAN LEFT	DRIVES CTV TO LEFT AT 3°/SECOND
PAN STOP	STOPS CTV AZIMUTH MOTION
* TILT UP	DRIVES CTV UPWARD AT 3°/SECOND
* TILT DOWN	DRIVES CTV DOWNWARD AT 3°/SECOND
TILT STOP	STOPS CTV ELEVATION MOTION
* ZOOM OUT	CTV ZOOM: DECREASES LENS FOCAL LENGTH
* ZOOM IN	CTV ZOOM: INCREASES LENS FOCAL LENGTH
ZOOM STOP	STOPS ZOOM
* IRIS OPEN	CTV IRIS: DECREASES LENS F/NUMBER
* IRIS CLOSE	CTV IRIS: INCREASES LENS F/NUMBER
IRIS STOP	STOPS CTV IRIS MOTOR
ALC PEAK	PROVIDES LIGHT CONTROL ON PEAK SCENE LUMINENCE
ALC AVERAGE	PROVIDES LIGHT CONTROL ON AVERAGE SCENE LUMINENCE
POWER ON	1. PROVIDES 28 VDC TO CTV 2. PROVIDES 28 VDC ON LCRU FM TRANSMITTER CONTROL LINE 3. COMMANDS S/C ON
POWER OFF	1. TURNS OFF POWER TO CTV 2. TURNS OFF POWER ON LCRU FM TRANSMITTER CONTROL LINE
S/C ON	TURNS ON LCRU 1.25 MHz VOICE SUBCARRIER
S/C OFF	TURNS OFF LCRU 1.25 MHz VOICE SUBCARRIER
* THESE COMMANDS HAVE ASSOCIATED INCREMENT COMMANDS.	

B. COMMAND TYPES

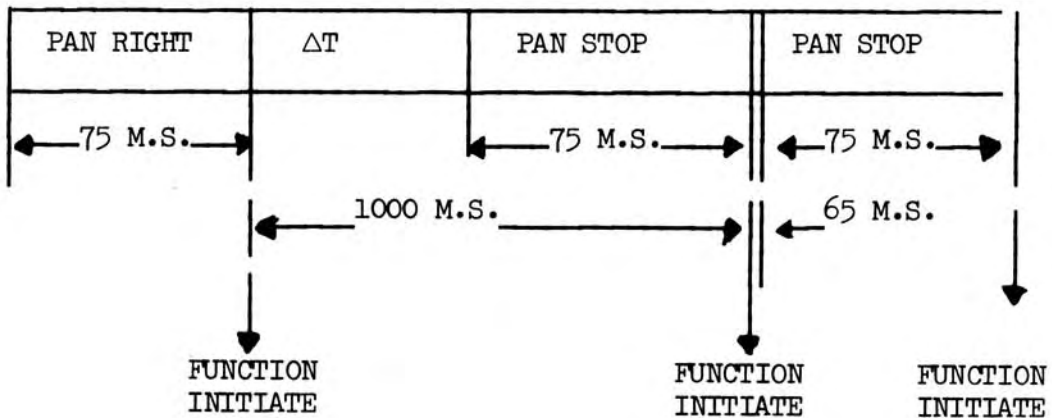
1. Type I Command



Single function RTC (e.g. pan right) at delay from RTC initiate until function start 1.9 seconds.

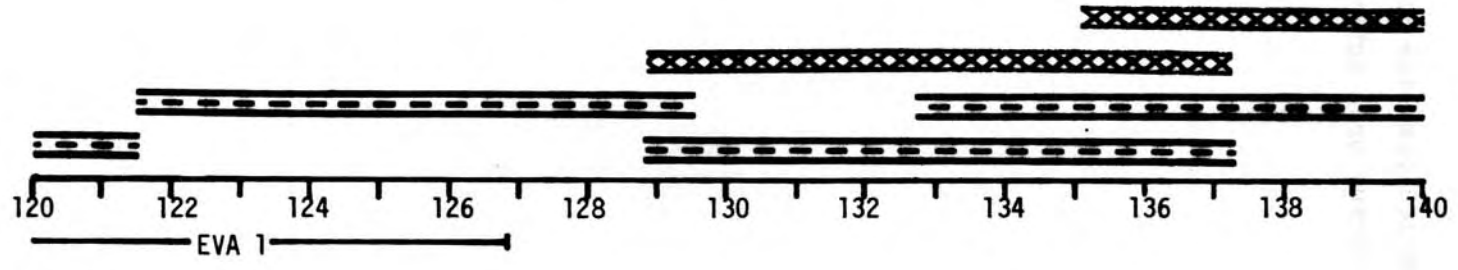
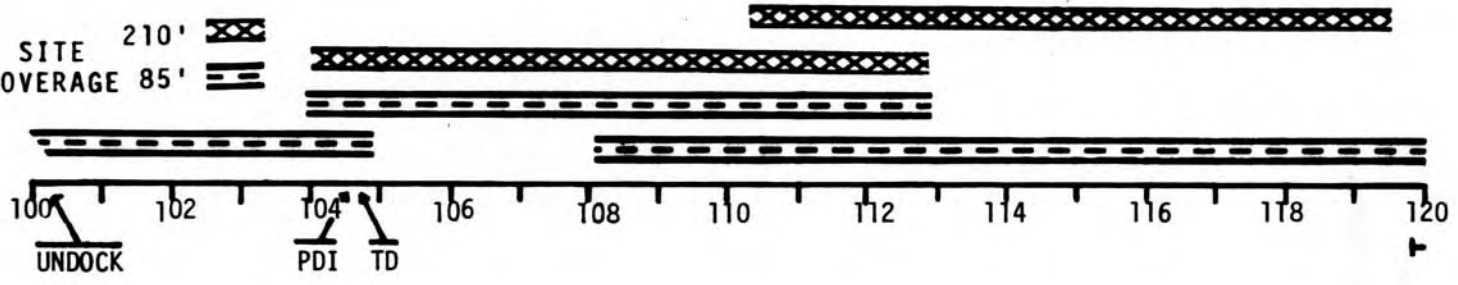
2. Type II Command (increment)

Dual function RTC (e.g. pan right at, pan stop, pan stop).
Two single function RTC's under one PBI with a built in wait period between commands.

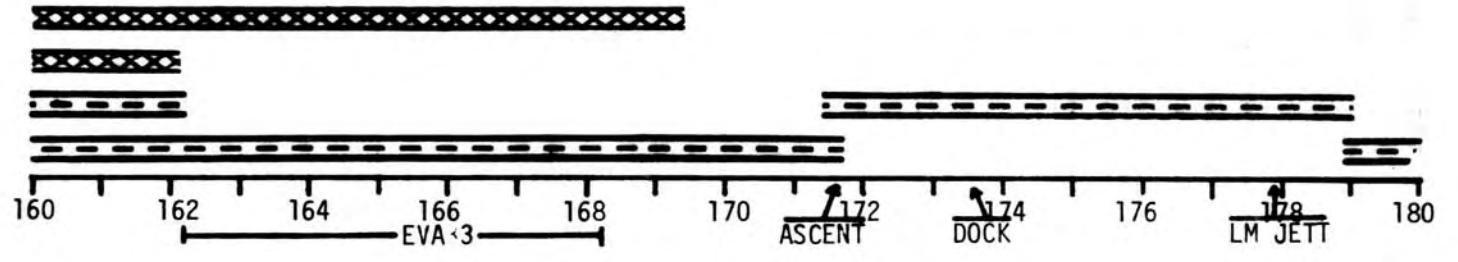
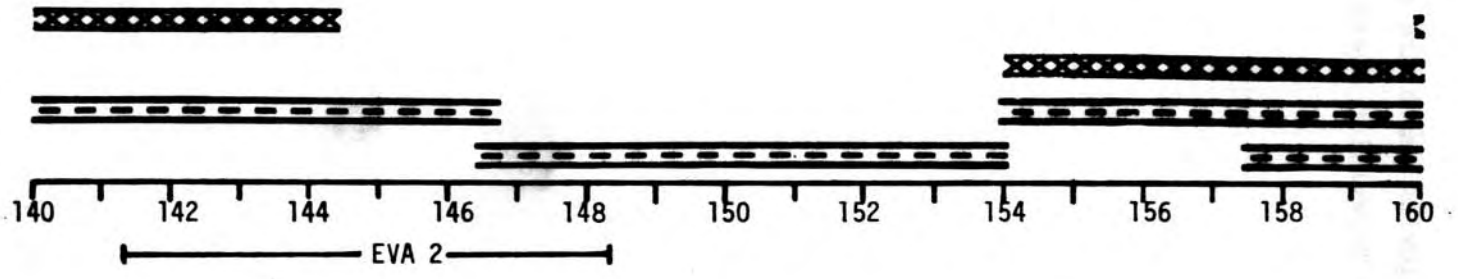
NOTE:
THE LAST COMMAND IS EXECUTED TWICE



SITE 210' 
COVERAGE 85' 



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VIII. The following pages are a detailed timeline of Lunar
Surface Television operation versus crew activities time.

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HOUR	MIN								
00	00	LM		LMP START EVA ONE CDR					
00	10			<p>ASSIST CDR</p> <p>DEPLOY CDR PLSS ANTENNA</p> <p>PLACE JETTISON BAG IN HATCH</p> <p>REMOVE LEC, LOOP END, FROM STORAGE BAG</p> <p>PASS LEC, LOOP END, TO CDR</p> <p>RECORDER - OFF</p> <p>VERIFY VOX SENS (?) - MAX</p> <p>VERIFY CB CONFIGURATION</p> <p>UTILITY & FLOODLIGHTS - OFF</p> <p>ATTACH LEC TO OVERHEAD HANDHOLD</p> <p>TRANSFER ETB TO SURFACE</p> <p>REMOVE FROM HANDHOLD & STOW LEC</p> <p>EGRESS</p> <p>CLOSE HATCH</p> <p>DESCEND TO SURFACE</p> <p>DEPLOY PLSS ANTENNA</p> <p>CHECK FOOTING STABILITY AND MOBILITY</p> <p>REMOVE CSC FROM POCKET</p> <p>DEPLOY CSC HANDLE & BAG</p> <p>COLLECT CONTINGENCY SAMPLE</p> <p>REMOVE HANDLE & CLOSE BAG</p> <p>CLIMB LM LADDER & PLACE CONTINGENCY SAMPLE ON PLATFORM</p> <p>DESCEND TO LADDER FOR LRV DEPLOY</p> <p>PULL D-HANDLE TO RELEASE LRV</p> <p>DESCEND TO SURFACE</p> <p>PULL LRV AFT CABLE AS REQUIRED TO OFFLOAD LRV FROM LM</p> <p>DISCONNECT & DISCARD AFT CABLE</p> <p>ERECT LRV GEO PALLET MTG POST</p> <p>DEPLOY RIGHT REAR FENDER EXTENSION</p> <p>CK REAR STEERING DECOUPLE RING SEAL</p> <p>CK RIGHT REAR HINGE PINS ENGAGED</p> <p>ERECT RIGHT SEAT, LOWER THE ARMREST</p> <p>PULL T-HANDLE & LOWER CONSOLE, LIFT HANDHOLD INTO POSITION, LOCK HANDHOLD/CONSOLE USING T-HANDLE</p> <p>REMOVE TRIPOD APEX - 3 PINS</p> <p>REMOVE AND STOW TOEHOLD, ERECT FOOTREST</p> <p>CK RIGHT FRONT HINGE PIN ENGAGED</p> <p>DEPLOY RIGHT FRONT FENDER EXTENSION</p> <p>VERIFY BATTERY COVERS CLOSED</p> <p>WALK TO MESA</p> <p>CONNECT 16MM POWER CABLE</p> <p>UNSTOW & INSERT STAFF INTO 16MM CAM</p> <p>UNSTOW 16MM CAMERA & PLACE ON MESA TABLE</p> <p>REMOVE 16MM MAG FROM ETB & ATTACH TO CAMERA</p> <p>PHOTO CDR/LRV 16MM CAM (F8, 1/250, 24 FPS)</p>	<p>EGRESS</p> <p>DEPLOY PLSS ANTENNA</p> <p>DESCEND LADDER TO DEPLOY MESA</p> <p>DEPLOY MESA</p> <p>RETRIEVE & DISCARD JETTISON BAG INTO QUAD I</p> <p>DEPLOY LEC</p> <p>DESCEND LADDER TO SURFACE</p> <p>CHECK FOOTING, STABILITY, AND MOBILITY</p> <p>KICK JETTISON BAG UNDER LM</p> <p>TRANSFER ETB TO SURFACE</p> <p>HANG ETB ON LEC STORAGE HOOK</p> <p>ADJUST MESA HEIGHT</p> <p>LOOSEN MESA BLANKET AROUND TV CAMERA</p> <p>OPEN MESA BLANKETS</p> <p>DEPLOY LMP PLSS ANTENNA</p> <p>UNSTOW, DEPLOY, AND PLACE TV TRIPOD ON SURFACE</p> <p>UNSTOW AND MOUNT TV CAMERA ON TRIPOD</p> <p>POSITION TV AT 12:00/50' TO VIEW QUADS I & IV</p> <p>ADJUST TV PER MCC REQUEST</p> <p>REMOVE LRV THERMAL BLANKET</p> <p>CHECK WALKING HINGES LATCHED</p> <p>DEPLOY LEFT LRV OFFLOAD TAPE ACROSS SECONDARY STRUT</p> <p>DEPLOY LRV AFT CABLE & PLACE ON LUNAR SURFACE</p> <p>DEPLOY RIGHT LRV OFFLOAD TAPE</p> <p>CHECK LRV RELEASED FROM LM</p> <p>PULL OFFLOAD TAPE UNTIL REAR WHEELS REST ON SURFACE</p> <p>REMOVE RIGHT OUTRIGGER CABLE</p> <p>REMOVE LEFT OUTRIGGER CABLE</p> <p>PULL OFFLOAD TAPE UNTIL FRONT WHEELS REST ON SURFACE</p> <p>DEPLOY LEFT REAR FENDER EXTENSION</p> <p>CK LEFT REAR HINGE PINS ENGAGED</p> <p>ERECT LEFT SEAT</p> <p>RELEASE HANDHOLD TIEDOWN</p> <p>PULL T-HANDLE & LOWER CONSOLE</p> <p>LIFT HANDHOLD INTO POSITION, LOCK HANDHOLD/CONSOLE USING T-HANDLE, REMOVE TRIPOD APEX - 3 PINS</p> <p>REMOVE AND STOW TOEHOLD, ERECT FOOTREST</p> <p>CK LEFT FRONT HINGE PIN ENGAGED</p> <p>DEPLOY LEFT FRONT FENDER EXTENSION</p> <p>DISCONNECT TELESCOPING RODS</p> <p>PULL ATT INDICATOR AND CBW PINS</p> <p>MOUNT LRV</p> <p>ACCOMPLISH LRV POST-DEPLOYMENT CHECKLIST</p> <p>TEST DRIVE LRV - PARK LRV IN QUAD IV NEAR MESA</p>	<p>VIDEO FROM LM 100 FT CABLE (CTV ON MESA)</p> <p>CTV POSITION NO. 1 (LOCATED AT +2 AT 50 FEET)</p>			
00	20								
00	30								
00	40								

17

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	RMT		
HR	MIN										
				LMP	CDR						
		LM (CONT)		<p>STOW 16PM CAM ON LRV LMP HANDHOLD UNSTOW 70MM CAM FROM MESA REMOVE FILTER FROM 70MM CAM & STOW REMOVE RESEAU COVER FROM 70MM CAM & STOW</p> <p>REMOVE 70MM MAG NH FROM ETB & ATTACH TO 70MM CAM STOW 70MM CAM IN CDR FLOOR PAN</p> <p>UNSTOW & ATTACH EVA 1 PALLET TO MESA TABLE REMOVE & DISCARD 16PM CAM BACK UNSTOW & PLACE ECS LION IN PALLET POCKET</p> <p>REMOVE QUAD 111 THERMAL BLANKETS FROM GEOLOGY PALLET OFFLOAD GEOLOGY PALLET FROM LM MOUNT GEOLOGY PALLET ONTO LRV CHECK LOWER LEFT HATCH - LOCKED REMOVE AND DISCARD PALLET HANDRAILS UNSTOW & PLACE SRC #1 ON MESA TABLE REMOVE SCB #1 FROM SRC #1 CLOSE CONTROL SAMPLE IN SRC #1, ATTACH SCB #1 TO HTC PULL PENET PIP PINS (3), PULL HTC STOWAGE PIP PIN</p> <p>OPEN HTC & SWING OUT, PULL HTC STOWAGE PIP PINS (4)</p> <p>REMOVE TOOL STOWAGE BRACKET FROM PALLET STOW TONGS ON HTC ASSEMBLE & STOW HANDLE/SCOOP ON HTC UNSTOW & TRANSFER PENET TO PALLET UNSTOW & TRANSFER GHORON TO CDR SEAT BACK</p> <p>UNSTOW & ATTACH SCB #2 TO HTC UNSTOW SCB #3 & ATTACH TO LRV PALLET CLOSE HTC TRANSFER FROM SCB #1: * CONE STEPS TO SCB #2 * 2-20 IRONS TO CDR & LMP FLOOR PAN * CONE STEW CAPS TO SCB #2</p> <p>REMOVE RAKE FROM MESA & STOW ON LRV PALLET CLIMB LM LADDER TO POWCH</p> <p>RETRIEVE CONTINGENCY SAMPLE & INGRESS LM STOW CONTINGENCY SAMPLE INSIDE LM CB (16) CONN: TV OPEN MODULATE - PH PUR W/PL - OFF TLM PCH - LD ATTACH LEC TO OVERHEAD HANDRAIL TRANSFER PALLET INTO LM DISCONNECT LEC FROM PALLET STOW LEC INSIDE CABIN</p> <p>REMOVE FROM PALLET & STOW FOOD, BATTERIES, & LION CANS</p> <p>PLACE PALLET ON LM FLOOR</p> <p>MOVE THROUGH LM HATCH RETRIEVE & DISCARD PALLET</p> <p>CLOSE LM HATCH DESCEND TO SURFACE REMOVE & DISCARD TV STOWAGE BRACKET TIDY THERMAL BLANKETS AROUND MESA & COVER CAVITY</p> <p>ATTACH GEOLOGY EQUIPMENT TO EMU</p> <p>ATTACH SCB #1 TO CDR EMU TETHER HANDLE/SCOOP CHECK TOOL STOWAGE BARS. SECURE & CLOSE HTC</p> <p>ATTACH 70MM CAM/BAG DISP TO EMU CHECK 16PM CAM SET FOR TRAVERSE PHOTOGRAPHY MOUNT LRV - FASTEN BELT READ OUT LRV & NAV SYSTEMS DISPLAYS TRAVERSE TO CHECKPOINT (17 MIN)</p>	<p>POWER DOWN LRV, DISMOUNT LRV LIFT LCRU MOUNTING POST LOCKS RELEASE Y-CABLE VELCRO TAB UNSTOW TCU CONNECTOR & DISCARD ADAPTER</p> <p>UNSTOW LCRU FROM MESA, MOUNT LCRU ON FRONT OF LRV</p> <p>UNSTOW & CONNECT LCRU POWER CABLE - DISCARD ADAPTER UNSTOW TCU FROM MESA MOUNT TCU FRONT OF LRV CONNECT TCU POWER CABLE UNSTOW RAKE & MOVE ASIDE ON MESA OPEN LRV ANTENNA STOWAGE CAN, UNSTOW LGA FROM CANISTER MOUNT LGA IN CDR HANDHOLD POINT LGA TO EARTH STRING & CONNECT LGA CABLE UNSTOW HGA FROM CANISTER MOUNT HGA ON LRV ROTATE ANTENNA ONTO STAFF UNSTOW CABLE, DISCARD FOAM CONNECT HGA CABLE TO LCRU</p> <p>RETRIEVE & CARRY TV CAMERA/TRIPOD TO *X STRUT TV POWER SW - "OFF" DISCONNECT & STOW TV CABLE, REMOVE TV CAMERA FROM TRIPOD MOUNT TV ON TCU CONNECT TV POWER CABLE, CONNECT TCU CABLE LCRU CB - "CLOSED" LCRU POWER SWITCH - "INT" LCRU POWER - "ON" DEPLOY LCRU W/TP ANTENNA LCRU MODE SWITCH - "PMI/HB" CHECK LCRU AGC, TEMP, & POWER LCRU MODE SWITCH TV RMT OPEN LCRU COVERS - 100% TIP ANTENNA AFT 45° & DEPLOY POINT HGA TO EARTH RETRIEVE ETB FROM LM LADDER STOW TWO EACH 70MM & 16MM MAGS & 500MM LENS CAMERA UNDER CDR SEAT</p> <p>CARRY ETB TO LMP SEAT PLACE LMP 70MM CAM ON FLOOR PAN MOUNT MAP HOLDER ON LMP HANDHOLD</p> <p>ATTACH BSLS TO LMP SEATBACK STOW ETB ON LADDER HOOK</p> <p>ATTACH LEC TO EVA #1 PALLET</p> <p>TRANSFER PALLET INTO LM</p> <p>TRANSFER LEC HOOKS TO SURFACE STOW HOOKS ON LADDER STOW HGA FOR TRAVERSE LCRU MODE SWITCH - "PMI/HB" MOUNT LRV POWER UP LRV ORIENT LRV FOR NAV SYSTEM INITIALIZATION POWER DOWN LRV LRV NAV CB - "CLOSE" NAV RESET - RESET READ HEADINGS, SSD, PITCH, & ROLL TO MCC VERIFY BEARING, DISTANCE, & RANGE - ZERO</p> <p>DISMOUNT LRV ATTACH TO LMP EMU: HAMMER CORE TUBE TOOL CORE TUBE DISPENSER SCB #4</p> <p>TETHER TONGS ATTACH 70MM CAM/BAG DISP TO EMU</p> <p>MOUNT LRV - FASTEN BELT POWER UP LRV</p> <p>TORQUE NAV GYRO TO HOU UPDATE TRAVERSE TO CHECKPOINT (17 MIN)</p>	<p>CTV OFF (NO TV UNTIL GCTA ON, ΔT = 5 MIN)</p> <p>LCRU ON - PMI/WB - GCTA OFF</p> <p>LCRU ON - PMI/WB - GCTA OFF</p> <p>LCRU ON - TV RMT - GCTA ON</p> <p>VIEW CREW ACTIVITY</p>					
	00										
	01										
	01										
	01										
	01		01:25								
	01	TRAVEL		OBSERVE, DESCRIBE TRAVERSE OVER SMOOTH MARE FILL MATERIAL							
	01										

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
01	30	TRAVEL (CONT)		DESCRIBE SURFACE FEATURES AND BLOCK DISTRIBUTION				
					NOTE ANY DIFFERENCES BETWEEN MARE AND RILLE RIM MATERIAL			
01	40		00:17	ARRIVE CHECKPOINT				
		CHECK POINT	00:02	DEPART CHECKPOINT				
01	50	TRAVEL		OBSERVE LOW SCARP AROUND ELBOW CRATER				
					OBSERVE ANY DIFFERENCES BETWEEN RILLE RIM MATERIAL AND MARE MATERIAL			
02	00	1 SOUTHERN PART OF ELBOW CRATER EJECTA BLANKET	00:07	ARRIVE STATION 1 POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV LCRU S-BAND MODE SELECT - FM/TV POINT HGA TO EARTH	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE			
					RADIAL SAMPLING OF ELBOW CRATER	VIEW SAMPLING OF ELBOW CRATER - NATO WHEN REQUESTED		
02	10	TRAVEL		PHOTO PAN	NATO 1 (RILLE WALL)			
					STOP HGA FOR TRAVERSE LCRU S-BAND MODE SELECT - FM/TV MOUNT LRV POWER UP LRV DEPART STATION 1	PAN TO ±170°, TILT TO -45° LCRU ON - FM/TV - GCTA OFF		
02	10	TRAVEL		LOOK FOR CHANGES IN LITHOLOGY OF GROUND TEXTURE AS INDICATIONS OF BASE OF FRONT				
					COMPARE MARE AND RILLE RIM MATERIAL TO APENNINE FRONT			
02	10	TRAVEL		OBSERVE CHARACTER AND DISTRIBUTION OF ST. GEORGE EJECTA BLANKET				
					ARRIVE STATION 2			
		2 BASE OF APENNINE FRONT		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV				

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN							
02	20	2 (CONT) BASE OF APEXINE FRONT NORTH OF ST. GEORGE CRATER		LCRU S-BAND MODE SELECT - FM/TV POINT HGA TO EARTH	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE	I	I	I
				RADIAL SAMPLING OF ST. GEORGE CRATER (AS SLOPE PERMITS)	VIEW SAMPLING OF CRATER - NATO WHEN REQUESTED			
				COMPREHENSIVE SAMPLING AREA AT FRONT	NATO 1 (APEXINE FRONT)			
					VIEW SAMPLING OF FRONT - NATO WHEN REQUESTED			
02	40			DOUBLE CORE TUBE	NATO 2 (RILLE RIM)	41	I	I
				500PH PHOTOGRAPHY - BLOCKS ON ST. GEORGE RIM AND MADLEY RILLE	VIEW DOUBLE CORE TUBE OPERATIONS - NATO WHEN REQUESTED			
				STEREO PAN FROM HIGH POINT - 100PH BASE ALONG FRONT				
02	50			PENETROMETER	NATO 3 (LUNAR MODULE)	I	I	I
				FILL SESC AT APEXINE FRONT	VIEW PENETROMETER - NATO WHEN REQUESTED			
03	00	TRAVEL	00:45	STON HGA FOR TRAVERSE LCRU S-BAND MODE SELECT - PH1/MB MOUNT LRV POWER UP LRV DEPART STATION 2	PAN TO +17°, TILT TO -45° LCRU ON - PH1/MB - GCTA OFF	I	I	I

20

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HR	MIN								
		TRAVEL (CONT)		LMP OBSERVE POSSIBLE RAY MATERIAL CDR					
03	50		00:28	ARRIVE LM					
		LM		<p>READY LRV NAV SYSTEM, BATTERY, AND MOTOR TEMPS; AND MATT-HOUR METER DISMOUNT LRV STOW 70MM CAMERA UNDER CDR SEAT STOW EXT HANDLE AND SCOOP ON HTC</p> <p>REMOVE SCR #1 FROM CDR PLSS AND STOW HTC OPEN SEQ BAY DOORS</p> <p>OFFLOAD ALSEP PWR PACKAGE</p> <p>POSITION PWR PACKAGE FOR REFUELING PULL TOOL STORAGE PIP PINS (4) UNSTOW UNITS, PASS ONE TO CDR, TETHER 2ND UNIT UNSTOW AND PASS CARRY BAR TO CDR DEPLOY FUEL CAST LANYARD ROTATE FUEL CAST DOWN AND DISCARD LANYARD UNDER LM UNSTOW AND ENGAGE DOME REMOVAL TOOL CHECK TOOL SECURELY ENGAGED REMOVE AND DISCARD DOME/TOOL UNSTOW FUEL TRANSFER TOOL TIP POWER PKG DOWN</p> <p>ENGAGE FUEL TRANSFER TOOL CHECK TOOL SECURELY ENGAGED REMOVE FUEL ELEMENT FROM CAST INSERT FUEL ELEMENT INTO RTG REPORT RTG FUELED REMOVE AND DISCARD TOOL AND TIP PWR PKG UP ATTACH POWER PACKAGE TO CARRY BAR CHECK OFFLOAD BOOMS RETRACTED, CLOSE SEQ BAY DOORS</p> <p>CARRY ALSEP PKGS TO DEPLOYMENT SITE</p>	<p>POWER DOWN LRV - LRV NAV CB OPEN DISMOUNT LRV</p> <p>SWITCH LCRU TO TV RMT ALIGN HGA TO EARTH STOW 70MM CAMERA UNDER CDR SEAT</p> <p>STOW TONGS ON HTC REMOVE HAMMER, CORE TUBE CAPS, AND TOOL FROM LMP PLSS AND STOW ON HTC REMOVE SCR NO. 4 AND STOW UNDER LMP SEAT REMOVE SCR NO. 2 FROM UNDER LRP SEAT AND STOW ON HTC OFFLOAD ALSEP EXPERIMENTS PKG (1) REMOVE AND DISCARD BIOM-TO-PKG STICK MOVE EXPTS PKG CLEAR OF SEQ BAY</p> <p>TETHER UNIT</p> <p>ASSEMBLE AND ATTACH CARRY BAR TO EXPTS PKG</p> <p>WALK TO MESA UNSTOW DRILL FROM MESA</p> <p>PLACE DRILL ON LMP FLOOR PAN AND LOWER SEAT REMOVE THERMAL BLANKET FROM OVER LRRR IN QUAD III</p> <p>OFFLOAD LRRR PALLET FROM LM PLACE PALLET ON SURFACE AND REMOVE LRRR FROM PALLET</p> <p>PLACE LRRR ON LMP SEAT</p> <p>SECURE LRRR ON LRV USING SEAT BELT STOW HGA SWITCH LCRU TO PMI/WB</p> <p>MOUNT LRV</p> <p>POWER UP LRV</p> <p>DEPART LM</p>	<p>LCRU ON - TV RMT - GCTA ON</p> <p>VIEW ALSEP OFFLOAD</p> <p>VIEW RTG FUEL REMOVAL FROM CAST</p> <p>VIEW RTC FUELING</p> <p>PAN TO ±170°, TILT TO -45° LCRU ON - PMI/WB - GCTA OFF</p>			17
04	10		00:21						
		TRAVEL							
			00:03						
		ALSEP SITE		<p>PLACE PKGS ON SURFACE WITH EXPTS IN FINAL POSITION</p> <p>DISCONNECT POWER PKG FROM BAR REPOSITION POWER PKG 10 FEET EAST REMOVE HFE STORAGE PIP PINS (3) TIP POWER PKG DOWN</p> <p>RELEASE RTC CABLE B. BOLTS (3) DEPLOY RTG CABLE AND DISCARD CABLE REELS</p> <p>REPORT SHORTING SWITCH READING CONNECT RTG CABLE TO C/S RELEASE SUBPALLET B. BOLTS (2) LIFT SUBPALLET FROM POWER PKG AND PLACE 10 FEET NORTH OF POWER PKG RELEASE SIDE B. BOLTS (4) AND CCIG COVER BOLT LIFT SIDE FROM SUBPALLET</p> <p>REMOVE B. BOLT BLOCKING CABLE REEL UNSTOW CABLE REEL DEPLOY SIDE LEGS AND PLACE SIDE ON SURFACE</p> <p>UNSTOW SIDE CABLE CONNECTOR</p>	<p>PARK LRV HEADING NORTH, FACING C/S SITE READ OUT LRV BATTERY TEMPS POWER DOWN LRV DISMOUNT LRV</p> <p>OPEN LRV BATTERY COVERS LCRU MODE SWITCH - "TV RMT" POINT HGA TO EARTH ALSEP DEPLOYMENT PLAN</p> <p>OFFLOAD LRRR FROM LRV AND SET ON SURFACE FACING SUN OFFLOAD DRILL FROM LRV AND SET ON SURFACE FACING SUN</p> <p>RELEASE HFE PALLET B. BOLTS (2) LIFT HFE PALLET FROM PWR PKG CARRY HFE PALLET 15 FEET NORTH C/S</p> <p>UNSTOW HFE CONNECTOR PLACE HFE PALLET ON SURFACE CONNECT HFE CABLE TO C/S</p> <p>CARRY HFE PALLET 30 FEET NORTH OF C/S, DEPLOYING CABLE</p> <p>PLACE HFE PALLET ON SURFACE AND FOLD MOUNTING BRACES</p> <p>TIP PALLET DOWN RELEASE PROBE BOX B. BOLTS (4) LIFT PROBE BOX FROM PALLET</p> <p>SEPARATE BOX AND LEAN PROBE WITH TOOL AGAINST PALLET</p>	<p>LCRU ON - TV RMT - GCTA ON WIDE-ANGLE PANORAMA OF ALSEP SITE</p> <p>NAV RTG</p> <p>NAV OF HFE SITE</p>			9
04	30								

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN								
04	30	ALSEP SITE (CONT)		LMP	CDR				
	40								
04	50								
	05			00					
05	10								

23

99

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HOUR	MIN								
		ALSEP SITE (CONT)		<p style="text-align: center;">LMP</p> <p>CARRY SIDE 55 FEET HE DEPLOYING CABLE SELECT SIDE DEPLOYMENT SITE REMOVE SIDE DUST COVER REMOVE AND IMPLACE GROUND SCREEN REMOVE CCIG COVER AND REMOVE FROM CAVITY PLACE SIDE ON GROUND SCREEN MOUNT CCIG IN GROUND SCREEN TUBE, PLACE SIDE ON GROUND SCREEN LEVEL AND ALIGN SIDE ROTATE CCIG ONTO SURFACE DEPLOY SIDE DUST COVER RETURN TO C/S DEPRESS SHORTING SW AND CHECK AMPS, ASTRO SW NO. 1 CLOCKWISE REQUEST TRANSMITTER TURN-ON MOUNT 70MM CAMERA ON RCU AND CHANGE MAG TO COLOR (MAG KK) RETRIEVE AND CARRY LRRR ~25 FEET WEST OF CENTRAL STATION DEPLOY LRRR PULL LEVELING LEG PIP PIN DEPLOY LEVELING LEG TIP LRRR DOWN LEVEL AND ALIGN LRRR REMOVE DUST COVERS AND PHOTO LRRR AND ALSEP RECHECK LEVEL AND ALIGNMENT NOTE: DEPLOY LSH SUNSHIELD AFTER LSH PHOTOGRAPHY COMPLETE SELECT SAMPLES TO FILL REMAINING SPACE IN SCB NO. 1, 2, 3, AND 4 MOUNT LRV</p>	<p style="text-align: center;">CDR</p> <p>DRILL BORE STEM INTO SURFACE REMOVE DRILL FROM STEM PLACE DRILL ON SURFACE; RETRIEVE PROBE FROM PROBE BOX INSERT PROBE INTO DRILL STEM PUSH PROBE TO BOTTOM OF STEM REPORT PROBE DEPTH CARRY RACK & DRILL TO CORING SITE NEAR LRV IMPLANT DRILL TREDDOLE ON SURFACE CHANGE 16MM FILM MAG START 16MM CAM - 12 FPS OPEN SCB AND ASSEMBLE 1ST TWO CORE STEMS THREAD STEM INTO DRILL DRILL CORE STEM INTO SURFACE ASSEMBLE 3RD & 4TH CORE STEM SECTIONS THREAD SECTIONS ONTO STEM ATTACH DRILL TO CORE STEM DRILL STEM INTO SURFACE ASSEMBLE 5TH & 6TH STEM SECTIONS THREAD SECTIONS ONTO STEM ATTACH DRILL TO STEM DRILL CORE STEM INTO SURFACE BREAK DRILL FROM STEM RETRIEVE CDR 70MM CAMERA AND OBTAIN PHOTO PANS 7 FT X-SUN FROM DRILL & 3 FT EITHER SIDE OF 7 FT POINT PLACE 70MM CAMERA ON LRV PULL DRILL/STEM FROM SURFACE AND PLACE IN VISE REMOVE AND STORE CORE STEMS IN SCB NO. 1 DISCARD UHT STRIP OFF OUTER PROTECTIVE GLOVES AND DISCARD SELECT SAMPLES TO FILL REMAINING VOLUME IN TWO SCB'S MOUNT AND POWER UP LRV READ BATTERY TEMPS DEPART ALSEP</p>	<p>MAV (SIDE SITE) VIEW (SIDE AND CCIG DEPLOY) NATO 11 (SIDE GROUND SCREEN) NATO 12 (CCIG PLACEMENT) NATO 13 (FULLY DEPLOYED SIDE/CCIG) MAV (CORE TUBE SITE) NATO 14 (CORE STEMS GOING INTO SURFACE) NATO 18 (CORE TUBE SAMPLE RECOVERY) VIEW SELECTED SAMPLING OPERATIONS VIEW SAMPLE COLLECTION OPERATIONS - NATO'S AFP (FULLY DEPLOYED ALSEP)</p>			
05	20								
05	30								99
05	40								
05	50								
06	00								

24

TIME		STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HH:MM	STATION		LMP	CDR				
	TRAVEL (CONT.)							
06:00		00:04	ARRIVE LM READ OUT NAV & LRV DISPLAYS POWER DOWN LRV CIRCUIT BREAKERS DISMOUNT LRV UNSTOW SMC FROM MESA CARRY SMC 60 FT SE OF LM REMOVE SMC FROM STORAGE CAN EXTEND SMC STAFF DEPLOY SMC FOIL PUSH SMC STAFF INTO SURFACE PHOTO SMC X-SUN AND DN-SUN RETURN TO LM OBTAIN 70MM PHOTO PANS AROUND LH AT 12:00, 4:00 and 8:00/30 FEET; AND INSPECT LH UNSTOW FLAG KIT FROM MESA REMOVE FLAG COVERING KEEP STAFF AND PASS FLAG TO CDR RETRIEVE HAMMER FROM HTC DRIVE STAFF INTO SURFACE PHOTO CDR/FLAG PASS LMP 70MM CAMERA TO CDR STOW HAMMER ON HTC REMOVE SCB NO. 1 FROM HTC AND PLACE IN SRC NO. 1 REMOVE SRC NO. 1 SEAL PROTECTOR CLOSE AND SEAL SRC NO. 1 PLACE SCB NO. 4 ON SRC NO. 1 PLACE SCB NO. 3 ON SCB NO. 4 TIDY MESA BLANKETS UNSTOW DUST BRUSH FROM LRV CLEAN CDR'S EMU INGRESS LM CARRYING SCB NO. 3 ATTACH LEC TO HANDHOLD TRANSFER SCB NO. 1 INTO LH REMOVE SRC NO. 1 FROM LEC STOW SRC NO. 1 IN LM TRANSFER ETB IN LM REMOVE ETB FROM LEC	PARK LRV AT MESA; POINT NORTH, X-SUN IN SUN POWER DOWN LRV SWITCHES & DISMOUNT LRV OPEN LRV BATTERY COVERS CLOSE LCRU THERMAL COVERS - 65% LCRU MODE SWITCH - "TV/RMT" POINT HGA TO EARTH RETRIEVE FROM MESA AND INSTALL FILTER ON 70MM CAMERA TRANSFER RESEAU COVER TO LRV RETRIEVE TONGS AND GNOMON FROM LRV SELECT SITE FOR POLARIMETRIC PHOTOGRAPHY OBTAIN FAR-FIELD POLARIMETRIC PHOTOGRAPHS • 3 PHOTOS, 50-110 DEGREE PHASE ANGLE • 3 PHOTOS, 20 DEGREES DOWN SUN FROM FIRST PHOTOS PLACE GNOMON AT SAMPLE SITE OBTAIN NEAR-FIELD POLARIMETRIC PHOTOGRAPHS • 1 PHOTO ON SUN • 3 PHOTOS, 90-DEGREES PHASE • 3 PHOTOS, 110-DEGREES PHASE • 3 PHOTOS, 130-DEGREES PHASE COLLECT A MINIMUM OF 4 ROCK SAMPLES IN DOC. SAMPLE BAG OBTAIN POST SAMPLING PHOTOS, X-SUN AND DOWN-SUN RETRIEVE GNOMON AND WALK TO LRV STOW SAMPLES IN SCB NO. 4 STOW TONGS ON HTC STOW GNOMON ON LRV SELECT FLAG DEPLOYMENT SITE DEPLOY & MOUNT FLAG INSTAFF PHOTO LMP/FLAG TRANSFER ETB TO LRV CDR FOOT PAN STOW 70 MM CAMERAS LH ETB TRANSFER CAM MAGS (70MM MAGS LL, 00 & 161MM MAGS CC, DD) FROM UNDER LRV SEATS INTO ETB REMOVE MAG H9 FROM 500MM LENS CAM; STOW INSTALL RESEAU COVER ON 500MM LENS CAM & STOW CAM ON LRV SEAT REMOVE 161MM MAG EE FROM CAM & MAGS FROM HOLDER; PUT IN ETB ATTACH ETB TO SRC TABLE CLEAN LRV'S EMU STOW LMP'S PLSS ANTENNA PLACE B-SLSS AND 500MM CAM ON LMP SEAT, COVER WITH THERMAL BLANKET ATTACH LEC TO SRC NO. 1 TRANSFER SRC NO. 1 INTO LH TRANSFER LEC HOOKS TO SURFACE ATTACH LEC TO ETB TRANSFER ETB INTO LH	LCRU ON - TV RMT - GCTA ON VIEW SMC DEPLOY OPERATIONS WIDE - ANGLE PANORAMA VIEW LRV DUST ACCUMULATION AND LRV TRACKS VIEW CDR SAMPLING VIEW FLAG DEPLOY HATO (FLAG AND CDR) HATO (FLAG AND LRV) VIEW EQUIPMENT STOWAGE VIEW LRV INGRESS AND EQUIPMENT TRANSFER TO LH			

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HR	MIN								
06	30	LM (CONT)	00:56	<p>LMP</p> <p>STOW ETB IN LM</p> <p>STOW SCB NO. 4 IN LM PASS LEC TO CDR ASSIST CDR - STOW CDR'S PLSS ANTENNA</p>	<p>CDR</p> <p>TRANSFER LEC HOOKS TO SURFACE STOW LEC ON LADDER HOOKS LCRU POWER SWITCH - OFF ADJUST LCRU THERMAL BLANKETS CLEAN EPU</p> <p>HAND SCB NO. 4 TO LMP STOW LEC ON PLATFORM</p>				
07	00					END EVA 1			
08									

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN								
				LMP	CDR	LCRU OFF - TV RMT - GCTA OFF			
00	00	LM		START EVA TWO					
00	10			<p>OPEN HATCH ASSIST CDR: DEPLOY CDR PLSS ANTENNA PLACE JETT BAG IN HATCH ATTACH LEC TO HANDHOLD READY ETB FOR TRANSFER</p> <p>CONFIRM "GO" FOR 2 - MM EVA TRANSFER PALLET INTO LM</p> <p>DISCONNECT LEC FROM PALLET ATTACH LEC TO ETB ASSIST CDR</p> <p>DISCONNECT AND STOW LEC REMOVE AND STOW PALLET EQUIPMENT PLACE PALLET ON FLOOR RECORDER-OFF VERIFY VOX SENS (2) - IAX VERIFY CB CONFIGURATION EGRESS</p> <p>DISCARD PALLET INTO QUAD 1 CLOSE HATCH DESCEND TO SURFACE CDR DEPLOY LMP PLSS ANT</p> <p>UNSTOW BOTH LCRU BATT FROM MESA PLACE ONE LCRU BATT IN LRV LMP FLOOR PAN</p> <p>UNMAP OTHER LCRU BATT IN QUAD III THERMAL BLANKET AND PLACE IN + Y FOOTPAD UNSTOW SRC NO. 2 AND PLACE ON MESA TABLE REMOVE SCB NO.5 FROM SCB AND ATTACH TO HTC ON LRV</p> <p>REMOVE SCB NO.6 AND NO.7 FROM GEO. PALLET; ATTACH NO.6 TO FRONT OF PALLET; NO.7 TO HTC TRANSFER FROM SCB NO.5 TO NO.7 • 3 CORE TUBES • CORE TUBE CAP DISP. - IN PACKET • SESC - IN POCKET • 2 - 20 BAG DISPENSERS PLACE 2 - 20 BAG DISPS. ON CDR AND LMP SEAT PLACE SCB NO.7 UNDER LMP SEAT ATTACH SCB NO.2 TO HTC</p> <p>ASSIST CDR</p> <p>ATTACH SCB NO.5 TO CDR PLSS TOOL HARNESS ATTACH SCOOP/EXT. HANDLE; TETHER ATTACH 20 BAG DISP. TO CAM BRACKET ATTACH 70 MM CAMERA TO EMU TIDY MESA BLANKETS MOUNT LRV</p>	<p>EGRESS CDR - CHECK TOSS JETT BAG IN QUAD 1 HAND LEC TO LMP</p> <p>DESCEND</p> <p>UNSTOW MESA PALLET NO.2 AND ATTACH TO MESA TABLE</p> <p>ATTACH LEC TO PALLET TRANSFER PALLET INTO LM SWITCH LCRU - INT POWER (IN EVENT THE LCRU BATT IS DI-CHARGED, A NEW BATT MAY BE INSTALLED AT THIS TIME) (HGA MAY REQUIRE ALIGNMENT, LCRU MODE SW IS IN TV RMT)</p> <p>TRANSFER ETB TO SURFACE</p> <p>ATTACH ETB TO SRC TABLE STOW LEC ON LADDER HOOK CARRY ETB TO LRV; SET IN CDR FLOOR PAN</p> <p>REMOVE THERMAL BLANKET OFF OF LRV LMP SEAT; STOW ON +Y STRUT HANG B - SLSS ON LMP SEAT BACK</p> <p>PUSH 500 MM LENS CAM TOWARD CDR SEAT PLACE CDR 70 MM CAM ON FLOOR PAN DEPLOY LMP PLSS ANTENNA STOW 70 MM (2) AND 16 MM (1) MAGS UNDER CDR SEAT ATTACH MAG "PP" TO 500 MM LENS CAM AND STOW CAM AND RESEAU COVER UNDER CDR SEAT ATTACH 16 MM MAG TO CAM (CARRY ETB TO LMP SIDE)</p> <p>INSERT MAPS IN MAP HOLDER PLACE LMP 70 MM CAM ON FLOOR PAN CARRY ETB TO MESA TABLE</p> <p>RETRIEVE LCRU BATT FROM LMP FLOOR PAN SWITCH LCRU - OFF REPLACE LCRU BATTERY</p> <p>SWITCH LCRU - INT PWR STOW OLD BATTERY UNDER CDR SEAT PUSH LRV CB'S IN TETHER TONGS</p> <p>ATTACH TO LMP PLSS TOOL HARNESS • SCB NO.2 • CORE TUBE CAP DISP. • HAMMER ASSIST LMP</p> <p>ATTACH 20 BAG DISP. TO CAM BRACKET ATTACH 70 MM CAM TO EMU STOW HGA FOR TRAVERSE SWITCH LCRU - PMI/WB MOUNT LRV</p>				
00	20								
00	30								
00	40								
						LCRU OFF - TV RMT - GCTA OFF (END BATT 1)			17
						LCRU ON - TV RMT - GCTA ON (START BATT 2)			8
						PAN TO + 170°, TILT TO - 45°			
						LCRU ON - PMI/WB - GCTA OFF			

27

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN			LMP	CDR				
		LM (CONT)	00:49	MOUNT LRV VISIT GEOLGY MAPS AND DETERMINE 1st LRV HEADING DEPART LM	MOUNT LRV POWER UP LRV DRIVE TO NAV INITIALIZATION SITE INITIALIZE NAV SYSTEM ALIGN LGA DEPART LM				
00	50	TRAVEL		OBSERVE SMOOTH WIRE CHARACTERISTICS		NOTE: NO TELEVISION UNTIL STOP AT STATION 4 AT 01:17			
			00:11	ARRIVE CHECK POINT					
01	00	CHECK POINT	00:02	DEPART CHECK POINT					
				PHOTOGRAPHY AS APPROPRIATE					35
				OBSERVE SECONDARY CRATER CLUSTER CHARACTERISTICS					
				ARRIVE STATION 4					
01	20	4 SECONDARY CRATER CLUSTER SOUTH OF 400M CRATER		POWER DOWN LRV - READOUT LRV NAV DISMOUNT LRV LOW S-BAND MODE SELECT - FI/TV POINT HGA TO EARTH SOIL/WAKE SAMPLE DOCUMENTED SAMPLE PHOTO PAIR 500M PHOTOGRAPHY OF APENLINE FRONT EXPLORATORY TRENCH POSSIBLE CORE TUBE THROUGH SECONDARY EJECTA		LCRU ON - FI/TV - CCTA ON WIDE-ANGLE PANORAMA OF SITE VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED VIEW TRENCHING OPERATIONS - NATO TRENCH SIDES NATO 1 (DESIGATED FRO. WFF)			16

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
01	30	4 (CONT) SECONDARY CRATER CLUSTER SOUTH OF 400M CRATER		SAMPLE TYPICAL AND EXOTIC ROCK TYPES COMPARE SECONDARY CRATER MATERIAL TO OTHER TERRAIN GEOLOGIC UNITS STON HGA FOR TRAVERSE LCRU S-BAND MODE SELECT - PH1/MB MOUNT LRV POWER UP LRV DEPART STATION 4	VIEW SAMPLING OPERATIONS - NATO WHEN REQUESTED PAN TO +170°, TILT TO -45° LCRU ON - PH1/MB - GCTA ON			
		TRAVEL	00:20	TRAVERSE SOUTH ALONG SMOOTH MARE SOUTHWEST OF SECONDARY CRATER CLUSTER TO BASE OF APENNINE FRONT OBSERVE SMOOTH MARE CHARACTERISTICS OBSERVE SECONDARY CRATER CLUSTER CHARACTERISTICS AND CRATER FORMS PHOTOGRAPHY AS APPROPRIATE				
01	40		00:10	ARRIVE CHECKPOINT 1				
		CHECK POINT 1						
01	50		00:04	DEPART CHECKPOINT 1				
		TRAVEL		TRAVERSE EAST ALONG APENNINE FRONT, DETERMINE POSITION OF BASE OF FRONT AND SEARCH FOR OPTIMUM SAMPLING AREAS FOR STOPS ON RETURN LEG OF TRAVERSE PHOTOGRAPHY AS APPROPRIATE OBSERVE POSSIBLE DEBRIS FLOWS, DOWNSLOPE MOVEMENT, AND LOOK FOR SOURCE				
02	00		00:10	ARRIVE CHECKPOINT 2				
		CHECK POINT 2						
		TRAVEL	00:04	DEPART CHECKPOINT 2				
				EAST ALONG APENNINE FRONT (SAME AS ABOVE)				
02	10		00:05	ARRIVE CHECKPOINT 3				
		CHECK POINT 3						
		TRAVEL	00:04	DEPART CHECKPOINT 3				
				ALONG APENNINE FRONT TO AREA STOP 5 (SAME AS ABOVE)				

20

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
		TRAVEL (CONT)						
02	20							
			00:12	ARRIVE AREA STOP 5				
02	30	AREA STOP 5 BASE OF APENNINE FRONT NEAR RIM OF FRONT CRATER		POWER DOWN LRV - READ OUT LRV NAV DISHOUT LRV LCRU 5-BAND MODE SELECT - FM/TV POINT HGA TO EARTH	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE			
				SURVEY AREA FOR SAMPLING	VIEW PROPOSED SAMPLING AREA			
				DOCUMENTED SAMPLES FROM UPSLOPE SIDE OF FRONT CRATER IN APENNINE FRONT	VIEW DOCUMENTED SAMPLING - NATO WHEN REQUESTED			
02	40							
				DOCUMENTED SAMPLES FROM NORTH RIM OF FRONT CRATER; PARTICULAR AT SHARP 80 METER CRATER ON RIM	HATO 1 (FRONT CRATER) VIEW DOCUMENTED SAMPLING - NATO WHEN REQUESTED			49
02	50							
				STEREO PAIR - 100 M SEPARATION ALONG APENNINE FRONT	HATO 2 (DESIGNATED FROM MAP)			
				EXPLORATORY TRENCH UPSLOPE OF FRONT CRATER	VIEW EXPLORATORY TRENCHING OPERATIONS - NATO TRENCH SIDES AND BOTTO			
03	00							

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
03	00	AREA STOP 5 (CONT) BASE OF APENINE FRONT NEAR RIM OF FRONT CRATER		500PH PHOTOGRAPHY OF TARGETS OF OPPORTUNITY	NATO 3 (APENINE FRONT)			
	10			MEDE STEREO PAIRS UPSLOPE AT TARGETS OF OPPORTUNITY	NATO 4 (DESIGNATED FROM MAP)			49
			00:53	STOP NGA FOR TRAVERSE LCRU S-BAND MODE SELECT - PM1/MB MOUNT LRV POWER UP LRV DEPART AREA STOP 5		PAN TO ±170°, TILT TO -45° LCRU ON - PM1/MB - CCTA OFF		
03	20	TRAVEL		OBSERVE LATERAL VARIATIONS IN MATERIAL AND SURFACE TEXTURES				
	30			SEARCH FOR BLOCKY AREAS ALONG APENINE FRONT WHICH ARE SUITABLE FOR SAMPLING (CRATERS, ETC.)				35
			00:14	PHOTOGRAPHY AS APPROPRIATE				
				ARRIVE STATION 6				
03	40	6 ALONG BASE OF APENINE FRONT ON SLOPE IN INTERCRATER AREAS OR ON CRATER RIMS - CHOSEN AT CREW'S DISCRETION BASED ON PREVIOUS OBSERVATIONS		POWER DOWN LRV - REABOUT LRV NAV DISMOUNT LRV LCRU S-BAND MODE SELECT - FM/TV POINT NGA TO EARTH	LCRU ON - FM/TV - CCTA ON WIDE-ANGLE PANORAMA OF SITE			
				SURVEY AREA FOR SAMPLING DESCRIPTION OF APENINE FRONT IN SAMPLING AREA AND LOCATION EXPLORATORY TRENCH	VIEW PROPOSED SAMPLING AREA VIEW TRENCH'S OPERATIONS - NATO ON EXP. OFF. CUE (NATC TRENCH SIDE AND BOTTOM IF POSSIBLE)			36

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/ECTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
03	50	6 (CONT) BASE OF APEENINE FRONT IN INTERCRATER AREA OR ON CRATER RIMS		COMPARISON OF APEENINE FRONT AND MATERIAL TO OTHER GEOLOGIC UNITS	NATO 1 (APEENINE FRONT)			
				DOCUMENTED SAMPLES OF APEENINE FRONT MATERIAL	VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED			
				500M PHOTOGRAPHY OF BLOCKS, OUTCROPS, ETC.				
04	00			CORE TUBE	NATO 2 (DESIGNATED FROM MAP)			36
				HEDC STEREO PAIRS OF TARGETS OF OPPORTUNITY	VIEW CORE TUBE OPERATIONS AND PENETROMETER TEST - NATO WHEN REQUESTED			
				STOM HGA FOR TRAVERSE LCRU S-BAND MODE SELECT PMI/MB				
04	10			DISMOUNT LRV POWER UP LRV DEPART STATION 6	PAR TO ±170°, TILT TO -45°			
				TRAVEL	LCRU ON - PMI/MB - GCTA OFF			
				00:40	OBSERVE LATERAL VARIATIONS IN MATERIAL AND SURFACE TEXTURES OF APEENINE FRONT			
04	20			SEARCH FOR BLOCKY AREAS ALONG APEENINE FRONT WHICH ARE SUITABLE FOR SAMPLING				12
				PHOTOGRAPHY AS APPROPRIATE				
				00:08	ARRIVE STATION 7 POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV			
04	30	BASE OF APEENINE FRONT IN INTERCRATER AREA OR ON CRATER RIMS - CHOSEN AT CREW'S DISCRETION BASED ON PREVIOUS OBSERVATIONS		LCRU S-BAND MODE, SELECT FM/TV POINT HGA TO EARTH	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE			36
				SURVEY SAMPLING AREA	VIEW PROPOSED AREA OF GEOLOGY ACTIVITY			
				DOCUMENTED SAMPLES OF APEENINE FRONT MATERIAL	VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED			

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN							
04	30	7 (CONT)		DESCRIPTION OF APENNINE FRONT IN SAMPLING AREA AND LOCATION				
		BASE OF APENNINE FRONT IN INTERCRATER AREAS OR ON CRATER RIMS		PHOTO PAN	NATO 1 (DESIGNATED FROM MAP)			
04	40			EXPLORATORY TRENCH	VIEW TRENCHING OPERATIONS - NATO OF TRENCH SIDE AND BOTTOM IF POSSIBLE			
				SODM PHOTOGRAPHY OF BLOCKS, OUTCROPS, ETC.	NATO 2 (APENNINE FRONT)			36
				DOUBLE-CORE TUBE	VIEW CORE TUBE OPERATIONS - NATO WHEN REQUESTED			
04	50			MEDC STEREO PAIRS OF TARGETS OF OPPORTUNITY UPSLOPE	NATO 3 (SECONDARY CRATER CLUSTER)			
				STOW MGA FOR TRAVERSE LCRU S-BAND MODE SELECT - PMI/WB	PAN TO :170°, TILT TO -45°			
05	00		00:40	MOUNT LRV POWER UP LRV DEPART STATION 7	LCRU ON - PMI/WB - GCTA OFF			
		TRAVEL		OBSERVE SECONDARY CRATER DEPOSITS AND RELATION TO OTHER TERRAIN				30
05	10			OBSERVE EASTERN EDGE OF POSSIBLE DEBRIS FLOW FROM APENNINE FRONT				

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN							
05	20	TRAVEL (CONT)		PHOTOGRAPHY AS APPROPRIATE				
			00:26	ARRIVE STATION B				
34	8	IN WARE MATERIAL NEAR ANDBETT CRATER		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV SWITCH LCRU TO FM/TV POINT HGA TO EARTH SURVEY SAMPLING AREA COMPREHENSIVE SAMPLING DOUBLE CORE TUBE - PENETROMETER PANORAMIC PHOTOGRAPHY TRENCH FILLET SAMPLING - POSSIBLE SAMPLE TYPICAL AND ATYPICAL ROCK TYPES	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE VIEW AREA OF PROPOSED GEOLOGY ACTIVITY VIEW COMPREHENSIVE SAMPLE NATO 1 (LUNAR MODULE) VIEW CORE TUBE OPERATIONS - NATO WHEN REQUESTED NATO 2 (DESIGNATED FROM WAP) VIEW TRENCHING OPERATIONS - NATO TRENCH SIDE AND BOTTOM IF POSSIBLE VIEW FILLET SAMPLING OPERATIONS - NATO WHEN REQUESTED			

30

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN								
06	00	8 (CONT) IN "ARE MATERIAL HEAP ARBEIT CRATER		LMP DOCUMENTED SAMPLING OF LARGE HARE CRATER FILL SESC NO. 1 STOW HGA FOR TRAVERSE SWITCH LCRU TO P11/MB MOUNT LRV POWER UP LRV DEPART STATION 8	CDR	VIEW DOCUMENTED SAMPLING OF CRATER - HATO OF CRATER RIM/FLOOR WHEN REQUESTED P21 TO -170°, TILT TO -45° LCRU 01 - P11/MB - GCTA OFF			
		TRAVEL	00:45						
				COMPARE "ARE MATERIAL WITH OTHER TERRAIN OBSERVE POSSIBLE RAY MATERIAL					12
06	20	LM	00:08	ARRIVE LM READOUT NAV AND LRV DISPLAYS POWER DOWN LRV C/B'S DISMOUNT LRV PHOTO LRV: X-SUN (2), DN-SUN (1) STOW 70 MM CAM/BAGS ON LMP SEAT ASSIST CDR REMOVE SCB NO. 5 FROM CDR PLSS TOOL HARNESS PLACE SCB NO.5 IN SRC NO.2 REMOVE SRC SEAL PROTECTOR CLOSE AND SEAL SRC NO.2 REMOVE SCB NO.2 FROM HTC AND PLACE ON MESA REMOVE SCB NO.6 FROM FRONT OF GEO. PALLET AND PLACE ON MESA UNSTOW DUST BRUSH FROM GEO. PALLET CLEAN CDR'S EMU STOW DUST BRUSH IN GEO. PALLET CHECK ALL SAMPLES REMOVED FROM LRV INGRESS, CARRY SCB NO.6 INTO LM ATTACH LEC TO HANDHOLD TRANSFER SRC NO.2 INTO LM REMOVE SRC NO.2 FROM LEC STOW SRC NO.2 IN LM	PARK LRV AT MESA; POINT NORTH X-SUN IN SUN POWER DOWN LRV SWITCHES DISMOUNT LRV ALIGN HGA SWITCH LCRU - TV RMT OPEN LRV BATT DUST COVERS STOW 70 MM CAM/BAGS ON CDR SEAT REMOVE FROM LMP PLSS TOOL HARNESS • CORE TUBE CAP DISP. - DISCARD • HAMMER - STOW ON HTC • SCB NO.2 - STOW ON HTC TIDY HARNESS VELCRO COVERS STOW TONGS ON HTC CARRY ETB TO LRV CDR FOOTPAD REMOVE 20-BAG DISPS FROM BOTH CDR AND LMP 70 MM CAM STOW CAMS IN ETB, BAGS IN CDR SEAT BAG REMOVE MAG FROM 500 MM LENS CAM; STOW IN ETB, CAM ON LMP SEAT TRANSFER ALL CAM MAGS UNDER CDR SEAT INTO ETB CLEAN LMP'S EMU AND STOW LMP PLSS ANT REMOVE 16 MM MAG FROM CAM AND MAPS FROM HOLDER; STOW IN ETB ATTACH ETB TO MESA TABLE PLACE B-SLSS AND 500 MM LENS CAM ON LMP SEAT; COVER WITH THERMAL BLANKET ATTACH LEC TO SRC NO.2 TRANSFER SRC NO.2 INTO LM TRANSFER LEC HOOKS TO SURFACE ATTACH LEC TO ETB	LCRU ON - TV RMT - GCTA ON VIEW LRV EQUIPMENT OFF LOAD VIEW LMP ASCENDING LADDER VIEW EQUIPMENT TRANSFER INTO LM			25

35

TIME		STATION	STOP OR RIDE TIME (HR - MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HOUR	MIN								
06	50	LM (CONT)		<p>LMP</p> <p>TRANSFER ETB INTO LM</p> <p>REMOVE ETB FROM LEC STOW ETB IN LM</p> <p>STOW SCB NO. 2 IN LM PASS LEC TO CDR ASSIST CDR; STOW CDR'S PLSS ANTENNA</p> <p>CLOSE HATCH</p>	<p>CDR</p> <p>TRANSFER ETB INTO LM</p> <p>TRANSFER LEC HOOKS TO SURFACE STOW LEC ON LADDER HOOK SWITCH LCRU - OFF ADJUST THERMAL BLANKETS (PER HOU REQUEST)</p> <p>ASCEND LADDER; CARRY SCB NO. 2</p> <p>HAND SCB NO. 2 TO LMP STOW LEC ON PLATFORM INGRESS</p>				25
	00						<p>POSITION CTV FOR THERMAL MANAGEMENT</p> <p>LCRU OFF - TV RMT - GCTA OFF</p>		
07	00			EVA TWO COMPLETE					

TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV PMT	
HR	MIN								
				LMP CDR	LCRU OFF - TV RMT - GCTA OFF				
00	00	LM		START EVA THREE					
00	10			<p>ASSIST CDR; DEPLOY CDR PLSS ANTENNA</p> <p>PLACE JETT BAG IN HATCH</p> <p>ATTACH LEC TO HANDHOLD</p> <p>CONFIRM "GO" FOR 2-MAN EVA</p> <p>TRANSFER LEC HOOKS INTO LM</p> <p>ATTACH LEC TO ETB</p> <p>ASSIST CDR</p> <p>DISCONNECT AND STOW LEC RECORDER - OFF</p> <p>VERIFY VOX SENS - (2) - "AX"</p> <p>VERIFY CB CONFIGURATION</p> <p>UTILITY AND FLOOD LIGHTS - OFF</p> <p>MOVE THRU HATCH</p> <p>CLOSE HATCH</p> <p>DESCEND TO SURFACE</p> <p>CDR DEPLOYS LMP PLSS ANTENNA</p> <p>RETRIEVE LCRU BATT FROM +Y FOOTPAD; PLACE IN LMP FLOOR PAN</p> <p>UNSTOW B-SLSS BAG FROM MESA AND STOW ON GEOLOGY PALLET FORWARD HOOKS</p> <p>REMOVE SCB NO.7 FROM UNDER LMP SEAT AND ATTACH TO HTC</p> <p>REMOVE 2-20 BAG DISPS. FROM SCB NO.7 AND PLACE ON CDR AND LMP SEATS</p> <p>REMOVE SCB NO.8 FROM PALLET AND ATTACH TO HTC</p> <p>ASSIST CDR</p> <p>ATTACH SCB NO.7 TO CDR PLSS TOOL HARNESS</p> <p>ASSEMBLE SCOOP/EXT HANDLE; TETHER</p> <p>CLOSE HTC</p> <p>ATTACH 20 BAG DISP. TO CAM BRACKET</p> <p>ATTACH 70 MM CAMERA TO EMU</p> <p>MOUNT LRV</p> <p>UNSTOW GEOLOGY MAPS AND DETERMINE FIRST LRV HEADING</p> <p>00:42 DEPART LM</p>	<p>EGRESS - COMM CHECK</p> <p>TOSS JETT BAG IN HAND LEC TO LMP QUAD 1</p> <p>DESCEND TO SURFACE</p> <p>TRANSFER LEC HOOKS INTO LM</p> <p>TRANSFER ETB TO SURFACE</p> <p>ATTACH ETB TO SRC TABLE</p> <p>STOW LEC ON LADDER HOOK</p> <p>CARRY ETB TO LRV; SET IN CDR FLOOR PAN</p> <p>SWITCH LCRU-INT PWR (IN EVENT THE LCRU BATT IS DE-CHARGED A NEW BATT MAY BE INSTALLED AT THIS TIME)</p> <p>DEPLOY LMP PLSS ANTENNA</p> <p>REMOVE THERMAL BLANKET FROM LMP SEAT - DISCARD</p> <p>HANG B-SLSS ON LMP SEAT BACK</p> <p>PUSH 500 MM LENS CAM TOWARD CDR SEAT</p> <p>PLACE CDR 70 MM CAM ON FLOOR PAN</p> <p>STOW 70 MM (2) and 16 MM (1) MAGS UNDER CDR SEAT</p> <p>ATTACH MAG "PP" TO 500 MM LENS CAM AND STOW UNDER CDR SEAT</p> <p>ATTACH 16 MM MAG TO CAM (CARRY ETB TO LMP SIDE)</p> <p>INSERT MAPS IN MAP HOLDER</p> <p>PLACE LMP 70 MM CAM ON FLOOR PAN</p> <p>CARRY ETB TO SRC TABLE</p> <p>RETRIEVE LCRU BATT FROM LMP FLOOR PAN</p> <p>SWITCH LCRU POWER - OFF</p> <p>REPLACE LCRU BATTERY</p> <p>SWITCH LCRU - INT PWR</p> <p>STOW OLD BATT UNDER CDR SEAT</p> <p>PUSH LRV CB'S IN TETHER TOMES</p> <p>ATTACH TO LMP PLSS TOOL HARNESS:</p> <ul style="list-style-type: none"> ● SCB NO.8 ● CORE TUBE CAP DISP. ● HAMMER <p>ASSIST LMP</p> <p>ATTACH 20 BAG DISP. TO CAM BRACKET</p> <p>ATTACH 70 MM CAM TO EMU</p> <p>STOW HGA FOR TRAVERSE</p> <p>SWITCH LCRU - PMI/WB</p> <p>MOUNT LRV</p> <p>POWER UP LRV</p> <p>DRIVE TO NAV INITIALIZATION SITE</p> <p>INITIALIZE NAV SYSTEM</p> <p>ALIGN LGA</p> <p>DEPART LM</p>	<p>LCRU ON - TV RMT - GCTA ON</p> <p>VIEW LRV LOADING</p> <p>LCRU OFF - TV RMT - GCTA OFF</p> <p>LCRU ON - TV RMT - GCTA ON (START BATT 3)</p> <p>PAN TO + 170°, TILT TO -45°</p> <p>LCRU ON - PMI/WB - GCTA OFF</p>			
00	20							10	
00	30							TOTAL BATT 2	
00	40							7	
		TRAVEL							

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HOUR	MIN							
00		TRAVEL (CONT)		COMPARE SMOOTH MARE MATERIAL TO RILLE RIM MATERIAL				
			00:07	ARRIVE SUPPLEMENTARY SAMPLE STOP				
	50	SUPPLEMENTARY SAMPLE STOP		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV SOIL/ROCK SAMPLE PHOTO PAN MOUNT LRV POWER UP LRV DEPART SUPPLEMENTARY SAMPLE STOP				
01		TRAVEL		COMPARE SMOOTH MARE MATERIAL TO RILLE RIM MATERIAL				
	00							30
01			00:12	ARRIVE STATION 9				
	10	9 AT RIM OF HADLEY RILLE AT SOUTHERN END OF THE TERRACE		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV LCRU S-BAND MODE, SELECT FM/TV POINT HGA TO EARTH SURVEY SAMPLING AREA OBSERVE AND DESCRIBE RILLE AND FAR WALL LFL PHOTOGRAPHY COMPREHENSIVE SAMPLE AREA CORE TUBE PANORAMIC PHOTOGRAPHY	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE VIEW AREA OF PROPOSED GEOLOGY ACTIVITY NATO 1 (FAR WALL OF RILLE) VIEW COMPREHENSIVE SAMPLING - NATO WHEN REQUESTED NATO 2 (DESIGNATED FROM MAP) VIEW CORE TUBE OPERATIONS - NATO WHEN REQUESTED BY EXP. OFF.			46
	20							
	30							

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
01	30	9 (CONT) AT RIM OF HADLEY RILLE AT SOUTHERN END OF TERRACE		DOCUMENTED SAMPLING OF CRATER AT EDGE OF RILLE	VIEW DOCUMENTED SAMPLING OF CRATER - NATO OF CRATER RIM AND BOTTOM			
				POSSIBLE 70MM PAN AT EDGE OF CRATER				
01	40			PENETROMETER	VIEW PENETROMETER TEST - NATO OF PENETROMETER ENTERING SURFACE			46
				STOP HGA FOR TRAVERSE LCRU S-BAND MODE, SELECT - PMI/WB MOUNT LRV POWER UP LRV DEPART STATION 9 00:50	PAN TO +170°, TILT TO -45° LCRU ON - PMI/WB - GCTA OFF			
		TRAVEL		CONTINUE DESCRIPTION OF RILLE AND RIM MATERIAL PHOTOGRAPHY IS APPROPRIATE ARRIVE STATION 10 00:03				7
02	00	10 ALONG RILLE RIM AT THE TERRACE		PARK LRV PARKING BRAKE ON POWER DOWN LRV - READ OUT LRV NAV SYSTEM DISMOUNT LRV LCRU S-BAND MODE, SELECT - FM/TV POINT HGA TO EARTH 500MM PANORAMIC PHOTOGRAPHY DOCUMENTED SAMPLE FROM CRATER ON RILLE RIM 70MM PAN STOP HGA FOR TRAVERSE LCRU S-BAND MODE, SELECT PMI/WB MOUNT LRV POWER UP LRV DEPART STATION 10 00:10	LCRU ON - FM/TV - GCTA ON WIDE ANGLE PANORAMA OF SITE VIEW DOCUMENTED SAMPLING - NATO IF REQUESTED PAN TO +170°, TILT -45° LCRU ON - PMI/WB - GCTA OFF			6
		TRAVEL		DESCRIPTION OF RILLE AND RIM MATERIAL PHOTOGRAPHY AS APPROPRIATE ARRIVE STATION 11 00:06				10

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HOUR	MIN								
02	20	11 AT RIM OF HADLEY RILLE AT NORTHWEST END OF THE TERRACE		PARK LRV, PARKING BRAKE ON POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV LCRU S-BAND MODE, SELECT-FM/TV POINT HGA TO EARTH OBSERVE AND DESCRIBE RILLE AND FAR RILLE WALL; COMPARE TO PREVIOUS OBSERVATIONS	LCRU ON - FM/TV - CCTA ON WIDE ANGLE PANORAMA OF SITE VIEW AREA OF PROPOSED GEOLOGY ACTIVITY VIEW DOCUMENTED SAMPLING OF RIM AND CRATER - NATO WHEN REQUESTED NATO 1 (NORTH COMPLEX) PAN TO +170°, TILT TO -45° LCRU ON - PMI/WB - CCTA OFF				
				SURVEY SAMPLING AREA					
				DOCUMENTED SAMPLES OF RILLE RIM AND CRATER AT EDGE OF RILLE					
				PANORAMIC PHOTOGRAPHY					
	30			COMPARE RILLE RIM MATERIAL TO OTHER TERRAIN STOW HGA FOR TRAVERSE LCRU S-BAND MODE, SELECT - PMI/WB MOUNT LRV POWER UP LRV DEPART STATION 11 00:19					
02	40	TRAVEL		OBSERVE CHANGES IN MATERIAL BETWEEN RILLE RIM, MARE AND NORTH COMPLEX					
			00:07	ARRIVE SUPPLEMENTARY SAMPLE STOP					
		SUPPLEMENTARY SAMPLE STOP		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV SOIL/ROCK SAMPLE POWER UP LRV DEPART SUPPLEMENTARY SAMPLE STOP 00:05				28	
02	50	TRAVEL		OBSERVE CHANGES IN MATERIAL BETWEEN RILLE RIM, MARE AND NORTH COMPLEX OBSERVE CHARACTERISTICS OF CRATER CHAIN ORIGINATING IN CHAIN CRATER OBSERVE POSSIBLE SECONDARY CRATERS					
			00:12						
03	00	12 SOUTHEASTERN RIM OF CHAIN CRATER IN NORTH COMPLEX		POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV LCRU S-BAND MODE, SELECT - FM/TV POINT HGA TO EARTH	LCRU ON - FM/TV - CCTA ON				

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
03	00	12 (CONT) SOUTHEASTERN RIM OF CHAIN CRATER IN NORTH COMPLEX AT JUNCTION OF ELONGATE DEPRESSION		<p>SURVEY SAMPLING AREA DOCUMENTED SAMPLE OF CRATER EJECTA DOCUMENTED SAMPLE OF NORTH COMPLEX MATERIAL</p> <p>70MM PAN</p> <p>POSSIBLE CORE TUBE DESCRIBE WALL OF CRATER AND RELATION TO ELONGATE DEPRESSION</p> <p>ATTEMPT TO DETERMINE IF CRATER IS ENDOGENETIC OR IMPACT. SEARCH FOR EXOTICS</p> <p>STOP HGA FOR TRAVERSE LCRU 5-BAND MODE, SELECT - PM1/WB MOUNT LRV POWER UP LRV DEPART STATION 12</p>	<p>WIDE ANGLE PANORAMA OF SITE</p> <p>VIEW AREA OF PROPOSED GEOLOGY ACTIVITY VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED</p> <p>NATO 1 (CHAIN CRATER)</p> <p>PAN TO -170°, TILT TO -45° LCRU ON - PM1/WB - ECTA OFF</p>			
		TRAVEL	00:23	<p>OBSERVE INTER-CRATER AREA IN NORTH COMPLEX AND COMPARE EJECTA BETWEEN CRATERS</p> <p>CONTINUE TO COMPARE NORTH COMPLEX TO OTHER TERRAIN TYPES</p> <p>ARRIVE STATION 13</p>				12
03	30	13 AREA STOP MULTIPLE OBJECTIVE STOP AT END OF NORTH COMPLEX SCARP BETWEEN CHAIN AND PLUTON CRATER		<p>POWER DOWN LRV - READ OUT LRV NAV DISMOUNT LRV LCRU 5-BAND MODE, SELECT FM/TV POINT HGA TO EARTH</p> <p>SURVEY ICARUS CRATER ON THE WESTERN RIM OF PLUTON CRATER</p> <p><u>ICARUS CRATER</u> DOCUMENTED SAMPLE</p> <p><u>PLUTON CRATER</u> DOCUMENTED SAMPLE</p> <p>OBSERVE AND DESCRIBE CRATER INTERIOR AND RIM</p>	<p>LCRU ON - FM/TV - GCTA ON WIDE ANGLE PANORAMA OF SITE</p> <p>VIEW AREA OF PROPOSED GEOLOGY ACTIVITY VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED</p> <p>NATO 1 (PLUTON CRATER)</p> <p>VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED</p>			49

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT	
HO	MIN								
03	50	13 (CONT) AREA STOP MULTIPLE OBJECTIVE STOP AT END OF NORTH COMPLEX SCARP BETWEEN CHAIN AND PLUTON CRATERS		<u>EAGLE CREST CRATER</u> OBSERVE AND DESCRIBE CRATER INTERIOR AND RIM <u>SCARPS</u> NOTE ANY LAYERING OR CHANGES IN VERTICAL SCARP AND SAMPLE BASED ON THE CHARACTERISTICS AND ACCESSIBILITY OF EACH OF THE ABOVE POINTS OF INTEREST THE FOLLOWING TASKS SHOULD BE COMPLETED AT THE DISCRETION OF THE CREW: DOCUMENTED SAMPLE PAN OR STERED PAN SINGLE CORE TUBE EXPLORATORY TRENCH SOIL SAMPLE SOONH TARGETS OF OPPORTUNITY PENETROMETER STOW HGA FOR TRAVERSE LCRU S-BAND MODE, SELECT - PMI/WB MOUNT LRV POWER UP LRV DEPART STATION 13	NATO 2 (EAGLE CREST CRATER) NATO 3 (DESIGNATED FROM WAP) NATO 4 (SCARP) VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED VIEW CORE TUBE OPERATIONS - NATO WHEN REQUESTED VIEW TRENCHING OPERATIONS - NATO WHEN REQUESTED VIEW SOIL SAMPLING OPERATIONS - NATO WHEN REQUESTED VIEW PENETROMETER OPERATIONS - NATO OF PENETROMETER ENTERING SURFACE PAN TO ±170°, TILT TO -45° LCRU ON - PMI/WB - GCTA OFF				49
		TRAVEL	00:53	OBSERVE AND DESCRIBE DIFFERENCES IN MATERIAL AND SURFACE TEXTURES BETWEEN NORTH COMPLEX AND MARE					23
04	30								

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES	LCRU/GCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN							
04	30	TRAVEL (CONT)		NOTE AMOUNT OF SECONDARY CRATERING PHOTOGRAPHY AS APPROPRIATE				
04	40		00:19	ARRIVE STATION 14				
		14 RING CRATER SOUTH OF NORTH COMPLEX IN MARE		PARK LRV, PARKING BRAKE ON POWER DOWN LRV - READ OUT LRV NAV SYSTEM DISMOUNT LRV LCRU S-BAND MODE, SELECT - FM/TV POINT HGA TO EARTH SURVEY SAMPLING AREA COMPARE BLOCKS AND MARE MATERIAL WITH NORTH COMPLEX DOCUMENTED SAMPLE OF MARE MATERIAL PHOTO PAN STOP HGA FOR TRAVERSE LCRU S-BAND MODE, SELECT - PH1/WB MOUNT LRV POWER UP LRV DEPART STATION 14	LCRU ON - FM/TV - GCTA ON WIDE-ANGLE PANORAMA OF SITE VIEW AREA OF PROPOSED GEOLOGY ACTIVITY VIEW DOCUMENTED SAMPLING OPERATIONS - NATO WHEN REQUESTED NATO 1 (DESIGNATED FROM MAP) PAN TO ±170°, TILT TO -45° LCRU ON - PH1/WB - GCTA OFF			
05	00	TRAVEL	00:20					
05	10		00:14	ARRIVE LM				
				DESCRIBE DIFFERENCES BETWEEN THIS AREA AND OTHER MARE AREAS NOTE DISTRIBUTION OF POSSIBLE SECONDARIES				

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TIME		STATION	STOP OR RIDE TIME (HR : MIN)	CREW OBSERVATIONS AND ACTIVITIES		LCRU/CCTA ACTIVITY	PMI WB	FM TV	TV RMT
HR	MIN								
				LMP	CDR				
		LM		<p>READ OUT NAV AND LRV DISPLAYS</p> <p>DISMOUNT LRV</p> <p>PHOTO LRV; V-SUN (2), DN-SUN (1)</p> <p>STOW 70 mm CAM/BAGS ON LMP SEAT</p> <p>ASSIST CDR</p> <p>REMOVE SCB NO. 7 FROM CDR PLSS TOOL HARNESS; TIDY VELCRO COVERS</p> <p>PLACE SCB NO. 7 ON MESA TABLE</p> <p>REMOVE SCB NO. 8 FROM HTC AND PLACE ON MESA TABLE</p> <p>REMOVE B-SLSS BAG FROM GEOLOGY PALLET AND PLACE ON MESA</p> <p>CHECK ALL SAMPLES</p> <p>UNSTOW DUST BRUSH FROM LRV. STOW ON LADDER</p> <p>REMOVE 16 mm CAM FROM LRV (INSTALL HEWING FROM ETB IF REQUIRED)</p> <p>PHOTO CDR DRIVING LRV</p> <p>STOW 16 mm CAMERA ON MESA RETRIEVE SMC FOIL</p> <p>PLACE SMC FOIL IN BAG FROM MESA</p> <p>STOW SMC IN ETB</p> <p>REMOVE 16 mm MAG FROM CAM AND STOW IN ETB; CHECK ALL ITEMS IN ETB</p> <p>CLEAN CDR'S EMU</p> <p>INGRESS, CARRY B-SLSS BAG INTO LM</p> <p>ATTACH LEC TO HAND HOLD</p> <p>TRANSFER SCB NO. 7 INTO LM</p> <p>REMOVE SCB NO. 7 FROM LEC</p> <p>TRANSFER ETB INTO LM</p> <p>REMOVE ETB FROM LEC</p> <p>DISCARD LEC ON PORCH</p> <p>STOW SAMPLES AND EQUIPMENT</p> <p>STOW SCB NO. 8 IN LM</p> <p>ASSIST CDR; STOW CDR'S PLSS ANTENNA</p> <p>CLOSE HATCH</p>	<p>PARK LRV AT MESA; POINT NORTH, X-SUN IN SUN</p> <p>POWER DOWN LRV SWITCHES</p> <p>DISMOUNT LRV</p> <p>ALIGN HGA TOWARD EARTH</p> <p>SWITCH LCRU - TV RMT</p> <p>OPEN LRV BATT DUSTS COVERS</p> <p>STOW 70 mm CAM/BAGS ON CDR SEAT</p> <p>REMOVE FROM LMP PLSS TOOL HARNESS</p> <p>CORE TUBE CAP DISP. - DISCARD</p> <p>HAMMER - STOW ON HTC</p> <p>SCB NO. 3 - STOW ON HTC</p> <p>TIDY HARNESS VELCRO COVERS</p> <p>ASSIST LMP</p> <p>STOW TOMES ON HTC</p> <p>CARRY ETB TO LRV CDR FLOOR PAN</p> <p>REMOVE PENETROMETER RECORDING DRUM AND PLACE IN SAMPLE BAG; STOW IN ETB</p> <p>REMOVE 20 - BAG DISP. FROM CDR CAM; STOW CAM IN ETB</p> <p>REMOVE MAGS FROM LMP 70 mm AND 500 mm</p> <p>LENS CAM; STOW MAGS IN ETB</p> <p>TRANSFER ALL CAMERA MAGS UNDER CDR SEAT INTO ETB</p> <p>STOW MAPS IN ETB (CARRY ETB TO LMP SIDE)</p> <p>ATTACH ETB TO MESA TABLE</p> <p>STOW HGA FOR TRAVERSE</p> <p>SWITCH LCRU - PMI/WB</p> <p>PMOUNT LRV</p> <p>POWER UP LRV</p> <p>DRIVE LRV 300 FEET EAST OF LM ON HEADING OF 096° UNTIL DIST. SHOWS 0.1K1, THEN HEAD LRV TO 255°</p> <p>PARK LRV</p> <p>POWER DOWN SWITCHES</p> <p>PULL CB'S (EXCEPT BUS (4) AND AUX PHR)</p> <p>DISMOUNT LRV</p> <p>ALIGN HGA</p> <p>OPEN LRV BATTERY DUST COVERS</p> <p>SWITCH LCRU - "EXT" PHR</p> <p>- TV RMT</p> <p>OPEN LCRU DUST COVERS 100%</p> <p>RETURN TO LM</p> <p>CLEAN LMP'S EMU; STOW LMP PLSS ANTENNA</p> <p>ATTACH LEC TO SCB NO. 7</p> <p>TRANSFER SCB NO. 7 INTO LM</p> <p>TRANSFER LEC HOOKS TO SURFACE</p> <p>ATTACH LEC TO ETB</p> <p>TRANSFER ETB INTO LM</p> <p>CLEAN EMU</p> <p>ASCEND LADDER; CARRY SCB NO. 8</p> <p>HAND SCB NO. 8 TO LMP</p> <p>DISCARD LEC</p> <p>INGRESS</p> <p>REPRESS CABIN</p>	<p>LCRU ON - TV RMT - CCTA ON VIEW</p> <p>LCRU ON - PMI/WB - CCTA OFF</p> <p>PAN TO ± 170°, TILT -45°</p> <p>LCRU ON - TV RMT - CCTA ON (EXT POWER)</p> <p>VIEW CDR'S RETURN TO LM</p> <p>HATO LM - VIEW EQUIPMENT TRANSFER INTO LM</p> <p>POSITION CTV FOR THERMAL IMAGING</p> <p>MCC COMMAND LCRU FM TRANSMITTER AND CTV</p> <p>OFF - LCRU ON - TV RMT - CCTA OFF</p>			
05	20								
05	30								
05	40								
05	50								
06	00		00:45						

END EVA THREE

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IX. LIFT-OFF AND POST-LIFT-OFF LCRU/GCTA OPERATION

A. General Description

At the end of EVA III, the LRV/LCRU/GCTA will be positioned 180° from the ascent launch azimuth (276°) at a range of 0.1 kilometer (328 feet) to view ascent with the color television camera (CTV). The LRV will be pointed at a bearing of 255° . The CTV will be ground commanded according to a predetermined command sequence to follow the ascent stage (page 46).

Post-Lift-Off operation of the LCRU/GCTA from August 2-8, 1971, at the Hadley Rille site will serve five purposes as follows:

- (1) Coverage of the LM ascent stage lift-off and initial trajectory
- (2) Survey of plume effects near the landing site and on the descent stage
- (3) Coverage of an eclipse of the sun by the earth on August 6, 1971
- (4) Survey of lunar landscape colors and albedo under changing sun angles
- (5) Observations of planets, stars, nebulae, and other astronomical objects

A complete schedule of camera operations is given in the detailed timeline section IX, B. Camera geometry is presented in Figure IX-1. The post-lift-off operations as presented in the detailed timeline will be accomplished based on LRV battery power remaining and thermal considerations. All post EVA III activities are time referenced in GMT rather than GET (Ground Elapsed Time) due to the possibility of GET updates during the mission. GET reference is provided as a flight plan reference only.

B. DETAILED TIME LINE

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SEITE	TOT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 2	16:40:00 (171:06:00 GET)	43°	115°	MCC-Command power on Read out LCRU voltage, radiator temperature and CTV temperature	47°E	27°S	MAD	2
	16:42:00	43°	115°	MCC - Command 1.25 MHZ sub- carrier off, position CTV to view LM ascent	47°E	27°S		3
	16:45:00	43°	115°	MCC - Monitor CTV until ascent	47°E	27°S		26
				<u>Ascent Command Sequence</u>				
	17:11:24 (171:37:24 GET)	43°	115°	MCC command: TILT UP	47°E	27°S		2
	17:11:26			MCC command: ZOOM OUT				
	17:11:34			MCC command: ZOOM STOP				
	17:11:36			MCC command: ZOOM IN				
	17:11:42			MCC command: TILT STOP				
	17:11:43			MCC command: TILT INC DOWN				
	17:11:45			MCC command: TILT INC DOWN				
	17:11:47			MCC command: TILT INC DOWN				
	17:11:49			MCC command: TILT INC DOWN				
	17:11:51			MCC command: TILT INC DOWN				
	17:13:24	43°	115°	MAV surface/LM descent stage for plume effects	46°E	27°S		3
	17:16:24	43°	115°	Pan horizon, MAV	46°E	27°S		3
	17:19:24	43°	115°	MCC - Command Power off	45°E	27°S		

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 2 (Cont)	17:52:00 (172:18:00 GET)	43°	115°	MCC - Command Power ON view Earth, AZ 190° El. 60°	41° E	17° S	MAD	2
	17:54:00	43°	115°	View Saturn, 2° East of Earth	41° E	27° S		2
	17:56:00	44°	116°	View Milky Way, 25° West of Earth	40° E	27° S		2
	17:58:00	44°	116°	Pan Horizon, MAV	40° E	27° S		3
	18:01:00	44°	116°	Point CTV for Thermal Management	40° E	27° S		1
	18:02:00	44°	116°	MCC - Command POWER OFF	39° E	27° S		
	22:00:00 (176:26:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU voltage, LCRU radiator temperature, and CTV temperature				2
22:02:00			MCC - Command 1.25 MHz Subcarrier OFF, POWER OFF					
Aug 3	00:51:00 (179:17:00 GET)	45°	119°	MCC - Command POWER ON, position CTV for LM Impact			GDS	5
	01:05:00	45°	119°	View LM Impact - NATO Impact area, read out LCRU Voltage, LCRU radiator temperature, and CTV temper- ature <u>Note</u> If LM Impact requirement is deleted, add TV/LCRU on for geology.				5
	01:10:00	45°	119°	MCC - Command 1.25 MHz Subcarrier OFF, POWER OFF				
	07:00:00 (185:26:00 GET)	47°	121°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU voltage, LCRU radiator temperature, and CTV temperature				2

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 3 (Cont)	07:02:00	47°	121°	MCC - Command 1.25 MHZ Subcarrier OFF, POWER OFF				
	13:00:00 (191:26:00 GET)			MCC - Command POWER ON, 1.25 MHZ Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Tempera- ture.			HSK	2
	13:02:00			MCC - Command 1.25 MHZ Subcarrier OFF and POWER OFF.			HSK	
	20:00:00 (198:26:00 GET)			MCC - Command POWER ON, 1.25 MHZ Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Tempera- ture.			MAD	2
	20:02:00			MCC - Command 1.25 MHZ Sub- carrier OFF and POWER OFF.			MAD	
Aug 4	02:00:00 (204:26:00 GET)	54°	151°	MCC - Command POWER ON, 1.25 MHZ Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Tem- perature.			GDS	2
	02:02:00			MCC - Command 1.25 MHZ Sub- carrier OFF and POWER OFF.			GDS	
	09:12:58 (211:38:58 GET)	56°	135°	MCC - Command POWER ON, view Earth AZ 190° EL 60°, Geology	175° W	26° S	GDS	2
	09:15:00	56°	135°	Pan Horizon, MAV	175° W	26° S		3
	09:18:00	56°	135°	NATO - Nearby crater or rock for sun angle effects	176° W	26° S		3
	09:21:00	56°	135°	MCC - Command 1.25 MHZ Sub- carrier ON, read out LCRU Voltage, LCRU Radiator Tem- perature, and CTV Temperature	176° W	26° S		2
	09:23:00	56°	136°	MCC - Position CTV for ther- mal management, command 1.25 MHZ Subcarrier OFF.	177° W	26° S		1

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 4 (Cont)	09:24:00	56°	136°	MCC - Command POWER OFF	177° W	26° S	GDS	
	16:00:00 (218:26:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature.			HSK	2
	16:02:00			MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF			HSK	
Aug 5	00:30:00 (226:56:00 GET)	61°	151°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature.			MAD	2
	00:32:00	61°	151°	MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF			MAD	
	06:00:00 (232:26:00 GET)	62°	155°	MCC - Command POWER ON, PAN HORIZON, MAV	110° W	24° S	GDS	4
	06:04:00	62°	155°	NATO - Nearby crater or rock for sun angle effects	110° W	24° S		4
	06:08:00	62°	155°	MCC - Command 1.25 MHz Subcarrier ON, read out LCRU Voltage, LCRU Radiator Temperature, and CTV Temperature.	111° W	24° S		2
	06:10:10	62°	155°	MCC - Position CTV for Thermal Management, Command 1.25 MHz Subcarrier OFF	112° W	24° S		1
	06:11:00	62°	155°	MCC - Command POWER OFF	112° W	24° S	GDS	
	13:30:00 (239:56:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			HSK	2
	13:32:00			MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF			HSK	

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 5 (Cont)	20:30:00 (246:56:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			MAD	2
	20:32:00			MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF				5
Aug 6	03:30:00 (253:56:00 GET)	63°	177°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			MAD	2
	03:32:00	63°	177°	MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF			MAD	
	10:30:00 (260:56:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			GDS	2
	10:32:00			MCC - Command 1.25 MHz Subcarrier OFF and POWER OFF			GDS	
	17:58:00	63°	-165°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature.	93° E	17° S	PKS	2

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 6 (Cont)	18:00:00	63°	-166°	MCC - Command 1.25 subcarrier OFF. Point CTV at Sun for 5 sec, zoom in	92°E	17°S	PKS	1
	18:01:00	63°	-166°	Pan horizon, MAV	92°E	17°S		5
	18:06:00	63°	-166°	Point CTV at Sun for 10 sec, zoom in.	91°E	17°S		1
	18:07:00	63°	-166°	Pan horizon, MAV	90°E	17°S		5
	-----	---	----	Repeat above sequence, 10 sec at Sun, 5-min pan on a 6-min cycle.	----	----		30
				<u>NOTE</u>				
				This cycle will be accom- plished based on amount of TV picture "blooming."				
	18:23:00	63°	-165°	Point CTV at CRESCENT SUN, zoom in (10 sec on Sun; 10 sec off Sun cycle for 2 min)	85°E	17°S		2
	18:25:00 (268:51:00 GET)	63°	-165°	Total eclipse, point CTV to view corona, ring, Venus	84°E	17°S		5
	18:29:00	63°	-165°	Point CTV to view Lunar Module, foreground, B-SLSS (color cal)	83°E	17°S		2
	18:31:00	63°	-165°	Point CTV to view total eclipse, corona, ring, Venus	82°E	17°S		5
	18:36:00	63°	-165°	Point CTV to view Apennines, foreground, B-SLSS	81°E	17°S		3
	18:39:00	63°	-165°	Point CTV to view eclipse, Zodical light, Venus	80°E	17°S		5
	18:44:00	63°	-165°	Point CTV WSW, 45° to view Milky Way, 30° to Saturn	79°E	17°S		4

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 6 (Cont)	18:48:00	63°	-164°	Point CTV to view corona, Zodiacal light, Venus	77°E	17°S	PKS	2
	18:53:00	63°	196°	Pan horizon, zoom out, in; MAV foreground rocks and B-SLSS, zoom in	77°E	17°S	HSK	8
	19:01:00	63°	196°	Point CTV to view eclipse ring	76°E	17°S		5
	19:06:00	63°	196°	Point CTV to view Zodiacal light 10° E of Earth	74°E	17°S		5
	19:11:00	63°	196°	Point CTV to view foreground rocks, MAV horizon	73°E	17°S		3
	19:14:00	63°	196°	Point CTV to view Apennine Front	72°E	17°S		2
	19:16:00	63°	196°	Point CTV to view eclipse ring, planetoid, Venus	72°E	17°S		10
	19:26:00	63°	196°	Zodiacal light, Venus	70°E	17°S		3
	19:29:00	63°	196°	Point CTV to Az 220° to view Saturn (30° WSW of Earth) zoom in	69°E	17°S		2
	19:31:00	63°	196°	Point CTV to Az 235° to view Milky Way (45° WSW of Earth) zoom out	68°E	17°S		2
	19:33:00	63°	196°	Point CTV to view LM Descent Stage Az 282°, zoom in	68°E	17°S	HSK	4
	19:37:00	63°	196°	Point CTV to view nearby rocks, craters, Az 270°, zoom in	67°E	17°S		7
	19:44:00	63°	196°	Eclipse ring, planetoid, Venus	65°E	17°S	HSK	10
	19:54:00	63°	197°	Pan horizon, zoom out and in	62°E	17°S		5

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 6 (Cont)	19:59:00	63°	197°	Foreground rocks and B-SLSS, zoom in	61°E	17°S	HSK MAD	5
	20:04:00	63°	197°	Eclipse ring, planetoid, Venus	60°E	17°S		10
	20:14:00	63°	197°	Zodiacal light 15° W of Earth	57°E	17°S		10
	20:24:00	63°	197°	Eclipse ring, planetoid, Venus	55°E	17°S		10
	20:34:00	63°	197°	Zodiacal light 15° E of Earth	52°E	17°S		10
	20:44:00	63°	197°	Eclipse ring, solar corona,, Venus	50°E	17°S		10
	20:54:00	63°	197°	Foreground rocks, Apennines, B-SLSS	48°E	17°S		3
	20:57:00	63°	198°	Eclipse, solar corona, Venus	47°E	17°S		9
	21:06:00 (271:32:00 GET)	63°	198°	Totality ends; solar crescent 10 sec	45°E	16°S		1
	21:07:00	63°	198°	Apennines, zoom in	45°E	16°S		2
	21:09:00	63°	198°	Pan horizon, zoom out and in	44°E	16°S		5
	21:14:00	63°	198°	Foreground rocks, zoom in	43°E	16°S		10
	21:24:00	63°	198°	Point CTV to cool camera	40°E	16°S		1
	21:25:00 (271:51:00 GET)	63°	198°	Power OFF	40°E	16°S		MAD
Aug 7	03:30:00 (277:56:00 GET)	62°	-156°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			GDS	2

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 7 (Cont)	03:32:00	62°	-156°	MCC - Command 1.25 MHz Sub-carrier OFF and POWER OFF			GDS	2
	10:00:00 (284:26:00 GET)	60°	-149°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature	142°W	14°S		2
	10:02:00	60°	-149°	MCC - Command 1.25 MHz sub-carrier OFF and Pan Horizon, MAV	142°W	14°S		5
	10:07:00	60°	-149°	Point CTV to view foreground, nearby rock or crater, B-SLSS, and zoom in	143°W	14°S		10
	10:17:00	60°	-149°	Point CTV to view Earth and Leo stars (Az - 178°, EL 63°)	146°W	14°S		5
	10:22:00	60°	-149°	Position CTV for thermal management	147°W	14°S		1
	10:23:00	60°	-149°	MCC - Command POWER OFF	147°W	14°S		
	16:00:00 (290:26:00 GET)			MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			HSK	2
	16:02:00			MCC - Command 1.25 MHz sub-carrier OFF and POWER OFF				
Aug 8	02:00:00 (300:26:00 GET)			MCC - Command POWER ON, 1.25 Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			HSK	2
	02:02:00			MCC - Command 1.25 MHz sub-carrier OFF and POWER OFF				

DATE	TIME (GMT) HR:MIN:SEC	SUN		TARGET/GCTA OPERATION	SUB-LUNAR		SITE	ΔT (MIN.)
		ELEV	AZ		LONG.	LAT.		
Aug 8 (Cont)	05:30:00 (303:56:00 GET)	55°	-134°	MCC - Command POWER ON, 1.25 MHz Subcarrier ON, and read out LCRU Voltage, Radiator Temperature, and CTV Temperature			GDS	2
	05:32:00	55°	-134°	MCC - Command 1.25 MHz sub-carrier OFF and Pan Horizon, MAV				5
	05:37:00	55°	-134°	Point CTV to view foreground, nearby rock or crater, B-SLSS, and Zoom in				10
	05:47:00	55°	-134°	Position CTV for Thermal Management				1
	05:48:00	55°	-134°	MCC - Command POWER OFF				7
	06:25:00	55°	-134°	Predicted loss of LCRU downlink due to Lunar libration effects on the LCRU HGA pointing (i.e., low downlink signal strength)				

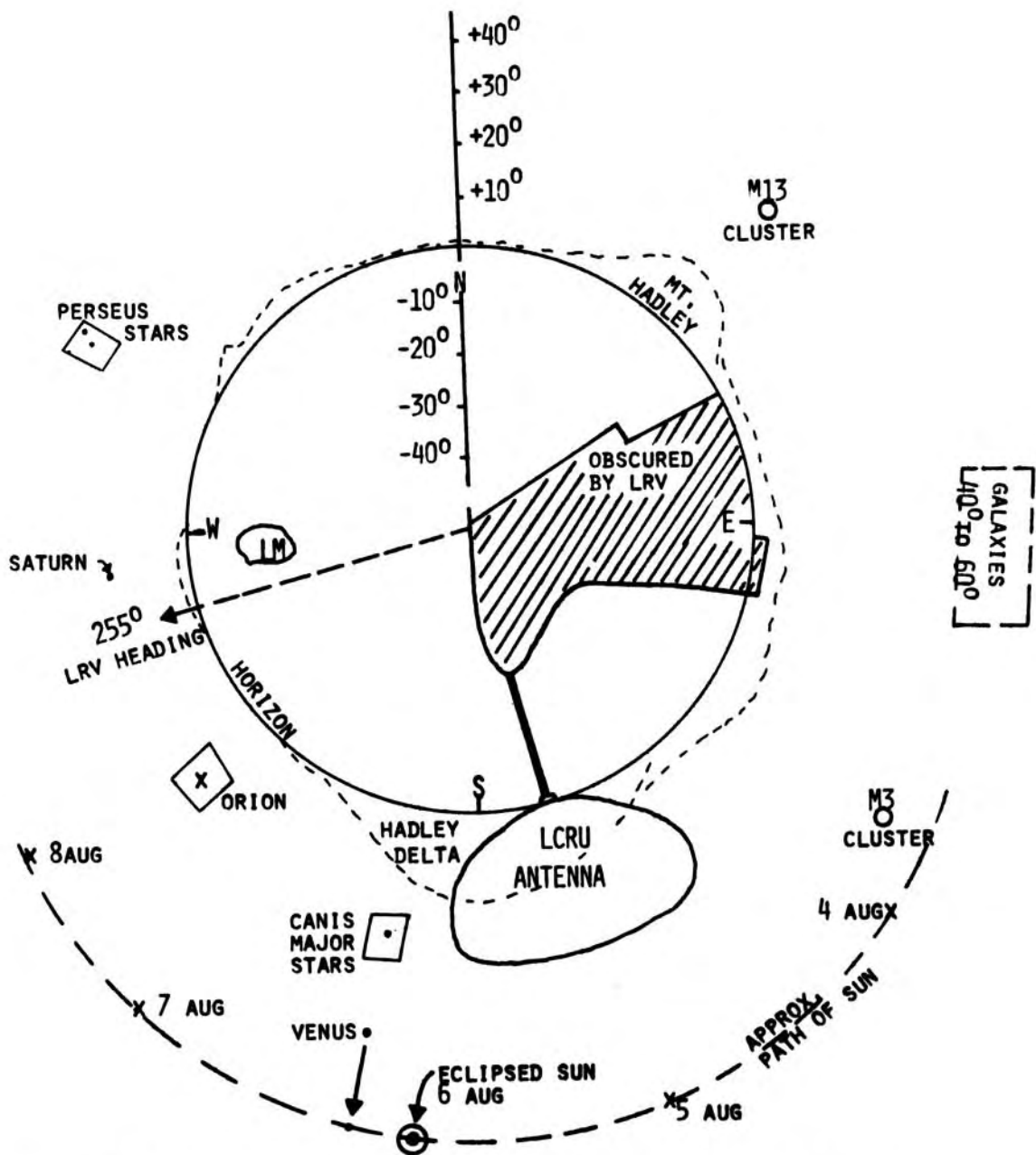
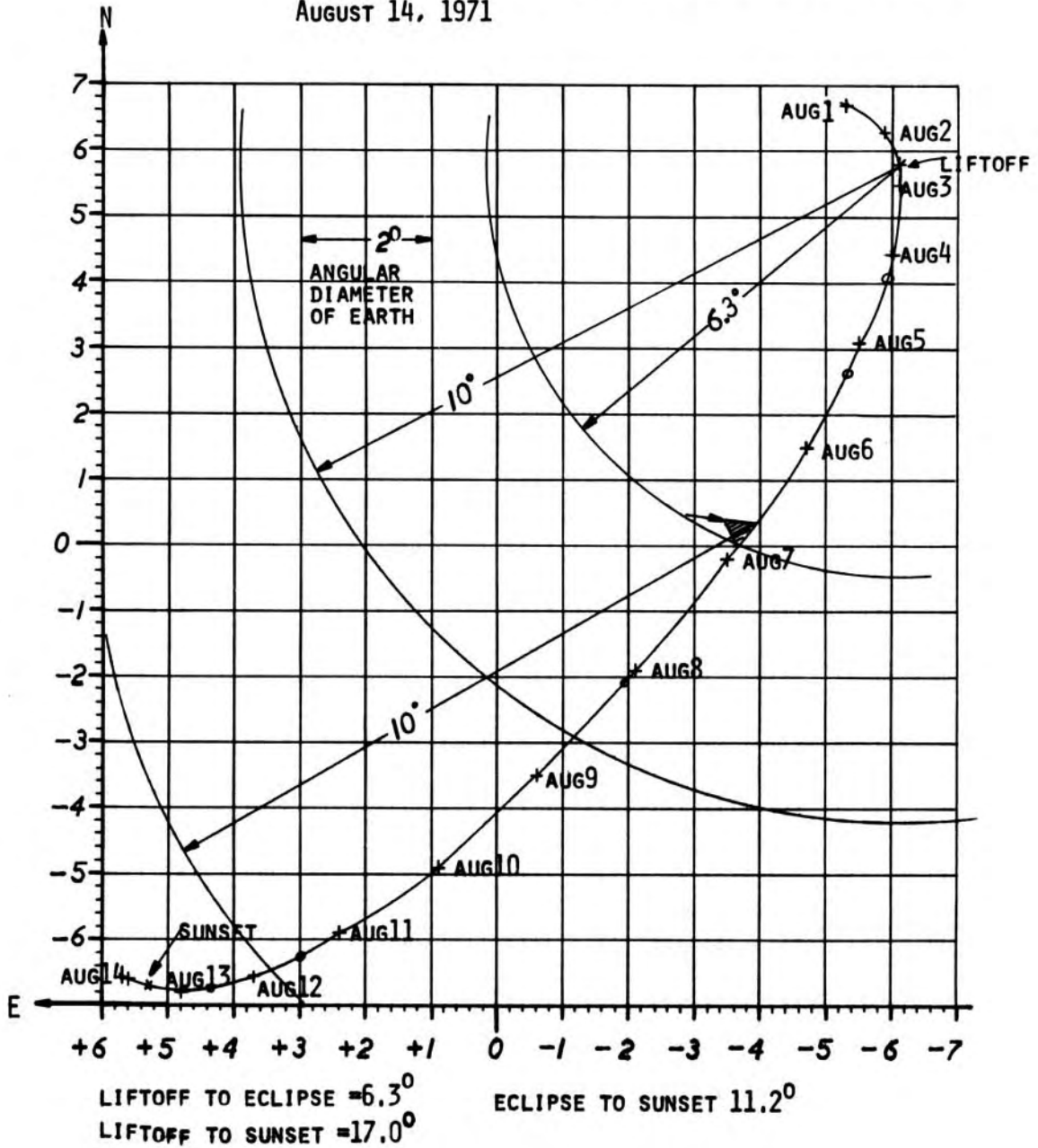


FIGURE IX-1. PANORAMA FOR CTV FROM LRV(328 FT EAST OF LM)
 FOR POST-LIFTOFF, APOLLO 15, HADLEY RILLE
 (ALTITUDE PLOTTED RADIALLY, 1MM=1°, ASTRONOMICAL
 POSITIONS ARE FOR 1PM CDT ON AUGUST 6, 1971)

FIGURE IX-2. LUNAR LIBRATION - LATITUDE AND LONGITUDE OF THE SUB-EARTH POINT AT 00:00:00 GMT ON AUGUST 2, 1971 TO AUGUST 14, 1971



APOLLO

LSTOP

FINAL

LUNAR SURFACE
TELEVISION
OPERATIONS PLAN

APOLLO 15

JULY 5, 1971



FCD
MSC
NASA