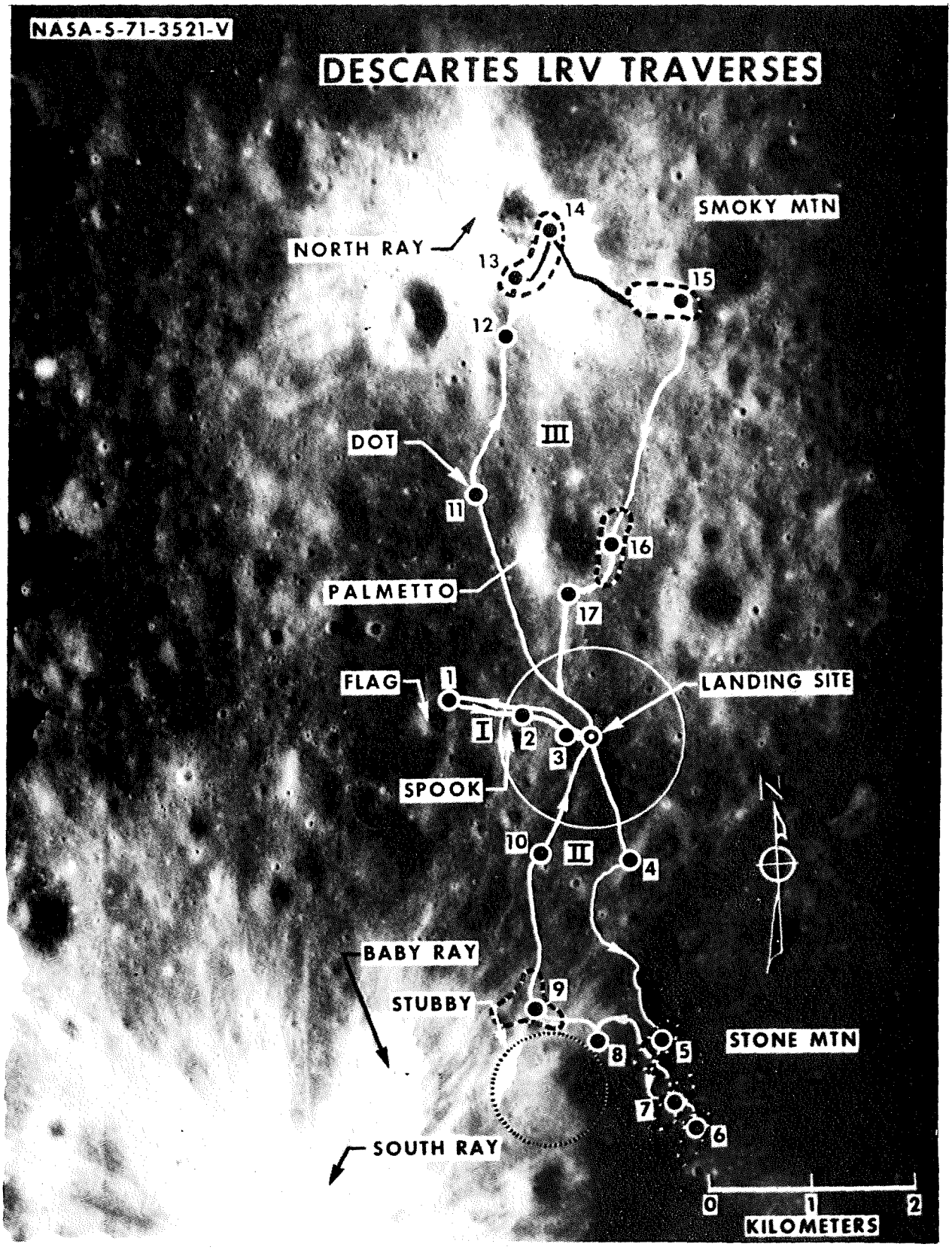
APOLLO 16
LRV TRAVERSES

December 16, 1971

Apollo 16


NASA-S-71-3521-V
DESCARTES LRV TRAVERSES
SMOKY MTN
NORTH RAY
14
13
15
12
DOT
III
11
16
PALMETTO
17
FLAG
1
LANDING SITE
I
2
3
SPOOK
10
II
4
BABY RAY
STUBBY
9
STONE MTN
8
5
7
6
SOUTH RAY
0
1
2
KILOMETERS
NASA — MSC
0
1
2
MILES

EVA I TRAVERSE DESCRIPTION

On EVA I, the initial period of activity in the LM vicinity occupies about 1-1/2 hours during which time the LRV is deployed and equipment is loaded on the LRV in preparation for the traverse. In addition, the far UV camera is set up near the LM and the first of several exposures of various astronomical targets is accomplished. Near the end of this period, the ALSEP is off-loaded and transported to its deployment site about 100 m west of the LM. For approximately the next 2-1/2 hours, the crewmen are occupied at the ALSEP site setting up and activating the various ALSEP experiments. Activity at the ALSEP site is concluded with the drilling of the 2.6 m core and its recovery. The drill stems from the core are separated into their two sections and are left at the site for retrieval later in the EVA. The LRV navigation system is initialized, and the geology traverse begins at 4 hours 01 minute into the EVA.

Approximately 2-1/2 hours is available on EVA I for the geology traverse. This time is spent in investigating and sampling the Cayley plains in the area west of the landing site and near the landing site itself. Three stations are planned: the first at Flag crater about 1.7 km west of the landing site; the second near Spook crater about 1.1 km west of the landing site; and the third back in the LM/ALSEP area. Details of the station activities appear in the following section. Activities at and in the vicinity of Spook and Flag craters are designed to gain a better understanding of the Cayley areally, as well as with depth. Material ejected from these craters may have been derived from depths as great as 60 m. Observations of any stratigraphy in the crater walls coupled with samples from the excavated materials will also be important

in the interpretation of the Active Seismic, Magnetometer and Heat Flow Experiment data.

At the completion of Station 2 activities the crewmen return to the vicinity of the LM, 5-1/2 hours into the EVA. A location is selected between the ALSEP area and the LM where about 50 minutes is spent in performing sampling activities and accomplishing the major portion of the Soil Mechanics experiment.

The EVA I closeout begins at 6 hours 20 minutes and cabin repressurization occurs 40 minutes later, ending the 7-hour EVA.

EVA I

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
LM	1:37	--	CAYLEY PLAINS	EGRESS AND EVA PREPARATION
ALSEP	2:24	--	CAYLEY PLAINS	ALSEP DEPLOYMENT
TRAVEL	--	14	ACROSS CAYLEY PLAINS AND RAYS	OBSERVE STATION 2 AREA AND DISTRIBUTION OF RAY MATERIAL
1 FLAG CRATER	0:30	--	FLAG CRATER, ABOUT 300 METERS IN DIAMETER IN CAYLEY PLAINS; ADJACENT RAY FROM SOUTH RAY CRATER.	EXPLORATION OF CONE CRATER SIZE CRATER EXCAVATING CAYLEY AND OBSERVATIONS OF ADJACENT RAY: PAN CRATER SAMPLING (USE PADDED BAGS HERE IF CONVENIENT) LPM SITE MEASUREMENT RAKE/SOIL SAMPLE
TRAVEL	--	06	ACROSS CAYLEY PLAINS AND RAYS	ASSESS STATION 2 REGION FOR BEST SAMPLING AREA

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
2 SPOOK CRATER VICINITY	0:31	--	SPOOK CRATER (ABOUT 300 METERS IN DIAMETER) AND SMALL BLOCKY CRATER TO THE NORTH	ASSESS SITE GEOLOGY AND BASED ON THIS AND RESULTS FROM FLAG DIVIDE TIME BETWEEN SPOOK AND BLOCKY CRATER: PAN DOCUMENTED SAMPLING - SPOOK CRATER RIM - BLOCKS ASSOCIATED WITH SMALL CRATER 500 MM PHOTOGRAPHY OF OUTLYING AREAS LPM READING GRAND PRIX
TRAVEL	--	08	CAYLEY PLAINS	OBSERVE RAY PATTERNS: AREA OF EVA II ROUTE TO STONE MOUNTAIN
3 LM/ALSEP AREA	0:50	--	CAYLEY PLAINS BETWEEN LM AND ALSEP	PAN SOIL/RAKE SAMPLE DOUBLE CORE TUBE DOCUMENTED SAMPLING SOIL MECHANICS ACTIVITIES TRENCH SOIL SAMPLES (IF TRENCH IS DUG FOR SOIL MECHANICS)
LM	0:40	--	CAYLEY PLAINS	CLOSEOUT

TRAVERSE STATION TIMELINES - EVA I

STATION 1 - FLAG CRATER (:30)

CDR	OVER-HEAD	DESCRIP-TION	LPM SITE MEASUREMENT		RAKE/SOIL SAMPLE	O/H
	:03	:02	:15		:08	:02
LMP	O/H	PAN	DESCRIP-TION	SAMPLING*	RAKE/SOIL SAMPLE	O/H

NOTES:

O/H = OVERHEAD

* = CONSIDER 2nd PAN NEAR END OF STATION IF TIME PERMITS.

STATION 2 - SPOOK CRATER (:31)

CDR	O/H	LPM MEAS.	SAMPLING		GRAND PRIX	O/H
	:03	:05	:15		:06	:02
LMP	O/H	PAN	500mm PHOTOS	SAMPLING*	GRAND PRIX	O/H

STATION 3 - ALSEP/LM AREA (:50)

CDR	O/H	TRENCH	TRENCH SAMPLES	RAKE/SOIL SAMPLE	SAMPLING*			O/H
	:03	:08	:03	:08	:20		:06	:02
LMP	O/H	PAN	DOUBLE CORE	TRENCH SAMPLES	RAKE/SOIL SAMPLE	PENETROMETER READINGS, ARM MP, RETRIEVE 2.6m CORE		SAMPLING	O/H

EVA II TRAVERSE DESCRIPTION

On EVA II, approximately the initial three-quarter hour involves egress and preparation for the traverse activities. Investigation of three areas occupies the 5-1/2 hours of traverse time. This time is spent in investigating the Descartes Formation (the Stone Mountain region), doing additional sampling of the Cayley Formation, and sampling blocks and blocky rays originating from South Ray Crater. Details of the station activities for EVA II appear in the following section. Stations 4 and 10 occur in the Cayley Formation and samples from these stations combined with Cayley samples from other EVA's should provide data on the areal variation of this unit and possible gradational relationships with the Descartes Formation. Samples of ray material from South Ray may be collected at Station 4. The relatively fresh sharp-rimmed, 50-meter crater at Station 10 should provide good samples of local bedrock. 164 ft

Stations 5, 6, 7 and 8 will investigate the Descartes Formation (Stone Mountain) and its relation to the Cayley. About 1-3/4 hours are spent at Stations 5 and 6 which will be located on the slopes of Stone Mountain depending on the crew's analysis of the local geology and trafficability. Activities there are designed to collect a wide variety of sample data using various collecting techniques. Existing craters and changes in slope will be areas of specific interest on the mountain front. A total of 50 minutes will be spent near the base of the Descartes Formation (Stone Mountain) and in addition to sampling, observations will be made on the relationships between the Cayley and Descartes formations.

One hour will be spent at Station 9 investigating boulders and ray material from South Ray Crater. A large boulder will be selected for detailed

sampling according to procedures outlined in the Field Geology experiment. Sampling of this region will not only provide material derived from below the surface several kilometers away but study of the length of exposure of these materials and materials from North Ray Crater will help to establish the rate of ray disappearance.

The remaining 40 minutes of the EVA is spent at the LM stowing samples and equipment and ingressing.

EVA II

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
LM	0:50	--	CAYLEY PLAINS	EGRESS AND EVA PREPARATION
TRAVEL	--	10	ACROSS CAYLEY PLAINS AND RAYS FROM SOUTH RAY	OBSERVE DISTRIBUTION OF RAYS, ABUNDANCE OF BLOCKS, AND SECONDARY CRATERS
4	0:15	--	IN CAYLEY PLAINS ADJACENT TO SOUTH RAY DEPOSITS	EXAMINE AND SAMPLE CAYLEY/RAY AREA: PAN DOCUMENTED SAMPLING SURFACE SOIL SAMPLE SHALLOW TRENCH SOIL SAMPLE
TRAVEL	--	19	ACROSS CAYLEY PLAINS TO BASE OF STONE MOUNTAIN	OBSERVE ANY CHANGES OF REGOLITH CHARACTERISTICS UPON APPROACH TO STONE MOUNTAIN. NOTE SLOPE CHARACTERISTICS ON STONE MOUNTAIN
5 STONE MOUNTAIN	0:30	--	IN DESCARTES FORMATION AT BASE OF STONE MOUNTAIN	NOTE CHARACTERISTICS OF DESCARTES FORMATION AND LOCAL GEOLOGY AND COMPARE TO ADJACENT CAYLEY: ASSESS UPSLOPE TERRACES: PAN DOCUMENTED SAMPLING - SURFACE SAMPLER SAMPLES (ONE ON UNDISTURBED SOIL, ONE ON TOP OF ROCK; RETURN ROCK) - CSVC (SINGLE CORE)

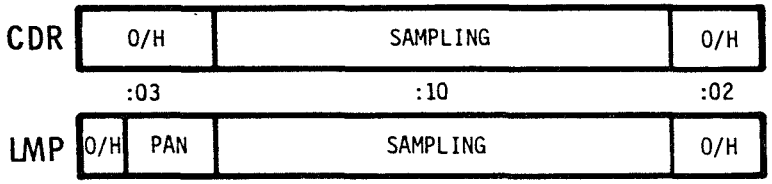
STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
TRAVEL	--	09	DESCARTES FORMATION	OBSERVE TERRACES AND ANY BEDROCK-REGOLITH CHANGES
6 STONE MOUNTAIN	1:00	--	SMALL CRATERS AT BASE OF TERRACE IN DESCARTES FORMATION. THE HIGHEST POINT REACHED IN THE DESCARTES FORMATION ON STONE MOUNTAIN.	OBSERVATION AND SAMPLING OF DESCARTES FORMATION: PAN - (TAKE ONE AT BEGINNING AND A SECOND AT THE MOST DISTANT POINT FROM THE LRV DURING SAMPLING DOCUMENTED SAMPLING - RAKE/SOIL SAMPLE - DOUBLE CORE (CONSIDER TRIPLE) 500 MM PHOTOGRAPHY UPSLOPE AND OTHER TARGETS PENETROMETER MEASUREMENTS
TRAVEL	--	02	DESCARTES FORMATION	OBSERVE TERRACES AND ANY BEDROCK-REGOLITH CHANGES
7 STONE MOUNTAIN	0:45	--	INTERMEDIATE AREA IN CRATERED AND TERRACED REGION OF DESCARTES FORMATION	STATION TO BE SELECTED AT SOME INTERMEDIATE POINT ON THE WAY DOWN STONE MOUNTAIN BASED ON THE ASSESSMENT FROM STATION 6 PAN DOCUMENTED SAMPLING 500 MM PHOTOGRAPHY OF SOUTH RAY CRATER (IF NOT TAKEN AT STATION 6)

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
TRAVEL	--	12	DESCARTES FORMATION	OBSERVE CRATERS, BLOCKS
8 STONE MOUNTAIN-STUBBY CRATER AREA	0:20	--	IN DESCARTES FORMATION AT BASE OF STONE MT. NEAR STUBBY	OBSERVE RELATIONS BETWEEN CAYLEY AND DESCARTES FORMATION IN STUBBY AREA: PAN DOCUMENTED SAMPLING - STUBBY RIM 500 MM PHOTOGRAPHY OF - SOUTH WALL OF STUBBY - OTHER TARGETS
TRAVEL	--	07	ACROSS CAYLEY FORMATION TO RAYS FROM SOUTH RAY CRATER	OBSERVE CHANGES IN REGOLITH AND NOTE CHARACTERISTICS OF RAYS
9 RAYS FROM SOUTH RAY CRATER	0:55	--	IN RAYS FROM SOUTH RAY CRATER OVERLYING CAYLEY	IN BLOCKY RAY AREA: PAN DOUBLE CORE RAKE/SOIL SAMPLE (REMOTE FROM LOCAL BOULDERS) DOCUMENTED SAMPLES - POSSIBLE BOULDER/PERMANENT SHADOW SESC SAMPLE - SELECT LARGE BOULDER FOR BOULDER SAMPLING - RAY SAMPLES

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
TRAVEL	--	13	ACROSS CAYLEY	OBSERVE RAY AND BLOCK DISTRIBUTION, COMPARE TO OTHER RAYS AND REGOLITH
10	0:20	--	FRESH ~50 M CRATER IN CAYLEY	PAN RADIAL SAMPLING OF SMALL FRESH CRATER: OBSERVE INTERIOR FOR COMPARISON WITH DOT CRATER ON EVA III.
TRAVEL	--	12	CAYLEY PLAINS	CHARACTERISTICS OF CAYLEY AND RAYS
LM	0:40	--	CAYLEY PLAINS	CLOSEOUT

TRAVERSE STATION TIMELINES - EVA II

STATION 4 - CAYLEY PLAINS (:15)

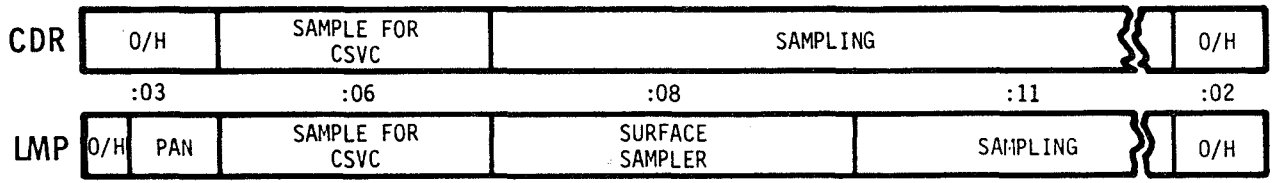


NOTES:

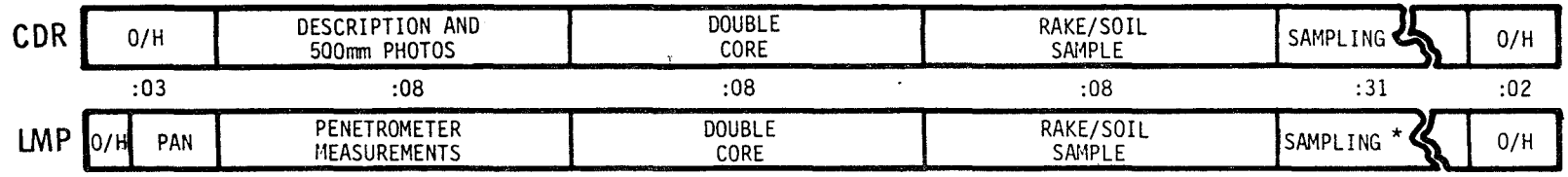
O/H = OVERHEAD

* = CONSIDER 2nd PAN NEAR END OF STATION IF TIME PERMITS.

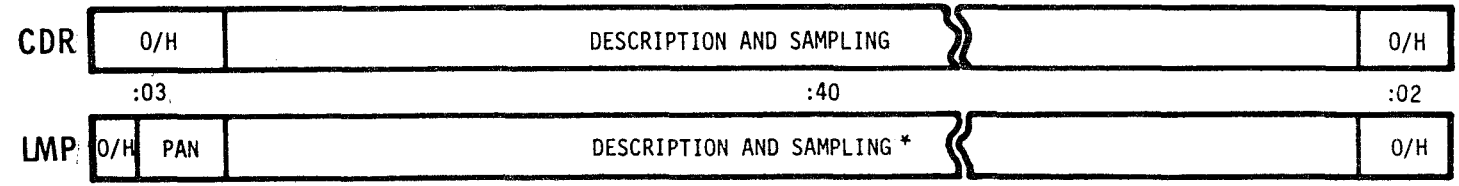
STATION 5 - BASE OF STONE MOUNTAIN (:30)



STATION 6 - STONE MOUNTAIN (:60)

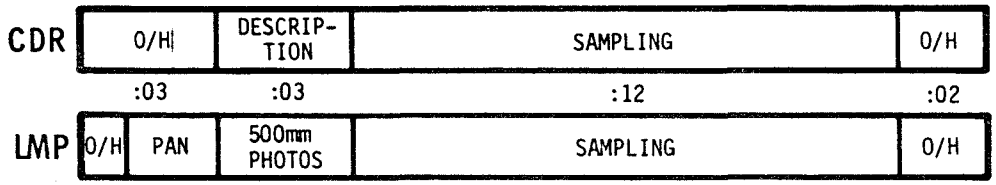


STATION 7 - STONE MOUNTAIN (:45)



TRAVERSE STATION TIMELINES - EVA II (CONT)

STATION 8 - STUBBY CRATER (:20)



NOTES:

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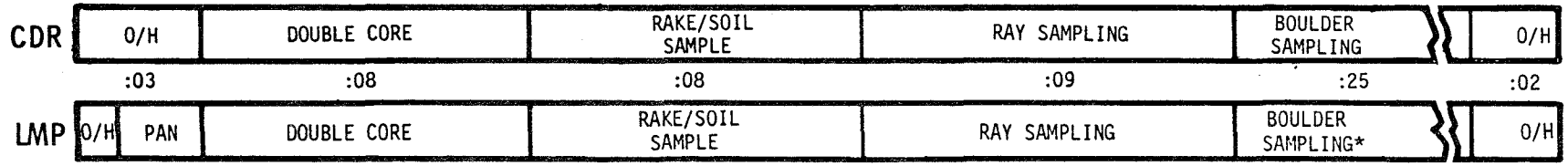
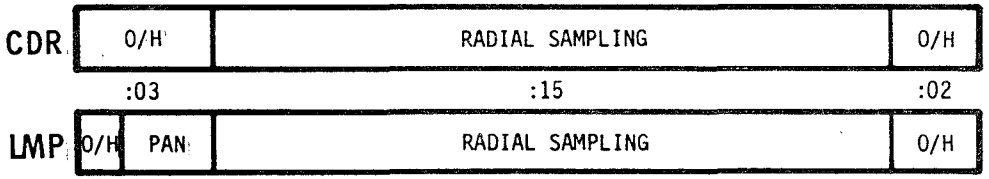
STATION 9 - SOUTH RAY EJECTA BLANKET (:55)



STATION 10 - CAYLEY PLAIN (:20)



EVA III TRAVERSE DESCRIPTION

Egress and preparation for the traverse will consume the first 3/4 hour of EVA III. The 5-1/2 hour traverse time will be used to investigate three broad points of interest; Smoky Mountain (Descartes Formation), and North Ray Crater and other areas in the Cayley Plains (Cayley Formation). Over two hours are spent in the vicinity of North Ray Crater (Stations 13 and 14) because of its importance in revealing the characteristics of the Cayley with depth. A crater of this size (~1 km) should have brought material up from a depth of 200 meters. Indeed, examination of the photography of the crater rim suggests that large blocks there may be correlated with different albedo banding seen in the crater wall. Extensive block sampling is planned there and 500 mm photography of the crater interior may not only document internal structures and stratigraphy but may also allow correlation of collected samples back into the crater stratigraphy.

Approximately one additional hour station time will be spent sampling the Cayley at four other stations (11, 12, 16 and 17) spread over the traverse route. Stops will include small craters less than 100 m diameter, such as Dot, and a larger crater, Palmetto, which while approaching North Ray in size, is much more subdued.

A second sampling of the Descartes Formation will involve investigation of the Smoky Mountain region. Approximately 3/4 hour is spent in extensively sampling that feature at a station whose exact location will be selected by the crew in real time.

Two portable magnetometer measurements will be taken on the traverse. After return to the LM, the last 3/4 hour will be spent stowing samples and equipment and ingressing.

EVA III

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
LM	0:45	--	CAYLEY PLAINS	EGRESS AND PREPARE FOR TRAVERSE
TRAVEL	--	22	ACROSS CAYLEY TOWARD NORTH RAY	OBSERVE CAYLEY AND RAYS FROM NORTH RAY
11	0:10	--	DOT CRATER; BLOCKY RIMMED POSSIBLY CONCENTRIC CRATER	PAN SOIL SAMPLE ROCK SAMPLE LPM READING
TRAVEL	--	15	TOWARD OUTER EJECTA BLANKET OF NORTH RAY CRATER	OBSERVE RAYS AND APPROACH TO EJECTA BLANKET
12	0:10	--	AREA NEAR OUTER EJECTA BLANKET OF NORTH RAY	SOIL SAMPLE ROCK SAMPLE
TRAVEL	--	03	UP ONTO RIM OF NORTH RAY	OBSERVE BLOCK DISTRIBUTION, VARIETY
13 NORTH RAY CRATER	0:56	--	SOUTH RIM OF NORTH RAY CRATER	EXAMINE EJECTA AND VIEW CRATER INTERIOR STEREO PAN DOCUMENTED SAMPLING 500 MM PHOTOGRAPHY OF CRATER RIM AND INTERIOR POLARAMETRIC PHOTOGRAPHIC AND SAMPLING

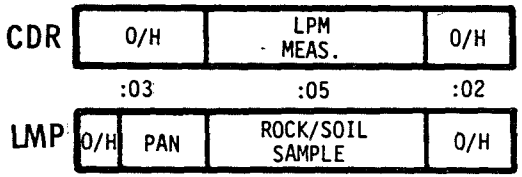
STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
TRAVEL	--	05	AROUND NORTH RAY RIM	NOTE BLOCK VARIETY AND DISTRIBUTION
14 NORTH RAY CRATER	1:05	--	AREA OF VERY LARGE BLOCKS ON SOUTHEAST RIM OF NORTH RAY CRATER	BLOCK FIELD WITH LARGE BLOCKS OF DIFFERENT ALBEDO: PAN 500 MM PHOTOGRAPHY OF INTERIOR OF NORTH RAY DOCUMENTED SAMPLING BOULDER SAMPLING RAKE/SOIL (REMOTE FROM LOCAL BOULDERS)
TRAVEL	--	14	FROM NORTH RAY TO BASE OF SMOKY MOUNTAIN (DESCARTES FORMATION)	OBSERVE TRANSITION WITH SMOKY MOUNTAIN
15 SMOKY MOUNTAIN	0:40	--	CRATER CLUSTER AT BASE OF SMOKY MOUNTAIN	IN DESCARTES FORMATION: PAN DOCUMENTED SAMPLING OF SMOKY MOUNTAIN - DOUBLE CORE (SINGLE, IF TRIPLE TAKEN ON STONE MT.) - RAKE SOIL 500 MM PHOTOGRAPHY OF SMOKY MT. PENETROMETER
TRAVEL	--	21	SOUTH ACROSS CAYLEY PLAINS TO PALMETTO CRATER	OBSERVE SMOKY MOUNTAINS/CAYLEY CHARACTERISTICS AND CHANGES
16 PALMETTO CRATER	0:36	--	RIM OF SUBDUED 1 KM CRATER IN CAYLEY PLAINS	PAN DOCUMENTED SAMPLING OF PALMETTO RIM SOIL/RAKE LPM READING

EVA III (CONT)

STATION	STATION TIME (HR:MIN)	TRAVEL TIME (MIN)	GEOLOGICAL FEATURES	OBSERVATIONS AND ACTIVITIES
TRAVEL	--	05	ACROSS CAYLEY PLAINS SOUTH OF PALMETTO TOWARD LM	OBSERVE LATERAL CHANGES IN CAYLEY CHARACTERISTICS
17	0:10	--	SOUTH RIM OF PALMETTO	DOCUMENTED SAMPLING SOIL/ROCK SAMPLE LPM READING
TRAVEL	--	13	ACROSS CAYLEY PLAINS TOWARD LM	OBSERVE CHARACTERISTICS OF CAYLEY PLAINS
LM	0:50	--	CAYLEY PLAINS	GRAND PRIX #2 CLOSEOUT

TRAVERSE STATION TIMELINE - EVA III

STATION 11 - DOT CRATER (:10)



NOTES:

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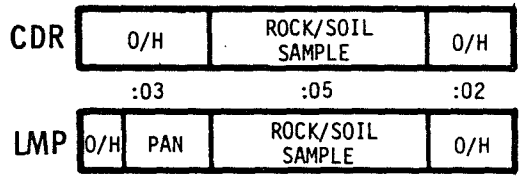
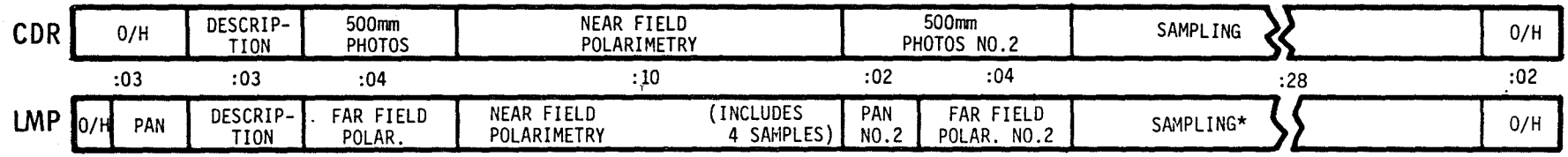
STATION 12 - NORTH RAY EJECTA BLANKET (:10)



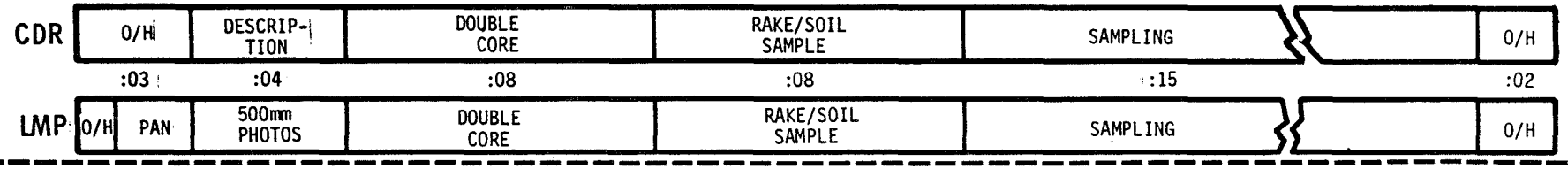
STATION 13 - NORTH RAY RIM (:56)



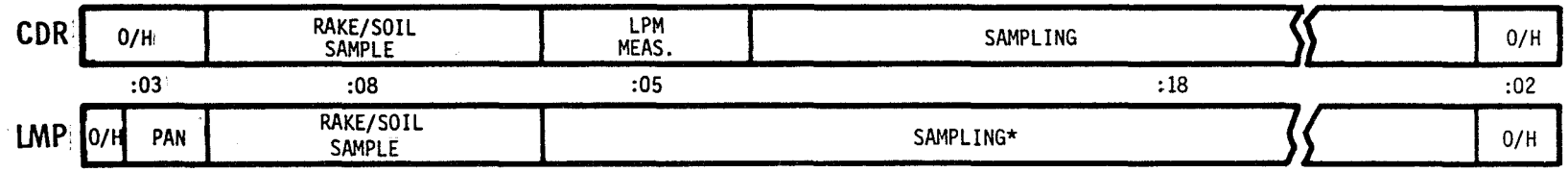
STATION 14 - NORTH RAY RIM (1:05)

TRAVERSE STATION TIMELINE - EVA III (CONT)

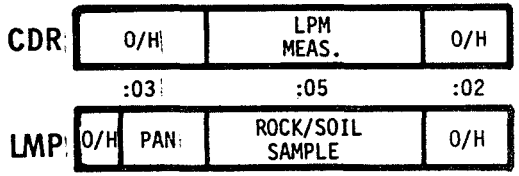
STATION 15 - BASE OF SMOKY MOUNTAIN (:40)



STATION 16 - PALMETTO CRATER (:36)



STATION 17 - SOUTH OF PALMETTO (:10)



Prelim
13-14

NOTES:

O/H = OVERHEAD

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SUN ELEVATION AND AZIMUTH AT DESCARTES