Viking Extended Mission Support

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This report covers the period from 1 January through 31 February 1978. It reports on DSN support of Viking spacecraft activities during the period and continues reporting on the DSN Viking Command and Tracking support. It also continues the reports on the status of DSN Mark III Data (MDS) Subsystem Implementation Project related Viking testing.

I. Viking Operations

A. Status

The two Viking Orbiters continued to make detailed photo maps of Mars during this reporting period. Viking scientists received close-up photos of surface feature details never before seen, as the planet slowly moved toward an alignment with the Earth and Sun.

As well as making detailed photographs of Mars, the Viking Orbiters also continued to check Martian cloud patterns, temperatures, and water vapor in the atmosphere. The Viking Landers continued their investigation into the composition of the Martian soil. Both Landers pushed rocks aside and picked up subrock soil samples for chemical analysis.

Photo mapping of the Mars surface by the Viking Landers also continued during this reporting period. Photographs of the Mars surface under one of Lander 1's descent rocket motors was taken using mirrors on the scoop mechanism.

On Jan. 19, 1978 the signal received from the Viking spacecraft reached its maximum signal level as the Earth-Mars distance reached a minimum of 99.7 million kilometers with a one-way-light-time of 5 min and 26 s.

B. Spacecraft Problems

On Feb. 8 the Viking Orbiter 2 spacecraft developed a major gas leak in the roll axis stabilization system. Despite vigorous corrective activity, the leak continued for more than two days. During this time, the leak was variable ranging from 100 g per day up to as much as 680 g (1.5 lb) per day. During the two days, about 900 g (2 lb) total of attitude control gas was lost. Prior to the leak, Orbiter 2 was using between 22 and 36 g of gas per day for normal operations. During the remaining weeks in February the Orbiter 2 spacecraft continued to experience an intermittent gas leak.

C. Radio Science

Radio Science activities and experimentation continued during January and February. These activities include near simultaneous Lander/Orbiter ranging, Orbiter 1 and 2 Earth occultation coverage, bistatic radar passes, and the Gravity Wave experiment passes.

II. Network Support

Table 1 shows the Viking Extended Mission (VEM) Tracking Support for January and February 1978. Noticeable during this period is the reduction of 64-m station support (DSS 14,

43, 63), from January to February. This will be a continuing trend as other Deep Space projects such as the Voyager mission to Jupiter and Saturn require the 64-m network.

III. DSN Mark-III Data Subsystem Implementation (MDS) Testing and Status

As indicated in the last report of this series, MDS test and training has been completed at all DSN stations except DSS 11 at Goldstone and DSS 61/63 in Spain. DSS 11 was released on 15 January to begin their MDS upgrade. DSS 61/63 completed their test and training during this reporting period.

A. DSS 61/63 Test Status

Test and training activity for Viking started in January and consisted of three Operational Verification Tests (OVTs), a DSN/MCCC System Interface Test (SIT), and a Viking Ground Data System (GDS) Test.

Two out of the three Viking OVTs were considered successful. The first OVT completed only 50% of the Sequence of Events (SOE) due to problems in the Simulation Conversion Assembly (SCA). The SCA is used by the DSN to simulate a spacecraft and generate simulated spacecraft telemetry data.

The SIT test as well as the first GDS test was also declared unsuccessful due to problems related to the SCA. On January 12 a successful Viking GDS retest was conducted at DSS 61/63.

After several successful demonstration passes with the Viking spacecraft, DSS 61/63 was placed under Viking configuration control effective January 31, 1978.

Table 1. VEM Tracking Support for Jan. and Feb., 1978

DSS	January		February	
	Tracks	Hours	Tracks	Hours
11	8	72		
12			4	13
14	40	319	25	218
42	22	166	23	76
43	57	294	14	207
44			11	51
61	10	88	38	243
62	6	27	2	25
63	13	101	21	181
Total	156	1067	138	1014

Note: Number of tracks represent the summation of all Viking spacecraft tracked. Track time represents scheduled station support.

Table 2. Number of Commands Transmitted in Viking Extended Mission During Jan. and Feb. 1978

DSS	No. of Commands	
	Jan.	Feb.
11	1947	
12		1
14	4565	1079
42	1447	1305
43	1593	1732
44		255
61	992	3548
62	1	1006
63	895	128
Total	11440	9054