Viking Orbiter Completion Mission

R. L. Gillette
Deep Space Network Operations Section

This report covers Viking Spacecraft activities from 1 April 1979 through 30 November 1979 and continues reporting on DSN Viking Tracking support for the same period.

I. Viking Operation

A. Orbiters

The Viking Orbiter 1 (VO-1) spacecraft continued to operate normally during this reporting period, collecting and returning to Earth weather data and high-resolution Mars surface photos, as well as relaying to Earth data from the Lander 2 (VL-2) spacecraft. Approximately 300 Mars photos a week have been returned to Earth during this reporting period. The Viking Orbiter 2 (VO-2) spacecraft ceased operation on 25 July 1978.

B. Landers

The Viking Landers also continued to operate as expected during this reporting period. All Lander 1 essential subsystems are healthy as the spacecraft collects imaging and meteorology data for weekly transmission to Earth whenever a Deep Space Station (DSS) is available. All Lander 2 essential subsystems are healthy, except for the transmitter which supports transmission of telemetry data directly to Earth. All data from Lander 2 are transmitted to Orbiter-1 and then relayed to Earth using the Orbiter transmitter.

II. Viking Orbiter Completion Mission

On 6 November 1979, a Viking Mars Orbit Trim Maneuver (MOT-20) officially terminated the Viking Survey Mission and moved the Viking Project into a new phase of the Viking Mission termed the Viking Orbiter Completion Mission. The Viking Orbiter Completion Mission (VOCM) is the fifth phase of the Viking Mission following the primary mission (terminated 15 November 1976), the Extended Mission (terminated 31 May 1978), the Continuation Mission (terminated 25 March 1979) and the Viking Survey Mission (terminated this reporting period, 6 November 1979). The Orbiter operations in the Completion Mission are currently scheduled to terminate on 1 February 1980. However, a proposal is currently being worked between the Viking Project and NASA to continue support until the Orbiter runs out of attitude control gas sometime in late 1980.

The objective of the Orbiter Completion Mission is to obtain moderate resolution photographic coverage of Martian surface areas not previously photographed or inadequately covered during the survey mission.

III. Viking Lander Monitor Mission

On 6 November 1979, along with the start of the Orbiter Completion Mission, the Lander 1 Spacecraft became a separate mission of its own, termed the Lander Monitor Mission (LMM). The objectives of the Lander Monitor Mission are to obtain S-band Ranging data from the surface of Mars periodically over a long time span for the conduct of Radio

Science and to obtain meteorology and imaging data from the surface of Mars periodically over a long time span to monitor and disseminate information relative to any significant changes with time.

Throughout the Lander Monitor Mission, the Lander 1 Spacecraft will be in an automatic-mission mode, operating autonomously on the programs that have previously been stored in the on-board computers. Lander-1 will be repointing its high-gain antenna and acquiring and storing imaging meteorology and engineering data frequently and will be ready to transmit these data to Earth every 7 or 8 days in response to a series of commands transmitted from a Deep Space Station. The Viking Lander 1 Spacecraft should be capable of returning Mars data up through 1990.

IV. Radio Science

The opportunity has arisen to make new radio occultation measurements of Mars with Viking Orbiter 1 during the Viking Completion Mission. Geometrically, the spacecraft as viewed from Earth is occulted by Mars every 24 hours for about 23 minutes. Acquisition of data from occultation events in November and December will provide new information on seasonal atmospheric fluctuations at the 5 km level, the correlation of ionospheric plasma temperature with solar activity, and improved characterization of several Martian topographic features.

During the period April 1979 through October 1979, the only Radio Science activity has been the near-simultaneous Lander-Orbiter Ranging Experiment.

V. Network Support

Table 1 shows the DSN tracking support for the Viking Mission from April 1979 through November 1979. Tracking support started increasing in July, as expected, with the resumption of science acquisition activity on the Orbiter 1 Spacecraft. Prior to July, because of pressure from Voyager and Pioneer for Network support, Orbiter 1 was placed in a housekeeping mode with all science instruments powered off at the end of the continuation Mission (25 March 1979). Since August, there has been a continual decrease in the requirements for tracking support. This is due to the reduction in overall tracking time required to return science data to Earth at the higher telemetry data rates made possible as Mars approaches opposition on 26 February 1980.

References

1. Gillette, R. L., "Viking Extended Mission Support", in *The Deep Space Network Progress Report 42-46*, pp. 29-32, Jet Propulsion Laboratory, Pasadena, California, August 15, 1978.

2. Gillette, R. L., "Viking Extended Mission Support", in *The Deep Space Network Progress Report 42-47*, pp. 15-20, Jet Propulsion Laboratory, Pasadena, California, October 15, 1978.

3. Gillette, R. L., "Viking Continuation Mission Support", in *The Deep Space Network Progress Report 42-48*, pp. 7-11, Jet Propulsion Laboratory, Pasadena, California, December 15, 1978.

4. Gillette, R. L., "Viking Continuation Mission Support", in *The Deep Space Network Progress Report 42-51*, pp. 14-18, Jet Propulsion Laboratory, Pasadena, California, June 15, 1979.

Table 1. DSN Viking Mission tracking support

DSS	1979							
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
11	2[a] / 14[b]	4 / 31	2 / 11	3 / 17	–	1 / 6	1 / 3	2 / 11
12	2 / 6	2 / 5	2 / 13	1 / 3	–	–	–	–
14	–	–	–	6 / 33	22 / 91	15 / 65	12 / 62	8 / 64
42	5 / 19	4 / 20	2 / 10	–	1 / 5	2 / 10	–	–
43	6 / 31	–	–	6 / 40	1 / 5	1 / 1	1 / 6	–
44	–	1 / 4	–	1 / 3	4 / 18	–	3 / 12	–
61	–	3 / 10	1 / 4	1 / 4	–	–	–	–
62	1 / 6	–	–	–	2 / 2	1 / 4	–	–
63	1 / 5	2 / 12	1 / 10	13 / 50	29 / 131	27 / 105	19 / 104	15 / 119
Total	17 / 81	16 / 82	8 / 48	31 / 150	59 / 252	47 / 191	36 / 187	25 / 194

[a]Number of tracks; the summation of all Viking spacecraft tracked.
[b]Track time: scheduled station support in hours.

a / b