# Viking Extended Mission Support

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*This report covers the period from 1 March through 30 April 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 Viking DSN Mark III Data Subsystem Implementation Project (MDS) related testing.*

## I. Viking Operations

### A. Status

The Viking Orbiter 1 spacecraft continued to make detailed photomaps of Mars during this reporting period and to return scientific data on Martian cloud patterns, temperatures, and water vapor in the atmosphere.

To conserve gas, the Viking Orbiter 2 scientific observations of the poles of Mars were discontinued during this reporting period and the spacecraft commanded into a roll drift mode of operation. In this mode Orbiter 2 cannot observe Mars or support relay links from Lander 2. However its radio signals were used to map gravity variations on Mars, caused by pockets of dense material called Mascons, which slightly change the orbital speed of the spacecraft.

The Viking Landers continued their investigation into the composition of the Martian soil. Plans were completed for automatic operation of both Landers with little or no instructions from Earth starting in early June.

### B. Orbiter 2 Aft-Bioshield Jettison

The Viking Orbiter 1 (VO-1) aft-bioshield (Fig. 1) was separated shortly after Lander separation in 1976. The shock impact on the VO-1 radio subsystem was a momentary change in the uplink signal level, indicating a momentary out-of-lock even with an uplink signal present. Also, a transient occurred in the traveling wave tube helix current, which required a half hour to recover. Because of these effects, and a failure in a gyro power supply on Viking Orbiter 2 (VO-2) at Lander separation, the VO-2 aft-bioshield was not separated during the Viking primary mission. The science community was interested in having this separation done during the extended mission, so as to provide a wider field of view for instrument operation.

The decision was made to separate the bioshield on March 3, 1978. The 64-meter Deep Space Station (DSS 63) located in Spain was the primary tracking station supporting the bioshield jettison with the 26-meter Spanish Deep Space Station (DSS 61) assigned as a backup if needed for commanding.

The separation sequence went entirely without problems. The first indication of a successful separation was an abrupt change in the spacecraft two-way doppler from DSS 63. The VO-2 aft-bioshield separation is the last major spacecraft event planned on either Orbiter.

### C. Spacecraft Problems

The VO-2 spacecraft developed a serious gas leak in the attitude control system in late March resulting in loss of half

of the spacecraft's remaining gas supply. To conserve gas the Orbiter's redundant attitude control system was switched on. To prevent depletion of the remaining gas due to leaks in the roll jets of the redundant attitude system, VO-2 was commanded into a roll drift mode of operation while scientists prepared the most useful science sequences for the remaining lifetime of the spacecraft.

### D. Radio Science

Radio Science activities and experimentation continued during March and April. These activities include near-simultaneous Lander/Orbiter ranging, VO-1 and VO-2 Earth occultation coverage, and the Gravity Field Experiment.

## II. Network Support

Table 1 shows the Viking Extended Mission (VEM) tracking support for March and April 1978. Noticeable during this period is the increase of 64-meter support (DSS 14, 43, 63) during April. This is primarily due to the gas leak problem on VO-2 requiring the additional 8-dB antenna gain from the 64-meter network over the 26-meter network to make up for the 21-dB signal loss when VO-2 was commanded into a roll drift mode and the transmitter configured to the spacecraft low-gain antenna.

Table 2 gives the total number of commands transmitted by the DSN for Viking Project during March and April 1978.

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

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

### A. DSS 11 Test Status

Test and training activities for Viking started in March and consisted of three Operational Verification Tests (OVTs) and a DSN/MCCC System Integration Test (SIT).

Only the third of the three Viking OVTs was considered successful. Problems in the Simulation Conversion Assembly (SCA) at DSS 11 and the Test and Training Computer in the Network Operations Control Area (NOCA) at JPL prevented testing of the telemetry system. Both the SCA and the Test and Training Computer are used by the DSN to simulate a spacecraft and generate simulated spacecraft telemetry data.

The first System Integration Test scheduled for 29 March was cancelled due to SCA problems and a last minute priority placed on the Viking Mission Computers by the Viking Project to support real-time operations. A Viking SIT retest on 7 April was considered successful.

After several successful demonstration passes with the Viking spacecraft, DSS 11 was placed under DSN Viking Configuration Control, effective 26 April.

**Table 1. VEM tracking support 1978**

| DSS | March | | April | |
|---|---|---|---|---|
| | Tracks | Hours | Tracks | Hours |
| 11 | 19 | 167 | – | – |
| 12 | 5 | 22 | 1 | 8 |
| 14 | 37 | 272 | 47 | 365 |
| 42 | 30 | 201 | 30 | 192 |
| 43 | 15 | 68 | 27 | 163 |
| 44 | 6 | 43 | – | – |
| 61 | 25 | 281 | 15 | 159 |
| 62 | 3 | 22 | 3 | 29 |
| 63 | 30 | 293 | 42 | 440 |
| Total | 170 | 1369 | 165 | 1356 |

Note: Number of tracks represent the summation of all Viking spacecrafts tracked. Track time, in hours, represents actual scheduled station support.

**Table 2. Commands transmitted during March and April 1978**

| DSS | Commands | |
|---|---|---|
| | March | April |
| 11 | 119 | – |
| 12 | 1 | 374 |
| 14 | 1326 | 3032 |
| 42 | 261 | 1079 |
| 43 | 124 | 275 |
| 44 | 3 | – |
| 61 | 1073 | 1503 |
| 62 | 461 | 73 |
| 63 | 2597 | 4005 |
| Total | 5965 | 10341 |

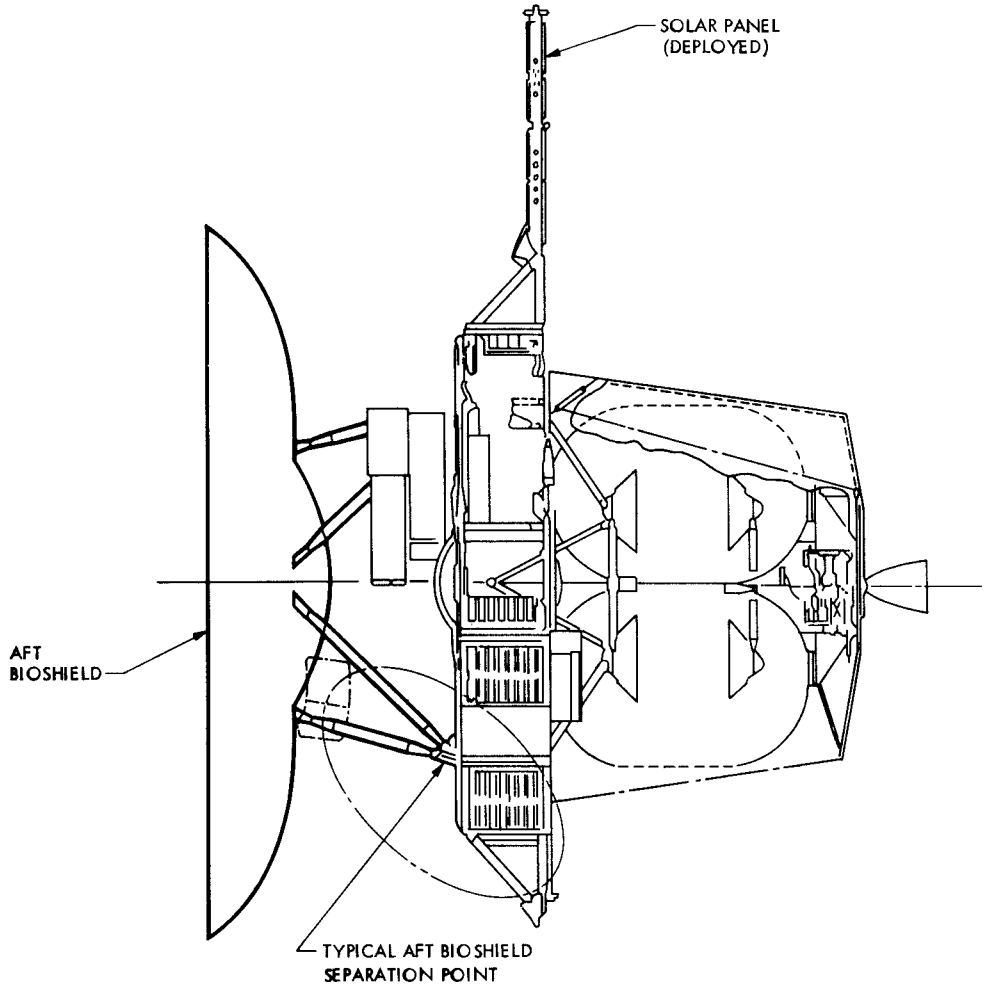


**Fig. 1. Location of aft bioshield separation points**