# Viking Mission Support

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*The previous article in this series described the results of the radio-frequency Compatibility Test Program for Viking test models of the Orbiter and Lander conducted at the Compatibility Test Area in August and September 1974. This article covers the initial phases of the network implementation for the Viking Project with particular emphasis on significant organizational changes that were found necessary to bridge a hitherto unforeseen gap between the higher level subsystem schedules and the lower level engineering modification schedules.*

## I. DSN Schedule Management

The DSN approach to schedule management for the Viking reconfiguration activities in the Deep Space Network has been described in Ref. 1. Starting from this basis, a family of schedules was developed starting with the Tracking and Data System (TDS) Level 3 Schedule and proceeding down through Levels 4 and 5 to individual deep space station implementation and test periods.

At Level 3, only major milestones representing TDS interaction with other systems of the Viking Project were identified. This schedule also included activities for the preparation of near-Earth support. The Level 3 schedule is updated monthly and published by the Viking Project Office, along with similar schedules for the other systems of the Project in Viking Project Working Schedules and Reports, Vol. II. A typical page from this document is shown in Fig. 1.

The next set of schedules shows activity necessary at each Deep Space Station (DSS) to meet the key milestones in Level 3. This, too, is updated monthly, in accordance with progress at each DSS and reported to the Viking Project Office for publication in the same document as the Level 3 schedules. A typical sheet for DSSs 11 and 14 for November 1974 is shown in Fig. 2.

At this point, it becomes necessary to identify implementation and test activity at the DSS subsystem level. For this purpose, a series of Level 5 schedules was developed. At Level 5, the required readiness dates for all DSS subsystems are shown together with the ensuing testing and training activities.

As in all the other schedules, the key dates needed to meet the committed Viking Project readiness dates are carried forward. These schedules are internal DSN documents and are distributed to the Project for information and to the DSSs and the implementation, test, and operations organizations as a basis for their own sub-tier planning.

The published document is called the DSN Viking Implementation Schedule and a typical page for November 1974 is shown in Fig. 3. This document is updated monthly from the data provided by the DSN Implementation Schedule (IMPSKED).

## II. Engineering Change Management

In October 1974, DSS 14 was out of service for approximately one month in order to reconfigure for the approaching Helios A launch, Pioneer 11 Jupiter encounter, and to include a substantial number of the engineering changes necessary to meet the Viking configuration published in Ref. 2.

At the conclusion of this work, it was intended to start Viking System Performance Testing in accordance with the foregoing schedules and plans. After several futile attempts to accomplish this work it became apparent that there was an urgent need for better visibility and control of the multitude of Engineering Change Orders (ECOs) which are needed to supplement the implementation of the subsystems before full system performance testing can be commenced.

Further investigation soon revealed that the ECOs needed for the other stations in the network were not clearly understood, and in many cases, were not scheduled properly to mesh with the subsystem need dates reflected in the Level 5 schedules. This implied a serious risk to the DSN's ability to meet the committed Project need dates.

## III. Corrective Action

At this point (November 1974), upper management attention was drawn to these potential difficulties, created to a large extent by the magnitude of the job involved, overloading of contributing organizations and preoccupation with preceding in-flight project problems, and the number of different organizational boundaries involved. A prompt response resulted in the establishment of a three-man task team charged to:

(1) Identify all the ECOs involved

(2) Select those essential to the Viking configuration

(3) Classify the essential ECOs according to categories of readiness

(4) Take all action necessary to expedite any of these latter ECOs which might delay the readiness dates

(5) Establish a frequent and regular reporting and management system at the ECO level.

The way in which the team was to work is shown in Table 1.

Division 33 was to compile the list of essential ECOs in order to permit the DSS directors to estimate subsystem readiness dates. Combined with operation data for the Mission Configuration Tests and the Operational Verification Tests, the DSN could estimate the chances of meeting the Viking need dates by comparison with the data originally provided by the Viking Project.

Where these dates could not be met, it became necessary to further reduce the test time (Organization 420), expedite the ECOs (Division 33), or renegotiate the Project need dates (Viking Project Office). As this work proceeded, all three approaches became necessary. The outcome of several iterations of this process had resulted in the DSN readiness summary shown in Fig. 4.

Further iterations were in progress to improve the schedule deviations to allow for contingencies which may arise in progress. Plans have been made for a computer-based ECO status reporting system using the following data sources as input:

(1) Data from the Engineering Division regarding engineering change kit deliveries to the cognizant operations engineers

(2) Data from the cognizant operations engineers regarding shipping and delivery of the modification kits to the stations

(3) Data from the station directors regarding implementation at the sites

It is planned to have this status reporting system in operation by mid-January 1975, and it will be described in the next report in this series.

## References


1. Mudgway, D. J., "Viking Mission Support," in *The Deep Space Network,* Technical Report 32-1526, Vol. XIII, p. 29, Jet Propulsion Laboratory, Pasadena, Calif., Feb. 15, 1973.

2. *DSN Preparation Plan, Rev. A,* Doc. 614-20, Nov. 15, 1973 (JPL internal document).

**Table 1. DSN Readiness summary**

| DSS | Readiness category | Start date | Total hours | Ready date | Project need date | Schedule deviation (12/3/74) |
|---|---|---|---|---|---|---|
| 14 | A/B | 11/15/74 | 499 | 2/24/75 | 2/10/75 | − 2 W[a] |
| | C | 11/15/74 | 92 | 2/15/75 | 6/9/75 | + 11 W |
| | F | 2/1/75 | 615 | 10/15/75 | 11/3/75 | + 2 W |
| 43 | C | 2/1/75 | 237 | 4/1/75 | 4/7/75 | + 1 W |
| | D | 4/1/75 | 198 | 7/1/75 | 8/1/75 | + 4 W |
| | F | 12/1/74 | 775 | 11/5/75 | 1/5/76 | + 8 W |
| 63 | C | 2/1/75 | 237 | 4/1/75 | 4/28/75 | + 4 W |
| | D | 4/1/75 | 198 | 7/1/75 | 8/1/75 | + 4 W |
| | F | 1/15/75 | 775 | 10/1/75 | 1/5/76 | + 12 W |
| 11 | A/B/C/F | 1/15/75 | 167 | 2/21/75 | 2/24/75 | 0 W |
| 42 | C/F | 2/1/75 | 177 | 3/7/75 | 4/7/75 | + 4 W |
| 61 | C/F | 2/1/75 | 177 | 3/7/75 | 4/28/75 | + 7 W |

[a]Ready date exceeds need date.

Maximum mission configuration test (MCT) rate is 10 hours per test, 2 tests per week.

Maximum operational verification test (OVT) rate is 6 hours per test, 2 tests per week for two weeks, prior to need date. Remaining OVTs are in parallel with system integration tests.

Station hours for ECO's which are not subject to MCTs or OVTs are not included in these estimates.

Categories of readiness:

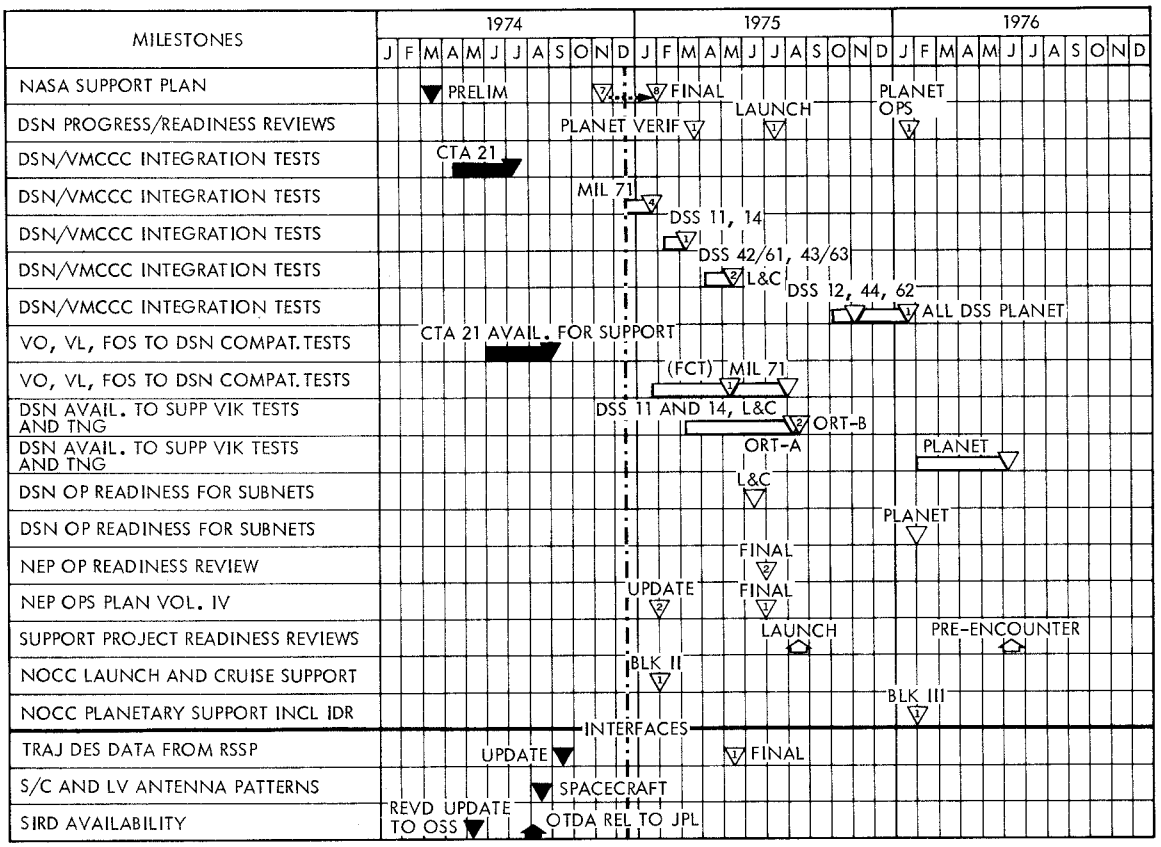
A Support planetary verification tests (telemetry and command)

B Support planetary verification tests (tracking and monitoring)

C Support launch phase system integration tests

D Block IV receiver committed at DSSs 43 and 63

F Support planetary phase system integration tests




RSSP - RANGE SAFETY SUPPORT PACKAGE

**Fig. 1. Extract from TDS schedule, Level 3 for November 1974**

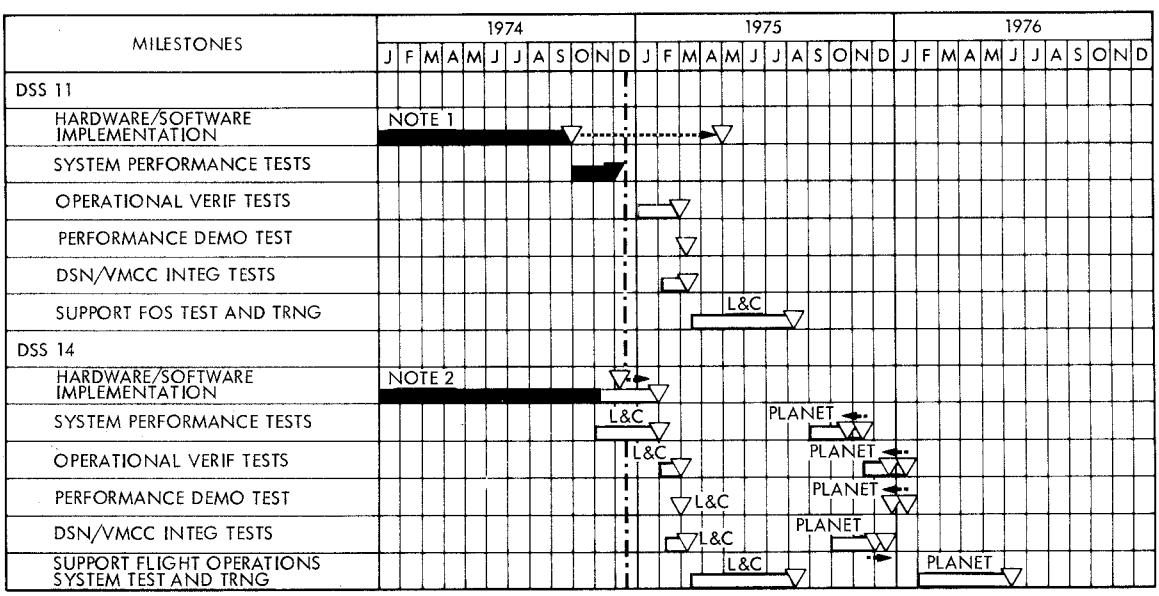



**Fig. 2. Extract from DSSs 11 and 14, Level 4 schedule for November 1974**

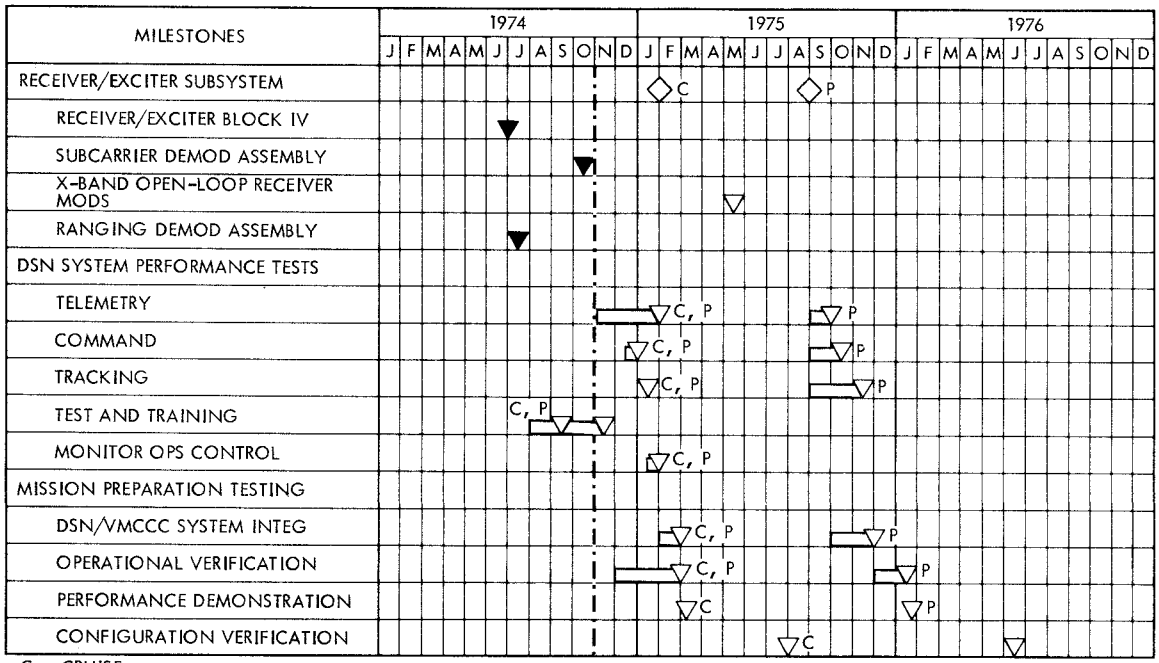



**Fig. 3. Extract for DSS 14 milestone schedule for November 1974**

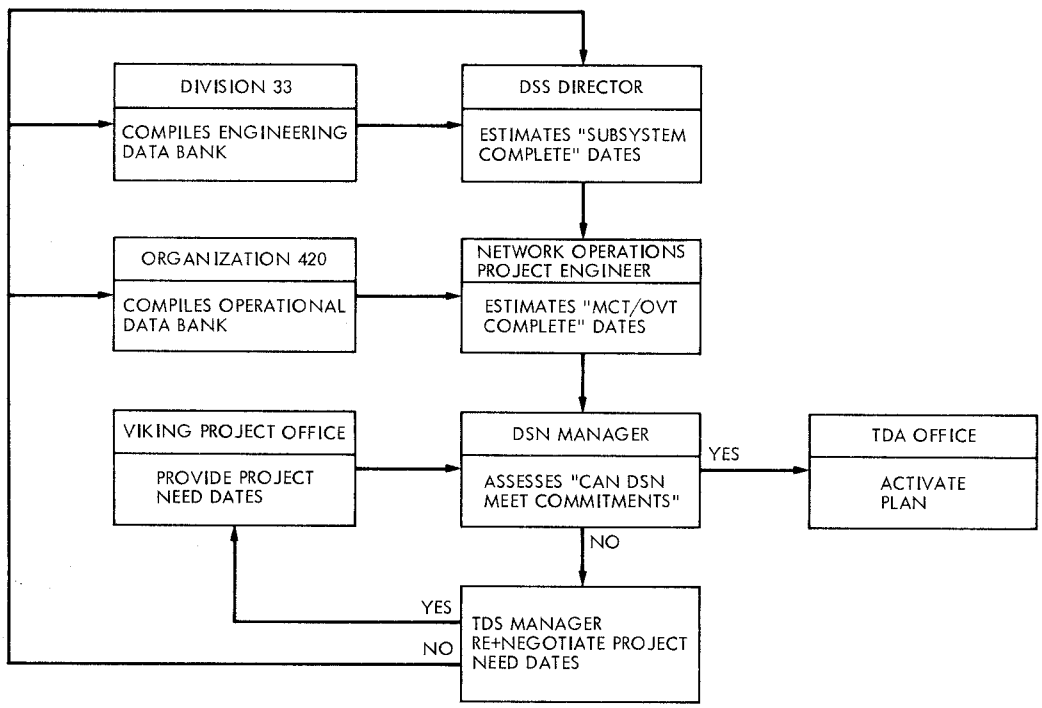



**Fig. 4. DSN/Viking readiness plan**