Deep Space Network Utilization for Flight Projects, Calendar Year 1981

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This article reports on the utilization of the Deep Space Network during calendar year 1981 in support of all flight projects.

I. Introduction

The Deep Space Network (DSN) Operations Scheduling Group, assigned to the Control Center Operations (CCO) Section, has the responsibility not only to schedule the allocation of network activities on a day-to-day basis, but also to forecast future network requirements and maintain accountability of how time is utilized throughout the network.

In order to accomplish these activities, various publications are generated by the DSN Scheduling Group (Ref. 1). Of these publications, the DSN Forecast (Ref. 2) and the Station Utilization Report, became the basis for the raw data utilized to develop this synopsis of flight project support for calendar year 1981. In addition, information is provided to show the number of real-time scheduling changes generated by each flight project. A real-time schedule change is a change to the original weekly published DSN 7-day operations schedule. Only changes that affected flight project support have been included.

II. Publications

A. DSN Forecast

The DSN Forecast provides a quarterly listing of:

(1) All project testing or tracking support required from the DSN. These requirements are based on each project's Support Instrumentation Requirements Document (SIRD) and Network Support Plan (NSP).

(2) Each project's required support by antenna size and longitude. Each unit of tracking requirement in the DSN Forecast represents 12 hours and is shown in 4-week increments.

(3) One year of history comparing project requirements vs actual support provided, and three years of project requirements in the future.

B. Station Utilization Report

The Station Utilization Report (SUR) published weekly provides:

(1) A breakdown of time accountability for each Deep Space Station (DSS) within the DSN, based upon its current station operating hours.

(2) A breakdown of all activities supported by work code category as authorized by the National Aeronautics and Space Administration's Office of Space Tracking and Data Systems.

III. Objective

The objective of this report is to show a correlation of flight project requirements and actual time received during calendar year 1981.

It must be noted that this report is only looking at one work code category utilized within the DSN. Currently there are three major work code categories with a total of 23 subcategories. These major work code categories and titles are listed below along with the number of associated subcategories.

(1) Work code category one, "DSN User Support," includes Spacecraft Tracking, Project/DSN Testing, Radio Astronomy, and Advanced Systems. There are a total of 11 subcategories.

(2) Work code category two, "Facility Support," includes Maintenance, Training, Engineering Support and Minor Modifications. There are a total of nine subcategories.

(3) Work code category three, "Other Activities," includes Major Modifications, Host Country Radio Science, and Miscellaneous. There are a total of three subcategories.

IV. Data Synopsis

A. Total Hours by Individual Flight Project

Table 1 shows the total hours requested and total hours received by individual flight projects. The percentages reflect how the total requirement for each individual flight project was satisfied. Actual hours received include pre/post calibration times.

B. Total Hours of All Flight Projects

The same hours were utilized for Table 2. However, the percentages were based on total hours for all flight projects for both requested hours and actual hours. The far-right-hand column denotes the total number of hours from acquisition of signal (AOS) to loss of signal (LOS) for each flight project.

C. Flight Project Percentage Distribution

Figure 1 represents a quick-look view by flight project and distribution of the percentage of hours in work code category IAI.

D. Flight Project Hours, Schedule Changes and Major Milestones

Figure 2 represents a quick-look correlation of flight project hours, changes to the weekly published DSN 7-day operations schedule and major milestones relative to calendar year 1981. The data are presented in 13 blocks, with each block containing four weeks of data.

V. Summary

During calendar year 1981, the Deep Space Network expended 63% of its total capability in support of work code category IAI, "Flight Project Support." The prime flight projects supported were Pioneer 10, Pioneer 11, Pioneer-Venus, Viking, Helios 1, Voyager 1 and Voyager 2. In addition, Pioneer 6, Pioneer 7, Pioneer 8 and Pioneer 9 were provided support on a best efforts basis.

Many factors influence the total number of hours provided for flight project support. Some of the major factors in 1981 are listed below:

(1) The fluctuation of mutual viewperiods between all spacecraft which became critical from September through December 1981.

(2) Extended station downtimes

DSS 14 2 Jan.–15 Jan. 1981

DSS 42 12 Jan.–2 Jan. 1981

DSS 12 4 Feb.–22 Mar. 1981

DSS 14 5 Oct.–25 Nov. 1981

(3) Termination of Helios 2 on 8 Jan. 1981.

(4) Voyager 2 Saturn Encounter on 27 Aug. 1981.

(5) Termination of the 26-meter subnet (DSSs 11, 44, and 62) on 1 Dec. 1981.

References

1. Durham, R., "DSN Scheduling System," *TDA Progress Report 42-62*, pp. 132–141, Jet Propulsion Laboratory, Pasadena, Calif., Apr. 15, 1981.

2. Enari, D. M., and Holritz, C. A., "Network Loading Visibility for Management," *DSN Progress Report 42-31*, pp. 128–131, Jet Propulsion Laboratory, Pasadena, Calif., Feb. 15, 1976.

Table 1. Total hours received by individual flight project

Project	Requested hours	Actual hours	% of $\frac{\text{actual hours}}{\text{requested hours}}$
Pioneer 6	0	184.5	–
Pioneer 7	0	163.1	–
Pioneer 8	0	58.7	–
Pioneer 9	0	541.7	–
Pioneer 10	8,748	5,551.8	63.5
Pioneer 11	9,078	6,042.8	66.6
Pioneer-Venus	12,852	9,773.3	76.0
Viking	606	132.3	21.8
Voyager	25,650	20,786.0	81.0
Helios	4,872	4,745.7	97.4

"Actual hours" includes pre- and postcalibration time.

Table 2. Total hours of all flight projects

Project	Requested hours	Percent of total requested hours	Actual hours	Percent of total actual hours	Spacecraft hours
Pioneer 6	0	–	184.5	0.4	139.5
Pioneer 7	0	–	163.1	0.3	113.7
Pioneer 8	0	–	58.7	0.1	47.5
Pioneer 9	0	–	541.7	1.1	428.8
Pioneer 10	8,748	14.1	5,551.8	11.5	4,689.4
Pioneer 11	9,078	14.7	6,042.8	12.5	5,109.0
Pioneer-Venus	12,852	20.8	9,773.3	20.3	8,277.1
Viking	606	1.0	132.3	0.3	74.3
Voyager	25,650	41.5	20,786.0	43.4	16,516.5
Helios	4,872	7.9	4,745.7	10.0	3,784.3

"Actual hours" includes pre- and postcalibration time.

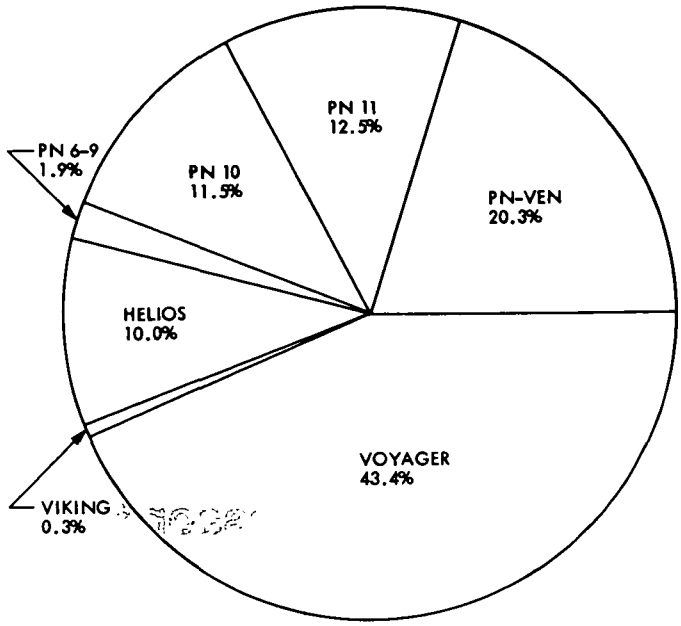

Fig. 1. Flight project percentage distribution

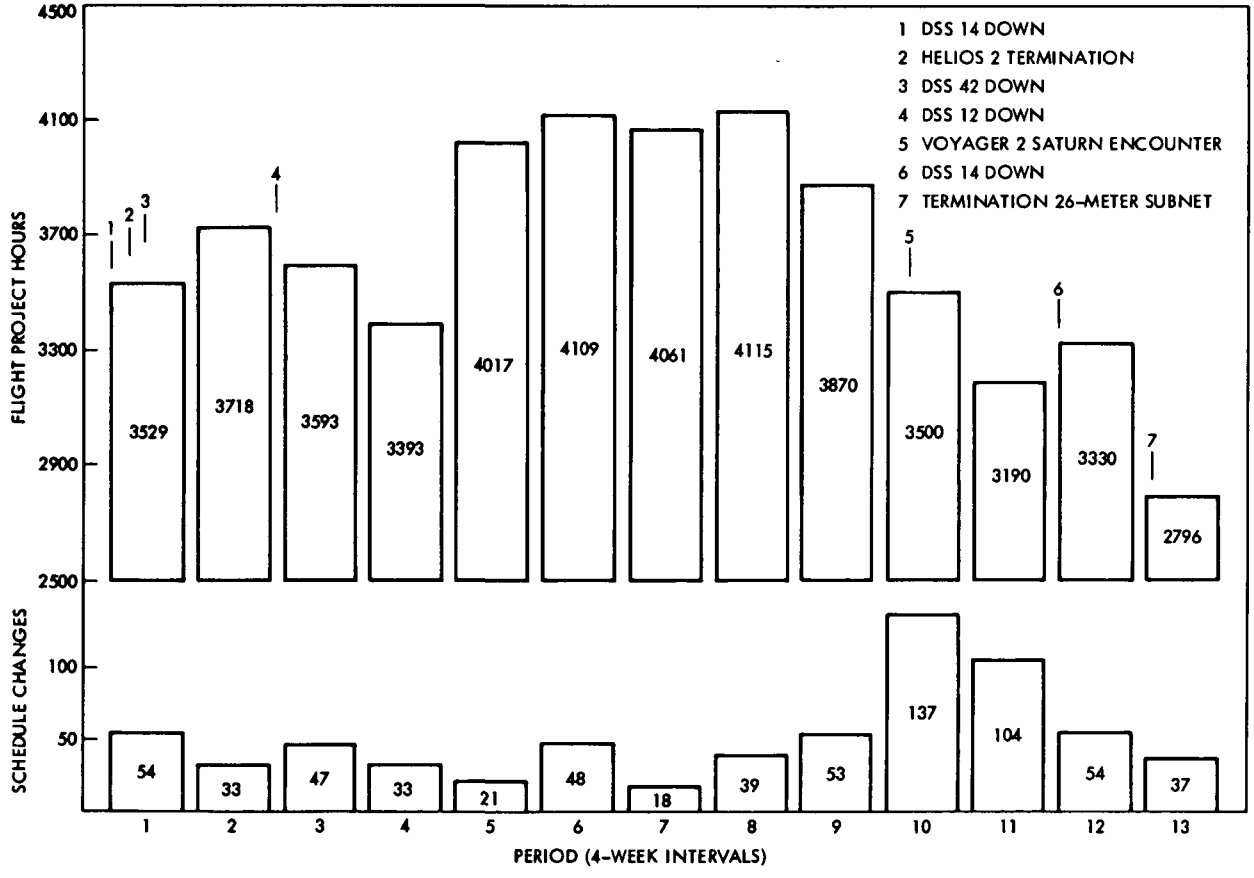

Fig. 2. Flight project hours, schedule changes, and major milestones