Helios Mission Support

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This article reports on activities of the DSN Network Operations Organization in support of the Helios Project from 15 December 1977 through 15 February 1978.

I. Introduction

This article is the twentieth in a continuing series of reports that discuss Deep Space Network support of Helios Mission Operations. Included in this article is information on Mark III Data Subsystems (MDS) testing at the conjoint Deep Space Station 61/63 (Madrid, Spain) and other mission-related activities.

II. Mission Operations and Status

The Helios-1 spacecraft experienced an anomaly over DSS 43 (Canberra, Australia) on January 2, 1978. DSS 43 lost the downlink, and at first the station suspected a maser problem but after investigating this possibility all station systems checked normal. DSS 44 (Honeysuckle Creek, Australia) was then asked to track the spacecraft, but no signal was observed. The spacecraft was then blind-commanded to its original configuration and carrier lock was achieved on DSS 43's receiver, but no telemetry data lock was obtained. Additional commands were transmitted to configure the spacecraft to 512 bits per second (bps) coded telemetry in Format 4. At 04:34 UTC, DSS 43 reported data lock. The reason for the anomaly was subsequently traced to a spacecraft regulator switch caus-

ing a power drop, which knocked the high-gain antenna off point resulting in a loss of downlink signal. Later, the data rate was changed to 256 bps to improve the signal-to-noise ratio (SNR).

On January 24, 1978, at 04:16 UTC, Helios-2 passed through its sixth aphelion with no scheduled ground station support. Last support prior to aphelion was over DSS 12 (Goldstone, California), which had LOS at 21:05 UTC on 23 January. The next support after aphelion was over DSS 67 (Germany). The spacecraft was in a medium power mode and only Experiments E-5A, E-5C and E-8 were on.

On January 15, 1978, DSS 42 (Canberra, Australia) lost Helios-2's downlink due to lunar occultation. Because the predicts did not show this event occurring, 1.4 hours of data were lost which could have been stored on board the spacecraft for future recovery. As a result, the appropriate parties have been notified and hopefully this type of oversight will not occur in the future.

A special Helios-2 de-spin maneuver over DSS 42 was conducted on January 16, 1978. Two attempts were required because the spacecraft's power regulator No. 1 switched on the first attempt, causing a maneuver abort.

On January 27, 1978, the Helios-2 spacecraft passed through its fourth aphelion. Ground station coverage was provided by DSS 42 (Canberra, Australia). The spacecraft was configured in medium power mode with all experiments on, except for E-3 and E-9. Overall coverage of both Helios-1 and Helios-2 for this period is listed in Table 1.

III. Special Activities

A. DSN Mark III Data Subsystems (MDS) Update

As reported earlier (Ref. 1), DSS 61/63 (Madrid, Spain) began MDS implementation on October 16, 1977. The Complex began its test and training phase on January 1, 1978. The Helios training consisted of demonstration tracks being conducted with DSS 61 (the 26-meter side) and DSS 63 (the 64-meter side). The first demonstration track was successfully performed on January 14, 1978. A total of six demonstration tracks were performed with DSS 61/63 with no major difficulty.

The DSS 61/63 Complex was placed under configuration control to support all flight projects on January 31, 1978.

On January 15, 1978, DSS 11 (Goldstone, California) was deactivated for MDS implementation. This is the last DSN facility to undergo modification and will complete the network's MDS upgrade. The MDS configuration for DSS 11 is shown in Figure 1. A report on DSS 11 will appear in the next article.

### B. Support of On-Board and Ground Experiments

In the last article, it was hoped that some results of the Experiment 12 (Faraday Rotation) data analysis would be available for this article, but this is not the case. As of this time, no data have been released for publication. As was stated before, due to the large amount of data collected, processing is taking longer than expected. As soon as results become available, they will be summarized in the next sequential article.

Reference

1. Goodwin, P. S., Rockwell, G. M., "Helios Mission Support", in *The Deep Space Network Progress Report 42-43*, pp. 24-46, Jet Propulsion Laboratory, Pasadena, California, December 15, 1977.

Table 1. Helios Tracking Coverage

Month	Spacecraft	Station Type	Number of Tracks	Tracking time (Hours, Min.)
December	Helios 1	26 Meter	56	185:14
		64 Meter	9	60:43
	Helios 2	26 Meter	26	191:31
		64 Meter	0	0:00
January	Helios 1	26 Meter	45	332:52
		64 Meter	2	11:56
	Helios 2	26 Meter	42	312:37
		64 Meter	7	51:30
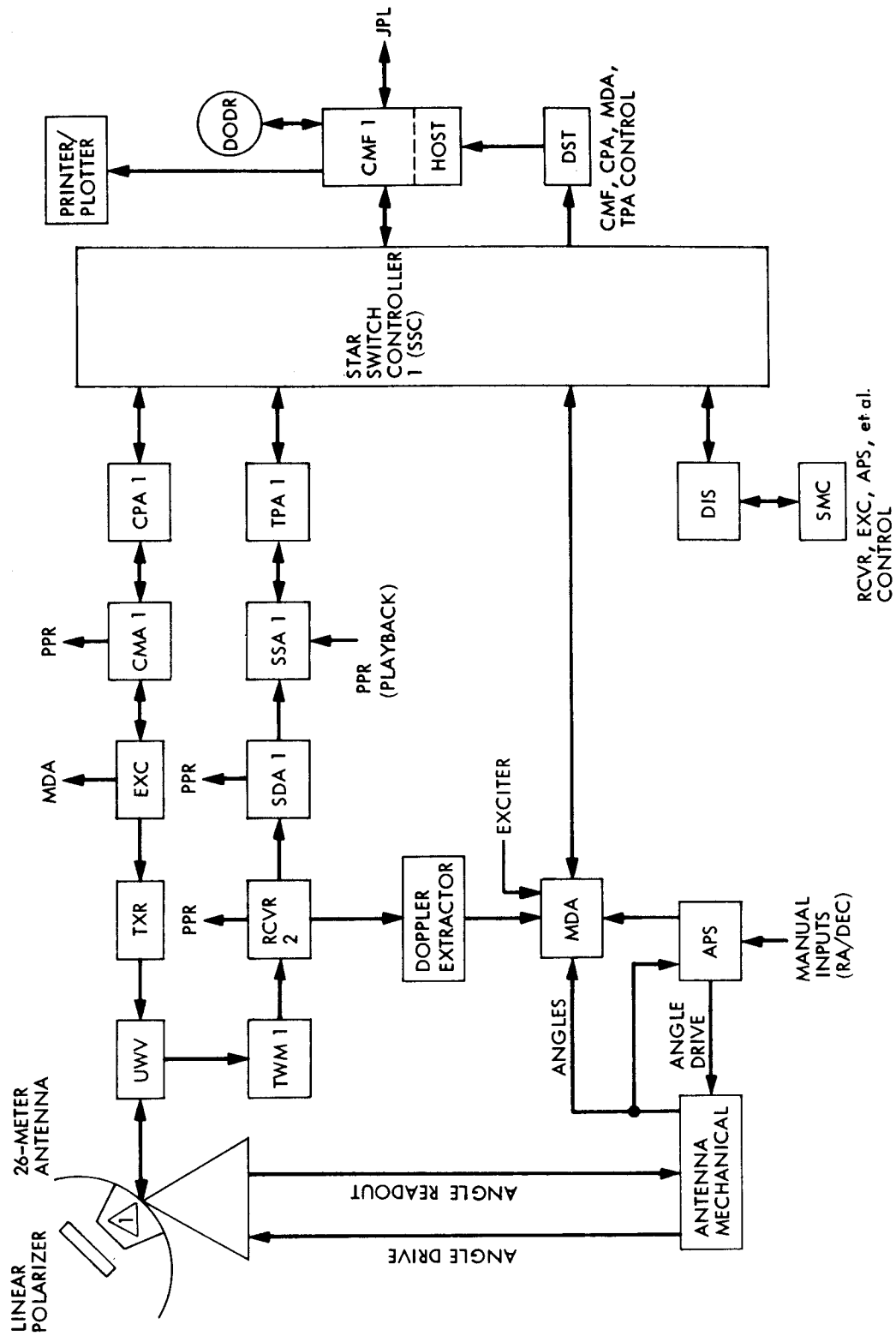
Fig. 1. Standard Helios configuration for DSS 11