Helios Mission Support

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TDA Mission Support

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This article reports on activities of the Network Operations organization in support of the Helios Project from 15 August 1977 through 15 October 1977.

I. Introduction

This article is the eighteenth in a continuing series of reports that discuss Deep Space Network support of Helios Mission Operations. Included in this article is information on the Mark III Data Subsystem (MDS) update at the conjoint Deep Space Station 42/43 complex (Canberra, Australia), an update on Radio Science Activities (Ref. 1), and other mission-oriented activities.

II. Mission Operations and Status

The Helios-1 spacecraft continued in a normal manner during this period, while it reached a major milestone of its journey. On September 4, 1977, the Helios-1 spacecraft entered its 1000th day – exceeding its guaranteed 18-month life by more than a year. Helios-1 is now in its sixth orbit around the Sun and still going strong despite numerous anomalies. At present the spacecraft is nearing its sixth perihelion, which will occur on October 21, 1977. The perihelion phase will run from October 9, 1977, through November 2, 1977. This period of high scientific interest will be covered in the next article of this series.

Helios-2 has also continued in a normal manner during this period with no major occurrences. As in the case of Helios-1, Helios-2 is also nearing a perihelion phase. This period will run from October 14, 1977, through November 7, 1977, with its fourth perihelion occurring on October 26, 1977. On October 4, 1977, from 2220 GMT until 0030 GMT, DSS-14 (Goldstone, California) was unable to acquire sync on the data from Helios-2. At a Sun-Earth-probe (SEP) angle of 0.89 degrees, the spacecraft entered the blackout region. The spacecraft was put in its read-in mode: DATA MODE 4, format 3, and 8 bits per second (b/s) coded. While in this configuration, the spacecraft will store data without any further commanding until October 12, 1977, and then will change to real-time transmission. The next tracking pass is scheduled for October 8, 1977, over DSS 63 (Spain) from 0930 GMT to 1300 GMT at an SEP angle of 1.0 degree. Good solid data lock is again expected at an SEP angle of 3.5 degrees, which will occur on October 12, 1977.

The relationship between the SEP angles of both Helios spacecraft is shown in Fig. 1. This figure shows clearly the close alignment of the two spacecraft during this period.

Overall coverage of both Helios-1 and Helios-2 is listed in Table 1.

III. Special Activities

A. DSN Mark III Data Subsystem (MDS) Support of Helios

As reported in the last article (Ref. 1), the conjoint complex DSS 42/43 (Canberra, Australia) was taken down for MDS implementation on July 15, 1977. The complex was brought up on September 26, 1977, to begin its MDS test and training phase. The first Helios demonstration track was on October 2, 1977, and was very successful. Other demonstration tracks are scheduled during this period and will be reported in the next article of this series. The Helios configuration for DSS 42/43 is shown in Fig. 2. This will be the same for DSS 61/63 (Spain), which begins MDS implementation on October 16, 1977.

B. Support of On-Board and Ground Experiments

As indicated before (Ref. 1), this perihelion period is of extreme interest to the science experimenters. The activities occurring during this period of October to December 1977 are shown in Fig. 3. Of these, the unique periods are the radial and spiral lineups and the Special Traveling Interplanetary Phenomena (STIP) period IV. The latter involves alignment of Helios-2 (1/4 AU in front of Earth). Voyagers 1 and 2 (1/2 AU behind Earth – down the tail), and Pioneer 9 (in front of Earth). Also, certain Earth satellites will be involved, such as ISEE-A and -B, GEOS, and IMPs H and J, and will be acquiring data along with the IMS Magnetometer Network and the European Ground Arrays. This presents a unique opportunity for interplanetary and terrestrial magnetospheric measurements. Hopefully, results of the above-planned activities will be available for the next article.

Data collection for Experiment 12 (Faraday Rotation) and the Solar Wind Experiment is also underway during this perihelion period. For Experiment 12, polarimetry and Meteorological Monitor Assembly (MMA) data collection is involved as it was earlier this year during Helios-2 superior conjunction (Ref. 2). The results of these experiments will be covered in the next article of this series.

References

1. Goodwin, P. S., Burke, E. S., Rockwell, G. M., "Helios Mission Support," in *The Deep Space Network Progress Report 42-41*, pp. 39-42, Jet Propulsion Laboratory, Pasadena, California, August 15, 1977.

2. Goodwin, P. S., Burke, E.S., Rockwell, G. M., "Helios Mission Support," in *The Deep Space Network Progress Report 42-40*, pp. 52-56, Jet Propulsion Laboratory, Pasadena, California, June 15, 1977.

Table 1. Helios tracking coverage

	Spacecraft	Station Type	Number of Tracks	Tracking time (Hours, Mins.)
August	Helios-1	26-meter	30	233:24
		64-meter	0	0:00
	Helios-2	26-meter	0	0:00
		64-meter	26	99:54
September	Helios-1	26-meter	39	225:16
		64-meter	0	0:00
	Helios-2	26-meter	0	0:00
		64-meter	30	94:18

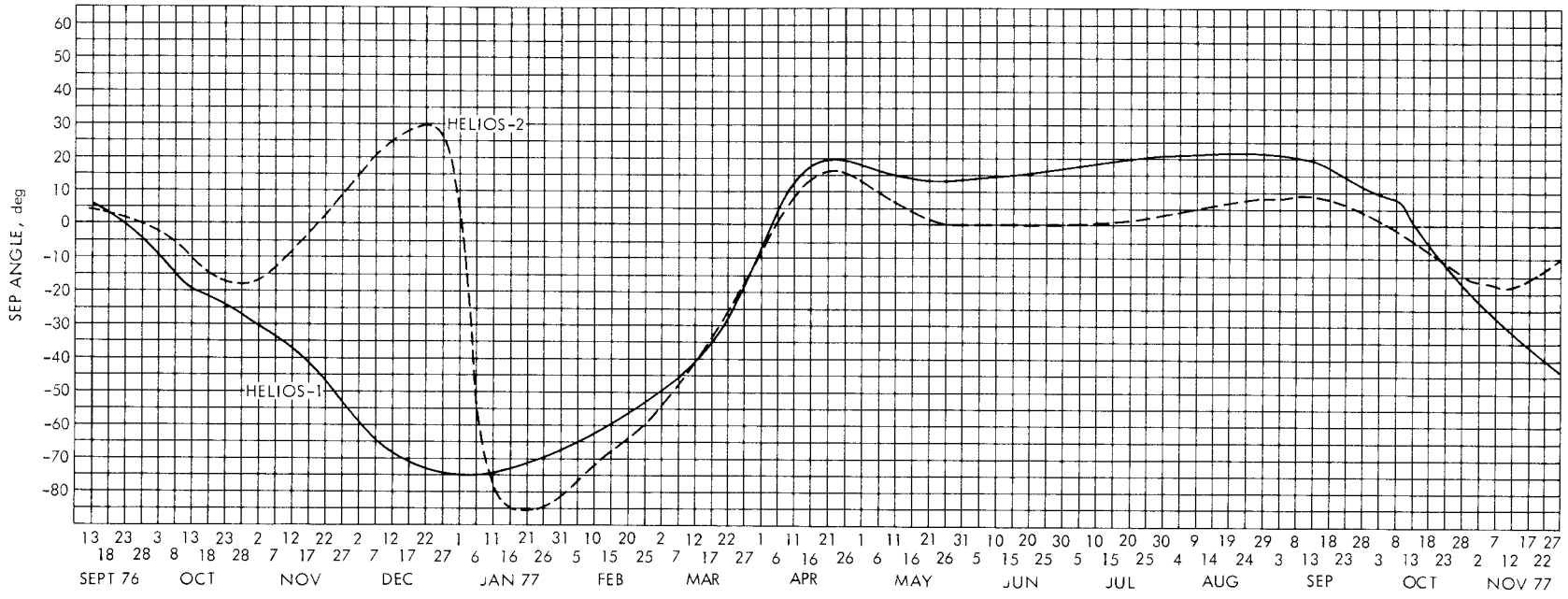

Fig. 1. Relationship of Helios-1 and -2 SEP angles vs time

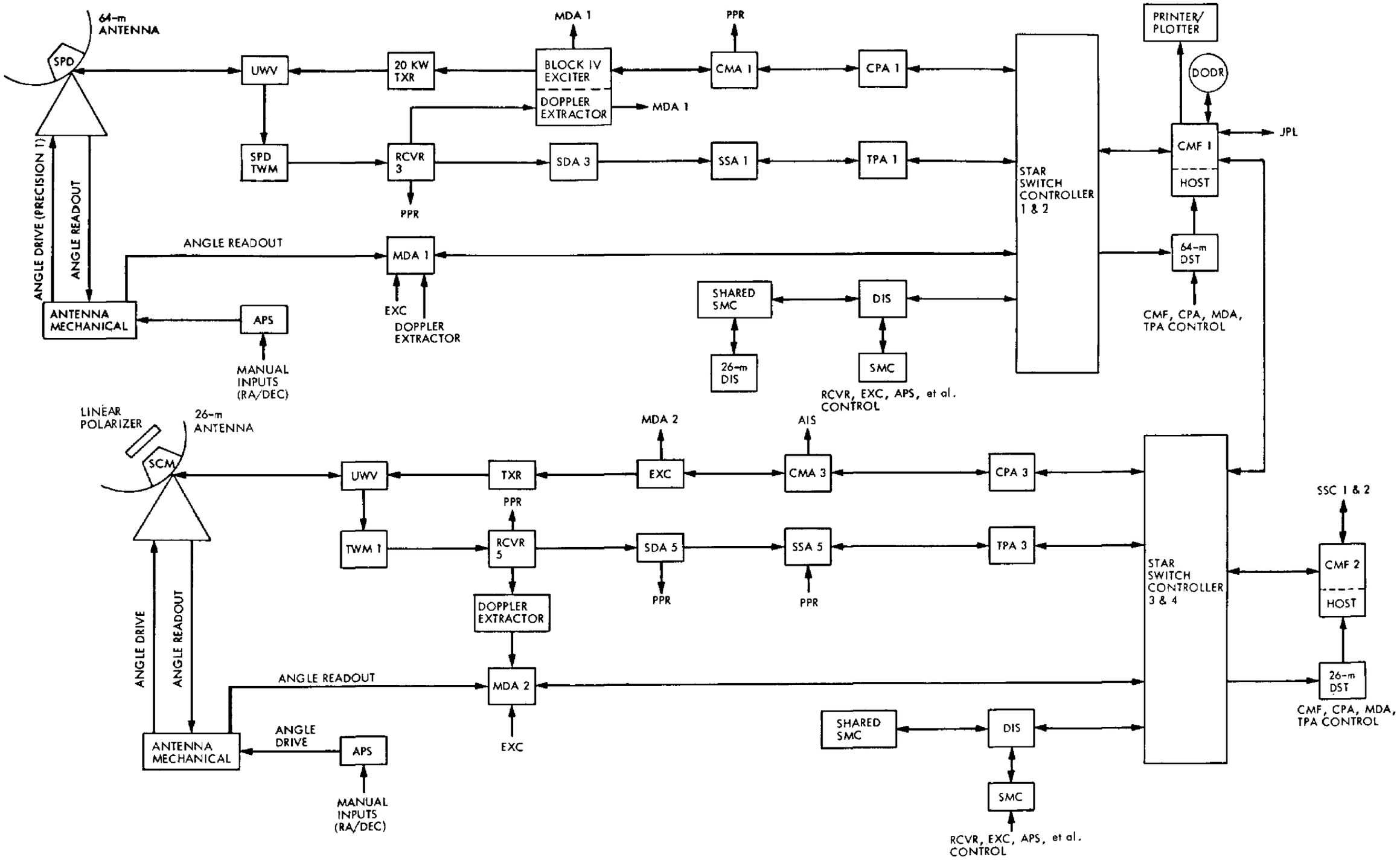

Fig. 2. Standard Helios configuration for DSSs 42/43 and 61/63

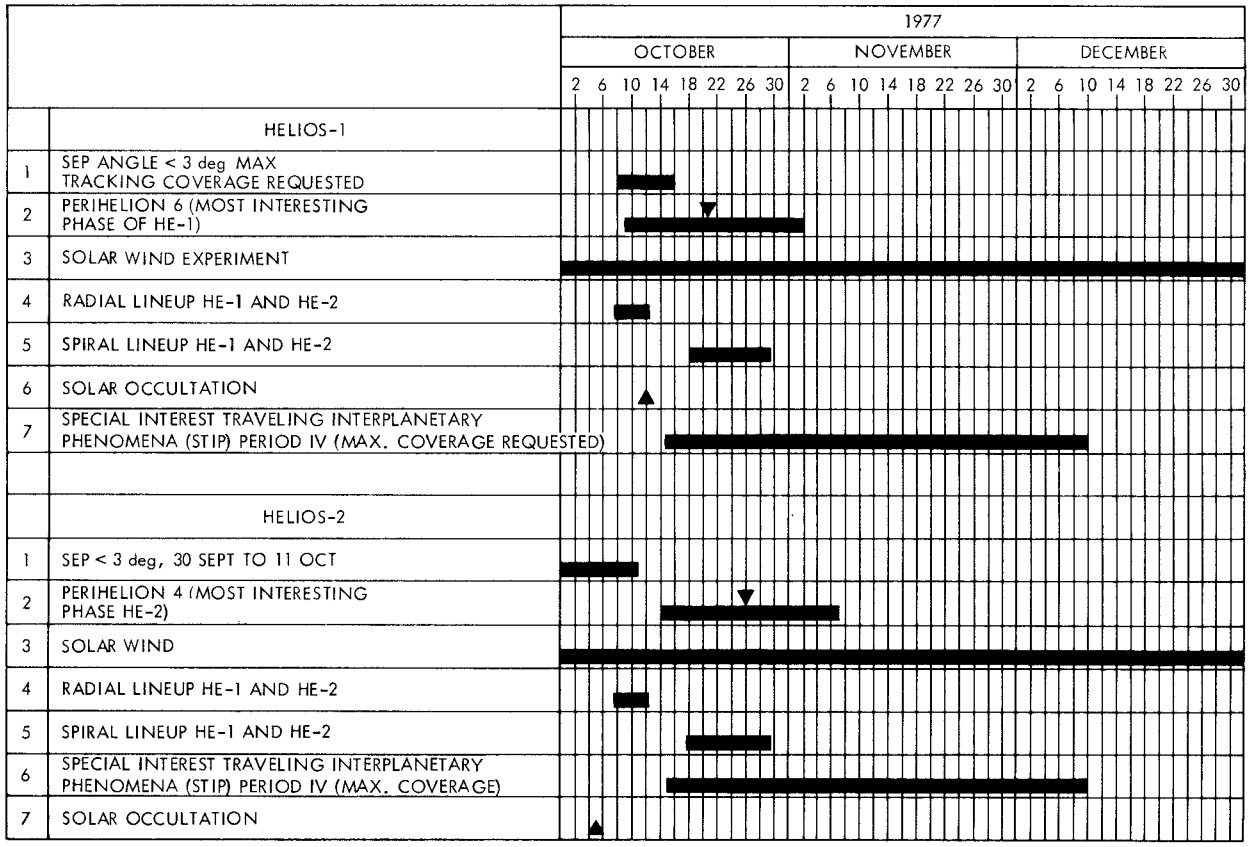

Fig. 3. Helios high activity period