Helios Mission Support

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TDA 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 June through 15 August 1978.

I. Introduction

This article is the twenty-third in a continuing series of reports that discuss Deep Space Network support of Helios Mission Operations. Included in this article is information on the Helios 1, 7th aphelion, Helios 2, 5th aphelion, science experiments, 22-bit error polynomial code (EPC) testing, and other mission-related activities.

II. Mission Operations and Status

On 23 July 1978, during a DSS 44 (Honeysuckle Creek, Australia) track, the downlink from Helios 1 was lost at 00:53 Universal Time, Coordinated (UTC). Shortly before that, an unexpected increase of the regulator output power suggested that another switch of the regulator (Ref. 1) had occurred. A spacecraft emergency was declared and 64-m DSS coverage requested from DSS 43 (Canberra, Australia). Helios 1 was acquired by DSS 43 at 03:24:45 UTC. As a result of the regulator switch, the high-gain antenna was off point and had to be commanded back to Earth point before normal operations could resume. Over 600 discrete commands were required to accomplish this pointing. The spacecraft emergency was subsequently lifted at 09:20 UTC. Since all spacecraft systems appeared operational, it was decided to leave Helios 1 in telemetry format 4 (no science data) and to monitor it 2 to 6 h per day, and further, to place the remaining available tracking coverage onto Helios 2 for science data collection.

On 2 August 1978, Helios 1 passed through its 7th aphelion at 08:11 UTC. No station coverage was provided because all experiments were turned off following the regulator switch on 23 July 1978. Five hours after aphelion, DSS 67/68 (Weilheim, Germany) tracked Helios 1 at a bit rate of 32 bits per second (bps) coded, in format 4.

On 2 July 1978, a regulator switch occurred on Helios 2 prior to an acquisition of signal (AOS) over DSS 67/68. As result, the AOS was not successful and at 07:00 UTC a spacecraft emergency was declared and 64-m DSS coverage requested by the Project. At 08:20 UTC, DSS 63 (Madrid, Spain) was released from Pioneer support to acquire Helios 2. DSS 63 had AOS at 10:24:47 UTC with a bit rate of 8 (bps) coded, format 4 (safe mode).

Spacecraft telemetry indicated that several bits had changed. Ground commanding set these status bits back to

normal configuration by 15:15 UTC. The spacecraft experiments were then turned on, and at 22:00 UTC the emergency was lifted.

The Helios 2,5th aphelion occurred on 1 August 1978. The spacecraft was at a bit rate of 32 bps coded with experiments E1, E6, and E8 on and all others off. On 10 August 1978, additional experiments were turned on. Overall coverage of both Helios spacecraft for this period is listed in Table 1.

III. Special Activities

A. Support of On-Board and Ground Experiments

As reported in the last article (Ref. 2), Faraday rotation data were collected over 64-m stations from 9 June 1978 through 28 June 1978. These data are still being collected and analysis has not yet begun. Following this period, we have returned to the 2-h, biweekly 64-m polarimetry-MMA training periods mentioned previously (Ref. 2).

Also, during the period of June through August 1978, a series of solar wind experiment tracks was scheduled. This experiment involves DSS 11, DSS 13, and DSS 14 at Goldstone, California, in addition to DSS 61 and 62 in Spain. The objective of this experiment is to measure the solar wind velocity near the Sun. This period has been designated STIP (Study of Traveling Interplanetary Phenomena) Interval V. The Helios 2 trajectory during this time presented a unique opportunity to study a region of solar wind in which enhanced turbulance existed. Last year, a similar solar wind experiment was conducted and was highly successful (Ref. 3).

B. German Space Operations Center (GSOC) Conversion to the 22-Bit-Error Polynomial Code (EPC) and the Mark III Command System:

On 31 July 1978, the Helios Network Operations Project Engineer (NOPE) conducted a highly successful data flow test between the DSN Compatibility Test Area-21 (CTA-21) at JPL and GSOC, while in the 22-bit EPC. This test verified that 22-bit interface between the DSN and GSOC is functional and that the conversion to flight operation support in October 1978 would go smoothly.

The first attempt to link up the Remote Command Terminal (RCT) at GSOC with the Mission Control and Computing Center (MCCC) Mark III Command System and with the DSN (CTA-21) was accomplished on 3 August 1978. All interfaces were validated and GSOC, via the RCT, was able to send command files to CTA-21's Command Processor Assembly (CPA), control the active/idle state of the Command Modulation Assembly (CMA), and receive transmission confirmation messages.

More tests are scheduled between now and October to further verify and refine interfaces and procedures. During this interval, telemetry, monitor, and Mark III Command System data will be tested. All tests will be conducted using the 22-bit EPC configuration.

References

1. Goodwin, P. S., Jensen, W. N., and Rockwell, G. M., "Helios Mission Support," in *The Deep Space Network Progress Report 42-44,* pp. 50-53, Jet Propulsion Laboratory, Pasadena, Calif., Feb. 15, 1978.

2. Goodwin, P. S., Rockwell, G. M., and Jensen, W. N., "Helios Mission Support," in *The Deep Space Network Progress Report 42-46,* Jet Propulsion Laboratory, Pasadena, Calif., June 15, 1978.

3. Goodwin, P. S., and Rockwell, G. M., "Helios Mission Support," in *The Deep Space Network Progress Report 42-41,* pp. 39-42, Jet Propulsion Laboratory, Pasadena, Calif., Aug. 15, 1977.

Table 1. Helios tracking coverage

Month	Spacecraft	Station type	Number of tracks	Tracking time (h, min)
June	Helios 1	26 meter	50	320:21
		64 meter	0	00:00
	Helios 2	26 meter	0	00:00
		64 meter	36	142:19
July	Helios 1	26 meter	47	269:26
		64 meter	2	6:47
	Helios 2	26 meter	2	14:49
		64 meter	27	120:50