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 during December 1976 and January 1977.

I. Introduction

This article is the fourteenth in a continuing series of reports that discuss Deep Space Network support of Helios mission operations. Included in this report is information concerning the demonstration tracks conducted over DSS 12 and DSS 62 utilizing the Mark III-DSN Data Subsystem, the Helios-2 Receiver-1 failure, the future use of the STDN-DSN telemetry and command cross-support, and other mission-oriented information.

II. Mission Operations and Status

Helios-1 continues to function normally in its extended mission. The fourth aphelion occurred on January 8, 1977, without any problems. During the aphelion, the spacecraft configuration was medium power, high-gain antenna, bit rate of 512 bps, and all experiments on. No critical spacecraft temperature exceedings occurred.

The Helios-2 spacecraft encountered some difficulty during this past period, namely, the apparent failure of its Receiver 1 on January 7, 1977. As a result, the command subcarrier has been changed to 448 Hz from 512 Hz while using Receiver 2. No problems are expected with command support on Receiver 2 using a 10-kW uplink in the near future. Receiver 1 was acquired again on January 12, 1977, only to be lost again shortly thereafter. Before the receiver failure, Helios-2 passed a greyout zone on January 1, 1977. This phase was covered by DSS 42 in Australia and later by station 67/68 in Weilheim, Germany. The Sun-Earth-Probe angle at entry was 0.38 deg and 0.46 deg at exit. The second aphelion for Helios-2
occurred on January 20. This period was not covered by a
ground station, but the next data received showed no
problems were encountered.

III. Special Activities

A. Mark III-DSN Data Subsystems Support of Helios

Since the report of the first demonstration track utilizing
the Mark III-DSN Data Subsystem at DSS 12 for Helios
(Ref. 1), 11 such passes have been conducted. As a result,
DSS 12 has been committed to support Helios flight opera-
tions. Following is a brief summary of the last 10 demonstra-
tion passes and the problems encountered.

Between January 5, 1977, and January 25, 1977, 10
demonstration tracks with Helios spacecraft were conducted
over DSS 12. In nearly every instance, the same problems and
detrimental conditions were evident. Listed below is a brief
description of each and the resulting effect on operations.

(1) The Communications and Monitor Formatter was
unable to consistently provide high-speed data output
to the station's communications buffer and in turn to
the Network Operations Control Center. Also, data
such as command and predicts going to the station
were hindered due to this same condition. Since the
first tests, hardware and software changes have
improved operation. Work is continuing to correct
the remaining problems.

(2) The Telemetry Processor Assembly (TPA), when
processing sequentially coded data, was unable to
interface properly with the Temporary Original Data
Record (TODR), and a failure in the TPA resulted. It
was found that with the addition of three modifica-
tions to the MODCOMP computer within the TPA,
this problem was corrected. In the interim, the TODR
has been disabled while sequentially coded data were
being processed.

(3) The Star Switch Controller, which interconnects all
device to the Communications and Monitor Format-
ter, was found to be arbitrarily reassigning output
ports without operator intervention. This problem is
being worked on and a solution is expected soon.

(4) The interface between the Digital Instrumentation
Subsystem and the Star Switch Controller has not
been adequate. The result has been dropouts of
monitor data leaving the station. This problem is also
being looked into in order to correct it as soon as
possible.

(5) During the early test tracks, the Network Operations
Control Center was lacking adequate monitor soft-
ware, and the station's monitor data could not be
validated and processed. Now that the software is
available, this problem no longer exists.

(6) The Communications and Monitor Formatter seems
limited as to what speed data can be replayed to or
received from the Network Operations Control Cen-
ter. Transmission rates in excess of 1 block per
second create data gaps. This problem needs correc-
tion, because a rate of 5 blocks per second is what the
system should be able to accommodate.

In addition to DSS 12 at Goldstone, California, DSS 62 in
Spain began its Mark III-DSN Data Subsystems test and
training phase on February 2. The first Helios demonstration
track was conducted with DSS 62 on February 12. On this
particular pass, no problems were encountered and this test
was highly successful. Although the problems listed above
were not evident during this particular exercise, they have
been observed on previous testing with other projects at the
Madrid station.

The configuration for Helios support is the same at DSS 62
as it is at DSS 12 (see Fig. 1).

B. STDN-DSN Cross-Support

Beginning March 1, 1977, the STDN-DSN cross-support
configuration (Ref. 2) will again be required for Helios
operations support. Prior to this time, the cross-support
configuration was tested to ensure success. The results of
this and the actual real-time support will be reported in future
articles. Also, the difference in the predicted signal-to-noise
ratio of Helios-2 data and the actual level received, observed
during the last cross-support period (Ref. 1), may be further
explained.
References


Table 1. Helios tracking coverage

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<th>Period</th>
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<th>Station type</th>
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Fig. 1. DSS 12/62 support configuration