

MONTHLY STATUS REPORT
DECEMBER, 1998
Solar Terrestrial Relations Observatory (STEREO)

SYSTEM

An APL bottoms-up costing effort is under way. This effort should be completed in January.

Currently, there are two areas where the conceptual spacecraft design does not meet the top-level program requirements. The first problem pertains to only the leading spacecraft. The trajectory for first 200 days of the mission for the leading spacecraft does not allow the spacecraft to remain Sun pointing while communicating with the Earth using the high-gain antenna. Subsequently, the data return for a major portion of this period does not meet the project requirement. The second problem is maintaining a downlink data return of 200 kbps at 1.0 AU Earth distance using the high-gain antenna. The current telecommunication baseline design falls approximately 50% short .

MISSION DESIGN AND NAVIGATION

Developed high- and low-drift rate planar trajectories for leading and trailing orbits to facilitate the orbit selection process by the science team. Developed a family of non-planar (inclined) leading trajectories in order to establish limits for the maximum Sun-Probe-Earth angle. Assessed the impact of launch date and launch vehicle selection on non-planar trajectories. Continued analysis of navigation techniques. Obtained Goddard Trajectory Determination System (GTDS) orbit determination software from Goddard Space Flight Center (GSFC) for evaluation.

MECHANICAL DESIGN

Development of the STEREO payload configuration for the Athena II launch vehicle continued during the reporting period. Selected candidate boom for magnetometer and gimbal drive system for the high gain antenna. Packaging of all currently known payload components/instruments has been successfully completed. A 21% weight margin (based on a 350 kg. payload limit for the Athena II) exists for this configuration.

STRUCTURE

Investigated vibration isolation of reaction wheel assembly. Beginning work on finite element model of spacecraft.

SOFTWARE

Discussions with the Contour team began to identify areas of commonality (in both hardware and software) that may reduce costs for both missions. Support tools and a benchmark program were prepared for a demonstration of a Lockheed Martin RAD6000

processor, although the demonstration has been temporarily postponed. Work on the variable length packet implementation design continued, as well as the onboard file system concept.

The flight software and mission operations leads are developing a Stereo concept of operations based on the TIMED model, and also considering features and lessons learned from NEAR. The initial efforts are in improving command and telemetry scheduling and solid state recorder operations, so that the ground and flight systems will be designed together to maximize use of bandwidth, simplify operations and reduce cost.

COMMAND AND DATA HANDLING

The cost comparison study of the Solid-State Recorder (SSR) development effort versus purchase options was further investigated. Option selection is still under consideration.

POWER

The power system design remains the same as presented in November. Make/buy decisions, and spares philosophies have been developed.

TELECOMMUNICATION

The baseline HGA dish size is 1.1m (limited by the fairing envelope). Potential X-band TWTAs are still being evaluated. Work is continuing on analyzing the performance obtainable for a Ka-band science downlink. However there is a paucity of Ka-band amplifiers under development. As reported last month, there is only one DSN station equipped to support a Ka-band downlink (Goldstone DSS 25), the other stations are planned to be upgraded starting in September 2001 with the last station completed September 2004.

The performance for the low-gain antenna has been calculated for the early part of the mission. To supplement the low-gain antenna performance during the early portion of the mission for the leading spacecraft, addition of one or two MGA antennas is being considered.

GUIDANCE AND CONTROL

Study of flexible spacecraft dynamics as applied to STEREO was begun, and a generic flexible model programmed in simulink. Preliminary tests and simulations with this model show it works fine from a programming viewpoint.

INSTRUMENT INTERFACE

A conceptual design for an Instrument Data Processing Unit (DPU) was presented on 12/3/98. The baseline unit is capable of interfacing the MAG, RBT, SWPA and EPD instruments to the spacecraft if required. The design emphasized low cost and flexibility.

The design of this modular system is proceeding and is being considered for use in several programs at APL.

GROUND SYSTEM, I&T & MISSION OPS

Mission Operations and I&T were presented at the December 10 weekly meeting. The presentation has been documented in SEI-98-100. Informal discussions with Goddard personnel took place on December 3 regarding the Mission Data Center and interfaces.

PRODUCT ASSURANCE

A radiation environment memo was issued on December 3. Performance Assurance program presentation was made at the December 10 STEREO meeting.