



Meetings

Tom Woods, participated in the *Living With a Star Workshop*, GSFC, Greenbelt, MD, January 25-26, 2001.

Brian Boyle and Bill Ochs, SORCE Mission Manager, attended the Alenia Tranceiver CDR at Dulles, MD, February 7-8, 2001

The SORCE IV & V planning meeting was held at GSFC February 21, 2001.

The March SORCE Monthly Review will be held March 22, 2001 at LASP.

The Chandler Rocket review will be held in Chandler, Arizona, April 3-4, 2001.

The SORCE Mission Operations Review will be held at LASP, Boulder, CO April 23-24, 2001.

SORCE is planning a Science Team Meeting July 9, 10, 11 2001 at the Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado.

SORCE February 2001 Project Summary

The EOS SORCE Mission is on schedule and within budget. Launch is scheduled for July 2002. No mission descopes are required at the present, but TIM Hitchhiker will likely not be manifest on shuttle until 2002-2003 and therefore build been lowered in priority to accomodate SORCE scheduling. SORCE continues to closely monitor and adjust all schedules to meet program needs. Instrument build is well underway and problems discovered through test are addressed immediately. Ongoing program concerns are diminishing slack, additional procurement costs, IFOG manufacture and reliability, orbit trajectory, and late delivery of the transeiver and the spacecraft bench. All of these issues are "front burner" and solutions and fixes are developing.

A Science position will be offered in the near future to replace Tony Canas, who left the SORCE program in early January. SORCE is planning to hold two science meetings per year in the future, one summer and one winter. The summer 2001 meeting will concentrate on the results of SORCE instrument calibration and characterization. The winter 2001 meeting, to be held after the delivery of the SORCE observatory to Orbital Sciences Corporation, will be of a broader science context, and may be held in conjunction with the Fall AGU meeting.

TIM Nears Completion

The SORCE Total Irradiance Monitor (TIM) is nearly assembled. This instrument is designed to measure the total solar irradiance (TSI) to an absolute accuracy of 100 parts per million (ppm), reporting four such TSI measurements per day. Previous spaceborne TSI instruments, such as those currently flying on ACRIMSAT and SOHO, have established a 22-year record of solar irradiance, recording the small fluctuations

due to solar activity about an average 1367 W/m². The SORCE's TIM will be continuing these measurements through its goal 5-year mission life. The TIM uses four electrical substitution radiometers (ESRs), each behind a precision aperture, to measure solar irradiance. A shutter modulates incident sunlight to a selected active ESR, while electrical heater power maintains a balanced ESR temperature with a reference sensor. Phasesensitive detection of the electrical power supplied to the active ESR at the shutter frequency measures TSI and reduces sensitivity to thermal drifts and noise. A digital signal processor (DSP) controls the instrument by timing shutter positions, maintaining the ESR temperatures via heater power cycling, and formatting instrument science and housekeeping data for telemetry downlink. These components are currently being assembled and tested at LASP.

Most component-level TIM characterizations are complete. NIST measured the 0.5 cm² precision apertures to stated accuracies of 25 ppm. LASP measured the ESR reflectances at several wavelengths spanning the visible and near infrared, and selected the flight ESRs based on their low (~100 ppm) and stable reflectances. SORCE has recorded the resistances of all ESR electrical leads to the needed accuracy level. The TIM flight instrument is currently undergoing electrical and DSP functionality tests.

Over the next couple months SORCE will continue characterizations and tests of TIM. "First Light" on the completed instrument assembly will be in early March, along with tuning of the thermal control circuitry. Thermal vacuum and shake tests will (hopefully!) verify instrument robustness. LASP is installing a heliostat that will facilitate end-to-end tests of the instrument and measure intra-instrument consistency by (nearly) equally illuminating adjacent TIM ESRs. TIM and the other three SORCE instruments are scheduled to be installed on the spacecraft optical bench in late spring, followed by co-alignment and functional tests. During integration and test on the spacecraft, we will finalize the preflight TIM measurement equation parameters, getting the science data analysis software ready for the SORCE July 2002 launch and subsequent TIM TSI measurements.

SIM Status

Significant progress has been made on the SIM Féry prism drive, CCD electronics and DSP code development. One flight CCD experienced a failure anomaly and the piece is at Goddard for analysis. CCD build will resume when this analysis is complete. Additional progress had been made in the focal plane, calibrator system and the sunshade and baffling design. The SIM case is assembled for vacuum test. Slit calibration has begun. The SIM thermal design was reviewed and resulted in only 3 minor RFA's (requests for action).



SOLSTICE Status

The SOLSTICE instruments are also in the processes of integration, calibration and testing. Instrument mechanical-optical integration is complete. O-ring seals for the coverbench interface require rework. Characterization of the detector head will require three weeks. A hardware fringe counter has been added to the electronics to eliminate grating drive reset caused by external disturbances. Unit level tests of the grating drive provide absolute accuracy, step response and bearing preload on the flight encoder heads before final integration.

XPS Status

The final assembly of the flight unit has been completed. The XPS PER (pre-environmental review) took place January 11, 2001 and XPS is now undergoing environmental test. Mass, power, and vibration tests are complete, EMI-EMC tests and thermal vacuum tests are in progress. Light leaks, shifting of mounting feet, and problems with the "dynamic breaking" command were discovered and fixes are already underway, or nearly complete. FOV (field of view) maps and XPS-MU interfaces should be complete in early March.

SORCE Data System Status

Progress on the Science Data System has been good, with many areas near completion. A planning meeting was held with the Independent Verification and Validation facility personnel at GSFC on February 21, 2001. The purpose of the meeting was to identify a level of IV&V that is appropriate for the SORCE mission. SORCE software requirements, development methodologies, and status were reviewed and a preliminary agreement for the SORCE mission was reached. IV & V facility personnel will perform an assessment of critical instrument and spacecraft flight software functions and a Memorandum of Agreement will be submitted to SORCE as early as mid-March.

Microprocessor Unit Status

The SSI (Science Support Interface) FPGA (field programmable gate array) final design is complete and has been released for software testing. The SSI telemetry FPGA design is in process and scheduled for delivery March 16, 2001. The flight PCB board should be delivered March 12, 2001. The engineering model of the MU power distribution is nearly done, and full integration into the EM MU is expected soon. The flight unit MU power distribution board parts are in house, build has begun and flight testing should be complete by the end of March. All GCI (generic channel interface) engineering model boards are complete and tested. Flight PCB fabrication has begun with the most progress on the SOLSTICE instrument.

Digital Signal Processor Status

The grating drive control performance on SOLSTICE meets and exceeds requirements. A control loop has been tweaked to add robustness, new PID constants for SOLSTICE are generated by model, refined by hardware test and models are updated with as-run values. Minor algorithm changes have been made to improve SOLSTICE

subsystems. TIM DSP software is ready for test with the complete instrument.

Spacecraft Systems

Spacecraft progress had been good. Instrument harness routing has begun. Instrument module MGSE and EGSE are on schedule for early April delivery. Thermal vacuum cables are also in design. The preliminary FMEA (failure mode and effects analysis) for SOLSTICE, SIM, TIM, and MU has been delivered and is in review. Power, mass, memory and bandwidth margins are in good shape. However, preliminary trajectory analysis results have determined that northerly trajectory options for the SORCE launch will result in unacceptable performance (mass to orbit) and stage 3 casualty expectations. But there is insufficient ground station coverage for a southerly trajectory option. SORCE and LASP are evaluating the used of additional ground stations (Pretoria and Malindia) for launch and early orbit campaign plus the impacts of a lower orbit inclination. Trajectories incurring performance penalties or high casualty rates are only last resort options.

Orbital News

Orbital spacecraft news follows. The static testing of the bus primary module is complete. The transeiver CDR was completed Feb. 7-8, 2001. The TAMS (tri-axial magnetometers) have been received from Ithaco. The FlatSat (flat satellite testing unit) is complete minus the APE EDU (attitude processing electronics engineering development unit). Orbital assisted in a successful TIM (technical interface meeting) harness integration at LASP. Study continues on the ACS (attitude control system) for a "gyroless" SORCE spacecraft, results look promising, and further gyro options are being explored. All flight cards (except APE LVPS) have been built as far as materials will allow, and parts procurement issues are being pursued. The RFA's Orbital received from the SORCE MCDR November 11, 2000 have been addressed.

Information Submission:

Each month SNS will present mission progress, highlights, and news. If you have any information to distribute to the SORCE Team, contact Kathy.Lozier@lasp.colorado.edu, and we will include it in the next month's issue of SNS.