

Helioseismic Magnetic Imager Program at LMSAL

Contract PY-2223 Progress Report for February 2004

Introduction

This is the 1st monthly progress report on the HMI program at LMSAL under C/D/E phase of the contract. We/LMSAL are collaborators with Stanford University on the HMI/SDO solar physics investigation being led by Prof. P. Scherrer of Stanford University.

Summary of Status

Highlights this month include: the remaining Request for Action from PDR were submitted, the remaining peer reviews were held, the interface working group for section 5.0 of the ICD and grounding/shielding meeting was attended, RAL proposal was received and negotiated, RAL and e2v were visited, the first CCD was packaged and commissioning began. HMI. We continued to have weekly SDO Project telecons, weekly HMI-specific telecons, nearly weekly CCD camera system telecons, weekly telecons with LightMachinery, weekly HMI status meetings, and a constant stream of internal technical meetings.

Schedule and Milestones

A detailed schedule was submitted mid-February. Shown below are some key program milestones, with an emphasis on those that will occur in the near term, or have occurred recently (for completeness).

Ordered life-test HCMs	Feb	Complete, Due 7/19/04
Peer Review of HEB & Oven	Feb 4	Complete
Grounding/Bonding Meeting	Feb 5-6	Attended
Visit RAL and e2v	Feb 9-11	Attended
Define GSFC common buy	February	EEE parts
Begin Phases C/D/E	February	Started
Begin shutter life test	March	Shutters are being assembled
Michelson Performance Review	April 7/8	At LightMachinery
Mission PDR	March 9-12	At GSFC
SDO Science Meeting	March 22-25	At Boulder
Complete SM instrument	September '04	
HMI CDR	Nov '04	
Deliver HMI to S/C	Nov '06	

Launch
Five year baseline mission

Apr '08

Major Activities During this Reporting Period

Significant progress was made in design and document release of mechanical and optical systems. The beam-splitter and rotating sandwich wave plate drawings and statement of work were release and a RFQ is being prepared for LightMachinery. The front window filter and blocking filter drawings, specifications and statement of work were released and the competitive bid sent out to three potential suppliers. The primary and secondary lens drawings were released and a RFQ is being prepared for competitive bid. Work began on the mirrors and other powered optics drawings. The envelope drawing, specification and SOW for the structure were released and the RFQ is being prepared for Vision Composites. The hollow core motor and shutter motor drawing revisions and assembly drawings were released. The focus/cal wheel and front door detail design is progressing. The cell drawings for the Lyot assembly are near completion. A preliminary board layout drawing of the oven pre-amp and oven control were completed. Work began on the calcite drawings. The CCD ICD was released and a preliminary CEB ICD was sent to RAL. The next revision of HEB and HOP MID were also released to support the release of the spacecraft ICD.

LightMachinery is making good progress on the beam-splitters for the mechanical model and the evaluation test unit. All of the material for the Michelsons has been received. The beam-splitter blanks have been polished and coated. The beam-splitter performance review was scheduled for the first week of April and LightMachinery is on track for the review. The sample ADP and KDP crystals were received and measured and performed as specified. The calcite lengths can now be specified and drawings generated. The two pieces of calcite received from Brazil was taken to Lambrecht for evaluation. The calcite is of high quality and there is enough to build one Lyot assembly. The wave plate were received and measured and perform as specified.

Due to the delay in ordering of the new rotors, the shutter life test was pushed back. The new rotors were not due until late April. As a result, we decided to proceed with the start of the life test with the old rotors. Three shutters are currently being assembled and tested for start date in mid-March. A mechanical interference during the fit check required some rework of one of the machined parts, which set back the start of the life test about two weeks. The life test is still schedule to begin in March, but closer to the end. The HCM prototype testing is progressing and the life test motor order was placed. The gearbox design was finalized and drawings are being generated. The FW design is also maturing.

The chamber retrofit for the HCM motor life test (and AIA mechanism life tests) is progressing. The chamber was cleaned, brought to vacuum, and hardware was received to retrofit the chamber to accommodate the life test mechanisms. The thermal control system and harness feed-throughs are currently being ordered.

The visit to e2v and RAL was very productive. E2v presented the first packaged device and images produced by the device from the start of the commissioning process. E2v will provide RAL with a functioning device by the end of March and deliver two evaluation units to LM in

April. They have also completed the processing of third batch of devices. The protective cover was received by E2v and is finalizing the design of the shipping container. E2v was waiting for a letter of contract, which they now have. RAL has been making great progress as well. The video card schematic is complete, the box layout design is maturing and the first iteration of the mechanical ICD occurred. The ghosting issue was characterized and the CDS/ADC ASIC is being packaged. All of the parts for the demonstration unit are on order and a bread board SECCHI camera will ready in early April to test the waveform generator ASIC with the CCD. The new ASIC design for the wave form generator was abandoned due to schedule risk. The CCD PWB design process was also started. The proposal received from RAL in January was higher than expected. Part of the visit this month involved negotiating the proposal. We suggested a few areas where cost could be reduced and areas of de-scope. RAL submitted a second proposal that was acceptable. A letter of contract is being prepared.

Great progress is being made in the electronics arena. The flight enclosure design had a peer review and the brass box enclosure design is complete. Drawings are being generated for the brass box. The HEB interconnect drawing, bridgeboard outline drawing and specification were released. The bridgeboard and brass board motherboard outline drawings were sent to layout, and the bridgeboard PCB and PCA is ready to start fabrication. The power, mechanism controller and oven controller specifications are near completion. The box level specification is being worked. The high rate board continues to mature. We still had little interaction on the topic of EEE parts common buy and have encouraged the Project to remedy this before it becomes to late. We did, however, host a successful Parts and Materials and Process control board.

Great progress is also being made in the software world. The ground operation peer review was attended at Goddard. The 1553 card was installed on the RAD6000 board with the adapter through the PCI bus and initial communications were made. Some code has also been loaded onto the board. The development of the external interface program for LMSAL EGSE specifically for HMI was complete. The SUROM display development has begun and progress continues in the command and telemetry development.

Other Activities During January

1. The thermal model was delivered.
2. The remaining RFA were submitted: a total of 28 are now in the projects hands.
3. A draft risk management plan was submitted to the project.
4. Internal requirements/design meetings were held on a variety of subsystems and assemblies.
5. S. Meyer and F. Lee attended a contamination peer review
6. A new systems engineer started on the program, John Miles.
7. The AIA/HMI bi-weekly management meeting continues.
8. The IFWG section 5.0/50.0 and Grounding meeting was attended my several member of the electrical team.
9. Jerry Drake attended the grounding operation peer review.
10. Michael Levay attended the I & T peer review.
11. HMI hosted the first EEE Parts and Materials and Process Control Board.
12. Alan Title and Phil Scherrer attended the SOC meeting with Townsend.

13. A detailed schedule was submitted to the project.
14. Several team members visited RAL and e2v in England.

Planned Activities For March

1. Continue drafting procurement specifications for the optical elements.
2. Work with the Project to determine if the Structural Model instrument needs to be vacuum compatible and contamination free. Both would be upscales to our plans but have been mentioned (by the Project) as perhaps being needed.
3. Continue to work with the AIA team to organize LMSAL personnel for both programs in an optimal manner.
4. Get Vision Composite under contract and have a structure kick-off meeting
5. Begin the shutter life test.
6. Select the magnet orientation and wire size for the HCMs.
7. Continue work on mechanical drawings and detailed design.
8. Release the oven control and mechanism control board specifications.
9. Start fabrication of the bridgeboard and motherboard for the brass box HEB.
10. Complete the enclosure drawings for the brass box HEB.
11. Attend the Mission PDR.
12. Attend the SDO science meeting.
13. On a routine (mostly weekly) basis continue to participate in telecons with the complete SDO group, the combined HMI/AIA-Project specific telecons, CCD Working Group telecons, LightMachinery telecons, BAE telecons; and to conduct HMI team meetings as well as specific meetings on Electronics/ Software, Filters, and Mechanical topics.

Design Updates

There were no significant design updates this month. As mentioned last month, a minor update occurred to the thermal design. I was decided to make use of the three unused thermal control circuits to provide redundancy for the three most important of the five zones presently being controlled as recommended in one of the RFAs.

Resource Requirements

The monthly mass status report is provided as separate file. The HMI HOP mass increased by a little bit due to design maturity of the oven and front door. The power estimates and allocations are not changed this month.

Issues/Concerns

- Undertaking the AIA program at LMSAL requires obtaining additional personnel quite rapidly and redistributing personnel between these two, and other, programs. It also requires procurement planning, resource planning and understanding schedule overlapping.
- The new ASIC design for the waveform generator has been abandoned and testing of the SECCHI ASIC design will begin in April.

- The existing version of the SMCSLite chip that is used in the CEB and in the Camera Interface board needs to undergo radiation testing to verify it is acceptable, and we need to keep on top of whether the newer version of this chip will be available in time for our programs.