Introduction

This is the second monthly progress report for the HMI program at LMSAL. We/LMSAL are collaborators with Stanford University on the HMI/SDO solar physics investigation, being led by Prof. P. Scherrer of Stanford University. The investigation was selected, on 15 August, in response to NASA Announcement of Opportunity AO 02-OSS-01. Phase A, which includes the periods described as Phase A and the Bridge Phase in the AO, will last 12 months.

Summary of Status

Highlights during this reporting period included signing a contract with Stanford University for a 12 month Phase A period, interacting with the Project and with the other investigators on a large number of topics via weekly Project-wide and HMI-specific telecons, submitting an updated Power Estimate, adding personnel to the LMSAL team, and preparing to attend the MDR at GSFC in early December. Iterations on spacecraft accommodations did not progress as rapidly as we had hoped, probably due to difficulties in accommodating the SHARPP components - no single instrument can be accommodated until everyone is.

Schedule and Milestones

The HMI proposal contained a top-level schedule that was based on the dates given in the AO. Now that the program has begun, a more rigorous schedule will be developed. We will make the schedule using MS Project and update it monthly in phase with the monthly progress report. The first schedule submission will be in January. Shown below are some key milestones, with an emphasis on those that will occur in the near term, or have occurred recently (for completeness).

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI Interface Meeting</td>
<td>Oct 17-18</td>
<td>Occurred at GSFC</td>
</tr>
<tr>
<td>Electrical Meeting at NRL</td>
<td>Nov 7</td>
<td>Cameras and high-speed bus</td>
</tr>
<tr>
<td>Mission Definition Retreat</td>
<td>Dec 3-5</td>
<td>At GSFC</td>
</tr>
<tr>
<td>Project Personnel Visit CA</td>
<td>Dec 11</td>
<td>Both Stanford and LMSAL</td>
</tr>
<tr>
<td>Systems Requirements Retreat</td>
<td>Feb ’03</td>
<td>At GSFC</td>
</tr>
<tr>
<td>HMI Requirements Retreat</td>
<td>Feb ’03</td>
<td>At Palo Alto</td>
</tr>
<tr>
<td>Submit Concept Study Report</td>
<td>Jun ’03</td>
<td>Includes a formal cost proposal</td>
</tr>
<tr>
<td>Begin Phase B-E</td>
<td>Oct ’03</td>
<td></td>
</tr>
</tbody>
</table>
Major Activities During this Reporting Period

The HMI program at LMSAL officially began on 1 October under a letter subcontract from Stanford University, barely a day after Stanford and GSFC signed their contract. Both of these activities occurred in record breaking time, and signing the contract between Stanford and LM in early November was also a fine accomplishment. Even before 1 October, members of the LMSAL HMI team participated in the SDO Kickoff Meeting at GSFC in early September and in the Project-wide weekly telecons. We then participated in an Interface Meeting at GSFC on 17-18 October, and weekly HMI-specific telecons were initiated on 24 October. Also, weekly HMI internal team meetings were initiated on 1 October. So, the program is off and rolling with much emphasis this month being placed on preparing for the Mission Definition Retreat that will take place on 3-5 December. Seven LMSAL team members will participate in this meeting.

One element of the Project-wide telecons has been to establish and track action items that originated at the Kickoff Meeting and during interactions since then. We have been responding on time to these Action Items. More comprehensive responses will be developed as the program matures, but the responses to date should help bound a number of spacecraft accommodation/interface possibilities (mechanical, thermal, electrical, programmatic, etc.). In a similar manner, the Project has been responding to questions we’ve put to them. We believe that significant progress has been made in establishing a concept for handling the high rate science data, understanding our requirements on data completeness and timing, and conceptualizing methods to satisfy the stringent HMI timing requirements. On 22 November we provided the Project with a summary of our past and present power usage estimates. We hope additional power will be made available to enable the simplified thermal control concept and improved high-rate telemetry interface reflected in the most recent estimate.

Internally we have begun to form the HMI team with initial emphasis on the disciplines that interface to the spacecraft. L. Springer became more and more involved in the program and will become the official LMSAL Program Manager on 2 December - J. Wolfson continuing to be part of the management and science team. B. Carpenter, who is presently the LMSAL SECCHI (on STEREO) Systems Engineer will be joining the team shortly now that his replacement on SECCHI has been identified and a transition plan initiated. He will participate in the MDR to get better acquainted with the total program. J. Drake, Software Lead on HIRDLS, will complete his second and last tour of duty for HIRDLS I&T in England and join the team in early December. And, a number of other LMSAL personnel are becoming more and more involved in HMI. A local web site, modeled after those in use on our other programs is now functional as are several e-mail lists.

Other Activities During November
1. L. Springer and R. Lindgren participated in meetings/discussions with our UK partners, SHARPP team members, and Project personnel on 7 November, taking advantage of the fact that Springer and others were at NRL for the SECCHI/STEREO CDR. Lindgren flew out especially for this one-day interaction.

2. We participated in a telecon with the Project and NRL to discuss the concern that our UK partners may not be able to obtain their required funding from PPARC; and if so, what some options might be to obtain the CCD camera systems for both HMI and SHARPP.

3. We continued to think about mechanism life testing. This will have to begin very early in the program for the mechanisms that are planned to move every 2-4 seconds during a 5 year mission in order to be able to undergo an accelerated life test that is adequate.

4. We provided the Project with a variety of preliminary items including:
   • an updated 3-d model of the OP with front legs moved backward as requested
   • the first monthly progress report (for October)
   • the first monthly (533) financial report
   • an updated power estimate including a redundant telemetry I/F board
   • information on operational concepts/desires
   • information on the HMI timing requirements

5. Connected with the timing requirements just noted, we have basically decided to incorporate a stable internal clock into our design to accomplish our requirements in this area without impacting the spacecraft design.

6. The analysis of the behavior of the MDI front filter/window on orbit continued in order to learn more about how to best design the HMI front filter/window.

7. Several personnel from Zygo Corporation visited while they were in San Jose for a trade show. They are quite interested in supplying the Michelson Interferometer.

8. A 4-day Thanksgiving “weekend” was enjoyed by all; after which folks flew to GSFC for the MDR.

9. On 29 November, we received a draft version of the Mission Assurance Requirements document and noted that it was not specifically an Instrument MAR.

**Planned Activities During December**

1. Establish the baseline wavelength and begin to slightly modify the optical-mechanical design to accommodate it if it has changed from the proposal baseline, as is quite likely.

2. Participate in the MDR on 3-5 December. Perhaps also have a splinter to further discuss the UK/camera situation.
3. Submit an updated mass estimate that includes additional mass to enhance reliability and a mass reduction by taking into account some shielding of the electronics by the existing S/C structure.

4. Provide the Project with a, probably simplified, finite element model of the OP.

5. Increase the size of the LMSAL HMI team.

6. Provide comments on the draft MAR.

7. Continue to participate in weekly Project telecons and HMI-specific telecons, and conduct weekly HMI team meetings.

8. Host an informal visit by several members of the Project who will be in the Bay Area for the AGU.

9. Enjoy a long Holiday period – LM is closed between Christmas and New Years.

**Design Updates**

It seems almost certain now that the HMI wavelength will change from 6768A to 6173A. This will have minimal impact on the instrument design and what impact it does have should make the design slightly “easier.”

**Issues/Concerns**

- The numbers of reviews and additional documentation required by NASA on flight programs ever since the Mars failures make it difficult to put adequate effort into doing “real work.”

- Observatory mass needs to be decreased in order to have an adequate margin at this point in the program. Although we believe HMI has an adequate mass estimate as proposed and thus baselined, we would like to have a small amount of additional mass to enhance reliability. Plus, as part of the Observatory, we will be impacted by hunts for possible mass savings along with everyone else.