

STEREO IMPACT Technical Progress Report

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Subject: IMPACT Monthly Technical Progress Report, Contract NAS5-00133

Lil:

Enclosed is the monthly technical progress report for the STEREO IMPACT project for the month of December 2003.

Sincerely,

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CC:

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IMPACT Team

STEREO IMPACT Technical Progress Report

1. IMPACT Overview

This report is presented in sections by institution. Section 1 is an IMPACT Project Manager / System Engineer's overview.

1.1. Contracting / Funding

Funding through mid-November has been received. There are rumors that an extension through February is in the works. Because of pipe-line delays in the system through to the subcontractors (Caltech and UMd) it is important that IMPACT be funded somewhat in advance of expected spending.

1.1.1. Liens

This is a list of Liens. Liens for activities at other institutions are sometimes repeated in their subsections of this report. These liens are estimated additional costs that might be incurred if problems happen. Only problems with a significant likelihood of occurrence are tracked. These liens are usually associated with risks in the risk list (see section 1.5), and you can see the predicted likelihood of occurrence there. Some of these liens have been requested to be encumbered by Project, marked (*).

UCB:

No.	Cause	Amount	Date
1*	LVPS schedule delays extend manpower (Risk UCB29). Cost a 1-month delay at full LVPS team spending rate.	\$35,000	01/04
2	Late failure in thermal vac requires rework/retest (Risk UCB27, etc).	\$30,000	02/04
3	Testing failure requires rebuild/retest a board (using existing spare parts)	\$20,000	~02/04
4	EMC rework and retest required (Risk UCB11). Assume rework can be done in a week or two.	\$30,000	05/04
5	Schedule delays cause the consumption of boom suite schedule contingency (various risks). Cost 35 days of contingency at UCB I&T team rate.	\$50,000	07/04
6	STE calibrations sources. \$12,500 Quote is over the earlier ROM of \$10K.	\$2,500	11/04
7	SEP Thermostats. These were over the budgeted amount. Budget was \$10K at Caltech. Parts were actually \$21,200, paid by UCB (for now Caltech will hold the \$10K against other liens)	\$11,200	11/03

Caltech:

No.	Cause	Amount	Date
1	Budget does not contain funding for investigations of part failures or contamination failures, re-makes of boards if coupons fail, etc. Some of this has already occurred, as more rework has been required in the hybrid development area than we budgeted for. Some die have failed test, some units have failed PIND testing, and in a couple of cases leaks have	\$50,000	03/04

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	<p>occurred after lead bending, which was caused by a problem with the tooling that has been corrected. In addition, QA costs have been a far bigger percentage of the overall cost than anticipated. Currently the yield of hybrids has improved with 16 of 20 passing electrical test in the last batch. (Amount = ~\$50,000 (guess); Probability = 100%; time frame = March 2004).</p>		
2	<p>Unfunded schedule reserve: ~\$25,000. This is becoming a reality, as our latest schedules show delivery in September 2004 (as required), whereas we had budgeted for delivery in July 2004. (Amount = \$25,000; Probability = 100%; time frame = August 2004).</p>	\$25,000	8/04
3	<p>Possible under-budgeting of environmental testing and bake out. \$100K has been allocated. However, recent estimates suggest that the thermal balance/thermal vacuum test may require about 3 weeks. Recent cost estimates at JPL suggest that that might take the entire \$100K. We are investigating other places for the environmental test program where the costs may be less. (Amount = ~\$50,000 (guess); Probability = 50%; time frame = July 2004).</p>	\$50,000	7/04
4*	<p>GSE Software support (extend a few months after January 2004)</p>	\$60,000	1/04
5*	<p>Engineering Assistant (Risk UCB033)</p>	\$24,000	1/04
6*	<p>Engineering support to maintain schedule (Risk UCB033)</p>	\$63,000	1/04
7*	<p>Technician Support to maintain schedule (Risk UCB033)</p>	\$38,000	1/04
8	<p>Overlooked hybrid costs: it was not realized that the cost estimate we were given for the hybrids did not include the qualification costs of 10 units. We have asked for a quote from JPL. (Amount = ~\$10,000 (guess); Probability = 100%; time frame = March 2004).</p>	\$10,000	3/04
9	<p>Unbudgeted tests: there are a number of tests outlined in the STEREO/IMPACT Requirements Verification Matrix that we are listed as responsible for but for which we did not budget. (Some I wasn't aware of and some I mistakenly thought would be done at UCB as part of EMC testing.) Test plans and procedures will need to be written and existing instrumentation either calibrated or new instrumentation obtained. These include requirements 4.10, 4.12, 4.23, 4.27, 4.28, and 4.42. If we have to get JPL to help us, the cost could be significant. (Amount = ~\$25,000 (guess); Probability = 50% (UCB might help us); time frame = July 2004).</p>	\$25,000	7/04

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UMd:

No.	Cause	Amount	Date
1	SIT foils fail acoustic test	\$20,000	2/04
2	SIT Vibration (currently planned to be combined with HET instruments, but may not work out)	\$15,000	2/04
3	Parts screening (some parts not yet Oked by PCB and may need addition screening)	\$10,000	9/03
4	Particle Calibration at BNL. This is desired but not required.	\$20,000	11/03
5*	Engineering Support to maintain schedule (Risk UCB033)	\$60,000	1/04

GSFC (Tycho):

No.	Cause	Amount	Date
1	Revise SEP Central/LET/HET vibration analysis if required	\$5,000	11/03
2*	Extra Solid-state Detector Lab manpower support to accommodate late detector delivery (Risk UCB033)	\$20,000	12/03
3	Travel for accelerator end-to-end test	\$5,000	12/03?
4	Tom Nolan flight software support (Risk UCB033)	\$15,000	2/04
5*	Engineering support to maintain schedule (Risk UCB033)	\$40,000	1/04
6			

1.2. **Significant System-Level Accomplishments**

- Held IMPACT team meeting and STEREO SWG at UCB
- Held Parts Control Board meeting to review and approve parts lists for boards ready for flight build
- Prepare for PER

1.3. **System Design Updates**

- None

1.4. **System Outstanding Issues**

- Cork contamination waiver approved by Contamination Committee, pending CCB approval.
- IMPACT harness shielding waiver approved by EMC committee, pending CCB approval
- SWEA door activation transient waiver approved by EMC committee, pending CCB action.
- SWEA VMI Multiplier MRB pending test results (PFR 6001)

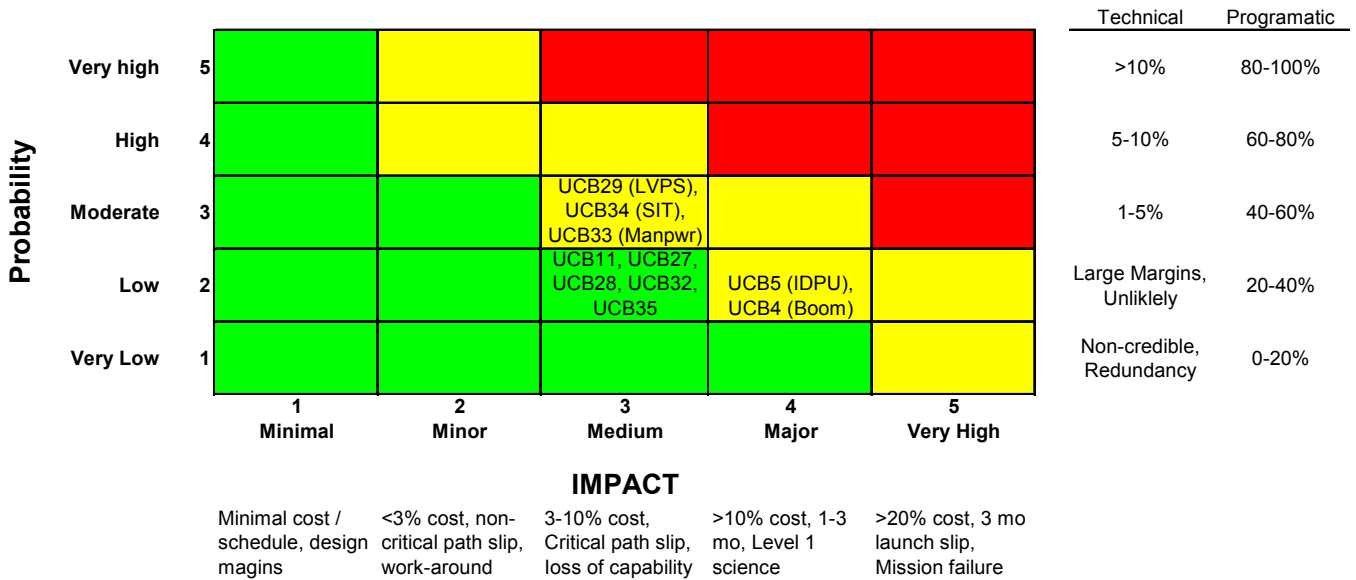
1.5. **Top 10 Risks**

Top 10 risks are attached. New risks related to SIT schedule slippage (UCB_34) and Actel failures (UCB_35) have been added, causing some low-risk items to fall off the bottom of the list.

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IMPACT Top Ten Risks 1/2004

Risk Matrix



No.	Risk Item	Score	Mitigation	Mitigation Schedule			
				Sub-system Test	System Test	Env test	Early Orbit Test
UCB_5	IMPACT boom is a new design. Failure could affect Imager pointing requirements as well as boom-mounted instruments.	MEDIUM	Design for reliability. Early prototype testing. Qual model testing completed. Adequate force margins demonstrated.	MEDIUM	MEDIUM	MEDIUM	LOW
UCB_4	The IDPU is a single point failure mechanism for the IMPACT suite and PLASTIC	MEDIUM	IDPU is a simple, reliable system. Extra attention has been paid to ensuring its reliability, minimizing the risk of fault propagation. Extensive EM & FM testing	MEDIUM	MEDIUM	MEDIUM	MEDIUM
UCB_34	SIT Schedule slippage, on critical path	MEDIUM	Add manpower to recover schedule	MEDIUM	LOW	LOW	LOW
UCB_29	LVPS behind schedule, on critical path; further slipping could delay delivery to spacecraft	MEDIUM	Add manpower to LVPS task to avoid further slippage	MEDIUM	LOW	LOW	LOW
UCB_33	Instrument fabrication & test schedule limited by available personnel	MEDIUM	Subcontract assembly work, authorize overtime, bring on new people	LOW	LOW	LOW	LOW
UCB_35	New undiagnosed Actel part failures may impact flight hardware	LOW	Keep abreast of Actel's analysis results; Make changes to minimize ground bounce which may be related to failures according to Actel	LOW	LOW	LOW	LOW
UCB_11	Stringent EMI requirements may delay schedule if testing fails	LOW	Careful design, ETU power converter testing, early system testing	LOW	LOW	LOW	LOW
UCB_27	Actel timing differences between flight & ETU parts may cause failures late in testing impacting delivery schedule	LOW	Do FM Thermal Vac early to allow time for finding and fixing timing problems; for designs on the critical path, consider installing a flight Actel in the ETU & thermal cycle.	LOW	LOW	LOW	LOW
UCB_28	Thermal limitations of detectors result in a low bakeout temperature which might require a very long bakeout impacting delivery schedule	LOW	Bakeout subsystems prior to detector integration to reduce time of instrument-level bakeout; early bakeout	LOW	LOW	LOW	LOW
UCB_32	Parts Review Boards & Parts Waiver process could delay flight fabrication	LOW	Work to get parts lists approved, waivers into system where PCB cannot agree.	LOW	LOW	LOW	LOW

2. Berkeley Status

2.1. *Summary of Status*

Schedule status through December has been provided separately.

2.2. *Major Accomplishments*

SWEA/STE:

- SWEA/STE flight boards fabricated, coupons out.
- First STE flight Preamp board loaded
- STE flight detector boards ready for detector mounting; first batch at detector mounting subcontractor.
- STE, SWEA Pedestal, and STE-U preamp housing in flight fab

IDPU:

- DCB flight units staking & conformal coat complete, ready for inspection and test.
- IDPU Comprehensive Performance Test procedure in review
- Working on software Build 3 for IMPACT.
- PLASTIC software Build #2.3 completed, ready for IDPU/PLASTIC ETU interface test scheduled for January, after Bern test.

LVPS/HVPS:

- SIT HVPS FM #1 delivered to UMd for test with instrument.
- SWEA/STE-D LVPS PWB fabricated, coupons out.
- PLASTIC LVPS in assembly.
- SEP boards fabbed, coupons passed.
- IDPU LVPS Layout modifications complete, in review.

Boom:

- All flight parts have been released and are out for manufacture, including rings. Most flight parts have been delivered, inspected, and cleaned.
- Assembly has started.

GSE:

- Last Science GSE (SWEA) in progress.

2.3. *Design Updates*

- None.

2.4. *Outstanding Problems*

2.5. *New Problems*

2.6. *Top Risks.*

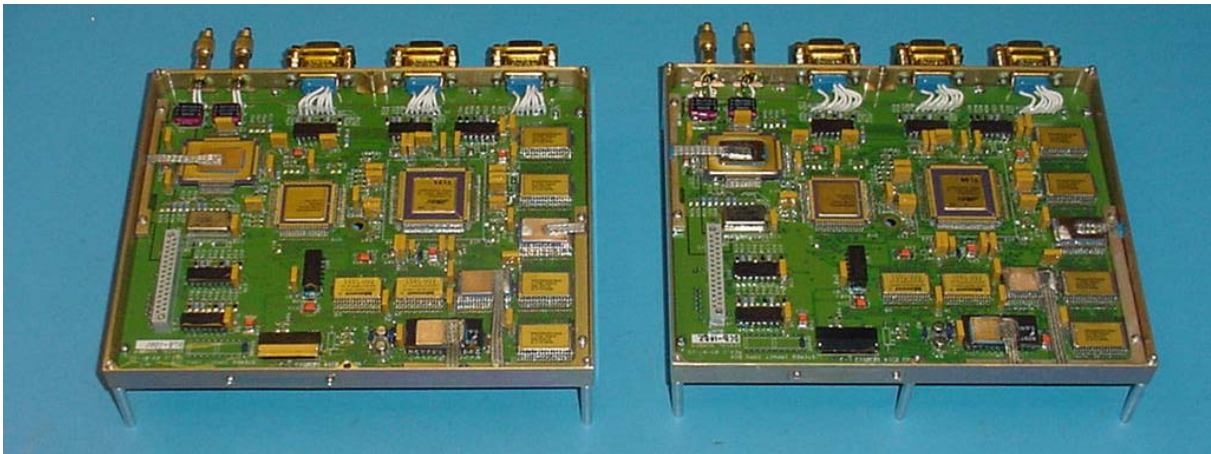
- LVPS schedule tight
- Open Actel problems

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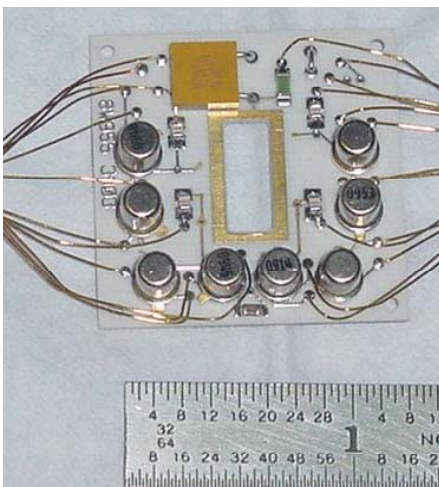
2.7. Problem/Failure Quick Look

ID #	Description	Assignee	Opened	Closed
1001	Qual boom deployment failure in Thermal Vac	McCauley	2003-08-15	2004-01-07

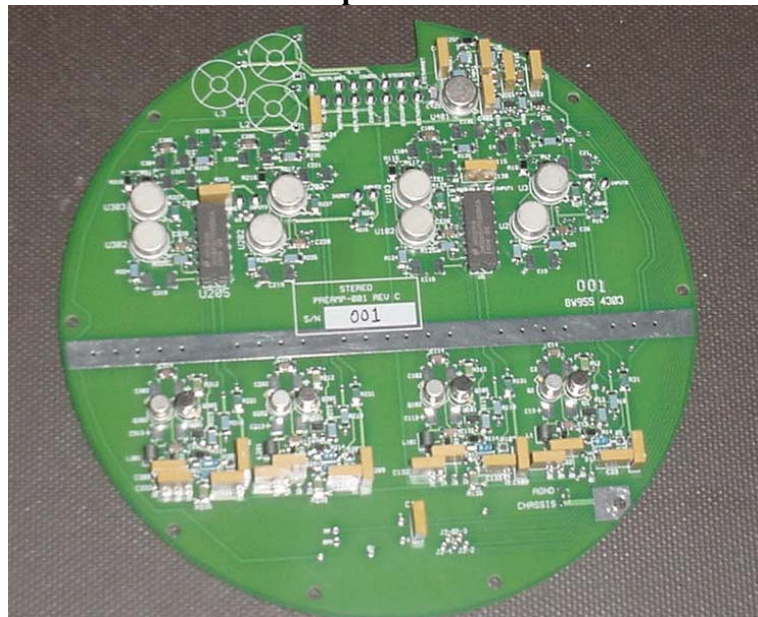
FM1 and FM2 IDPU Data Controller Boards



STE FM Detector Board



STE-U FM1 Preamp board



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3. GSFC (SEP) Status

STEREO/IMPACT/SEP/GSFC Progress Report for December, 2003 – (von Roseninge, Baker, Hawk, Shuman, Nahory, Wortman)

3.1. *Summary of Status*

The current delivery dates of the HET flight units to Caltech are end of April, 2004.

3.2. *Major Accomplishments*

We have now received our first flight detectors for the HETs. 9 H1 detectors and 10 H3 detectors have been received from Caltech. We require 4 H1 detectors and 14 H3 detectors for the flight units. Additional H3 detectors will become available at the end of January.

Purchase of the SIT and SEPT heaters and SIT operational thermostats was shifted from Caltech to GSFC. An alternate thermostat was identified by Antonio Reyes and existing parts located in the MAP Project inventory. These parts had set points which differed by ~ 3 degrees from what was originally specified. John Hawk verified that the substitute parts were acceptable.

The HET flight model 1 PC board is fully populated except for 2 PHASIC chips and the flight Actel. The first 2 flight PHASICS have been received. Additional changes to the Actel design are being contemplated to respond to concerns which have been recently raised regarding ground-bounce problems in the flight Actels for both HET and SIT. We have therefore made a decision to mount a socket on the first HET flight board to allow us to proceed with testing all other parts of the board. This way, when we finally are able to mount a flight Actel, we will be reasonably certain that any problems which we see are related to the flight Actel and not to other parts of the HET board. At present, we envision that the socket will be replaced by a flight Actel after 2-3 weeks. The flight Actels do not fit into the socket.

The two flight SEPT S/C brackets were shipped to the University of Kiel. Thermal coatings of all remaining collimators and the telescope doors were finally completed and the parts have now all been shipped. These were very late for a variety of reasons, delaying the SEPT vibration test.

Population of the SIT energy board is essentially complete. Remaining issues regarding the mounting of MDM connectors and RF shields should be resolved soon.

Progress has been made on the thermal coatings/surfaces for SEPT. Four electronics boxes were selectively black-anodized and Ge-coated black Kapton tape was applied on parts of the exterior. Application of Ag-Teflon tape was delayed until material with certs is available (i.e. until after the SEPT telescopes are shipped to the US). The boxes, a can of Aeroglaze paint, and a bottle of Aeroglaze primer have all been shipped. 4 collimators were also shipped; 8 more collimators and 16 doors are being coated with so-called Goddard Composite.

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The detector life-test thermal vacuum system is now up and running reliably. SIT solid-state detector testing is in process.

Tycho von Rosenvinge attended the IMPACT team and Science Working Team meetings at Berkeley in December. He also attended the IMPACT Pre-Environmental Review conducted at Berkeley in early January.

An algorithm was developed for compressing upload tables used by the HET on-board processing code. This will allow tables to be compressed by ~ a factor of 10, reducing the amount of space required in the E2PROM in SEP Central as well as the time to upload the tables. Further progress was made in defining the processing of HET penetrating particles on-board.

The SIT thermal vacuum and thermal balance tests have been shifted from Caltech to GSFC.

3.2.1. Next Month-

- Investigate concerns about the dynamic heating of LET detectors immediately after fairing release.
- Fabricate some preliminary LET foils for test.
- Participate in test of integrated engineering test units at Caltech; test uploads to E2PROM and to RAM.
- Complete HET on-board software specifications.
- Cross-check drawings and SIT ETU parts; examine Engineering Model HiVPS for SIT to make sure that changes in its size/shape are accommodated in its box design.
- Finish HET flight board 1 and SIT flight energy board 1 and start testing.
- Investigate/implement changes to Actels re ground bounce issue.
- Continue testing flight detectors for HET and SIT.
- Update ICD with APL to include mounting hole diameters and correct LET FOV.
- Update mass of SEP Main.
- Work on defining the HET and SEPT radioactive sources to be supplied by GSFC.
- Close out remaining RFAs from CDR.

3.3. **Design Updates**

Work being shifted from UofMD and from Caltech may require some additional funding.

3.4. **Outstanding Problems**

3.5. **New Problems**

Mostly continued slow schedule slipping.

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3.6. ***Top Risks***

No significant risks at GSFC? Need to ensure that manpower becomes available per the current plan.

We are running behind schedule with respect to detectors and the HET final electronics design. The HET delivery dates have been revised accordingly.

3.7. ***Problem/Failure Quick Look***

4. Kiel/ESTEC (SEPT) Status

December 2003

4.1. Summary of Status

- a) Electronics boxes received thermal coating at GSFC and were returned to Kiel.
- b) Delay in application of thermal coating caused rescheduling of environmental tests. Now scheduled for week 4, 2004. But remaining 8 collimators, 20 covers, and 2 brackets are still not returned to Kiel by end of December. This poses threat of further delay.

4.2. Major Accomplishments

- a) Mechanical assembly of electronics boards into E-boxes not successful because spacer material (Epoxy) showed insufficient pressure capability when screws were torqued with standard bolt torque of 1.1 Nm.
- b) New spacer material identified (PEEK, Polyetherketon) and spacers manufactured.
- c) S/C powered thermistors assembled.
- d) Magnet system painted with Chemglaze z306 which was supplied by GSFC.
- e) Flight detector stacks and foil systems assembled.
- f) Preparations for vibration and TV test ongoing. Vibration test sequence fully defined and agreed by ESTEC/Kiel. Auxiliary mechanical parts for shaker fabricated.
- g) IABG test report of Acoustic Noise Test completed.
- h) SEPT Input for IMPACT PER compiled.
- i) Electronics for FM2 SEPT-E fully tested.
- j) Delivery of electronics for FM1 SEPT-E and FM1 SEPT-NS to Kiel.
- k) Delivery of GSE to Kiel.
- l) Assembly of electronics for FM2 SEPT-NS board 80 % complete.
- m) PDFE LAT test will be reconducted (see November 2003 report). Start early January 2004.

4.3. Design Updates

4.4. Outstanding Problems

1. Application of thermal coating at GSFC continues to be delayed. Covers not yet received. Brackets for SEPT-NS not yet received. Schedule is extremely tight to meet the January 19, 2004 vibration start date.

4.5. New Problems

4.6. Top Risks

4.7. Problem/Failure Quick Look

1. Epoxy spacers need to be replaced by PEEK spacers (see Major Accomplishments 1/2 above).

5. Caltech/JPL (SEP) Status

5.1. Summary of Status

Activities centered on the detector development, electronics development, and flight and GSE software development.

Major Accomplishments:

- LET board coupons passed inspection. All coupons on the boards we are responsible for have now passed inspection and no more coupons remain to be tested.
- Enough LET flight detectors have been received to populate both flight sensors.
- Integrated EM LET mechanical housing for the first time with a subset of flight detectors and conducted series of tests with radioactive sources.
- Finished assembly of SEP Analog/Post-Reg flight boards S/N 1 & 2 and then delivered them to Space Instruments for further testing.

Critical Milestones status:

- Milestone 18 (HET-All Flight Detectors Received) has not been accomplished due to detector mount problems, which have now been resolved. All HET detectors should be received by sometime in January 2004.
- Milestone 19 (LET-All Flight Detectors Received) has not been accomplished. Mount problems also delayed progress. All L3 and most L1 and L2 detectors have been received. All ordered detectors are now expected by mid-January.
- Milestone 20 (SEP Package-EM I&T Complete) has not been accomplished. Great progress was made in the EM interface test in October but it was deemed another test is needed and is scheduled for the week of 26 January 2004.

Detectors:

- The following table summarizes the delivery status of silicon detectors for LET and HET as of 31 December 2003.

Item	Needed for flight	Ordered	Received	Notes
L1 proto		5	6	1,2
L1 flight	20	30	23	3,4
L2 proto		2	2	5
L2 flight	4	9	4	
L3 proto		2	2	5
L3 flight	4	9	9	
H1 proto		2	2	
H1 flight	4	9	9	
H3 proto		2	2	
H3 flight	14	20	10	

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Notes:

1. Micron delivered one more L1 prototype detector than was ordered so that we could test all of the available devices.
 2. Measurements at Caltech showed that the prototype L1 detectors are thicker than specified (typically about 28 microns vs. the specified range of 18-22 microns. If necessary these are flyable devices.
 3. One of the flight L1 detectors is cracked and will be replaced by Micron.
 4. In addition to the flight L1 detectors listed, Micron delivered 8 additional "B-grade" L1 detectors for evaluation. These devices have higher leakage currents than specified, but may still be useful for flight.
 5. Of the two L2 and two L3 prototypes, one of each kind is classified as "B-grade"
- Micron has completed their fabrication and testing of the remaining flight L1 and L2 detectors and plans to ship them to Caltech the first week in January.
 - Thermal-vacuum life testing of the LET detectors is continuing at Caltech. One significant problem has been identified in this test: of the 11 L3 detectors (prototype plus flight), 6 have exhibited long-term leakage current growth. Of these 6 problem detectors, 4 are still in a thermal-vacuum run and might eventually stabilize. Devices with such leakage current growth would be problematical for flight. It should still be possible to select the four required flight L3 detectors from the 5 devices that did not show current growth. Also, Micron has agreed to fabricate replacements for some of the problem detectors.
 - Since the HET detectors are all 1-mm-thick devices made from the same type of silicon wafers as the L3's, current growth may turn out to be a problem for these detectors as well. Hopefully thermal-vacuum testing of HET detectors at GSFC in January will establish how serious this problem is. Micron rejected a number of H3 detectors in their own vacuum testing, probably due to the same problem. As a result of the low yield of H3 detectors, Micron has started the manufacture of additional H3's and expects to complete the delivery of all the flight H3 detectors around the end of January.

Electronics:

- Integrated EM LET mechanical housing for the first time with a subset of flight detectors and conducted series of tests with radioactive sources.
- Finished assembly of SEP Analog/Post-Reg flight boards S/N 1 & 2 and then delivered them to Space Instruments for further testing.
- Started assembly of SEP Logic flight boards S/N 1 & 2. One of the boards will have an EM ACTEL socket installed in order to test the PCB layout modifications and make sure the board works with the EM ACTEL before flight ACTEL installation.
- Sent flight parts kit and assembly documentation to GSFC for SEP Bias Supply boards S/N 1 & 2. The assembly is due to start in early January. The final bias voltage setting components will be installed at Caltech after sufficient testing of flight detectors, which is currently under way.
- LET flight board test coupons passed GSFC inspection.
- Continued support of second ACTEL device failure investigation. In the meantime, ACTEL Corp. has reimbursed us for the first device that failed to program, but has not yet made a decision on the reimbursement of the second device.

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- Work continued on LET flight software, which is about 70% complete (not counting Andrew Davis' part).
- Several data sets containing stimulus events were created and were delivered to Bob Radocinski for analysis. Generally, the data look good, but there are some peculiarities that still need to be tracked down.
- Analysis of data sets generated by the Thorium alpha source was completed and instrument performance seemed nominal.
- An attempt was made to use a Polonium alpha source, but we found that the protons generated had not enough range to penetrate L1 and trigger L2 (probably due to a thicker than expected window on the Polonium source).
- Progress was made on LET data packet handling software. LET data packets now include housekeeping leakage currents and temperatures. However, rate, event and beacon packets are presently zero-filled.

Software (Davis):

- Completed and delivered first fully featured and working version of LET event processing software to Rick Cook. I expect he will come back with a list of suggestions and revisions.
- Continued with further testing of the current version using simulated events.

GSE:

- The LET sensor (engineering model) was assembled and partially populated with detectors. This allowed the testing of the LET E/M with a laboratory radiation source to produce events in the LET E/M. In addition to the events from the laboratory radiation source, the LET E/M also used to generate stimulus events.
- To support these activities and provide an initial look at LET data, the following software was developed.
 - Software was written to parse, display, and summarize the events from the runs using the radiation source. This software was limited to being able to display events that had interactions with a single detector in each layer of LET. Other types of events were marked as exceptions for the purposes of this software. Scatter-plots showing the relative PHA value of events in different layers were produced.
 - Software was written to sort and produce histograms for each of the stimulus levels for each LET detector.

5.2. *Design Updates*

- Resource updates will be sent separately.

5.3. *Outstanding Problems*

- The problems with the two flight ACTELs are being investigated by ACTEL and by Rich Katz at GSFC.
- Higher than expected thermal vacuum run failures of the L3 detectors will require Micron to provide a few additional flight devices.
- Preliminary analysis suggests that the nominal fairing release time will cause excessive heating to the L1 detectors (to 65C) based on the heating levels specified, which may have considerable margin (factor 3) over what might actually be experienced. The lower heating level would only heat the detectors to 45C. In the

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meantime, partly for other reasons, an additional window is being added to LET and perhaps that will mitigate the problem. More calculations are underway.

5.4. ***New Problems***

- None

5.5. ***Top Risks.***

- ACTEL parts may not be reliable. This would affect many NASA projects.
- Higher than expected free molecular heating might require a re-design of the LET sensor head.
- The budget is very tight with no reserve being held at Caltech.

5.6. ***Problem/Failure Quick Look***

- None.

5.7. ***Lien List***

- Budget does not contain funding for investigations of part failures or contamination failures, re-makes of boards if coupons fail, etc. Some of this has already occurred, as more rework has been required in the hybrid development area than we budgeted for. Some die have failed test, some units have failed PIND testing, and in a couple of cases leaks have occurred after lead bending, which was caused by a problem with the tooling that has been corrected. In addition, QA costs have been a far bigger percentage of the overall cost than anticipated. Currently the yield of hybrids has improved with 16 of 20 passing electrical test in the last batch. (Amount = ~\$50,000 (guess); Probability = 100%; time frame = March 2004).
- Overlooked hybrid costs: it was not realized that the cost estimate we were given for the hybrids did not include the qualification costs of 10 units. We have asked for a quote from JPL. (Amount = ~\$10,000 (guess); Probability = 100%; time frame = March 2004).
- Unfunded schedule reserve: ~\$25,000. This is becoming a reality, as our latest schedules show delivery in September 2004 (as required), whereas we had budgeted for delivery in July 2004. (Amount = \$25,000; Probability = 100%; time frame = August 2004).
- Possible under-budgeting of environmental testing and bake out. \$100K has been allocated. However, recent estimates suggest that the thermal balance/thermal vacuum test may require about 3 weeks. Recent cost estimates at JPL suggest that that might take the entire \$100K. We are investigating other places for the environmental test program where the costs may be less. (Amount = ~\$50,000 (guess); Probability = 50%; time frame = July 2004).
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6. SIT MONTHLY TECHNICAL PROGRESS REPORT

December 2003

6.1. **SUMMARY of STATUS**

- a. SIT TELESCOPE - Prototype returned to UMd to participate in SIT testing. Flight foils are at GSFC. Flight MCPs were tested at UMd and are being stored at GSFC. Flight solid state detectors are at GSFC undergoing test.
- b. SIT TOF System - FM1 was downgraded to ETU and is part of the ETU electronics under test at UMd. Work is proceeding at MP Ae to generate a new FM1 and FM2.
- c. SIT Energy System – ETU is integrated in the ETU electronics at UMd. Flight units are under construction at GSFC.
- d. SIT Logic System – The updated ETU logic board and updated motherboard have been integrated with the remaining electronics.. Testing is underway at UMd.
- e. SIT HVPS - Flight HVPS FM1 is undergoing test at UMd.
- f. Flight Software – Version 11/20/03 is installed in the ETU under test at UMd.

6.1.1. Schedule Changes

The current SIT schedule is available from Jim Rogers

6.2. **MAJOR ACCOMPLISHMENTS**

6.2.1. This Month

ETU: The problem with the ETU Actel was identified and fixed. Modifications to the design made to meet setup time requirements on the flight memory were found to have a logic flaw. This flaw prevented updated data from being sent to memory in cases where there was more than one 6-bit memory write instruction in a 24-bit word. The symptoms were tracked down at UMd and the cause was discovered and fixed by George Winkert at GSFC. The new chip works well and we are convinced we have properly identified the problem and fixed it.

Energy board: QA approval was received to begin assembly of the flight energy boards while final part issues are worked out.

ATOF Board – Construction and testing is proceeding on both ATOF and DTOF flight TOF boards.

STEREO IMPACT Technical Progress Report

HVPS - FM1 was completed at UCB and shipped to UMD. Testing was begun but a failure in the UMD vacuum system (the HVPS was not in the chamber at the time) has delayed further testing until the pump can be replaced.

6.2.2. Next Month

Next month we will test the HVPS, release the Logic Board for PCB fabrication and complete the design for the Mother Board. We hope to receive the TOF boards. We will also support the PER and the final ETU "Pow-wow" at Caltech.

6.3. **DESIGN UPDATES**

6.3.1. Resources

	Last Month	This Month	Change
Mass (kg) *	1.46	1.46	0
Power (W)	1.56	1.56	0.0
Telemetry (bps)	418	418	0

* Includes 200g book-kept by GSFC for SIT structure

A new estimate of Actel power for the flight units indicates that power will increase. Previous estimates had neglected the effect of the triple gates in the flight units for single-event upset protection.

6.4. **OUTSTANDING PROBLEMS**

We are continuing to work Energy parts issues.

6.5. **NEW PROBLEMS**

Latest version of the Actel does not run flight software.

6.6. **NEW RISKS**

6.7. **PROBLEM/FAILURE QUICK LOOK**

Starts at first turn-on of flight hardware.

ID #	Description	Assignee	Opened	Closed

7. CESR (SWEA) Status

CESR- TOULOUSE- France

Author : Claude Aoustin / Project Manager

SWEA PROGRESS REPORT # 27 (January 12, 2004)

December 2003

CESR is in charge of :

- Electrostatic analyzer with deflectors, grids and Retractable Cover
- Detector consisting of two MCP rings
- Amplifiers and discriminators
- 3 High voltages

7.1. *Summary of Status*

7.1.1. ETU1

Delivery to UCB was planned for 12/07/2002 : done 26/09/2002

7.1.2. ETU2

Mechanical fabrication 100 % done
Integration done for the vacuum test configuration.
Electronic boards tested (100 %).

7.1.3. FM1 / FM2

Mechanical fabrication 100 % done.
Electronics boards fabrication : 100% done

7.2. *Major accomplishments*

7.2.1. FM1 :

Delivered to SSL : 8 December.

7.2.2. FM2 :

FM2 integrated : 2 parts (bottom with the inner sphere ready for MCP characterization test; top with grids, external sphere and pin puller.
Calibrations should be finished by mid March.
Delivery to SSL UCB by end of March.

7.3. *Design Updates*

Mass : 967 g (EM is 950g without cover opening mechanism)
Power : 446 mW min ; 662 mW max

STEREO IMPACT Technical Progress Report

7.4. ***Outstanding Problems***

HV resistors life test 1000 h. on going.

LT1024 radiation test performed by GSFC. It shows drift of the bias current. This has an impact on the deflectors HV. The 1 Mgohms resistors R18 and R31 have been changed by 5.1 Mgohms resistors. This is minimizing the impact of the radiation and is acceptable for the science data quality up to 12 krads. Furthermore a sheet of 1mm of copper has been added on the top of all the LT1024.

7.5. ***New problems***

7.6. ***Top Risks***

7.7. ***Problem Failure Quick Look***

HV multiplier from VMI HM 402 P 10 failed at -70°C !

Problem Failure report 6001 updated by Dave.

Failure analysis done by GSFC. It is showing a bad bonding inside the component.

Two parts from the same lot sent to Lilian for testing.

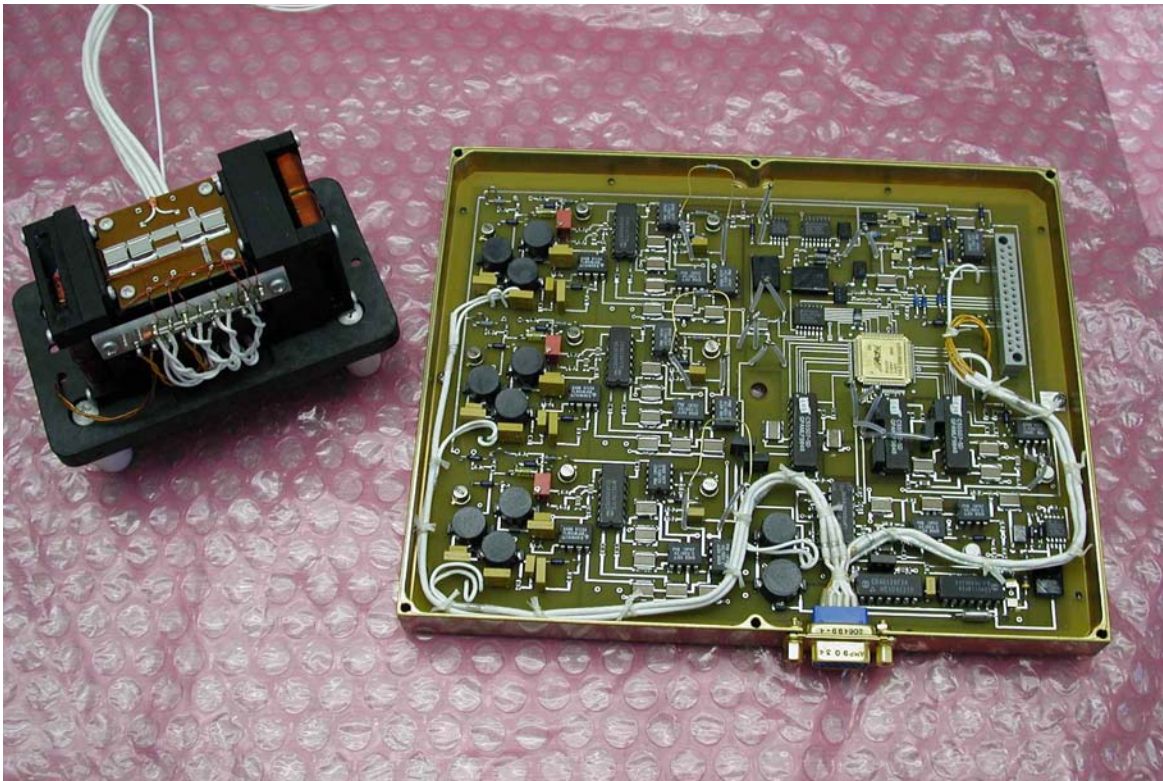
STEREO IMPACT Technical Progress Report

8. GSFC (MAG) Status

Status as of January 8:

1. FM1 is complete and has completed all electrical tests and adjustments. The remaining jumpers will be lowered to the board this week, and the board coated next week. Temperature cycling will follow but also see below.
2. The analog part of FM2 has been completed and electrically adjusted. The FPGA will be burned this week and installed on the board next week. At this point FM2 will be in a state identical to FM1 so we plan to thermal cycle the units together.
3. The heater boards (FM1 & FM2) are complete and tested but not the filter daughter boards. The layout is complete and fabrication in progress. We expect to have them here shortly.

FM1 MAG Electronics and FM2 Sensor



STEREO IMPACT Technical Progress Report

9. EPO at UCB

Monthly E/PO Report

December, 2003

Informal Education and Public Outreach:

We worked more on the Helios data to examine interpolations in order to make the data gaps smoother in sound and on the graphs for our Sounds in Space web page.

We have organized a Space Physics Teacher Professional Development workshop that will be held at SSL in Berkeley on February 7th after the GEMS Associate training at the Lawrence Hall of Science. We will hand out and lead the first activity of our magnetism lesson. The workshop is being organized together with several other mission E/POs and the Sun Earth Connection Education Forum (SECEF).

Cross Cutting:

We gave a poster at the American Geophysical Union (AGU) meeting in San Francisco, CA on December 12th entitled: "Using Backward Design in NASA educational resources". In this poster we shared the design philosophy we used when creating our STEREO-IMPACT magnetism lesson and the lesson itself with other E/PO professionals.

STEREO E/PO in general:

At AGU, L. Peticolas spoke with Rachel Weintraub from the Goddard Visualization Center about what types of visualizations would be good to have in our STEREO E/PO efforts and in the STEREO pre-launch package in general.

STEREO IMPACT E/PO issues were discussed with Dr. Terry Kucera at Berkeley and N. Craig gave a brief history and the summary of continuously changing management and its related problems from the umbrella STP Project.

Respectfully Submitted,
IMPACT E/PO scientists Nahide Craig, Laura Peticolas