

STEREO IMPACT Technical Progress Report

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

Harry:

Enclosed is the monthly technical progress report for the STEREO IMPACT project for the month of June 2002.

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*

UCB and NASA have signed the new contract covering the launch slip together with its associated budget. Associated mods need to be made to the UMD and Caltech subcontracts.

A pair of new allotments from NASA are in the works which should take us most of the way to FY03. UMD has been funded through the end of FY02, as will Caltech as soon as the new funds from NASA clear. 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.

1.2. *Significant System-Level Accomplishments*

- Working EMC issues; all IMPACT waivers but one approved; the last has no concerns.
- Participated in thermal blanket discussions with APL to resolve ESC issues.
- Second monthly IMPACT/PLASTIC telecon to discuss issues (mostly IDPU software).
- PAIP: Working the ESTEC appendix (the last hurdle). Project comments to the latest version have been forwarded to ESTEC.
- Supported Magnetics workshop at APL
- Worked with Project planner on integrated schedule
- Worked with APL on thruster contamination/heating issues
- Still working on parts screening issues (selecting contractors, developing details test specs), getting approvals.

1.3. *System Design Updates*

- None

1.4. *System Outstanding Issues*

- SEPT proton energy threshold not meeting requirement due to extra aluminum deposited to improve stray light rejection
- STE-U location has not been nailed down yet
- STE radiation source has not been approved yet by Project
- Data Analysis meeting to outline Data Analysis Plan scheduled for July
- Operational heater power budget over allocation. Waiver to allocations submitted.

1.5. *Top 10 Risks*

Top 10 risks are attached. No change from last month.

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IMPACT Top Ten Risks 4/2002

No.	Risk Item	Score	Mitigation	Mitigation Schedule						
				PDR	Bread-board Test	CDR	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.	HIGH	Design for reliability. Early development and test to ensure reliability.	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
UCB_21	Custom VLSI used in SEP may have schedule and cost risk	MEDIUM	Early development to prove design; use Amptek in place of VLSI in SIT (still use VLSI in HET, LET)	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
UCB_23	Non-standard parts qualification failure could impact delivery schedule	MEDIUM	Early parts selection and screening	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
UCB_15	GSFC Approval Requirements could delay instrument delivery or add cost	MEDIUM	Difficult to assess, history is mixed	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW
UCB_4	The IDPU is a single point failure mechanism for the IMPACT suite and PLASTIC	HIGH	IDPU is a simple, reliable system. Extra attention will be paid to ensuring its reliability	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
UCB_13	IMPACT team is thin; loss of a critical team member could delay delivery	MEDIUM	Reassign work amongst team as and when required	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
UCB_11	Stringent EMI requirements may delay schedule if testing fails	MEDIUM	Careful design, early testing	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	LOW
UCB_1	ITAR restriction of information exchange with foreign Cos may result in problems not discovered until late in the program	MEDIUM	Various channels of communication have been found within the ITAR restrictions to allow adequate information flow. Some exchanges are still forbidden and may cause a problem.	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW
UCB_18	LET Detectors from a new manufacturer	MEDIUM	Backup L1 detectors ordered; low risk, meet requirements	MEDIUM	MEDIUM	LOW	LOW	LOW	LOW	LOW
UCB_10	Complex Interlocking IMPACT schedule increases risk of late delivery to spacecraft	MEDIUM	A milestone schedule of deliveries has been set up to minimize schedule interaction and give power to control schedule to institutions while maintaining top level schedule slack; an integrated Project-level schedule is in progress. It is not clear yet if this will actually reduce risk	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	LOW

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2. Berkeley Status

2.1. *Summary of Status*

The UCB schedule with updated status will be delivered separately.

2.2. *Major Accomplishments*

SWEA/STE:

- Problems with a glitch occurring during the pulse reset have been worked and significantly improved but not completely fixed. Work continues.
- SWEA/STE layout work in progress. First board done (DAC board), but waiting remaining boards before release.
- SWEA/STE FPGA design in progress.

IDPU:

- Data Controller Board ETU#1 in FPGA testing.
 - Problems with the UT80CRH196KD DMA facility. UTMC has a new part that is supposed to fix this in progress. We also have a work-around that we will use if necessary.
- Flight Software: Add Burst, MAG, SEP code.
- IDPU ETU box is in fabrication

LVPS/HVPS:

- IDPU LVPS layout in progress
- SIT HVPS layout complete and boards fabricated, ready to be loaded.
- LVPS/HVPS ICD in progress

Boom:

- Thermal model delivered to APL. Some refinement of instrument models still required.
- Boom FEM issues closed
- Prototype /Flight tubes on order.
- Working on details of rings
- Joint thermal test pending quote from Wyle
 - Maintaining boom heater options for now
- Harness needs to get ordered (10 week lead time)
- New location for STE-U identified; updated ICD drawings need to be submitted to APL

GSE:

- MAG IDPU simulator software complete and in test, due to be delivered to GSFC early July.
- Work for C&T GSE in progress (Command encoder, MOC Interface); telemetry displays pending telemetry specification.
- Spacecraft Emulator software received from APL. Emulator hardware currently supporting testing of the IDPU 1553 interface at Elf; due back at UCB mid July for testing with the C&T GSE.

2.3. *Design Updates*

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2.4. ***Outstanding Problems***

- Boom thermal issue; to be resolved by joint cold test
- Need a final decision on SWAVES air-coil (effects boom ETU schedule)

2.5. ***New Problems***

- UT80C196KD processor DMA problem needs to be resolved

2.6. ***Top Risks.***

No new risks identified.

2.7. ***Problem/Failure Quick Look***

None.

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3. GSFC (SEP) Status

STEREO/IMPACT/SEP/GSFC Progress Report for June, 2002 – (von Rosenvinge, Baker, Hawk, Reames, Shuman, Wortman)

3.1. *Summary of Status*

Mostly on-schedule. The HET H1 and H3 detector mounts are currently in fabrication and should be received soon. The PCB layout and mechanical designs for the LET2 and LET3 detector mounts have been completed and we are waiting for approval from Caltech and Micron Semiconductor (the detector manufacturer) before submitting the designs for fabrication. Connectors for all detectors have been ordered. The PCB coupons for the L1 detector mounts have been submitted for GSFC analysis.

3.2. *Major Accomplishments*

The Caltech PHA ASIC and associated test board were received from Caltech. Initial tests were run using Forth, but subsequent tests have been run using software written in MISC assembly language. A very long serial command is required to completely configure the ASIC. Code was developed for sending commands to the MISC and then for the MISC to send to the ASIC. Additional code was developed to send pulser pulses to the ASIC, for the MISC to read the resulting pulse-height events, and for the MISC to read the results out as a serial bit stream. This was a good exercise because there will be very similar code for the flight configuration.

George Winkert has begun work on the front-end logic for SIT. He will produce a pin-out by July 19, consistent with Peter Walpole's schedule for laying out the board on which the MISC/front-end Actel chip will be mounted.

3.2.1. Next month

1. Fabricate the L2 and L3 detector mounts. Continue work on the overall SEP mechanical design.
2. Prepare for a Software Requirements Review on August 6.
3. Continue work on the HET GSE, on-board software, and PHA ASIC test software.
4. Continue testing the PHA ASIC.
5. Continue development of the preliminary front-end electronics design for SIT.
6. Deliver a thermal model to APL.

3.3. *Design Updates*

None quantified this month.

3.4. *Outstanding Problems.*

No major problems outstanding.

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3.5. *New Problems*

None.

3.6. *Top Risks*

No significant risks at GSFC? Need to ensure that manpower becomes available per the current plan. Work on the SIT front-end electronics design was delayed due to availability of the engineer responsible for this. He has now started work on this task and he can meet the schedule. He has already reviewed the requirements and sees nothing that is not straightforward.

3.7. *Problem/Failure Quick Look*

4. Kiel (SEPT) Status

SEPT Monthly Technical Progress Report

June 2002

4.1. *Summary of Status*

1. Most parts of prototype sensor housing machined. Pinpullers ordered. Drawing of cover mechanism issued.
2. Combined Kiel/ESTEC schedule issued.
3. Prototype detector stack damaged during handling. Returned to manufacturer Canberra for repair. Delays first test of detector/electronics assembly.
4. Monte Carlo simulation results help in defining the Parylene foil thickness. Parylene foil vendor found. Specifications of foil and support ring in progress.
5. Electronics parts procurement completed to 90%. Test of analogue electronics (PDFEs) continues. Noise source identified. New version of prototype FPGA burnt.
6. Revised ESTEC PA plan issued.

4.2. *Major Accomplishments*

1. The various mechanical parts of the prototype sensor housing are machined and assembled. This is not yet the ETU. Improvements identified for machining the ETU parts.
2. The schedule discrepancies between Kiel and ESTEC have been resolved. The first combined SEPT schedule has been distributed.
3. Pinpullers ordered from TiNi Aerospace (US\$ 50,000). Funding problems still to be solved, as original proposal and budget did not include covers with pinpullers. The cover mechanism drawing is distributed. It may make a door review obsolete.
4. One of the four detector segments failed to show a signal. Visual inspection indicates that one of the 6 coax cables of the stack may be the culprit by not making contact inside the Canberra housing. Possible failure scenario: during mounting/demounting in the vacuum system, stress could have been inadvertently exerted to the cables. The detector stack is returned to Canberra for repair. The test of the integrated detector/electronics assembly is delayed. In order to recover, a surplus detector from the SOHO mission is hooked up to the electronics and tests will start in July.
5. The mathematical model was refined to include a foil with foil density, chemical composition, and foil thickness as parameter. Negotiations are in progress with the new vendor Lebow Company, Goleta, California. Possible candidates are Parylene N, Parylene C, or Parylene D with thickness ranging from 2 to 8 micrometer.
6. Around 90% of the flight parts have been ordered. For non-qualified parts replaceable parts have been identified and ordered as well according to the SEPT PA plan.
7. Testing of the electronics is progressing. Noise sources could be identified. A noise floor according to specification can be achieved using a high end pulser for stimulation.
8. A new FPGA for SEPT has been developed (Revision Code 1) with several minor improvements in respect to rev 0. Three FPGAs are burnt and ready for assembly.
9. Assembly of one additional set of electronics (1 analogue and 1 digital board) is under preparation. A special test circuit for parts radiation testing is progressing. A revised ESTEC PA plan has been issued.

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4.3. *Design Updates*

1. A STEREO Configuration Change Request has been issued to update the Mission Requirements Document to reflect the 60 keV threshold for ions (see last month's progress report for a rationale).

4.4. *Outstanding Problems*

4.5. *New Problems*

4.6. *Top Risks*

4.7. *Problem/Failure Quick Look*

5. Caltech/JPL (SEP) Status

June 2002

5.1. Summary of Status

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

Major Accomplishments:

Detectors:

- The thinning of a silicon wafer containing six copies of the L1 detector with the front (junction) size fabrication already completed is progressing. After some initial problems related to a change of technicians at JPL, the gold masking of the wafer was successfully completed. At the end of the month the etching was partially completed and looked good in terms of etch uniformity. The previously-encountered problem of accelerated etching in certain areas correlated with the implanted pattern on the opposite side of the wafer did not appear to be recurring.
- A meeting was held at Micron Semiconductor on June 28. They expect to be doing the ion implantation of the 20 micron wafers for the L1 "plan B" option in July.
- Micron reviewed designs for the L2 and L3 detector mounts and identified a dimensional incompatibility between the L3 detector and mount designs. The necessary modification is being made to the mount drawing at GSFC.
- Micron's work on the prototype L2, L3, H1, and H3 detectors remains on hold waiting for receipt of detector mounts.

Electronics:

- Continued testing of PHA VLSI chip. All functions now have been exercised. Anomalies that will be fixed for re-spin have been identified. Plan for re-submission has been established and date of re-submission set for 7 Oct. 2002. Decisions needed to finalize hybrid schematics have been made.
- Decided to keep the same bias for L3 and H1-6 detectors. Separating them would have been nice, but would require more resources.
- Received preliminary parts lists for Bias Supply and Analog/Post-regulator boards from Space Instruments; started assessing flight parts availability.
- Obtained re-quote from Actel and determined flight quantity for common buy on US-based instruments. SEP is the only instrument on IMPACT using 72S type Actel parts.
- Obtained quote from AMI on VLSI re-spin as a shared wafer with another project. We also obtained a quote from UTMC on re-spinning VLSI through their rad-hard process, as a back-up measure in case the VLSI should fail upcoming radiation tests.
- Started response to Hybrid PDR action items list.

- Resource tables: no significant changes for this month.

Software:

- Worked on Build 1 of LET flight software.

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- Worked on software to control GPIB instruments and serial ports for VLSI testing.
- Worked on software to automate VLSI testing.

GSE:

- Continued work on the Graphical User Interface (GUI) code for handling the page display windows for LET. This is Java code that creates and manages the windows which will contain the LET page displays and responses to the user's mouse and keyboard inputs. This code is independent of the data format.

5.2. *Design Updates*

- No changes to mass and power estimates.

5.3. *Outstanding Problems*

- L1 thinning continues to be a challenge.

5.4. *New Problems*

- None.

5.5. *Top Risks.*

- The budget is very tight with no reserve being held at Caltech.
- Schedule slack that we show explicitly will be taken away from us.
- Development of the L1 detector. (See April and September reports for details.) Risk mitigated by creating slack in schedule and by starting a parallel development effort using different and more conventional manufacturing technique.
- Development of the VLSI chip. (See September report for details.) Risk mitigated by providing for two more months for the layout and checking while still keeping 30 weeks for a second run which now will be necessary.

5.6. *Problem/Failure Quick Look*

- None.

6. SIT MONTHLY TECHNICAL PROGRESS REPORT

June 2002

6.1. **SUMMARY of STATUS**

- a. SIT TELESCOPE - Prototype is in house and working.
- b. SIT TOF System - Flight coupons have been approved and flight assembly is in process.
- c. SIT Energy/Logic System - Prototype energy system has been integrated with the prototype TOF system and both are under test with GSE logic board
- d. SIT HVPS - HVPS ETU fabrication in process

6.1.1. Schedule Changes

The SIT schedule has been updated and is available from Robert Palfy

6.2. **MAJOR ACCOMPLISHMENTS**

6.2.1. This Month

Energy/TOF - The energy system prototype was gotten to work over its entire range of inputs. A bench calibration was performed. The energy and TOF systems were connected together and the GSE software was modified to allow the two systems to work together. Pulser stimulation of the integrated system was successfully performed. Finally, the combined system was connected to the prototype telescope and several alpha particle runs were performed. After some modifications of the energy logic we obtained satisfactory alpha results. Current performance meets our science requirements.

6.2.2. Next Month

We expect the flight TOF boards to be completed in the upcoming month and shipped in early August.

We will stack and box up the TOF and energy boards in a configuration closer to flight (currently they are spread out on the bench top). This will alert us to potential interference problems and will allow us to perform thermal tests on the system.

We hope to receive the engineering unit of the HVPS in July and to begin integrating it with the prototype telescope and the TOF and energy boards.

We expect work to begin at GSFC on implementing our front end logic and will work with George Winkert there to support this.

If there is time, we will start the flight layout of the energy system.

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6.3. **DESIGN UPDATES**

6.3.1. Resources

	Last Month	This Month	Change
Mass (g) *	1336	1336	0
Power (mW)	1354	1354	0
Telemetry (bps)	418	418	0

* Includes 200g bookkept by GSFC for SIT structure

6.4. **OUTSTANDING PROBLEMS**

6.5. **NEW PROBLEMS**

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 # 10 (July 15, 2002)

June 2002

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*

Mechanical design end 17/12/2001 completed

Mechanical analyzer fabrication end 22/04/2002
completed

Electronics fabrication completed, test completed

ETU Assembly start 17/06/2002 end 07/2002

Delivery to UCB was planned for 12/07/2002 : not before end September !

7.2. *Major accomplishments*

Mechanical fabrication :

- First EM analyzer and housing fabricated.
- Deflector grids fabrication: one set (2 grids) fabricated. Transparency lower than expected (75% per grid). Could be increased for the flight models if necessary by having bigger cells.
- Spheres treatment and black coating finished. Spheres received in Toulouse.
- Verification under vacuum in September. Vacuum chamber ready, Electron beam tested before verification of the instrument at some keV.

Electronics boards are designed, fabricated, populated and under test.

The Electronics boards have been integrated together and tested. No noise on the amplifiers in this configuration and when the HVs are On.

Next step is the integration of the MCP. Will be done end August.

Pin Puller arrived in Toulouse. Given to the subcontractor. Mechanical support designed and under fabrication for the EM2.

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7.3. *Design Updates*

Mass : 1040 g

Power : 446 mW min ; 662 mW max

7.4. *Outstanding Problems*

AMPTEKS amplifiers quality:

- additional burn in will be done : 1000h at 125°C on 10 pieces.
- specification given to Hirex : subcontractor specialized for testing flight parts.

7.5. *New problems*

None

7.6. *Top Risks*

7.7. *Problem Failure Quick Look*

None

8. GSFC (MAG) Status

Nothing to report.

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9. EPO at UCB

June E/PO Report:

IMPACT EPO was presented with a poster at the first NASA Office of Space Science Education and Public Outreach Conference in Chicago, Illinois, June 12--14, 2002. The title of the Poster was **Our Sun - the Star of Classroom Activities and Public Outreach Events**.

284 Educators, EPO Scientists and Leads, Science Museum personnel, NASA OSS Education Forum and Support staff attended the conference. First Keynote Address was given by **Dr. Edward J. Weiler**, Associate Administrator for Space Science, NASA.

Conference Goals and Purpose

The goals of the Conference were to strengthen and deepen the education and public outreach efforts of the Office of Space Science and to enhance the ability of the space science community to contribute to these efforts. The presentations and discussions were in the following areas:

- Ways in which scientists can participate in education and outreach.
- Issues and challenges faced by educators in formal and informal venues to incorporate results from space science research in exhibits, the classroom, and other venues.
- Ways in which science education research can help us in our efforts.
- Examples of a broad range of initiatives, including those that exemplify the participation of scientists, outreach to underutilized/underserved communities, and the effective use of technology.

Respectfully submitted,

Nahide Craig