D. Management and Schedule

The IMPACT investigation involves a team of experts selected for their complementary skills in instrument building, data processing, scientific data analysis and interpretation, data dissemination and archiving, and education and outreach. The team has clear lines of authority and clear areas of responsibility for each team member that take maximum advantage of the experience of the members. Communication, efficiency, and need-driven documentation are hallmarks of the IMPACT management process. Instrument development, mission operations, data processing, dissemination, archiving and analysis, and education and outreach are all managed with the same approach.

All aspects of the investigation are highly leveraged on previous and existing NASA and ESA experience, investment, and infrastructure. UCB has extensive project management experience on NASA missions, including WIND, POLAR, MGS, and Lunar Prospector instruments, as well as the FAST and HESSI SMEX missions. UCB has developed similar instruments with CESR for WIND and MGS, and with GSFC on MGS and Lunar Prospector. The SEP group has worked together on a similar instrument complement for ACE.

D.1 Team Organization

The IMPACT investigation management organization (Figure D.1.1) is based on that for the UCB FAST/SMEX, HESSI/SMEX and WIND/3DP projects. The IMPACT Principal Investigator has overall authority on decisions affecting the science return of the investigation as a whole. She is the point of contact for NASA STEREO Mission Managers. She is ultimately accountable for the IMPACT Team's delivery of hardware, software, data products, education and outreach products, and scientific results. An Executive Committee consisting of team members with particular expertise in instrumentation (Lin, von Rosenvinge, Acuna) STEREO science integration (Gosling), data processing, dissemination and archiving (Russell), and education and outreach (Craig) is available to the PI for advice and assistance on matters pertaining to the overall investigation.

D.1.1 Project Manager and Operations/data Manager roles and Responsibilities

The PI delegates the investigation engineering management and technical oversight during the Phase B-D implementation periods to a senior UCB Project Manager (PM), Mr. David Curtis, who is responsible for the successful delivery of the IMPACT instruments, mission operation plans, and ground system. The Project Manager, under the direction of the PI, keeps the budget, schedule and technical integrity of the investigation on-track. This includes following and documenting the development and construction phases of all IMPACT instruments and setting up the ground system testing and integration framework. He defines the requirements and interfaces of the major technical elements and ensures that they are compatible with the STEREO project plans. The PM is the principal point of contact for the STEREO project MOC and SSC on technical aspects of the IMPACT investigation. The PM's role declines to a consulting role after Phase C/D.

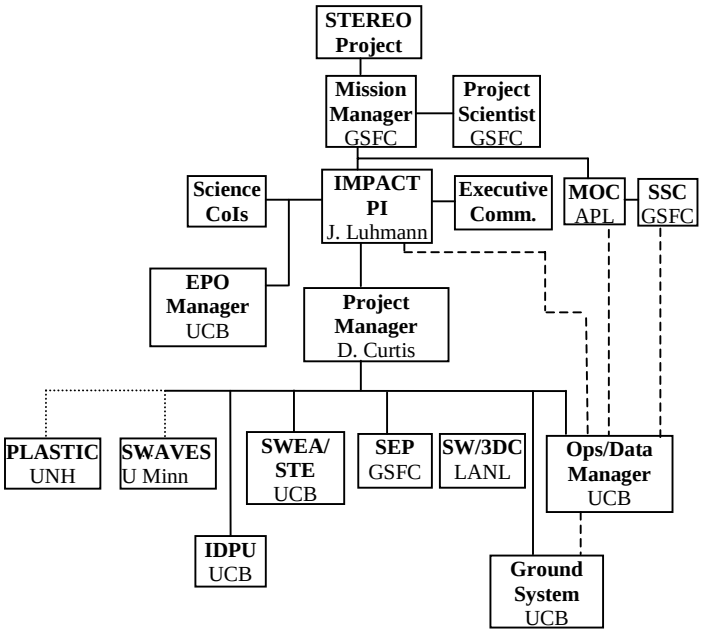


Figure D.1.1 Management Organization Chart: Dashed line indicates post-Launch. Dotted Line indicates coordination with SWAVES and PLASTIC.

Toward the middle of Phase C/D the PM is assisted at a modest level by a UCB Operations/Data Manager (ODM), who takes over in Phase E. The ODM, whose detailed duties are described in Section D.2, is responsible for the collection and verification of the IMPACT instrument command sequences, their integration, and their on-time delivery to the project MOC and SSC. The ODM reports to the PI and to the Executive Committee on matters related to interaction with the team and with the STEREO project. Our experience with the WIND mission support at UCB suggests that the ODM role could be handled by one person working an average of 25% time on the project through Phase E once the systems are set up.

D.1.2 IMPACT Subsystem Organization

The PM's and ODM's jobs are made more efficient by organizing the 7 IMPACT instrument providers into three units based on a combination of technical and institutional considerations. The three units consist of: an SW/SWEA-STE-MAG group represented by Lin at UCB, an SEP group represented by von Rosenvinge at GSFC, and a DPU group represented by the PM. The SWEA-STE-MAG group includes the STE and SWEA from UCB and CESR

Toulouse, and the GSFC MAG (which occupy the IMPACT boom). The SEP group includes the GSFC/Caltech LET and HET, the UMD SIT, and Kiel/ESTEC SEPT. The DPU group includes the UCB IDPU, common LVPS, SIT HVPS and the Ground System, and is closely coordinated with the PLASTIC instrument development team as well as the SWAVES team and the spacecraft C&DH.

The three IMPACT instrument units work with the PM during Phase A-D, and the ODM during Phase E to enable efficient communication and delivery of hardware and software. At a low level during Phase C/D, and then at full capacity during Phase E, the IMPACT investigation Operations/Data Manager (ODM) at UCB works with the instrument units to enable delivery of the investigation data base to the SSC and the project-designated archive. The ODM also works with the SSC and the imaging team to enable optimum co-location of, and access to, the merged STEREO imaging and in situ data. The ODM reports to the PI and Executive group on issues related to his/her interaction with the team and with the STEREO project.

D.1.3 CoInvestigators and Associate Scientists Roles and Responsibilities.

The IMPACT CoIs and Associate Scientists provide an ongoing resource for PI Dr. Janet Luhmann and the STEREO project to draw upon throughout the investigation. The breadth that the CoI resource represents in experience and STEREO science is summarized in Table D.1.1. IMPACT investigation scientists interface directly to the IMPACT Education and Public Outreach (E/PO) activity and to the STEREO SSC activities. The specific roles and responsibilities of each CoI are breifly described below.

Professor Robert Lin and Dr. Davin Larson at UCB in concert with Drs. Jean-Andre Sauvaud, Philippe Louarn and Jean Dandouras of CESR/CNRS in Toulouse are responsible for the delivery of the STE and SWEA electron instruments and the interpretation of the measurements, with UCB primarily responsible for STE and CESR/CNRS primarily for SWEA.

Dr. Mario Acuna of GSFC is the MAG provider and scientist. Professor Christopher Russell at UCLA processes the MAG data and is responsible for the overall IMPACT investigation Web-based data access system.

Dr. Keith Ogilvie of GSFC is responsible for overseeing magnetic and electrostatic backgrounds controls for the IMPACT SW package and MAG.

Drs. Tycho von Rosenvinge and Donald Reames at GSFC are in charge of the LET experiment and also of the HET instrument and overall coordination of the IMPACT SEP component.

Dr. Richard Mewaldt and Professor Edward Stone of Caltech, together with Dr. Mark Wiedenbeck of JPL are the HET scientists also participating in LET development and testing and the development of the SEP common electronics.

Drs. Horst Kunow, Reinhold Mueller-Mellin, and Volker Bothmer of the University of Kiel are the SEPT scientists who contribute SEPT and its calibrated data for the IMPACT investigation. Drs. Trevor Sanderson and Richard Marsden of ESTEC supply electronics for the SEPT.

Professor Glenn Mason of the University of Maryland is the SIT scientist, responsible for delivering SIT and its data toward the fulfillment of IMPACT goals. Drs. Axel Korth and Stefano Livi of Max Planck Institute of Aeronomy will supply the TOF board with Co-Investigator Dr. Robert Lin of UCB supplying the High Voltage Power Supply.

Dr, Jack Gosling of Los Alamos National Laboratory coordinates the scientific interaction between IMPACT and the PLASTIC and SECCHI investigations, with CoIs Dr. David McComas and Herbert Funsten contributing solar wind expertise.

Dr. Jean-Louis Bougeret of DESPA in Meudon is in charge of the IMPACT investigation interface with the SWAVES investigation and the related science.

Dr. Jon Linker of SAIC brings to the IMPACT investigation solar data-based global corona and CME models that interface with the interplanetary transport and ICME models of Dr. Victor Pizzo of NOAA-SEC and Prof. Tamas Gombosi of the University of Michigan. Dr Karoly Kecskemety of KFKI in Hungary works with Co-Investigator Gombosi to enhance the use of the Michigan model for IMPACT SEP data interpretation purposes. Dr. Chee Ng applies the information on ICME shocks from these global simulations to SEP transport models.

A detailed listing of hardware, software, and GSE development responsibilities is listed in Appendix G. Our investigation also includes Associate Scientists who work with the above CoI members on key instrumental and scientific tasks: Dr. Alan Cummings, Caltech, on the electronics design, fabrication and test activities for LET and HET; Dr. Richard Leske, Caltech, on LET and HET calibration, testing and data analysis activities; Dr. Daniel Reisenfeld, Los Alamos National Laboratory, on solar wind data analysis; Dr. Stuart Bale, Space Sciences Laboratory, UCB, on coordinations with the Radio/Plasma Wave team, and integrated in-situ and radio data analysis and processing software; Prof. Dr. Vytenis M. Vasyliunas Max Planck Institut fuer Aeronomie, on general theoretical support; Dr. Zoran Mikic, SAIC, with CoI Linker, on the coronal and Solar Wind modeling; Dr. Pete Riley, SAIC with CoI Linker, on Solar Wind modeling; Dr. Darren DeZeeuw, University of Michigan, with CoI Gombosi, on Sun-to-Earth Simulations; Dr. Dusan Odstrcil, NOAA Space Environment Center and CIRES U. of Colorado, with CoI Pizzo, on interplanetary propagation models; Dr. Nahide Craig, Space Sciences Laboratory UCB, as IMPACT E/PO manager.

Table D.1.1 IMPACT Co-Investigator Roles, Experience and Expertise

Co-Investigator	Primary Role														Experience													Expertise										
	MAG	SWEA	STE	SIT	SEPT	LET	HET	Mission Ops.	SWAVES Coord.	Plastic Coord.	Modeling	Data Access Archiving	EPO		IMP	PVO	ISEE	ISTP	SAMPEX	SOHO	IMAGE	TWINS	MGS/ Lunar Pros.	Ulysses	ACE	CassiniGalileo	Cluster		Solar	Corona	CME	Solar Wind	IMF	SEP	Space Weather	CIRs	Pickup Ions	ACRs	NASA Funding
J. Luhmann - PI								X	X		X	X	X			X		X								X				X	X	X	X		X			X
M. Acuna	X							X										X					X									X						X
C. Russell	X											X				X	X	X								X						X		X				X
K. Ogilvie	X	X															X	X													X		X					X
J. Dandouras		X	X														X									X						X		X				
D. Larson		X	X					X										X												X		X		X				X
P. Louarn		X	X																							X						X		X				
J. Sauvaud		X	X					X															X			X						X		X				
H. Funsten								X		X											X	X		X								X						X
J. Gosling										X					X		X							X	X	X			X	X	X	X	X		X	X			X
D. McComas				X				X		X						X		X			X	X		X	X	X				X	X	X	X		X	X			X
S. Livi				X																				X								X						
A. Korth				X														X						X		X						X						
R. Lin		X	X					X	X						X		X	X					X	X			X		X	X	X	X		X				X
G. Mason				X				X										X	X						X						X		X		X	X	X	X	X
V. Bothmer					X															X				X					X	X	X	X	X	X	X	X			
H. Kunow					X			X												X				X						X	X			X		X			
R. Marsden					X												X	X		X				X						X	X		X	X	X	X		X	
R. Mueller-Mellin					X			X												X				X							X			X		X		X	
T. Sanderson					X												X	X		X				X							X		X	X	X	X		X	
T. von Rosenvinge						X	X	X							X		X	X	X						X								X		X	X	X	X	X
D. Reames						X	X								X		X	X	X														X	X	X				X
R. Mewaldt						X	X	X							X		X		X						X								X		X		X		X
E. Stone						X	X								X		X		X						X	X							X				X		
M. Wiedenbeck						X	X	X									X								X								X				X		X
K. Kecskemety											X									X							X			X				X					
J. Bougeret									X									X						X														
T. Gombosi											X															X									X				X
J. Linker											X																		X	X	X	X			X			X
C. Ng											X																						X		X				X
V. Pizzo											X																		X	X	X	X			X			X

D.2 Management Process

D.2.1 Decision Making.

The IMPACT investigation policy is that problems are solved at the lowest reasonable organizational level where authority is commensurate with responsibility. Instrument builders have the responsibility to deliver hardware and software according to the project-approved investigation schedule and cost plan, and have authority to make decisions within that plan. Decisions affecting schedule, cost or weight/ power resources move up to the PM who has the authority to adjust them with consideration for the full investigation. The PI is brought into these decisions when they affect the investigation's science requirements and/or overall budget. The PM makes investigation decisions that are within the technical development plan with the concurrent understanding of the PI. The PM also optimizes use of shared components, including the IDPU, common LVPS, and GSE within the investigation and with our coordinated PLASTIC and SWAVES investigation partners. Any change affecting the science return, or the investigation resources beyond the investigation reserves, shall be discussed and decided with the STEREO Program Management. Decisions affecting science return, including all investigation descopes, are made by the PI with input from the PM, executive group and others as she deems necessary.

D.2.2 Communication, Meetings and Documentation.

The PI initiates semiweekly (through Phases A-D) and then monthly (during Phase E) teleconferences with the IMPACT team that review the state of the IMPACT investigation, identify problems or opportunities, and formulate strategies for dealing with the latter. This group is also available to the PI on an as-needed consulting basis. The PI has established an IMPACT investigation Web site at UCB (http://sprg.ssl.berkeley.edu/impact) where investigation documents, including a summary of the group teleconferences, are available to team members and the project. Investigation documentation are written, revised and updated as required for the investigation to progress by the STEREO project. We identify early and clearly who is responsible for all documentation. Interface control documents (mechanical, electrical and information), used to track interfaces, and to test and inspect assemblies, are the PM's responsibility, although the PM may solicit inputs from the appropriate team member. The ODM maintains records of instrument command histories and data received, processed and submitted. We use the latest tools for design documentation and configuration control. The control documents are maintained on line on the Web. Change notices are issued via email and the Web documents kept up to date. Other reporting is handled or delegated by the PI.

Semiannual meetings of the entire IMPACT team set team policy, review progress, plan IMPACT science operations, and promote collaborations on scientific analyses. During Phases A-D, the team meetings include instrument reports, project representative reports, and the PM overview of the IMPACT investigation status. As the ODM roles phase in, discussions include the mechanics of the experimenter to ODM to MOC/SSC connections, and experimenter plans for instrument-level data validation and calibration software provision to the ODM. During Phase E, the major part of the team meetings is dedicated to science discussions and workshops. Throughout all mission phases, the IMPACT EPO team member describes the development of our EPO connections and solicits assistance, participation, and specialized science products from the team. In this forum, team members also have the opportunity to provide feedback on any aspect of the investigation, including their concerns regarding the organization or management of the investigation. SWAVES, SECCHI and PLASTIC team representatives will be invited to attend. At least one of the team meetings will be routinely coordinated in location and time with SECCHI, SWAVES, PLASTIC, and/or STEREO project meetings by prearrangement.

The venue of the science team meetings is where the IMPACT modeling activities first come into play in Phases C/D. Our plans for synergistic modeling and data analysis require that our investigation operations and data processing strategy be designed to allow ready comparisons with modeling results. In particular, our summary data base design is to include the information needed to compare the IMPACT investigation data with the results from our global MHD models of solar wind structure and ICMEs, and to perhaps accommodate some of the modeling results and display tools. The IMPACT modeling activity is fully integrated during Phase E.

Team meeting agendas will be set by the PI with input from the IMPACT team. The PI will record highlights and action items from the team meetings for posting on the IMPACT Web site. Newsworthy results will be communicated to the STEREO project scientist and the STEREO E/PO personnel.

D.2.3 Reviews.

In addition to internal meetings, the IMPACT team will support Project meetings as required. This includes weekly Project/Instrument telecons, and periodic meetings.

The IMPACT team will also support instrument and project level formal reviews and informal peer reviews, as called out in the PAIP, appendix B, section 2. Review support packages in the form of viewgraphs

shall be provided to Project for formal reviews in advance.

D.2.4 Reporting.

Financial reporting shall be in the form of 533M and 533Q reports as required by the contract, including explanations of significant variances from the planned expenditures.

D.2.5 Government and APL Furnished Property.

No government-furnished property or services are required for the IMPACT development. Some QA services may be contracted with GSFC, such as PWB screening, on a cost basis.

APL will provide two spacecraft emulators, and facilities for integration and test of the instrument with the spacecraft (to be called out in the spacecraft/instrument ICD). No other APL services are required.

D.3 Risk Management.

The PM keeps a status record of each partner's funding and expenditures, their percent completion, and their major deliverables versus schedule. If any partner appears to present a risk to the schedule and/or budget of the overall investigation, a review is held involving the PM, the PI, the relevant instrument group leader (see Section D.1.2), and the partner in question, to develop a plan to return to the schedule or budget. If the partner cannot return to the schedule or budget, an alternative plan is developed. In particular, if an instrument contributing one of the baseline measurements is involved, an alternative instrument may be procured within the team. This is possible because of overlapping experience and expertise, as in plasma analyzer technology between UCB and CESR, magnetic field measurements between GSFC and UCLA, and SEP instrument expertise at GSFC, Caltech and UMd. Many reliable and current designs exist within our institutions due to their ongoing involvement in space hardware. In most cases an entire instrument would not be involved, and work can be traded within the team to reduce the cost or accelerate the pace of progress toward delivery.

Table D.3 outlines identified risk areas and possible mitigation options (not prioritized). The IMPACT instrumentation has significant heritage, greatly reducing technical, schedule, and cost risks. In particular, the MAG, SWEA, SIT, SEPT, plus much of HET and LET are virtual copies of previously flown instruments, so the risk is very low. The STE is based on proven technology, but in a new application. There is some technical risk in meeting the lower energy levels for STE, but our approach is to achieve the best energy threshold we can without investing in a significant development program, so the cost risk is contained. The new development for STE is scheduled for early prototype fabrication and testing, to be completed before CDR (5/01). At that point, decisions about descopes can be made.

Table D.3 IMPACT Risk Management Options

	Risk Area	Contingency Plan	Impact
1	STE Noise	Increase threshold	Lose lowest energy
2	STE develop.	Drop STE	No suprathermal electrons
3	SWE develop.	Drop STE, UCB augments SWE	No suprathermal electrons
4	Internat'l support for SWE or STE	UCB builds both; or drops STE, builds SWE	Increased US cost; or no suprathermal electrons
5	SIT Hybrids	Non-hybrid solution	Increased mass and power
6	SIT/3DC TOF	Simpler version	Increased mass and power
7	LET/HET VLSI	Use VLSI from ACE/SIS plus commercial preamp	Increased mass and power resources
8	LET/15um detectors	Use spare detectors from WIND/LEMT	Reduced reliablilty and possibly reduced geometrical factor
9	Internat'l support for SEPT	UCB builds SEPT	Increased US cost
10	Boom develop.	Body mount SWE and/or STE	Reduce phase space coverage
	Resources (mass, power)	Some of above plus:	
11		Descope STE	Reduced angular resolution
12		Descope/eliminate SWE deflector	Reduce phase space coverage
13		Descope LVPS Isolation	Increased risk
14		Remove burst memory	Loss of high time resolution science
15		Eliminate SEPT out-of-ecliptic telescope	Loss of phase space coverage and geometric factor
16		Reduce number of HET and/or LET detectors	Loss of energy range, geometrical factor, and/or background rejection
17		Power cycle instruments	Continuous coverage, burst science
18		Eliminate SIT telescope	No SEP composition measurements below 1 MeV/nuc
19	Cost or Schedule	Reduce testing	Risk of failure

The descopes in Table D.3 also include options that reduce mass and power resource requirements, so that growth in these areas can be contained. Currently all reserves (mass, power, and money) are being held by Project, so Project is part of all trades, and will release its reserves as it sees fit. Should any of these reserves be passed on to the instrument team to control, they will be held by the Project Manager, and only released at a rate appropriate to the level of maturity of the design level of completion of the project. The CDR is a crucial time for making descopes required to keep the development on track and be able to make any significant savings.

D.4 Project Schedule

The following pages show schedules for development of IMPACT at the various CoI institutions. These schedules have been integrated, and are linked by deliverable hardware and documentation. The first schedule is an overview of the phases of the program and the activities going on in each phase. The following pages show the top-level schedule for each institution or major development item. Major system milestones are mostly on the UCB and I&T schedules. The schedules are available in Microsoft Project 98 format from the Project Manager for further analysis at a lower level.

These schedules contain margin included in each task element. In addition, there are options the Program Manager can use to reorganize the schedule as needed; for example some work that is listed serially can be done in parallel if required. Delivery to the Spacecraft is shown around July 2003 (on the I&T schedule), which is early in the instrument integration interval; the ability to deliver later if necessary provides more hidden slack.

The Project Manager shall maintain these linked schedules throughout the development program. CoIs will provide institutional schedules and status monthly to the PM so that he can coordinate the various activities and reorganize or prioritize work as required to maintain adequate schedule slack. The integrated schedule will then be provided to Project.

D.5 ITAR-Related Issues and Plans

In view of current ITAR restrictions and concerns, and the involvement in IMPACT of hardware CoInvestigators from the University of Kiel, ESTEC, and Max Planck Institut fuer Aeronomie (in SEP/SEPT and SEP/SIT, respectively), we have established procedures for team interactions using the guidelines of both the Project and of the various institutional members involved. The content of the ITAR-related technical interactions for IMPACT is described in NASA Letters of Agreement written by the Project office at GSFC in consultation with UCB.

In brief, the SEP/SEPT instrument is being provided in its entirety by the University of Kiel and ESTEC. The instrument will be imported to GSFC for integration with the IMPACT SEP package and eventually with the STEREO spacecraft at APL. It is expected that the Project and GSFC will provide the necessary import licensing for SEPT as described in the attached LOAs with the German agency DLR and with ESTEC. The SEP/SIT contribution from the Max Planck Institute is a time-of-flight circuit that will be integrated into the SEP/SIT instrument built by the University of Maryland. It is also expected that the Project and GSFC will provide the necessary licensing for the information and hardware exchange described in the attached LOA with the German agency DLR that pertains to SEP/SIT. Such licensing has previously been provided by the GSFC Project Offices on a large number of international collaborations of this nature. We expect that precedent will apply to STEREO. Our SEP lead CoInvestigator, Dr. Tycho von Rosenvinge, is located at GSFC and will act as the local signatory for these licenses for IMPACT imports as required by the GSFC licensing office. Our remaining foreign contribution, from CESR/CNRS in France, similarly involves delivery of the completed SWEA box that needs only to meet the specifications for the science and the interfaces to the IMPACT boom/mast and IDPU. The SWEA analyzer will be delivered to Berkeley using import licensing, preferrably provided by the GSFC Project Office, but if not UCB will handle the licensing.

The procedures being followed by non-NASA institutions within the IMPACT Team are as follows, by hardware-providing institution:

UCB: At UCB, consultation with the University of California Office of the President (UCOP), in the presence of their legal counsel, has led to draft guidelines for UCB Space Sciences Laboratory participation in flight projects. These guidelines will hopefully be made official during Phase B. The level of foreign CoI interaction involved for IMPACT, according to UCOP views, is not of the scope or type requiring a TAA. IMPACT falls within the traditional fundamental research definition wherein exchanges involve what is available in the public domain. Indeed, it is University of California policy not to support what is considered exclusive and/or classified research. We have been advised not to disseminate materials given to us that are marked or otherwise specified as restricted to US citizens only. The balance of our interactions are in the purview of open literature, open conference discussions and presentations, and open workshops. PI and/or Project Manager communications with hardware contributors to IMPACT are conducted at a high level in person, by telephone, email, and web-sites, to specify requirements needed for delivery of an IMPACT system-compatible unit, and contain no technical information that is not widely available, including on unrestricted portions of the JHUAPL Project website. The University of California Office of the President will handle our import licensing in the undesirable event that the GSFC Project Office defers that task to us.

UMD: The UMD policies parallel those of UCB. Technical information exchanged is of the nature of specifications to make the hardware compatible. It is expected that GSFC will handle the import licensing for the UMD for the Max Planck Institute contribution to the SEP/SIT instrument, with assistance from IMPACT SEP lead CoI von Rosenvinge at GSFC.

CalTech: Caltech is generally using JPL advisors on ITAR issues, and as such, is planning to follow the NASA Center model of obtaining a TAA. Institutional uncertainties on ITAR response at Caltech has impeded Caltech, and thereby the IMPACT SEP subsystem development, from moving forward during the Phase A

Study period. The withdrawal of Waseda University from the IMPACT SEP investigation leaves the scope of the anticipated TAA covering interactions only with the University of Kiel and ESTEC. As this TAA application has not yet been submitted, we expect further delays in Caltech's contributions, and resulting risk to the IMPACT Phase B,C,D schedule. We are aware that the NASA policies and response to ITAR matters will change over the next few months as NASA Headquarters reviews the impact of ITAR on NASA's science missions. There is also congressional activity on ITAR and both Universities' and NASA responses that are likely to ease the communications problems during Phase B.

D.6 IMPACT Concerns

A list of the top IMPACT team concerns follows. These concerns are further discussed in the instrument sections.

1. SEP FOV. Getting the SEP FOV clear has been a major undertaking in Phase A, and while we have made a lot of progress and are close to an adequate solution, we are not quite there yet. Proposed new spacecraft configuration changes must be evaluated against all IMPACT fields of view.
2. Schedule problems. The current project schedule is shorter in Phase B/C/D than what we proposed to. While it is not impossible to meet the new schedule, it does impose constraints that add risk against system reliability and cost. This situation has been exacerbated by delays in Phase A due to ITAR, delays in funding, extra work required by the loss of the Waseda contribution, and extra work required in clearing the SEP FOV (with associated changes in the SEP configuration).
3. Electro-Static Cleanliness (ESC). The treatment of the solar arrays is still under study. In addition, other non-conducting surfaces must be identified and their ESC impact evaluated. Finding thermal control finishes that meet the ESC requirements is a problem that should not be put off too long.
4. Magnetics. In order to meet the magnetics goal for the spacecraft without adding significantly to the cost, magnetics issues must be considered early in the design process, in the selection of materials and processes, and in the procurement of subsystems. The reaction wheels and the separation system are two areas that have been identified to date as having potential magnetics problems.
5. Thermal. No thermal analysis has yet been completed for IMPACT. This represents a risk against the power budget for operational heaters.
6. Mass and Power budget. The mass budget is close to the Project allocation with the exception of the SEP and SEPT-NS bracket allocation. The power budget is in some trouble. We hope to get an increased power allocation from Project when they have completed the system-level power study. If more power is not available, the system will have to be redesigned to allow for power cycling of some subsystems, with associated loss in science. Also, resource estimates assume aggressive optimization, which has impacts on cost and reliability.
7. STE and SEPT aperture covers. A result of the Phase A Study is that these detectors require in-flight reclosable covers. We are studying solutions to this problem, which will involve some small mass increase not yet budgeted.
8. SWEA needs to be removed from the spacecraft and returned to UCB for post-environmental functional tests. No adequate test can be performed at APL.

D.7 Education/Public Outreach

In the original IMPACT proposal, our E/PO effort did not foresee the centralized organization that Project has since created at GSFC under Leslie Cusick. Our activities to date have thus focused on redefining our activities in light of this new leadership at GSFC, and carrying forward where we can under the minimal funding available for IMPACT E/PO in these early phases of the mission. The following activities that occurred during the Phase A period were not included in the originally proposed E/PO plan. These have been made possible through leveraging existing E/PO infrastructure within the UCB SEGway Program under the leadership of IMPACT E/PO coordinator Nahide Craig.

D.7.1 Website Development

We have started to design the IMPACT EPO website at http://cse.ssl.berkeley.edu and update the News and Events as appropriate. Also, we are linked to the Sun-Earth Connection Forum on-line calendar of the Mission E/PO Project timelines. (http://sunearth.ssl.berkeley.edu/scientists/webEPOdates.htm and the Center for Science Education Site http://cse.ssl.berkeley.edu under MISSIONS).

D.7.2 K-12 Education

Formal Education: In a Lawrence Hall Science two week Summer 2000 Program titled "Solar Astronomy Camp", Nahide Craig introduced the STEREO mission to 6-9th graders and discussed the STEREO Poster.

D.7.3 Coordination Plans

Nahide Craig has discussed with Leslie Cusick the coordination of efforts with the other STEREO E/PO partners, and plans to hold a splinter session for E/PO at the December 2000 STEREO Meeting in Berkeley to plan future joint activities.

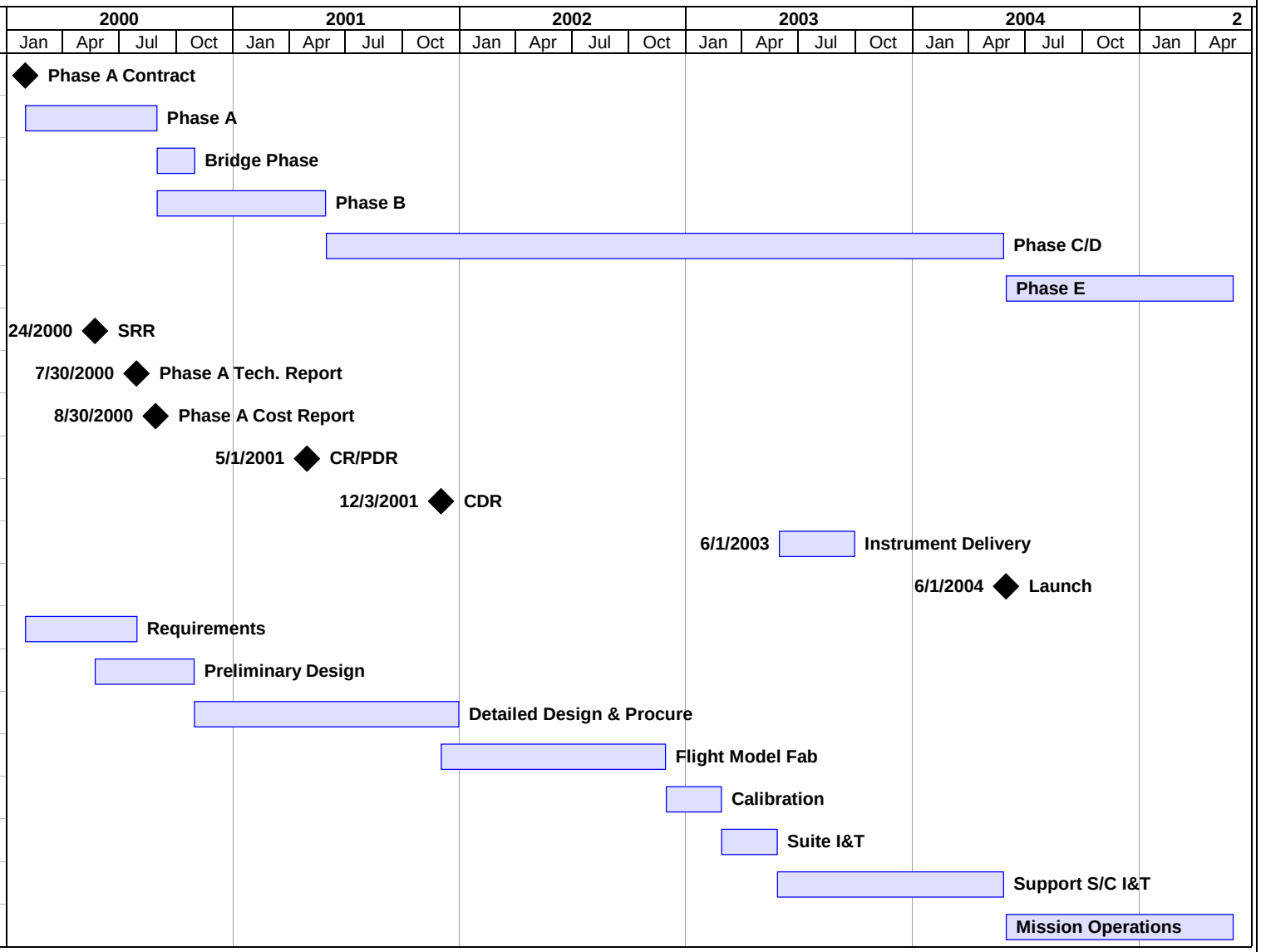
D.7.4 Public Outreach

IMPACT E/PO representatives intend to participate in the total Solar Eclipse Web cast 2001 as part of the Live@TheExploratorium program that

reaches thousands of visitors on-site at the museums and hundreds of thousands on-line through Internet. By our participation in this event, both STEREO and IMPACT gain visibility. STEREO/IMPACT PI Janet Luhmann published a popular article “Space Weather: Physics and Forecasts” in the British *Physics World* July 2000 issue.

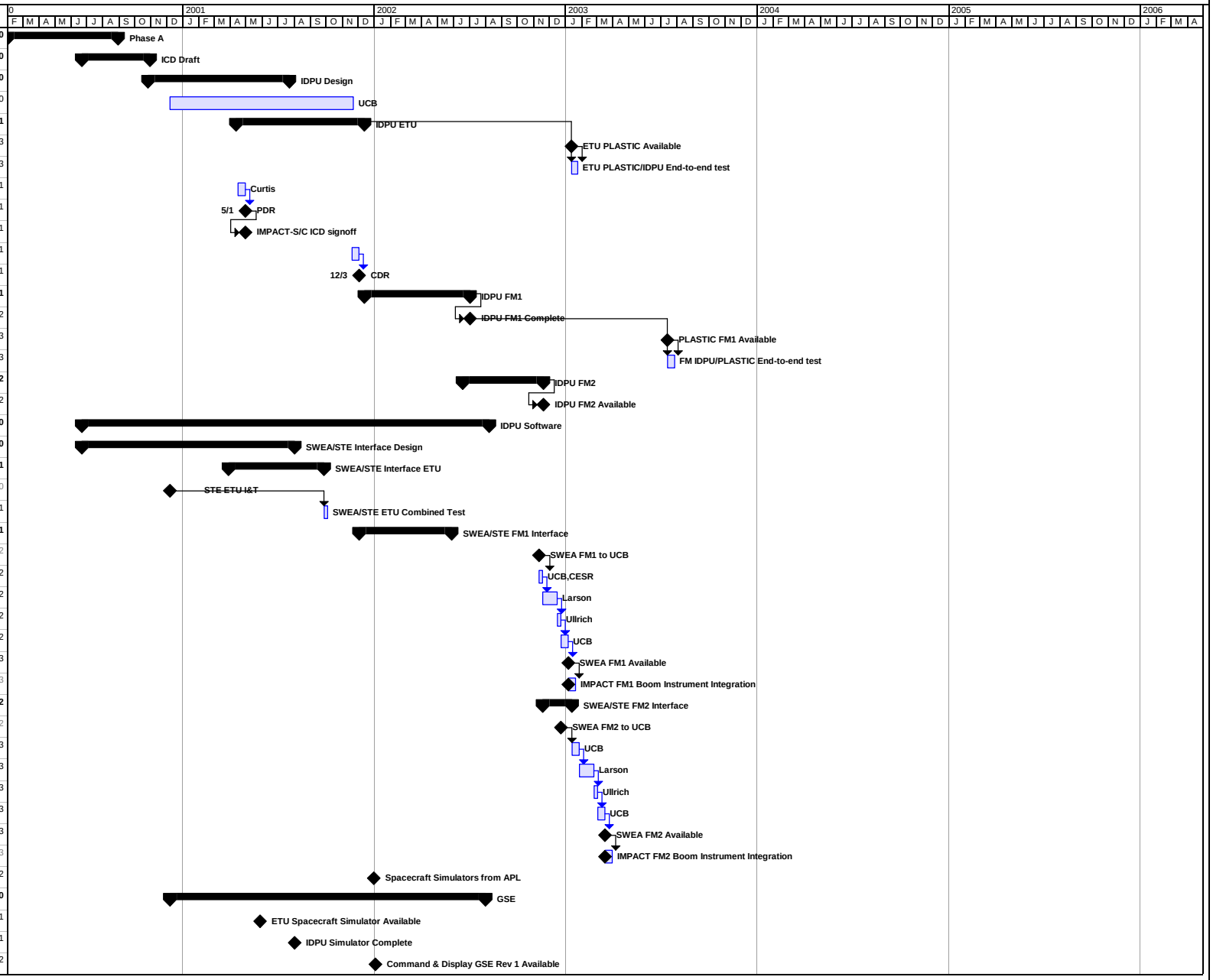
IMPACT Schedule Overview

ID	Task Name
1	Phase A Contract
2	Phase A
3	Bridge Phase
4	Phase B
5	Phase C/D
6	Phase E
7	SRR
8	Phase A Tech. Report
9	Phase A Cost Report
10	CR/PDR
11	CDR
12	Instrument Delivery
13	Launch
14	Requirements
15	Preliminary Design
16	Detailed Design & Procure
17	Flight Model Fab
18	Calibration
19	Suite I&T
20	Support S/C I&T
21	Mission Operations



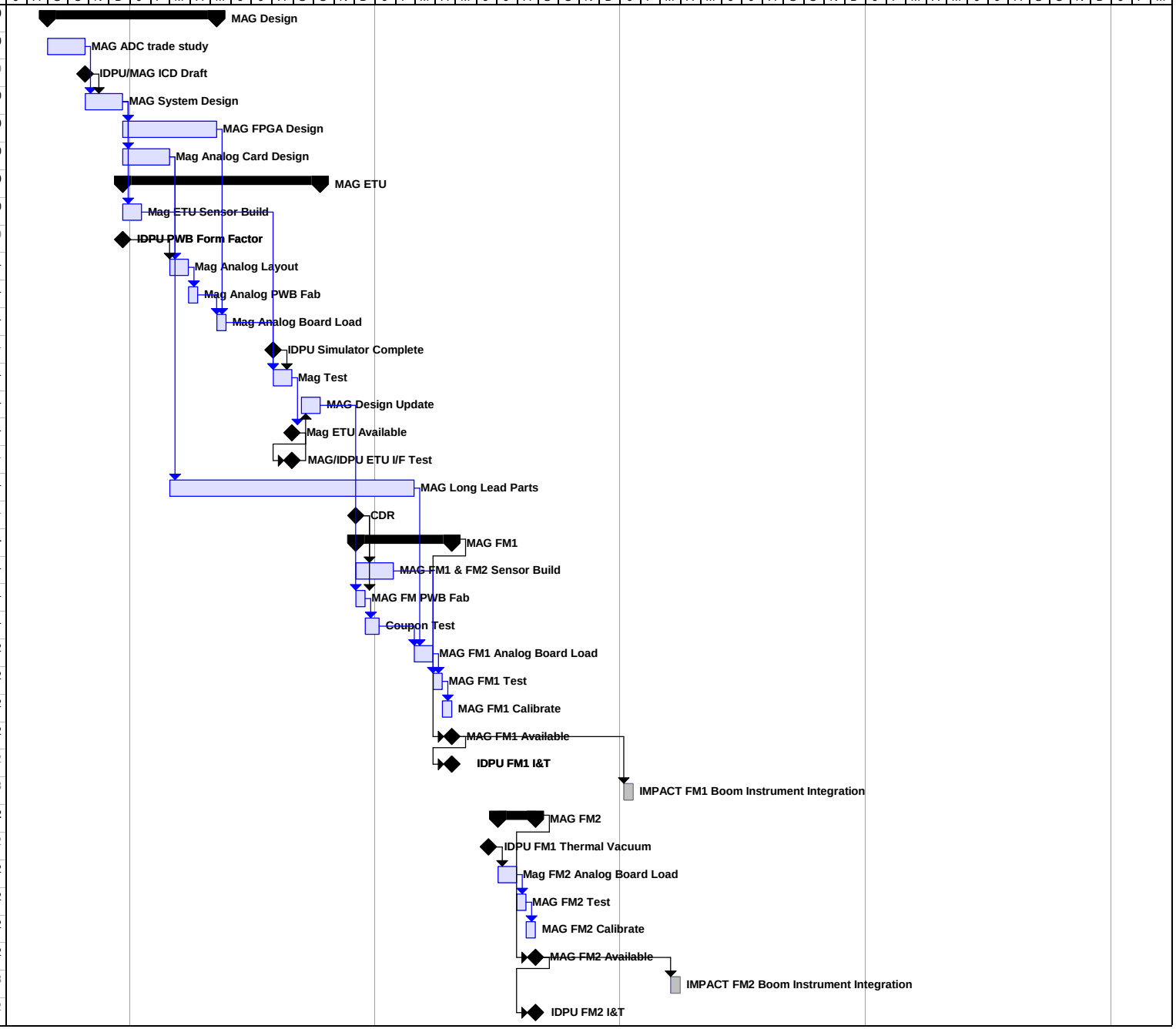
IMPACT UCB Development

ID	Task Name	Start
1	**Phase A**	**2/2/2000**
14	**ICD Draft**	**6/23/2000**
22	**IDPU Design**	**10/27/2000**
29	IDPU Long Lead Parts Procure	12/8/2000
30	**IDPU ETU**	**4/13/2001**
43	ETU PLASTIC Available	1/13/2003
44	ETU PLASTIC/IDPU End-to-end test	1/13/2003
45	PDR Presentation Prep	4/17/2001
46	PDR	5/1/2001
47	IMPACT-S/C ICD signoff	5/1/2001
48	CDR Presentation Prep	11/20/2001
49	CDR	12/3/2001
50	**IDPU FM1**	**12/14/2001**
64	IDPU FM1 Complete	7/3/2002
65	PLASTIC FM1 Available	7/15/2003
66	FM IDPU/PLASTIC End-to-end test	7/15/2003
67	**IDPU FM2**	**6/19/2002**
77	IDPU FM2 Available	11/20/2002
78	**IDPU Software**	**6/23/2000**
91	**SWEA/STE Interface Design**	**6/23/2000**
100	**SWEA/STE Interface ETU**	**3/30/2001**
109	STE ETU I&T	12/8/2000
110	SWEA/STE ETU Combined Test	9/28/2001
111	**SWEA/STE FM1 Interface**	**12/4/2001**
119	SWEA FM1 to UCB	11/11/2002
120	SWEA FM1 I&T	11/12/2002
121	SWEA FM1 Calibrate	11/19/2002
122	SWEA Vibration Test	12/17/2002
123	SWEA Thermal Vac	12/24/2002
124	SWEA FM1 Available	1/6/2003
125	IMPACT FM1 Boom Instrument Integratic	1/7/2003
126	**SWEA/STE FM2 Interface**	**11/19/2002**
132	SWEA FM2 to UCB	12/23/2002
133	SWEA FM2 I&T	1/14/2003
134	SWEA FM2 Calibrate	1/28/2003
135	SWEA FM2 Vibration Test	2/25/2003
136	SWEA FM2 Thermal Vacuum	3/4/2003
137	SWEA FM2 Available	3/17/2003
138	IMPACT FM2 Boom Instrument Integratic	3/18/2003
139	Spacecraft Simulators from APL	1/1/2002
140	**GSE**	**12/8/2000**
152	ETU Spacecraft Simulator Available	5/28/2001
153	IDPU Simulator Complete	8/2/2001
154	Command & Display GSE Rev 1 Availabl	1/3/2002



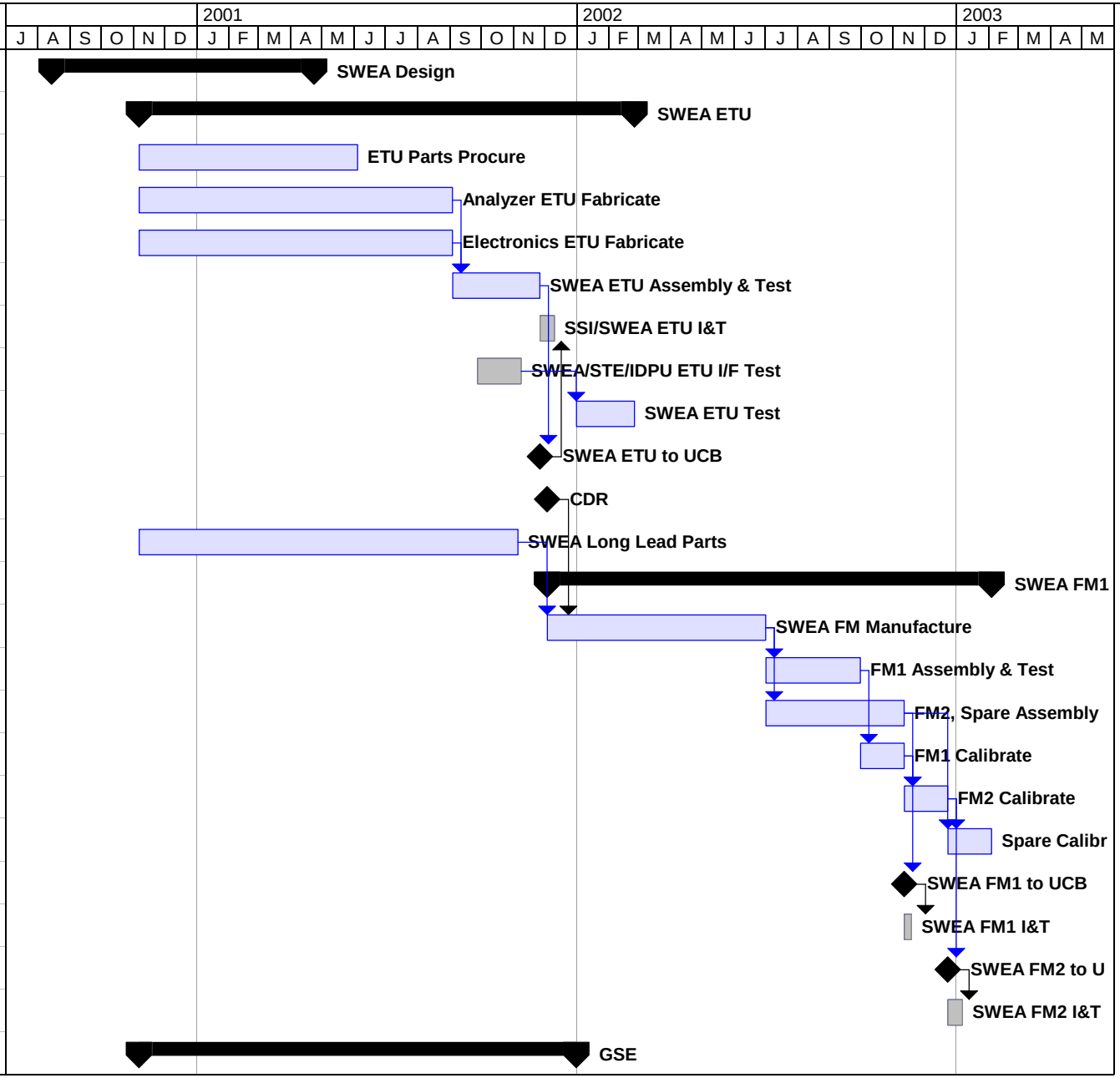
IMPACT Mag Development Schedule (GSFC)

ID	Task Name	Start
1	**MAG Design**	**9/1/2000**
2	MAG ADC trade study	9/1/2000
3	IDPU/MAG ICD Draft	6/23/2000
4	MAG System Design	10/27/2000
5	MAG FPGA Design	12/22/2000
6	Mag Analog Card Design	12/22/2000
7	**MAG ETU**	**12/22/2000**
8	Mag ETU Sensor Build	12/22/2000
9	IDPU PWB Form Factor	12/8/2000
10	Mag Analog Layout	3/2/2001
11	Mag Analog PWB Fab	3/30/2001
12	Mag Analog Board Load	5/11/2001
13	IDPU Simulator Complete	8/2/2001
14	Mag Test	8/3/2001
15	MAG Design Update	9/14/2001
16	Mag ETU Available	8/30/2001
17	MAG/IDPU ETU I/F Test	8/31/2001
18	MAG Long Lead Parts	3/2/2001
19	CDR	12/3/2001
20	**MAG FM1**	**12/4/2001**
21	MAG FM1 & FM2 Sensor B	12/4/2001
22	MAG FM PWB Fab	12/4/2001
23	Coupon Test	12/18/2001
24	MAG FM1 Analog Board Lc	3/1/2002
25	MAG FM1 Test	3/29/2002
26	MAG FM1 Calibrate	4/12/2002
27	MAG FM1 Available	4/25/2002
28	IDPU FM1 I&T	4/26/2002
29	IMPACT FM1 Boom Instrument	1/7/2003
30	**MAG FM2**	**7/3/2002**
31	IDPU FM1 Thermal Vacuur	6/19/2002
32	Mag FM2 Analog Board Lo	7/3/2002
33	MAG FM2 Test	7/31/2002
34	MAG FM2 Calibrate	8/14/2002
35	MAG FM2 Available	8/28/2002
36	IMPACT FM2 Boom Instrument	3/18/2003
37	IDPU FM2 I&T	8/28/2002



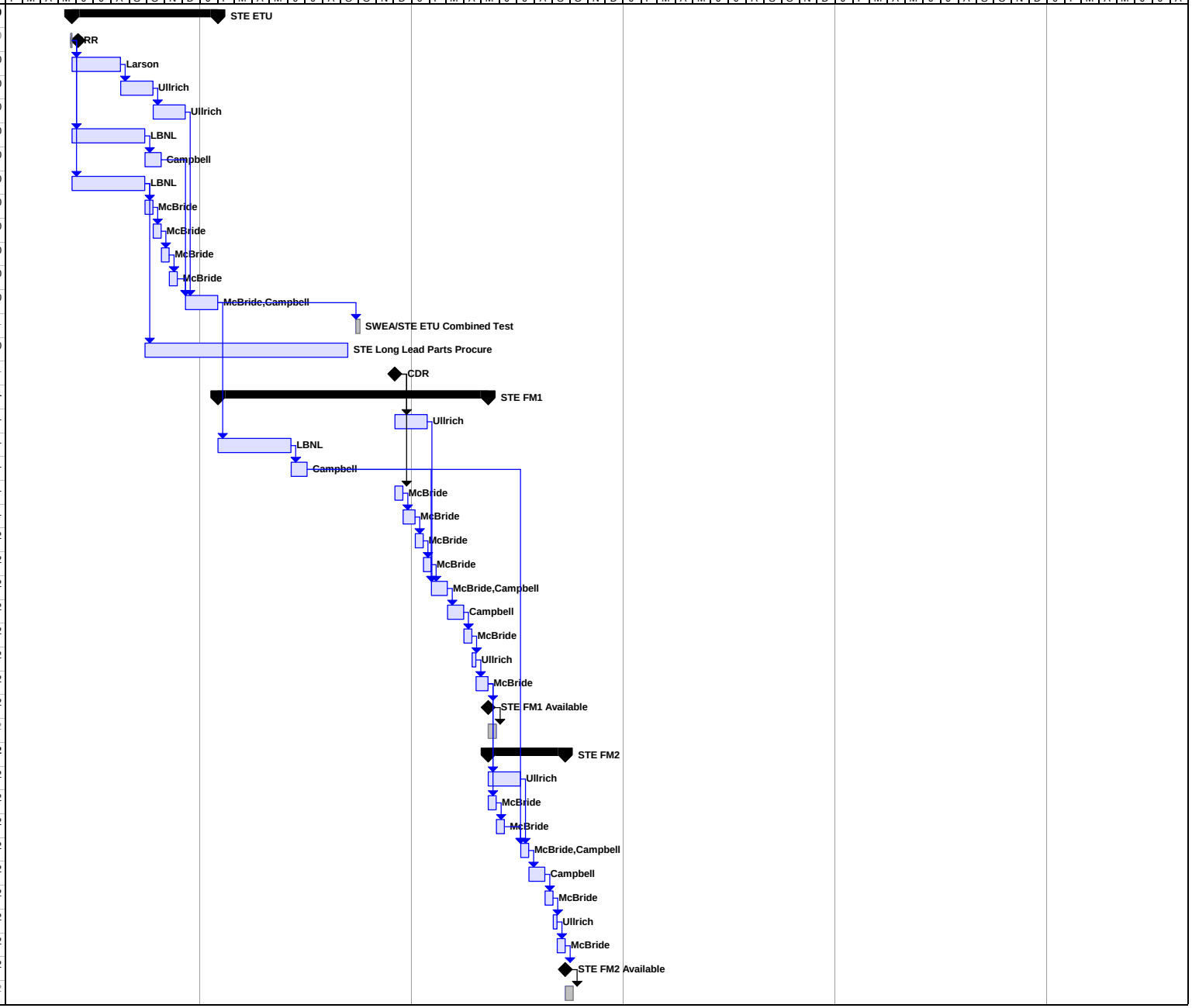
IMPACT SWEA Development Schedule (CESR)

ID	Task Name	Start
1	**SWEA Design**	**8/15/2000**
5	**SWEA ETU**	**11/7/2000**
6	ETU Parts Procure	11/7/2000
7	Analyzer ETU Fabricate	11/7/2000
8	Electronics ETU Fabricate	11/7/2000
9	SWEA ETU Assembly & T	9/4/2001
10	SSI/SWEA ETU I&T	11/27/2001
11	SWEA/STE/IDPU ETU I/F	9/28/2001
12	SWEA ETU Test	1/1/2002
13	SWEA ETU to UCB	11/26/2001
14	CDR	12/3/2001
15	SWEA Long Lead Parts	11/7/2000
16	**SWEA FM1, FM2, Spare**	**12/4/2001**
17	SWEA FM Manufacture	12/4/2001
18	FM1 Assembly & Test	7/2/2002
19	FM2, Spare Assembly & T	7/2/2002
20	FM1 Calibrate	10/1/2002
21	FM2 Calibrate	11/12/2002
22	Spare Calibrate	12/24/2002
23	SWEA FM1 to UCB	11/11/2002
24	SWEA FM1 I&T	11/12/2002
25	SWEA FM2 to UCB	12/23/2002
26	SWEA FM2 I&T	12/24/2002
27	**GSE**	**11/7/2000**



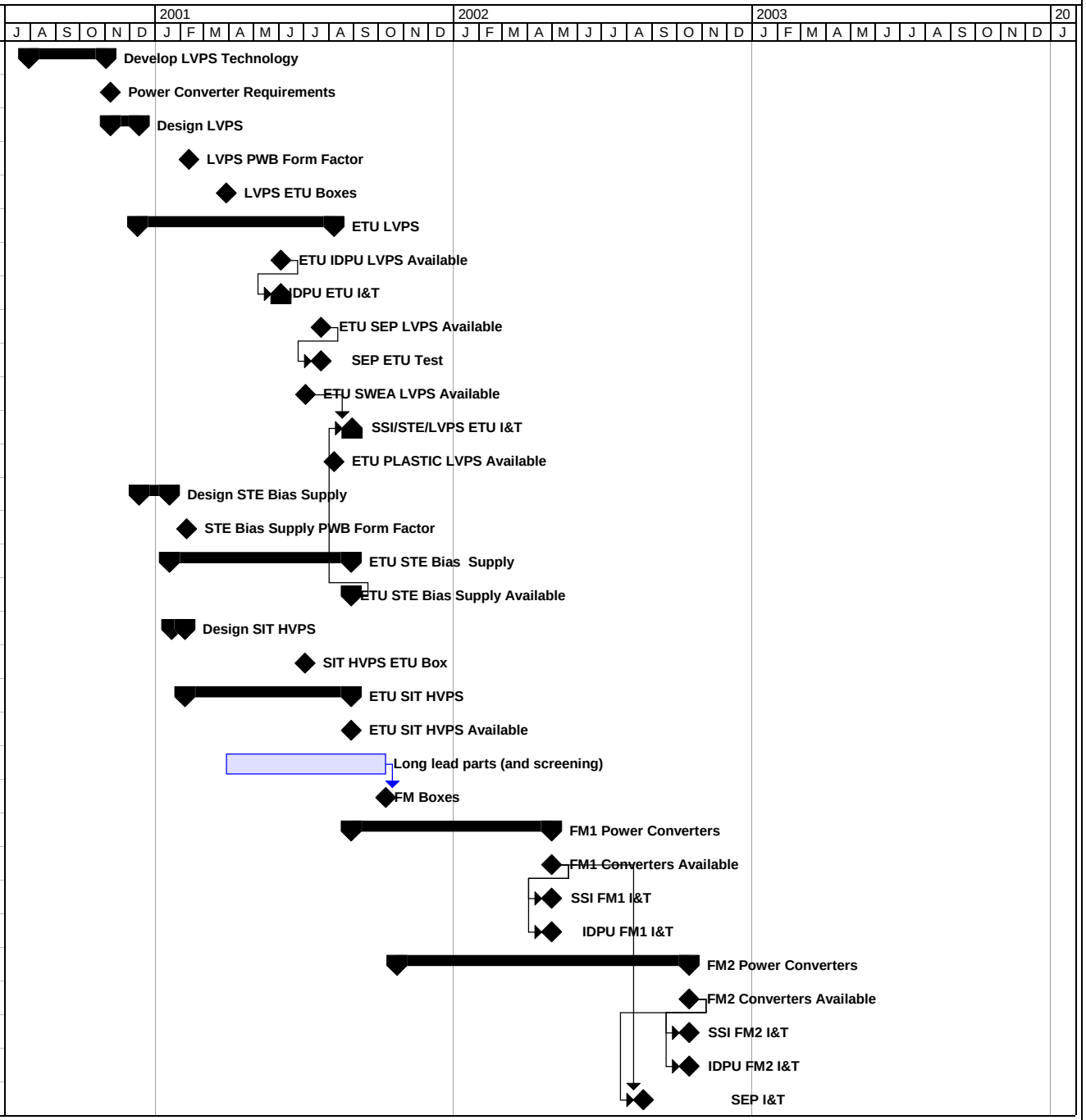
IMPACT STE Development Schedule (UCB)

ID	Task Name	Start
1	**STE ETU**	**5/26/2000**
2	SRR	5/24/2000
3	STE Optics Design	5/26/2000
4	STE Box Design	8/18/2000
5	STE ETU Box Fab	10/13/2000
6	STE ETU Detector	5/26/2000
7	STE ETU Detector Tests	9/29/2000
8	STE CSA Design	5/26/2000
9	STE ETU CSA Layout	9/29/2000
10	STE ETU CSA PWB Fab	10/13/2000
11	STE ETU CSA Load	10/27/2000
12	STE ETU CSA Test	11/10/2000
13	STE ETU I&T	12/8/2000
14	SWEA/STE ETU Combined Test	9/28/2001
15	STE Long Lead Parts Procure	9/29/2000
16	CDR	12/3/2001
17	**STE FM1**	**2/2/2001**
18	STE FM1 Box Fab	12/4/2001
19	STE FM Detectors	2/2/2001
20	STE FM Detector Test	6/8/2001
21	STE FM1 CSA PWB Fab	12/4/2001
22	STE FM1 CSA PWB Coupons	12/18/2001
23	STE FM1 CSA Load	1/8/2002
24	STE FM1 CSA Test	1/22/2002
25	STE FM1 I&T	2/5/2002
26	STE FM1 Calibrate	3/5/2002
27	STE FM1 Clean/Stake/Coat	4/2/2002
28	STE FM1 Vibrate	4/16/2002
29	STE FM1 Thermal Vacuum/Balance	4/23/2002
30	STE FM1 Available	5/13/2002
31	IMPACT FM1 Boom Instrument Integrati	5/14/2002
32	**STE FM2**	**5/14/2002**
33	STE FM2 Box Fab	5/14/2002
34	STE FM2 CSA Load	5/14/2002
35	STE FM2 CSA Test	5/28/2002
36	STE FM2 I&T	7/9/2002
37	STE FM2 Calibrate	7/23/2002
38	STE FM2 Clean/Stake/Coat	8/20/2002
39	STE FM2 Vibrate	9/3/2002
40	STE FM2 Thermal Vacuum	9/10/2002
41	STE FM2 Available	9/23/2002
42	IMPACT FM2 Boom Instrument Integrati	9/24/2002



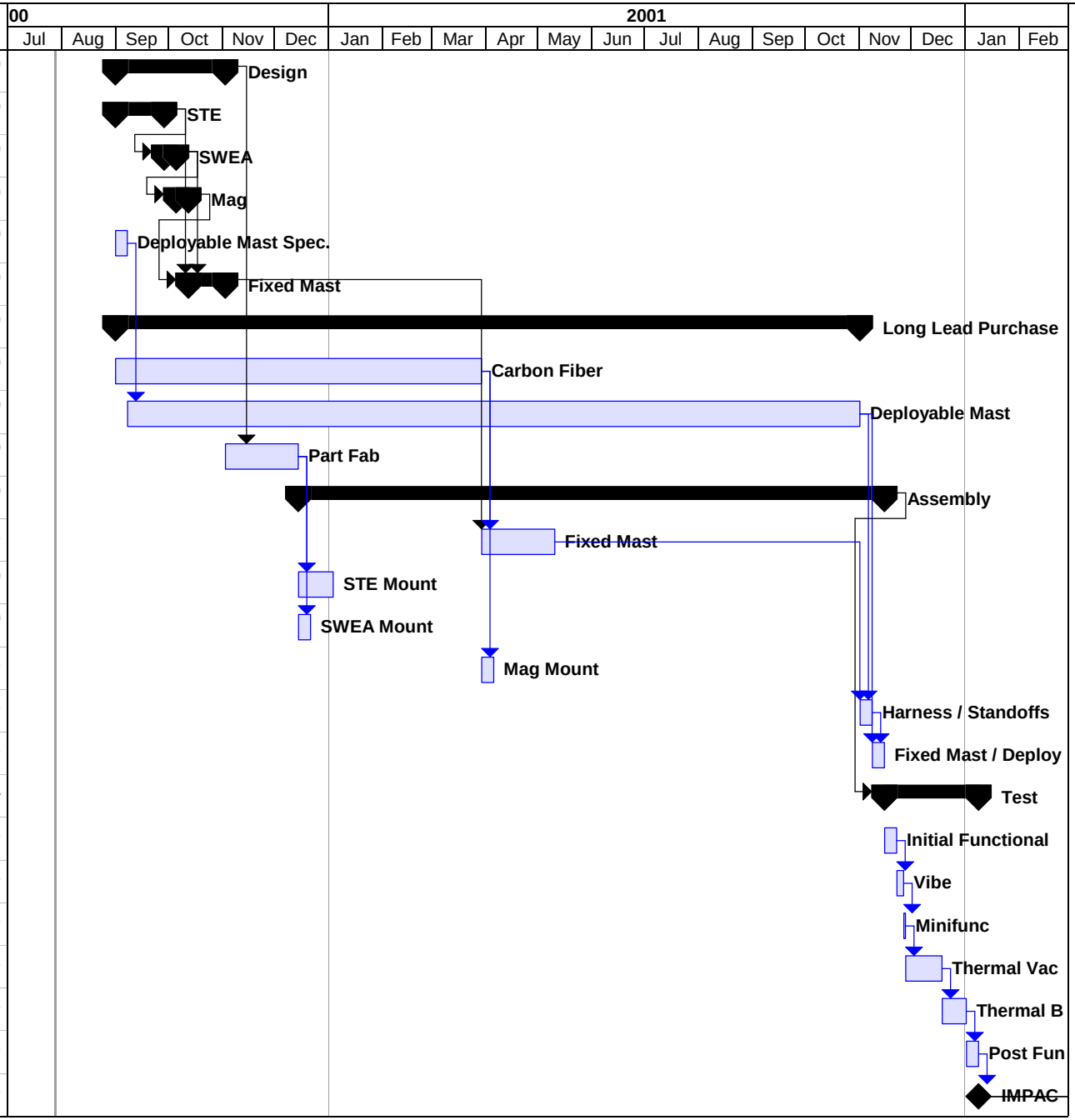
IMPACT Power Supply Development Schedule (UCB)

ID	Task Name	Start
1	**Develop LVPS Technology**	**7/31/2000**
5	Power Converter Requirements	11/8/2000
6	**Design LVPS**	**11/8/2000**
11	LVPS PWB Form Factor	2/12/2001
12	LVPS ETU Boxes	3/29/2001
13	**ETU LVPS**	**12/11/2000**
26	ETU IDPU LVPS Available	6/4/2001
27	IDPU ETU I&T	6/4/2001
28	ETU SEP LVPS Available	7/23/2001
29	SEP ETU Test	7/23/2001
30	ETU SWEA LVPS Available	7/4/2001
31	SSI/STE/LVPS ETU I&T	8/30/2001
32	ETU PLASTIC LVPS Available	8/8/2001
33	**Design STE Bias Supply**	**12/13/2000**
35	STE Bias Supply PWB Form Factor	2/9/2001
36	**ETU STE Bias Supply**	**1/19/2001**
43	ETU STE Bias Supply Available	8/29/2001
44	**Design SIT HVPS**	**1/22/2001**
46	SIT HVPS ETU Box	7/4/2001
47	**ETU SIT HVPS**	**2/7/2001**
53	ETU SIT HVPS Available	8/29/2001
54	Long lead parts (and screening)	3/29/2001
55	FM Boxes	10/10/2001
56	**FM1 Power Converters**	**8/29/2001**
74	FM1 Converters Available	5/1/2002
75	SSI FM1 I&T	5/1/2002
76	IDPU FM1 I&T	5/1/2002
77	**FM2 Power Converters**	**10/24/2001**
93	FM2 Converters Available	10/16/2002
94	SSI FM2 I&T	10/16/2002
95	IDPU FM2 I&T	10/16/2002
96	SEP I&T	8/21/2002



IMPACT Boom Development Schedule (UCB)

ID	Task Name	Start
1	**Design**	**9/1/2000**
2	**STE**	**9/1/2000**
7	**SWEA**	**9/29/2000**
10	**Mag**	**10/6/2000**
12	**Deployable Mast Spec.**	9/1/2000
13	**Fixed Mast**	**10/13/2000**
19	**Long Lead Purchase Parts**	**9/1/2000**
20	Carbon Fiber	9/1/2000
21	Deployable Mast	9/8/2000
22	Part Fab	11/3/2000
23	**Assembly**	**12/15/2000**
24	Fixed Mast	3/30/2001
25	STE Mount	12/15/2000
26	SWEA Mount	12/15/2000
27	Mag Mount	3/30/2001
28	Harness / Standoffs	11/2/2001
29	Fixed Mast / Deployable Mas	11/9/2001
30	**Test**	**11/16/2001**
31	Initial Functional	11/16/2001
32	Vibe	11/23/2001
33	Minifunc	11/27/2001
34	Thermal Vac	11/28/2001
35	Thermal Blance	12/19/2001
36	Post Func	1/2/2002
37	IMPACT Boom Available	1/8/2002

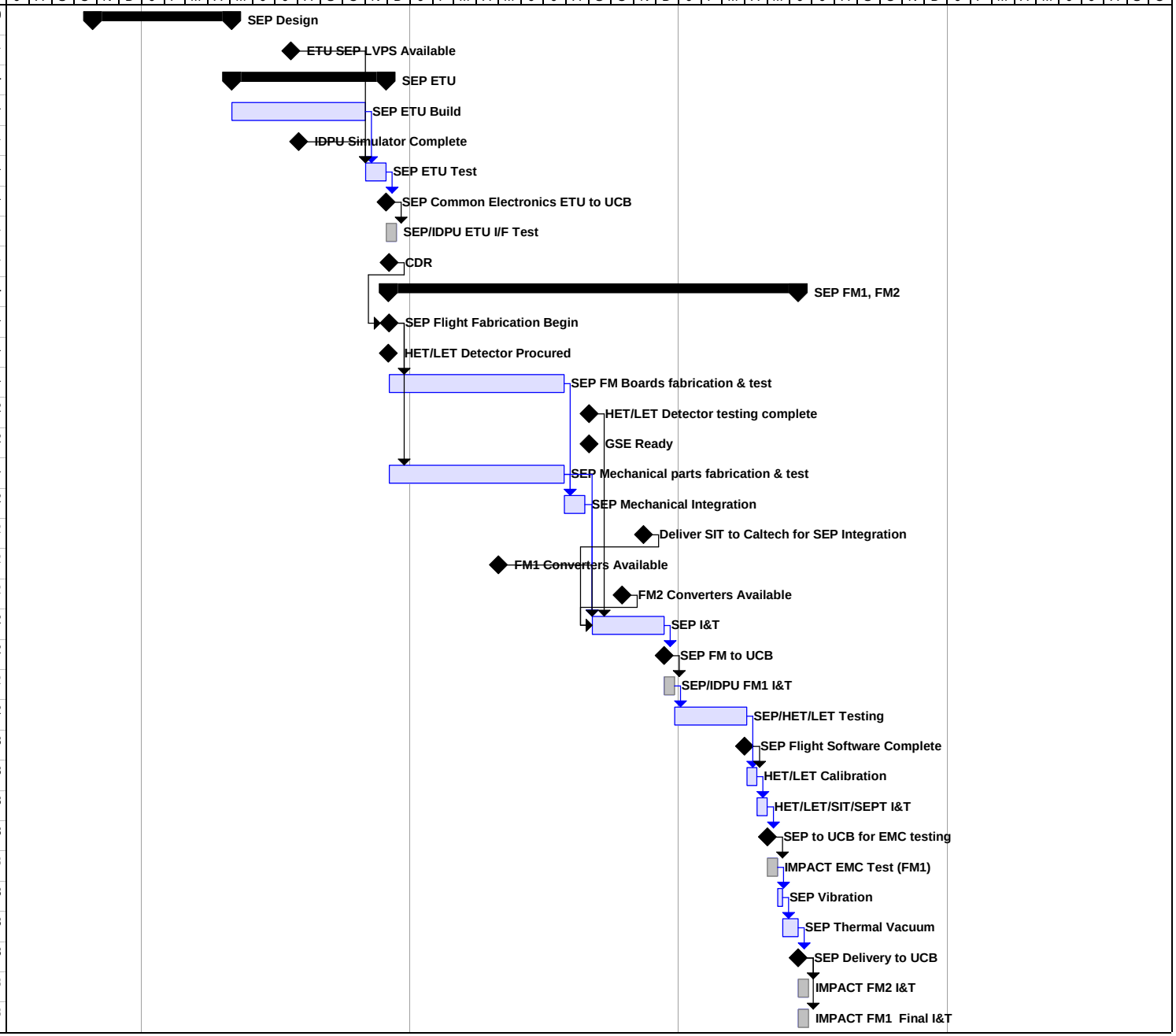


IMPACT Boom Development Schedule (UCB)

ID	Task Name	Start	00						2001													
			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
38	IMPACT FM2 Boom Instrument In	3/18/2003																				
39	IMPACT FM1 Boom Instrument In	1/7/2003																				

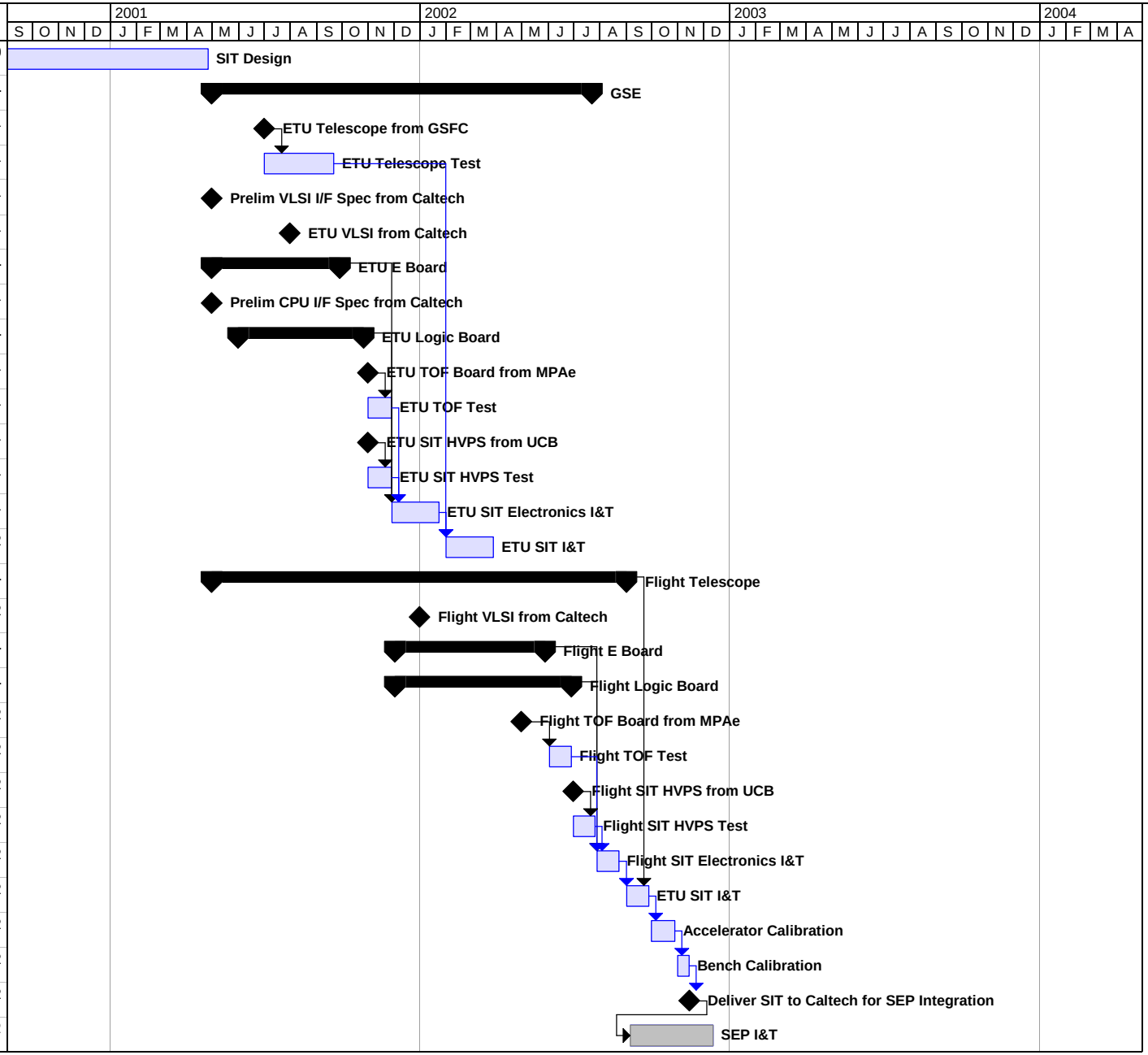
IMPACT HET/LET/SEP Common Development Schedule (Caltech/GSFC)

ID	Task Name	Start
1	**SEP Design**	**10/27/2000**
4	ETU SEP LVPS Available	7/23/2001
5	**SEP ETU**	**5/4/2001**
6	SEP ETU Build	5/4/2001
7	IDPU Simulator Complete	8/2/2001
8	SEP ETU Test	11/2/2001
9	SEP Common Electronics ETU	11/29/2001
10	SEP/IDPU ETU I/F Test	11/30/2001
11	CDR	12/3/2001
12	**SEP FM1, FM2**	**12/3/2001**
13	SEP Flight Fabrication Beg	12/3/2001
14	HET/LET Detector Procure	12/3/2001
15	SEP FM Boards fabricatior	12/4/2001
16	HET/LET Detector testing (	9/2/2002
17	GSE Ready	9/2/2002
18	SEP Mechanical parts fabr	12/4/2001
19	SEP Mechanical Integratio	7/30/2002
20	Deliver SIT to Caltech for S	11/14/2002
21	FM1 Converters Available	5/1/2002
22	FM2 Converters Available	10/16/2002
23	SEP I&T	9/6/2002
24	SEP FM to UCB	12/12/2002
25	SEP/IDPU FM1 I&T	12/13/2002
26	SEP/HET/LET Testing	12/27/2002
27	SEP Flight Software Comp	4/1/2003
28	HET/LET Calibration	4/4/2003
29	HET/LET/SIT/SEPT I&T	4/18/2003
30	SEP to UCB for EMC testir	5/1/2003
31	IMPACT EMC Test (FM1)	5/2/2003
32	SEP Vibration	5/16/2003
33	SEP Thermal Vacuum	5/23/2003
34	SEP Delivery to UCB	6/12/2003
35	IMPACT FM2 I&T	6/13/2003
36	IMPACT FM1 Final I&T	6/13/2003



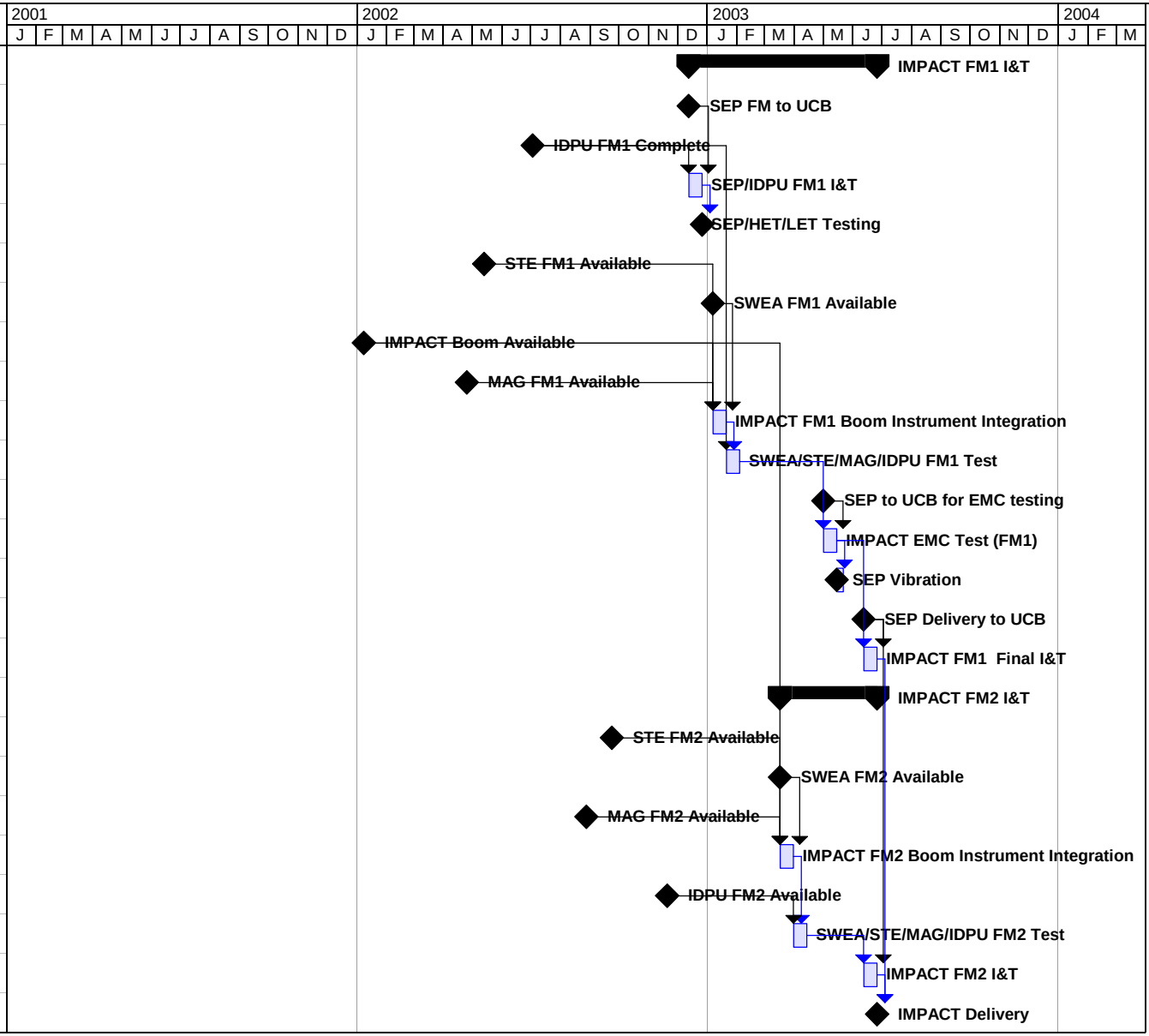
IMPACT SIT Development Schedule (UMd)

ID	Task Name	Start
1	SIT Design	9/1/2000
2	**GSE**	**5/1/2001**
6	ETU Telescope from GSFC	7/2/2001
7	ETU Telescope Test	7/2/2001
8	Prelim VLSI I/F Spec from Caltech	5/1/2001
9	ETU VLSI from Caltech	8/1/2001
10	**ETU E Board**	**5/1/2001**
17	Prelim CPU I/F Spec from Caltech	5/1/2001
18	**ETU Logic Board**	**6/1/2001**
25	ETU TOF Board from MPAe	11/1/2001
26	ETU TOF Test	11/1/2001
27	ETU SIT HVPS from UCB	11/1/2001
28	ETU SIT HVPS Test	11/1/2001
29	ETU SIT Electronics I&T	11/29/2001
30	ETU SIT I&T	2/1/2002
31	**Flight Telescope**	**5/1/2001**
39	Flight VLSI from Caltech	1/1/2002
40	**Flight E Board**	**12/3/2001**
48	**Flight Logic Board**	**12/3/2001**
56	Flight TOF Board from MPAe	5/1/2002
57	Flight TOF Test	6/3/2002
58	Flight SIT HVPS from UCB	7/1/2002
59	Flight SIT HVPS Test	7/1/2002
60	Flight SIT Electronics I&T	7/29/2002
61	ETU SIT I&T	9/2/2002
62	Accelerator Calibration	10/1/2002
63	Bench Calibration	11/1/2002
64	Deliver SIT to Caltech for SEP Integ	11/14/2002
65	SEP I&T	9/6/2002



IMPACT Suite Integration & Test (UCB)

ID	Task Name	Start
1	**IMPACT FM1 I&T**	**12/13/2002**
2	SEP FM to UCB	12/12/2002
3	IDPU FM1 Complete	7/3/2002
4	SEP/IDPU FM1 I&T	12/13/2002
5	SEP/HET/LET Testing	12/27/2002
6	STE FM1 Available	5/13/2002
7	SWEA FM1 Available	1/6/2003
8	IMPACT Boom Available	1/8/2002
9	MAG FM1 Available	4/25/2002
10	IMPACT FM1 Boom Instrument Inte	1/7/2003
11	SWEA/STE/MAG/IDPU FM1 Test	1/21/2003
12	SEP to UCB for EMC testing	5/1/2003
13	IMPACT EMC Test (FM1)	5/2/2003
14	SEP Vibration	5/16/2003
15	SEP Delivery to UCB	6/12/2003
16	IMPACT FM1 Final I&T	6/13/2003
17	**IMPACT FM2 I&T**	**3/18/2003**
18	STE FM2 Available	9/23/2002
19	SWEA FM2 Available	3/17/2003
20	MAG FM2 Available	8/28/2002
21	IMPACT FM2 Boom Instrument Inte	3/18/2003
22	IDPU FM2 Available	11/20/2002
23	SWEA/STE/MAG/IDPU FM2 Test	4/1/2003
24	IMPACT FM2 I&T	6/13/2003
25	IMPACT Delivery	6/26/2003



STEREO IMPACT Meetings
Revision 2000-7-12 David Curtis

Meeting	Date	Location
Peer Review #1, System	October 2000	U.C.Berkeley
Peer Review #2,	December 2000	U.C.Berkeley
IMPACT Team Meeting	December 12 2000	U.C.Berkeley
SWG#3	December 13,14 2000	U.C.Berkeley
Peer Review #2 SWEA/STE/IDPU	January 2001	U.C.Berkeley
Peer Review #3 SEP	February 2001	GSFC
Peer Review #4 Mechanical	March 2001	U.C.Berkeley
Peer Review #5 Software	April 2001	U.C.Berkeley
PDR	May 2001	APL
SWG#4 + IMPACT Team	June 2001	GSFC (Combine with PDR?)
CDR	December 2001	APL
SWG#5 + IMPACT Team	December 2001	UNH (Combine with CDR?)
SWG#6 + IMPACT Team	June 2002	GSFC
SWG#7 + IMPACT Team	December 2002	NRL
SWG#8 + IMPACT Team	June 2003	GSFC
Delivery to Spacecraft	July 2003	APL
SWG#9 + IMPACT Team	December 2003	Paris
SWG#10 + IMPACT Team	June 2004	KSC
Launch	June 2004	KSC