Department of Energy Re-baseline Review of the GLAST Large Area Telescope (LAT) Project

WHEN: July 31, 2003
WHERE: Department of Energy (DOE)

REVIEW COMMITTEE:
This review was chaired by DOE (Dan Lehman) and had one independent technical consultant, Dr. Sam Aronson (BNL), who served as the leader of the May 2003 review management subcommittee. In addition, there were six reviewers from DOE and eight reviewers from NASA HQ and the GLAST Mission office (shown below).

DOE	NASA	LAT Project/SLAC	Consultant
Kathy Turner	Kevin Grady	Peter Michelson	Sam Aronson
Aesook Byon-Wagner	Al Vernacchio	Lowell Klaisner	
John O'Fallon	Bernie Graf	Dick Horn	
Steve Tkaczyk	Mark Seidleck		
Dan Lehman	Jack Liebee		
Ev Valle	Steve Ritz		
	Steve Horowitz		
	Don Kniffen		

REVIEW PURPOSE:
The purpose of this DOE review was to complete a detailed examination of the full LAT fabrication project re-baseline proposal. Specific charges for the review were to evaluate the proposal in terms of cost, schedule, and management; and to determine if the plan is well justified and credible to successfully complete the project. The outcome of this review will provide guidance to DOE to proceed with a Baseline Change Proposal (BCP) and Critical Decision 3 (Start of Construction) approval meeting and for NASA to proceed with the Gamma-ray Large Area Space Telescope (GLAST) Mission Confirmation.

FABRICATION PROJECT STATUS:

	Current Baseline (as of 6/30/03)	**Proposed**	**Increase**
Estimate at Completion (EAC)	$107.9M	$117.2M	$9.7M
[1]Total Estimated Cost (TEC)	$121.7M	$133.4M	$11.7M
Total Project Cost (TPC)	$121.7M	$133.4M	$11.7M
Remaining Contingency in TEC	$ 13.8M	$16.2M	$2.4M
[2] Contingency as % of costs-at-risk	25.0%	25.0%	
Total DOE contribution	$37.0M	$42.0M	$5.0M
Percent Complete (as of 6/30/03)	50.6%		

[1](includes DOE, NASA, Japan)
[2](excluding Education and Public Outreach (EPO), a level of effort subsystem)

NOTE: The Total Estimated Cost (TEC) at the time of baseline was $121.2 million. At present, NASA has added additional funds for EPO and Japan has added additional funds to cover their procurement responsibilities on the project, thereby increasing the TEC.

The project schedule remains the same:

Mission Need (CD-0)	June 25, 2001
Preliminary Baseline Range (CD-1)	August 28, 2002
Performance Baseline (CD-2)	November 8, 2002
Start of Fabrication (CD-3)	July 15, 2003 (now scheduled for August 31, 2003)
End of Fabrication (CD-4)	March 15, 2006

PROJECT HISTORY and ISSUES SINCE BASELINE:

As noted at the joint DOE Critical Decision 3 (CD-3) and NASA Conceptual Design Review (CDR), held in May 2003, there were several issues facing the LAT project, including the French Space Agency (CNES) default at the end of April and additional cost, contingency, and schedule issues that have been building since late 2002. In addition, there were unresolved technical issues in Mechanical/Thermal and Tracker subsystems. The CD-3/CDR review committee felt that the costs due to the CNES default could not be covered within the project over the long term and needed a solution by the funding agencies. The committee asked the project to update the cost and contingency analysis and recommended that CD-3 and CDR status be approved, contingent upon resolution of these issues. The subsequent DOE/NASA Joint Oversight Group (JOG) meetings, and the NASA GLAST Mission Preliminary Design Review (MPDR) in early June agreed with these findings and the plan to proceed.

The LAT team did a re-evaluation and presented the reprogrammed plan to the agencies at the end of June. This plan called for a rebaseline of the fabrication project costs during the fabrication phase of the LAT program. In addition, there are increased commissioning and operations costs during the fabrication phase, as well as during the commissioning and operations phase. Over the past month, the LAT project management team has further scrubbed and refined the plan, before presenting it at the current review.

TECHNICAL:

The Committee felt that the project has made good progress in the technical design since the May review. A conceptual design for the calorimeter to grid structural interface has been developed and analyzed. This approach will be reviewed by the GLAST project office in August. Two solutions for the design of the cross-LAT to electronics boxes thermal interface have been identified and component tests are in progress. A selection of the final design is expected by August 8, 2003. The redesign of the tracker bottom tray is now complete and verification is in progress. The full tracker engineering model vibration test is planned for September 2003. The electronics designs in each subsystem have been progressing steadily, but are not yet fully validated. The Committee had some concerns the tracker subsystem and electronics designs not being fully tested yet. Overall, the Committee felt that the technical status of the project is at the appropriate level of maturity and is progressing well.

COST:
The original baseline TEC at Completion (for the LAT fabrication project) was $121.7 million. The re-baselined TEC will be $133.4 million, an increase of $11.7 million. The re-baselined Cost at Risk is $63.7 million, is the Estimated Cost to Complete less Education and Public Outreach costs. The contingency will now be $16.2 million or 25 percent of the Cost at Risk. The schedule has 14 weeks of float funded at $3.9 million, which, if considered contingency, would increase the total contingency to $20.1 million. This total, as a percent of the equally adjusted Cost at Risk, would be approximately 34 percent.

The re-programmed plan will also require an additional $5.5 million in commissioning and operations costs. The total additional costs, by year, are summarized in Table 1 below.

Table 1. Large Area Telescope—Increased Costs ($M)

	FY 03	FY 04	FY05	FY06	Total
[1] Fabrication Project	1.9	8.0	1.8	0.0	11.7
Commissioning/Operations	0.2	1.0	1.6	2.7	5.5
Total	2.1	9.0	3.4	2.7	17.2

[1] The fabrication project costs are what needs to be baselined for DOE. NASA does not distinguish between the costs for the fabrication project and the commissioning and operations costs.

The Committee's brief assessment of the revised costs was that they appear reasonable. However, the project was requested to provide additional cost backup to support the Baseline Change Request which is being prepared for DOE approval.

SCHEDULE:
The only change to the Level 1 Milestones in conjunction with the rebaselining effort is a revision to the CD-3 date from July 15, 2003 to August 31, 2003. (The joint BCP and CD-3 approval meeting is scheduled for August 18, 2003). There are several changes to lower level milestones.

The Critical Decision 4 (CD-4), Start of Operation, date of March 15, 2006, remains the same. It was noted that CD-4 is currently defined as successful when the NASA GLAST Project Manager accepts and takes responsibility for the LAT instrument, which is upon successful completion of environmental testing and the pre-shipment review prior to being sent to the spacecraft contractor for observatory integration. This takes place after the LAT instrument has been shown to be fully functional and compliant with GLAST Mission requirements upon the successful completion of the pre-environmental test review (which is when it leaves the Stanford Linear Accelerator Center). It was proposed to change the definition of CD-4 from the completion of the pre-shipment review to the pre-environmental test review.

The Committee's brief assessment of the revised schedule was that it appears reasonable. The schedule can be further assessed when it is fully integrated, resource loaded and incorporated into the Project Management Control System.

FUNDING:
The current funding profiles and the increased funding guidance from the agencies are shown in Tables 2 and 3 below.

Table 2. Current Agency Funding Profiles ($M)

	FY00	FY01	FY02	FY03	FY04	FY05	Total
DOE	3.0	5.7	8.1	8.9	7.9	3.4	37.0
NASA	3.9	3.8	13.1	24.7	22.1	15.7	83.3
JAPAN	--	--	--	--	1.0	0.4	1.4
Total	6.9	9.5	21.2	33.6	31.0	19.5	121.7

Table 3. Fabrication Project Increased Funding Guidance ($M)

	FY 03	FY 04	FY05	Total
DOE	--	--	5.0	5.0
NASA	1.8	3.0	1.9	6.7
Total	1.8	3.0	6.9	11.7

In addition, Stanford University anticipates carrying commitments forward under its cost-reimbursement contract with NASA, consistent with the costs set out in Table 1, of up to $5 million from FY 2004 to FY 2005. The new agency funding plan is shown in Table 4 below.

Table 4. New Agency Funding Profiles ($M)

	FY00	FY01	FY02	FY03	FY04	FY05	Total
DOE	3.0	5.7	8.1	8.9	7.9	8.4	42.0
NASA	3.9	3.8	13.1	26.5	25.1	17.6	90.0
JAPAN	--	--	--	--	1.0	0.4	1.4
Total	6.9	9.5	21.2	35.5	34.0	26.3	133.4

MANAGEMENT:
The management of the LAT project has been revamped since the May CD-3/CDR review. The new Project Manager, Lowell Klaisner, the former Deputy Project Manager and Chief Engineer, demonstrated a reasonably thorough grasp of the project in his several presentations to the Re-baseline review committee.

Much of the project management team, including all the subsystem managers are held over from the previous management organization. However, some key positions in the organization remain to be filled and this is being addressed. The Committee was told several times (including by the SLAC Director) that communication within LAT project management and between project management and the Laboratory is much improved.

Most, if not all, of the issues being dealt with by LAT management were identified and analyzed at the May CD-3/CDR review, so it is somewhat early to see the effect of the new management culture on the direction of the project.

RISK ANALYSIS:
A new determination of the required contingency in the re-baselined fabrication project was presented. This was based on a risk analysis that seemed appropriate and defensible. There were sensible explanations of the differences among subsystem contingencies. The proposed overall contingency (appropriately held by project management) is approximately $16 million or 25-34 percent of the Cost at Risk. The difference between these numbers is related to whether or not one considers the funded slack time in the project as contingency.

Given that the proposed re-baselined fabrication budget contains an increase of about $12 million, 25 percent contingency on the Cost at Risk seemed reasonable to the Committee at this stage in the project.

REVIEW SUMMARY:
The Committee felt that the updated plan for the LAT fabrication project is reasonable to proceed. They agreed that the contingency is adequate and the schedule is still lean, but acceptable. The change in definition of the end of fabrication to be when the instrument is fully functional and passes review before it leaves SLAC was supported by the Committee. Overall, the Committee supported the re-baseline plan for the LAT fabrication project and recommended that the BCP and CD-3 status be approved by DOE.

ACTION ITEMS	Due Date
1. Provide an updated Gant chart of scheduled activities leading to the end of fabrication.	Aug. 18, 2003
2. Revise and update the contingency analysis table presented at the review.	Aug. 18, 2003
3. Complete the development of back-up material containing the lower level subsystem cost and schedule estimates on which the additional funding request is based.	Aug. 18, 2003
4. Hold a detailed status review of the LAT project.	Feb. 2004