GLAST Large Area Telescope:
I & T Input to Monthly Technical/Cost/Schedule Review 02/25/04

Elliott Bloom
SU-SLAC
Subsystem Manager

Brian Grist
SU-SLAC
Subsystem Engineer

elliott@slac.stanford.edu, bgrist@slac.stanford.edu
650-926-2469 650-926-2998

Last Month's Accomplishments

- Deliver report on utility of Van de Graaff to LAT End-to-End test committee.
- Considerable effort on I&T LAT requirements flow to prepare for this year's integration efforts:
  - Meetings with Pat Hascall – Test Plan flow and LAT-MD-02730 (LAT performance and operations test plan).
  - Meetings with Dick Horn – Roadmaps to integration and I&T K/O review
  - Meetings with Joy Henegar – I&T K/O review
- MGSE design-status review of equipment needed to integrate the LAT. 2/5/04
  - MGSE design review to approve long lead purchases. 2/24/03
- Release of GASU specifications by ELX allowed considerable work on GASU code development by I&T.
- Bug fixes and enhancements to LATTE V 2.0
- Training mockup design complete and parts are all on order.
- Bld. 33 nitrogen main line connected.
- Received mini-CAL, some NCRs generated and passed on to QA.
- Van de Graaff refurbished, reassembled, and pumped down.
- Prepared for and completed OSHA inspection (lab wide).

Key Milestone for Next 3 Months

Milestone Description	Original Date	Current Date	Major Requirements to Achieve Milestone	Notes
Bldg 33 Upgrades	09/01/03	03/31/04	Nitrogen purge System operational except for final SLAC safety inspection, and use for flight hardware certification. Install network firewall for computer security.	Last items in a long list of items
ACD tent work- Bld 33	01/30/04	05/01/04	Design complete ready to order. Preproduction review scheduled for 2/26/04	*Need for ACD 10/10/04. Complete tent work before LAT integration begins.*
I&T K/O Review	3/11/04		Department roadmaps produced by week of March 1.	
Lehman Review	3/29/04	3/29/04	• Reviewed K/O material • Procedure lists • LAT- Performance and Operations Plan, LAT-MD-02730	*Work with Systems Engineering.*
ACD EM Tower Tiles and Electronics and mechanical support	02/17/04	March/ April	ACD to deliver tiles, photo-tubes, freeboards for use with single tower + GASU . I&T to produce EGSE scripts.	*Delivery time still under negotiation. No firm date yet.*
LAT assembly readiness review	05/06/04	06/06/04	One month before first flight parts arrive (beginning of LAT assembly and integration).	*First delivery of flight hardware to I&T sufficient to start assembly is July 13. (TKR A, GRID, TEM/TEMPS)*
I&T training mockup complete and ready for use	01/03/04	03/10/04	• All I&T mechanical & electrical techs on board and ready to train. • Requisitions are in the system for new hires.	*See following slides for overview of mockup and hires.*

Training Mockup Status

- **The main purpose of the mock up hardware will be to exercise and validate the integration sequences outlined in LAT Assembly doc, LAT-MD-00676.**

I&T Mock-Up Manufacturing List

Item	# units	Tot. Cost	Charge Code	Bid Out	Bid In	P.O. Out	In Hand	ECD
baseplate	1	$7,900	see Eric					25-Feb
rotation stand frame	1	$3,400	see Eric	12-Dec				30-Jan
rotation stand attachment hardware	1	$2,500	see Eric		n/a		done	
CAL baseplates	8	$5,840	2600172	5-Dec				18-Feb
Design Time for baseplates/stand		$6,000	2600172		n/a			
TEM/PSU boxes (for 1 bay)	8	$13,200	2600172		5-Dec	23-Jan		10-Mar
new mock GASU box	1	$300	2600172		n/a			25-Feb
new mock PDU box	1	$300	2600172		n/a			25-Feb
Menning plates	14	$1,706	2600172		n/a			25-Feb
cable trays	Half set	$1,121			28-Jan			25-Feb
cable trays hardware		$1,050						
mock cables	full set	$0			n/a			as reqd.
TEM-GASU cables	8	$6,400	2600172		5-Dec			
TEM box-CAL connectors ($77.15 ea)	5	$386						
TEM box connectors ($75.05 ea)	17	$1,276	2600172			Glenair	5	29-Jan
TEM box connector saver ($189.40 ea	2	$379	2600172			Glenair	2 done	
GASU box connectors	8	$600	2600172			Glenair	0	29-Jan
GASU connector savers ($189.40 ea)	8	$1,515	2600172			Glenair	8 done	
PSU-PDU cables	8	$6,400	2600172		5-Dec			
PSU box connectors ($16.56 ea)	10	$166	2600172			Positronics	10 done	
PSU connector savers ($228.14 ea)	2	$456	2600172			Positronics	2 done	
PDU box connectors ($10.53ea)	8	$84	2600172			Positronics	10 done	
PDU connector savers ($228.14 ea)	8	$1,825	2600172			Positronics	4	
EMI skirt mock-up	1 side	$0						
Corner bracket mock-up	2 corners	$0						
SIU/EPU/Empty boxes								25-Feb
Stud for menning plates								25-Feb
Total cost to IFCT Dept.		$49,004						

Completed Items in Green
Updated costs in yellow

Job Hire Status

- **Currently 10 total new positions**
- **1 Hired**
- **9 have been posted, résumés coming in.**

New Position Status

Status as of: 2/24/2004 15:59

Job Req#	Job Title	Req Written	Req. Approved	Job Posted	Interviewees Selected	Interviews Scheduled	Interviews Complete	Hired	Action Needed	Actionee
29264	SVAC, Engineering Physicist	●	●	●	●	●	●	●		
29406	ONLINE, Engineering Physicist	●	●	●	○	○	○	○	Waiting for applicants	Ric, Elliott
29420	ONLINE, Engineering Physicist	●	●	●	○	○	○	○	Waiting for applicants	Ric, Elliott
22399	IFCT, Mechanical Technician, Lead	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Eliazar
22400	IFCT, Mechanical Technician	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Eliazar
24265	IFCT, Mechanical Technician	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Eliazar
22395	IFCT, Electrical Engineer	●	●	●	◎	○	○	○	Tim is sorting resumes	Tim
22396	IFCT, Electrical Technician	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Brian, Larry
22397	IFCT, Electrical Technician	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Brian, Larry
22398	IFCT, Electrical Technician	●	●	●	◎	○	○	○	Picking interviewees	Tim, Elliott, Brian, Larry

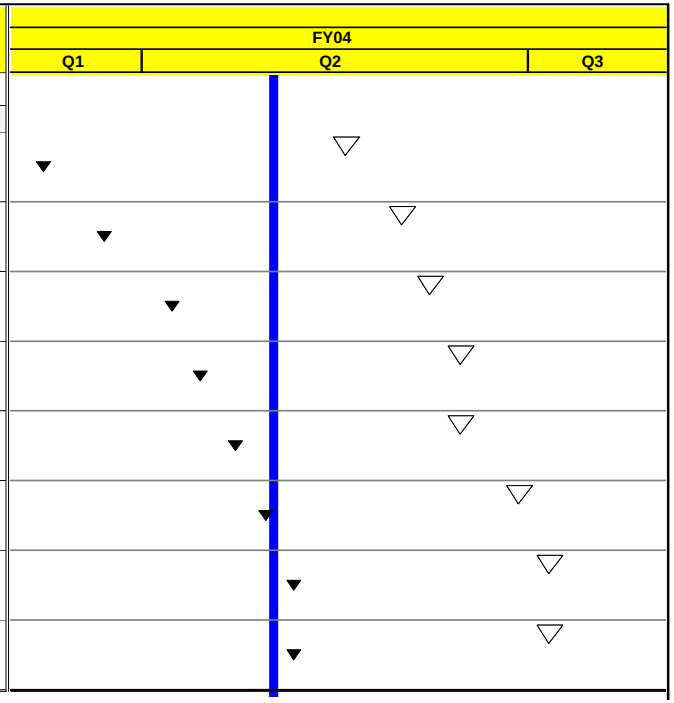
○ Not started
◎ In-Process
● Complete

Jobs are posted on SLAC website at

http://www-public.slac.stanford.edu/hr/jobs/search.asp

EGSE Need Milestones

AV	Activity ID	ND	Activity Description	AV: Early Finish	Float	Baseline Finish	Early Finish
4.1.7 Electronics							
4.1.9 I&T							
7	1M7941130	9	EGSE TEM/TEM PS/CTS w/ FE Elec #1-Elec to I&T	01/20/04	-42	12/08/03	02/17/04
7	1M7941150	9	EGSE TEM/TEM PS/CTS w/ FE Elec #2-Elec to I&T	02/12/04	-41	12/22/03	03/01/04
7	1M7941160	9	EGSE TEM/TEM PS/CTS w/ FE Elec #3-Elec to I&T	02/20/04	-41	01/07/04	03/08/04
7	1M7941170	9	EGSE TEM/TEM PS/CTS/GASU FE	02/27/04	-41	01/14/04	03/15/04
7	1M7941180	9	EGSE Development Hrdw/FSW 1st Delivr-Elec	02/27/04	-36	01/22/04	03/15/04
7	1M7941190	9	EGSE TEM/TEM PS/CTS #1 for Bldg 33-Elec to I&T	03/12/04	-41	01/29/04	03/29/04
7	1M7941420	9	EGSE TEM/TEM PS/CTS #2 for Bldg 33-Elec to I&T	03/19/04	-41	02/05/04	04/05/04
7	1M7941430	9	EGSE TEM/TEM PS/CTS w/ GASU for B33-Elec to	03/19/04	-41	02/05/04	04/05/04

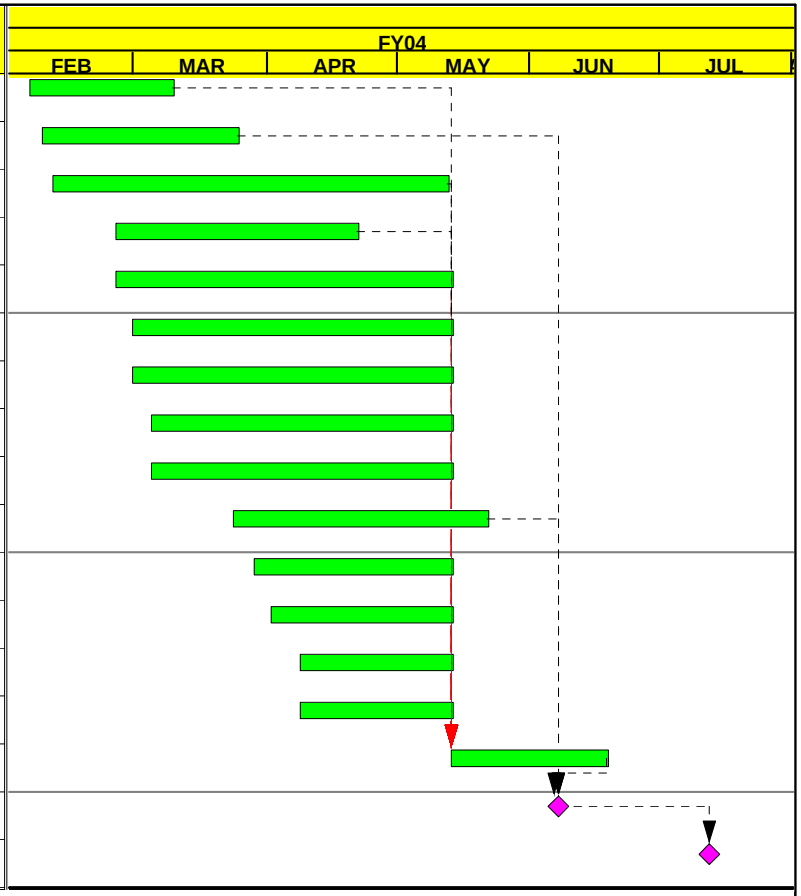


1	This item includes an **EM-2 TEM**, a **TEM Power Supply**, a **Crate Test System** with **LCB** and **Front-end Electronics (shared)**. It is to be used by Ric Claus for development of Online software.
2	This item includes an **EM-2 TEM**, a **TEM Power Supply**, a **Crate Test System** with **LCB** and **Front-end Electronics (shared)**. It is to be used by Selim Tuvi for development of Online software.
3	This item includes an **EM-2 TEM**, a **TEM Power Supply**, a **Crate Test System** with **LCB** and **Front-end electronics (shared)**. It is is to be used by Jim Panetta for development of Online software.
4	This item includes a **Crate Test System**, an **EM GASU** and **Front-end Electronics (shared)**. It is to be used by Ric Claus for development of Online software.
5	This item includes an **Early Release of Flight Software** and **Hardware interfaces**. It is to be used by Ric Claus for development of Online software for full LAT testing through SIU.
6	This item includes an **EM-2 TEM**, a **TEM Power Supply**, a **Crate Test System** with **LCB** . It is to be used in the building 33 room 103 Integration Test Facility.
7	This item includes an **EM-2 TEM**, a **TEM Power Supply**, a **Crate Test System** with **LCB** . It is to be used in the building 33 room 103 Integration Test Facility.
8	This item includes a **Crate Test System** with **LCB, EM GASU** and **EM PDU**. It is to be used in the building 33 room 104 Integration Test Facility for single and multi-tower tests during integration.

MGSE Schedule

- **Held 2 reviews of Integration MGSE on Feb 5th, 24th. The material can be seen at:**
  - **http://www-glast.slac.stanford.edu/IntegrationTest/MGSE/default_MGSE.htm**
- **Have been approved to order some long lead items**
- **This schedule is not in PMCS, this already show a slip from baseline.**

NEAR TERM MGSE	Orig Dur	Early Start	Early Finish
Formal Stress Analyses Reports	22*	02/06/04*	03/09/04
Metrology Bay (included 2wks buffer)	32	02/09/04*	03/24/04
Grid Perimeter Ring & GPR to Grid Brackets	65	02/11/04*	05/12/04
Drive Gear and Bearings	40	02/26/04*	04/21/04
4x4 Rotation Stand Weldment	56	02/26/04*	05/13/04
GPR Support Shaft - Flange Assys	54	03/01/04	05/13/04
Z-Axis Horizontal Lift Spreader	54	03/01/04	05/13/04
Proof Test Weights (4x4 Integration Hdwr)	50	03/05/04	05/13/04
Proof Test Weights Brackets (4x4 Int. Hdwr)	50	03/05/04	05/13/04
1x4 Lift Fixture (also works for EM SB)	43	03/24/04	05/21/04
4x4 Lift Fixture	34	03/29/04	05/13/04
GSE Tower Mass Simulators	30	04/02/04	05/13/04
Personal Access Platform Weldment (Steel)	25	04/09/04	05/13/04
Personal Access Platform Weldment (Alumin.)	25	04/09/04	05/13/04
LAT Rotation Stand Assembly and Proof Test	25	05/14/04	06/18/04
MGSE Complete for Integration Readiness Revie	0		06/07/04*
Receive Tracker A RFI	0	07/13/04*	



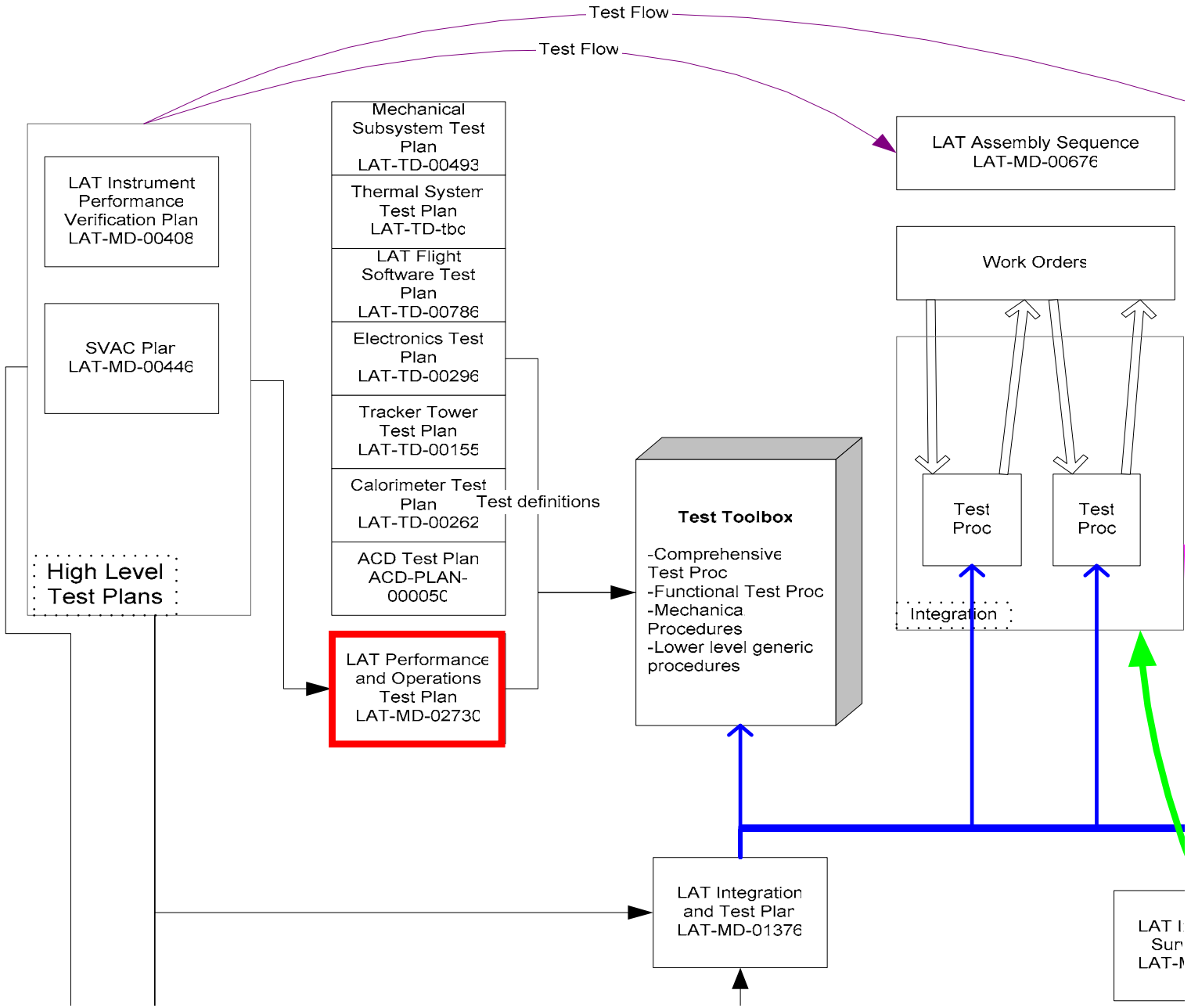
I&T TRK Tower Mechanical Mockup & ELX/I&T 5 Tray GTRC6 Mini-tower

ID	Task Name	Duration	Start	Finish
1	**Tracker Tower Test Fixtures**	**40 days**	**Fri 2/13/04**	**Fri 4/9/04**
2	Receive signed off drawings for Grid and Tracker	0 days	Mon 3/1/04	Mon 3/1/04
3	Design assembly fixture (Tony)	15 days	Mon 3/1/04	Fri 3/19/04
4	Fabricate assembly fixture	15 days	Mon 3/22/04	Fri 4/9/04
5	Receive Modified 1X4 Grid	0 days	Mon 3/8/04	Mon 3/8/04
6	Design Shims for Tower to Grid (BJ)	5 days	Mon 3/1/04	Fri 3/5/04
7	Fabricate interface parts (cones, studs, and bushings)	10 days	Mon 3/1/04	Fri 3/12/04
8	Design Lifting fixture (BJ)	10 days	Fri 2/13/04	Fri 2/27/04
9	Fabricate lifting fixture	20 days	Mon 3/1/04	Fri 3/26/04
10	**Bottom Tray**	**49 days**	**Mon 2/2/04**	**Fri 4/9/04**
11	Design Tooling for modifying Corner Flexures (BJ/Reggie)	10 days	Fri 2/13/04	Fri 2/27/04
12	Fabricate tooling for corner flexure modification	10 days	Mon 3/1/04	Fri 3/12/04
13	Update corner flexures on tray	5 days	Mon 3/15/04	Fri 3/19/04
14	Verify Mid Span Flexure removal	20 days	Mon 2/2/04	Mon 3/1/04
15	Remove Mid Span Flexures from Tray	5 days	Tue 3/2/04	Mon 3/8/04
16	Update or Fabricate new Mid Span Flexures (Tracker)	25 days	Mon 2/23/04	Fri 3/26/04
17	Modify drawing and Mid Span Flexure attach tooling	10 days	Mon 3/22/04	Fri 4/2/04
18	Attach Mid Span flexures	5 days	Mon 4/5/04	Fri 4/9/04
19	**Flex Cables**	**40 days**	**Fri 2/13/04**	**Fri 4/9/04**
20	Determine Cable Type and Mounting	14 days	Tue 2/17/04	Fri 3/5/04
21	Procure Mini Tower flex Cables & connectors (3 sets)	10 days	Mon 3/8/04	Fri 3/19/04
22	Install connectors on cables	5 days	Mon 3/22/04	Fri 3/26/04
23	Design bending tooling for grid pass through of cables (Tony)	10 days	Fri 2/13/04	Fri 2/27/04
24	Fabricate bending tool	10 days	Mon 3/1/04	Fri 3/12/04
25	Design tooling for cable attach to grid (Tony)	20 days	Fri 2/13/04	Fri 3/12/04
26	Fabricate attach tooling	20 days	Mon 3/15/04	Fri 4/9/04
27	Design Mate/De-Mate tooling (Tony)	10 days	Fri 2/13/04	Fri 2/27/04
28	Fabricate Mate/De-Mate Tooling	20 days	Mon 3/1/04	Fri 3/26/04

I&T TRK Tower Mechanical Mockup & ELX/I&T 5 Tray GTRC6 Mini-tower

29		**Mechanical Tower Test Article**	**54 days**	**Mon 2/2/04**	**Fri 4/16/04**
30		Ship Prototype Trays to SLAC from INFN	12 days	Wed 2/25/04	Thu 3/11/04
31		Collect fasteners and assembly parts	5 days	Mon 2/2/04	Fri 2/6/04
32		Fabricate Aluminum Sidewalls (Modify Composite sidewalls)	10 days	Mon 3/1/04	Fri 3/12/04
33		Assemble Mechanical Tower	5 days	Mon 4/12/04	Fri 4/16/04
34		Start Tracker integration testing	0 days	Fri 4/16/04	Fri 4/16/04
35		**Mini Tower**	**38 days**	**Tue 2/10/04**	**Fri 4/2/04**
36		Design sidewalls and lifting ring (BJ)	5 days	Tue 2/10/04	Tue 2/17/04
37		Fabricate sidewalls and lifting ring	10 days	Wed 2/18/04	Tue 3/2/04
38		Receive 5th Tray and assemby clips	0 days	Fri 3/12/04	Fri 3/12/04
39		Remove Cables	1 day	Wed 3/10/04	Wed 3/10/04
40		Receive Connectors	0 days	Fri 3/12/04	Fri 3/12/04
41		Install 4 connectors onto cables	2 days	Fri 3/12/04	Mon 3/15/04
42		Assemble Tracker Mini Tower	8 days	Tue 3/16/04	Thu 3/25/04
43		Design Mini-Tower stand (BJ)	10 days	Tue 2/10/04	Tue 2/24/04
44		Fabricate Mini Tower Stand	20 days	Wed 2/25/04	Tue 3/23/04
45		Test and assemble components into stand	5 days	Mon 3/29/04	Fri 4/2/04
46		**Modify EM Tower (SLAC or INFN?)**	**15 days**	**Mon 3/22/04**	**Fri 4/9/04**
47		EM Tower delivered from Italy	0 days	Mon 3/22/04	Mon 3/22/04
48		Remove Bottom Tray and Cables	5 days	Mon 3/22/04	Fri 3/26/04
49		Modify bottom tray	5 days	Mon 3/29/04	Fri 4/2/04
50		Reassemble EM Tower	5 days	Mon 4/5/04	Fri 4/9/04

Focus on Early Test Flow Plan



Issues Concerns Suggestions Risks

- Finalization of LAT requirements
- EGSE definition document needs to be completed
- Pressure from SC to not use flight science data link during aliveness tests. Only have housekeeping data through 1553 link.
- High rate test methodology needs definition.
  - I&T currently working on very high rate Van de Graaff solution.
  - Justification for using Van de Graaff has been submitted to Mike Huffer, Chair of LAT End-to-End testing committee.
  - Need final report of committee
  - Working with Steve Ritz to get head start on LAT CPT.

Status/Closure of action items

No Change from Last Month

- **No action items from last months review meeting**
- **CDR RFA #13: ACD RFA of detailed dimensions in facility and hook height.**
  - **I&T response submitted 8/29/03 that included a dimension study and access dimensions. Discussions with ACD indicated acceptance of our plan. ACD and I&T working toward accommodating early delivery of ACD at SLAC, and understanding logistics at SLAC in depth.**
- **CDR RFA #14b: ACD installation MGSE**
  - **MGSE clearances for ACD installation were discussed in the response to RFA #13. Currently a concept exists for the lift fixture. It has had initial bounding analysis, but the complete design and final analysis is not complete.**

Some (IFCT) Integration Procedures that need input

- **Procedures needing Subsystem input identified during LAT-MD-000676 "Integration Sequence" development meetings**
  - **Mechanical Subsystem input needed**
    - CAL Module Fastener Installation and Torqueing
    - Shear Plate Assembly and Liquid Shim Procedure
    - Grid box electrical system installation and checkout Procedure
    - DSHP and Heat Pipe Patch Panel Mounting Procedure
    - Heater control box mounting and checkout Procedure
    - E-Box 3rd Layer Flatness Check Procedure
    - Bulkhead Panel Torque Procedure
    - GASU Mounting Bolt Torque Procedure
    - SIU/EPU/MTY Mounting Bolt Torque Procedure
    - X-LAT Heat Pipe Shimming Procedure
    - X-LAT Plate Bolt Torqueing Procedure
  - **ACD Subsystem input needed**
    - ACD Lift Bracket Mounting Procedure
    - ACD Mounting Bolt Torque Procedure
  - **ELX Subsystem input needed**
    - GASU ACD freeboard simulator test Procedure
    - GASU, PDU, SIU, EPU test Procedures.
  - **TKR Subsystem input needed**
    - TKR Module Mounting Procedure
  - **Mechanical Integration**
    - Accelerometer and thermistor installation and checkout Procedures
    - Ground cooling system installation and leak check Procedure

Open Flight Design Issues Status & Closure Plan

- **Work out sharing of EM CAL between CAL and I&T from October 15, 2003 until flight integration begins on July 13, 2004.**
  - **We expect I&T will need CAL EM for less than 2 months in this time period.**
  - **This is a reduction from 50/50 to 25/75 for I&T/CAL EM sharing in this 8 month time frame.**
  - **With delivery of tower A, we will require CAL EM to enable "2 tower" checkout. This is in addition to the 2 months before integration begins.**

- **EM-2 plan is now in flux due to delays in delivery of flight like TKR–grid interface. Formulating a new plan that is consistent with integration schedule.**
  - **I&T is building a full mechanical TKR tower with final flight interface.**
  - **Define goal of EM fit check. Review plan with Marc C. and Tom B. to understand the 1x4 and 1x1 grid and EM Tracker requirements. - Bloom/Grist**
  - **Fit check of appropriate TKR Mechanical model needs to be done with CAL EM, new flight interface 1X1 and 1x4 grid as early as possible. Current date has slipped to mid April.**

- **Identify and implement a work around to G3 delay that implements ACD schedule impact. Haller/Bloom/T. Johnson**
  - **Gained 20 days by early delivery of initial specification document by Huffer to Claus. Need timely progress towards final specification document to allow full gain of schedule. Date to ACD is now ~ March 12. Ric and Jim are planning to visit ACD at Goddard on 3/1/04 to help the start the GASU software effort.**

Cost and Schedule Status

	WBS	BAC	BCWS	BCWP	ACWP	SV $	CV $	% BCWS	% BCWP	% ACWP	SPI Trend	CPI Trend	SPI	CPI	Cpi_Fcst	CpiSpi_Fcst
65	4.1.9	6,907	2,885	2,876	2,827	-9	50	41.77	41.65	40.93	↔	↓	0.997	1.018	6,788	6,800

- **Cumulative Schedule Variance**
  - **Work Scheduled: 2885 k$**
  - **Work Performed: 2876 k$**
  - **Schedule Variance: -9k$ (-0.3%)**
    - **8k$ is 1x4 lift fixture done in February (NOT). (3 month delay)**
  - **Threats to Schedule:**
    - **Completion of test plans.**
    - **Delivery of EM parts from subsystems for EM-2 program.**

- **Cumulative Cost Variance**
  - **Work Performed: 2876 k$**
  - **Actual Cost: 2827 k$**
  - **Cost Variance: +50k$ (+1.8%)**