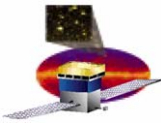**Gamma-ray Large Area Space Telescope**

GLAST Large Area Telescope
Instrument Science Operations Center
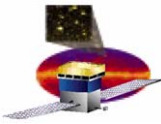
**Monthly Status Review
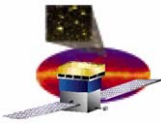8 February 2007**

Rob Cameron

ISOC operations facility

❑ **ISOC Operations Facility**

- **Construction is completed**

- **Final pieces of furniture to be delivered in Feb**

- **Operations computers installed**

  - **5 workstations**

  - **Overhead monitor**

- **Networking**

  - **Dedicated SLAC subnet for operations computers, as "Internet Free Zone"**

- **Office phones will be used for communication with external elements**

  - **patched into operations voice circuits at NASA/GSFC MOC**

  - **GLAST I&T at General Dynamics factory**

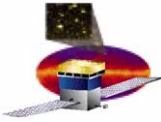- **Essentially ready to support GLAST operations testing**

Operations Area

Dataflow Lab

- ❑ **We now have space for the LAT Calibration Unit!**
    - – **CU should be returning to SLAC in March, following shipping review**
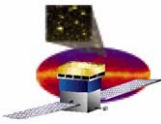
CHS Activities

- ❑ **Ops TIM held at GD, Jan 30- Feb 1. Highlights:**
  - – **Reviewed HK downlink capabilities**
    - • **Current design causes some random LAT HK packets not to be transmitted in real-time when the downlink rate is 8kbps or less. Dropped HK packets are not deterministic, as diagnostic packets are generated for transmission.**
    - • **Discussed possible change to spacecraft FSW that would improve downlink of real-time instrument HK data**
    - • **Real-time HK telemetry is used to verify procedure execution**
  - – **L&EO planning**
    - • **Presentation and discussion of the Timeline Management Tool to be used for L&EO planning**
    - • **Discussed plan to transition to GSSC science timeline during checkout**
    - • **Provided GD with LAT turn-on and checkout information during a splinter meeting discussion about the instrument timeline**
  - – **Leap second progress: MOC will support correct UTC, including leap seconds in tools and products. ISOC will also support UTC for operations.**
  - – **Flight Operations Review (FOR) scheduled for July 2007**
- ❑ **Draft operations agreement between ISOC and MOC has been reviewed and is ready to be baselined**
- ❑ **Mission Planning Exercise scheduled for March 5-11**
  - – **Exercise ISOC mission planning software and processes**
  - – **Exercise interfaces with MOC and GSSC**
- ❑ **LICOS Telemetry displays for general use and ETE1 testing have been developed**
- ❑ **Requirements update of LAT-SS-00021 ISOC Level III Specification is in work - ECD March 2007**
- ❑ **B0-8-0 T&C database delivered to GD on 1/22/07**

Narrative Procedure Development

- ❑ **Total of 94 narrative procedures in development**
  - **90 for on-orbit operations (some also used for L&EO)**
  - **4 for L&EO use only**
  - **Since last monthly review**
    - **Deleted 1 on-orbit procedure because the command will be included in another procedure**
- ❑ **52 procedures ready for PROC development**
  - **48 on-orbit procedures**
    - **Includes all NPs needed for ETE1 and ETE2**
  - **4 L&EO procedures**
- ❑ **Development of ARR and ToO procedures on-hold until FSW B0-9-0**
- ❑ **Observatory-level procedures being worked with GD in bi-weekly meetings**
  - **LAT power on**
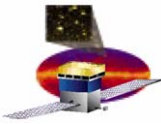 - **Observatory Command Checkout**
 - **ARR and ToO Tests**
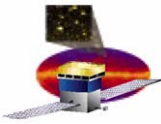
Narrative Procedure Status

Status by ETE									
ETE	Date	# of Procedures	Level						
			1	2	3	4	5	6	
ETE 1	Feb-07	9	0	0	0	0	9	0	
ETE 2	Mar-07	21	0	0	17	3	1	0	
ETE 3	Apr-07	23	8	1	14	0	0	0	
ETE 4	Jun-07	41	11	0	8	0	0	0	
		94	19	1	39	3	10	0	

Schedule				
	Planned Draft	Draft Actual	Planned Level 3	Level 3 Actual
Apr	3	4	0	0
May	7	8	0	0
Jun	9	5	0	0
Jul	4	0	2	2
Aug	6	8	1	1
Sep	4	9	11	11
Oct	6	7	12	11
Nov	12	11	8	16
Dec	13	12	2	1
Jan	9	8	16	10
Feb	10	0	16	0
Mar	6	0	11	0
Apr	5	0	10	0
May	0	0	5	0
	94	72	94	52
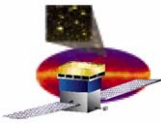
Cumulative NP Progress				
	Planned Draft	Draft Actual	Planned Level 3	Level 3 Actual
Apr	3	4	0	0
May	10	12	0	0
Jun	19	17	0	0
Jul	23	17	2	2
Aug	29	25	3	3
Sep	33	34	14	14
Oct	39	41	26	25
Nov	51	52	34	41
Dec	64	64	36	42
Jan	73	72	52	52
Feb	83		68	
Mar	89		79	
Apr	94		89	
May	94		94	

Narrative Procedure Development Progress
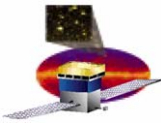

Cumulative NP Progress
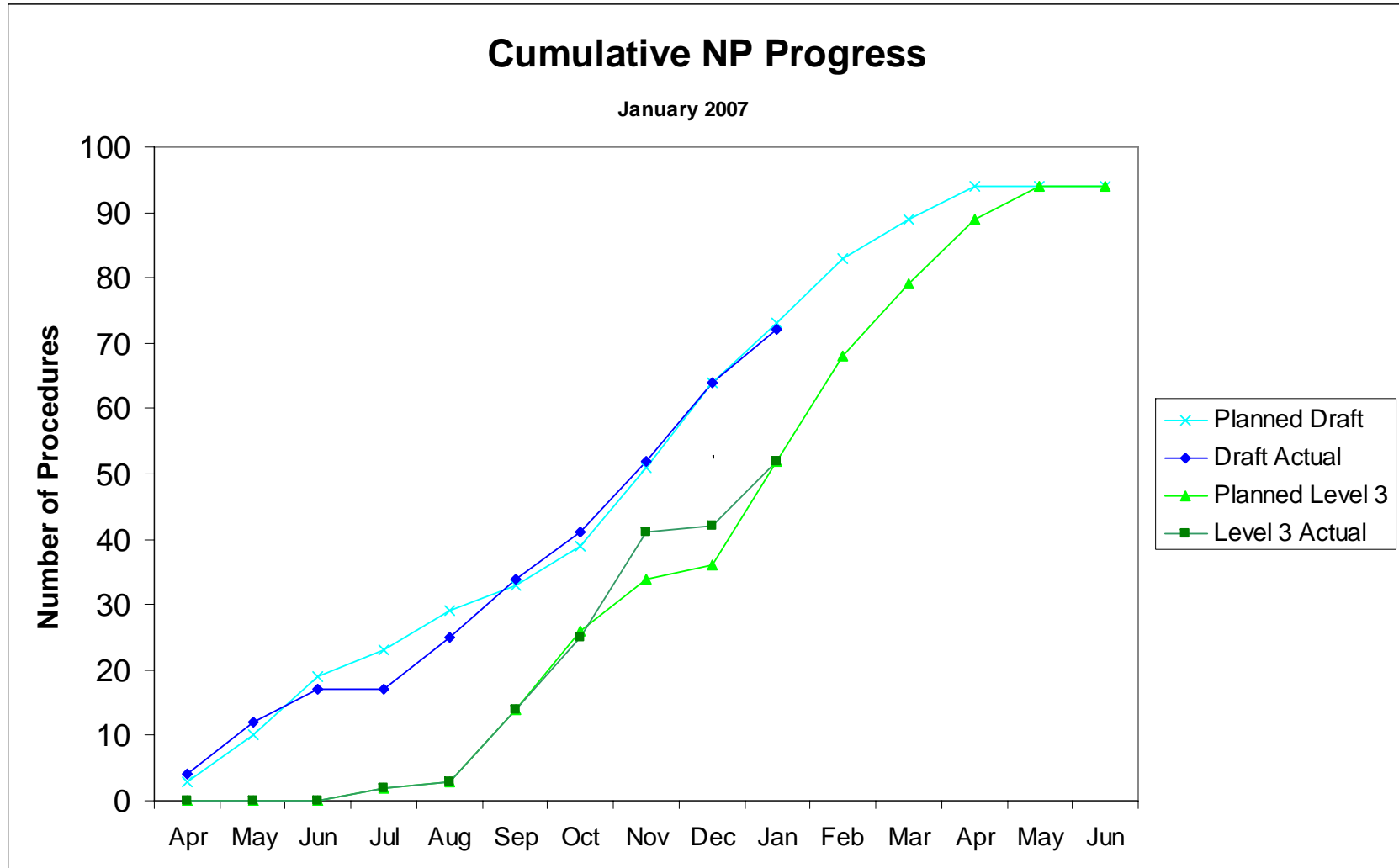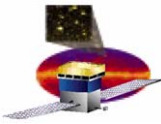
PROC Development

- ❑ **20 PROCs in development**
- ❑ **The following 11 PROCs are in review**
  - **LAT_NOOP**
  - **LAT_1TASK_MSG_ENAB**
  - **LAT_TASK_MSG_DISA**
  - **LAT_CMD_CONFIRM**
  - **LAT_DWELL_TLM**
  - **LAT_STOP_DWELL_TLM**
  - **LAT_CREATE_DIR**
  - **LAT_DUMP_DIR**
  - **LAT_DELETE_DIR**
  - **LAT_COPY_FILE**
  - **LAT_DELETE_FILE**
- ❑ **Aaron Nguyen (FOT) is scheduled to come to SLAC on Feb 8-9 to revalidate ETE1 PROCs against the testbed, following some PROC updates**
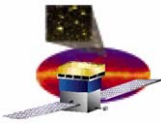
Flight Operations Software Progress

- ❑ **Provided a level-0-tracking-database query tool to show spans of data received at SLAC from GD**
- ❑ **Binary command packet dump tool, to be used for LICOS-ITOS command comparison**
  - – **Issue: no current LICOS support of C&T DB enumerations**
  - – **Big job for FSW or Online**
  - – **In the near term, command comparison must use numeric command arguments**
- ❑ **ISOC tool development**
  - – **Telemetry table display GUI**
  - – **Alert system**
  - – **Mission Planning Tool**
- ❑ **ISOC CHS Core release 2.2**
  - – **Testing complete**
  - – **Preparation for ETE1 and MPEx1: exercise and practice with tools in operations room**
- ❑ **Calibration trending tool development**
  - – **Database being populated with test data**
  - – **Web interface available**
- ❑ **ISOC computing platform (installers, etc.)**
- ❑ **Started LICOS Telemetry display tool for matching ITOS displays**
- ❑ **Ric Claus is leading weekly Flight Operations Software developers' meeting**

ISOC Testing

- ❑ **ISOC/CHS 2.2 acceptance testing status**
  - – **testing completed 2 Feb**
  - – **11 issues uncovered and entered in Jira - all were fixed**
  - – **fully verified 39 reqts, partially verified 3**
- ❑ **GRT6 preparations in progress**
  - – **test date: 20-21 Feb**
  - – **test procedure going thru final tweaks**
- ❑ **Mission Planning Exercises (formerly called Day-in-the-Life)**
  - – **scheduled for 5-11 March**
  - – **exercise a week of mission planning**
  - – **ISOC will use release 2.2 Mission Planning software**

Tool example: LAT Mission Planning

❑ **GUI suite for planning LAT on-orbit activities**
  – **LAT "Activity" manager**
  – **On-board LAT Absolute Time command Sequence (ATS) builder**
  – **File upload scheduler**
  – **Science run scheduler**
  – **Real-time PROC scheduler**

❑ **Connected to MP databases**
  – **Orbit data and events**
  – **FSW files**
  – **LAT PROCs**
  – **LAT commands**

❑ **Generates files compliant with Operations Data Products ICD**

Requirements Tracking

Requirement Category	Release Status & Plan (as of 02/05/07)									
	1 **6/05** GRT2	**1.2** **11/05** GRT3	**1.3** **2/06**	**1.4** **5/06**	**2** **7/06** GRT5	**2.1** **10/06**	**2.2** **2/06** GRT6 ETE1 MPE	**3** **4/07** GRT7 ETE2-3	**4** **6/07** ETE4-6	**total**
Misc (Facility, Redundancy, Security, Doc, etc.)	3	1		2	7	2	4	16	27	62
Mission Planning	2	2					30	14	4	52
Telemetry Processing	1	3	1	7	4	13	1	11	3	44
Science Data Processing				1	2	3		29	1	36
Telemetry Monitoring		1	1	2	1	15	1	10	2	33
Logging			3			4		3		10
Trending			12		6	3		1		22
Anomaly Tracking & Notification						6	3	7	1	17
# new reqts verified	6	7	17	12	20	46	39	91	38	276
cumulative total	6	13	30	42	62	108	147	238	276	

Key:	
	Incremental release (only new requirements tested)
	Major release (all requirements satisfied to date tested)
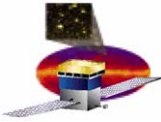
End-to-End 1 Preparation Status

– **A half-day practice session prior to ETE1 for the LISOC real-time monitoring engineers is planned for February 13**

   • **housekeeping and diagnostic telemetry collected during LAT testing will be played-back from ISOC L0 archive.**

– **Weekly coordination meetings to address issues and plan for future tests have begun**

– **Preliminary resource scheduling for the test complete**

   • **personnel, roles & responsibilities, WS assignments, etc. within LISOC**

   • **will be updated to accommodate ETE1 date change and as needed for the follow-up tests**

– **The HK telemetry dropouts, though still an issue for LAT, no longer identified as a lien against ETE1 for LAT**
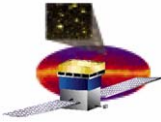
Science Operations

❑ **General**

- **Offers of involvement by collaboration for SO tasks have been received, and responsibilities for the tasks have been assigned.**

- **For some large topics, like background and IRF monitoring, working groups have been established**

❑ **Data Processing**

- **L1 pipeline: Warren Focke and Larry Wai have run simulated L0 data (two 1-minute files) through the test L1 pipeline. Includes subdivision of files for parallel reconstruction and generation of digi reports.**

- **Digi reports are merged across processes. Work on merging the reconstructed events is ongoing.**

- **Naming of output directories is being coordinated with SAS for registration with the Data Server.**

Science Operations (cont.)

❑ **Monitoring**

- **David Paneque (SLAC) has started looking at trending of physics quantities. He will work with subsystems to define the quantities.**

- **SLAC and INFN/Pisa SO groups met at GLAST Symp. on LAT monitoring (pre-digi), and configuration of the monitoring applications.**

- **SLAC, INFN/Perugia, INFN/Padova, IN2P3/CENBG, and UW groups met at GLAST Symp. to discuss issues for IRF monitoring. Gino Tosti (Perugia) agreed to be the first leader of the group. The group will define in more detail the functions to be implemented and have prototypes of the monitoring tasks implemented by the end of March.**

- **Methods for in-flight monitoring of the perimeter of the SAA are being explored (Eric Grove, NRL & Hiro Tajima, SLAC). TKR LRS counters can run in the SAA. Diagnostic methods for low-energy electrons are also being considered.**

❑ **Optimization**

- **The effect of phasing attitude maneuvers with orbital dawn on exposure uniformity and overshooting of (simulated) attitude maneuvers is being investigated (J. McEnery, NASA). Preliminary results were presented to the mission Science Working Group on Feb. 2**
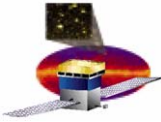
SAS Status: Service Challenge
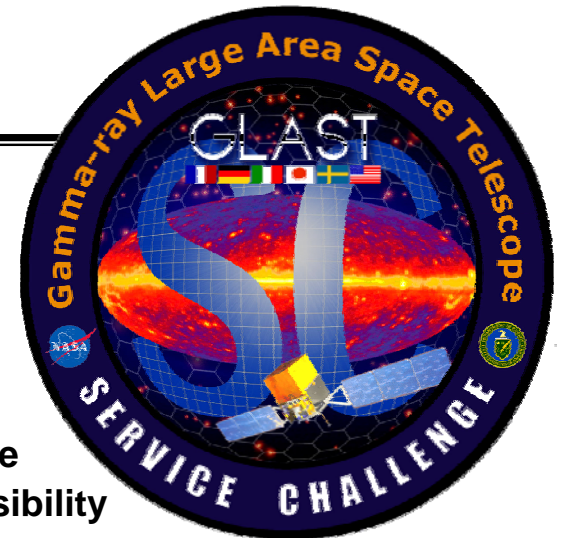
❑ **Service Challenge Work**
- **Working to 3 near term goals**
  - **1-year gtobssim run (mid Feb)**
    - **Pointing**
    - **Include diffuse response and exposure cubes in pipeline**
      - » **Nicola Omodei (Pisa) to take over pipeline responsibility**
  - **1-day Gleam run with pointing**
    - **Pointing, new background interleave scheme**
    - **Backgrounds generated; rates extracted**
    - **Testing (still) about to start (waiting until after Symposium)**
    - **Leading to new 55 day run (end Feb/mid Mar)**
  - **L0 Gleam run (leading to single downlink runs)**
    - **L0 file simulation now being tested; first runs happening**
    - **First looks have no surprises**
      - » **In use for L1 pipeline testing**
    - **L1 processing chain being updated**
      - » **Processing chain defined and input to pipeline**
      - » **Script work in progress**
    - **Trial instrument and ASP monitoring plots**
    - **Prototype ASP**
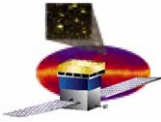
SAS: Sundry Items

❑ **Shift Log installed**

   – **Being customized to SciOps spec now for ETE1**

❑ **Ordered 50 TB disk**

   – **Ship date no later than end Feb**

   – **Pressure on disk from SASS has dropped off for now**

   – **Plan to combine IFC $$ with SLAC CEP to get to 150 TB disk, 400 compute cores by launch. Money appears to be in place**

❑ **Xrootd**

   – **DC2 files (some 32k of them) imported to xrootd to test functions and latencies to/from tape**

   – **Should have demo of functionality by mid February**

❑ **Starting work in France on running pipeline jobs at Lyon**
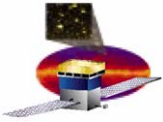
Backup slides

LAT Procedures (1/4)

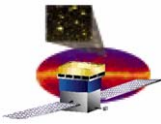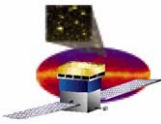| Number	Ver.	Level	initial draft	level 3	Name	Author
L-LCM-01	0.9	5	april	july	Change Task Messaging	Bator
L-LCM-02	0.8	5	april	july	Change Task Command Confirmation	Bator
L-LHK-02	0.8	5	april	august	Request Dwell Telemetry	Bator
L-LAT-03	0.7	5	october	october	Send No-op Commands	Bator
L-FIL-01	0.6	4	june	november	File Upload	Bator
L-FIL-02	0.3	3	may	november	File Copy from SIU to EPU	Bator
L-FIL-03	0.3	4	september	october	File Upload Cancel	Bator
L-LEO-01	0.19	3	june	october	LAT Configuration 1 Start Up (L&EO)	Pineau
L-LEO-03	0.22	3	june	october	HVBS Power On	Pineau
L-LFS-01	0.7	5	may	september	File Copy	Bator
L-LFS-02	0.7	5	may	september	File Delete	Bator
L-LFS-03	0.7	5	may	september	Directory Create	Bator
L-LFS-04	0.7	5	may	september	Directory Delete	Bator
L-LFS-05	0.7	5	may	september	Directory Dump	Bator
L-LFS-06	0.4	3	may	october	File System Status	Bator
L-LFS-07	0.7	5	may	october	File Dump	Bator
L-LFS-08	0.4	3	september	october	File System Check	Bator
L-LIM-07	0.6	3	september	october	Configure GBM Interface Handling	Condamoor
L-LPA-01	0.14	3	september	october	Initiate Physics Observation	Pineau
L-LPA-02	0.9	3	september	october	Terminate Physics Observation	Pineau
L-LPA-03	0.3	3	november	november	Enable/Disable GRB Messages	Bator
L-LPA-04	0.3	3	november	november	Set Active Event Handler Configuration	Bator
L-LPA-05	0.3	3	november	november	Associate Event Handler Configuration	Bator
L-LPA-06	0.4	3	november	november	Set Event Data Output Stream	Bator
L-MEM-01	0.11	3	april	september	Memory Dump	Bator
L-MEM-03	0.4	3	september	october	Memory Write	Bator
L-MEM-04	0.4	4	june	september	Dump Memory Pool Statistics	Bator
L-MEM-05	0.4	3	june	september	Dump System Symbol Table	Bator
L-MEM-06	0.5	3	august	september	Dump Memory Relative to Symbol	Bator

LAT Procedures (2/4)

Number	Ver.	Level	initial draft	level 3	Name	Author
L-MEM-07	0.4	3	august	september	Dump PCI Device Header	Bator
L-LCI-01	0.2	3	november	due Dec	Calibration Data Collection Run	Pineau
L-LEO-02	0.10	3	august	september	SIU/EPU Hardware Functional	Pineau
L-LEO-12	0.4	3	october	november	LAT GRB Handling Setup	Pineau
L-LIM-01	0.4	3	october	january	Hold Mode	Condamoor
L-LIM-09	0.4	3	october	january	Dump Power System Configuration	Condamoor
L-LIM-10	0.4	3	october	january	Dump Detector Configuration	Condamoor
L-LMC-01	0.4	3	august	november	CAL Low Rate Counter	Condamoor
L-LMC-02	0.5	3	august	november	TKR Low Rate Counter	Condamoor
L-LMC-03	0.4	3	august	november	ACD Tile Counter (Pair)	Condamoor
L-LMC-04	0.4	3	august	november	ACD Tile Counters (All)	Condamoor
L-LMC-05	0.4	3	august	november	TEM Deadtime Counter	Condamoor
L-LIM-11	0.7	3	october	november	Initiate ToO Observation	Pineau
L-LIM-12	0.4	3	november	november	Abort ToO Observation	Pineau
L-LIM-13	0.2	1	november	due Jan	Monitor ToO Completion	Pineau
L-PBC-03	0.2	2	november	due Feb	EPU Boot	Condamoor
L-TCS-01	0.1	1	december	due Feb	Start TCS	Bator
L-TCS-02	0.1	1	december	due Feb	Stop TCS	Bator
L-TCS-03	0.1	1	december	due Feb	Change TCS Mode	Bator
L-TCS-04	0.1	1	december	due Feb	Restart TCS	Bator
L-TCS-05	0.1	1	december	due Feb	Set TCS Parameters	Bator
L-TCS-06	0.1	1	december	due Mar	Set LTC Parameters	Bator
L-TCS-07	0.1	1	january	due Mar	Control LTC Heaters	Bator
L-LPA-07	0.4	3	january	due Feb	Initiate Compression Debug	Pineau
L-FIL-04	0.1	1	january	due Feb	File Upload to SIU (Boot)	Bator
L-FIL-05	0.1	1	january	due Feb	File Upload to EPU (Boot)	Bator
L-LCM-03	0.4	3	september	january	Generate CPU Code Module Listing	Condamoor
L-LCM-04	0.4	3	september	january	Generate CPU Task Listing	Condamoor
L-LCM-05	0.4	3	september	january	Configure MSG Output Interface	Condamoor

LAT Procedures (3/4)

Number	Ver.	Level	initial draft	level 3	Name	Author
L-LCM-06	0.3	3	november	january	Run Memory Scrubber	Condamoor
L-LCM-07	0.3	3	november	january	Internal Communcation Statistics Monitor	Condamoor
L-LCM-08	0.3	3	december	january	Configure CPU Error Handling	Condamoor
L-LCM-09	0.1	1	december	due Feb	Configure Memory Scrubber	Condamoor
L-LHK-01	0.1	1	january	due Mar	Restart and Reinitialize LHK	Bator
L-LIM-02	0.1	1	january	due Mar	Load Shed	Condamoor
L-LIM-03	0.1	1	january	due Mar	Safe Mode	Condamoor
L-LIM-04			due Feb	due Apr	Set ACD Bias Voltages	Condamoor
L-LIM-05			due Feb	due Apr	Set CAL Bias Voltages	Condamoor
L-LIM-06			due Feb	due Apr	Set TKR Bias Voltages	Condamoor
L-LIM-08			due Feb	due Apr	Configure ACD High-Voltage Handling	Condamoor
L-LIM-14	0.1	1	december	due Feb	Main Feed On	Condamoor
L-LIM-15	0.1	1	december	due Feb	Component Power On	Condamoor
L-LIM-16	0.1	1	december	due Feb	Component Power Off	Condamoor
L-LIM-17			due Dec	due Feb	ARR Abort	Condamoor
L-LIM-18	0.1	1	december	due Feb	PID Signals	Condamoor
L-MEM-02			due Feb	due Mar	SIU Memory Dump (Boot)	Bator
L-MEM-08			due Feb	due Mar	Dump PCI Device Header (Boot)	Bator
L-MEM-09			due Feb	due Mar	Write PCI Device Header	Bator
L-MEM-10			due Mar	due Apr	Write PCI Device Header (Boot)	Bator
L-MEM-11			due Mar	due Apr	Access RAD750 CPU Register	Bator
L-MEM-12			due Mar	due Apr	Memory Write (Boot)	Bator
L-LAT-01	0.7	3	october	november	LAT Turn On	Pineau
L-LAT-02	0.7	3	november	december	LAT Power Down	Pineau
L-PBC-01			due Mar	due Apr	SIU Secondary Boot	Condamoor
L-PBC-02			due Mar	due Apr	SIU Primary Boot (Warm Reset)	Condamoor
L-PBC-04	0.1	1	january	due Feb	EPU Primary Boot (Warm Reset)	Condamoor
L-PBC-05			due Feb	due Mar	Load RTOS Image to RAM	Condamoor
L-PBC-06			due Feb	due Mar	Load Secondary Boot Code to RAM	Condamoor
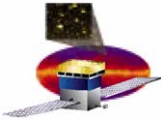
LAT Procedures (4/4)

Number	Ver.	Level	initial draft	level 3	Name	Author
L-PBC-07			due Feb	due Mar	Load Secondary Boot Script to RAM	Condamoor
L-PBC-08			due Apr	due May	Boot No-op	Condamoor
L-PBC-09			due Apr	due May	PBC Error Dump	Condamoor
L-PBC-10			due Mar	due Apr	Dump Boot Diagnostics	Condamoor
L-PBC-11			due Apr	due May	Dump Selected Primary Boot Image	Condamoor
L-PBC-12			due Apr	due May	Spontaneous Reboot Handling	Condamoor
L-SMS-01			due Apr	due May	Enable/Disable Magic 7 Copy	Condamoor