

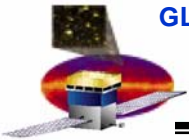
LAT Manager's Meeting

30 Sep 2004

LAT Analysis Status

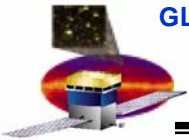
John Ku

Jack Goodman



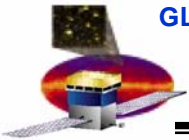
Structural Analysis: Completed Tasks

- **LAT System Level**
 - **LAT Environmental TIM Support**
 - Outlined LAT Structural Tests planned for, including detailed information on objectives, test flow and philosophy, success criteria, instrumentation needs, and required data output
 - Will present this outline in the October 1 I&T TIM
 - **LAT Instrumentation Progress**
 - Accelerometer positioning was reviewed and updated with Design Engineering and Systems Engineering
 - Accelerometer mounting method worked out for various subsystems
 - Accelerometer selection complete – meets all outgassing, structural and schedule requirements
 - Worked with ACD SS to resolve accelerometer placement confusion
 - **LAT Thermal Distortion correlation to test addressed**
 - Determined locations of thermistors on Grid and XLAT plate to allow for on-orbit thermal distortion calculation
 - Sensitivity study of pointing to Grid and XLAT temperature gradients complete
 - **Provided load definition of CAL tab with sharp fillet**
 - **Reviewed SC Test Flexure delivery parameters**
 - **Supported FDLC2 (Flight Design Load Cycle 2) data reduction (answered questions relating to the LAT FEA Model)**



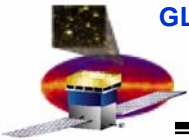
Structural Analysis: Completed Tasks

- **LAT Subsystem Level**
 - **TKR Subsystem**
 - **TKR Flight Design**
 - Calculated minimum bubble diameter in EMI shielding tape on TKR top tray
 - Specified fastener torques on all TKR fasteners
 - Provided input on TKR tray process control tests and quality assurance of composite parts
 - **TKR GSE Assemblies**
 - TKR Turnover fixture analysis complete
 - **TKR Additional Studies**
 - Performed helicoil versus bare thread pullout to validate analysis assumptions
 - Provided input on Wirebond encapsulation or no encapsulation
 - Reviewed TART report
 - **EBOX Subsystem**
 - Supported CAL TRR – Initiated RFA to reevaluate presence of SIU mass simulator
 - TEM Standoff analysis revisited in light of CAL vibration tests; recommended CAL SS remove SIU mass simulator to reduce risk of fatigue failure
 - **Grid Subsystem**
 - Met with LMCO and GSFC to discuss RAD qualification test plan
 - Shear Plate component qualification test and data reduction complete; shear plate strength is adequate to carry all shear loads even if there is no friction between CAL tabs and Grid
 - Restarted Grid Static Strength Test analysis
 - **MGSE**
 - Shipping Container re-analysis complete; all transportation environments are met
 - New configuration of Personnel Access Platform analyzed; no known issues at present
 - Rotation Stand proof test analysis performed to ensure proper loading



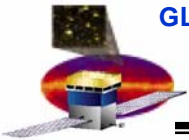
Structural Analysis: Current Tasks In-process

- **LAT System Level**
 - **Most discussions complete, but need to close the loop on LAT Dynamics Test, LAT Acoustic Test, and LAT Vibration Test Plans**
 - Support I&T Environmental Test TIM and all follow-on discussions ECD=Ongoing
 - Continue to address accelerometer details ECD=Oct-04
 - Re-run Modal Test proof-of-concept analysis with final accel locations ECD=Nov-04
 - Sine vibration pre-test analysis ECD=Dec-04
 - **LAT Thermal Distortion Analysis**
 - Final analysis and reporting of results pending further discussion ECD=Dec-04
 - **MGSE for Integration Analysis**
 - MGSE Final Report in-progress ECD=Oct-04
 - Radiator MGSE and SC simulator for acoustic test will commence in Sep-04
 - **Shipping Container Analysis**
 - Container analysis complete, Final report in-progress ECD=Oct-04



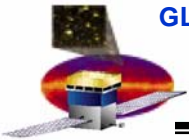
Structural Analysis: Current Tasks In-process

- **LAT Subsystem Level**
 - **TKR Subsystem**
 - Continued support of TKR TWR 0 testing, as-needed ECD=TBD
 - Continued support of TKR NCR disposition, as-needed ECD=Ongoing
 - **EBOX Subsystem**
 - Re-analyze EBOX for new design and loads ECD=Nov-04
 - Develop EBOX test plan/procedure ECD=Nov-04
 - **Grid Subsystem**
 - Shear plate qualification test complete; report in-progress ECD=Oct-04
 - Pullout testing of RMB keenserts ECD=Oct-04
 - Grid Static Pre-test Analysis (for strength and stiffness survey) ECD=Oct-04
 - Grid Static Test plans/procedures/STE ECD=Dec-04
 - Proof Test Spectrum-provided Flexures ECD=Jan-05
 - Test Grid ECD=Feb-05
 - Support RAD and XLAT issues, as needed ECD=Ongoing



Structural Analysis: Conclusions/Remarks

- **Conclusions**
 - Transition to I&T analysis is almost complete, as the last lingering design “tweaks” are made.
 - Communication between cross-functional groups continues to be good as we move towards integration and test.
- **Remarks**
 - An important assumption made is that the FDLC2 (Flight Design Load Cycle 2) data reduction will be completed NLT Nov-04
 - This impacts pre-test analysis for LAT and all Subsystems
 - Early results show that although most loads have decreased, some may have increased. This means test loads may have to be increased. This is especially important for subsystem qualification tests, i.e. delta-qual of subsystem after integration would be bad.
 - Man-power plans for the next six months are being reviewed.



Thermal Engineering Activities – Completed 1/2

1. Design Engineering and Support

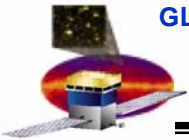
- LAT MLI concepts defined, being evaluated by Spectrum Astro
- MLI Interface between LAT and ACD is defined

2. LAT Level Thermal Analysis and Tests

- Thermal math model, Ver. 6 completed and being verified

3. Subsystem Support and Oversight

- Electronic Box Detailed Thermal Analyses
 - * all boxes completed
- Working with INFN/Bari to define Tracker TVAC test bakeout parameters and test instrumentation
- Approved ACD requested change for cold survival limit from -40C to -30C



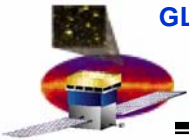
Thermal Engineering Activities – Completed 2/2

4. LAT Thermal Control System

- TCS algorithm revised and incorporated into FSW
- Grid top flange heat exchanger, detailed design finalized

5. Lockheed Thermal Control System Hardware

- X-LAT Assembly Thermal Vacuum Test Plan Initial release
- Radiator Assembly Thermal Vacuum Test Plan Initial release



Thermal Engineering Activities – Current 1/2

1. Design Engineering and Support

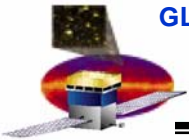
- Environmental Specification – change Tracker Acceptance Level Tests (35 degC to 40 degC)

2. LAT Level Thermal Analysis and Tests

- LAT Transition from Survival to Operating Mode
- Sequence of LAT test segments
- LAT TVAC Test Plan

3. Subsystem Support and Oversight

- Tracker Tower A TVAC tests
 - * Test Plan and Test Procedures in preparation
 - * Tracker thermal Math Model being used for predictions of test thermal profile
 - * Test orientation/setup for towers defined, MGSE for Tower A being fabricated; tests postponed indefinitely



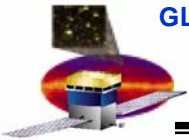
Thermal Engineering Activities – Current 2/2

4. LAT Thermal Control System

- Development tests for VCHP assembly/disassembly procedure, issue is thermal conductance at triple joint
- Update *LAT Test Thermal Requirements* –TD-00997
 - Add description of auxiliary heat exchangers (X-LAT and Grid)
 - Identify cooling solutions of all individual tests, in review

5. Lockheed Thermal Control System Hardware

- X-LAT Assembly Thermal Vacuum Test Plan in review
- Radiator Assembly Thermal Vacuum Test Plan in review
 - *Overall testing concepts agreed by LM, SLAC and NASA/GSFC
- Radiator thermal math model, TVAC test configuration
- X-LAT Plate test procedures in preparation



Thermal Engineering Activities - Planned

1. Design Engineering and Support

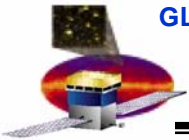
- Finalize MLI interface to ACD and radiators in conjunction with MLI design concepts
- Detailed design and fabricate MLI blankets

2. LAT Level Thermal Analysis and Tests

- Thermal Math Model, Ver. 6.1, reduced node
- Thermal Math Model, Ver. 6.2, LAT TVAC test configuration
- LAT Thermal Vacuum Test Procedure
- Correlate integrated Thermal Math Model after LAT TVAC tests
- 200 Node Launch Vehicle Thermal Math Model

3. Subsystem Support and Oversight

- Flight Tracker Nos.1-16, TVAC test configuration concept,
*detailed designs for MGSE
- Supervise TVAC tests of Tower A and first flight tracker



Thermal Engineering Activities - Planned

4. LAT Thermal Control System

- Preliminary verification in LM Radiator Acceptance Tests
- Define LM TVAC tests
- TCS verified in LAT TVAC tests at NRL, Q3/05

5. Lockheed Thermal Control System Hardware

- X-LAT Plate TVAC Test Procedures
- Radiator Acceptance Test Plan, final version
- Radiator TVAC Test Procedures