LAT Manager's Meeting

1 Sep 2004

LAT Analysis Status

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Structural Analysis: Completed Tasks

- **LAT System Level**
  - **LAT Instrumentation plan reviewed to remove unneeded channels**
    - Was: 61 Fly-away, 40 removable = 101 total
    - Is: 33 Fly-away, 31 removable = 64 total
    - Detailed review with subsystems in-process to ensure compatibility
  - **LAT Acoustic Test Issues Supported, resolution coming soon**
    - Discussed acoustic test STE design options (SLAC, GSFC) and agreed upon an approach for the test configuration.
      - STE for SC simulation dramatically simplified, additional acoustic analyses by Swales in-work
      - Vertical orientation, mounted in 4x4 integration stand, supported by test flexures
    - As designs for holding radiators commences, we are all working to the same baseline
  - **LAT Thermal Distortion correlation to test addressed**
    - Discussed thermal telemetry locations needed to accurately predict on-orbit thermal distortion
      - Simulation underway to assess locations chosen
  - **LAT RFA's regarding Integrated LAT and subsystem testing closed, updates to Performance Verification Spec complete; update to LAT dynamics test plan coming soon**
- **LAT Subsystem Level**
  - **TKR Subsystem**
    - TKR Flight Design
      - Provided torque values for all fasteners at top level drawing
      - Provided dynamic motion of Tracker components subjected to flight and test environments
    - TKR GSE Assemblies
      - Lift Fixture shipped to Italy
      - Inner Shipping Container report and proof test complete
      - Made recommendations for TKR tray box modifications for handling
    - TKR Additional Studies
      - Bias circuit analysis summary and recommendations provided to Tiger Team
      - Supported Tiger Team in various analyses
  - **EBOX Subsystem**
    - EBOX Margins re-evaluated. Continuing…
  - **Grid Subsystem**
    - Supported Radiator Test plan
    - Supported Grid instrumentation location definition
  - **MGSE**
    - No additional activity than mentioned above (instrumentation, LAT acoustic test config.)

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**
    - All preliminary analyses complete
    - Agreements between SLAC analysis and I&T made, designs are underway, final analyses concurrent
  - **LAT Thermal Distortion Analysis**
    - Simulation to evaluate accuracy of thermal distortion calculations using only flight telemetry ECD=Sep-04
    - Final analysis and reporting of results pending further discussion ECD=Oct-04
  - **MGSE for Integration Analysis**
    - Analyses of 4x4 integration stand continue
    - Radiator MGSE and SC simulator for acoustic test will commence in Sep-04
  - **Shipping Container Analysis**
    - New container analysis to be performed with new parameters ECD=Nov-04
- **LAT Subsystem Level**
  - **TKR Subsystem**
    - Continued support of TKR TWR A testing, as-needed ECD=TBD
    - Continued support of TKR NCR disposition, as-needed (e.g. bias circuit delam) ECD=Ongoing
    - Analysis of TKR Turn-over fixture and other MGSE ECD=Sep-04
  - **EBOX Subsystem**
    - Re-analyze EBOX for new design and loads ECD=Sep-04
    - Develop EBOX test plan/procedure ECD=Sep-04
  - **Grid Subsystem**
    - Grid Static Testing (for strength and stiffness survey) ECD=Sep-04
    - Grid Static Test plans/procedures/STE ECD=Nov-04
    - Test Grid ECD=Feb-05
    - Support RAD and XLAT issues, as needed ECD=Ongoing

Structural Analysis: Conclusions

- **Conclusions**
  - **Communication between cross-functional groups is improving as we move towards integration and test. This is very good because we are all working together to the same baseline, which will minimize surprises later on**
    - **We need to keep up the pace and continue to have productive meetings**
    - **We do not want to have meetings that go in circles – each meeting should have the goal of "closing the loop" on the issue at hand. This has happened many times in August.**
  - **"Devil in the details" is a common theme. Structural Analysis group is happy to perform analyses as needed. Even though most of the design and analyses are complete, there are many details that need addressing, such as fastener torque tables, torque tolerances, notes on drawings, etc. We have sufficient manpower to absorb this load.**
  - **A reminder, as the subsystems and the LAT move into production and test phases, that the Structural Analysis group can provide assistance with test planning, testing, data reduction and anomaly investigation**

Thermal Engineering Activities – Completed 1/2

1. Design Engineering and Support

- Environmental Specification, Section 11 reviewed

2. LAT Level Thermal Analysis and Tests

- Temperature input to STOP Analysis
- LAT Thermal Vacuum Testing, 8-10/05
  - * Held first Technical Interchange Meeting, NRL 6/2/04
- Thermal-Vacuum Test Plan: initiated review
- Concurrence with LM/GSFC on integrated thermal math model changes for Ver. 6
- Influence of using Grid ground HEX during LAT TVAC testing

3. Subsystem Support and Oversight

- Correlated calorimeter submodel – reviewed and ready to be integrated into Ver. 6
- Tracker EM Tower Thermal Vacuum Balance tests
  - * Correlated tracker submodel ready to be integrated into Ver. 6
- Electronic box stack test –ΔT across box/X-LAT plate higher than predicted but total ΔT agrees with predictions
- Electronic Box Detailed Thermal Analyses
  - *** TEM and TPS completed, within specs**
  - *** SIU/EPU completed, Qual. spec. exceeded, Acceptance level – no exceedance expected.**

Thermal Engineering Activities – Completed 2/2

4. LAT Thermal Control System

- Flight Software reviewed, modifications added
- Discussions with DAQ group (Gunther/Nelson) to supply flight DAQ/EGSE to be used in LM radiator acceptance tests
- GRID thermostats and heaters ordered
- X-LAT plate ground heat exchanger concept and detailed design completed

5. Lockheed-Martin Thermal Control System Hardware

- X-LAT plate test plan; draft in review

NASA Review of LAT Instrument Performance Verification Plan

Thermal RFA #2 still open

Thermal RFA #62 & #68 closed – change in Environmental Spec.

Thermal Engineering Activities – Current 1/2

1. Design Engineering and Support

- Environmental Specification – change to Tracker Acceptance Level Tests (35°C to 40°C)
- Qualification Plan, reviewed thermal profile – no changes
- Initiated MLI design activities

2. LAT Level Thermal Analysis and Tests

- GRID geometric model
- EMI skirt addition
- S/C actual solar array
- Cullimore & Ring (SINDA) heat pipe subroutine in evaluation (vs LM proprietary)

3. Subsystem Support and Oversight

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

Thermal Engineering Activities – Current 2/2

4. LAT Thermal Control System

- Development tests for VCHP assembly/disassembly procedure, re: single use vs reuse of heat transfer adhesive at triple joint
- Update *LAT Test Thermal Requirements* –TD-00997
- Grid top flange heat exchanger conceptualized, finalized after TD-00997 updated

5. Lockheed Martin Thermal Control System Hardware

- TCS software algorithm in review
- Radiator thermal math model, TVAC test configuration
- Radiator Acceptance Test Plan
    *Overall testing concepts agreed by LM,SLAC and NASA/GSFC
- X-LAT Plate test procedures in preparation
- Grid top flange heat exchanger detailed design in progress

Thermal Engineering Activities - Planned

1. **Design Engineering and Support**
   - Define MLI interface to ACD, S/C and radiators
   - 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
   - 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, thermal vacuum test configuration concept finished, detailed designs for MGSE to start in August

4. **LAT Thermal Control System**
   - Verified in LAT TVAC tests, 8-10/05

5. **Lockheed Martin Thermal Control System Hardware**
   - X-LAT Plate Test Plan final version
   - X-LAT Plate Test Procedures
   - Radiator TVAC Test Plan, TVAC Test Procedure