Mechanical Systems
Mechanical / Thermal Hardware
October 2004 Status

Marc Campell, Subsystem Manager
Accomplishments during November.
- Grid #1 was delivered to SLAC on 11/8/04.
- Grid #2 finish machining 85% complete.
- Procedures & Job Hazard Analyses (JHAM) were released for the B/33 operations.
- Grid Box Base Assembly drawing revision was released.
- LM completed panel bonding (facesheets to honeycomb) of both Radiator panels (discrepancies noted)
- LM has completed all in-process testing of the X-LAT Heat Pipes (XLHP).
## 3 Month Milestones Nov - Jan

<table>
<thead>
<tr>
<th>Milestone Description</th>
<th>Original Date</th>
<th>Current Date</th>
<th>Major Reqmnts to Achieve Milestone</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Grid Box Base Assy ops</td>
<td>07/22/04</td>
<td>12/23/04</td>
<td>All parts + MGSE in house</td>
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<td></td>
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<td>Procedures in place</td>
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<td>Hold MRR</td>
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<tr>
<td>Grid Heat Pipe bond process Qual</td>
<td>02/24/04</td>
<td>11/15/04</td>
<td>write test report</td>
<td>ECD 12/10/2004</td>
</tr>
<tr>
<td>Design Heater Control Box</td>
<td>08/19/04</td>
<td>11/12/04</td>
<td>release drawings</td>
<td>in release cycle</td>
</tr>
<tr>
<td>Fabricate Heater Control Box</td>
<td>10/28/04</td>
<td>12/17/04</td>
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<tr>
<td>Test Heater Control Box</td>
<td>12/13/04</td>
<td>02/18/05</td>
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<tr>
<td>Order TCS electronics components</td>
<td>01/30/04</td>
<td>12/17/04</td>
<td>release drawings of using assemblies</td>
<td>activity started</td>
</tr>
<tr>
<td>Order TCS flight hardware</td>
<td>12/19/03</td>
<td>11/30/04</td>
<td>LM procured TCS components</td>
<td>parts on order</td>
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<tr>
<td>Heaters, thermostats &amp; thermistors</td>
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<td>Grid thermostats</td>
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<td></td>
<td></td>
<td></td>
<td>Qual test complete</td>
<td>report in review at GSFC</td>
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<tr>
<td>Receive Grid #2, EMI skirts, details</td>
<td>11/15/04</td>
<td>03/22/05</td>
<td>EMI skirts &amp; details</td>
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<td></td>
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<td>Grid final machining &amp; inspection</td>
<td>ECD 2/2/05</td>
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<td></td>
<td></td>
<td></td>
<td>Grid plating</td>
<td>ECD 2/25/05</td>
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<td></td>
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<td></td>
<td>grid box machining &amp; hardware instal</td>
<td>ECD 3/18/05</td>
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<tr>
<td>Grid #2 Static Load Qual Test</td>
<td>12/16/04</td>
<td>02/28/04</td>
<td>Load case analysis</td>
<td>prelim eval complete</td>
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<td></td>
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<td>in-house vs out-house analysis</td>
<td>ECD 12/17</td>
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<td></td>
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<td>SOW, RFP &amp; vendor selection</td>
<td>Dec</td>
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<td></td>
<td></td>
<td></td>
<td>MGSE &amp; test fixture design</td>
<td>Jan</td>
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<td></td>
<td></td>
<td></td>
<td>MGSE &amp; test fixture fab</td>
<td>Feb</td>
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<td></td>
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<td></td>
<td>Test Readiness Review</td>
<td>Mar</td>
</tr>
<tr>
<td>Receive X-LAT plate</td>
<td>12/09/04</td>
<td>02/14/05</td>
<td>Complete X-LAT heat pipe fab</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Complete X-LAT plate assy</td>
<td>Jan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complete Thermal Vac testing</td>
<td>Feb</td>
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</tbody>
</table>
57 of 81 (70%) drawings released
  – 18 MLI drawings have been added to MECH drawing list
  – 4 unreleased parts not needed until I&T operations
    • In check

Known drawing revisions
  – Dec – 2 planned
    • X-LAT (in check) & Radiator IDD’s
Concerns

• Lockheed Martin - X-LAT plate & Radiator delivery schedule
  – Manufacturing progress is slower than expected
  – LM has been requested to provide an estimated cost at completion
  – Each step of the way there have been problems typical for a first article build
    • Need to reduce the time it takes to resolve these problems from weeks to days
  – -Y panel has disbonded core near reservoir from shop aid that did not provide adequate pressure during cure, and
  – -Y panel has core improperly trimmed out from design error
    • LM developing a repair method for these
Concerns (cont)

- Grid to I&T delivery date – schedule continues to compress.
- Grid thermal control components & Downspout Heat Pipe to Grid thermal joint are not verified until LAT T/Vac test.
  - Difficult to access these components at this level (remove Radiators & ACD).
- GSFC does not want to ship S/C flexures for static load test unless ITAR plans to their satisfaction are in place.
  - ITAR czars Bill Brown, GSFC and Steve Williams, SLAC to resolve this issue.
Open Flight Design Issues

• TCS validation vs. LM modified Radiator Thermal Vacuum & Balance plans
  – TCS test requirements being developed with Tom McCarthy
  – ~3 additional TCS cases proposed
  – Cost & schedule impacts will be evaluated
  – TCS risk assessment and Qual test plan requested by GSFC

• Define GBA Static Load test requirements & plans
  – Detailed load cases & STE being developed
    • 1st draft complete – loads have gone down and many test cases will be deleted or combined
    • Stress to perform another iteration on the load cases, then
    • Test in-house vs out of house decision can be made
Open Flight Design Issues (cont)

- Radiator wiring nomenclature (closed for Mech, track in Sys Engr)
  - The temp sensors going to the Spacecraft are labeled #1 - 6 but they go to VCHPs #0 - 5.
  - Likewise the primary & redundant heater leads from the Heater Control Box to the reservoir heaters are labeled #1 - 6, but go to reservoirs #0 - 5.
  - This means that heater #1 & temp sensor #1 are on VCHP 0. This will surely cause confusion down the line.

- Current status
  - Radiator wiring will be labeled 0 – 5, IDD to be revised
  - CR will generated to change the Spacecraft ICD & labeling on Spacecraft to Radiator harness drawing to 0 - 5
  - PDU, SIU & Heater Control Box will remain unchanged (1 -6) with a plan to use a mapping table (per G. Haller)
  - Flight software counts VCHP’s +Y 0 – 5 & -Y 0 – 5 get renamed 0 - 11
  - Instrumentation spreadsheet will be updated
Open Flight Design Issues (cont)

• Radiator integration sequence
  – Coupon testing of repeated make & break of joint in process
  – Disassembly facilitated by use of mold release agent

• X-LAT MLI blanket billowing will violate stay clear

• Radiator MLI blanket and wiring violates stay clear
  – Working issue with LM & Spectrum Astro
  – S/C to LAT MLI design options in work with Spectrum Astro
    • Spectrum will not support MLI design effort at this time

• Radiator vibration requirements
  – Current proposal is pre & post low level sine sweep, sine vibe and Acoustic testing
  – Working with GSFC & LM to minimize & finalize requirements
  – Preliminary design of vibration test fixture complete.
  – Design concepts for Acoustic test fixture due 12/13/04
# MECH Qualification Program

<table>
<thead>
<tr>
<th>Qual Test</th>
<th>Status</th>
<th>ECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Top Flange Heat Pipe bond process qual</td>
<td>Complete report in work.</td>
<td>Dec 04</td>
</tr>
<tr>
<td>Grid Box Assy Static Load test</td>
<td>Planning in work. Perform on Grid #2</td>
<td>Mar 05</td>
</tr>
<tr>
<td>X-LAT Plate Thermal Vac test</td>
<td>at LMMS</td>
<td>Feb 05</td>
</tr>
<tr>
<td>Radiator Variable Conductance Heat Pipe new extrusion</td>
<td>Passed burst test, heat capacity test after charging</td>
<td>Comp</td>
</tr>
<tr>
<td>Radiator Acoustic</td>
<td>at LMMS</td>
<td>Mar 05</td>
</tr>
<tr>
<td>Radiator Thermal Vacuum</td>
<td>at LMMS</td>
<td>May 05</td>
</tr>
<tr>
<td>TCS-Radiator Thermal Balance</td>
<td>Scope is changing. Need to define requirements</td>
<td>May 05</td>
</tr>
</tbody>
</table>
**PMCS**

- Mech Sys (SLAC only) current schedule variance -$250K
  - Driven by Static Load Test did not start
- Mech Sys (SLAC only) cum schedule variance -$823K
  - Driven by late receipt of Grid #1, Grid #2, TCS hardware and Static Load Test did not start.

- Mech Sys (LM only) current cost variance -$467K, and
- Mech Sys (LM only) cum cost variance -$504K
  - LM is behind schedule and not on their headcount profile
  - 18+ EM profile expected for next several months
  - Cost variance will grow at ~$600K per month for those months

- Need to implement scope reductions presented in Face to Face meeting to contain these overruns
  - Radiator Vibe test
  - X-LAT Thermal Cycle vs Thermal Vac
  - Add consider deleting Acoustic Test
Program Threats

• Top threats to maintaining schedule
  – Grid Box is a pathfinder for Flight hardware operations in B33
  – Highly compressed, success oriented schedule
  – LM X-LAT & Radiator delivery have no float and LM manufacturing is not maintaining their schedule

• Top threats to staying within cost
  – LM staying on schedule
  – LM maintaining headcount profile, esp. planned roll-off
  – SLAC staying on schedule
  – Interdependencies with DAQ for fab, assy & test of TCS