Mechanical Systems
Mechanical / Thermal Hardware
November 2004 Status

Marc Campell, Subsystem Manager
Accomplishments during December.

- Pathfinder for the handling of Flight hardware in B/33.
- 4 of 5 Top Flange Heat Pipes were bonded into Grid.
- Tracker mounting hardware installed into Grid.
- LM completed bonding doublers onto Radiator panels
- X-LAT Plate fab is complete less Nickel plating.
# 3 Month Milestones Dec - Feb

<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>
<td>Complete</td>
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<td></td>
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<td></td>
<td>Procedures in place</td>
<td>complete</td>
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<td></td>
<td></td>
<td></td>
<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>
<td>procurement cycle</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 Heaters, thermostats &amp; thermistors</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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<td></td>
<td></td>
<td></td>
<td>Grid thermostats</td>
<td>Qual test complete report in review at GSFC</td>
</tr>
<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>
<td>complete</td>
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<td></td>
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<td></td>
<td>Grid final machining &amp; inspection</td>
<td>ECD 2/2/05</td>
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<td></td>
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<td>Grid plating</td>
<td>ECD 2/25/05</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>grid box machining &amp; hardware installation</td>
<td>ECD 3/18/05</td>
</tr>
<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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<tr>
<td></td>
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<td>in-house vs out-house analysis</td>
<td>ECD 12/17</td>
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<td>SOW, RFP &amp; vendor selection</td>
<td>Dec</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>MGSE &amp; test fixture design</td>
<td>Jan</td>
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<tr>
<td></td>
<td></td>
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<td>MGSE &amp; test fixture fab</td>
<td>Feb</td>
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<td></td>
<td></td>
<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>
<td>Complete</td>
</tr>
<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>
</tr>
</tbody>
</table>
Drawing Release Plan

- 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
  - Jan – 2 planned
    - X-LAT (in release cycle) & Radiator IDD’s
Concerns

- Lockheed Martin - X-LAT plate & Radiator delivery schedule
  - LM’s estimated cost at completion is $8.49M
    - Exceeds available budget of $7.5M
    - Approval for additional funding will require DOE Chicago office approval (est. 3 months)
    - LM directed to work on Flight hardware only
    - Suspend test planning, design and other preparations
    - Suspend MGSE design and fab
  - Manufacturing progress is slower than expected
  - 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
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).
Open Flight Design Issues

- Requirements for Grid survival heaters & thermostats being revised to raise minimum Tracker temperatures
  - Bonding operations on hold pending CCB

- 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 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
    - Working group meeting planned for Jan
- 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 are next
  - Effort on hold
## 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>TBD*</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>TBD*</td>
</tr>
<tr>
<td>Radiator Thermal Vacuum</td>
<td>at LMMS</td>
<td>TBD*</td>
</tr>
<tr>
<td>TCS-Radiator Thermal Balance</td>
<td>Scope is changing. Need to define requirements</td>
<td>TBD*</td>
</tr>
</tbody>
</table>

* LM test program on hold pending funding resolution
PMCS

• Mech Sys (SLAC only) current schedule variance +76K
  – Received Flight Grid #1 (late)
• Mech Sys (SLAC only) cum schedule variance -$746K
  – Driven by late receipt of Grid #2, TCS hardware and Static Load Test did not start.

• Mech Sys (LM only) current cost variance -$426K, and
• Mech Sys (LM only) cum cost variance -$929K
  – LM is behind schedule and not on their headcount profile
  – LM has provided a spending profile for Jan – Mar to take them up to $7.5M
  – Investigating other testing options for Radiator and X-LAT plate
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