Mechanical Systems
Mechanical / Thermal Hardware
July 2004 Status

Marc Campell, Subsystem Manager
Accomplishments

• Accomplishments during August
  – Grid #1 inspection prior to plating complete
    • 15 issues found
    • MRB approved disposition of these items
  – Grid #1 alodine operations complete
    • Brush Nickel operations started
  – Grid #2 finish machining in process
  – Process qualification tests for 2 of 3 top flange heat pipe samples complete (I&T techs performing)
  – Variable Conductance Heat Pipe (VCHP) qualification complete
    • Burst, heat capacity and shut off testing
  – All flight VCHP’s charged and leak tested
  – X-LAT Heat Pipe bonding trials successfully completed
Grid #1 Alodine Processing
Tapemation Status

• Grid #1 at Brush Nickel shop (Platron)
  – Drawing revised to improve producibility
• Radiator Mount Brackets and EMI skirts needed for next assembly machining
  – All parts completed machining – out for electroless nickel plating

Milestones
• Plating complete 9/10
• Grid Box Machining complete 9/22
• Final hardware installation 9/28
• Clean, inspect pre-ship review 9/29
• Ship to SLAC 10/1
Grid Critical Path

- MGSE
  - 9/15/04

- Detail Part Fab & Procure
  - 9/15/04

- Plate Grid
  - 9/10/04
  - Tapemation complete & Ship to SLAC
    - 10/1/04

- Grid Box Base Assy Operations
  - 10/15/04

- Grid RFI
  - 10/15/04
## 3 Month Milestones Aug - Oct

<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>Receive Grid #1, EMI skirts, details</td>
<td>03/30/04</td>
<td>10/01/04</td>
<td>Grid plating &amp; grid box machining</td>
<td></td>
</tr>
<tr>
<td>Deliver Grid to I&amp;T</td>
<td>07/22/04</td>
<td>10/15/04</td>
<td>All parts + MGSE in house</td>
<td>ECD 9/15</td>
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<tr>
<td></td>
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<td></td>
<td>Procedures in place</td>
<td>in review</td>
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<td>Hold MRR</td>
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<tr>
<td>Release Grid Box Assy Procedures</td>
<td>04/15/04</td>
<td>09/16/04</td>
<td></td>
<td>in work</td>
</tr>
<tr>
<td>Procure Grid Assembly MGSE</td>
<td>05/17/04</td>
<td>09/14/04</td>
<td></td>
<td>on order</td>
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<tr>
<td>Grid Heat Pipe bond process Qual</td>
<td>02/24/04</td>
<td>09/16/04</td>
<td></td>
<td>testing started</td>
</tr>
<tr>
<td>Design Heater Control Box</td>
<td>08/19/04</td>
<td>10/19/04</td>
<td></td>
<td>in work</td>
</tr>
<tr>
<td>Order TCS electronics components</td>
<td>01/30/04</td>
<td></td>
<td></td>
<td>activity started</td>
</tr>
<tr>
<td>Order TCS flight hardware</td>
<td>12/19/03</td>
<td>10/30/04</td>
<td>LM procured TCS components</td>
<td>parts on order</td>
</tr>
<tr>
<td>Heaters, thermostats &amp; thermistors</td>
<td></td>
<td></td>
<td>Grid thermostats</td>
<td>parts in house now</td>
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<td></td>
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<td></td>
<td>Qual test pending</td>
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</tbody>
</table>
Drawing Release Plan

- 54 of 60 (90%) drawings released
  - Unreleased parts not needed until I&T operations
- Known drawing revisions
  - Aug – 5 released
  - Sep – 4 planned (X-LAT & Radiator IDD’s, Grid as built, Grid box machining)
Concerns

• 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).
• X-LAT plate & Radiator delivery schedule
  – Ramp up in manufacturing progress is slower than expected
Open Flight Design Issues

- TCS – location of Grid thermistors, fly away instrumentation and associated wiring needs to be finalized (top assembly drawing)
  - Grid thermostats will operate at 35V & 1A; 42V failure mode
  - Qualification testing of parts underway
    - 1000 of 30,000 cycles completed

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

- Define GBA Static Load test requirements & plans
  - Interface loads developed
  - Detailed load cases & STE being developed
  - Hired a Mechanical Engineer for this task
Open Flight Design Issues (cont)

- Radiator integration sequence
  - Initial wet joint trials completed.
  - Evaluation of repeated make & break of joint will be evaluated
  - Disassembly facilitated by use of mold release agent
- Radiator level EMI test was deleted
  - Engineering test of coupon started
  - Coupon is not passing – fixes are under investigation
- 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
- LM will use -6dB pre & post acoustic tests to verify Radiator instead of low level sine sweep
  - Low level sine sweep to 150 Hz may be required anyway to address Delta II concern
  - Investigating twang or tap tests on Radiator as alternate
  - Radiator very stiff in Z axis (direction of Delta II mode)
## MECH Qualification Program

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

- Mech Sys (SLAC only) current period schedule variance -$110K and
  - $53K associated with Thermal Cycle test which was removed from PCMS
  - Remainder for TCS and Grid assembly
- Mech Sys (SLAC only) cum schedule variance -$400K (less $53k)
  - Driven by late receipt of Grid #1
Program Threats

• Top threats to maintaining schedule
  – Grid delivery from Tapemation
  – Grid design & fabrication are occurring concurrently
  – Highly compressed, success oriented schedule
  – LM X-LAT & Radiator delivery have no float and LM manufacturing not maintaining schedule
  – Grid Box will be pathfinder for Flight hardware operations in B33

• Top threats to staying within cost
  – Staying on schedule
  – LM staying on schedule
  – Cost of work arounds to improve schedule
  – Interdependencies with DAQ for fab, assy & test of TCS