GLAST Large Area Telescope: 
I & T Input to Face to Face Managers Meeting, 
February 11th, 2004

Elliott Bloom 
SU-SLAC 
Subsystem Manager 

Brian Grist 
SU-SLAC 
Subsystem Engineer 

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650-926-2469                        650-926-2998
Cost and Schedule Variances & story at the end of March

• End of December
  – Schedule Variance: -8k$ (-0.3%)
  – Cost Variance: +71k$ (+2.7%)

• Preliminary End of January
  – Schedule Variance: ~-8k$ (no change from December)
  – Cost Variance: estimate of ~+60k$ (not much change from December)

• Expected end of March (without making changes)
  – Schedule Variance of ~-60k$ due to MGSE fabrication later than in current baseline.
  – Positive Cost Variance to continue to decrease as MGSE using more designers than in baseline. Contributes ~ -27k$ in cost variance.
  – Tom Borden is now working for I&T focusing on tracker interface issues. He will be using a designer (BJ). This is currently not in the PMCS. Contributes ~ - 30k$ in cost variance.
Job Hire Status

- Currently 10 total new positions
- 1 Hired
- 9 have been posted, résumés coming in.

<table>
<thead>
<tr>
<th>Job Req#</th>
<th>Job Title</th>
<th>Req Written</th>
<th>Req. Approved</th>
<th>Job Posted</th>
<th>Interviews Selected</th>
<th>Interviews Scheduled</th>
<th>Interviews Complete</th>
<th>Hired</th>
<th>Action Needed</th>
<th>Actionee</th>
</tr>
</thead>
<tbody>
<tr>
<td>29264</td>
<td>SVAC, Engineering Physicist</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<td></td>
<td></td>
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<td>Eduardo, Elliott</td>
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<tr>
<td>29406</td>
<td>ONLINE, Engineering Physicist</td>
<td>•</td>
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<td>Select Interviewees</td>
<td>Ric, Elliott</td>
</tr>
<tr>
<td>29420</td>
<td>ONLINE, Engineering Physicist</td>
<td>•</td>
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<tr>
<td>22399</td>
<td>IFCT, Mechanical Technician, Lead</td>
<td>•</td>
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<td>Tim, Eliazar</td>
</tr>
<tr>
<td>22400</td>
<td>IFCT, Mechanical Technician</td>
<td>•</td>
<td>•</td>
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<td>Select Interviewees</td>
<td>Tim, Eliazar</td>
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<tr>
<td>24265</td>
<td>IFCT, Mechanical Technician</td>
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<tr>
<td>22395</td>
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<td>22396</td>
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<td>•</td>
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<td></td>
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<td>Select Interviewees</td>
<td>Tim, Brian</td>
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</tbody>
</table>

Jobs are posted on SLAC website at [http://www-public.slac.stanford.edu/hr/jobs/search.asp](http://www-public.slac.stanford.edu/hr/jobs/search.asp)
4.1.9 - Integration and Test

Test Flow Plan

Test Plan Flow
Pat Haskell
Feb 9, 2004

GLAST LAT Project
Face to Face Managers Meeting 02/11/04
Some (IFCT) Integration Procedures that need input

- Procedures needing Subsystem input identified during LAT-MD-000676 “Integration Sequence” development meetings
  - Mechanical Subsystem input needed
    - CAL Module Fastener Installation and Torqueing
    - Shear Plate Assembly and Liquid Shim Procedure
    - Grid box electrical system installation and checkout Procedure
    - DSHP and Heat Pipe Patch Panel Mounting Procedure
    - Heater control box mounting and checkout Procedure
    - E-Box 3rd Layer Flatness Check Procedure
    - Bulkhead Panel Torque Procedure
    - GASU Mounting Bolt Torque Procedure
    - SIU/EPU/MTY Mounting Bolt Torque Procedure
    - X-LAT Heat Pipe Shimming Procedure
    - X-LAT Plate Bolt Torqueing Procedure
  - ACD Subsystem input needed
    - ACD Lift Bracket Mounting Procedure
    - ACD Mounting Bolt Torque Procedure
  - ELX Subsystem input needed
    - GASU ACD freeboard simulator test Procedure
    - GASU, PDU, SIU, EPU test Procedures.
  - TKR Subsystem input needed
    - TKR Module Mounting Procedure
  - Mechanical Integration
    - Accelerometer and thermistor installation and checkout Procedures
    - Ground cooling system installation and leak check Procedure
**MGSE Schedule**

- Held a review of Integration MGSE on Feb 5\textsuperscript{th}. The material can be seen at: 
  - [http://www-glast.slac.stanford.edu/IntegrationTest/MGSE/default_MGSE.htm](http://www-glast.slac.stanford.edu/IntegrationTest/MGSE/default_MGSE.htm)
- Received 11 RFA’s.
- Have NOT been approved to order long lead items
- The schedule below is based upon immediate approval to order long lead items.
- This schedule is not in PMCS, this already show a slip from baseline.

<table>
<thead>
<tr>
<th>DRAFT MGSE</th>
<th>Orig Dur</th>
<th>Early Start</th>
<th>Early Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Stress Analyses Reports</td>
<td>10</td>
<td>02/06/04*</td>
<td>02/20/04</td>
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<tr>
<td>Metrology Bay (included 2wks buffer)</td>
<td>32</td>
<td>02/09/04*</td>
<td>03/24/04</td>
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<tr>
<td>Grid Perimeter Ring &amp; GPR to Grid Brackets</td>
<td>65</td>
<td>02/11/04*</td>
<td>05/12/04</td>
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<tr>
<td>GPR Support Shaft - Flange Assys</td>
<td>54</td>
<td>02/23/04</td>
<td>05/06/04</td>
</tr>
<tr>
<td>Z-Axis Horizontal Lift Spreader</td>
<td>54</td>
<td>02/23/04</td>
<td>05/06/04</td>
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<tr>
<td>Drive Gear and Bearings</td>
<td>40</td>
<td>02/26/04*</td>
<td>04/21/04</td>
</tr>
<tr>
<td>4x4 Rotation Stand Weldment</td>
<td>56</td>
<td>02/26/04*</td>
<td>05/13/04</td>
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<tr>
<td>Proof Test Weights (4x4 Integration Hdwr)</td>
<td>50</td>
<td>02/27/04</td>
<td>05/06/04</td>
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<tr>
<td>Proof Test Weights Brackets (4x4 Int. Hdwr)</td>
<td>50</td>
<td>02/27/04</td>
<td>05/06/04</td>
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<tr>
<td>4x4 Lift Fixture</td>
<td>34</td>
<td>03/22/04</td>
<td>05/06/04</td>
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<tr>
<td>1x4 Lift Fixture (also works for EM SB)</td>
<td>43</td>
<td>03/24/04</td>
<td>05/21/04</td>
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<tr>
<td>GSE Tower Mass Simulators</td>
<td>30</td>
<td>03/26/04</td>
<td>05/06/04</td>
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<tr>
<td>Personal Access Platform Weldment (Steel)</td>
<td>25</td>
<td>04/02/04</td>
<td>05/06/04</td>
</tr>
<tr>
<td>Personal Access Platform Weldment (Alumin.)</td>
<td>25</td>
<td>04/02/04</td>
<td>05/06/04</td>
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<tr>
<td>Deliver MGSE to Mechanical Subsystem</td>
<td>0</td>
<td>05/20/04*</td>
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<tr>
<td>MGSE Complete for Integration Readiness Review</td>
<td>0</td>
<td>06/07/04*</td>
<td></td>
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<tr>
<td>Receive Tracker A RFI</td>
<td>0</td>
<td>07/13/04*</td>
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**GLAST LAT Project**

**Face to Face Managers Meeting 02/11/04**

**EGSE Need Milestones (Feb 9th)**

<table>
<thead>
<tr>
<th>AV</th>
<th>Activity ID</th>
<th>ND</th>
<th>Activity Description</th>
<th>AV: Early Finish</th>
<th>Float</th>
<th>Baseline Finish</th>
<th>Early Finish</th>
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<tr>
<td>4.1.7 Electronics</td>
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<tr>
<td>7</td>
<td>1M7941130</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS w/ FE Elec #1-Elec to I&amp;T</td>
<td>01/20/04</td>
<td>-42</td>
<td>12/08/03</td>
<td>02/17/04</td>
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<td>7</td>
<td>1M7941150</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS w/ FE Elec #2-Elec to I&amp;T</td>
<td>02/12/04</td>
<td>-41</td>
<td>12/22/03</td>
<td>03/01/04</td>
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<tr>
<td>7</td>
<td>1M7941160</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS w/ FE Elec #3-Elec to I&amp;T</td>
<td>02/20/04</td>
<td>-41</td>
<td>01/07/04</td>
<td>03/08/04</td>
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<tr>
<td>7</td>
<td>1M7941170</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS w/ FE Elec #4-Elec to I&amp;T</td>
<td>02/27/04</td>
<td>-41</td>
<td>01/14/04</td>
<td>03/15/04</td>
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<tr>
<td>7</td>
<td>1M7941180</td>
<td>9</td>
<td>EGSE Development Hrdw/FSW 1st Delivr-Elec</td>
<td>02/27/04</td>
<td>-36</td>
<td>01/22/04</td>
<td>03/15/04</td>
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<tr>
<td>7</td>
<td>1M7941190</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS #1 for Bldg 33-Elec to I&amp;T</td>
<td>03/12/04</td>
<td>-41</td>
<td>01/29/04</td>
<td>03/29/04</td>
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<tr>
<td>7</td>
<td>1M7941420</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS #2 for Bldg 33-Elec to I&amp;T</td>
<td>03/19/04</td>
<td>-41</td>
<td>02/05/04</td>
<td>04/05/04</td>
</tr>
<tr>
<td>7</td>
<td>1M7941430</td>
<td>9</td>
<td>EGSE TEM/TEM PS/CTS w/ GASU for B33-Elec</td>
<td>03/19/04</td>
<td>-41</td>
<td>02/05/04</td>
<td>04/05/04</td>
</tr>
</tbody>
</table>

1. This item includes an EM-2 TEM, a TEM Power Supply, a Crate Test System with LCB and Front-end Electronics (shared). It is to be used by Ric Claus for development of Online software.

2. This item includes an EM-2 TEM, a TEM Power Supply, a Crate Test System with LCB and Front-end Electronics (shared). It is to be used by Selim Tuvi for development of Online software.

3. This item includes an EM-2 TEM, a TEM Power Supply, a Crate Test System with LCB and Front-end electronics (shared). It is to be used by Jim Panetta for development of Online software.

4. This item includes a Crate Test System, an EM GASU and Front-end Electronics (shared). It is to be used by Ric Claus for development of Online software.

5. This item includes an Early Release of Flight Software and Hardware interfaces. It is to be used by Ric Claus for development of Online software for full LAT testing through SIU.

6. This item includes an EM-2 TEM, a TEM Power Supply, a Crate Test System with LCB. It is to be used in the building 33 room 103 Integration Test Facility.

7. This item includes an EM-2 TEM, a TEM Power Supply, a Crate Test System with LCB. It is to be used in the building 33 room 103 Integration Test Facility.

8. This item includes a Crate Test System with LCB, EM GASU and EM PDU. It is to be used in the building 33 room 104 Integration Test Facility for single and multi-tower tests during integration.
4.1.9 - Integration and Test

GLAST LAT Project

Face to Face Managers Meeting 02/11/04

I&T TRK Tower Mechanical Mockup & ELX/I&T 5 Tray GTRC6 Mini-tower

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracker Tower Test Pictures</td>
<td>31 days</td>
<td>Fri 2/13/04</td>
<td>Fri 2/26/04</td>
</tr>
<tr>
<td>Design assembly fixture (Tony)</td>
<td>16 days</td>
<td>Mon 2/10/04</td>
<td>Fri 2/12/04</td>
</tr>
<tr>
<td>Fabricate assembly fixture</td>
<td>16 days</td>
<td>Mon 2/10/04</td>
<td>Fri 2/26/04</td>
</tr>
<tr>
<td>Receive modified I&amp;T Grid Assembly</td>
<td>0 days</td>
<td>Mon 2/10/04</td>
<td>Mon 2/10/04</td>
</tr>
<tr>
<td>Design Shirring for Tower to Grid (BJ)</td>
<td>5 days</td>
<td>Mon 2/10/04</td>
<td>Fri 2/26/04</td>
</tr>
<tr>
<td>Fabricate interface parts (connectors, clips, and bushings)</td>
<td>10 days</td>
<td>Mon 2/10/04</td>
<td>Fri 2/27/04</td>
</tr>
<tr>
<td>Design lifting fixture (BJ)</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 2/25/04</td>
</tr>
<tr>
<td>Fabricate lifting fixture</td>
<td>20 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/18/04</td>
</tr>
<tr>
<td>Bottom Tray</td>
<td>49 days</td>
<td>Mon 2/17/04</td>
<td>Thu 4/8/04</td>
</tr>
<tr>
<td>Design Tooling for modifying Corner Flexures (BJ/Rgreg)</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 2/25/04</td>
</tr>
<tr>
<td>Fabricate tooling for corner fixture modification</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/11/04</td>
</tr>
<tr>
<td>Update corner fixture on tray</td>
<td>5 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/11/04</td>
</tr>
<tr>
<td>Verify Mid Span Flexure removal</td>
<td>10 days</td>
<td>Mon 2/20/04</td>
<td>Fri 3/11/04</td>
</tr>
<tr>
<td>Remove Mid Span Flexures from Tray</td>
<td>6 days</td>
<td>Mon 2/24/04</td>
<td>Fri 3/11/04</td>
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<tr>
<td>Update of Fabricate new Mid Span Flexures (Tooter)</td>
<td>26 days</td>
<td>Mon 2/24/04</td>
<td>Fri 3/11/04</td>
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<tr>
<td>Modify drawing and Mid Span Flexure attach tooling</td>
<td>10 days</td>
<td>Fri 3/10/04</td>
<td>Thu 4/1/04</td>
</tr>
<tr>
<td>Assemble Mid Span fixtures</td>
<td>5 days</td>
<td>Fri 4/2/04</td>
<td>Thu 4/8/04</td>
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<tr>
<td>Flex Cables</td>
<td>40 days</td>
<td>Fri 2/13/04</td>
<td>Thu 4/8/04</td>
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<tr>
<td>Devise the Cable Type and Mounting</td>
<td>5 days</td>
<td>Mon 2/10/04</td>
<td>Fri 2/26/04</td>
</tr>
<tr>
<td>Receive Mini Tower Test Cables &amp; connectors (3 sets)</td>
<td>10 days</td>
<td>Mon 2/24/04</td>
<td>Fri 3/5/04</td>
</tr>
<tr>
<td>Install connectors on cables</td>
<td>5 days</td>
<td>Mon 3/6/04</td>
<td>Fri 3/12/04</td>
</tr>
<tr>
<td>Design bending tooling for grid pass through of cables (BJ)</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/5/04</td>
</tr>
<tr>
<td>Fabricate bending tool</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/11/04</td>
</tr>
<tr>
<td>Design tooling for cable attach to grid (Tony)</td>
<td>20 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/18/04</td>
</tr>
<tr>
<td>Fabricate attach tooling</td>
<td>20 days</td>
<td>Fri 2/13/04</td>
<td>Thu 4/2/04</td>
</tr>
<tr>
<td>Design Motor Drive Testing (Tony)</td>
<td>10 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/5/04</td>
</tr>
<tr>
<td>Fabricate Motor Drive Testing</td>
<td>20 days</td>
<td>Fri 2/13/04</td>
<td>Thu 3/18/04</td>
</tr>
<tr>
<td>Mechanical Tower Test Article</td>
<td>54 days</td>
<td>Mon 2/20/04</td>
<td>Thu 4/15/04</td>
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<tr>
<td>Ship Prototype Trays to SLAC from INFN</td>
<td>12 days</td>
<td>Thu 2/18/04</td>
<td>Fri 3/5/04</td>
</tr>
<tr>
<td>Collect fasteners and assembly parts</td>
<td>5 days</td>
<td>Mon 2/24/04</td>
<td>Fri 3/5/04</td>
</tr>
<tr>
<td>Fabricate Aluminum Sidewalls (Modify Composites sidewalls)</td>
<td>10 days</td>
<td>Mon 2/24/04</td>
<td>Fri 3/11/04</td>
</tr>
<tr>
<td>Assemble Mechanical Tower</td>
<td>5 days</td>
<td>Fri 4/1/04</td>
<td>Thu 4/8/04</td>
</tr>
<tr>
<td>Start Tracker integration testing</td>
<td>6 days</td>
<td>Thu 4/1/04</td>
<td>Thu 4/8/04</td>
</tr>
<tr>
<td>Mini Tower</td>
<td>36 days</td>
<td>Mon 2/20/04</td>
<td>Fri 4/3/04</td>
</tr>
<tr>
<td>Design sidewalls and lifting ring (BJ)</td>
<td>5 days</td>
<td>Tue 2/10/04</td>
<td>Mon 2/16/04</td>
</tr>
<tr>
<td>Fabricate sidewalls and lifting ring</td>
<td>10 days</td>
<td>Tue 2/17/04</td>
<td>Mon 3/1/04</td>
</tr>
<tr>
<td>Receive 5th Tray and assembly clips</td>
<td>0 days</td>
<td>Fri 3/12/04</td>
<td>Fri 3/12/04</td>
</tr>
<tr>
<td>Assemble Tracker Mini Tower</td>
<td>10 days</td>
<td>Mon 3/15/04</td>
<td>Fri 3/26/04</td>
</tr>
<tr>
<td>Design Mini Tower stand (BJ)</td>
<td>10 days</td>
<td>Tue 2/10/04</td>
<td>Mon 3/2/04</td>
</tr>
<tr>
<td>Fabricate Mini Tower Stand</td>
<td>20 days</td>
<td>Tue 2/10/04</td>
<td>Mon 3/22/04</td>
</tr>
<tr>
<td>Test and assemble components into stand</td>
<td>5 days</td>
<td>Mon 3/29/04</td>
<td>Fri 4/4/04</td>
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<tr>
<td>Modify EM Tower (SLAC or INFN?)</td>
<td>15 days</td>
<td>Mon 3/22/04</td>
<td>Fri 4/9/04</td>
</tr>
<tr>
<td>EM Tower delivered from Italy</td>
<td>0 days</td>
<td>Mon 3/22/04</td>
<td>Mon 3/22/04</td>
</tr>
<tr>
<td>Receive Bottom Tray and Cables</td>
<td>5 days</td>
<td>Mon 3/22/04</td>
<td>Fri 3/26/04</td>
</tr>
<tr>
<td>Modify bottom tray</td>
<td>5 days</td>
<td>Mon 3/29/04</td>
<td>Fri 4/2/04</td>
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<tr>
<td>Reassemble EM Tower</td>
<td>5 days</td>
<td>Mon 4/5/04</td>
<td>Fri 4/10/04</td>
</tr>
</tbody>
</table>

4.1.9 - Integration and Test
Interdependencies: subsystems, LAT office and/or project office.

- Approval to start long lead MGSE procurements.

- Need completion of LAT-MD-02730 “LAT Performance and Operations Test Plan”

- Need input on specific process procedures for integration (see procedure list)

- Need EGSE deliveries from Electronics.

- Tracker Mechanical mock-up and 5 tray mini-tracker tower, parts from Tracker.

- Clearance of grid perimeter ring revisited with ACD and Mechanical Integration. Eric wants to increase, but then will intrude into current stay clear in LAT-Spacecraft ICD.
The main purpose of the mock up hardware will be to exercise and validate to certain extent the integration sequences outlined in LAT-MD-00676.

Additional purposes include and are not limited to:

- Exercise AI&T documentation (integration procedures, installation logs, etc)
- Identify issues with the cable integration sequence.
- Identifying any potential issues with the MGSE hardware.
- Identify floor usage space issues (crane restrictions, cart access space, etc).
- Train personnel for flight hardware integration.
- Exercise crane operations for flight hardware integration.
- Exercise de-integration operations and identify any potential problems.

4.1.9 - Integration and Test
Open Flight Design Issues Status & Closure Plan

  - We expect I&T will need CAL EM for less than 2 months in this time period.
  - This is a reduction from 50/50 to 25/75 for I&T/CAL EM sharing in this 8 month time frame.
  - With delivery of tower A, we will require CAL EM to enable “2 tower” checkout. This is in addition to the 2 months before integration begins.

- EM-2 plan is now in flux due to delays in delivery of flight like TKR–grid interface. Formulating a new plan that is consistent with integration schedule.
  - I&T is building a full mechanical TKR tower with final flight interface.
  - Define goal of EM fit check. Review plan with Marc C. and Tom B. to understand the 1x4 and 1x1 grid and EM Tracker requirements. - Bloom/Grist
  - Fit check of appropriate TKR Mechanical model needs to be done with CAL EM, new flight interface 1X1 and 1x4 grid as early as possible. Current date has slipped to mid April.

- Identify and implement a work around to G3 delay that implements ACD schedule impact. Haller/Bloom/T. Johnson
  - Gained 20 days by early delivery of initial specification document by Huffer to Claus. Need timely progress towards final specification document to allow full gain of schedule. Date to ACD is now ~ March 12. Ric and Jim are planning to visit ACD at Goddard on 3/1/04 to help the start the GASU software effort.
Issues Concerns Suggestions Risks

- Finalization of LAT requirements
- EGSE definition document needs to be completed
- Pressure from SC to not use flight science data link during aliveness tests. Only have housekeeping data through 1553 link.
- MGSE manufacturing is stalled due to necessity for more review.
- High rate test methodology needs definition.
  - I&T currently working on very high rate Van de Graaff solution.
  - Justification for using Van de Graaff has been submitted to Mike Huffer, Chair of LAT End-to-End testing committee.
- Loss of I&T pre-integration and post integration test schedule.
  - Pre-integration cut from 8 weeks with tower A,B to 4 weeks with tower A and min-tower. August – now.
  - Final LAT testing and SVAC at SLAC cut from 16 weeks to 11 weeks. July – now.
Draft EM-2 Plan

1x1 Grid Available
APR 1

Finish TKR Mechanical Model
Setup using 1x1
APR 15

Fit Check 1x?
MAY 10
MAY 22

Return EM CAL
MAY 30

1x4 Grid Available?

Receive EM CAL
APR 4

CAL Available from High rate test.
MAY 14

Functional Test Review
MAR 15

EGSE Ready
MAR 15

MGSE ready for EM ACD
MAR 15

Setup / Preparation 1x1
APR 5
APR 19

Receive 5th tray from Pisa
MAR 12

Convert EM TKR to 4xy layers

Receive EM ACD
MAR 8

Receive GASU/LCB
APR 4

EM TKR MiniTower Ready
APR 2

EM-2 Test
- Functional Tests
- Cosmic Ray
- Van de Graaff
APR 20
APR 30

High Rate Test
MAY 6

4.1.9 - Integration and Test