



Mechanical Systems July 2003 GSFC Status

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The logo features a stylized satellite or space station component in the foreground, with a colorful, multi-layered circular graphic behind it, possibly representing a grid or a lens. The colors transition from blue at the top to red and orange at the bottom.

Accomplishments

- **Accomplishments during August**
 - **Issued PO for Flight Grid & Grid Box Assembly Machining**
 - **Received 1 x 4 Grid**
 - **Started 1 x 4 testing – Deliver to I&T**
 - **Completed CAL-Grid interface conceptual design**
 - **Completed X-LAT thermal interface conceptual design**
 - **Started X-LAT thermal interface EM testing**

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Issues & Concerns

- **Top 5 threats to maintaining schedule**
 - Completion of Grid detailed Stress analysis – is in work
 - Inadequate manpower – LM support & TCS support
 - CAL-Grid interface design implementation (design modifications)
 - Resolution of X-LAT – E-Box interface
 - EM tests and flight designs are being performed in parallel – increases impact of any EM test failure
- **Top 5 threats to staying within cost**
 - As CDR design and fabrication plans solidify, we may find that fabrication costs exceed what was budgeted (which was based on preliminary/conceptual designs)- Grid costs OK
 - Grid Box Assy Test program may exceed what was budgeted due to scope increase – especially Static Load test
 - TCS prototype costs (may require PDU, SIU & GASU boards for LM Radiator Thermal Balance test)
 - CAL-Grid interface design taking longer than budgeted
 - EM program taking longer than budgeted

Open Flight Design Issues

ISSUE	CLOSURE
1. Finalize CAL-Grid interface design	Analysis,design finalization, GSFC approval
2. Finalize X-LAT to E-box design	Analysis,design finalization, GSFC approval
3. Close the loop on Grid-ELEC interface (grounding & EMI)	Meeting req'd for consistent implementation across LAT
4. Delete Radiator level EMI test requirement?	perform EM test w/ D. Nelson
5. Mechanically install Radiators for LAT EMI test?	EMI test plan out for review
6. Grid-TRK interface define Grid datums & TRK tooling interface	Investigating use of existing TRK drill fixture
7. Define GBA Static Load test requirements & plans	Working w/ analyst
8. S/C Flexures for GBA static load test?	Working w/ analyst & GSFC
9. GBA Thermal cycle vs Thermal Vacuum test approval	What paper needs to be submitted
10. RFA on adding a U heat pipe to X-LAT plate in case of XLHP failure	Working w/LM on implementation impacts
11. Other RFA's closure	
12. Examine removing X-LAT plates from GBA static load and thermal cycle tests to beak schedule dependency	Working schedules with LM
13. How to handle ITAR hardware in B/33	Working with SLAC legal & I&T

Mech Sys Parts List

- All mechanical parts are approved by SLAC & GSFC

	Inorganic	Polymer & Composite	Lubricant	Process	Total
Mechanical	78	26	4	11	119

- Expect ~5 miscellaneous fasteners to be added to this list
- 9 EEE parts for Thermal Control System are not yet approved
 - 1 Thermistor submitted, approved and ordered
 - 3 Thermal Switches (2 Grid, Radiator) awaiting set point definition
 - 4 Heaters (2 Grid, Radiator reservoir and anti-freeze) awaiting final sizing
 - 1 RTD (for Radiator) awaiting definition

3 Month Milestones

Milestone Description	ECD	Major Requirements to Achieve Milestone
CCHP MRR	Jul-03	Completed
Grid Box detailed stress analysis	Aug-03	In work
Grid Box Design Review (SLAC)	Sep-03	Complete stress analysis. CAL-Grid interface closure. Incorporate design mods as req'd. GSFC complete drawing package review.
Cal-Grid RFA closure meeting	Aug-03	Complete conceptual drawings of shear fittings and grid. Develop approved LAT test plan. Develop approved LAT Analysis Plan. Obtain concurrence and required analyses from NRL. Complete stress analysis showing positive margins. Complete concepts for cabling.
X-LAT I/F RFA closure meeting	Aug-03	Develop shim budget and shim plan for E-boxes. Complete and document stress analysis on heat pipes and heat pipe bonded joint. Complete and document thermal distortion and ascent loads sensitivity analysis. Complete component thermal test on interface joint.
Deliver 1 x 4 Grid to I&T	Sep-03	Complete 1x4 testing
Grid MRR	Sep-03	Award 4X4 Grid contract. Supplier develops manufacturing and test plan per SOW LAT-CR-02252-01. SLAC reviews and approves.
Radiator MRR	Sep-03	Spec & IDD complete and sent to LM. LM complete Radiator TCS & mechanical designs. Close CDR RFA's. EEE parts list approved. Radiator stress analyses complete.
Grid Billets Available	Sep-03	Ultrasonic inspection
Rough machine grid billets	Oct-03	Grid MRR

3 Month Milestones

Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
Grid Box detailed stress analysis	08/03/03	09/02/03	Final approved analysis report memo released.	<i>Load extraction and stresses from LAT model completed. Radiator Mount Bracket modified. Two more detailed models to be completed on Grid Box corner and on Tracker attachment. ECD of first draft report is 9/2/03.</i>
Grid Box Design Review	08/01/03	09/17/03	Complete stress analysis. Incorporate design mods as required.	<i>ECD 9/2/03.</i>
			CAL-Grid interface closure.	<i>Design review tentatively scheduled for 9/17/03.</i>
			GSFC complete drawing package review.	<i>GSFC review complete.</i>
Cal-Grid RFA closure meeting	08/03/03	09/17/03	Complete conceptual drawings of shear fittings and grid.	<i>Conceptual dwgs completed-detail dwgs in work.</i>
			Develop approved LAT test plan and LAT Analysis Plan.	<i>Lack of test loading detail and test load levels at critical interfaces - to be completed 9/8.</i>
			Obtain concurrence and required analyses from NRL.	<i>Complete less final drawing from NRL.</i>
			Complete stress analysis showing positive margins.	<i>shear plate & grid perimeter completed 8/4, grid interior 9/2.</i>
			Complete concepts for cable tray installation and I & T activities.	<i>Design concepts completed.</i>
			Obtain GSFC concurrence on interface design.	<i>Complete less LAT test plan & LAT analysis plan.</i>

3 Month Milestones (cont)

Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
X-LAT I/F RFA closure meeting	08/03/03	9/19/03 + 4-6 weeks	Develop shim budget and shim plan for E-boxes	<i>ECD 9/5/03.</i>
			Complete and document stress analysis on heat pipes and heat pipe bonded joint	<i>ECD 8/29/03 but will not complete on time-stress support focused on 1X4 test & LAT strength test plan.</i>
			Complete and document thermal distortion and ascent loads senitivity analysis and complete component thermal test on interface joint.	<i>Complete</i>
			Develop test concept for thermal performance of E-box stack.	<i>ECD 9/12/03</i>
			Document preliminary system level thermal analysis to show positive margins.	<i>ECD was 9/19/03 but progress stalled due to no thermal support from LM-will delay RFA closure by 4-6 weeks.</i>
			Obtain GSFC concurrence on interface design.	<i>Tentative meeting date 9/26/03</i>
Deliver 1 x 4 Grid to I&T	09/03/03	10/01/03	Complete 1x4 testing - static load test.	<i>Successful TRR 8/25/03. OK to proceed. ECD 9/12/03</i>
			Drill TRK interface after test.	<i>Delivery of the 1x4 Grid to I&T will occur on 10/1/03 after test results review, final 1X4 modification, and test configuration disassembly.</i>
Grid MRR	09/12/03	09/23/03	Award 4X4 Grid contract.	<i>Contract awarded 7/29</i>
			Supplier develops manufacturing and test plan per SOW LAT-CR-02252-01. SLAC reviews and approves.	<i>Tapemation rev 1 of plan due 8/25/03</i>
			Grid Box Design Review complete	<i>Not required, but smart thing to do.</i>

3 Month Milestones (cont)

Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
Grid Billets Available	09/12/03	09/16/03	Ultrasonic inspection (closures) at Mitchell labs	<i>1 billet out of flatness spec-investigating. Mitchell not approved supplier.</i>
Rough machine grid billets #1	10/03/03	09/25/03	Grid MRR	
Radiator MRR	09/03/03		Spec & IDD complete and released to LM.	<i>The Spec is 90% complete.</i>
			LM complete Radiator TCS & mechanical designs.	<i>Radiator TCS awaiting GSFC decision if redundant S/C power will be always on. Deleloping design for thermostatic control of redundant feed if both are on.</i>
			Close related CDR RFA's.	<i>CDR RFA's closure in work.</i>
			EEE parts list approved.	<i>In work - need final part numbers from LM.</i>
			Radiator stress analyses complete.	<i>Radiator stress analysis completed but needs independent review.</i>

Schedule Variances

4.1.8.5 Thermal Control System

- **Current SV = -\$110K TCS components not received**
 - **Components not yet specified by LM**
 - **Awaiting decision if primary and redundant S/C power will be on simultaneously**
- **Cum SV = -\$304K late start due to unavailability of key personnel across subsystem lines**
 - **Design, fab, assemble and test control system prototype**
 - **Analyze TCS performance**
 - **Detail drawings & spec for hardware**
- **Recovery plan**
 - **Plan is not in place**
 - **Requirements for prototype are needed**
 - **Mech Sys to hire thermal engineer??**

Schedule Variances (cont.)

4.1.8.7 Grid EM program

- Cum SV = -\$216K = -\$145 Labor and -\$71 Mat'l
- -\$71 Material is EM hardware procurements
 - 1x4 Grid, Cantilever Beam, CAL-Grid interface test, Grid HP process tests

EM TASK	SV x \$000	COMMENT
Grid Top Flange HP processes	19	Deferring until Fall 03
CAL tab coupon tests	2	Planned work complete,
1 Bay Grid test*	18	Test definition is TBR
Cantilever Beam test*	50	Test deleted. To be folded into 1 x 4 test
1 x 4 Grid test	52	Will complete in Aug
X-LAT Plate prototype design, fixtures & fab*	73	LM will perform. Tasks will be deleted after LM Phase II is approved
EMI skirt mock-up	4	Will complete in Aug
Total	\$218	

4.1.8.7 Grid EM program

- Recovery Plan
 - EM tasks marked * (\$141K) will be re-planned along with incorporation of LM Phase II efforts

Schedule Variances (cont.)

4.1.8.8 Flight Fab, Assy & Test

- **Cum SV = -\$277K late start of Assembly preparations**
 - **Grid Tasks -\$95K**
 - **Grid Mat'l & fixtures -\$70K**
 - **X-LAT Tasks -\$112K (need to remove from plan)**
- **Recovery plan**
 - **Detailed recovery plan is in work**
 - **Grid MGSE next up for Designers after Grid Box designs are released**

Cost Variances

4.1.8.3 Mechanical System Dev

- Cum CV = -\$204k
 - Will continue until CAL-Grid and X-LAT – E-box interfaces are finalized

Lockheed-Martin cost breakdown by WBS was not available

- Cum CV = +\$583K
 - LM did not spend according to plan last month

4.1.8.7 Engineering Modeling

- Cum CV = -\$110K = -\$59K Labor and -\$51K Material
 - Most of CV is for ongoing EM tests related to Cal-Grid and X-LAT interfaces
- Recovery plan
 - Re-plan 4.1.8 along with incorporation of LM Phase II efforts

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Program Threats

- **Top 6 threats to maintaining schedule**
 - Completion of Grid detailed Stress analysis
 - Inadequate manpower
 - CAL-Grid interface design implementation (design modifications)
 - Resolution of X-LAT – E-Box interface
 - EM tests and flight designs are being performed in parallel – increases impact of any EM test failure
 - LM does not get their requested information in a timely manner
- **Top 6 threats to staying within cost**
 - As CDR design and fabrication plans solidify, we may find that fabrication costs exceed what was budgeted (which was based on preliminary/conceptual designs)
 - Grid Box Assy Test program may exceed what was budgeted due to scope increase
 - TCS prototype costs (may require PDU, SIU & GASU boards)
 - CAL-Grid interface design taking longer than budgeted
 - EM program taking longer than budgeted
 - LM cost for X-LAT work larger than budgeted