Mechanical Systems
September 2003 GSFC Status

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Accomplishments

- **Accomplishments during October**
  - Tapemation completed rough machining of billet #1
  - Heat treatment and straightening of Grid should complete by 10/31, Mother Nature willing
  - EMI & grounding issues resolved and changes incorporated
  - Grid – TRK flex cable issues resolved & Grid model updated with these changes
  - Radiator specification released
  - Downspout and Top Flange Heat Pipes progressing through Manufacturing
  - Scott Herzberz hired for Mechanical Engineer position
  - Complete re-baseline activities

Issues & Concerns

- Close last remaining issues prior to the start of detailed machining of the grid (analysis- CLA changes & detailed stress report, TRK I/F)
- Grid to I&T delivery date
- Resolution of X-LAT – E-Box interface including completion of analyses and testing
- X-LAT plate & Radiator delivery schedule

Open Flight Design Issues

ISSUE	CLOSURE
2. Finalize X-LAT to E-box design	Peer review planned 11/5/03
3. Close the loop on Grid-ELEC interface (grounding & EMI)	Closed: Nickel at all mating ground plains EMI gaskets for all EMI skirt pieces
5. Mechanically install Radiators for LAT EMI test?	EMI test plan out for review F. Blanchette working
6. Grid-TRK interface define Grid datums & TRK tooling interface	Investigating coordinating with TRK tooling
7. Define GBA Static Load test requirements & plans	Rob Black has been assigned as responsible engineer for this test
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	Closed: Is being incorporated.
11. Other RFA's closure	Most being closed by recent peer reviews
12. Examine removing X-LAT plates from GBA static load and thermal cycle tests to break schedule dependency	Closed: X-LAT no longer required for these tests

Mech Sys Parts List

- All mechanical parts are approved by SLAC & GSFC

	Inorganic	Polymer & Composite	Lubricant	Process	Total
Mechanical	117	26	4	13	160

- 10 EEE parts for Thermal Control System are not yet approved
  - 1 thermistor submitted, approved and ordered
  - 4 Thermal Switches (Grid pri & redn, Radiator reservoir and anti-freeze)
    - set point has been defined (ELEC reviewing)
  - 4 Heaters (Grid pri & redn, Radiator reservoir and anti-freeze) awaiting final sizing
  - 1 RTD (for Radiator)
  - All parts to be submitted for approval by 10/31

3 Month Milestones

Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
Grid Box detailed stress analysis (Combined with below)	08/03/03	10/31/03	Final approved analysis report memo released.	*Analysis complete. Final report due 10/31/03*
X-LAT I/F RFA closure meeting Will be split into 2 meetings; A design review on 9/25/03 (complete) and final review that includes thermal analysis.	08/03/03	11/05/03	Develop shim budget and shim plan for E-boxes	*Complete*
			Complete and document stress analysis on heat pipes and heat pipe bonded joint	*Complete*
			Complete and document thermal distortion and ascent loads senitivity analysis and complete component thermal test on interface joint.	*Complete*
			Develop test concept for thermal performance of E-box stack.	*Complete*
			Design review #1	*Complete*
			Document preliminary system level thermal analysis to show positive margins.	*ECD 11/3/2003*
			Obtain GSFC concurrence on interface design.	*Tentative meeting date 11/05/03*
Deliver 1 x 4 Grid to I&T	09/03/03	11/24/03	Complete 1x4 testing - static load test.	*Complete less report.*
			Modify Top Flange & cable chaseways	*TRK cable final design*
			Drill TRK interface after test.	*Coordinated Grid - TRK tooling study to verify method.*

3 Month Milestones (cont)

Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
Grid MRR	09/12/03	11/27/03	Award 4X4 Grid contract.	*Contract awarded 7/29*
			Close open items list (14 items)	*ECD 10/31/2003*
			Grid - TRK IDD released	*ECD 11/28/03*
			Grid Box Design Review complete	Complete 10/23/03
Grid Billets Available	09/12/03	09/16/03	Ultrasonic inspection	*Billet # 1 inspected (no flaws) & delivered to Tapemation. Billet #2 being remade due to out of flatness at mill ECD 10/31/03*
Rough machine grid billets #1	10/03/03	10/15/03		*Complete*
Radiator MRR	09/03/03	11/17/03	Spec & IDD complete and released to LM.	*Spec released 10/15/03*
			LM complete Radiator TCS & mechanical designs.	*LM finalizing design w/ VCHP overtemp thermostat for redundant power*
			Close related CDR RFA's.	*CDR RFA's closure in work.*
			EEE parts list approved.	*LM parts need to be submitted for approval*

Schedule Variances

4.1.8.5 Thermal Control System

- **Cum SV = -$388K 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**
  - **ELEC is doing some work on flight designs**
  - **Lori Bator coordinating LAT instrumentation plan update**
  - **Requirements for prototype are needed**
  - **Jack Goodman hired as LAT thermal engineer to lead this effort**

Schedule Variances (cont.)

4.1.8.7 Grid EM program

- Cum SV = -$162K = -$125 Labor and -$37 Mat'l
- -$37 Material is EM hardware procurements
  - 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	Write test report
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	5	Write test report
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	0	complete
Total	162	

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 = -$409K late start of Assembly preparations**
  - **Grid Tasks -$105K**
  - **Grid Mat'l & fixtures -$175K (Flight Grid)**
  - **X-LAT Tasks -$129K (will to remove from plan)**
- **Recovery plan**
  - **Rebaseline 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 = -$297k**
  - **Will continue until TRK-Grid and X-LAT – E-box interfaces are finalized**
  - **Additional resources for this will be captured in rebaseline plan.**

Lockheed-Martin cost breakdown by WBS was not available

- **Cum CV = +$668K**
  - **LM did not spend according to plan last month**
- **Recovery plan**
  - **LM manufacturing effort full turn on after MRR 11/03**

4.1.8.7 Engineering Modeling

- **Cum CV = -$124K = -$78K Labor and -$45K Material**
  - **Most of CV is for ongoing EM tests related to Cal-Grid, X-LAT and Spacecraft interfaces**
- **Recovery plan**
  - **Additional resources for this will be captured in rebaseline plan.**

Program Threats

- Top 5 threats to maintaining schedule
  - Inadequate manpower
  - Closure of open items for Grid manufacturing
  - 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