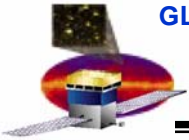


# **Mechanical Systems Mechanical / Thermal Hardware April 2004 Status**

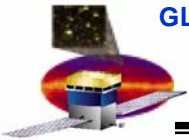
**Marc Campell, Subsystem Manager**



# Accomplishments

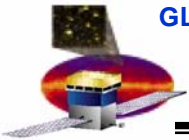
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- **Accomplishments during May**
  - **Tapemation has completed machining all bays and Tracker cable chaseways on Flight Grid #1**
  - **Released 3 drawings per plan**
    - **Including Rev 04 of Grid drawing**
  - **Completed bending the Variable Conductance Heat Pipes for the Radiators**
  - **Completed X-LAT cooling pipe design/layout**
  - **Held X-LAT Manufacturing Readiness Review**



### 3 Month Milestones May - July

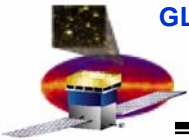
Milestone Description	Original Date	Current Date	Major Reqmnts to Achieve Milestone	Notes
X-LAT Plate MRR		5/27/04	Complete	
Receive Grid #1, EMI skirts, details	03/30/04	08/31/04	Close MRR action items	<i>Revised Grid plating requirements to pull in date</i>
			Stop changing the design	<i>TRK mods &amp; wing mods for Radiator installation proposed</i>
			resolve grid plating issues	<i>Is the logest task in the flow investigating modifying or deleting reqmts</i>
Grid #1-BFA match drilling	01/27/04	06/09/04	BFA and Grid available	<i>early June window</i>
			Release procedure	<i>Final draft in review</i>
Grid #2 OK to proceed	03/01/04	06/15/04	Sufficient progress on Grid #1	
Grid #2 start machining	03/01/04	06/15/04	Sufficient progress on Grid #1	
Grid Heat Pipe bond process Qual	02/24/04	06/30/04		<i>manpower priorities</i>
Radiator Integration Demo	02/19/04	06/15/04		
Grid Assembly MGSE Design	02/04/04	06/30/04	release Top Assy dwgs	<i>in work - drafts available</i>
Order TCS electronics components	01/30/04			<i>activity started</i>
Order TCS flight hardware Heaters, thermostats & thermistors	12/19/03	06/30/04	Update of LAT instrumentation plan	<i>Spreadsheet updated</i>
			Get LM RTD's, thermistors & heaters approved & on EEE parts list	<i>need to add new thermistor with longer leads</i>
			Grid heaters	ordered
			Grid thermostats	parts due in house now 35 & 42 V issue
			MECH thermistors	received
			Other Subsystem thermistors	ELEC - PO LAT level?
			LM procured TCS components	started



## Tapemation Status

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- **Completed machining bays & chaseways**
  - 5+ Mdays lost due to SNK machine failure
- **Grid flatness checked**
  - Flat within .018” & there is .022” extra material to clean up part
- **Workarounds in process or under evaluation**
  - Current plan would deliver Grid to SLAC on 9/28
  - Modifying Grid Box Machining requirements, plating requirements & deleting a final inspection of EMI skirts assembled on Grid pulls delivery date forward to ~8/31 depending on final plating requirements
- **Other tall poles**
  - Plating 1 to 3 weeks
  - Deburring & polishing of Grid to get surface finish = 10 Mdays
  - Inspection of Grid 12 Mdays
    - Have not received Tapemation’s inspection plan

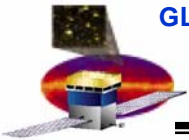


## Tapemation Status (con't)

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### Milestones

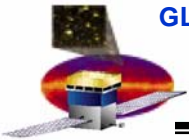
- BFA (ACD) match drilling 6/9
  - Pulling this task forward to meet ACD window adds 1 day to Grid schedule
- Spacecraft interface drilling – as available prior to plating
- Machining complete (ready to plate) 6/30
- Grid inspection complete 7/19
- Plating complete 8/3
- Grid Box Machining complete 8/17
- Final hardware installation 8/23
- Clean, inspect pre-ship review 8/30
- Ship to SLAC 8/31



## Drawing Release Plan

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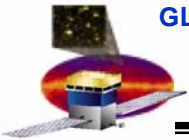
- **56 of 59 (95%) drawings released**
- **Remaining hardware is needed for MECH assembly operations in May**
  - **April – 10 released (9 planned)**
  - **May – 3 released (2 planned)**
  - **June – 4 planned**
- **~6 new parts (shims, misc. details) required for Grid Box & I&T assembly operations will be added to plan next month**
- **Known drawing revisions**
  - **April - 1 revised (Grid)**
  - **May – 3 revised (Grid)**
  - **June – 9 planned (X-LAT & Radiator IDD's, Grid Box Machining, EMI skirts)**



# Concerns

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- **Tapemation Grid #1 delivery schedule**
  - **Difficult to press vendor as we keep making design changes**
- **Grid to I&T delivery date – schedule continues to compress.**
- **Coordination of MECH assembly plans and LAT I&T integration plans.**
  - **Late delivery of Grid to SLAC drives whether work will be performed prior to or after delivery to I&T**
  - **I&T will loan technicians to perform Mech operations**
- **Tapemation Grid #2 delivery schedule**
  - **Start of Grid #2 on hold until we complete Grid #1 machining**
  - **Tapemation proposing some changes to machining operations**
- **Grid Box Assy Static Load test will be performed on Grid #2 after start of I&T on flight unit. This increases risk.**
- **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 have no float remaining due to late starts and manufacturing has just begun**

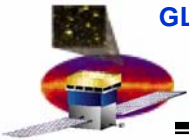


# Open Flight Design Issues

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- **Grid-TRK interface definition **CLOSED****
  - **Bushings into grid are back**
- **TCS – location of Grid heaters, thermostats, RTD's and associated wiring needs to be finalized (top assembly drawing)**
  - **Grid thermostats are rated to 30V & 2A for 200,000 cycles**
  - **Planned operation at 35V & 1A; 42V failure mode**
  - **Telecon with GSFC (PCB), SLAC & TI held**
  - **Considering Qualification testing of parts**
  - **Only thermostat available with 3 deg on-off differential (power concern)**
  - **Honeywell has qualified parts to these voltages & current, but larger temperature range**
  - **Possible power impact, cost & schedule impacts need to be compared to qualifying TI parts**
- **Define GBA Static Load test requirements & plans**
  - **Interface loads developed**
  - **Detailed load cases & STE being developed**
  - **Plan to hire Mechanical Engineer for this task**

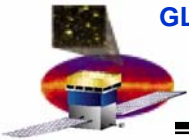




## Open Flight Design Issues (cont)

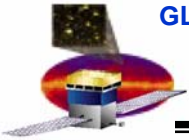
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- TCS validation vs. LM modified Radiator Thermal Vacuum & Balance plans
  - What are TCS test requirements?
  - TCS risk assessment and Qual test plan requested by GSFC
- Radiator integration sequence
  - Grid modified to allow installation using pure translation
  - Wet joint trials underway. Disassembly a concern
- Radiator level EMI test was deleted
  - Engineering test at this level has been quoted by LM
- Radiator heater wire sizing (26 vs. 24 gage)
- X-LAT plate needs 0.5" radius in some locations that may violate 00040 drawing stay clears near S/C interface
- X-LAT MLI blanket billowing will violate stay clear
- Radiator MLI blanket violates stay clear
- LM proposed -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



## MECH Qualification Program

<b>Qual Test</b>	<b>Status</b>	<b>ECD</b>
<b>Grid-Top Flange Heat Pipe bond process qual</b>	<b>Ready to go</b>	<b>June 04</b>
<b>Grid Box Assy Static Load test</b>	<b>Planning in work. Perform on Grid #2</b>	<b>Feb 05</b>
<b>Grid Box Assy Thermal Cycle test</b>	<b>Plan to delete test</b>	
<b>X-LAT Plate Thermal Vac test</b>	<b>at LMMS</b>	<b>Nov 04</b>
<b>Radiator Variable Conductance Heat Pipe new extrusion</b>	<b>Passed burst test, heat capacity test after charging</b>	<b>June 04</b>
<b>Radiator Acoustic</b>	<b>at LMMS</b>	<b>Nov 04</b>
<b>Radiator Thermal Vacuum</b>	<b>at LMMS</b>	<b>Mar 05</b>
<b>TCS-Radiator Thermal Balance</b>	<b>Scope is changing. Need to define requirements</b>	<b>Mar 05</b>



# PMCS

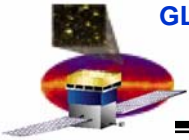
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## Current Cost Variance

- **Mech Systems +\$181K**
  - Took credit for late procurement of TCS hardware
- **Lockheed Martin +\$220K**
  - March accrual (750K) was zeroed out and the April accrual (590K) went in = \$160K
  - Remaining \$60K LM is under running their projected plan (late starts)

## Current Schedule Variance

- **Mech Systems +\$195K**
  - Took credit for late procurement of TCS hardware



# Program Threats

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- **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 manufacturing has just begun
  - Grid Box will be pathfinder for Flight hardware operations in B33
- **Top threats to staying within cost**
  - Staying on schedule
  - Grid design changes and cost of work arounds to improve schedule
  - Interdependencies with DAQ for fab, assy & test of TCS