Mechanical Systems
Mechanical / Thermal Hardware
April 2004 Status

Marc Campell, Subsystem Manager

Accomplishments

- **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	*Revised Grid plating requirements to pull in date*
			Stop changing the design	*TRK mods & wing mods for Radiator installation proposed*
			resolve grid plating issues	*Is the logest task in the flow investigating modifying or deleting reqmts*
Grid #1-BFA match drilling	01/27/04	06/09/04	BFA and Grid available	*early June window*
			Release procedure	*Final draft in review*
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		*manpower priorities*
Radiator Integration Demo	02/19/04	06/15/04		
Grid Assembly MGSE Design	02/04/04	06/30/04	release Top Assy dwgs	*in work - drafts available*
Order TCS electronics components	01/30/04			*activity started*
Order TCS flight hardware Heaters, thermostats & thermistors	12/19/03	06/30/04	Update of LAT instrumentation plan	*Spreadsheet updated*
			Get LM RTD's, thermistors & heaters approved & on EEE parts list	*need to add new thermistor with longer leads*
			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

- 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)

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

- 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

- 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 fight 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

- 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)

- 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 is 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

Qual Test	Status	ECD
Grid-Top Flange Heat Pipe bond process qual	Ready to go	June 04
Grid Box Assy Static Load test	Planning in work. Perform on Grid #2	Feb 05
Grid Box Assy Thermal Cycle test	Plan to delete test	
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	June 04
Radiator Acoustic	at LMMS	Nov 04
Radiator Thermal Vacuum	at LMMS	Mar 05
TCS-Radiator Thermal Balance	Scope is changing. Need to define requirements	Mar 05

PMCS

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

- 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