Mechanical Systems
Mechanical / Thermal Hardware
August 2005 Status

Marc Campell, Subsystem Manager

SLAC Status

Grid Qual Static Load Test

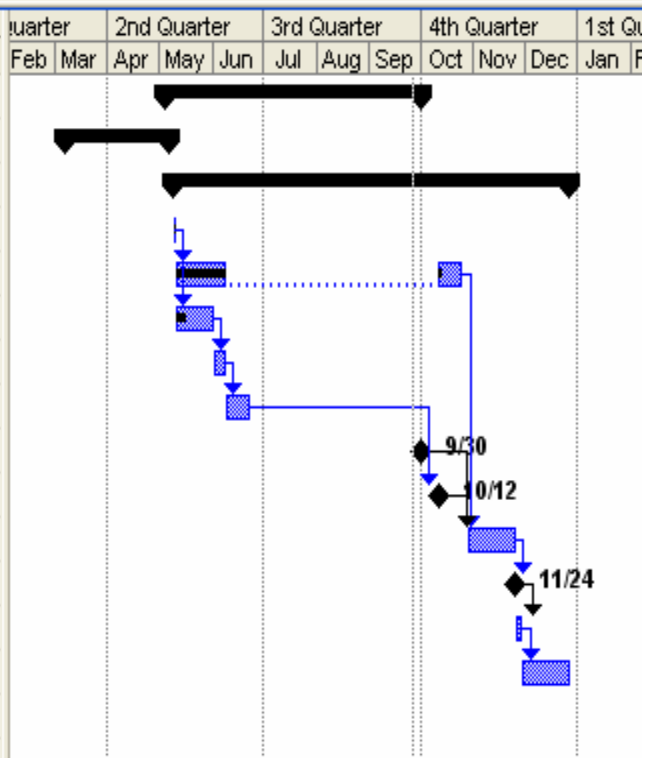
- **Hardware**
  - **Grid Box assembly is 99% complete, ECD 9/30/05**
- **Pre-Test (SLAC activities)**
  - **Test Interface Plate (TIP) Assembly complete less strain gage application which will be done at NTS now**
  - **Need to return Spectrum's Interface plate by mid-Oct.**
  - **Shipping container for Grid 2 on TIP is in house**
  - **Ship to NTS 10/7 (after crane repair)**

Grid Qual Static Load Test (cont)

- **Test (NTS activity)**
  - **Component flexure test required to proof load flexures prior to integration with the Flight LAT on the Test Interface Plate has been added to NTS SOW**
    - **Test performed on TIP assembly prior to SLT**
    - **Flexure strain gages also characterized for LAT sine vibe testing**
  - **NTS' purchase order has been updated**
  - **Due to facility conflicts at NTS, they have opted to perform the test in an area that requires a large baseplate (9' x 9' x 3" thk steel) to be fabricated.**
  - **The Grid Box and NTS load frame will be mounted to this.**
  - **This gives us better access to the test article and it will allow faster set up changes to configuration.**
  - **The down side is that it will take 5 – 6 weeks to fabricate the baseplate (ECD 10/24).**
  - **The test would start 3 days after completion of the baseplate.**

Grid Qual Static Load Test Schedule

Task Name	Duration	Start	Finish	Predecesso	Resou
Hardware (SLAC)	**106 days**	**Wed 5/4/05**	**Fri 9/30/05**		
Engineering/Procurement (SLAC)	**45 days**	**Mon 3/7/05**	**Fri 5/6/05**		
Test (Supplier)	**164 days**	**Mon 5/9/05**	**Mon 12/26/05**		
Contract Award	1 day	Mon 5/9/05	Mon 5/9/05	11	
Fixture design & Fab (TBR)	31 days	Tue 5/10/05	Mon 10/24/05	15	
Procedure draft	15 days	Tue 5/10/05	Tue 5/31/05	15	
SLAC review/approval	5 days	Wed 6/1/05	Tue 6/7/05	17	
Procedure released	10 days	Wed 6/8/05	Tue 6/21/05	18	
Receive test article from SLAC	0 days	Fri 9/30/05	Fri 9/30/05	8	
SLT test readiness review	0 days	Wed 10/12/05	Wed 10/12/05	19FS-3 day:	
SLT Operations (prep & test)	20 days	Fri 10/28/05	Thu 11/24/05	20FS+3 day	
Static Load Test Complete	0 days	Thu 11/24/05	Thu 11/24/05	22	
SLAC OK to tear down	2 days	Fri 11/25/05	Mon 11/28/05	23	
Write SLT test report	20 days	Tue 11/29/05	Mon 12/26/05	24	



Drawing Release Plan

- 66 of 73 (90%) drawings released
  - 3 MLI drawings (in check)
  - 4 shims/spacers not needed until Radiator fit check (in check)
- Known drawing revisions

Concerns

- **Lockheed Martin - Radiator delivery schedule**
  - **See LM presentation**
- **Completion of Grid Thermal Control System hardware installation delay until Sep 05.**
  - **Heater bonding fixture trials successfully completed**
  - **Heater installation complete**

Open Flight Design Issues

- **Radiator integration sequence**
  - **Coupon testing of repeated make & break of joint has been tested. Results were inconclusive due to test facility problems.**
  - **Test will be repeated at NTS**
  - **Disassembly facilitated by use of mold release agent**
- **Radiator vibration requirements**
  - **Sine vibration testing will not be performed at LM**
    - **Test options under investigation**

MECH Qualification Program

Qual Test	Status	ECD
Grid-Top Flange Heat Pipe bond process qual	Complete. Report released	Comp
Grid Box Assy Static Load test	Planning in work. Perform on Grid #2	Nov 05
X-LAT Plate Thermal Vac test	Complete less MRB on final results	Comp
Radiator Variable Conductance Heat Pipe new extrusion	Passed burst test, heat capacity test after charging	Comp
Radiator Acoustic	at LMMS	Comp
Radiator Thermal Vacuum	at LMMS	Comp
TCS-Radiator Thermal Balance	at LMMS	Comp
Radiator Sine Vibration	Test alternatives in work	
Radiator Heat Pipe Thermal Joint	Continue coupon tests at NTS	Oct 05

Radiator Sine Vibe Test Approach

Requirement

2. The primary objective of the high-level sine vibration test is to exercise the radiator interfaces to 1.25 x CLA.
The dynamic response of the radiator in its test configuration should be verified in the pretest analysis. If the provided sine vibration input spectrum does not produce adequate reaction forces, the vibration spectrum in the low frequency band should be increased to compensate.

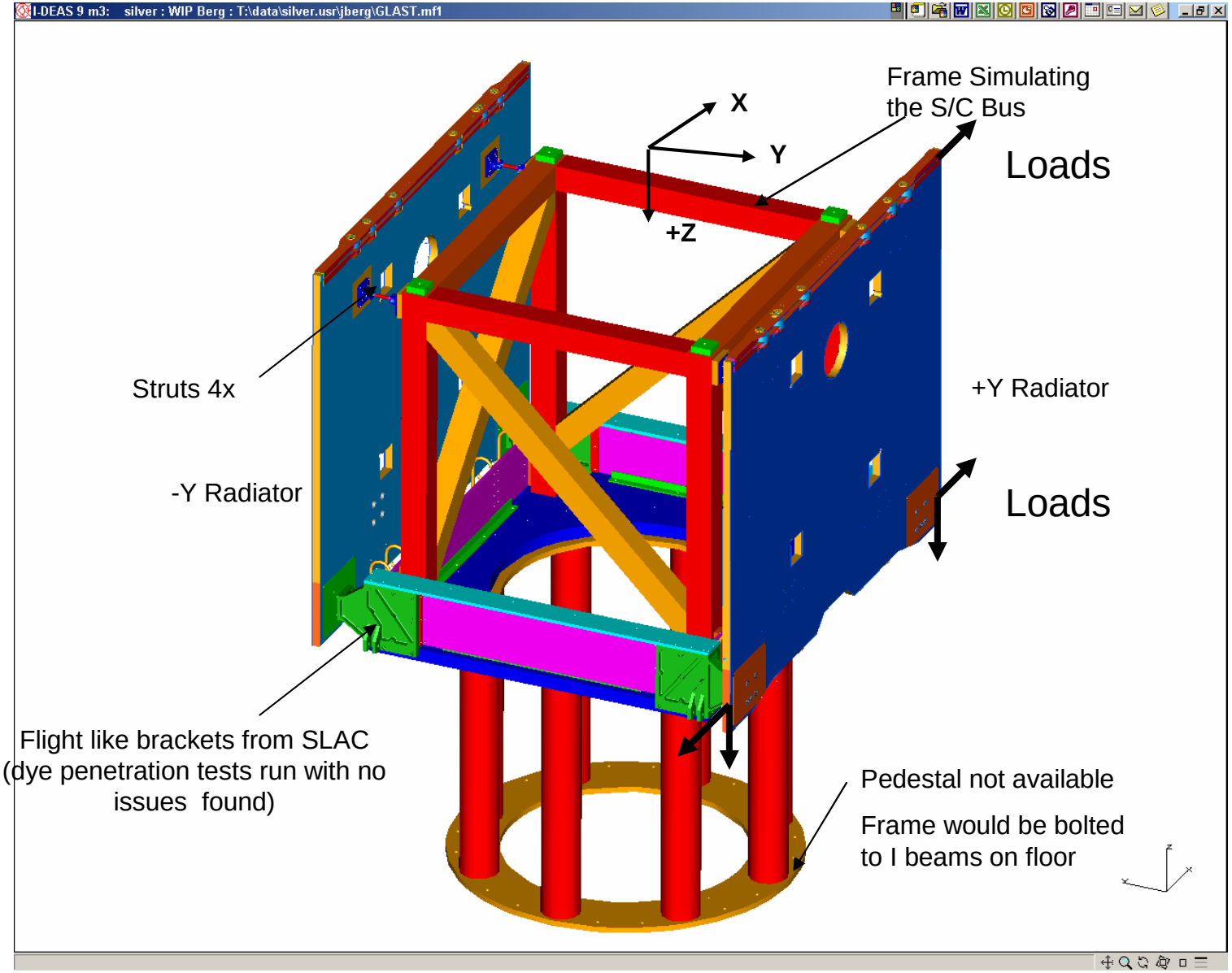
Approach

- **Analysis shows that the interface loads normal to the panel (Y-axis) were enveloped by the Acoustic test**
- **Acoustic test had a flight-like Radiator Mount Brackets**
- **Propose performing static load test to address the in-plane (X and Z axis) loading requirement**

Static Load Test Proposal

- Radiators would be mounted to flight like interfaces on the Acoustic test fixture
- Load fixtures would mount to handling inserts on the X sides of the panel
- Panel is sequentially loaded in +X, -X, +Z and –Z directions (or pull at –Z corner to produce shear load and moment at RMB interface) TBR
- X loads are approximately 200 lbs
- Z loads are approximately 200 lbs
- Handling insert coupons were tested in shear and B basis capability is 800 lbs TBR (just need to verify)

Static Load Test Test Configuration



Test Approach (Cont)

Requirement 1

1. **The Radiators shall be capable of full operational performance after exposure to the sinusoidal vibrations loads due to the launch environment shown in Table 11a. This is specified in the IRD requirement, which reiterates Goddard Space Flight Center (GSFC) policy that sine vibration testing is performed only up to 50 Hz. Notching of the test levels shown is allowed to avoid over-testing of the structures.**

Approach

- **Waiver would be required for this requirement**

Test Approach (Cont)

Requirement

3. **In order to address any vulnerability to the MECO high frequency (110 Hz – 120 Hz) event, the LAT and all subsystems will conduct a low-level sine sweep test to identify all resonant frequencies up to 200 Hz. This low-level sine sweep spectrum for the LAT and all subsystems is shown in Table 11b.**

Approach

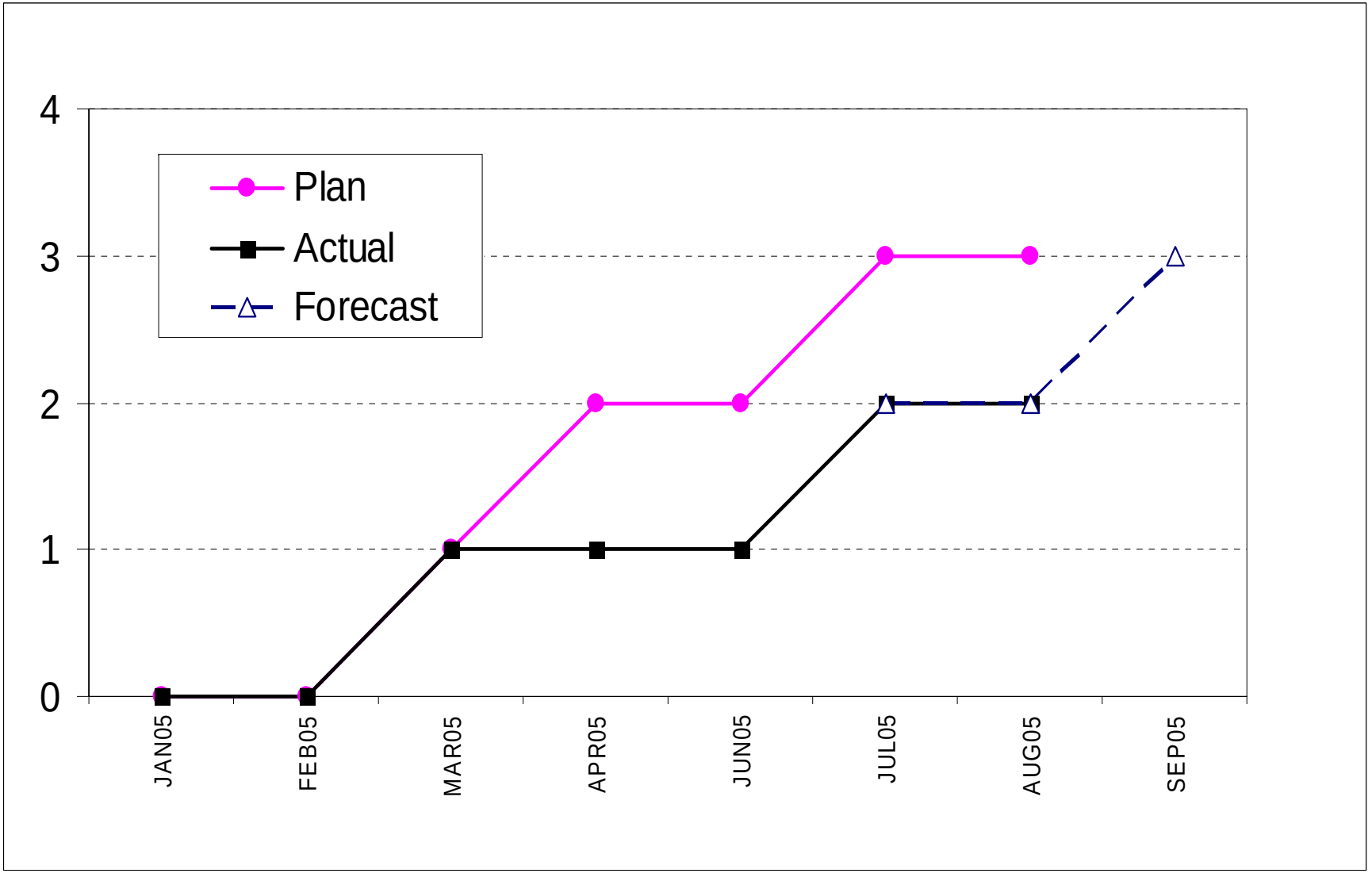
- **Analyzing Acoustic test data including tap testing to determine if modes can be identified.**
  - **Preliminary check looks promising**
  - **Also need damping (Q) factor**
- **If modes were not identified then need to investigate test approach**
  - **Modify tap test?**
  - **Modal test?**
  - **Note Radiators are not installed during LAT level vibration testing**
- **Waiver required to explain how the data was arrived at if not by sine sweep?**

Next Steps

- Agree on test approach
  - Received comments back on chart package
  - Set up telecon to discuss open issues
- Arthur Scholz will detail out Static Load Test implementation
- Conduct TRR
- Process required waivers

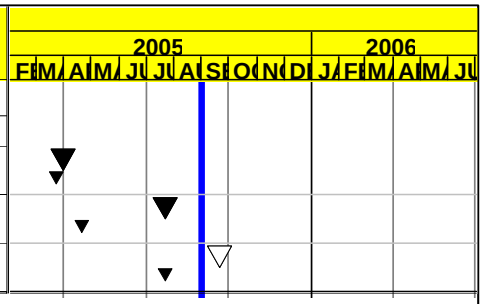
Cost/Schedule Reports for 4.1.8 Mechanical Systems Presentation August 2005 Month End

Level 3 Milestone Count



Level 3 Milestone List

Activity Description	Baseline Finish	-2m Var	-1m Var	Bsln Var	Early Finish
4.1.8 Mechanica					
Flight Grid RFI-Mech to I&T	03/23/05	-5	-5	-5	03/30/05A
X-LAT Thermal Plate RFI from Mech	04/20/05	-65	-65	-65	07/22/05A
Radiators ready for I&T (from Mech	07/22/05	-36	-41	-41	09/20/05



Run Date	09/21/05 15:25	**GLAST LAT PROJECT**	LT-DZ: Baseline Variance	Report #10
Data Date	09/01/05	**Level 3 Milestones**	FL-D4: AV: Level 3 Milestones	Sheet 11
		Baseline Variance (Organized by Subsystem)		

Milestone Variance Explanation

Radiator RFI -41 days

- **Schedule Impact**
  - **No impact to LAT schedule**
- **Cost Impact**
  - **$540K change request is in process for funds to complete test program and ship hardware**

Cost Report

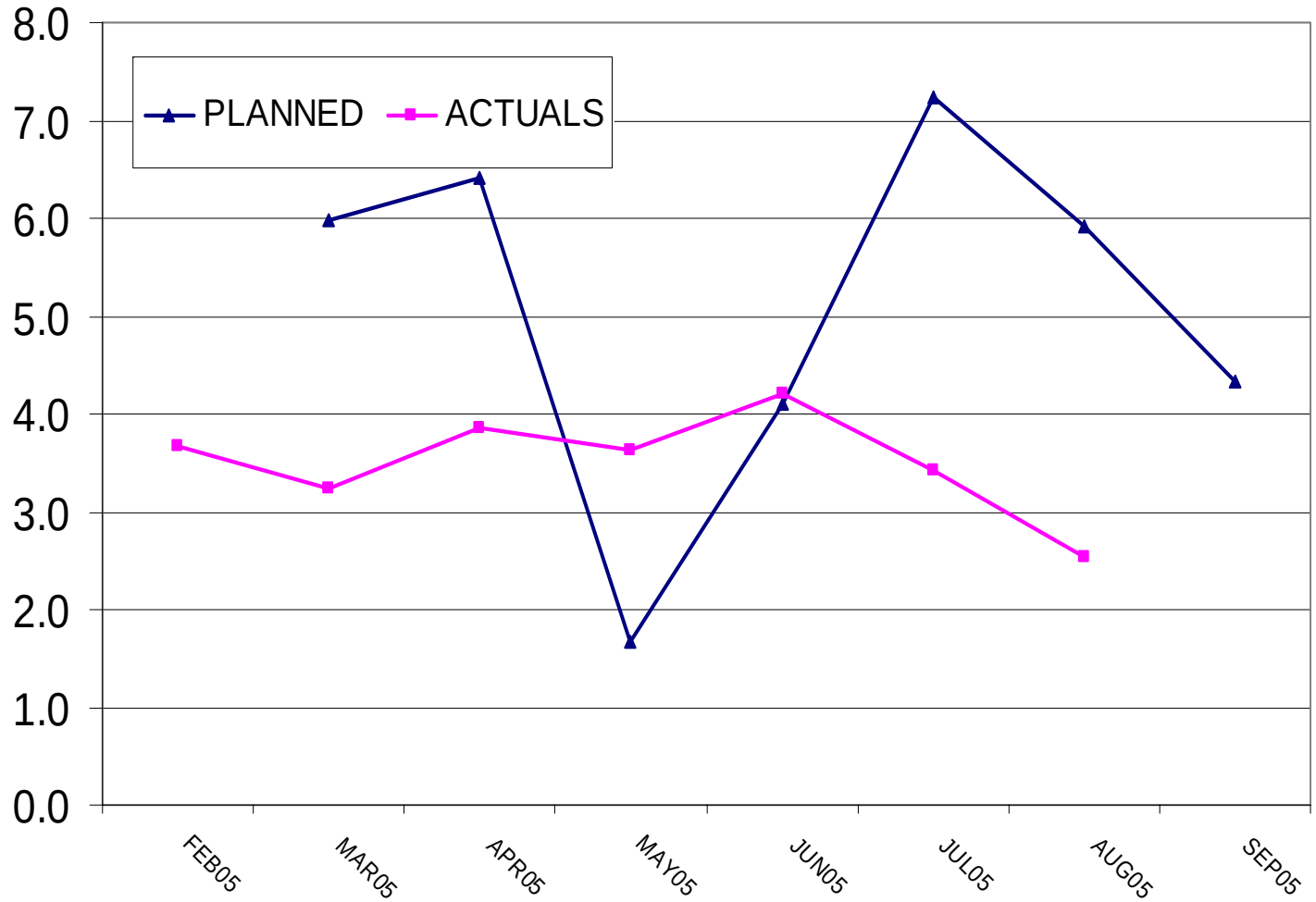
Monthly Contractor Financial Management Report 31-Aug-05								NASA form 533M Approved OMB # 2700-0(	Report for Month Ending: 8/31/2005	
Reporting Category	Cost Incurred				Estimated Cost			Estimated Final Cost		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Contract	Contractor Estimate	Contract Value	
	Actual	Planned	Actual	Planned	AT COMPL	0				
4.1.8 MECHANICAL SYSTEMS										
4.1.8.1 MANAGEMENT	297	85	4,407	3,794	77	0	-613	3,871	3,871	0
4.1.8.2 RELIABILITY & QUALITY ASSURANCE	0	0	399	393	0	0	-6	393	393	0
4.1.8.3 MECHANICAL SYSTEM DEVELOPMENT	0	0	1,088	1,088	0	0	0	1,088	1,088	0
4.1.8.4 THERMAL SYSTEMS DEVELOPMENT (LM)	0	0	1,043	1,043	0	0	0	1,043	1,043	0
4.1.8.5 THERMAL CONTROL SYSTEM (SLAC)	45	108	760	849	79	0	89	929	929	69
4.1.8.6 RADIATORS, HEAT PIPES, THERM TEST, X-LAT (L	-128	59	7,498	7,797	54	0	299	7,851	7,851	0
4.1.8.7 GRID	0	0	656	640	0	0	-16	640	640	0
4.1.8.8 FABRICATION, ASSEMBLY, AND TEST	134	235	655	944	3	0	289	947	947	15
4.1.8.9 LAT I&T SUPPORT	0	13	0	103	1	0	103	104	104	
CAPW[3]Totals:	347	500	16,504	16,650	215	0	146	16,866	16,866	85

Cost Variance Explanation

- **Why overrun/underrun?**
  - **LM has overrun their contract**
- **What will be done to correct?**
  - **Additional funding required**

FTE Report

4.1.8 Mechanical Systems



FTE Variance Explanation

- **Why overrun/underrun?**
  - **Delay caused by late start of Grid Box #2 assembly work**
- **What is the impact?**
  - **Delay in Grid Static Load Test**
  - **No LAT impact**