Mechanical Systems
Mechanical / Thermal Hardware
October 2005 Status

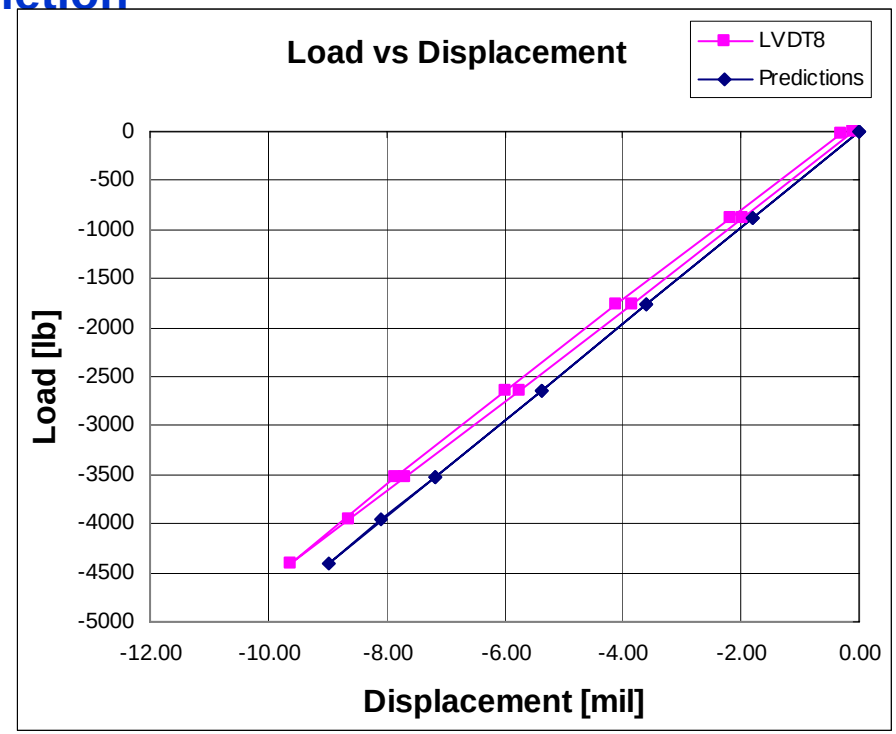
Marc Campell, Subsystem Manager

Grid Qual Static Load Test

- **Test Status**
  - Testing has gone very smoothly with good results
  - Test set up between load cases has taken much longer than expected
- **Progress since last month**
  - Load frame proof tested
  - Grid de-mated from flexures
  - Load case (LC) 7 flexures only test completed
  - Grid re-mated to flexures
  - LC 3 Drumhead stiffness & LC 4 Torsional stiffness tests completed
  - LC 2 OBS lift strength testing set up complete, ECD 11/30
  - LC 1 Flight loads strength testing ECD 12/8

Grid Qual Static Load Test

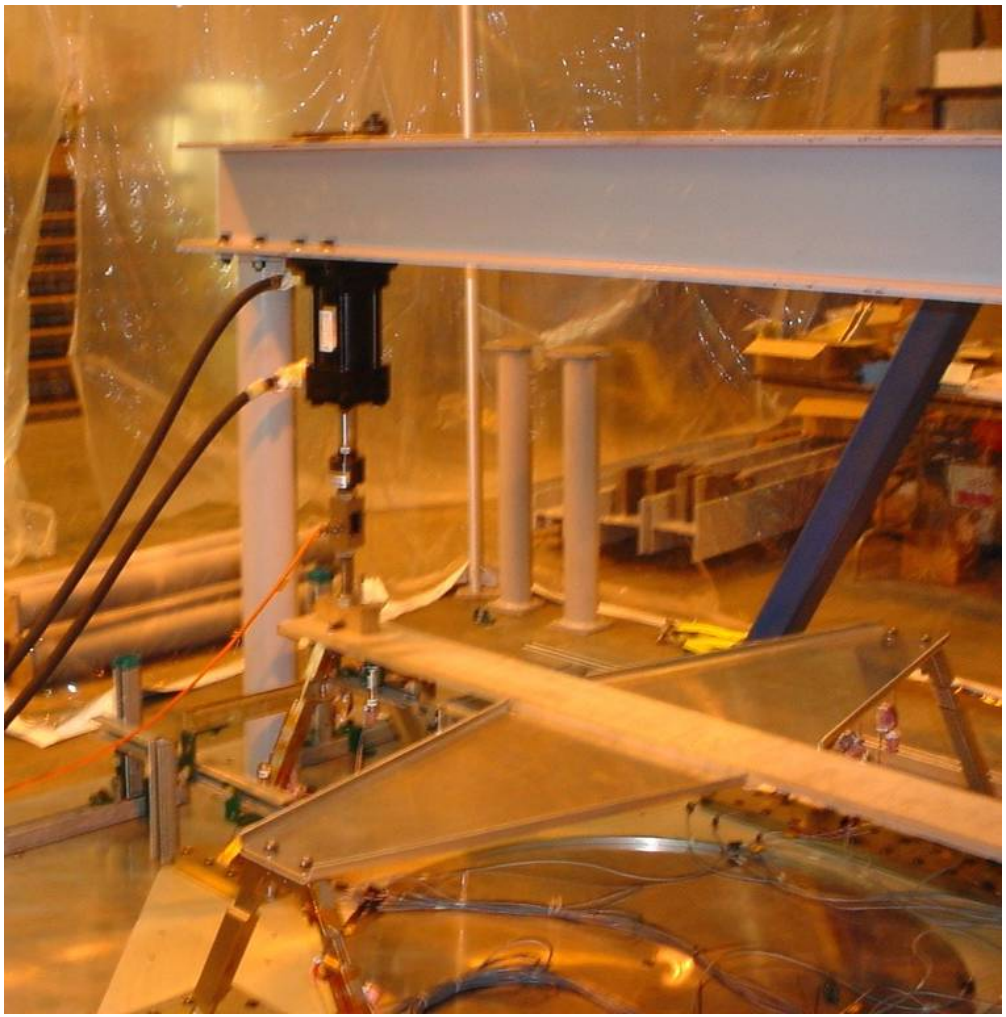
- **LC 5 & 6 stiffness testing without CAL baseplates deleted**
  - **Test results from LC3 & 4 have been reduced and show good correlation to the model**
  - **Tap test of the Grid performed with good correlation to predicted frequencies**
  - **34 Hz torsion mode within 8.5%**
  - **182 Hz Drumhead mode within 14%**
  - **GSFC concurs with LC deletion**

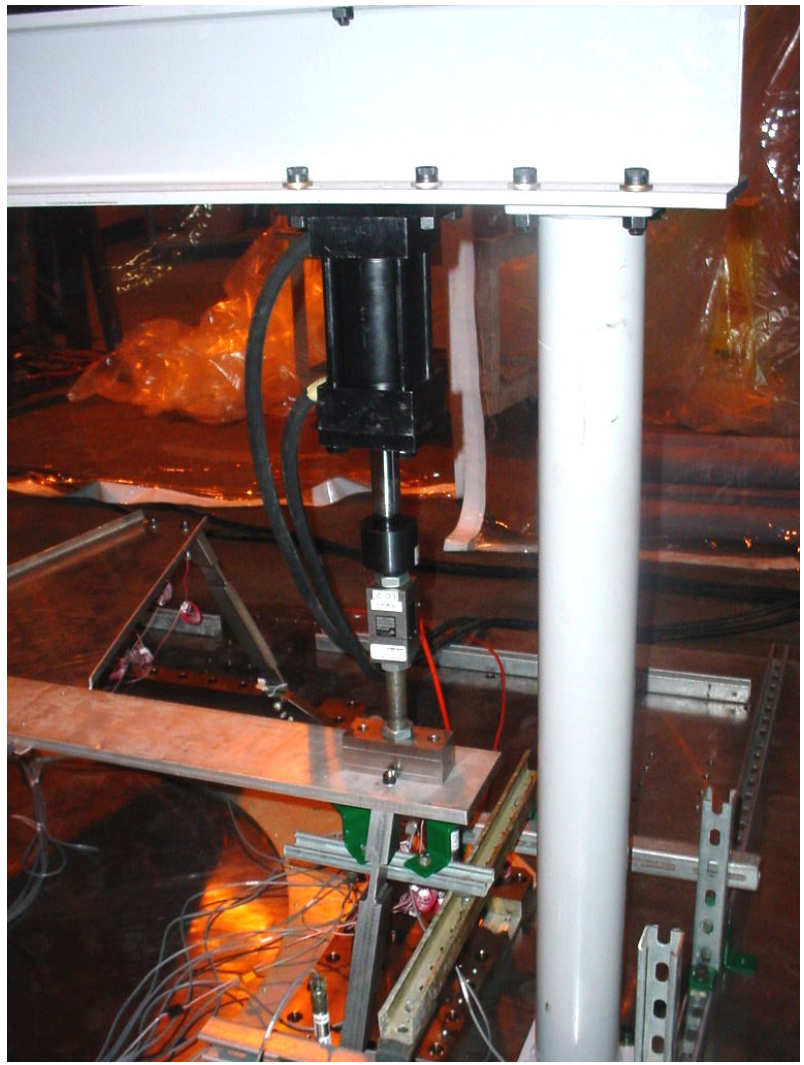


LC 3 Grid center displacement

Grid Qual Static Load Test (cont)

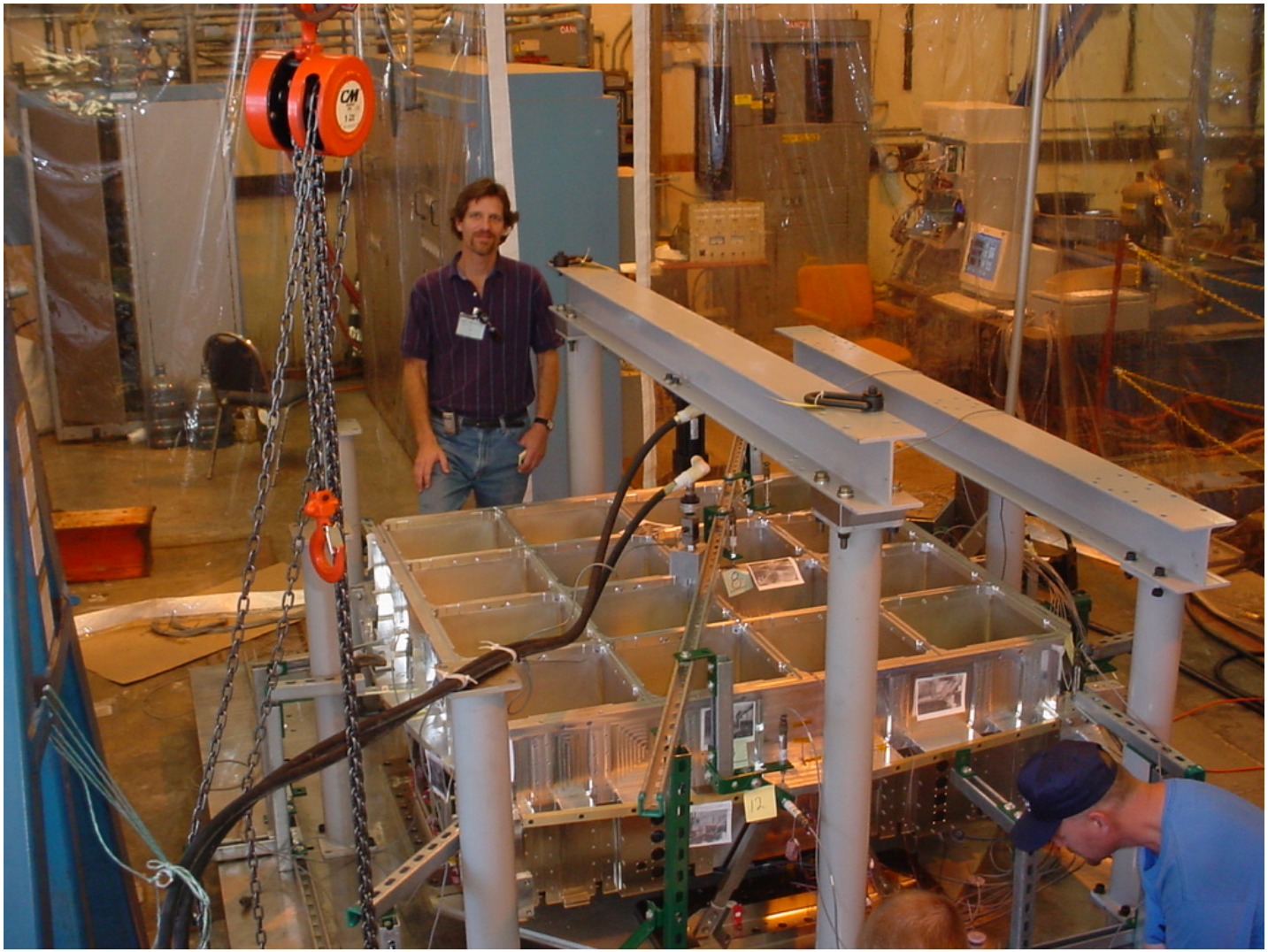
- **Load Case 7**





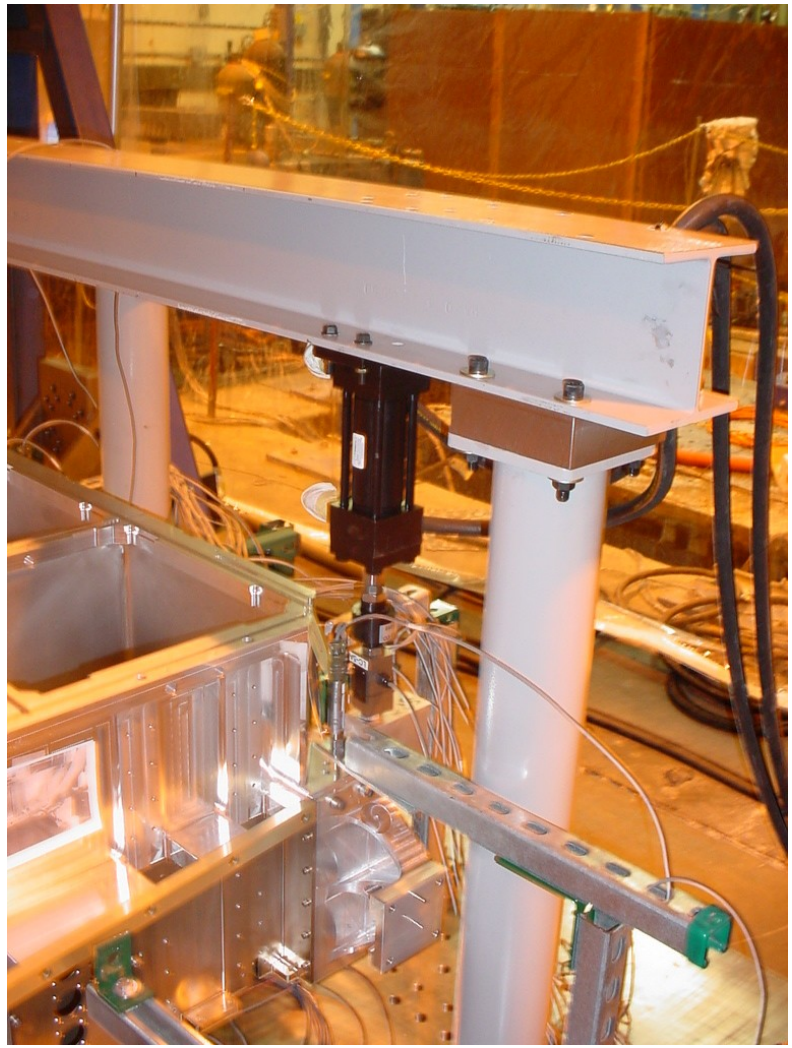
Grid Qual Static Load Test (cont)

- **Load Case 3**



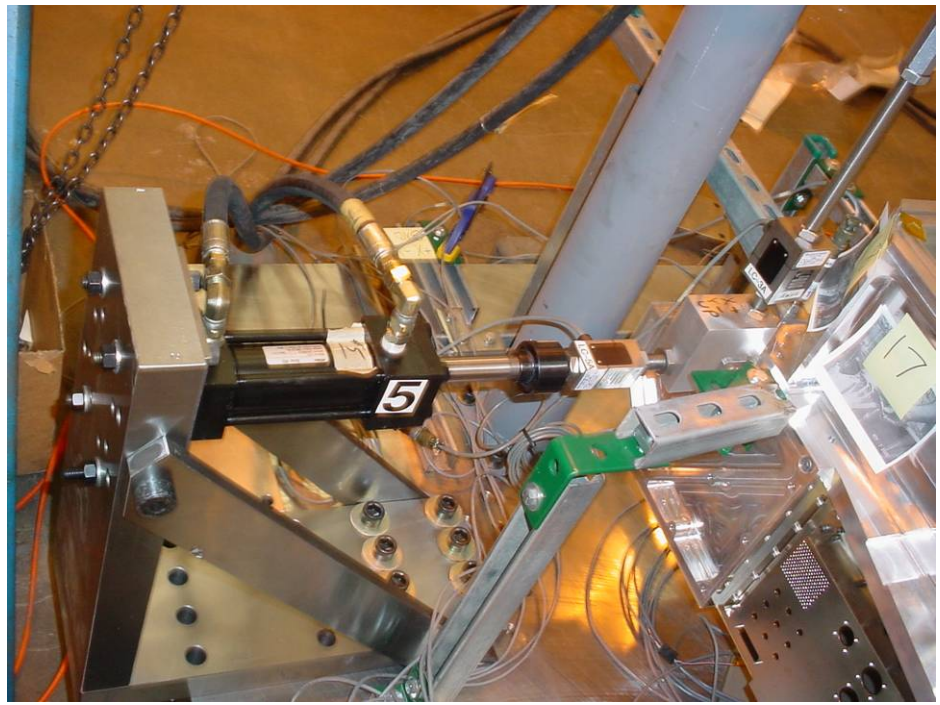
Grid Qual Static Load Test (cont)

- **Load Case 4**



Grid Qual Static Load Test (cont)

- **Load Case 2**



Concerns

Lockheed Martin – open items

- **All hardware delivered**
- **Waiting for final End Item Data Package**

Lockheed Martin – financial

- **LM has billed through July and only $185k remains on contract value for Aug. & Sept. activities including T/VAC testing**
- **No additional invoices received so far**

Open Flight Design Issue

- **Radiator sine vibration test options**
  1. **Qualify by analysis**
  2. **Static Load test of Radiator - LAT interface at SLAC**

Radiator - Qualify by analysis

- Bonded structures usually require workmanship testing per GEVS, however…
  - Insert Witness coupons were fabricated along with panels
    - These were used to establish B basis
  - Acoustic testing loaded these inserts normal to the panel
    - In plane shear loads not checked by Acoustic
- Pro's
  - Insert testing has shown >10x design load capability in shear
  - Minimizes handling of Radiators
  - No cost & schedule impacts
- Con's
  - Workmanship of interface not tested in shear
  - Interface will see shear loads in OBS sine vibe test, but probably not to Radiator Qual levels. Problem found at this time would severely impact the Mission
  - Uphill battle to convince Baird/Fransen of this approach
- Next steps
  - Review LM insert coupon test data
  - Update analysis with as built mass and use updated LAT model
  - Determine if positive margins can be obtained with no test factor of safety applied (currently not)
  - Review locations of the negative margins

Radiator – Static Load Test of Interface

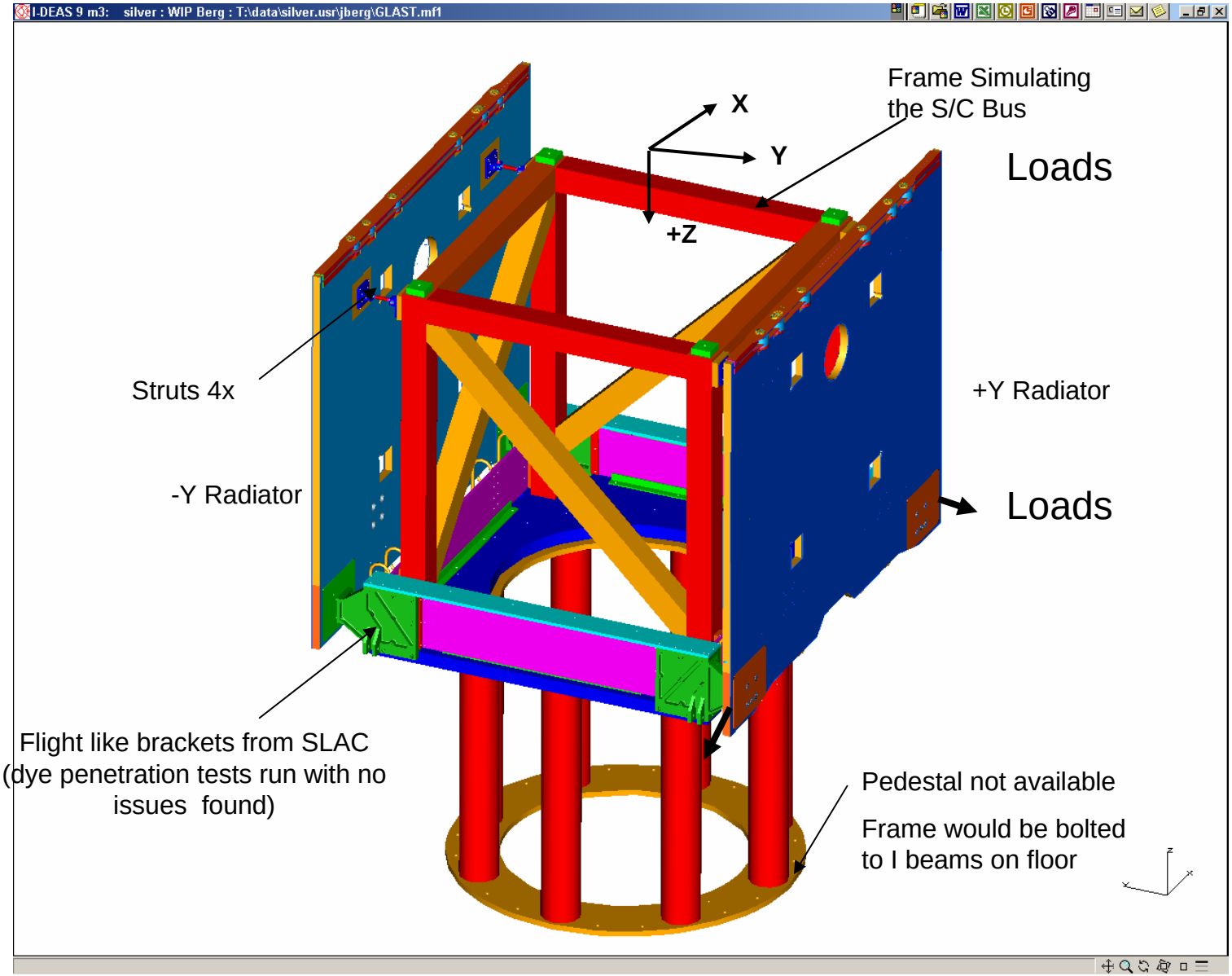
- **Radiators would be mounted to flight like interfaces on the Acoustic test fixture**
  - **Load fixtures would mount to handling inserts on the X sides of the panel**
  - **Panel is pulled at –Z corner to produce shear load and moment at RMB interface**
  - **X and Z load components are approximately 200 lbs**
  - **Handling insert coupons were tested in shear and B basis capability is 525 lbs**
- **Pro's**
  - **Workmanship test of critical interface**
  - **Flight-like load distribution into insert pattern**
  - **Test fixtures and flight like interfaces exist**
  - **Can perform additional tap testing to look for MECO modes if required**
- **Con's**
  - **Additional handling of Radiators**
  - **Potential contamination of Radiators**

Radiator – Static Load Test of Interface (cont)

Next steps

- **Agree on test approach**
- **Detail out Static Load Test implementation**
  - **Fixture tie down, load application, data acquisition, strain gage requirements, pass/fail criteria, cleanliness approach**
  - **Fabricate fixtures**
- **Complete review of LM Acoustic test data to see if MECO modes can be found or if additional testing is required**
- **Conduct TRR**
- **Conduct test**
- **Process required waivers**
  - **No sine vibe of Radiators**
  - **No 0 – 150 Hz sine sweep for MECO modes**

Static Load Test Test Configuration



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	Dec 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	Jan 06
Radiator Heat Pipe Thermal Joint	Continue coupon tests at NTS	Jan 06

Triple Joint Qualification

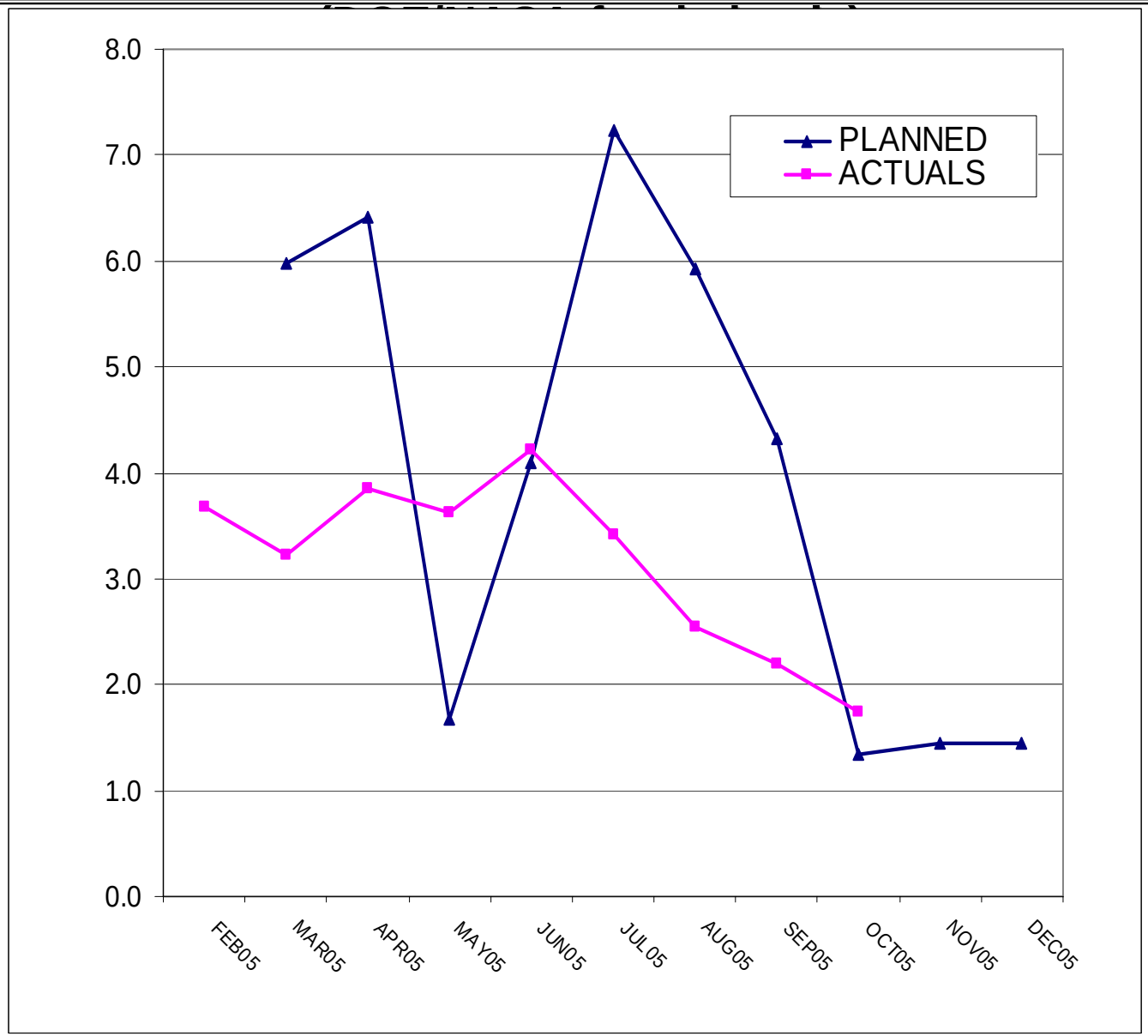
- **Radiator integration sequence**
  - **Coupon testing of repeated make & break of joint has been tested. Results were inconclusive due to test facility problems.**
  - **Disassembly facilitated by use of mold release agent**
  - **Test will be repeated**
    - **PO ready to be placed at NTS or**
    - **Perform in B33 upon completion of E-box testing**
  - **Coupon rework required to test as individual coupons started**

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

Cost Report

Reporting Category	Cost Incurred/Hours Worked				Estimated Cost/Hours to Complete			Estimated Final Cost/Hours		Unfilled Orders Outstanding
	During Month		Cum. to Date		Detail		Balance of Contract	Contractor Estimate	Contract Value	
	Actual	Planned	Actual	Planned	NOV05	DEC05				
4.1.8 MECHANICAL SYSTEMS										
4.1.8.1 MANAGEMENT	-819	27	4,150	3,898	28	23	389	4,590	4,590	
4.1.8.2 RELIABILITY & QUALITY ASSURANCE	0	0	399	393	0	0	-6	393	393	
4.1.8.3 MECHANICAL SYSTEM DEVELOPMENT	0	0	1,088	1,088	0	0	0	1,088	1,088	
4.1.8.4 THERMAL SYSTEMS DEVELOPMENT (LM)	0	0	1,043	1,043	0	0	0	1,043	1,043	
4.1.8.5 THERMAL CONTROL SYSTEM (SLAC)	32	0	830	929	0	0	99	929	929	
4.1.8.6 RADIATORS, HEAT PIPES, THERM TEST, X-LAT (LM)	701	0	8,198	8,391	0	0	193	8,391	8,391	
4.1.8.7 GRID	0	0	656	640	0	0	-16	640	640	
4.1.8.8 FABRICATION, ASSEMBLY, AND TEST	37	0	706	947	0	0	241	947	947	
4.1.8.9 LAT I&T SUPPORT	0	0	0	104	0	0	104	104	104	
4.1.8.A MISSION I&T SUPPORT	0	11	0	11	11	10	138	159	159	
CAPW[3]Totals:	-50	38	17,069	17,444	39	33	1,142	18,284	18,284	

FTE Report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PLANNED
ACTUALS
FEB05
MAR05
APR05
MAY05
JUN05
JUL05
AUG05
SEP05
OCT05
NOV05
DEC05