CRaTER Instrument Critical Design Review (I-CDR)

Instrument Management

June 27-28, 2006

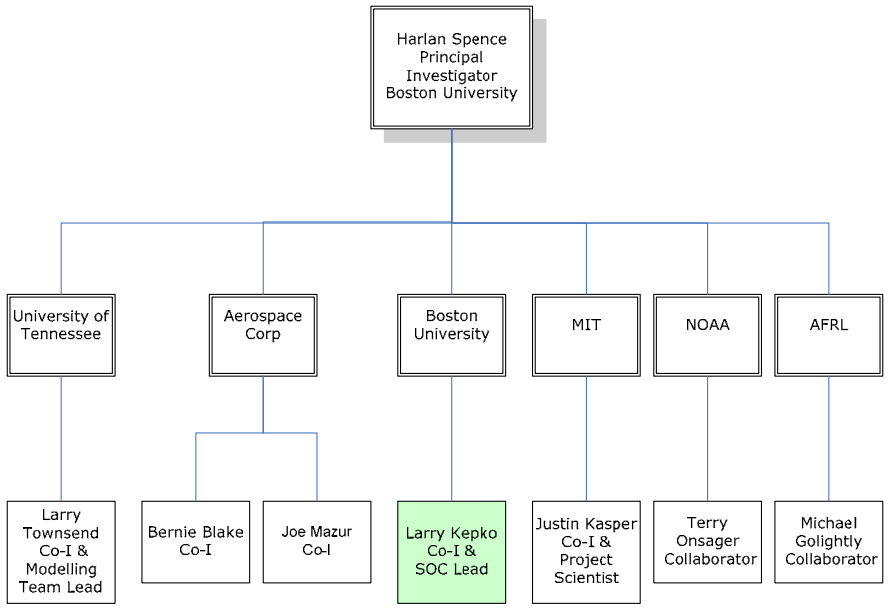
Topics

- Organizational Changes since PDR
- Master Milestone Schedule
- Flight Model Schedule
- Risk Management
- Current CDRL compliance matrix

CRaTER Organizational Changes since I-PDR

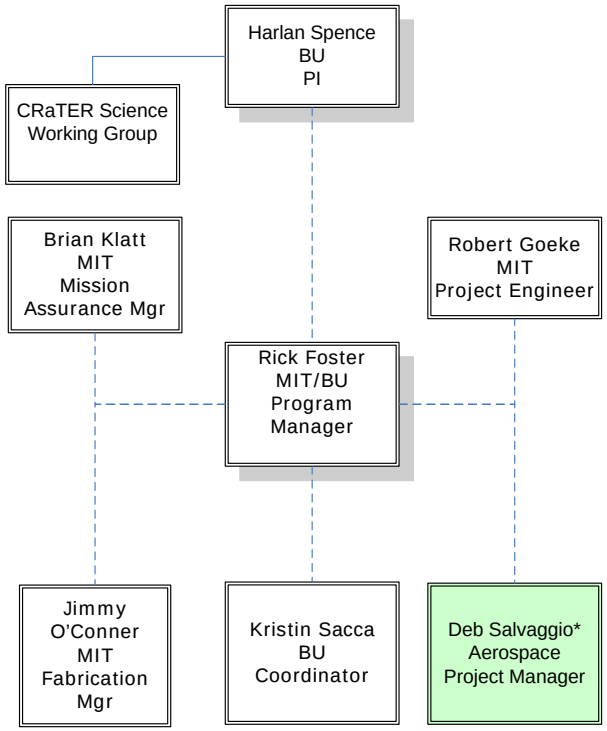
Organizational Changes since I-PDR - Science

- Larry Kepko designated as the Science Operation Center (SOC) Lead
  - EPO responsibility assignment pending clarification of LRO EPO implementation plans.
  - Instrument Calibration Lead responsibilities transferred to Prof. Spence
- Potentially designating Michael Golightly as a Co-Investigator
- In general, there has been no significant changes to the CRaTER Science Team since I-PDR.



Organizational Changes Since I- PDR – Management

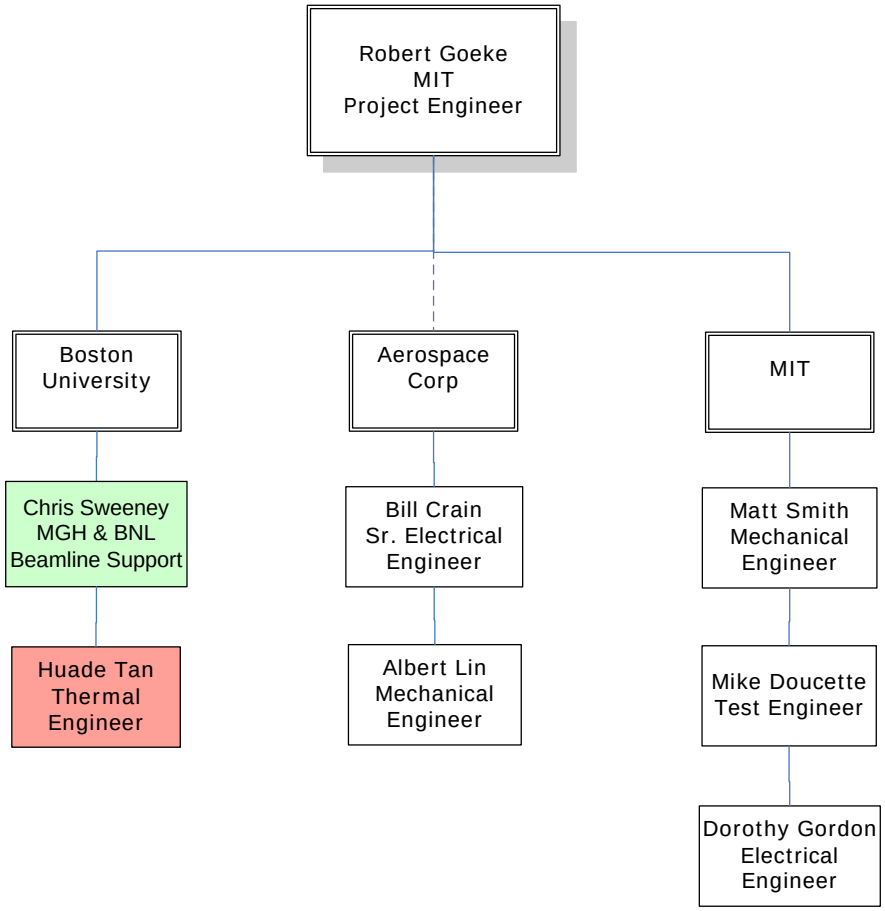
- New Project Manager (Deb Salvaggio) at Aerospace Corp.
- New Quality Assurance Manager (Paul Carranza) at Aerospace Corp.
- No Management changes at CRaTER-East since I-PDR
- CRaTER reporting to LRO Project Office was streamlined since I-PDR, resulting in better communications with the LRO Payload Management and Systems Engineering



*Within Aerospace, Paul Carranza joined the team as the Aerospace QAM in June '06

Organizational Changes Since I-PDR - Engineering

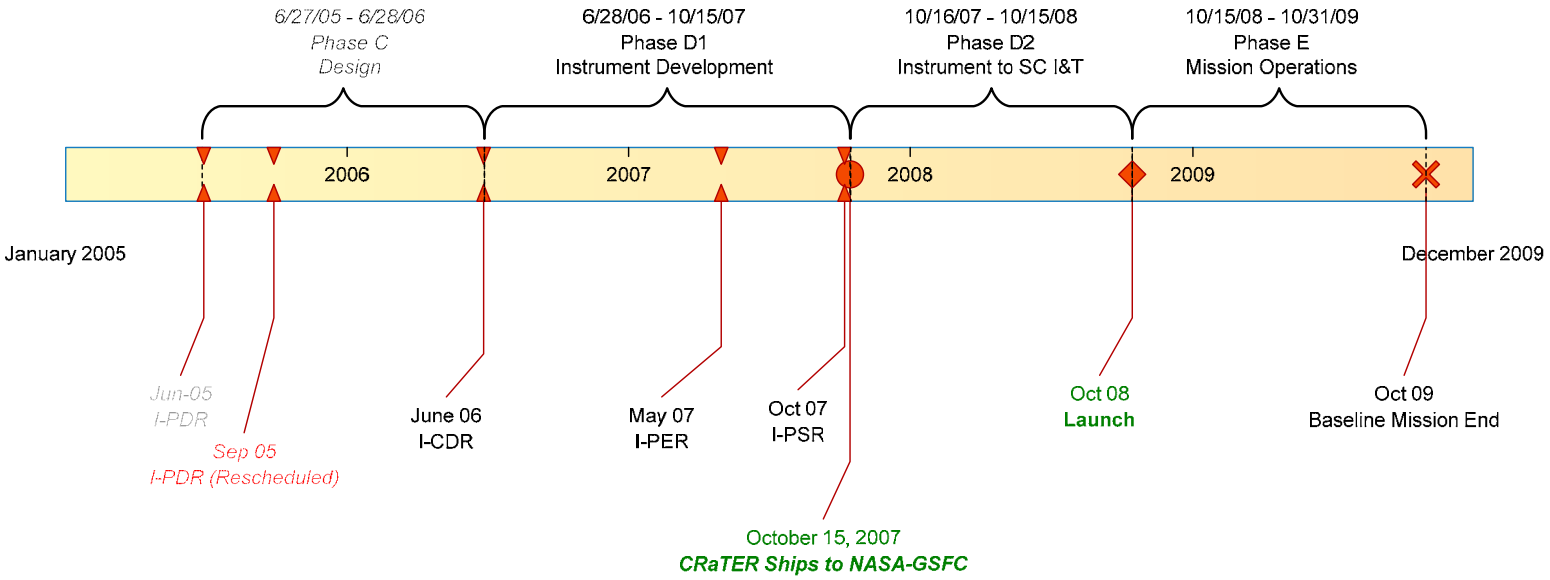
- Huade Tan (Student Engineer) joined the project after I-PDR to do the instrument Thermal Model. He recently left the project, upon graduation (and completion of our thermal model).
  - Continuing Thermal Analysis responsibilities transferred to Robert Goeke (assumed to be minimal at this point)
- Chris Sweeney currently providing technical support to project during beam runs at MGH and BNL
  - Integration and Test Lead responsibilities transferred to Robert Goeke
- An additional technical staff person may be required to assist in the verification activities.



CRaTER Master Milestone Schedule

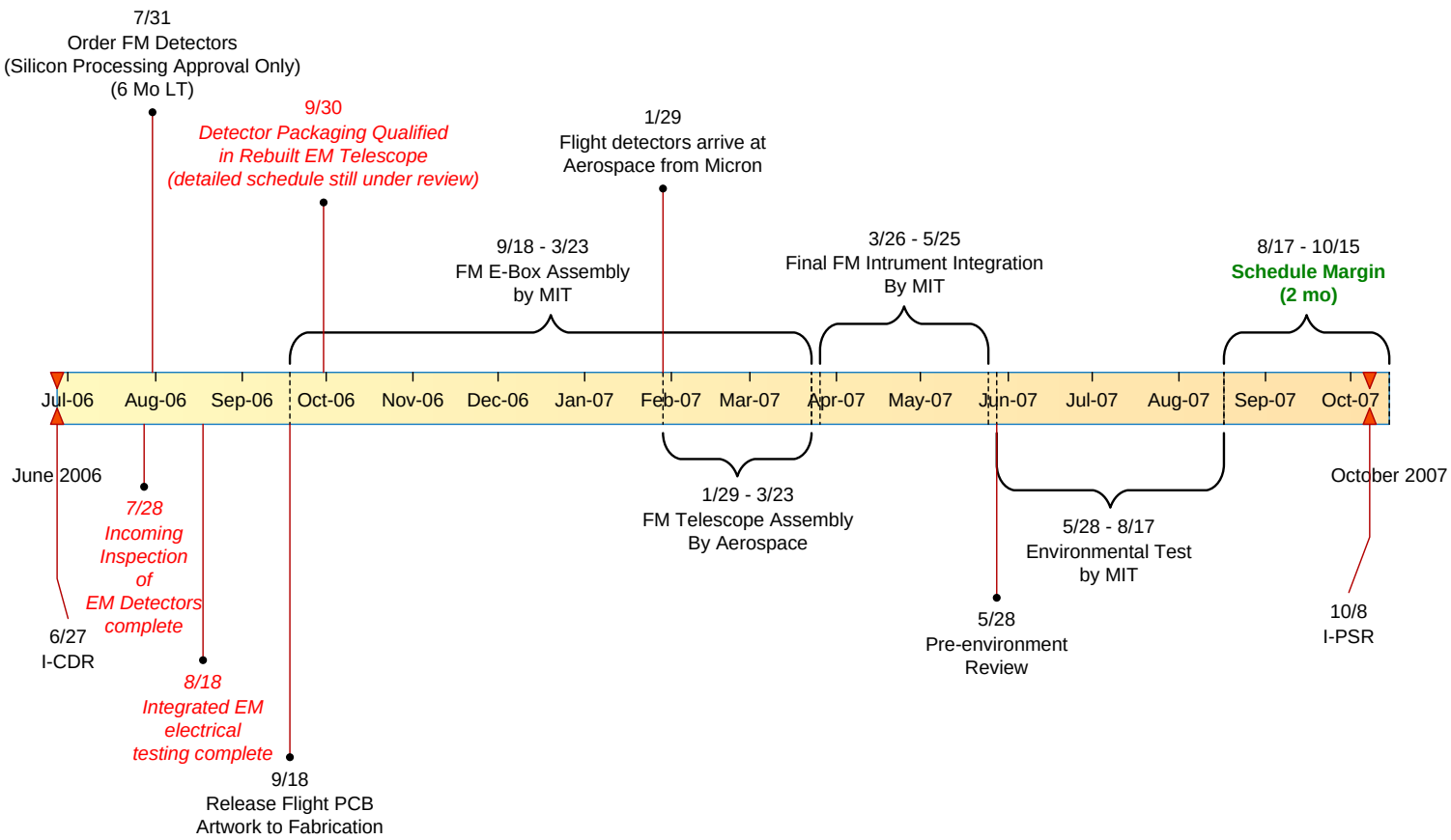
CRaTER Master Phase Schedule

CRaTER Master Milestone Rev08.vsd



Phase D1 Milestones

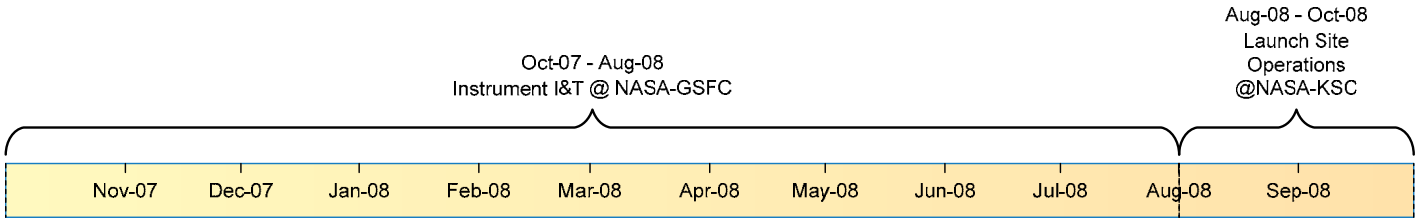
CRaTER Master Milestone Rev08.vsd



Red Milestones are carry forward items from Phase C

Phase D2 Milestones

CRaTER Master Milestone Rev08 - D2.vsd

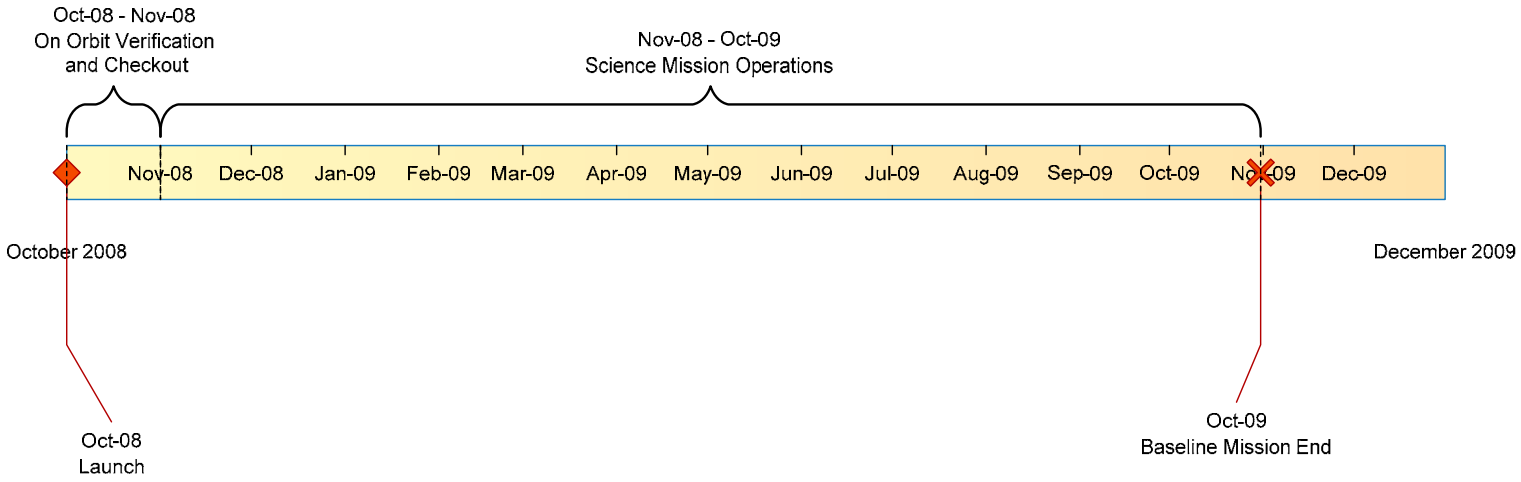


October 2007 October 2008

CRaTER Team detailed responsibilities during this Phase will be firmed up by the CRaTER Pre-ship Review.
The CRaTER instrument has no special needs to be handled by the CRaTER Team itself during this period. In general, the plan is that the CRaTER Team will largely be playing a support role to the NASA-GSFC I&T team, mostly providing inputs to their plans and procedures, which some onsite presence during certain test periods.

Phase E Milestones

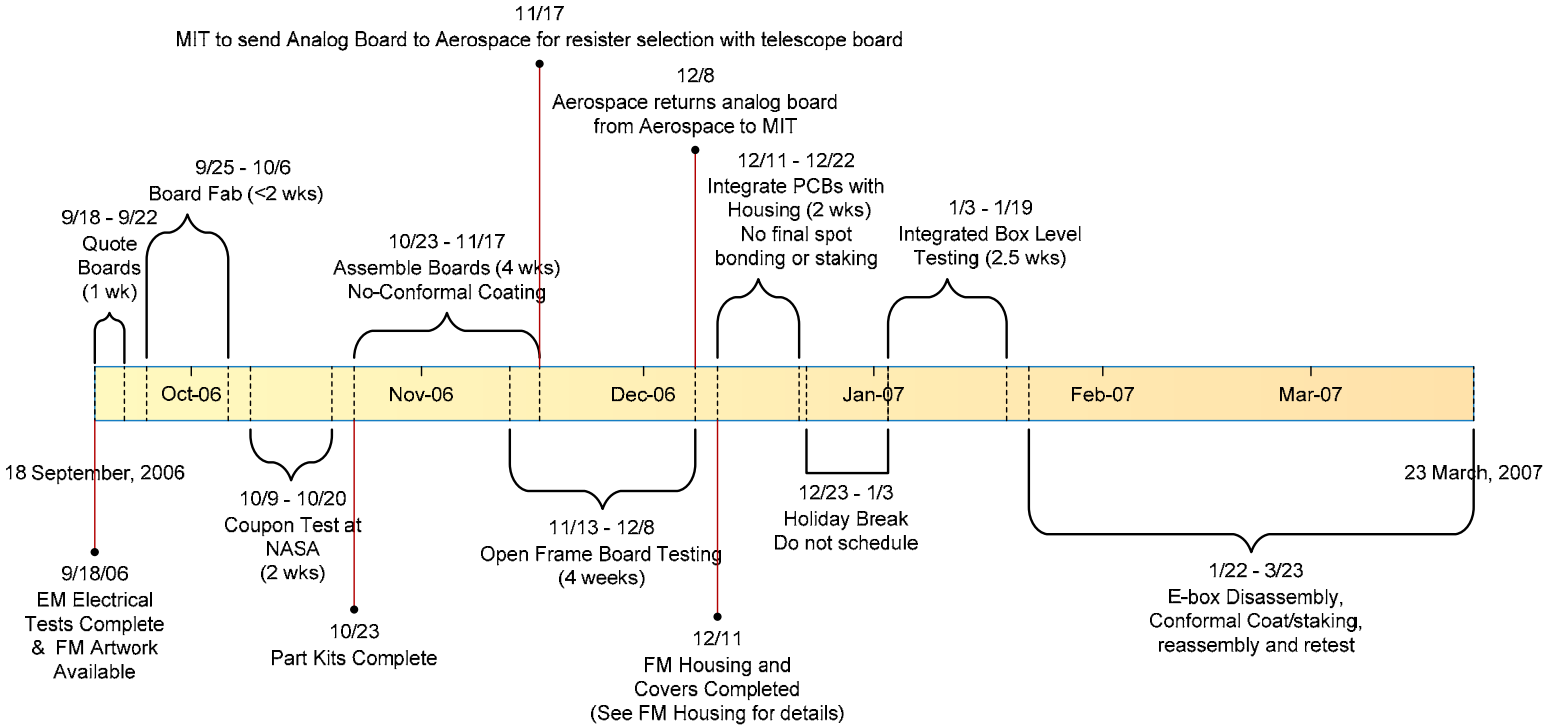
CRaTER Master Milestone Rev08 - D2.vsd



Flight Model Schedule

Flight Model Electronics Box Assembly by MIT*

CRaTER Flight Model Rev02.vsd

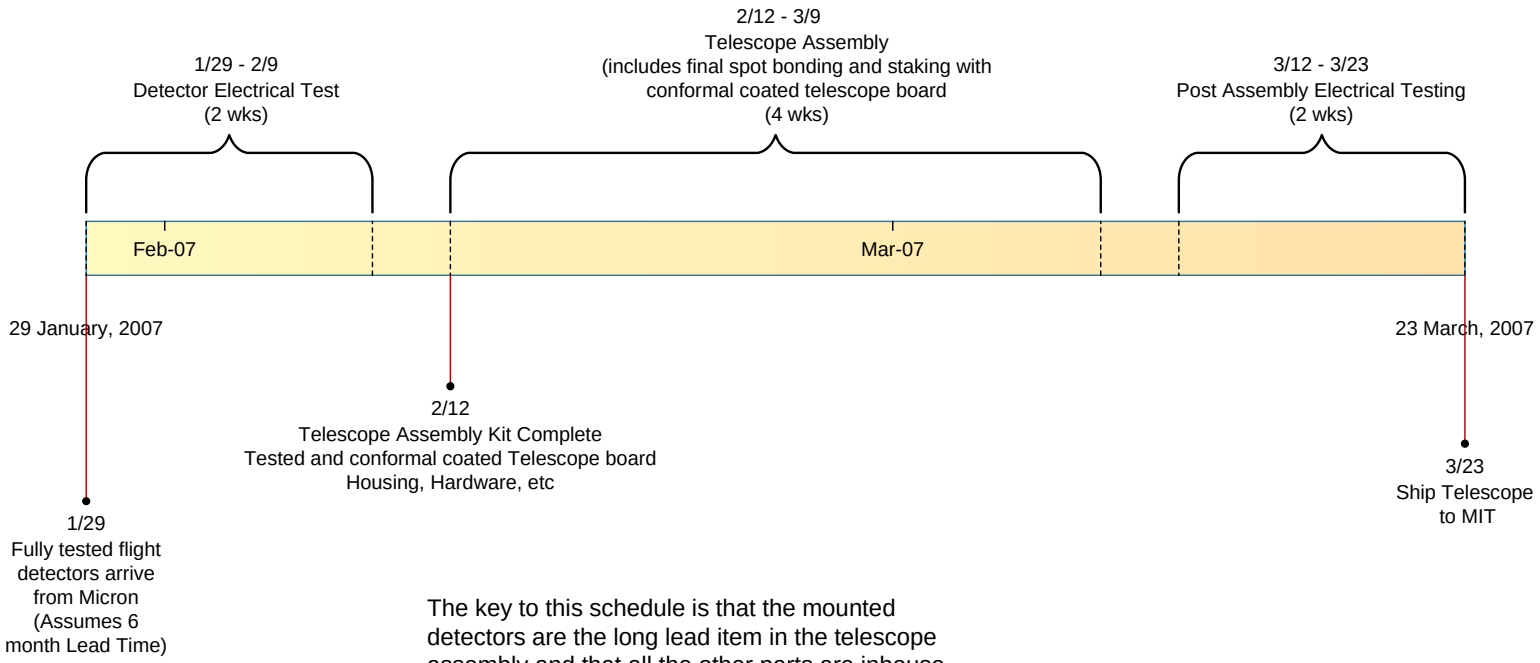


This phase shows the activities at MIT to build the flight electronics box. Important milestones are the final release of the electronics artwork for the analog and digital board by 9/18/06 and the required EEE parts in house by 10/23/08. The housing is discussed on a task schedule sheet.

*Note: It shows the Analog board going to Aerospace for resister selection midway thru the schedule. This will require that Aerospace have the flight telecope board completed by 11/17/06 to support this procedure. In turn, MIT needs to provide telescope EEE parts to Aerospace in time for Aerospace to meet their assembly date.

Flight Model Telescope Assembly by Aerospace

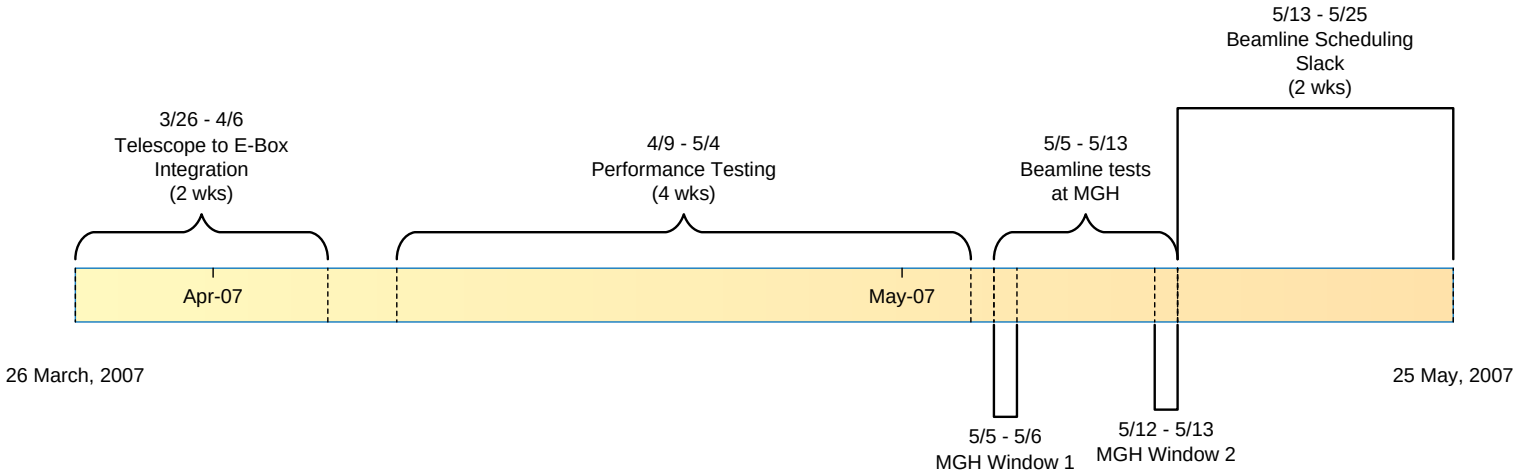
CRaTER Flight Model Rev02.vsd



The key to this schedule is that the mounted detectors are the long lead item in the telescope assembly and that all the other parts are inhouse and ready to assemble by 2/12/07. This includes the housing, telescope board, detector board mounting hardware, TEP, fasteners, etc

Final Flight Model Integration by MIT

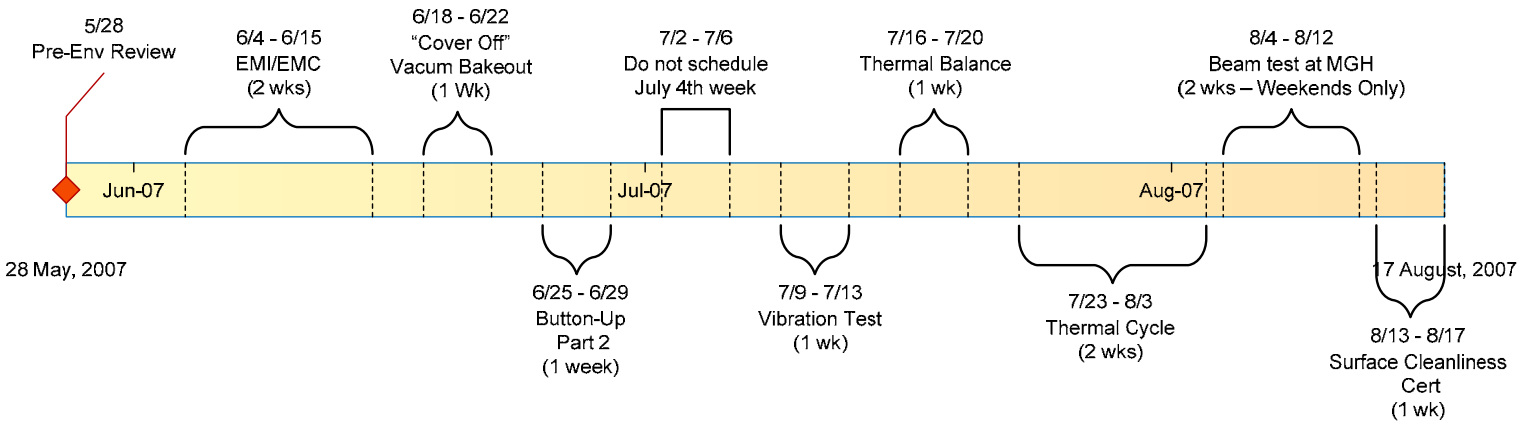
CRaTER Flight Model Rev02.vsd



By the beginning of this period, the MIT team has finished the electronics box and the Aerospace team has completed the telescope. Both of these assemblies have had all the boards conformally coated and all the internal spot bonding completed. These two subassemblies are now integrated at MIT and run thru a set of exhaustive performance tests prior to proceeding to the environmental test phase. They finish this phase with a series of Proton Beam Exposures at the Proton Therapy Facility at Mass General Hospital.

CRaTER Environmental Test by MIT

CRaTER Flight Model Rev02.vsd



This is a the required set of environmental tests for this instrument. The instrument will start the phase fully buttoned up, with the exception of the top and bottom covers, which will be spot bonded after the bakeout.
Environmental tests that are being deferred to post delivery at GSFC are acoustics, shock and outgassing certification.
This schedule shows the instrument to be ready for delivery 2 months in advance of the required 10/15/07 delivery date, which shows up as schedule margin on the CRaTER Master Milestone schedule.

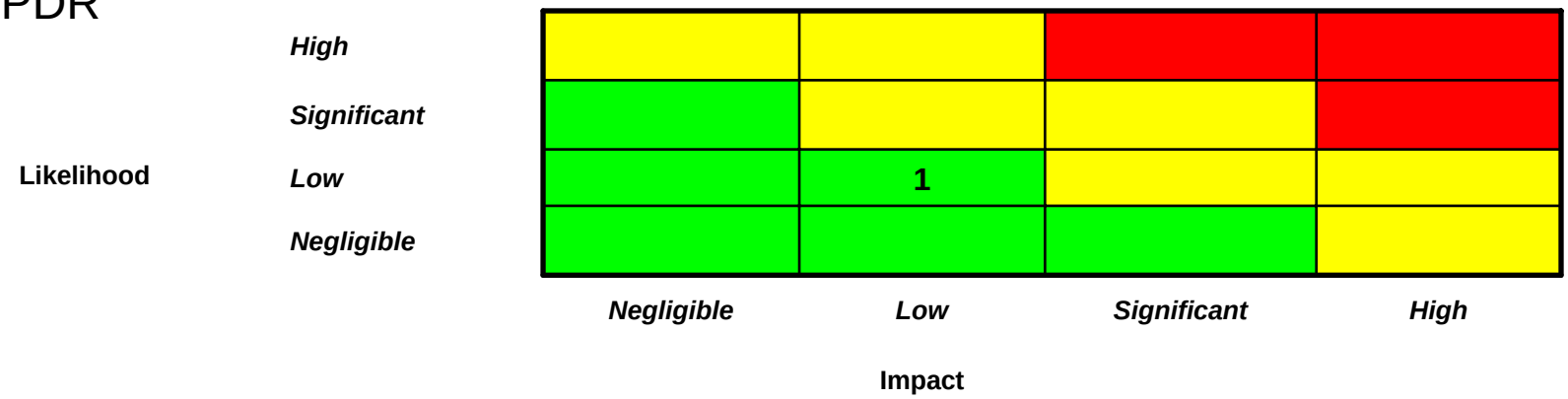
CRaTER Project Risk Analysis

- The *Risk* that CRaTER has been holding since I-PDR is associated with the procurement of the flight detectors from Micron Semiconductor.
- This risk is predominately viewed as the risk of securing suitably packaged and tested devices in time to support the flight build schedule.
  - These devices are not classified as new technology devices with the associated R&D risks.
  - Even with this identified risk, Micron Semiconductor is still strongly considered the vendor of choice for these types of detectors.
- Since I-PDR, however, we have elevated the risk classification from a “Green” level to a “Yellow” level.
  - This is due to a management assessment that the likelihood of the detectors causing a slip in delivery schedule of the flight unit to NASA has increased from “Low” to “Significant”.
  - This assessment is based on our not meeting our original schedule for getting engineering models devices in house and certain open issues associated with the packaging of these devices.

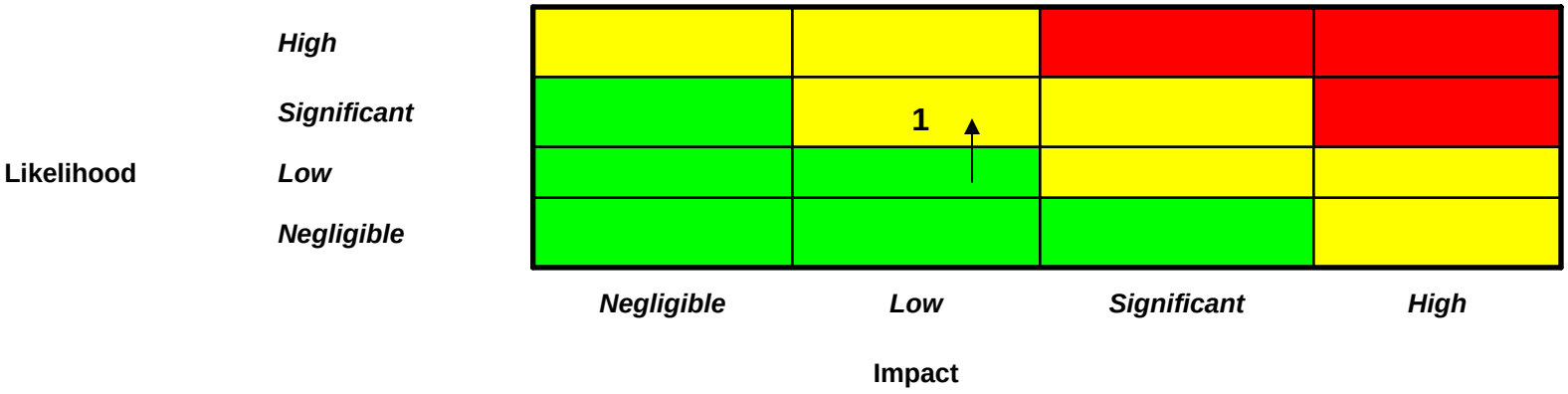
- Several measures are being implemented to manage this risk.
  - **Better Communications …** There are several functions within the CRaTER Project (Science, Engineering, QA & Management) and we need to develop a more efficient way of communicating issues from these different segments with Micron.
  - **Additional Testing and Review Points …** We plan to implement the flight detector procurement that has two phases. First, the processing of the detector silicon itself and second, the approval to mount the processed silicon onto the flight detector board package.
    - This will allow us to keep to a flight build schedule and find time to implement an engineering model based set of mechanical tests for the detector packaging design (Note: At I-PDR, we were only going to do a sine survey of the EM telescope, but now feel that is inadequate)
- Additional Risks on the Horizon ??
  - None to report at the moment. However, we are now in the process of requesting firm quotes from the vendors for quantity and lead times that supports our schedule.
    - The CRaTER Project has not had to reallocate any funds from it's financial reserves at this point, which helps mitigate unforeseen additional screening costs that may be required during flight part procurement.

Risk Matrix

I-PDR



I-CDR



CDRL Status at I-CDR

ID	Task Name	Finish	Resource Names	Link
1	*CDRL009 Safety Assessment Report - inputs*	4/5/06	Klatt	*As-Requested*
2	*CDRL006 Safety Requirements Checklist -inputs*	4/5/06	Klatt	*As-Requested*
3	*CDRL010 Inputs to MSPSP*	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04015/04015_rA.pdf
4	CDRL011 Hazard Control Verif. And Tracking	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04014/04014_rA.pdf
5	CDRL022 Trend Analysis - Parameters List	6/26/06	Goeke	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04008/04008_r01.pdf
6	**CDR-90**	**4/5/06**		
7	**CDRL019 Parts Stress Analysis - Preliminary**	**4/5/06**	**Goeke**	**http://snebulos.mit.edu/projects/crater/file_cabinet/0/04010/04010_r01.pdf**
8	Telescope Board	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04010/04010_01_r02.pdf
9	Analog Board	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04010/04010_02_r02.pdf
10	Digital Board	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04010/04010_03_r02.pdf
11	E-Box Chassis	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04010/04010_04_r01.pdf
12	**CDR-60**	**4/5/06**		
13	CDRL046 EEE Parts Control Plan - Final (in CDRL002)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01204/01204_rFj.pdf
14	CDRL063/072 Instrument Functional and Performance Requirements and Trac	4/5/06	Kasper	http://snebulos.mit.edu/projects/crater/file_cabinet/0/05002/05002_r01.pdf
15	CDRL073 Requirements Verifcation Traceability Matrix	4/5/06	Kasper,Goeke,Klatt	
16	*CDRL074 Inputs to Mission Ops Plan*	4/5/06	Spence	*Included as inputs to LRO Mission Design Document*
17	*CDRL075 Inputs to Orbitor Integration and Test Plan*	4/5/06	Goeke	*As Requested*
18	CDRL076 Instrument Configuration Control Plan - Final	4/5/06	Goeke	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01201/01201_rA.pdf
19	*CDRL082 CAD Model - Final*	4/5/06	Goeke	*Submitted to NASA-GSFC*
20	*CDRL084 Thermal Model*	4/5/06	Goeke	*Submitted to NASA-GSFC*
21	CDRL085 Instrument Grounding Diagram	4/5/06	Goeke	http://snebulos.mit.edu/projects/crater/file_cabinet/0/03001/03001_01_r01.pdf
22	CDRL086 Remove/Instrall before Flight List	4/5/06	Goeke	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04007/04007_r01.pdf
23	*CDRL087 Inputs to Instrument to Spacecraft Integration Plan*	4/5/06	Goeke	
24	**CDR-45**	**4/5/06**		
25	CDRL0001 Heritage Matrix -Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04013/04013_rA.pdf
26	CDRL002/065 PAIP - Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01204/01204_rFj.pdf
27	CDRL005 System Safety Control Plan (Part of PAIP) -Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01204/01204_rFj.pdf
28	CDRL007 Preliminary Hazard Analysis - Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04015/04015_rA.pdf
29	CDRL037 Stress Corrosion Eval Form	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04006/04006_rA.pdf
30	CDRL048 EEE Parts ID List - Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04002/04002_01_r03.pdf
31	**CDR-30**	**4/5/06**		
32	**CDRL017 FMEA and CIL - Final**	**4/5/06**	**Goeke**	**http://snebulos.mit.edu/projects/crater/file_cabinet/0/04009/04009_r01.pdf**
33	Worksheet	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04009/04009_01_r01.pdf
34	**CDRL020 Worse Case Analysis - Final**	**4/5/06**	**Goeke**	
35	Digital Processing Electronics	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04011/04011_02_r01.pdf
36	Analog Processing Electronics	4/5/06		http://snebulos.mit.edu/projects/crater/file_cabinet/0/04011/04011_01_r01.pdf
37	CDRL023 Limited Life Items List - Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04005/04005_rA.pdf
38	CDRL029 Risk Management Plan	4/5/06	Foster	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01202/01202_r01.pdf
39	CDRL030 System Performance Verif Plan and Matrix - Final	4/5/06	Goeke	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01206/01206_r03.pdf
40	CDRL035 Materials and Process List - Final	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04001/04001_01_rA.pdf
41	*CDRL036 Matlerial Usage Agreements -Final*	4/5/06	Klatt	*None Currently Required*
42	CDRL038 Polymeric Materials and Composites Usage - Final (in CDRL035)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04001/04001_01_rA.pdf
43	*CDRL039 Materials Waiver - Final*	4/5/06	Klatt	*None Currently Required*
44	CDRL040 Inorganic Materials List - Final (in CDRL035)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04001/04001_01_rA.pdf
45	CDRL041 Fastener Control Plan - Final (in CDRL002)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01204/01204_rFj.pdf
46	CDRL042 Lubrication Usage List - Final (in CDRL035)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04001/04001_01_rA.pdf
47	CDRL044 Material Process Utilization List - Final (in CDRL035)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/04001/04001_01_rA.pdf
48	CDRL050 Instrument Contamination Control Plan - Final	4/5/06	Foster	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01203/01203_r06.pdf
49	CDRL051 ESD Control Plan - Final (in CDRL002)	4/5/06	Klatt	http://snebulos.mit.edu/projects/crater/file_cabinet/0/01204/01204_rFj.pdf
50	CDRL081 Flight Rules and Contraints - Preliminary	4/5/06	Spence	*Deferred to inclusion in CRaTER User's Manual*
51	**CDR-5 Work Days**	**4/5/06**		
52	I-CDR Package	4/5/06	Goeke	http://snebulos.mit.edu/projects/crater/docs/presentations/CRaTER-CDR-Agenda.html