CXC Manager’s Status Report

Chandra User Committee Meeting

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12 June 2003

Topics

- Program Level Status
- Report on extended phase budget*
- Operations
  - S/C heating issue*
  - Manual momentum dumping*
  - Noisy IRU–1 gyro–1*
- Mission Metrics
- Data Systems
- Chandra Grant Awards

* Special topic requested by CUC

Program Level Status

- Spacecraft continues to perform extremely well overall and operations continue to be routine. Anomalous thruster firings and noisy gyro current have occurred in the last 6 months (details below). No safe modes have occurred since last report.
- Cycle 5 proposal deadline 3/14/03 with 793 proposals submitted; Peer review 6/24/03; Chandra Fellows Peer Review held 1/14/03 – 5 new Fellows selected.
- SSU Scientist, Peter Edmonds hired, 9 press releases and 17 image releases made in last 6 months.
- MSFC Quarterly Review held 4/1/03. No significant actions.
- MSFC issued a sole source RFP for the follow–on 5–year contract to SAO on 4/21/03; proposal submitted 5/16/03 (details below).
- The out–year profile poses some challenge however beyond this, there are no significant near–term budget or staffing issues.

Second 5–year Budget

- Budget guidelines for follow–on CXC contract require a reduction in the overall CXC labor
- Proposal submitted to NASA includes an overall ~23% reduction in labor from the FY02 budget level ramping down during FY04–FY06 and level (with inflation) thereafter (59 FTE total across program)
- Reductions in Operations through:
  - Bringing ground–system maintenance in–house (sub–contract consolidation); Moving the Software Maintenance Facility from West Coast to SAO; Changing shift structure; Reduced systems engineering
- Reductions in Science Center through:
  - Greater stability in CXCDS requiring fewer developers and corresponding science staff; Partial automation of V&V; Completion of once–off calibrations
- Other: ACIS and HRC engineering support, GTO programs
- Reductions will be implemented starting 10/03 with maximal use of attrition

Operations Status

- Nominal Spring Eclipse season in Jan/Feb; development of a software change to handle eclipses autonomously near completion.
- 1 ACA dark current calibration (from loads); Started process of lowering the ACA CCD temperature from −10 to − 15 deg C in order to mitigate the increasing number of hot pixels. Reduction as expected after first two 1−degree steps.
- 4 executions of SCS 107 due to high solar activity
  - 3 due to ‘puffed−up’ belts as Chandra neared belt entry (high coronal stream activity); have added 4 hours pad to avoid unwanted stoppages.
  - No ACIS CTI degradation above expectations (3% vs 5% budget)
- 5 Load interrupt TOOs, 1 <24 hours.
- Science Instruments operating extremely well
  - Continued work on ACIS contamination at low energies: contaminant non-uniform (thicker near edges) and contains F implying braycote lubricant.
- Anomalies
  - MUPS thruster decreasing efficiency
  - Noisy gyro−1 in IRU−1

Operations Status

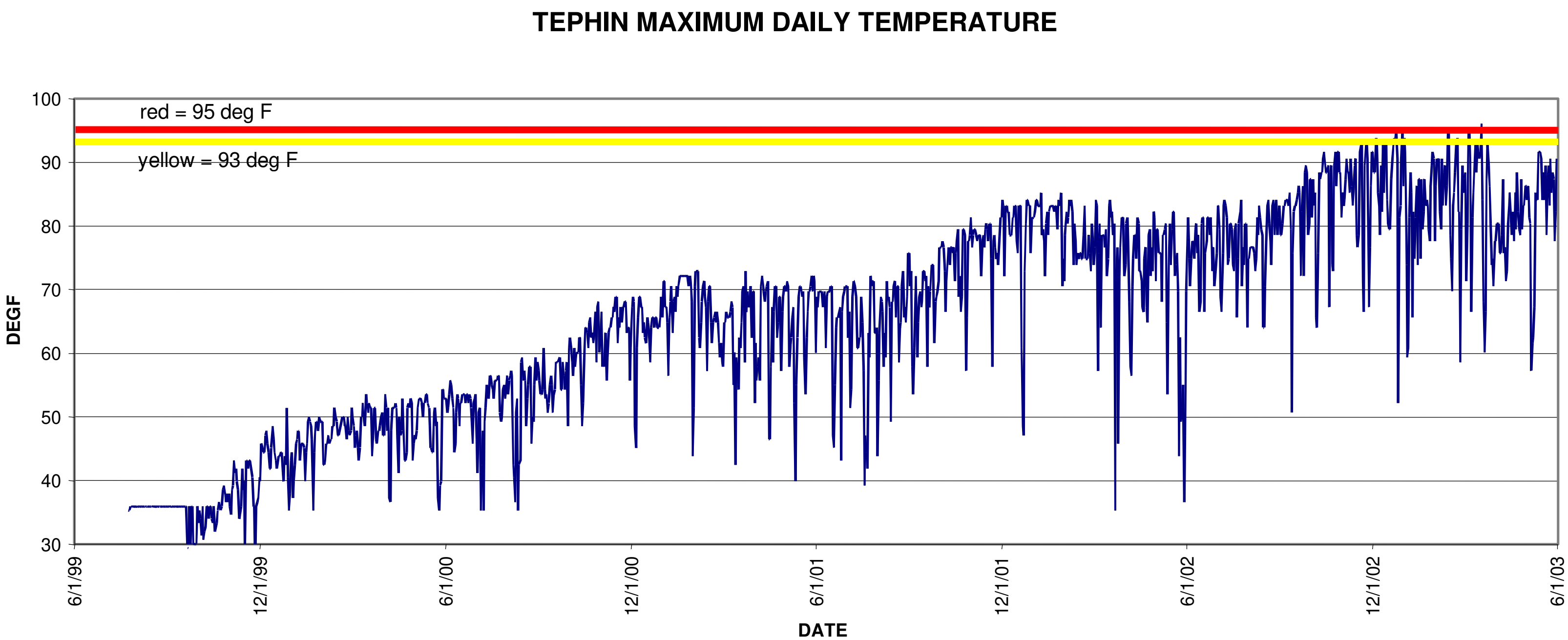
- Load interrupt TOOs

Date	Target	Request
12/21/02	U Gem	3 days
02/26/03	GRB030226 (DDT)	24 hours
03/28/03	GRB030328 (DDT)	3 days
04/25/03	H1743–322	3 days
05/30/03	GRB030528	3 days

- Operations Ground System Updates

Date	Version	Change
04/28/03	GRETA 2.0	Multiple fixes and enhancements
05/15/03	DSN NSP	DSN Network Simplification Project

Thermal Trends



- MLI Surface degradation greater than pre–launch predictions
  - Pre–launch solar absorptance, $\alpha = 0.25$
  - Current, telemetry–based value, $\alpha = 0.4–0.6$
  - α predicted to reach max (~0.6) then level off
  - Largest thermal effects on units nearest spacecraft surface (e.g. EPHIN)
- EPHIN mounted on top (–Z), sun–side of Chandra
  - Constant sun exposure
  - Representative indicator of thermal degradation

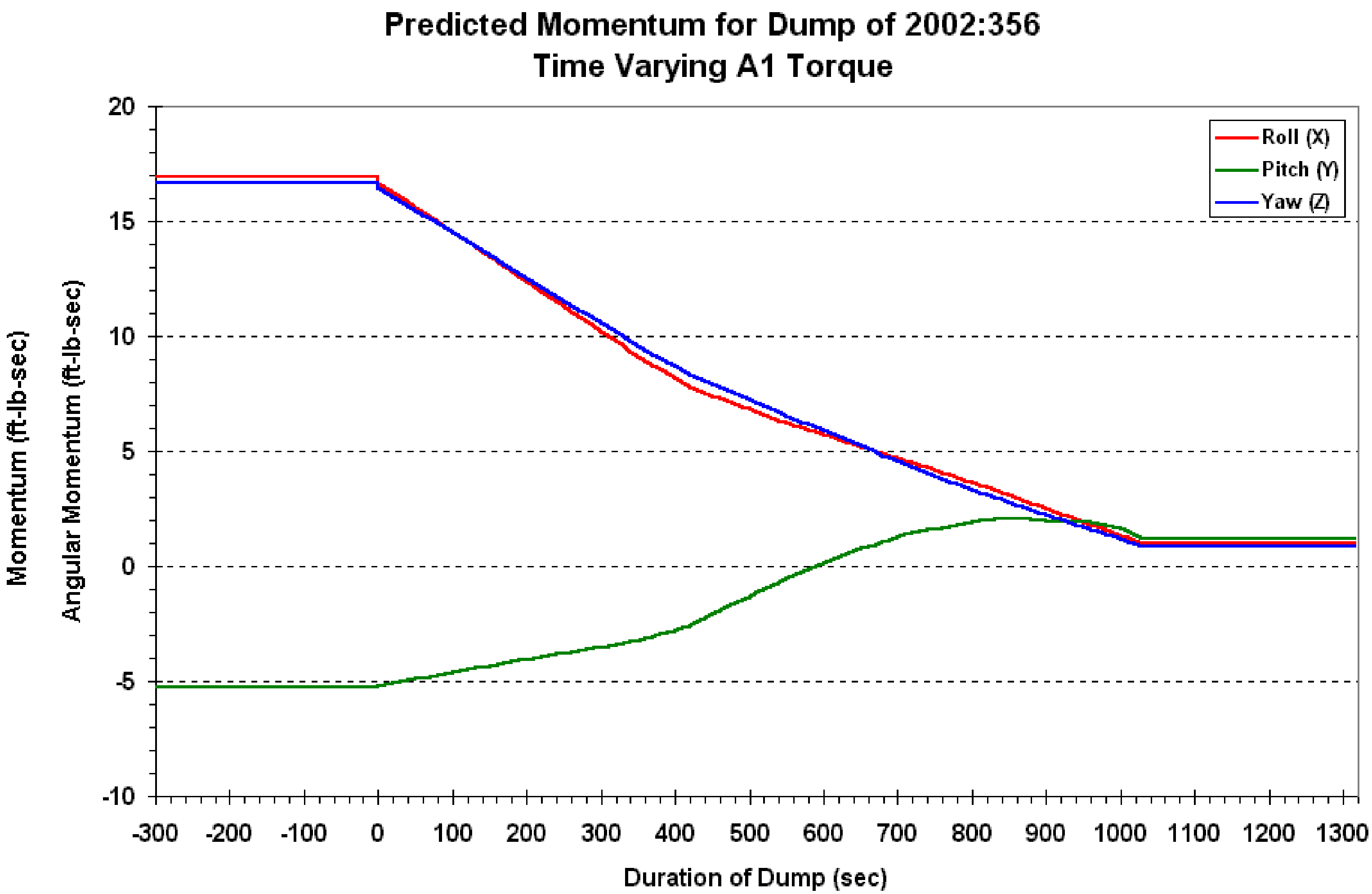
Thermal Trends

- Revised thermal modeling effort completed May 02
  - Provided thermal life–time temperature predictions
  - Heat–up seems accelerated compared with predictions (worst case)
  - Identified units most affected by thermal degradation
- Formed Thermal Working Group
  - Creating "Do not exceed" limits for mission scheduling (red limits generally indicate where performance may start to degrade, per vendor)
  - Assess scheduling restrictions based on temperature predictions and unit performance
- Future Actions
  - Initiate thermal materials study to determine exact degradation mechanism
  - Create models for mission scheduling
- Current and near–term Operational Impact
  - Minor scheduling impacts due to ACIS and EPHIN constraints
  - If α roll–off not confirmed by Jan 04 perihelion data, further constraints will be required

MUPS Thruster Anomaly

- Momentum Unloading Propulsion System (MUPS) used to unload momentum built up from solar pressure, gravity gradient and maneuvers
- Hydrazine fuel system, 4 thrusters (0.1 lb) with redundant (B–side) set
- The momentum unload on Dec 22, 2002 took longer to complete than predicted. Of note: unload made with high initial starting temperature (due to prior attitude).
- Modeling of system momentum consistent with decreasing performance of the A–1 thruster during the unload (100 to ~50%)
- Analysis of prior dumps indicates evidence of similar behavior in 2 other thrusters
- Subsequent unloads at high starting temperatures have shown similar degraded efficiency, however 2 unloads at low starting temperatures have shown nominal performance.
- Cause still unknown, however thrusters considered safe to use. B–side thrusters seen to operate nominally during safe modes. Also, are managing momentum to require 1–2 dumps per month (could manage to zero dumps in principal)
- Plan is to utilize at low starting temperatures, monitor performance and continue fault tree analysis. No operational impact so far.

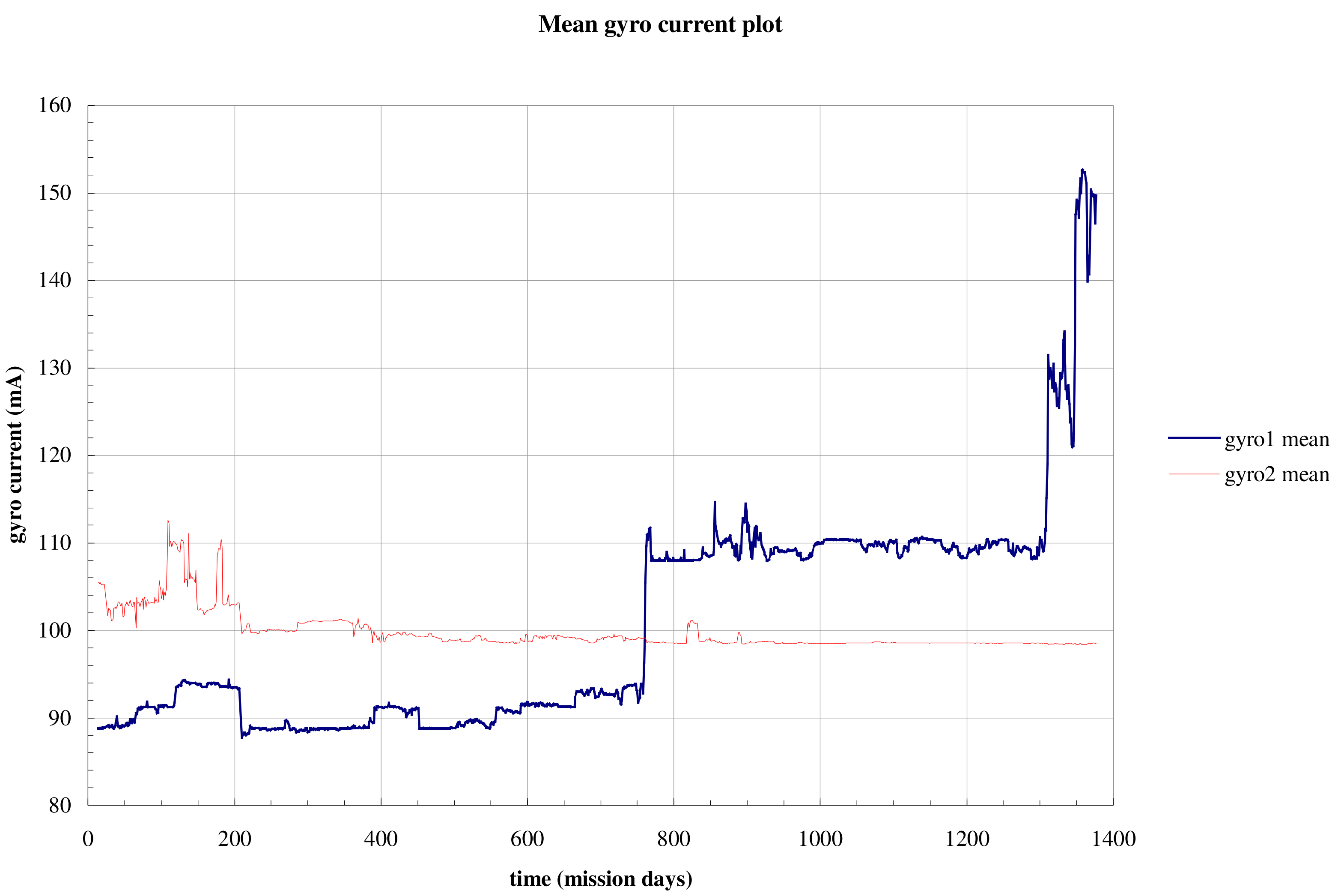
MUPS Thruster Anomaly



Noisy Gyro–1

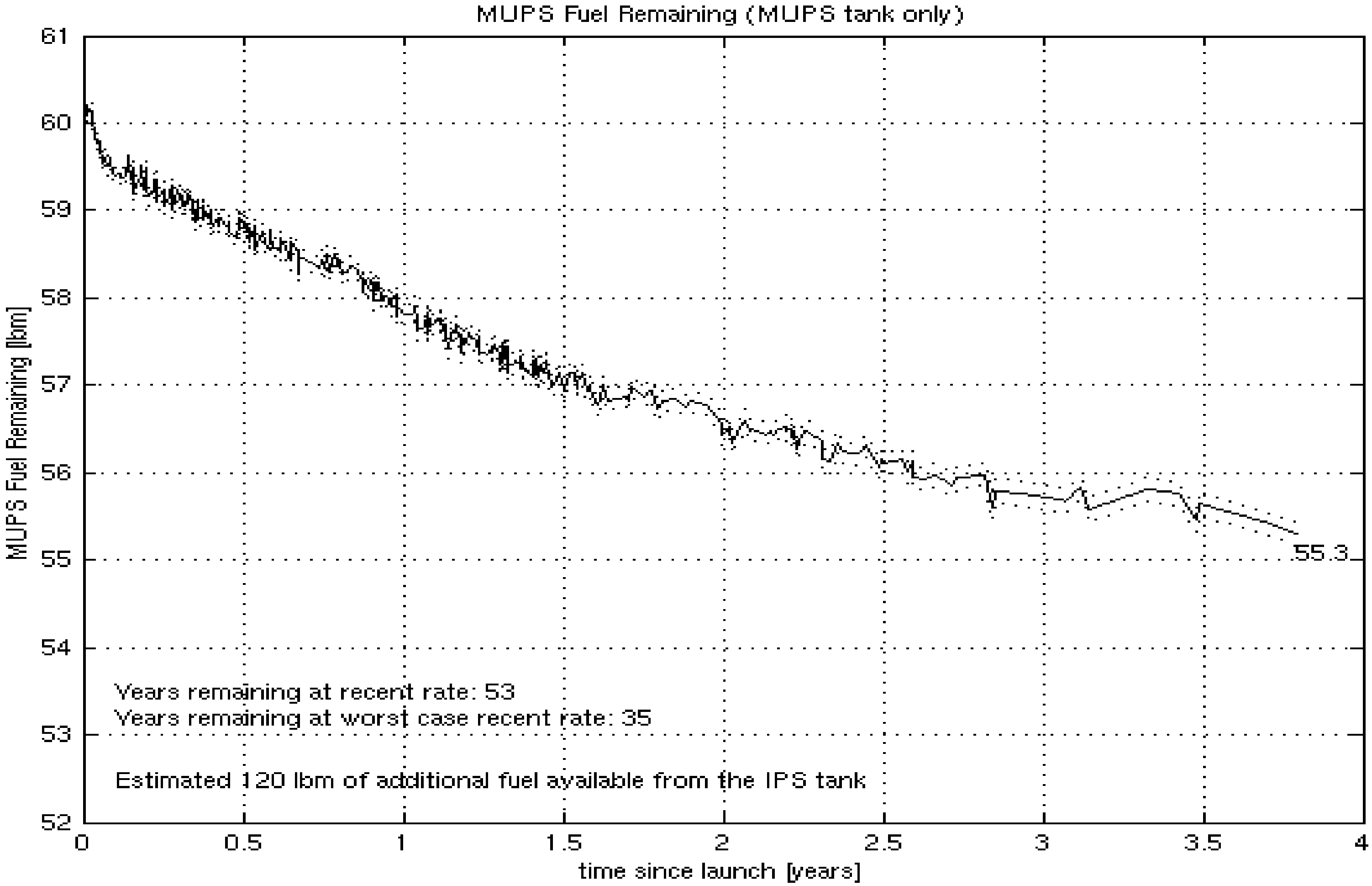
- Chandra operates with 2 gyros each with 2 channels packaged in a single Inertial Reference Unit (IRU–1). A redundant IRU–2 remains off and available for safe–mode transitions.
- Gyro–1 has exhibited typical behavior until Feb 03 when its current increased from ~120 mA to ~130 mA; further current increases followed with associated noisy periods; current now steady at 140 mA
- Vendor advises present behavior consistent with similar behavior seen with small number (<5 of ~120) of other gyros that led to eventual failure, but that remaining life likely to be ~> months
- Plan
  - Perform a hot and cold–restart – could reset current permanently (less likely) or for months (more likely)
  - Prepare swap products in the event they are needed and run with IRU–2 with safe mode swapping back to IRU–1
  - IRU–2 turned on in order to calibrate in parallel with operations
  - Assess flight software changes for 1–gyro operation and other options
- Currently no operational impact and all other gyros nominal

Noisy Gyro–1

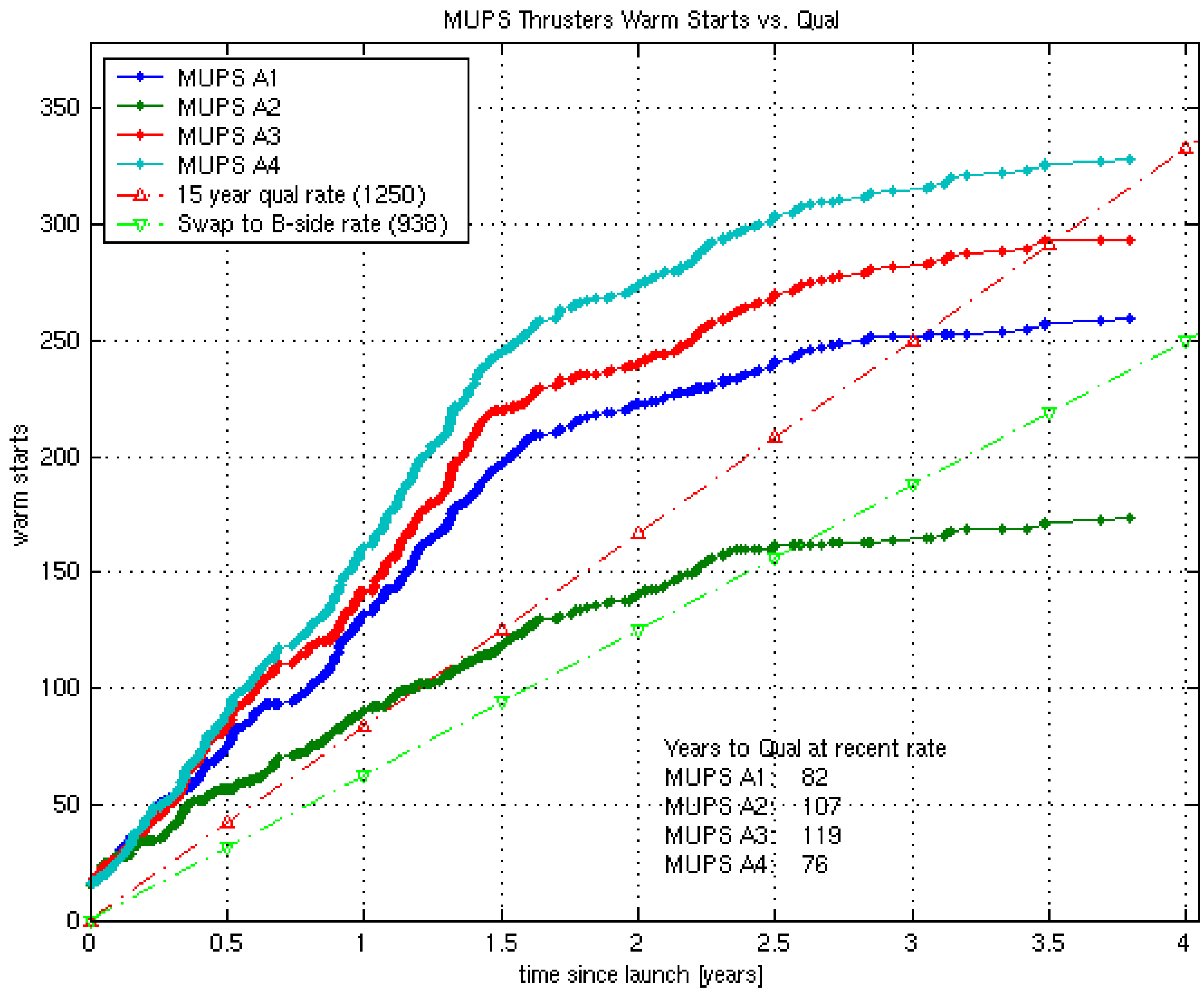


Mean gyro current plot
160
150
140
130
120
110
100
90
80
0
200
400
600
800
1000
1200
1400
gyro current (mA)
time (mission days)
gyro1 mean
gyro2 mean

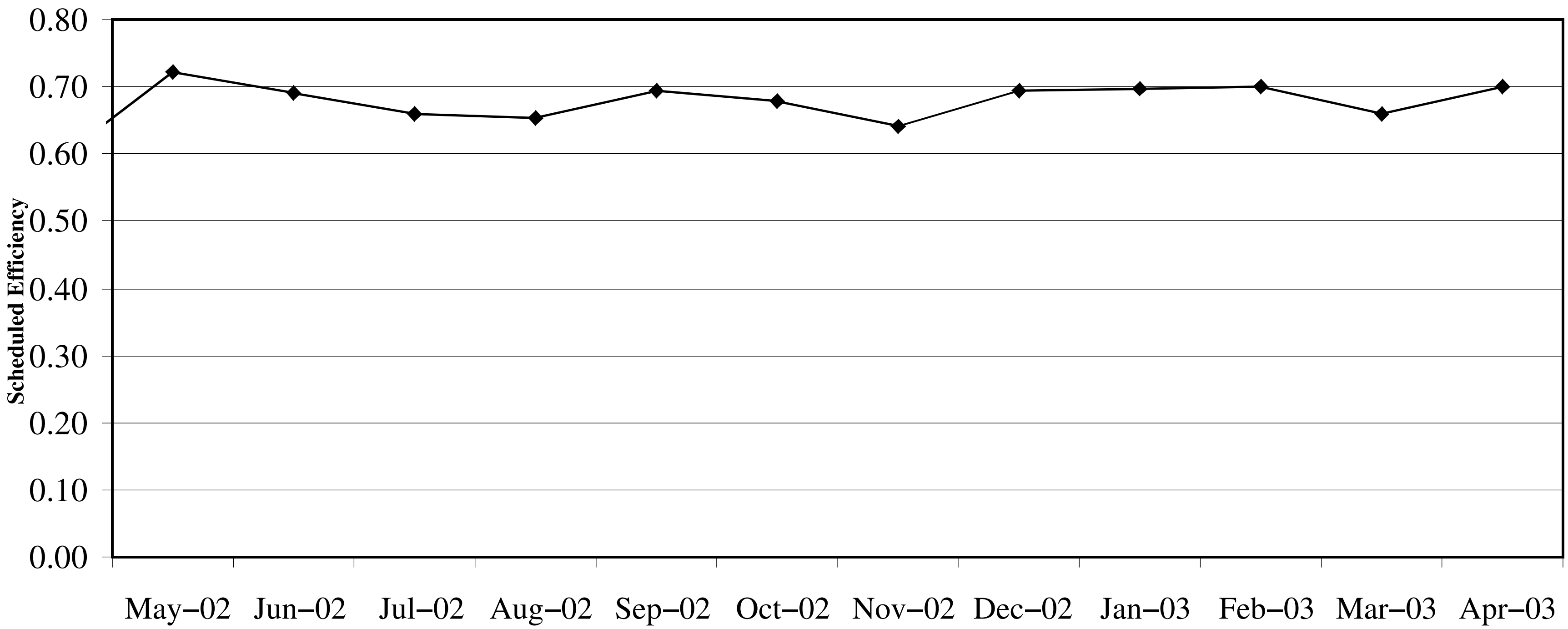
MUPS Fuel Usage



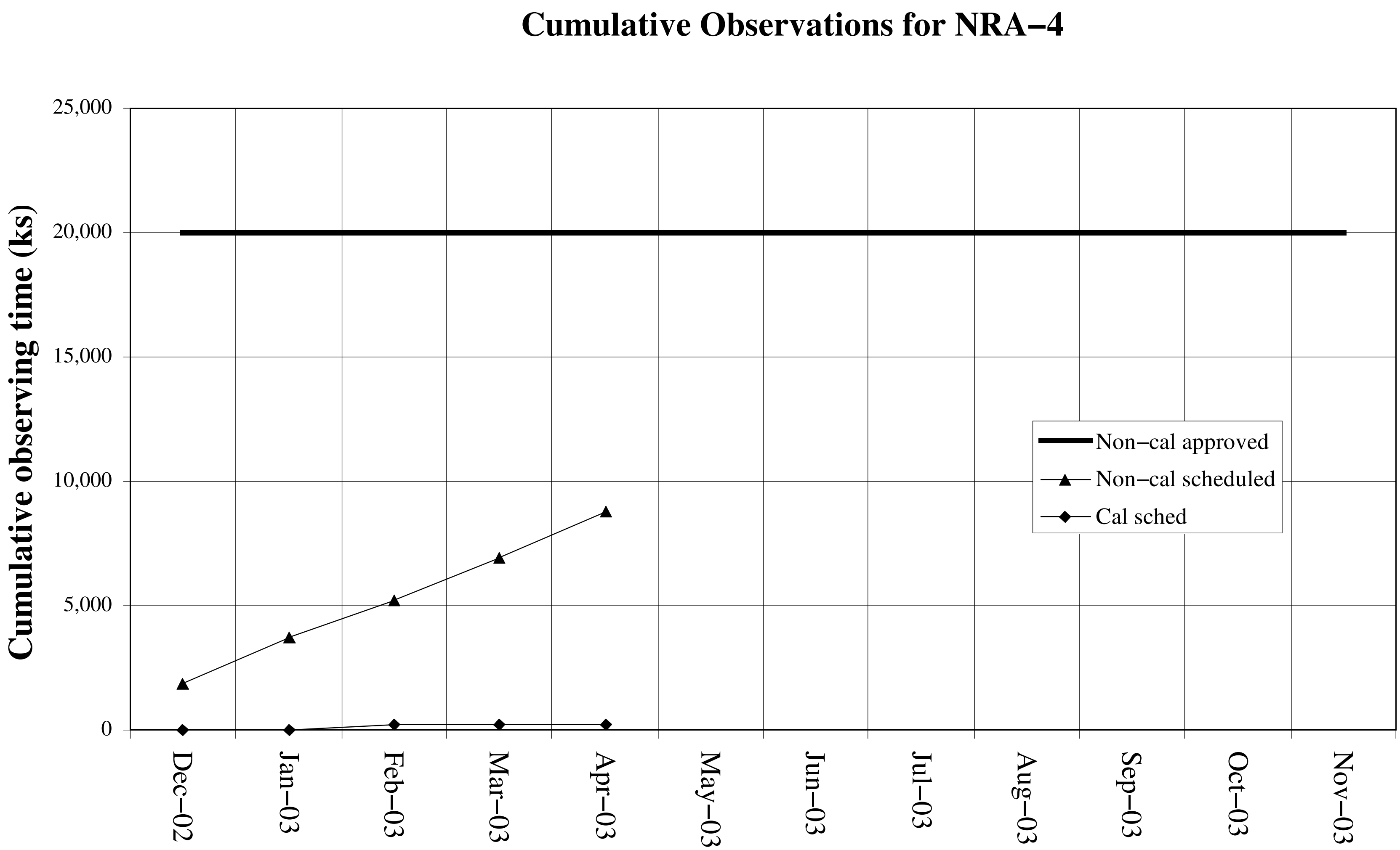
MUPS Warm Start Count



Scheduled Observing Efficiency



Cumulative Observations for NRA−4



Data Systems

- Data processing
  - Average time from observation to data delivery has continued at <1 week\

- Data System Software Releases (major)

Date	Release	Content includes
12/27/02	WebCHaSeR	Web interface to CHaSeR
02/14/03	CalDB 2.21	Corrected versions of ACIS CTI–corrected
response		
06/30/03	CIAO 3.0	In testing

- Grant Awards
  - Grant award time has been impacted by a transition to a new Institutional MIS system (PeopleSoft). Awards are now mostly caught–up, however elapsed time from data delivery to grant award did reach >3 weeks since December (cf <1 week prior to December). Workarounds now in place.

Data Delivery Effectiveness

		As of middle of following month					As of 5/16/03		
Month	**Number of Obs**	**Days to Data Delivery**			**Number Deliv**	**Number Outstanding**	**Number Deliv**	**Number Outstanding**	**Obsids Outstanding** (see following page for details)
		Min	**Avg**	**Max**					
May–02	59	1	5	10	59	0	59	0	
Jun–02	63	0	4	10	63	0	63	0	
Jul–02	74	2	5	12	74	0	74	0	
Aug–02	51	2	6	15	51	0	51	0	
Sep–02	68	1	5	16	67	1	68	0	
Oct–02	65	1	5	17	65	0	65	0	
Nov–02	64	0	5	28	62	2	64	0	
Dec–02	79	1	5	16	79	0	79	0	
Jan–03	57	1	5	16	57	0	57	0	
Feb–03	62	1	5	20	62	0	62	0	
Mar–03	115	1	5	29	115	0	115	0	
Apr–03	126	0	5	16	126	0	126	0	

Chandra Grant Awards

GRANT AWARD EFFECTIVENESS		**As of middle of following month**			**As of 5/16/03**		
Month of Data Delivery	No. Grants (1)	No. Grants Awarded	No. Outstan ding	Avg days to award (2)	No. Grants Award ed	No. Outstan ding	**Outstanding Awards** Proposal no, Comments
Grants to Non–Federal Institutions							
May	35	34	1	6	35	0	
Jun	9	9	0	8	9	0	
Jul	13	13	0	6	13	0	
Aug	17	17	0	7	17	0	
Sep *	17	13	4	12	17	0	
Oct *	13	9	4	12	13	0	
Nov *	17	10	7	20	17	0	
Dec *	62	15	47	43	62	0	
Jan *	20	15	5	16	20	0	
Feb *	22	9	13	20	22	0	
Mar *	23	19	4	21	23	0	
Apr *	9	7	2	10	7	2	4400674 A , 4500164