Monitoring and Trends Analysis
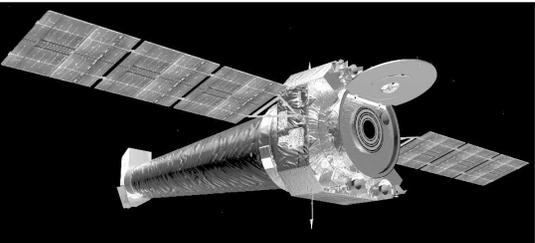
Presented to
Chandra Users Committee
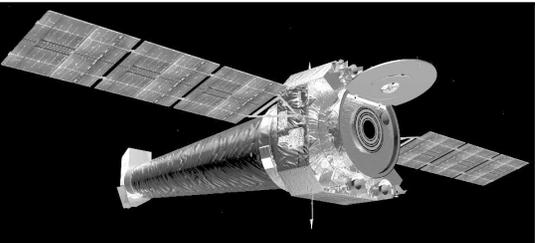by
Scott J. Wolk CXC/SAO

What is MTA?

- Objective: To maximize the science return from *Chandra* by monitoring spacecraft performance and predicting future trends.
  - A coordinated approach
  - MTA is not viewed as the function of one scientist.
  - It is a core function of the SOT & CXC with one scientist taking the lead role as advocate.

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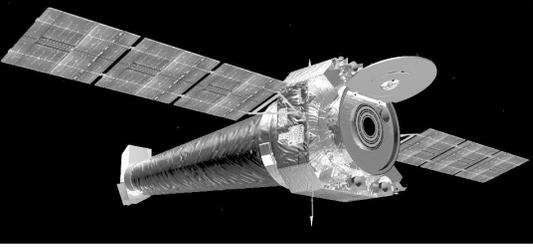
Roles

- All members of the SOT and TST participate.
  - IPI Teams, CAL, DOSS.
    - IPI teams advocate for, monitor and trend their instruments.
    - Cal. designs and analyzes observations with specific goals. These include quantifying temporal and spatial responses.
    - DOSS is responsible for the above and:
      - All non-IPI instruments (ACA, SIM, PCAD, etc.)
      - Data flow (real time and database management)
      - Problem tracking
      - All infrastructure
        - http://cxc.harvard.edu/mta/sot.html

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Problem Tracking

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Specific Monitoring

- Emphasis of work early in mission.
- Realtime data
  - Alerts
- Images
  - Including partial ObsIds when needed
- Spectra
- ACA
- Radiation
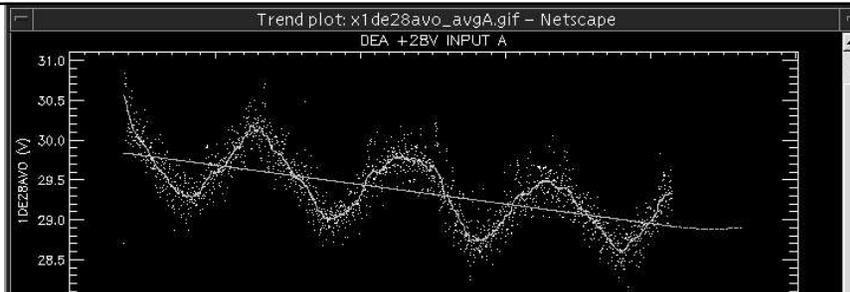 - Alerts

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Trending

- All data are science data.
- Focus on automated trending.
- Created "operational limits" to augment "health & safety limits."
- Specific attention is given to known problems – (e.g. CTI, Radiation)
- Fidelity issues slow pro-active automated analysis of focal plane data.

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Data Products

- In 1999, the database consisted of daily averages in RDB tables.

- Upgraded to Sybase and higher fidelity in Feb 2002.

- New databases being added
  - Inc. CTI, ACIS HK, LETG & HETG
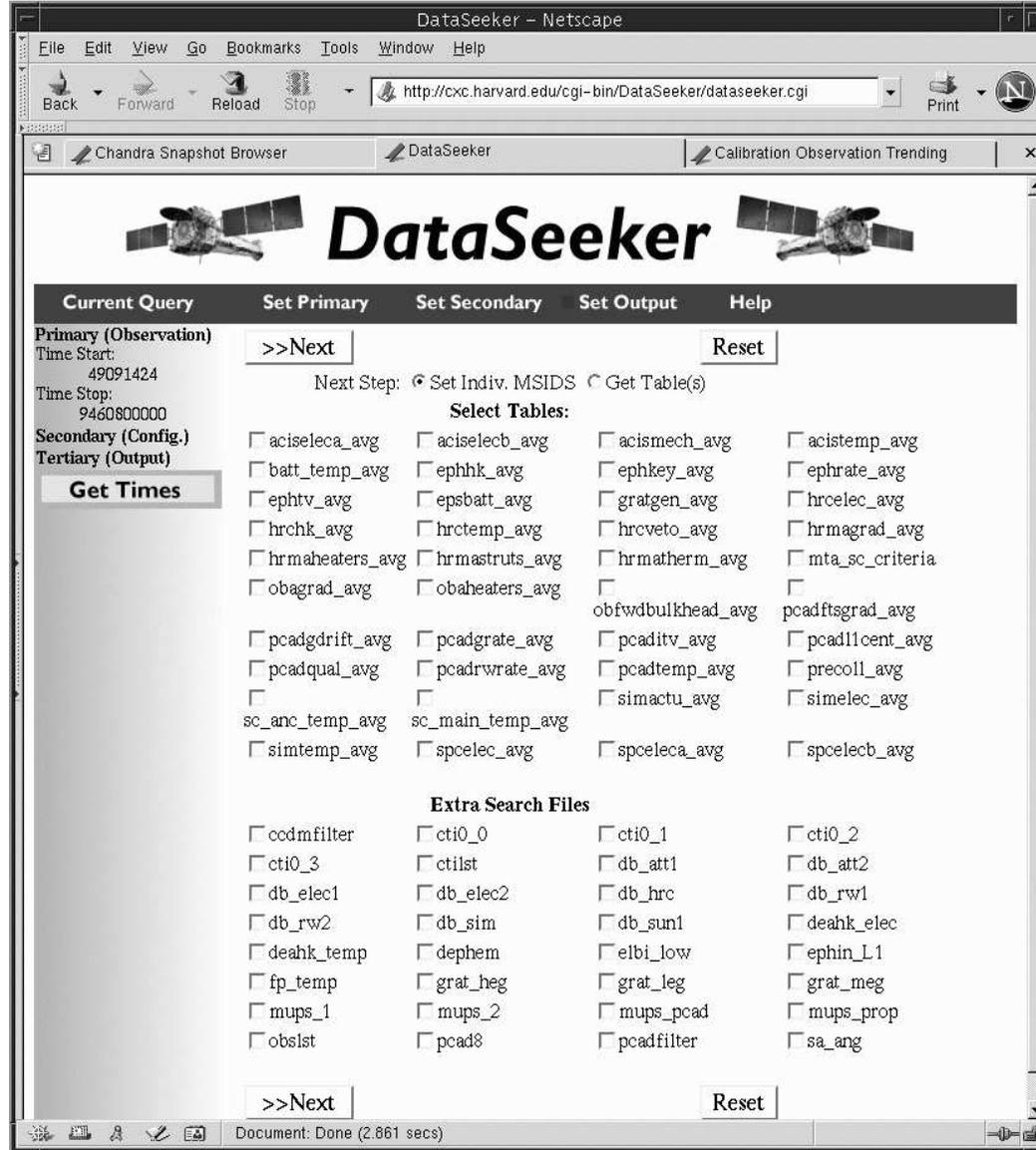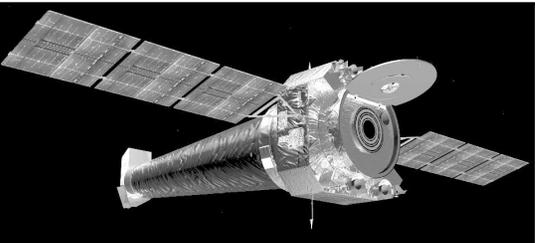
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Communication

- Oversee dataflow to IPI teams.

- Alert system
  - Yellow and Red alerts.

- Web system
  - About 100,000 pages.
  - About 800 pages replaced daily.

- Weekly and Monthly Reports
  - Can be delivered to CUC.
  - http://cxc.harvard.edu/mta/REPORTS

- Team overlap

April 2003 Monthly report

OUTLINE

1. Configuration
2. ACIS
    1. Dose
    2. CTI
    3. Focal Plane Temperature
    4. Bad Pixels
    5. Background
3. HRC – Dose
4. Gratings – Focus
5. PCAD
6. Radiation Zone Timing
7. Quarterly Trends
8. Spacecraft Motions

- **Configuration/Radiation Overview for Apr 2003**
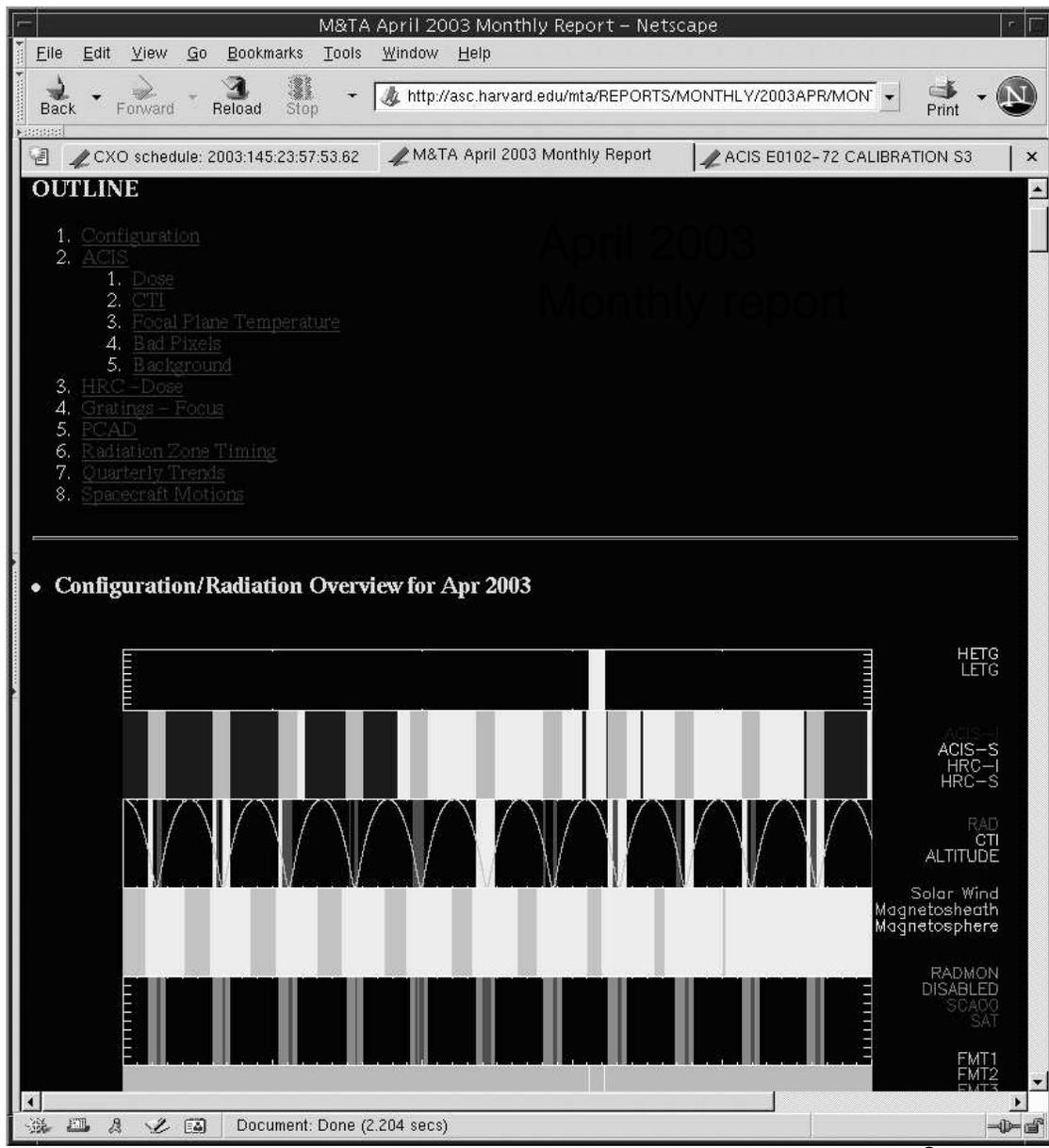
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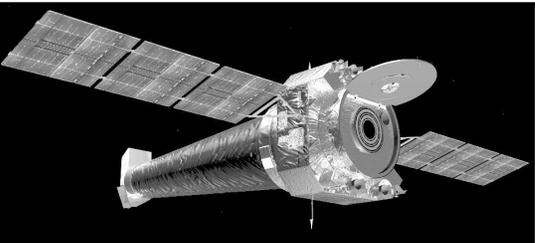
Example: Pointing Control & Attitude Determination

- Celestial Location Monitoring
- IRU – Current draw is higher than expected.
- MUPS – Seem to under-perform when warm.
- Warm Pixels - Increasing at a rate of 2-3% per year.
  - Cooling focal plane to ameliorate.

Dark current histogram (pixels per e−/sec bin)

Legend:
1999:223
2000:326
2001:060
2002:057
2002:137
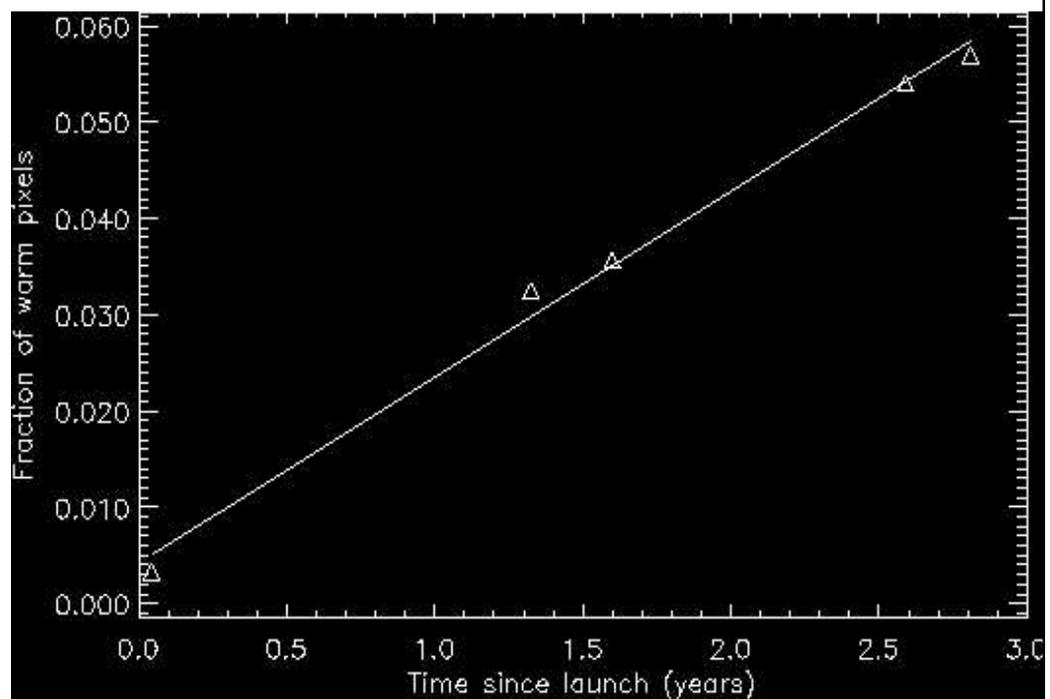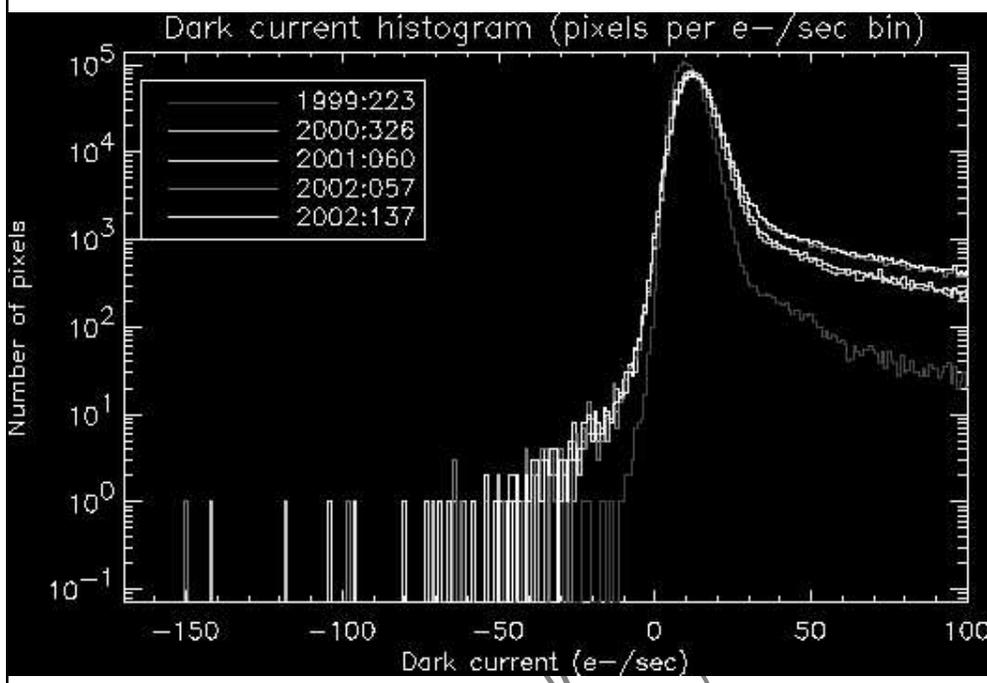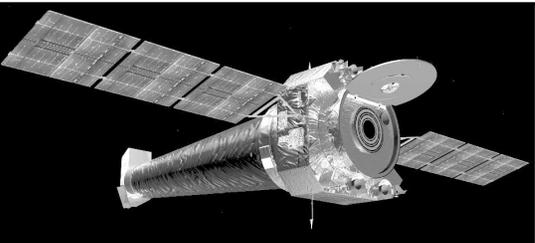
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Long Term Prospects

- Chandra
  - ➤ Focus
  - ➤ Resolving Power
- ACIS
  - ⇔ Low Energy QE
  - ✓ CTI
  - ✓ Bad Pixels
- HRC
  - ✓ Dose

- EPHIN
  - ⇔ Thermal
- SIM
  - ✓ Motions
  - ⇔ Thermal
- PCAD
  - • ACA
    - ⇔ dark current
    - ✓ offsets
  - ⇔ Gyros
  - ⇔ MUPS

While we may need to change our approach in how we operate the spacecraft, there are currently no issues which indicate that the fundamental capabilities of *Chandra* will change within the next 5 years.

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