John Nousek (Penn State University)

Swift Mission Conference - State College, PA – 18 Nov. 2009
Swift launch:
20 Nov 2004 !!
Swift Observatory Status

Swift continues to run smoothly after nearly five years!

- **Observatory Science Up-time:** 97.5%

- **Ground Station Status:** Nominal
  - Malindi 18454 passes since Launch, 98.8% successful
  - USN 1532 passes since Launch, 94.3% successful
  - TDRSS currently providing 99.5% success rate

- **Observatory Status:** Nominal
  - ACS: executed 152811 slews, >99% within 3’ accuracy

- **Observatory Lifetime:** Above prediction

- **Flight Operations Team Response:** Excellent
  - After hours response once every four days

- **Science Operations Team Response:** Excellent
  - Respond to 1.6 ToO requests per day, conduct ~4-8 ToO obs. per day

Statistics from Rob Laverghetta, FOT – as of 31 Oct 2009
Evolution of Swift Operations

• Original prime mission: 2004-2006 – Swift the GRB Explorer
• Up to Nov. 2004 – Pre-launch:
  – Swift primarily a GRB detection and afterglow followup mission
  – Ground-breaking operations design allows immediate response to GRBs
  – Automated follow-up allows introduction of new GRB without new schedule
  – Targets of Opportunity limited to new non-Swift GRBs or rare events
    • Expected schedule re-plans only once / month; ToO once / week
  – Planning using TAKO software / five times a week
• Prime mission – 2005-2006:
  – Execution closely follows plans, except:
    • XRT TEC power supply fails, forcing operations to passively maintain XRT below -50 C
    • Automated target process is great success allowing highly flexible and rapid ToO response
Swift Operations Currently

- 1st mission extension: 2006-2008 – High-z GRBs and the GI Program
  - Swift reduces time on late afterglow followup and increases effort on finding high redshift GRBs
    - Swift introduces GI targets, followed by pressure for increased ToO and monitoring campaigns
  - TAKO planning software modified to incorporate XRT temperature control; other ancillary software improves ACS reliability
  - Improved ToO automation allows multiple ToOs in short period without new schedule (including nights and week-ends)

- Targets of Opportunity and Monitoring Campaigns occur every day
  - Typical load of 4-8 ToO or Monitoring observations every day
Swift Operations Ahead

• 2nd mission extension: 2009-2011 – Swift: the ToO Observatory
  – Swift executes ~70-75 separate pointings per day
    • Each pointing is planned, although significant labor by human science planner to have each pointing a different target
  – Under an initiative approved by 2008 Senior Review, MOC has conducted an Automation Initiative to streamline science planning
  – Elements include:
    • Target management database – MySQL database to automatically ingest target information from ToO requests, target lists from GI approved proposals and GRB information from GCN circulars
    • More highly automated TAKO software – will allow higher automation to XRT temperature control and ACS slew behavior
  – Goal is to allow faster, easier science planning, with capability to increase GI monitoring campaigns and rapid ToO response to large numbers of targets
Conclusions

• Swift has delivered a remarkably successful science mission to date, powered by an innovative operations concept that has continued to evolve as driven by scientific interest.

• The latest changes will enable an even more responsive observatory, giving more GI monitoring and ToO responsiveness.

• For Senior Review 2010, we can present yet another important increase in Swift capability – Can you suggest ways to make this ability into a ‘killer app’?