GLAST Large Area Telescope:

ISOC Subsystems
WBS: 4.1.B

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Review History

- IOC Peer Design Review — August 2001
- LAT PDR/Baseline Review — January 2002
- Delta PDR/Baseline Review — July 2002
- LAT CDR/CD3 — May 2003
- ISOC Peer Review — March 2004

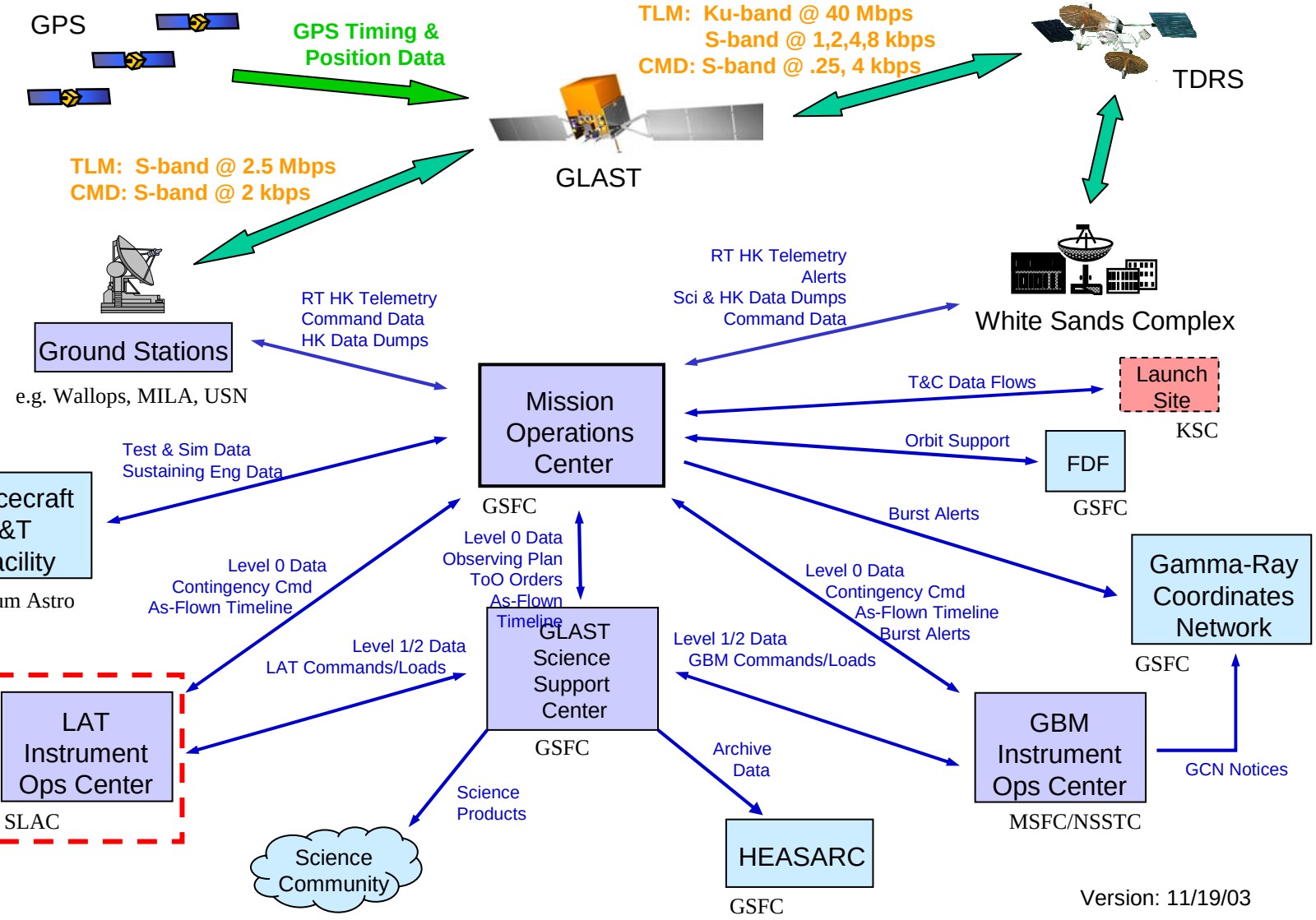
Significant Changes Since Last Lehman Review?

- GLAST Ground System Operation management team in placed
- Completed element peer reviews:
  - GLAST Science Support Center Peer Review
  - Mission Operations Center Peer Review
  - Instrument Science Operations Center Peer Review

Potential Site – KIPAC building at SLAC

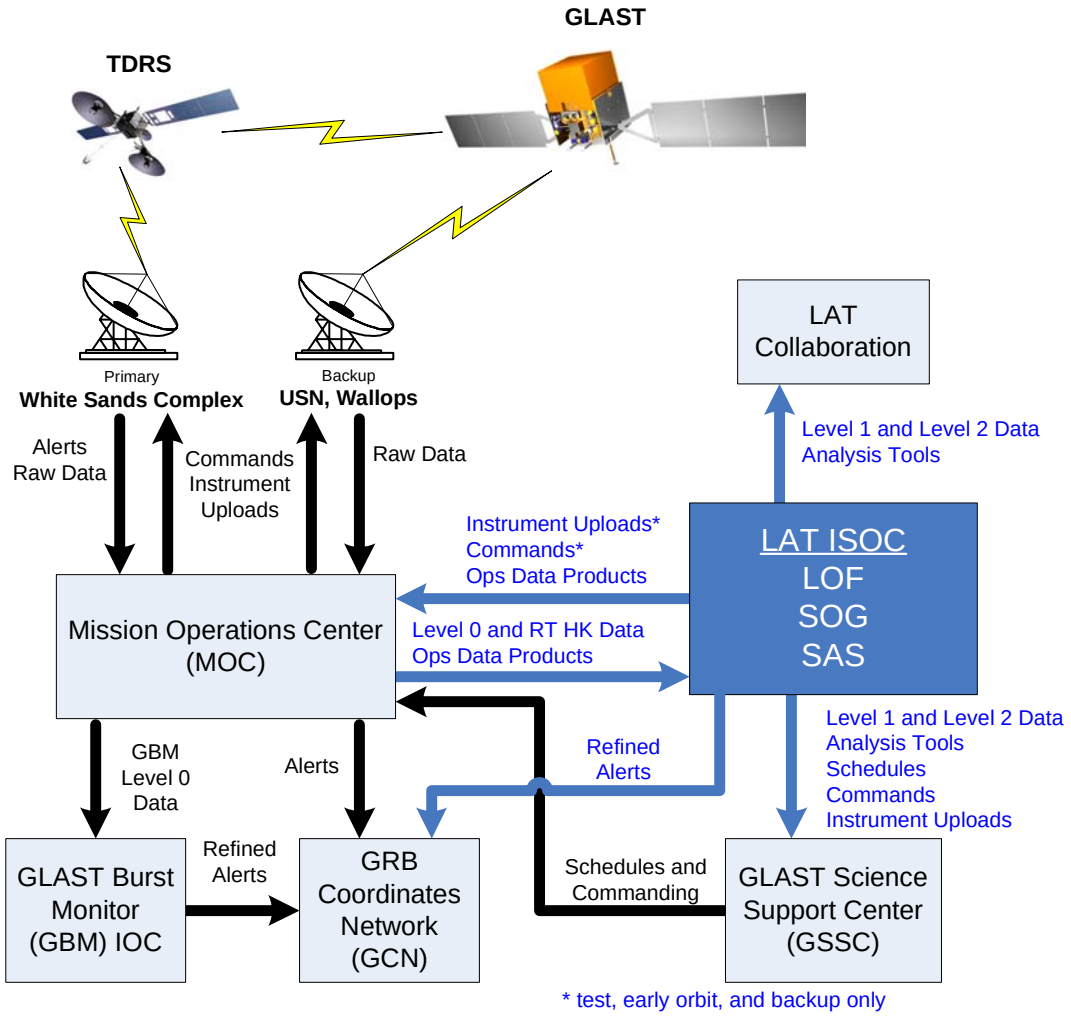
- A Working Group was formed to review the Instrument Operations Center (IOC) implementation plan
  - Formulation of the Science Operations Group within ISOC
- Rebaselined the ISOC budget
- Bill Craig is acting ISOC manager

Mission Block Diagram – Mission View



Version: 11/19/03

Mission Block Diagram – ISOC View



ISOC Mission

- Primary Mission
  - Science
    - Acquisition, Analysis, Calibration, etc…
- Secondary Mission
  - Review and maintain LAT Instrument health and safety
    - Review and trend health and safety telemetry
    - Provide necessary support for contingency operations
      - Immediate health and safety operations are handled at the GLSAT-MOC
  - Configure and maintain the flight data bases
    - Command, telemetry, and calibration
  - Instrument command generation and validation
  - Archive Level 0 telemetry packets and higher-level products

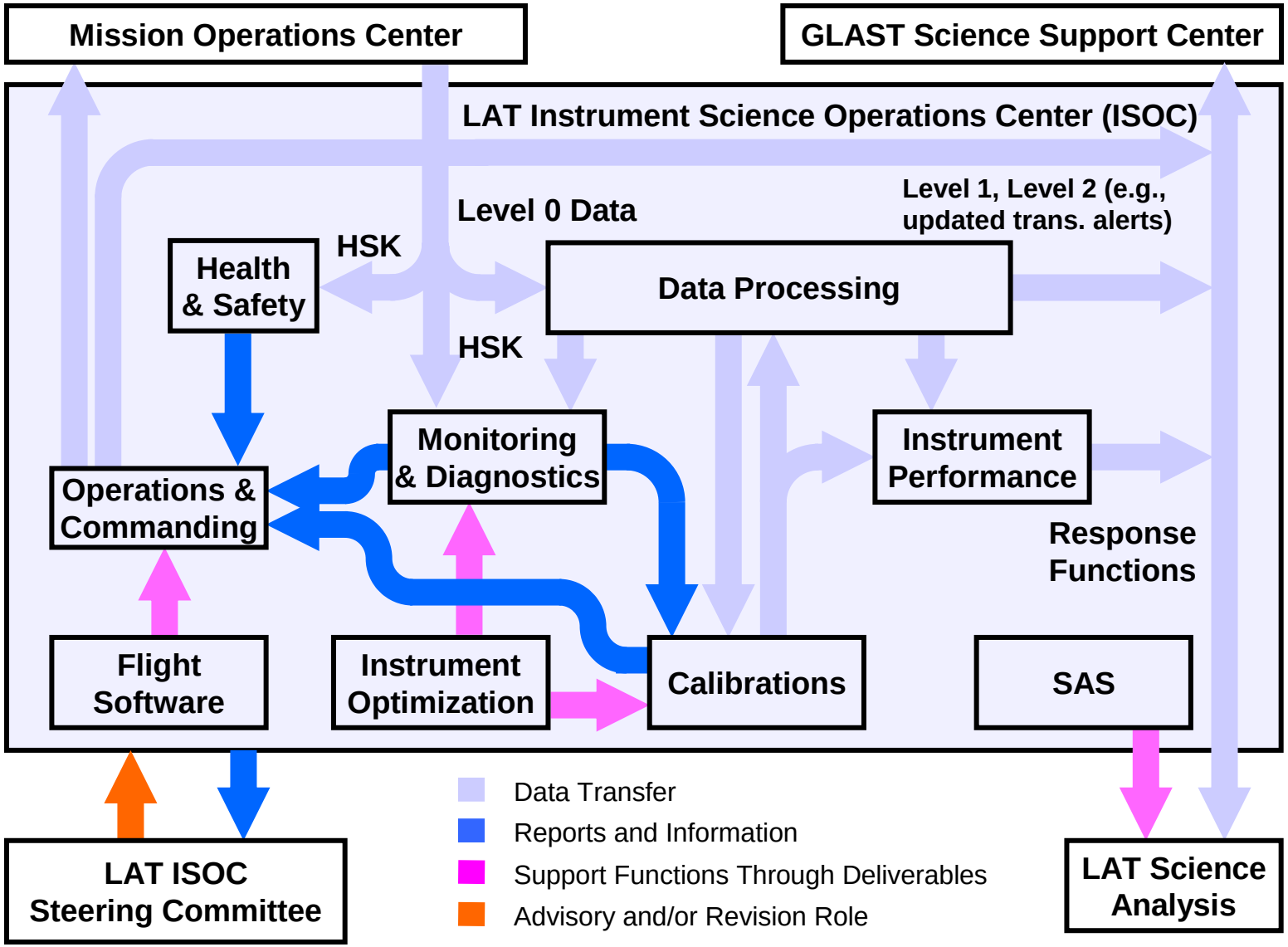
To Meet The Mission

- An Ad Hoc Working Group was formed to review the Instrument Operations Center (IOC) implementation plan
- Members of the Working Group are: S. Digel (chair), E. do Couto e Silva, R. Dubois, P. Nolan, H. Tajima (with participation from S. Ritz, instrument scientist)
- Charge to the working by the Project PI
  - Examine the plans to date for the IOC and, in particular, assess the adequacy of the IOC plan for serving the science needs of the collaboration.
  - Develop an operational picture/description that illustrates the role of each IOC element and the relationships between the elements.
  - Develop a strawman staffing plan that identifies needed full-time (and part-time) scientists, engineers, technicians, etc. Consideration should be given to how I&T activities will eventually phase out and the IOC will become fully operational.
  - Examine examples from other space astrophysics missions (e.g. CGRO/EGRET, SWIFT, Chandra, RXTE, SOHO/MDI., etc.) to understand the "lessons learned" and apply them in the context of GLAST

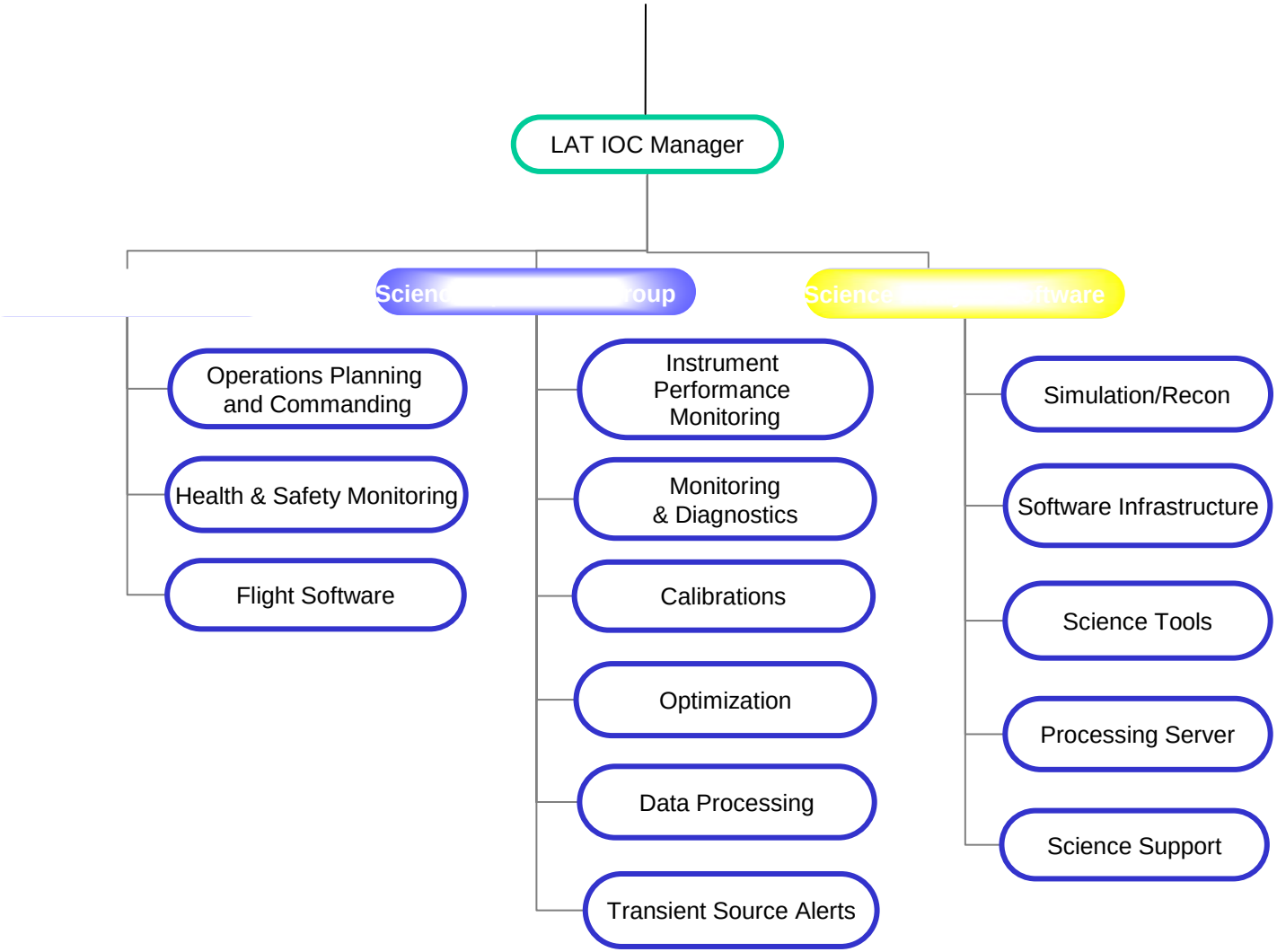
Major Findings from Working Group

- Identified the need for a Science Operations Group within ISOC to support the instrument activities
- Established a preliminary staffing plan/road map for formulating and staffing the ISOC
- Identified the roles and responsibilities for the three major components of the ISOC

ISOC Functional Architecture



ISOC Elements & Functions



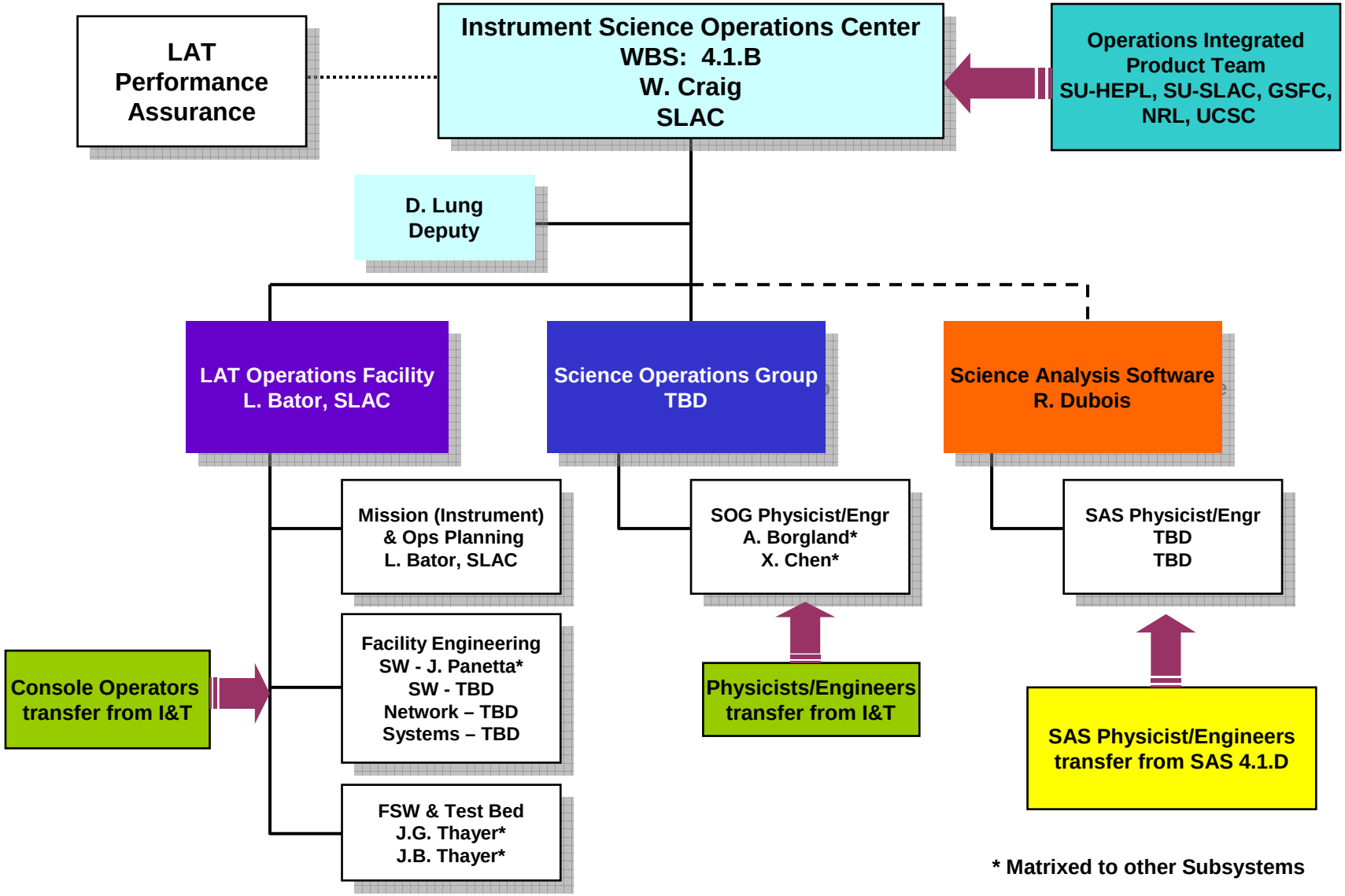
ISOC Elements Description

- **LAT Operations Facility (LOF)**
  - Responsible for day-to-day operations of the LAT instrument and facility
  - Generate and coordinate commanding plans for the LAT instrument
- **Science Operations Group (SOG)**
  - Supports LAT instrument calibration activities
  - Performs LAT instrument activity planning, trending & performance analysis and anomaly investigation
  - Perform sustaining engineering for the LAT instrument
- **Science Analysis Software (SAS)**
  - Performs higher level data processing (Level 1 & 2) using Level 0 data provided by MOC, and provides data products to the GSSC
  - Archives and distributes science data products (for LAT collaborations)

ISOC Design Approach

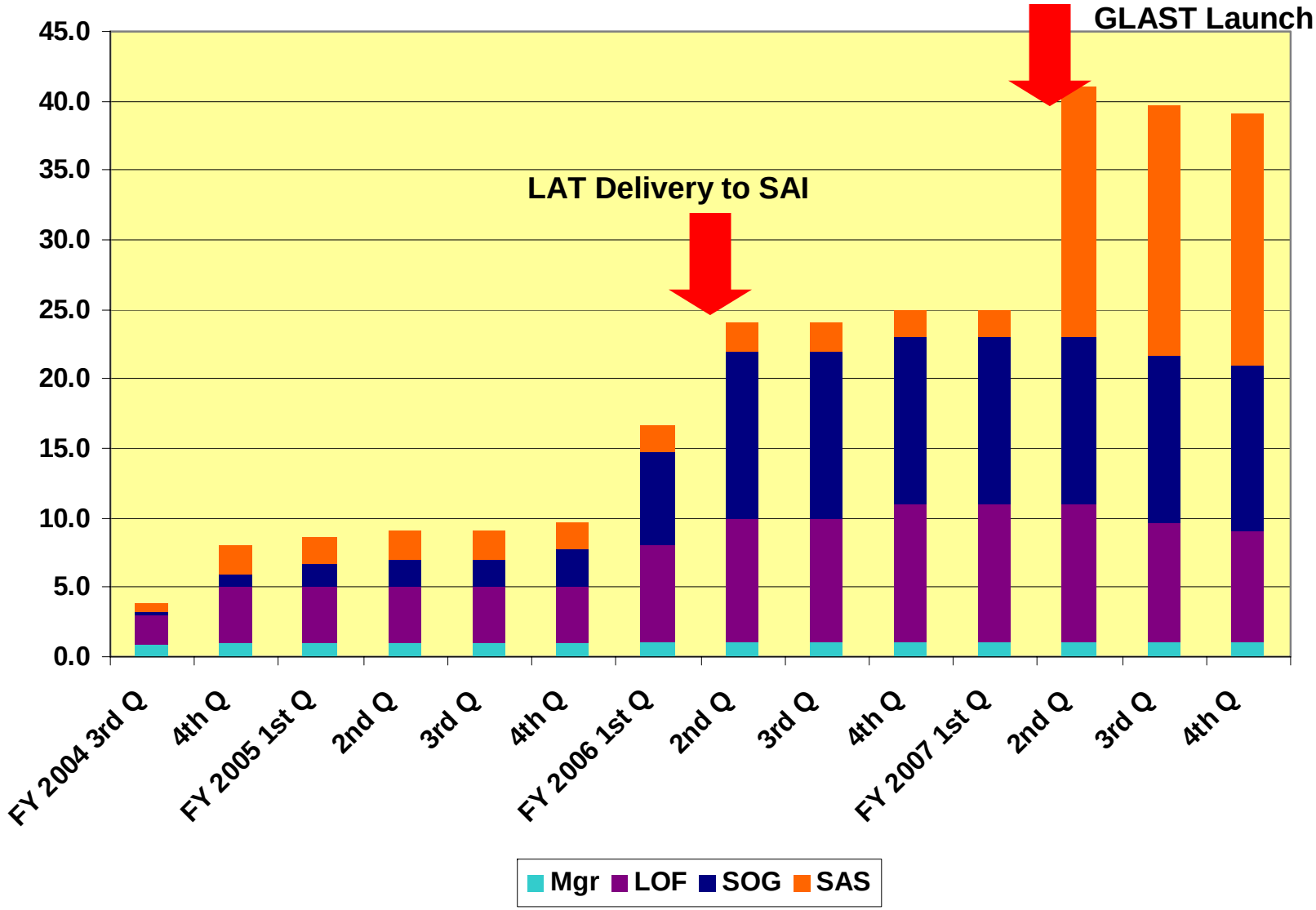
- ISOC design approach is to use as much as possible of the software and tools developed by Electronics, I&T and SAS
  - Many of the ISOC physicist and engineers are matrixed with other LAT subsystem to gain experience
- LOF
  - ISOC ground software and operational tools will be developed and derived in coordination with I&T efforts
  - Command and telemetry database will be developed in coordination with I&T efforts
  - LOF team will include technicians, engineers and programmers who were involved with I&T throughout the instrument integration and testing
- SOG
  - Draw from Science Verification Analysis and Calibration (SVAC) pre-launch efforts
  - Use analysis tools, instrument simulation, and processing pipeline developed by SAS
  - Use or develop additional operational tools from tools used for I&T
  - SOG personnel will include scientists and programmers who were involved with I&T
- SAS
  - Experienced scientists and programmers who have developed the data processing, simulation/reconstruction, science tools and databases in support of Data Challenges and I&T

ISOC Organization



* Matrixed to other Subsystems

ISOC Staffing Plan



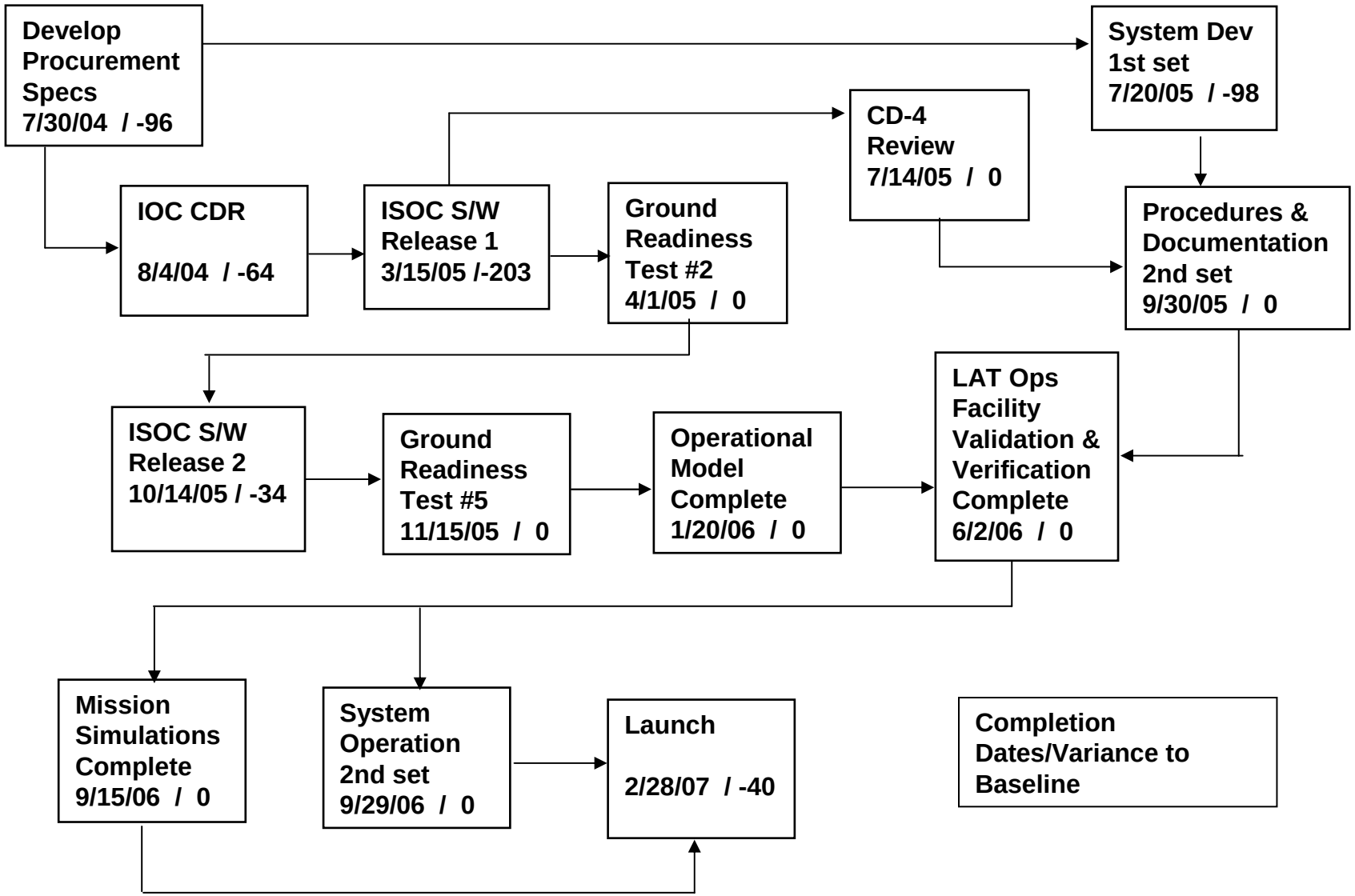
ISOC Peer Review (3/2/04) Summary

- Charge for the review
  - Requirements properly address the principal function of the center
  - ISOC design maturity, qualification and verification planning near CDR level
  - Open design issues and appropriate closure plans
  - Are the design, planning, and formulation of the ISOC properly defined?
- Review was focused on the operation aspect of ISOC
- 20 Request For Action/Recommendations
  - Concern areas are:
    - Staffing profile
    - ISOC organization
  - No significant technical finding or recommendation

Major ISOC Release & Review Dates

• ISOC Detail Design Review	August 4 2004
• LOF SW Release 1 Support GRT #2	March 15, 2005
• LOF SW Release 2 Support GRT #5	October 14, 2005
• Mission Operations Review	October 18, 2005
• Operation Readiness Review	December 15, 2006
• Launch	February 2007

ISOC Critical Path



Approved
Cost Changes Since Rebaseline

- **No significant changes from rebaseline**

(k$)

4.1.B Baseline, November 03	**$326**
Changes:	
Stanford Benefits Rate Increase	**$ 2**
4.1.B Baseline, February 04	**$328**

Road Map to ISOC Detail Design Review

- Establish agreements between the subsystems and ISOC for transitioning the necessary tools and staffing
  - Between I&T and IOSC
  - Between SAS and ISOC
  - Between Electronics and ISOC
- Increase LOF staff
- Address all RFAs/Recommendations from the Peer Review