

Mission Impediments

Early Findings from a Study of 2 SMEX, 2 MIDEX, and 3 Discovery Missions

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Study of Mission Impediments

- See what trips up a smooth mission development and operation and what might be done in AO's and evaluations to prevent these problems
- Seven missions chosen for study
 - Two SMEX missions: GALEX, RHESSI
 - Two MIDEX missions: FUSE, IMAGE
 - Three Discovery missions: Genesis, MESSENGER, Deep Impact
- Approach
 - Prepare for interviews by examining weekly reports to the AA for OSS and monthly reports to the Deputy AA for OSS
 - **<== We are here**
 - Interview Program and Project staff to gain a technical and management understanding of mission impediments and how they might have been prevented
 - Propose improvements to AO's and evaluations

Weekly and Monthly Reports and Their Limitations

- **Weekly reports**

- **Submitted by Project Managers directly to the AA**

- **Tend to focus on accomplishments with occasional, important technical problems**

- **Record is complete but reports are always brief and often opaque**

- **Monthly reports**

- **Prepared by Program Executives for report to the Deputy AA**

- **Focused on programmatic issues: Schedule, cost, and significant technical concerns that threaten schedule & cost**

- **While the information is somewhat more detailed than the weekly reports, the record is incomplete, with many gaps and unreadable files**

- **Monthly reports don't always synchronize well with weekly reports**

- **What's missing**

- **Clear descriptions of technical problems**

- **Information about institutional, management, or process impediments**

- **Information about how problems were solved**

- **Insight into preventing problems like these in the future**

Surprising Finding from Weekly Reports and a Hypothesis

- **Except for two, spin-stabilized missions that both had problems making star trackers work, every other impediment was unique**
- **Hypothesis: Mission development success depends on success in so many technical and management processes that problems do not appear to repeat**
- **Testing the hypothesis: What can prevent a mission development team from paying attention to detail?**
 - **Are these associated with the occurrence of technical and programmatic problems?**

What Can Prevent You From Paying Attention to Detail?

- **No leader**
- **Not enough staff**
- **Inexperience**
- **Clutter**
- **Technical complexity**
- **Organizational conflicts**
- **Proprietary processes**
- **Contractual prohibitions**
- **International regulations**
- **Believing claims of high heritage**

What Can Help You Pay Attention to Detail?

- **Competent team that stays with the mission and worries all the time**
- **Penetrating peer review**
- **Competent independent review, scheduled at appropriate times**
- **Investigating anything that does not go as planned**
- **Threat of cancellation**

Preliminary Findings from Weekly Reports--SMEX

- **GALEX**

- Detector design
- Digitizer board design and performance
- Telescope astigmatism
- X-band transmitter
- Attitude and Power Electronics box during I&T
- NUV and FUV fabrication

- **RHESSI**

- Detector grid fabrication
- Pegasus XL launch vehicle slips
- Vibration test failure at JPL

Preliminary Findings from Weekly Reports--MIDEX

- **FUSE**

- Inertial Reference Unit reliability
- Reaction Wheel reliability
- LEO-T Antenna outages

- **IMAGE**

- Star tracker problems
- Main instruments encountered many fabrication difficulties
- Damage occurred during vibration test
- Several launch delays

Preliminary Findings from Weekly Reports--Discovery

- **Genesis**

- Star tracker design issue
- Sample Return Capsule temperatures higher than expected
- Power Control Assembly failures
- SRC fabrication and test problems
- On-orbit concentrator rejection grid anomaly

- **MESSENGER**

- Spacecraft structure vendor not on schedule
- Propellant tank fails qualification testing
- MLA instrument funding problems

- **Deep Impact**

- Persistent cost and schedule concerns