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Mars Reconnaissance Orbiter CARD Experience and Lessons Learned

NASA Cost Symposium
November 20, 2002

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Section 301 Requirement of FY2001 Authorization Bill

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Before any funds may be obligated for Phase B of a project that is projected to cost more than $150,000,000 in total project costs, the Chief Financial Officer for the National Aeronautics and Space Administration shall conduct an independent life-cycle cost analysis of such project and shall report the results to Congress. In developing cost accounting and reporting standards for carrying out this section, the Chief Financial Officer shall, to the extent practicable and consistent with other laws, solicit the advice of expertise outside of the National Aeronautics and Space Administration.

Expectation

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- 2 JPL projects with prior experience of going through IPAO independent cost analysis process
  - Space Interferometery Mission
  - Starlight
- MRO expected process to be similar which was not the case
- MRO experience unique because IPAO requested that MRO develop a CARD

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Questions

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- What is a CARD?
  - **C**ost **A**nalysis **R**equirements **D**escription
  - Contains enough information about the system to develop a total mission cost estimate
  - Should be flexible enough to accommodate the use of many estimating methodologies
- Why do we need the CARD?
  - ***Consistency***: provides a common source of reference for all cost analysts
  - ***Maintainability***: facilitate recording of changes to the project as the design matures
  - ***Traceability***: capture a point design and use it to reconcile an estimate

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Challenge

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- Project facing many unknowns building a CARD for the first time
  - When is the CARD due?
  - How should we do this?
  - Where do we start?
  - Who is going work on it?
- Reality of the situation
  - Need to develop CARD as fast as possible
  - No one on the project has experience with a CARD
  - JPL has never built a CARD before
  - Everybody on the team is busy

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Approach

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- Get expert help
  - Contact IPAO
  - 2 JPL people brought in to do the work
  - After 1 week, added an engineer to support collection of technical data
- Start with DoD CARD outline as a guide
  - Existing and working format
  - Adapt DoD CARD outline for NASA/JPL
  - Incorporate NASA unique elements
- Collect existing material
  - PIP, proposal, briefings
  - Obtain electronic format whenever possible

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Approach

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- Begin developing the CARD
  - Review material collected
  - Identify useful information
  - Assemble and integrate pieces into document
- Review the CARD
  - Accuracy
  - Content
  - Completeness
  - Organization
- Update CARD and Iterate Review Process
  - Involves many people at different levels
- Submit Draft CARD to IPAO

Results

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- Completed "Draft CARD" in about a month
- CARD was reviewed by IPAO
- Additional data was requested that was appended to CARD as an attachment
- IPAO developed an independent estimate
- MRO has moved on to the next phase of development

Lessons Learned

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- Start the CARD development process early
  - Ideal situation is to be keeping pace with design
  - Fast turnaround
- Detail requested not compatible with maturity of design
  - Understand that this is a "Living" document
  - More detailed information available as design matures
- Utilize available resources to your advantage
  - Don't have to start from scratch
  - Proposal documents, briefing packages, etc

Lessons Learned

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- Project is the owner for the CARD and should be the developer
  - Project office knows the mission best
  - Simplifies the development and review process
- Make the CARD as complete as possible
  - Try to avoid having any unknowns
  - Minimize amount questions that would be asked later

Process Improvement

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- NASA needs a formal CARD policy
  - When is a CARD required?
  - Will it need to be updated and how often?
- Develop a standardized format/template for future NASA missions
  - Manned vs. Unmanned missions
  - Specific formats applicable to maturity of design
- Add CARD development as part of training program for project managers and engineers

Final Thoughts

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- CARD is a valuable tool in the cost community
- Long term benefits
  - Most current data readily available
  - Historical reference
  - Support calibration of costing tools
  - Support development of parametric models
- Something to think about
  - Should the CARD be a requirement for all projects?
  - Should a CARD be developed for past missions?