AO Lessons Learned Workshop

Cost & Schedule Data: How Much is Needed?

Orbital Sciences Corporation
Dulles, Virginia

Ed Belte
Director of Advanced Systems
Science & Technology Programs
Space Systems Group

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belte.ed@orbital.com

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Cost and Schedule Data is Important

- Since Time is Money, Cost and Schedule go Hand in Hand
- NASA Needs to Evaluate Cost and Schedule Credibility

- Items Being Evaluated Include:
  - Are all the Cost Elements Accounted for?
  - Are There Enough $$$ to for the Proposed Mission Schedule (Cost vs. Schedule Duration)
  - Is the Critical Path Understood?
  - Where are Major Decision Points Made?
  - Are the Major Task Time Spans for the Critical Path Items Realistic?
  - Are There Sufficient Resources?
- Level of Assessment Should Vary With AO Phase
  - AO - STEP 1
    - Top Level Assessment of Feasibility
    - Limited Amount of Data Required
  - Phase A Concept Study Report - STEP 2
    - Detailed Level Assessment – Can the PI Really Make it Happen?
    - Significantly More Data Required to Demonstrate a Credible Plan for Execution

Comments to Schedule Requirements

- Regardless of the Mission Size or Complexity a One Page Summary Schedule Should be Included in all AOs and Concept Study Reports
  - An Electronic MS Project Schedule Should Only be Submitted With the CSR
  - Requirements and Guidelines for the Amount of Desired Detail Should be Spelled Out
- Wording Requirements and Table Requirements for all AOs and CSRs Across all Mission Types (SMEX, MIDEX, Discovery, etc . . .) Should be the Same
  - Consistent Wording and Consistent Tables Translate into Less Work (Reinventing the Wheel) for Most Proposers (Since Many are Repeat Proposers)
- Provide Less Detail on Items Which have Less Chance of Significantly Impacting Overall Cost or Schedule; e.g.
  - Less Detail
    - Implementation of the E/PO Program
    - Data Analysis
    - Phase E and F Operations
  - More Detail
    - Instrument Development
    - Significant Spacecraft Development Items (e.g. Electric Propulsion)
    - Deep Space Operations

Comments to Cost Requirements

- Current Level of AO and CSR Cost Requirements Seem Reasonable
- As With Schedule Comments; Wording and Table Formats Need Consistency Across all AO Mission Types
  - For Example, Table 1 of the 2003 SMEX CSR and Figure 1 of the 2006 Mars Scout CSR Ask for Nearly the Exact Same Information – However, the Formats and How the Data is Presented Differ
- Wording in Both the SMEX and Mars Scouts AOs Suggests a "Desire" to Include Detailed Information Which Seems Unnecessary for an AO – The Words "Highly Encouraged" are Read as "Requirement" by Proposers
  - Recommend Deletion of all "Highly Encouraged" Statements – State What is Required and Delete the Rest
- In the 2007 SMEX AO a Requirement was Added to Include Table B8
  - It is Unclear What Table B8 Adds to the Ability to Understand Proposed Costs and Cost Risk

TABLE B8
FULL TIME EQUIVALENTS, WORK YEAR EQUIVALENTS,
AND EFFECTIVE DIRECT COSTS

Organization	NASA Civil Servant FTEs	Other Civil Servant FTEs	JPL Employee WYEs	Other Contractor WYEs	Effective Direct Costs (FY 2008)
PI organization					
other organizations					

Specify each organization in Table B8 in a separate row. All entries should be cumulative over the proposed baseline mission life, and costs should be in FY 2008 dollars.

Cost and Schedule Data Detail Should Vary With AO Phase

- The AO Response Should:
  - Demonstrate that Mission Element Cost Distribution and Schedule Durations are Consistent With Past Missions
  - Contain a Top Level Summary per Major Element to Allow Feasibility Evaluation
  - Provide Appropriate Details on "New Developments"
  - Show Sufficient Reserves
  - Address Funding Constraints
- The Concept Study Report Should:
  - Provide Details on Cost Elements for a Full Evaluation Down to the Subsystem/Major Component Level
  - Contain a Complete Detailed MS Project Schedule for all Mission Activities
  - Maintain Reserve Levels
  - Provide a Full Accounting of All Mission Costs
  - Contain a "Full Up" Plan that Demonstrates Cost and Schedule Credibility Within the Cost Cap

Back-up Slides
With Suggested Wording Changes to AO and CSR Paragraphs

Suggested Wording for Schedule Requirements in all AOs:

A Summary Project Schedule (Not Exceeding a Single Page) to Meet The Proposed Launch Date Which Covers Phase B Through Phase F of the Investigation Must be Proposed. The Summary Schedule Must Include The Following Major Project Review Dates:

- **System Requirements Review**
- **Mission PDR & CDR**
- **Confirmation Review**
- **Instrument Pre-Ship Review(s)**
- **Environmental Test Readiness Review**
- **Launch Site Pre-Ship Review**
- **Launch Readiness Review**

Instrument Development Spacecraft Bus Development, Instrument-to-Spacecraft/Host Integration and Test, Launch Vehicle Integration and Launch, Mission Operations, Schedule Critical Path and Funded Schedule Reserve Must be Clearly Identified.

Suggested Wording for Schedule Requirements in all CSR Reports:

A Summary Project Schedule (Not Exceeding a Single Page) to Meet The Proposed Launch Date Which Covers Phase B Through Phase F of the Investigation Must be Proposed. The Summary Schedule Must Include The Following Major Project Review Dates:

- **System Requirements Review**
- **Mission PDR & CDR**
- **Confirmation Review**
- **Instrument Pre-Ship Review(s)**
- **Environmental Test Readiness Review**
- **Launch Site Pre-Ship Review**
- **Launch Readiness Review**

Instrument Development Spacecraft Bus Development, Instrument-to-Spacecraft/Host Integration and Test, Launch Vehicle Integration and Launch, Mission Operations, Schedule Critical Path and Funded Schedule Reserve Must be Clearly Identified.

Proposers must also electronically submit a detailed MS Project Schedule. As a guideline, the schedule should not exceed approximately x,xxx line items. The schedule should not depict non-critical tasks that are less than one day in duration. The schedule and workflow for the complete mission life cycle must be clearly defined. Schedules for all major activities, interdependencies between major items, deliveries of end items (component/box-level), critical paths, funded and unfunded schedule margins, and long-lead procurement needs (defined as hardware and software procurements required before the Confirmation Review should be clearly identified. Any essential technology developments and decision points as well as major Engineering Test Units should be included. The schedule must also include a level 2 software build and delivery schedule that clearly indicates the relationship of the deliveries to the system integration and test activities from the start of test bed level testing all the way through final spacecraft level tests prior to launch must also be included.

Suggested Wording for "Highly Encouraged" Statement(s) in SMEX and Mars Scout AO

Although not a requirement, the proposers are highly encouraged to provide the following items, which will not be counted against the page limit, to enable the validation of their costs.

- **MEL**
- **WBS**
- **WBS Dictionary**
- **WBS Cost Table**
- **Basis of Estimate Details**

Recommend Rewriting This Statement as Follows:
Proposers are required to provide a Master Equipment List, which will not be counted against the page limit, to enable the validation of their costs.