



# Proposed Budget Evaluator's View

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# Goal of TMC Cost Evaluation

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- To tell Selection Official whether proposed mission can be executed for the proposed cost
  - Desire to avoid repeat of 1999 SMEX-lite experience
  - Need to understand technical and programmatic baseline
  - Want to know that proposer has taken concept far enough to have some confidence in executability within program constraints
- TMC tries to not rely solely on cost model results
  - Try to use model results as indicators of areas to look at more closely
  - Assumption that proposers understand their costs better than TMC panel
  - Proposal is their chance to educate TMC on their proposed project
- Cost data in tables and appendices can often provide answers to TMC questions



# SMEX AO Cost Tables – B3 & B4

- Goal of table is to show costs in a format that is consistent across proposals
- Also provides a consistent format for presentation of TMC estimate results
  - A typical Step 1 can be 30 (or more) proposals
- We suspect this is a tricky table for proposers
  - We see lots of mistakes in this table
  - Not directly traceable to typical WBS
- Historically was more important when fewer people used a standard or product-oriented WBS
- Today we have a NASA standard WBS
  - May be time to retire this table

TABLE B3  
TOTAL MISSION COST FUNDING PROFILE TEMPLATE  
FOR SMEX INVESTIGATIONS  
(FY costs<sup>1</sup> in Real Year Dollars, Totals in Real Year and 2008 Dollars)

Cost Element	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2008)
Phase A									
Phase B									
Reserves									
Phase C/D									
PMMA/SE <sup>2</sup>									
Instruments*									
Instrument IAT <sup>3</sup>									
Spacecraft Bus									
Spacecraft IAT <sup>3</sup>									
Other HW Elements*									
Launch + 30 Days Ops									
Science Team									
Pre-Launch GDS/MCS <sup>4</sup>									
EPO <sup>7</sup>									
DSN <sup>8</sup>									
Other*									
Instrument Reserves									
Spacecraft Reserves									
Other Reserves									
Phase E									
PM <sup>6</sup>									
Science Team									
MO&DA <sup>5</sup>									
DSN <sup>8</sup> /Tracking									
EPO <sup>7</sup>									
Other*									
Reserves									
Phase F									
PI Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
4-Month Bridge Phase <sup>9</sup>									
Contributions									
For Each Element Above*									
Total Contributions	\$	\$	\$	\$	\$	\$	\$	\$	\$
Total Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
SBO Activities <sup>8</sup> (specify)									
Total Enhanced Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$



# SMEX AO Cost Tables – B5

- Goal of table is to show costs by Phase in an easy-to-read format
- Good for understanding proposed spending profile
- Probably pretty easy to prepare
- Same data could be conveyed in a well-planned WBS table, but probably easier to keep as a separate table

TABLE B5  
MISSION PHASE SUMMARY FOR COST  
(FY costs<sup>1</sup> in Real Year Dollars, Totals in Real Year and 2008 Dollars)

Mission Phase	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2008)
Phase A/B									
Phase C/D									
Phase E									
Phase F									
PI Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions									
Total Mission Cost									
SEO Activities									
Total Enhanced Mission Cost									

1 Costs must include all costs including any fee



# SMEX AO Cost Tables – B8

- New table for SMEX AO
- Was not useful for cost reviewers
- Probably difficult to prepare
- More important to see time commitments for key individuals

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.



## Older Tables

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- Recurring / Non-recurring split
  - Not useful and difficult to prepare
- Breakdown of Labor, Material, Subcontracts, etc.
  - Occasionally useful
  - Always frustrating that costs were not totaled
- Cost by Organization
  - Often useful for understanding relative roles of different institutions
  - Not requested in AOs any more
  - Could get same data from WBS table with a WBS dictionary or some other mapping of WBS elements to organizations



# WBS Table – The Only One We Need?

- All proposers are required to use a NASA standard WBS at level 2
- Preparing a table showing columns with Fiscal Year and Rows with WBS element should be relatively easy
- TMC evaluation should be doable if everyone sticks to standard WBS
- WBS should be shown down to level proposers used to prepare estimate

	Phase A/B			Phase C/D				Phase E				
WBS Element	FY1	FY2	Total	FY2	FY3	FY4	Total	FY4	FY5	FY6	Total	Project Total
WBS 1.0 PM												
WBS 1.1												
WBS 1.2												
WBS 2.0 SE												
WBS 2.1												
WBS 2.2												
WBS 2.3												
.												
.												
.												
Project Total												



# Basis of Estimate

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- TMC wants to be confident that proposed cost is adequate
- Cost tables are not enough to provide this confidence
- Look at proposal text and appendices for additional clues
  - Estimate preparation description
    - Most proposals include some variation of: “Grassroots by performing organization with reviews by several levels of management”
    - If some or all of the proposed cost is based on something other than grassroots (models, analogies, other), that is important information
  - Validation
    - We like to see results of cost models or independent estimates
      - Not enough to say it was done, we want to see the results and a discussion of any significant discrepancies
    - We really like comparisons with past projects – more on next chart
  - WBS dictionary
    - Very useful for understanding project’s book-keeping
    - Same information can be conveyed with good estimate preparation description of BOE sheets
  - BOE sheets
    - Wide range in evaluator opinion on usefulness of BOE sheets
    - Probably more data than we need for Step 1





# Comparison With Past Projects

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- All proposals claim extensive heritage in technical sections
- If heritage is valid, then cost of heritage systems should provide a good sanity check on proposed costs
- We try to do this in TMC validation, but we do not have access to costs for all past projects
- This type of comparison has been requested in AOs for years, but is very rarely provided in proposals
  - Some proposals will say it is done without showing results
- Very convincing when it is done well
  - Show cost of heritage item, discuss any significant technical or programmatic differences, and provide a rationale for the proposed cost
- SMEX heritage tables were partially an attempt to solicit this type of comparison
  - Non-cost reviewers may have other reasons for the SMEX heritage tables



# Cost Risk Analysis (S-curves)

AO  
Cost/Schedule  
Workshop

- Movement in the cost community towards the use of probabilistic cost risk analysis
- Some desire to see S-curves in proposals
- Some desire to see TMC estimates shown as S-curves
- No consensus standards for how to do analysis
- Tremendous variety in processes today
- Currently no penalty for leaving it out of proposal
- Likely to become a requirement, but we need to think about how we will use this information before we start requiring it



# Other Feedback From the Cost Team

AO  
Cost/Schedule  
Workshop

- AO should not specify a funding profile
  - Let proposers show what they need
  - If adequate early funding is not available, then AO should have been postponed
- AO should not specify required level of cost reserves
  - Proposer should propose what they think they need and provide a rationale for that level
- Funded schedule reserve should be kept separate from cost reserves
  - Traditionally handled that way by most proposers, but SMEX AO combined them
- If a project has descopes, we want to see values for the projected savings in cost, mass, or other resources
  - Should specify what time the estimates of savings are valid
- EPO does not need to be evaluated in Step 1
  - Not a discriminator