Earth Venture Instrument – 5
Technical, Management, and Cost Evaluation
Pre-Proposal Web Conference

Third Stand Alone Missions of Opportunity Notice
Announcement of Opportunity NNH17ZDA004O,
Earth Venture Instrument - 5
Program Element Appendix K
July 19, 2018

Outline

Introduction

EVI-5 PEA K

TMC (Technical, Management, and Cost) Evaluation

Accommodations

References

Questions

Introduction

Purpose of this Presentation

1. Present a short overview of the Technical, Management and Cost (TMC) Evaluation of proposals submitted as a result of the Earth Venture Instrument-5 (EVI-5) Program Element Appendix (PEA) K of the Third Stand Alone Missions of Opportunity Notice (SALMON-3) Announcement of Opportunity (AO).
2. Present some EVI-5 PEA K reminders
3. Point to reference documents
4. Answer questions

Important Note: This PEA is to the SALMON-3 AO. All proposers must read this PEA & the SALMON-3 AO carefully, and all proposals must comply with the requirements and constraints contained within the two documents.

EVI-5 PEA K

EVI-5 PEA K

CubeSat Investigations: PEA Section 4.6.2

Requirement K-18: All CubeSat investigations proposing compliance with the requirements in the NASA Launch Services Program, Program Level Dispenser and CubeSat Requirements Document shall propose CubeSat form factors (size) no larger than 6U, with qualifying form factors of 1U, 1.5U, 2U, 3U, 6U (2x1x3). **Also, 1x1x6 form factors deployed from the ISS *that* meet LSP requirements**. Concepts that do not comply with these standards shall clearly describe how their designs are packaged and deployed. CubeSat form factors larger than 6U will not be considered.

EVI-5 PEA K

Payload Risk Classification: PEA Section 4.6.4

NASA's Science Mission Directorate has defined a new approach to managing Class-D science missions. Described in NASA Science Mission (SMD) Class-D Tailoring/Streamlining Decision Memorandum, this approach was approved by SMD leadership to guide the implementation of Tailored Class D investigations. Links to this document, along with other Class-D policy and guideline documents, can all be found in the EVI-5 Library. All Class D instrument and/or CubeSats proposals must use the principles, guidelines, and approaches described in these documents and are thus considered to be Tailored Class D Investigations.

Proposals responding to NASA AOs that are proposed to be in the other risk classes (i.e., A, B, or C), or are proposed as Class D but have lifecycle costs greater than $150M, may also contain proposed adjustments to NASA requirements. Proposers must identify the tailorable requirements described in NPR 7120.5E that are being adjusted, provide a rationale for the adjustment, and describe any cost or schedule impacts that would occur should the adjustment be rejected by NASA. The panel evaluating the third evaluation criterion, TMC Feasibility of the Proposed Investigation Implementation, will also provide comments to the Selection Official on the proposed adjustment and its justification. These comments will not be considered for the TMC Feasibility of the Proposed Investigation Implementation risk rating but may be considered in the selection decision.

EVI-5 PEA K

Classified Materials : PEA Sec 5.2.1 supersedes SALMON-3, 5.9.4

In order to increase the capabilities of investigations proposed in response to this PEA, while minimizing the development and operations risks within the PIMMC, proposers may choose to leverage technology with classified heritage that was developed by other institutions and agencies as well as technology developed by NASA and NASA-funded partners. NASA allows 3 options to support heritage claims from classified programs.

Delivery to NASA

The delivery to NASA option of a classified appendix regarding heritage requires delivery to NASA Headquarters (HQ) separately from the proposal. A single copy of the classified appendix regarding heritage must be submitted along with a cover letter referencing the submitted proposal by name, PI, and proposing organization.

Delivery in Place

Proposers may choose to utilize the option for "delivery in place" of the classified appendix regarding heritage, where the classified material is not delivered to NASA but is kept at the point of origin.

Sponsor Verification

Proposals that include technologies with classified heritage may utilize sponsor verification. This option is only available if the sponsor organization is not a team member in the proposal. Such proposals would only reference classified materials, including associated cost basis of estimates; the materials would not to be provided to NASA in any format. In lieu of a direct review of the classified materials, the evaluation panel will compile a list of questions regarding claims made in the proposal that need to be substantiated by the classified material. The list would be sent to the sponsor of the classified programs who must verify that the claims are supported.

TMC Evaluation

TMC Evaluation

Evaluation Criteria

Evaluation Criteria from Section 7.2 of the SALMON-3 AO:

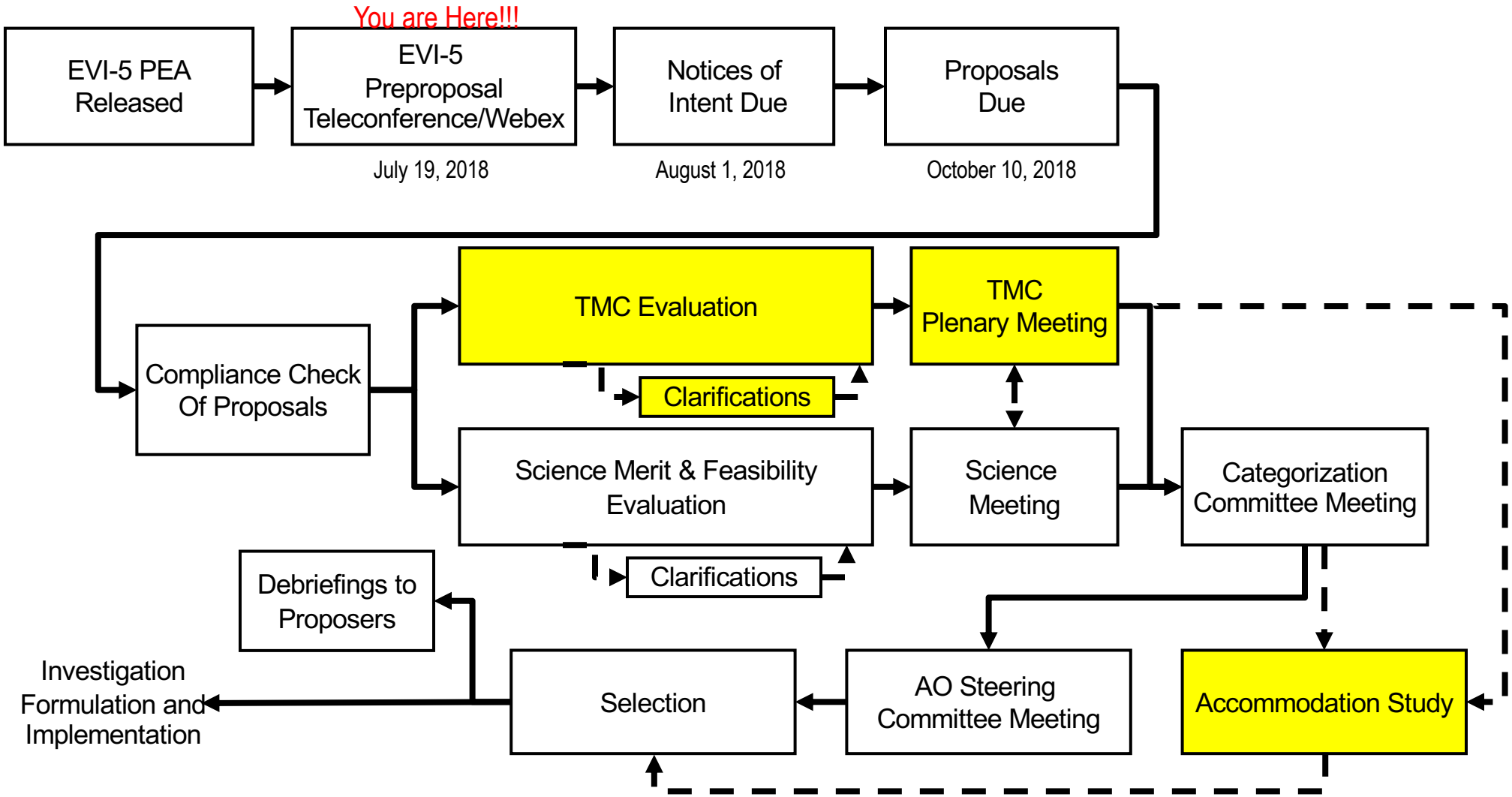
1. Intrinsic Science, Exploration, or Technology Merit of the Proposed Investigation (Science Panel);
2. Experiment Science, Exploration, or Technology Implementation Merit and Feasibility of the Proposed Investigation (Science Panel);
3. **TMC Feasibility of the Proposed Investigation Implementation (TMC Panel).**

Weighting: the first criterion is weighted approximately 40%; the second and third criteria are weighted **approximately 30%** each.

TMC Evaluation: The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented **as proposed**, including an assessment of the likelihood of their completion within the proposed cost and schedule.

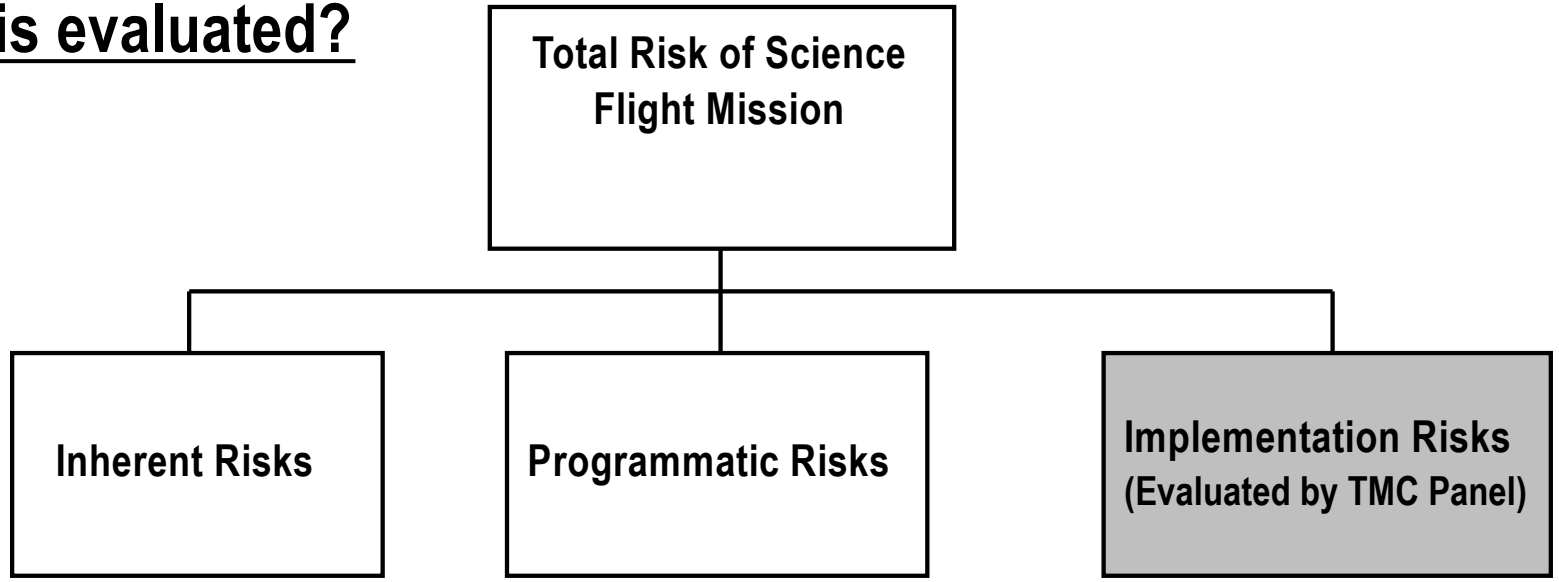
TMC Evaluation

EVI-5 PEA Solicitation, Evaluation and Selection Flow



TMC Evaluation

What is evaluated?



Risks that are unavoidable to do the investigation:

- Launch environments
- Space environments
- Mission durations
- Unknowns
- Etc.

Risks that are uncertainties due to matters beyond project Control:

- Environmental Assessment approvals
- Budgetary uncertainties
- Political impacts
- Late/non-delivery of NASA provided project elements
- Etc.

Risks that are associated with implementing the investigation:

- Adequacy of planning
- Adequacy of management
- Adequacy of development approach
- Adequacy of schedule
- Adequacy of funding
- Adequacy of Risk Management (planning for known & unknown)

TMC Evaluation

TMC Evaluation Purpose and Principles

TMC evaluation purpose: to assess the likelihood that the submitted investigations' technical and management approaches can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

- Basic Principles:
  - It is assumed that the proposer is the expert on his/her proposal.
  - Proposer's task is to demonstrate that the investigation implementation risk is low.
  - TMC panel's task is to try to validate proposer's assertion of low risk.

- Merit is to be assessed on the basis of material in the proposal. All Proposals are evaluated to identical standards and not compared to other proposals.
- TMC Panels consist of evaluators who are experts in the factors that they evaluate.
- TMC Panels develop findings for each proposal - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses). Risk Ratings should reflect the written strengths and weaknesses.
- The Cost Analysis is integrated into overall Risk Rating.
- Proposal Risk Assessment: Proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.

TMC Evaluation

TMC Panel Evaluation Factors

Factors C1 – C5: TMC Feasibility of the Proposed Investigation Implementation: Please refer to Section 7.2.4 of the SALMON-3 AO for details. These factors are evaluated as applicable for each proposed investigation.

- Factor C-1. Adequacy and robustness of the instrument implementation plan.
- Factor C-2. Adequacy and robustness of the investigation design and plan for operations.
- Factor C-3. Adequacy and robustness of the flight systems. *(CubeSats Only)*
- Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
- Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.

TMC Evaluation

TMC Panel Evaluation Findings Definitions

- **Major Strength:** A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.

Note: Findings that are considered "as expected" are not documented in the Form C.

TMC Evaluation

Potential Major Weaknesses Clarification Process

NASA is requesting clarifications of Potential Major Weaknesses (PMWs) identified by the evaluation panels in all three criteria; Intrinsic Science Merit of the Proposed Investigation, Experiment Science Implementation Merit and Feasibility of the Proposed Investigation, and TMC Feasibility of the Proposed Investigation Implementation.

- NASA requests such clarification uniformly, from all proposers.
- All requests for clarification from NASA and the proposers' responses are in writing.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers.
- PIs whose proposals have no PMWs are informed that no PMWs have been identified at that time.
- The form of the clarifications is strictly limited to a few types of responses:
  - Identification of the locations in the proposal (page(s), section(s), line(s)) where the PMW is addressed.
  - Noting that the PMW is not addressed in the proposal.
  - Stating that the PMW is invalidated by information that is common knowledge and is therefore not included in the proposal.
  - Stating that the analysis leading to the PMW is incorrect and identifying a place in the proposal where data supporting a correct analysis may be found.
  - **Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside of the proposal**.

The PIs are given at least 24 hours to respond to the request for PMW clarification. Any response that goes beyond the five forms of clarification stated above will be deleted and not shown to the evaluation panel.

TMC Evaluation

Scientific/Technical Evaluation : Additional Considerations

As an amendment to the evaluation criteria given in Section 7.2 of the SALMON-3 AO, the evaluation of the TMC Feasibility of the Proposed Investigation Implementation, includes the following exception to Factor C-4:

- Factor C-4, adequacy and robustness of the management approach and schedule, including the capability of the management team, is amended for Tailored Class D instrument and CubeSat investigations to assess the qualifications and experience of the management team as a whole as opposed to assessing the capabilities of each of the Key Team Members independently. The panel may provide comments to the Selection Official on the relevant managerial experience of the PI and on whether appropriate mentoring and support tools are in place. Any such comments will not contribute to the TMC Feasibility of the Proposed Investigation Implementation risk rating.

TMC Evaluation

TMC Cost Analysis

Process Steps:

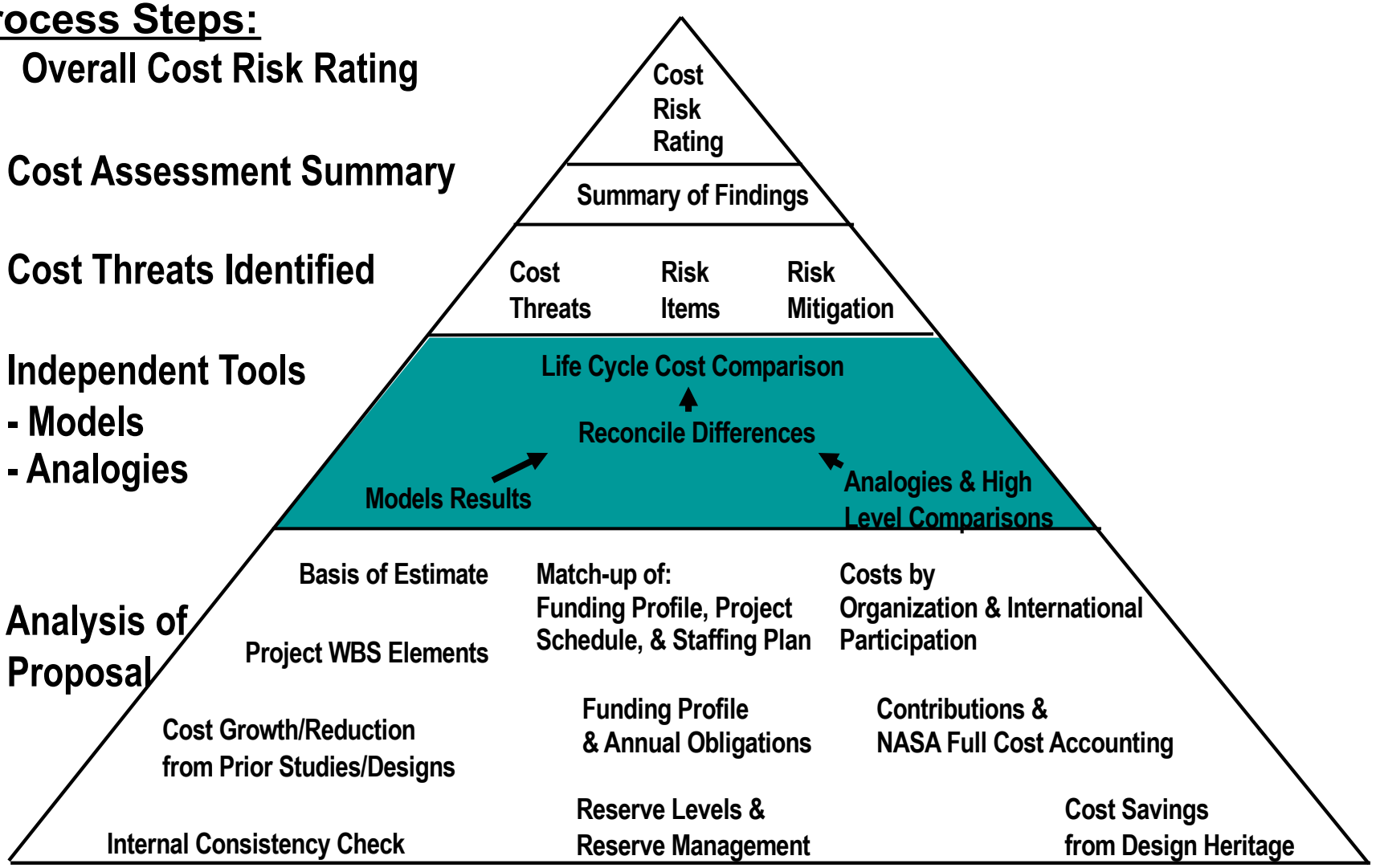
5. Overall Cost Risk Rating

4. Cost Assessment Summary

3. Cost Threats Identified

2. Independent Tools
   - Models
   - Analogies

1. Analysis of Proposal



TMC Evaluation

TMC Cost Analysis: Cost Threat Matrix

The likelihood and cost impact, if any, of each weakness is stated as "This finding represents a cost threat assessed to have an Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Very Minimal/Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations, **which results in a reduction from the proposed unencumbered reserves**."

- The likelihood is the probability range that the cost impact will materialize.
- The cost impact is the best estimate of the range of costs to mitigate the threat.

The cost threat matrix, below, is populated by the cost estimator with dollar amounts of the expected cost impact.

		Cost Impact (CI, % of PI-Managed Mission cost to complete Phases A/B/C/D or % of Phase E not including unencumbered cost reserves)					
		Very Minimal (1% < CI ≤ 2.5%)	Minimal (2.5% < CI ≤ 5%)	Limited (5% < CI ≤ 10%)	Moderate (10% < CI ≤ 15%)	Significant (15% < CI ≤ 20%)	Very Significant (CI > 20%)
Likelihood (L, %)	Almost Certain (L > 80%)						
	Very Likely (60% < L ≤ 80%)						
	Likely (40% < L ≤ 60%)						
	Possible (20% < L ≤ 40%)						
	Unlikely (L ≤ 20%)						

TMC Evaluation

TMC Cost Risk Definitions (1 of 4)

The three criteria below are indicators of Cost Risk. Evaluators must consider these criteria and other relevant information (e.g., cost model applicability, uncertainty of the cost models error bars, effect of cost issues that fall below the minimum cost threat threshold, likelihood of cost impacts, mitigating factors such as major strengths, etc.) together with their judgement in determining the appropriate Cost Risk for a particular investigation.

Three criteria are considered for the determination of the Cost Risk for a proposed investigation; 1) The level of unencumbered reserves after any reduction by TMC identified cost threats; 2) The comparison of proposed cost with the TMC Base Independent Cost Estimate considering the appropriate error bars; and 3) The proposed cost, including reserves, supported by material in the proposal.

Appropriate Cost Reserves are defined as the minimum unencumbered reserves required by the Announcement of Opportunity (AO), or higher as judged by the TMC evaluation panel based on the justification provided by the PI (Principal Investigator). Unencumbered cost reserves higher than the minimum AO requirement may be necessary for some investigations, such as those requiring specific technology maturation.

TMC Evaluation

TMC Cost Risk Definitions (2 of 4)

Low Risk

- No cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of all modelled lower Work Breakdown Structure (WBS) levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is very well supported by the information in the proposal.

Low/Medium Risk

- No cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of most modelled lower WBS levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is well supported by the information in the proposal.

TMC Evaluation

TMC Cost Risk Definitions (3 of 4)

Medium Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost or the cost of most modelled lower WBS levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is mostly supported by the information in the proposal.

Medium/High Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost or the cost of most modelled lower WBS levels are lower than the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is not well supported by the information in the proposal.

TMC Evaluation

TMC Cost Risk Definitions (4 of 4)

High Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves significantly below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of most modelled lower WBS levels are significantly lower than the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is not supported by the information in the proposal.

TMC Evaluation

TMC Risk Ratings

TMC Evaluation: to assess the likelihood that the submitted investigations' technical and management approaches can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

Based on the narrative findings, each proposal is assigned one of three risk ratings, defined as follows:

- **LOW Risk**: There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the proposer's capability to accomplish the investigation well within the available resources.
- **MEDIUM Risk**: Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Investigation design may be complex and resources tight.
- **HIGH Risk**: One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.

Note: Only Major Findings are considered in the risk rating.

Accommodations

Accommodations

Instrument Investigations: PEA Section 4.6.1

Requirement K-17. Proposals for instrument investigations that will be accommodated on a NASA selected platform shall clearly state the proposed instrument mass, volume dimensions, power requirements, platform stabilization requirements, thermal requirements, observational geometry requirements, launch vibration constraints, electromagnetic interference / electromagnetic compatibility (EMI/EMC) requirements, data rate requirements, and all other requirements (or constraints or preferences) that the instrument places on the platform for accommodation, launch, deployment, and operations. A "Template for EVI Accommodation Worksheet" is provided on the EVI-5 Library to aid proposers to provide these data. This table shall be provided in the experiment implementation section (Section E) of the proposal. **This table does not count towards the proposal page limit.**

Accommodations

Scientific/Technical Evaluation: PEA Section 6.1

The panel evaluating the third evaluation criterion, TMC Feasibility of the Proposed Investigation Implementation, will also provide comments to NASA regarding the extent to which the proposed instrument is compatible with potential satellite platform interfaces and operations or the CubeSat mission is compatible to potential launch opportunities. These comments will not be considered for the TMC Feasibility of the Proposed Investigation Implementation evaluation.

After the evaluation, but prior to the selection decision, NASA will perform an accommodation study of selectable instrument investigation proposals to assess the extent to which the proposed instrument is compatible with potential satellite platform interfaces and operations. This accommodation study will also consider the accommodations of selectable CubeSat proposals for launch.

References

EVI-5 Acquisition Homepage

The EVI-5 Acquisition Homepage is found at http://essp.larc.nasa.gov/EVI-5/.

EVI-5 Library

All reference documents are available at http://essp.larc.nasa.gov/EVI-5/evi-5_library.html

- *TRL 6 Examples* document
- *EVI Common Causes of Major Weaknesses* document
- *TMC on Class C and Class D Payloads* document
- Class D Policy and Related Links Website

Questions

All questions regarding the EVI-5 PEA K MUST be addressed to:

Hank Margolis, PhD
Earth Venture Instrument-5 Program Scientist
Earth Science Division
Science Mission Directorate
NASA Headquarters
Washington, DC 20546

Preferably by email at:
hank.a.margolis@nasa.gov
Subject line to read "EVI-5 PEA K"