Stand ALone Missions of Opportunity Notice Draft Explorer 2010 Missions of Opportunity Program Element Appendix H7 and Technical, Management and Cost Evaluation

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Explorer Workshop
July 13, 2010

Introduction: Purpose

Purpose of this Presentation

1. Present to the community the Draft Explorer 2010 Missions of Opportunity (MO) Stand Alone Missions of Opportunity Notice (SALMON) Announcement of Opportunity (AO) Program Element Appendix (PEA) H7 highlighting the "technical, management, and cost feasibility" criteria and requirements that are assessed by the Technical, Management and Cost (TMC) panel.

2. Answer questions.

Introduction: Outline

I. Introduction
II. Type of Missions of Opportunity
III. TMC Evaluation
IV. Evaluation Criteria
V. SALMON AO Highlights
VI. Draft Explorer MO SALMON PEA H7 Highlights
VII. References
VIII. Questions
IX. Supplemental Information

Introduction: SALMON

MO investigations traditionally have been solicited in conjunction with NASA Science Mission Directorate's (SMD) AOs for Principal Investigator (PI) led missions [e.g., Discovery, Explorer, Earth System Science Pathfinder (ESSP), Mars Scout, and New Frontiers].

SALMON, a five-year omnibus AO, incorporates PEAs for general MO proposal opportunities, as well as focused proposal opportunities for specific flight opportunities. The AO includes U.S. and non-U.S.-led mission opportunities.

SALMON is intended to provide more frequent opportunities for science and technology investigations on space flight missions that advance the high priority science, technology, and exploration objectives of NASA's Mission Directorates.

Each PEA is a separate and independent solicitation, has its own solicitation number in NSPIRES, its own proposal due date, and its own funding available for selected investigations.

Types of Missions of Opportunity

5.2. Partner Missions of Opportunity (SALMON AO)

For the purpose of this AO, a PMO is one in which the proposer offers to participate in a non-NASA space mission that is planned or that has been approved by its sponsoring organization. By funding U.S. participation in a non-NASA space mission, NASA seeks to allow the scientific community to conduct a science or technology investigation of interest to NASA as part of a non-NASA space mission. Such missions may be sponsored by non-U.S. governments, by other U.S. agencies, or by private sector organizations. PMO investigations on a military satellite are allowed as long as the satellite is not planned for weapons testing….

…NASA will evaluate the proposed investigation content and feasibility, and not the sponsor's entire mission. While the investigator is not required to document the entire mission of the sponsor, the U.S. investigator must fully document in the proposal their complete investigation and how it is accomplished in the sponsor's mission. This documentation must be sufficient to allow an evaluation of the adequacy of the sponsor's mission to provide all resources required for a successful investigation.

Note that selection by NASA through this AO does not constitute selection of a PMO investigation as part of the non-NASA mission, which is necessarily a decision made by the sponsor of the mission.

Type of Missions of Opportunity

5.4. New Science Missions using Existing Spacecraft (SALMON AO)

Under this AO, a mission using an existing NASA space asset to conduct a new science investigation may be proposed as a MO if it meets several specific criteria:

- The proposal must make use of a NASA spacecraft or other working space asset once it has completed its prime (and extended) mission(s).
- The proposed mission must constitute a new science investigation and may not be an extension, supplement, redirection, or follow-up of the spacecraft's original science mission or any previously approved mission extensions.
- The new science mission must constitute a science investigation addressing the objectives of the research programs identified in the *NASA Strategic Plan and in the respective PEA.*
- The proposal must be solely for mission operations, data analysis, and/or ground hardware and not propose any hardware or other modifications to the spacecraft or its prime mission except when new onboard software is required to effect the investigation. In addition, the proposed investigation must not impose any changes on the requirements of the prime mission.

Type of Missions of Opportunity

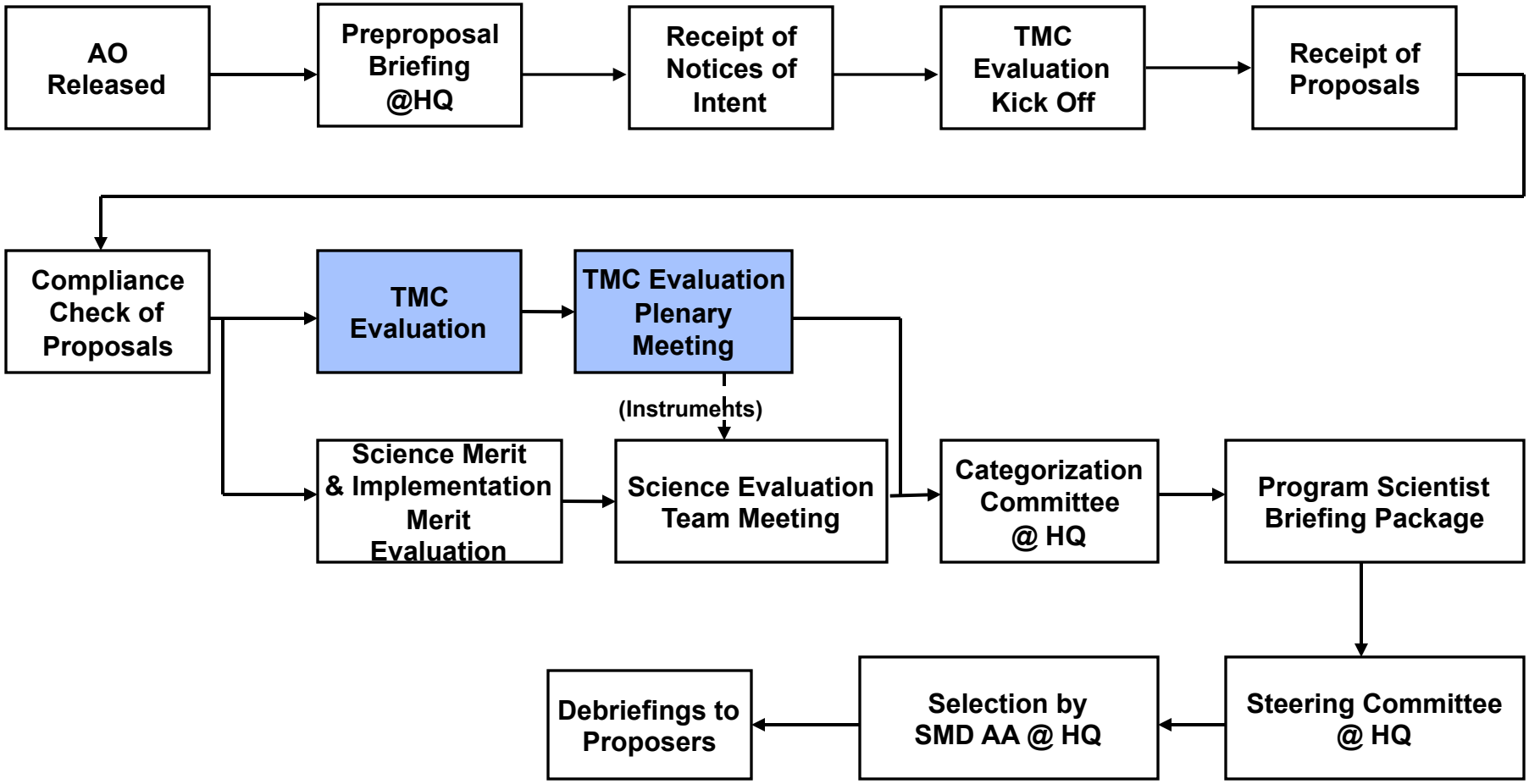
5.5 Small Complete Missions (SALMON AO)

Under this AO, complete but small science, research, or technology investigations may be solicited by a specific Program Element. In such a case, scientifically or technically valuable proposals at any cost within the budget allocation listed in the PEA are permitted. The launch date timetable for proposed SCMs will be listed in the PEA.

The complete but small science, research, or technology investigation must include its own access to space, all phases of development, mission operations and data analysis, archiving of data, and the publication of science results within the proposed cost. Launch services, if provided, will be described in the appropriate PEA. Proposals for the delivery and use of science instruments or other technology to the ISS will be considered under the Small Complete Mission category.

TMC Evaluation

Proposal Evaluation Process



TMC Evaluation

The **NASA Science Mission Directorate (SMD) Science Office for Mission Assessments (SOMA)** was established in 1996 by the Office of Space Science to support the Discovery and Explorer Programs, now also supports the New Frontiers, Mars Scout, Earth System Science Pathfinder (ESSP), and others. The TMC process is a standard process used by SOMA to support all SMD evaluations. Lessons learned from each evaluation are incorporated into the process for continuous improvement.

TMC Evaluation – The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This includes an assessment of risk of completing the investigation within the proposed schedule and cost.

There are three possible Risk Ratings: Low, Medium, and High

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. Mission 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.

TMC Evaluation

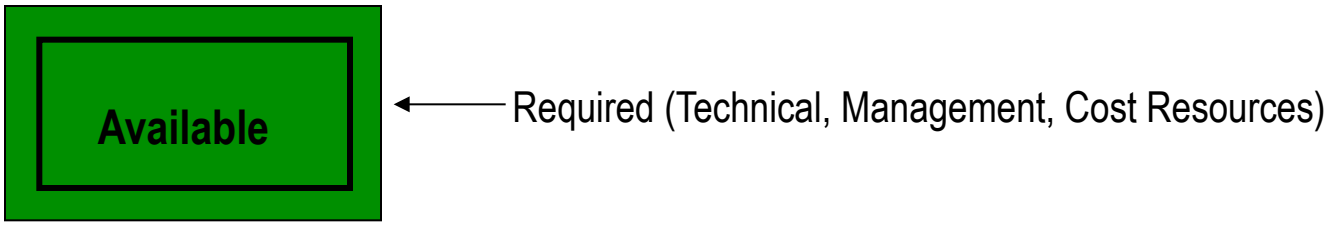
TMC Envelope Concept

Envelope: All TMC Resources available to handle known and unknown development problems that may occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

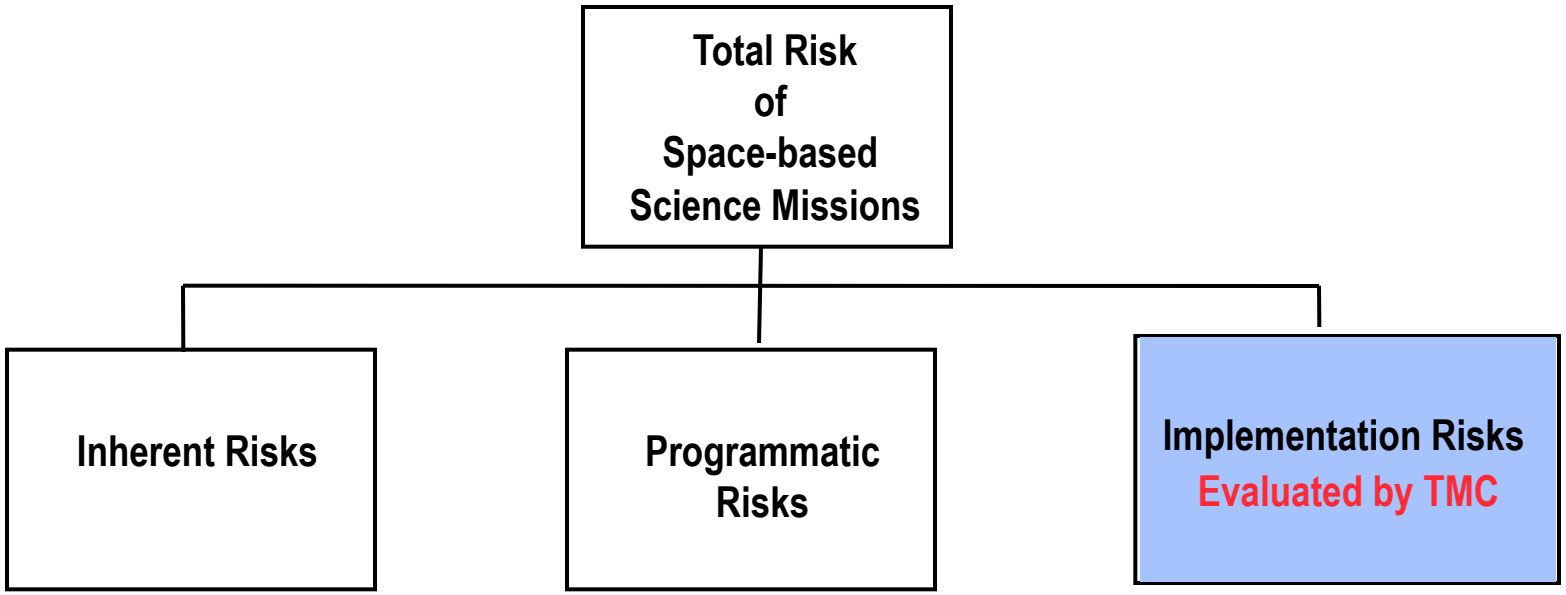
Low Risk: Required resources fit well within available resources

Medium Risk: Required resources just barely inside available resources. Tight, but likely doable

High Risk: Required resources DO NOT fit inside available resources. Expect project to fail



TMC Evaluation



Risks unavoidable to the investigation:

- Launch environments
- Space environments
- Unknowns
- Etc.

Risks that are uncertainties due to matters beyond project's control:

- Environmental Assessment approvals
- Budgetary uncertainties
- Political impacts
- 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 & unknowns)

TMC Evaluation

TMC Evaluation Principles

- **Basic Assumption**: Proposer is the expert on his/her proposal.
  - Proposer's task is to provide evidence that the investigation implementation risk is low.
  - TMC panel's task is to try to validate proposer's assertion of low risk.
- **All Proposals are evaluated to identical standards and not compared to other proposals.**
- **TMC Panels consist of evaluators who are experts in the areas of the proposals that they evaluate.**
- **TMC Panels develop consensus findings for each proposal.**
  - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).
- **The Cost Analysis is integrated into overall risk.**
- **Step-One Proposal Risk Assessment:**
  - Step-One proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.

Evaluation Criteria

The Evaluation Criteria (Section 7.2 of SALMON AO) are:

- Scientific merit of the proposed investigation (40%);
- Implementation merit and the feasibility of the proposed investigation (30%); &
- ***Technical, management, and cost feasibility, including cost risk*** *(30%)*

Note that PEAs may specify additional evaluation factors for these criteria.

Draft Explorer 2010 MO PEA

Evaluation Factors

Proposals will be evaluated per the evaluation criteria set forth in Section 7.2 of this SALMON AO.

Evaluation Criteria

7.2.4 TMC Evaluation Criteria

Each proposed investigation will be evaluated for its technical, management, and cost feasibility, including cost risk, as expressed in terms of specific major and minor strengths and weaknesses. The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This includes an assessment of risk of completing the investigation within the proposed schedule and cost.

The evaluation will consider, as appropriate, implementation factors such as the overall mission design (i.e., “mission architecture”); spacecraft design and design margins; communication and navigation/ tracking; and the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.).

This assessment will also consider the adequacy of the proposed organizational structure, the roles and experience of the known partners, the management approach, the commitments of partners and contributors, and the team’s understanding of the scope of work (covering all elements of the mission, including contributions). The relationship of the work to the schedule, the mission’s interdependencies, and associated schedule margins will also be evaluated. When appropriate, the likelihood of launching by the proposed launch date will be assessed.

Evaluation Criteria

7.2.4 TMC Evaluation Criteria (continued)

Since it is recognized that teaming arrangements for implementing the mission may not be complete before the proposal closing date, proposers will not be penalized if the proposal indicates only candidate (but credible) implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that should reasonably allow successful implementation of the mission.

Mission resiliency (the flexibility to recover from problems) will also be evaluated. This will include an assessment of the approach to descope the Baseline Investigation in the event that development problems force reductions in scope. Investigations proposing new technology, i.e., technologies having a Technology Readiness Level (TRL) less than 6, will be penalized for risk if adequate backup plans to ensure success of the investigations are not described.

The methods and rationale used to develop the estimated cost, and the discussion of cost risks, will be assessed. Proposals will be evaluated for the adequacy of the cost reserves; proposals with inadequate cost reserves, and those that do not demonstrate a thorough understanding of the cost risks, will be penalized. The single biggest item that reduces cost risk is a complete and detailed basis of estimate, including complete cost model input data, vendor quotes, comparisons to similar analogous investigations, etc.

The risk management approach the science investigation team intends to use will be assessed, as will any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities.

Evaluation Criteria

7.2.4 TMC Evaluation Criteria (continued)

The role, qualifications, and experience of the PI will be assessed, as will the commitment, spaceflight experience, and past performance of the PI and his or her implementing institution, against the needs of the investigation. The role, qualifications, and experience of the PM (if assigned separately from the PI) will be assessed, as will the commitment and past performance of the PM and his or her implementing institution, against the needs of the investigation.

The plans for managing the risk of contributed critical goods and services will be assessed including the commitment of every partner as documented in letters of commitment and the adequacy of contingency plans for coping with the failure of a proposed cooperative arrangement.

For PMO investigations that fly on non-NASA missions, factors involving spacecraft and launch vehicle capabilities will be considered in the evaluation to assess the adequacy of mission resources in support of a successful PMO investigation (Section 5.2).

This evaluation will result in narrative text, as well as an appropriate adjectival rating.

SALMON AO Highlights

In addition to the requirements given in the SALMON AO, **all proposed Explorer MO investigations must also provide:** (1) a detailed description of the proposed provisions for sharing of science data, plans that scientific data returned from at least those aspects of the mission in which NASA is involved shall be made available to the U.S. scientific community in a timely way, and the status of the host mission sponsoring agency's commitment to enter into an appropriate agreement with NASA for data sharing; and (2) a detailed explanation of how the U.S. heliophysics or astrophysics science community benefits from the proposed investigation.

See Section 4.3 of EX 2010 PEA

SALMON AO Highlights

In addition to the requirements given in the SALMON AO, **all proposed partner MO investigations must also demonstrate**: (1) their formal relationship with the sponsoring agency's host mission (e.g., already selected contribution, invited contribution, or proposed contribution); and (2) the status of the host mission within the sponsoring agency (i.e., Pre-Phase A, Phase A, or Phase B) including the level of commitment that the sponsoring agency has made to complete the mission.

See Section 4.3 of EX 2010 PEA

SALMON AO Highlights

In addition to the requirements given in the SALMON AO, **all proposed small complete mission investigations must also provide** a letter of commitment from the program or agency providing access to space. This letter of commitment must contain: (1) a detailed description of the proposed provisions for access to space (e.g., long duration balloon, sponsored flight to the ISS, secondary ride on another U.S. sponsored mission, etc.); and (2) the status of those proposed flight provisions within the sponsoring program or agency (i.e., conditional, confirmed, conceptual, etc) including the level of commitment that the sponsoring program/agency has made to support that flight opportunity.

See Section 4.3 of EX 2010 PEA

SALMON AO Highlights

4.3 Proposal Commitment

Proposals shall include a commitment by the PI and the proposing institution for the cost, schedule, and scientific performance of the investigation. If, at any time, this commitment appears to be in peril, the investigation will be subject to cancellation; where applicable, such cancellation will be taken by NASA regardless of the impact of this cancellation on any host mission. NASA funding for a selected investigation is subject to cancellation if there is a cost overrun charged to NASA for any reason, including a launch delay caused by any non-NASA partner. Any cancellation of the investigation will be consistent with the terms of the awarded contract, grant, or cooperative agreement.

SALMON AO Highlights

4.4.2 Flow-down of Objectives

The science goals, objectives, and necessary measurements that constitute the baseline mission shall be explicitly stated in the proposal.

The flow-down from investigation goals to measurement objectives and payload performance shall be stated clearly and supported by quantitative analysis where possible.

The scientific requirements for the investigation shall be explicitly described and, where appropriate, these must be linked to the objectives of the host mission. The requirements that these objectives and observations impose on the mission design elements shall be discussed. An “objectives-to-measurements-to-mission traceability” discussion shall be included in the proposal in either narrative or tabular form.

SALMON AO Highlights

4.6.2 Single Principal Investigator

…For Partner Missions of Opportunity, it is important for proposers to this AO to understand that the PI assumes all risk for any delays in the implementation of the parent mission and shall, therefore, propose appropriate reserves for such schedule contingencies.

4.6.3 Management Plan and Structure for Flight Investigation

…With the exception of USPI proposals, all PI-led investigations must have a qualified Project Manager (PM) named in the proposal.

4.8.5 Agreements with Selected Non-U.S. Participants

… It is NASA's policy to establish formal international agreements for cooperative activities with non-U.S. partners. Owing to the short duration of the Phase A concept study, it may not be possible for NASA to conclude an international agreement prior to the conclusion of Phase A. …

…If applicable, proposals shall demonstrate how the Phase A concept study can be completed in the absence of an international agreement.

SALMON AO Highlights

4.7.5 Cost Risk Management

The proposal shall discuss the methods and rationale (cost models, cost estimating relationships of analogous missions, etc.) used to develop the estimated cost, and shall include a discussion of cost risks. Innovative cost effective features, processes, or approaches will be considered a strength if proven sound. However, even with innovative cost features, mission proposals that are unable to show an adequate unencumbered reserve are likely to be judged a high cost risk and not selected.

For the purpose of this AO, an adequate unencumbered reserve on the PI Mission Cost shall be measured against the cost to complete all Phases (A-F) of the mission. A minimum 25% unencumbered cost reserve shall be required for Phase A through Phase D. Minimum unencumbered cost reserves are not specified in this AO for Phases E and F; the PI shall establish and identify adequate reserves for these phases of the mission. The PI Mission Cost shall not increase from that offered in the proposal. The cost reserves shall not include funded schedule reserves. Minimum funded schedule reserves are not specified in this AO for any phase; the PI shall establish and identify adequate funded schedule reserves for all phases of the mission.

SALMON AO Highlights

Appendix B

- Appendix B provides instructions on what information must or should be provided.
- Specific Topics areas with page limits are described in Table B.1 and Appendix B text.
- Proposals must provide the information requested in Appendix B and must be compliant with all constraints, guidelines and requirements in AO.
- If this information is not provided as applicable, weaknesses may be noted in the evaluation.
- If there is a conflict between AO and Appendix B, the AO takes precedence.

Draft Explorer MO SALMON PEA H7 Highlights

Cost and Schedule Constraints

The PI-managed Mission Cost cap for an Explorer MO, including all mission phases and the cost of accommodation on and/or delivery to the host mission, if applicable, is $55M in Fiscal Year (FY) 2011 dollars.

For Partner MOs, the proposing PI must provide evidence that the sponsoring organization intends to fund the primary host mission and that the NASA commitment for U.S. participation is required by the sponsoring organization prior to December 31, 2013. The launch date itself for a Partner MO is not constrained.

For Small Complete Mission MOs, proposers must specify the launch date in the proposal, which is to be no later than December 31, 2018. Explorer MO investigations with an anticipated launch date requirement later than the end of calendar year 2018 should be proposed in response to a subsequent opportunity.

Draft Explorer MO SALMON PEA H7 Highlights

Cost and Schedule Constraints (continued)

It is intended that proposed investigations be evaluated and selected through a two-step competitive process (Section 7 of this SALMON AO). Step 1 is the solicitation, submission, evaluation, and selection of proposals prepared in response to this PEA. As the outcome of Step 1, one or more Step 1 proposals may be selected for Phase A study and review if their perceived value to the Explorer Program is significant. NASA will issue awards (provide funding to NASA Centers and the Jet Propulsion Laboratory (JPL), award contracts to non-NASA institutions, or utilize other funding mechanisms, as applicable) to the selected proposers to conduct Phase A concept studies and submit Concept Study Reports to NASA. Step 2 is the preparation, submission, evaluation, and continuation decision (downselection) of the Concept Study Reports. As the outcome of Step 2, NASA may continue one or two investigation(s) into the subsequent phases of mission development for flight and operations.

The SALMON AO, Section 7.3, provides that a proposal may be selected for development without first completing a Phase A concept study. The proposal must make the case that it is not only necessary, but that it is also technically feasible for the project to be selected for development without a competitive Phase A concept study. The proposer must recognize that NASA would only make such a decision without a Phase A competition if the MO proposal was sufficiently compelling.

Draft Explorer MO SALMON PEA H7 Highlights

Technical Requirements and Constraints

In addition to the requirements given in the SALMON AO, all proposed *Explorer MO investigations* must also provide: (1) a detailed description of the proposed provisions for sharing of science data, plans that scientific data returned from at least those aspects of the mission in which NASA is involved shall be made available to the U.S. scientific community in a timely way, and the status of the host mission sponsoring agency's commitment to enter into an appropriate agreement with NASA for data sharing; and (2) a detailed explanation of how the U.S. heliophysics or astrophysics science community benefits from the proposed investigation.

In addition to the requirements given in the SALMON AO, all proposed *partner MO investigations* must also demonstrate: (1) their formal relationship with the sponsoring agency's host mission (e.g., already selected contribution, invited contribution, or proposed contribution); and (2) the status of the host mission within the sponsoring agency (i.e., Pre-Phase A, Phase A, or Phase B) including the level of commitment that the sponsoring agency has made to complete the mission.

Draft Explorer MO SALMON PEA H7 Highlights

Technical Requirements and Constraints

In addition to the requirements given in the SALMON AO, all proposed *small complete mission investigations* must also provide a letter of commitment from the program or agency providing access to space. This letter of commitment must contain: (1) a detailed description of the proposed provisions for access to space (e.g., long duration balloon, sponsored flight to the ISS, secondary ride on another U.S. sponsored mission, etc.); and (2) the status of those proposed flight provisions within the sponsoring program or agency (i.e., conditional, confirmed, conceptual, etc) including the level of commitment that the sponsoring program/agency has made to support that flight opportunity.

Launch Vehicle Services and Funding

No launch vehicle will be provided by NASA through this solicitation. In addition, NASA is prohibited by law from purchasing non-U.S. launch vehicles, nor may NASA funds provided to an investigation be used to purchase a launch vehicle from a non-U.S. source.

Draft Explorer MO SALMON PEA H7 Highlights

Future Additions to the PEA

- NM 7120-81 is the NASA Interim Directive (NID) for NASA Procedural Requirements (NPR) 7120.5D. Effective September 22, 2009, NM 7120-81 is the governing NPR until NPR 7120.5 is formally revised.
- SALMON section 4.1 “Participation” will be modified with language similar to the Draft Explorer 2010 AO section 4.2.1.
- SALMON Full Cost Accounting discussions (e.g. section 4.7.1) will be modified with language similar to the Draft Explorer 2010 AO (e.g. section 5.6.6).
- SALMON clarification request discussions (e.g. section 7.1.1) will be modified with language similar to the Draft Explorer 2010 AO (e.g. paragraph 3 section 7.1.1).
- SALMON Table B7. “NASA New Start Inflation Index” will be substituted with Table B4 on the Draft Explorer 2010 AO.

Ready to be added to Program Library:

- “NASA’s Mission Operations and Communications Services”

Note: In the event of an apparent conflict between the guidelines in the SALMON AO, Appendix A, Appendix B, and a PEA, the order of precedence is: the PEA, then the SALMON AO, then Appendix B, then Appendix A.

References

Explorer Acquisition Home Page

An Explorer Acquisition Homepage, available at http://explorers.larc.nasa.gov/EX/, will provide updates and any PEA addenda during the Explorer MO solicitation process. It will provide links to the Program Library, information about the preproposal conference, a list of potential proposers and teaming partners, and questions and answers regarding the PEA.

Program Library

The Explorer Program Library provides additional regulations, policies, and background information on the Explorer Program. The Program Library is accessible at http://explorers.larc.nasa.gov/EX/ex_Library.html

Lessons Learned from Technical, Management, and Cost Review of Proposals 2nd Edition

http://sso.larc.nasa.gov/TMCLessonsLearned_Step1_Update_120409_2.pdf

Questions

Supplemental Information

TMC Evaluation Factors and Sub-Factors

Generally, the degree to which Proposals address the following factors (as applicable for the specific MO) directly relates to the rating of Low, Medium, or High Risk:

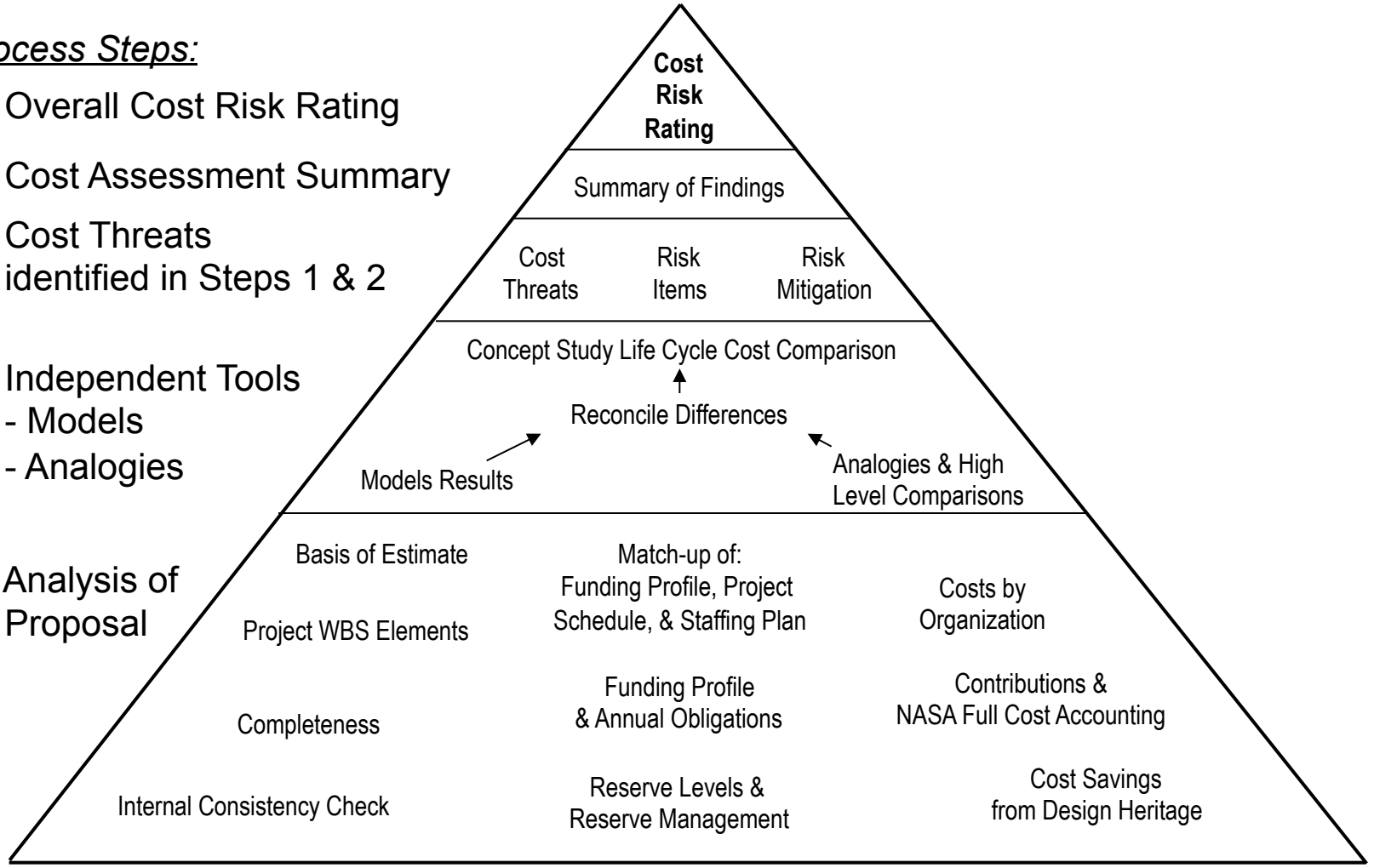
- **Instrument**
  - Instrument Design, Accommodation, and Interface
  - Design Heritage
  - Environment Concerns
  - Technology Readiness
  - Instrument Systems Engineering
- **Mission Design and Operations**
  - Mass Margins
  - Trajectory Analysis
  - Launch Services
  - Concept of Mission Operations
  - Ground Facilities – New/Existing
  - Telecom
- **Flight Systems**
  - Hardware/Software Design
  - Design Heritage
  - Spacecraft Systems Design
  - Design Margins (Excluding mass)
  - Qualification and Verification
  - Assembly, Test, and Launch Operations
  - Mission Assurance
  - Development of New Technology
- **Management and Schedule**
  - Roles and Responsibilities
  - Team Experience and Key Individuals' Qualifications
  - Project Management and Systems Engineering
  - Organizational Structure and Work Breakdown Schedule (WBS)
  - International Participation
  - Risk Management, Including Descope Plan and Decision Milestones
  - Project-Level Schedule
  - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
  - Basis of Estimate (BOE)
  - Cost Realism and Completeness
  - Cost Reserves by Phase
  - Comparison with TMC Estimates (Including
  - Parametric Models/Analogies)

TMC Independent Cost Assessment

"The Pyramid"

Process Steps:

5. Overall Cost Risk Rating
4. Cost Assessment Summary
3. Cost Threats identified in Steps 1 & 2
2. Independent Tools
   - Models
   - Analogies
1. Analysis of Proposal



Typical TMC Evaluation Questions

- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & funds) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and include all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., funds, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks, including risk of using new developments, and are there adequate fallback plans to mitigate them, to assure that investigation can be completed as proposed?

Typical TMC Evaluation Questions

- Is the schedule workable?
- Does it reflect an understanding of work to be done and the time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet the proposed dates?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc) allow successful completion of investigation? Is the PI in charge?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?

Characteristics of Low Risk Ratings

- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which neither a workaround is planned, nor a very sound plan to develop and qualify the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and consequently the proposed resources are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- The schedule includes reserve time, to find and fix problems if things do not go according to plan.
- All contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.

Characteristics of High Risk Ratings

Technical Design Margins (Mass, Power, etc.)

- Insufficient data provided from which to independently verify the margins.
- No margin provided or conflicting data provided.
- Margin provided deemed too low based on the maturity of the design.

Cost

- Concerns relating to cost reserve (Below AO requirement, too low based on liens/threats, phasing inconsistent with anticipated needs).
- Unable to validate proposed cost

Instrument Implementation

- Heritage claims not substantiated/development risks not adequately addressed.
- Inadequate/inconsistent description and detail.
- Inconsistencies between instrument requirements and bus capabilities.

Complex Operations

- More common in payloads containing multiple instrument that required tight scheduling/sequential operations. Operations not adequately addressed.

Characteristics of High Risk Ratings

Systems Engineering
- Incomplete flow-down of science requirements to payload/flight system accommodations.
- Incomplete description of how the systems engineering function will be executed.
- Inadequate resources allocated to accomplish this function.

Management Plans
- Confusing/conflicting organizational roles and responsibilities.
- Lack of demonstrated organizational/individual expertise for specified role.
- Insufficient time commitments for key personnel.

Schedules
- Insufficient detail from which to perform an independent assessment.
- Inadequate/no schedule reserve identified.
- Overly ambitious schedules that are not consistent with recent experiences.