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# 2012 Astrophysics Explorer Mission of Opportunity Evaluation Plan

## Stand Alone Mission of Opportunity Notice (SALMON-2) Program Element Appendix (PEA) L

January 9, 2013



# Approval

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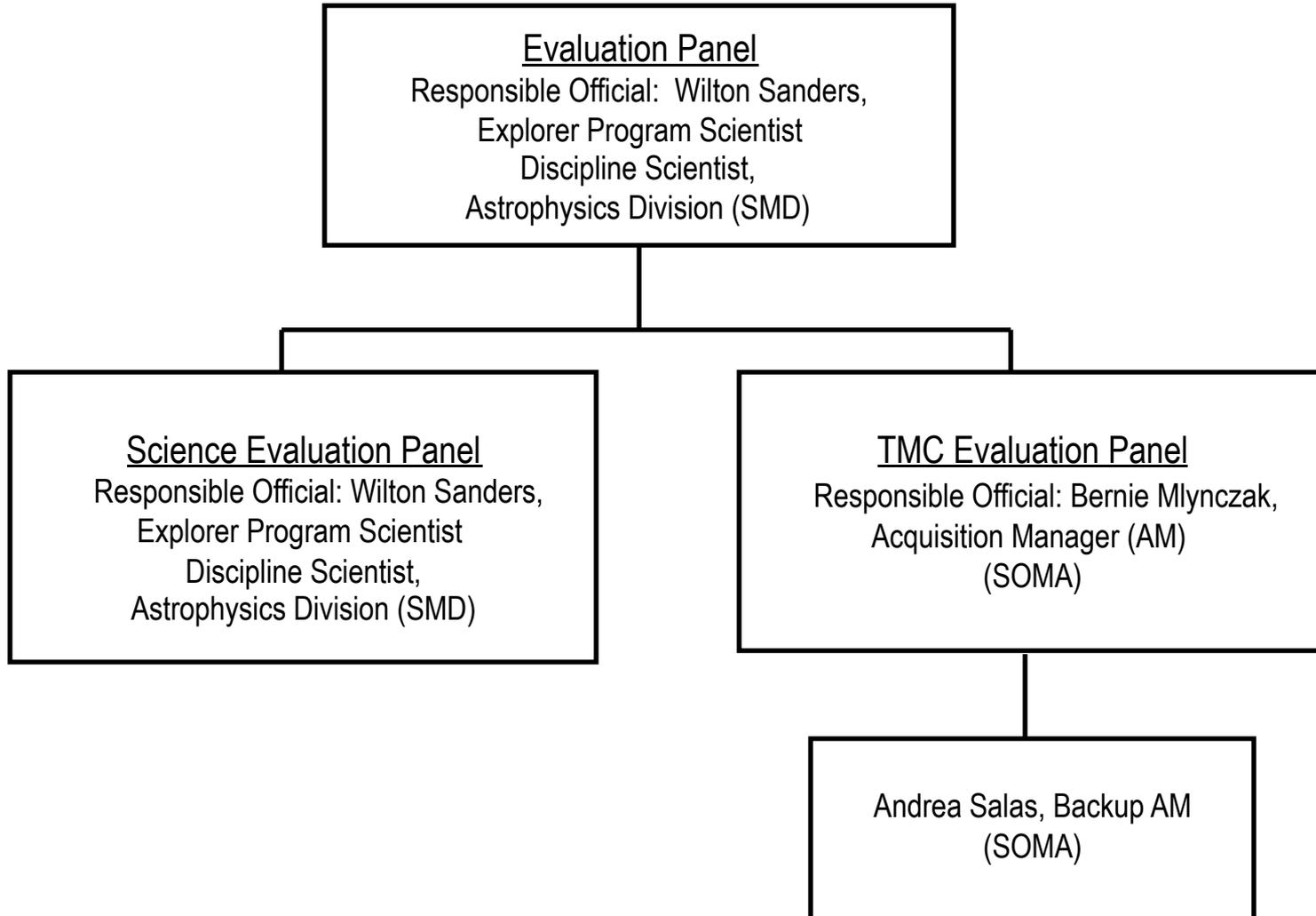
# Principles for Evaluation

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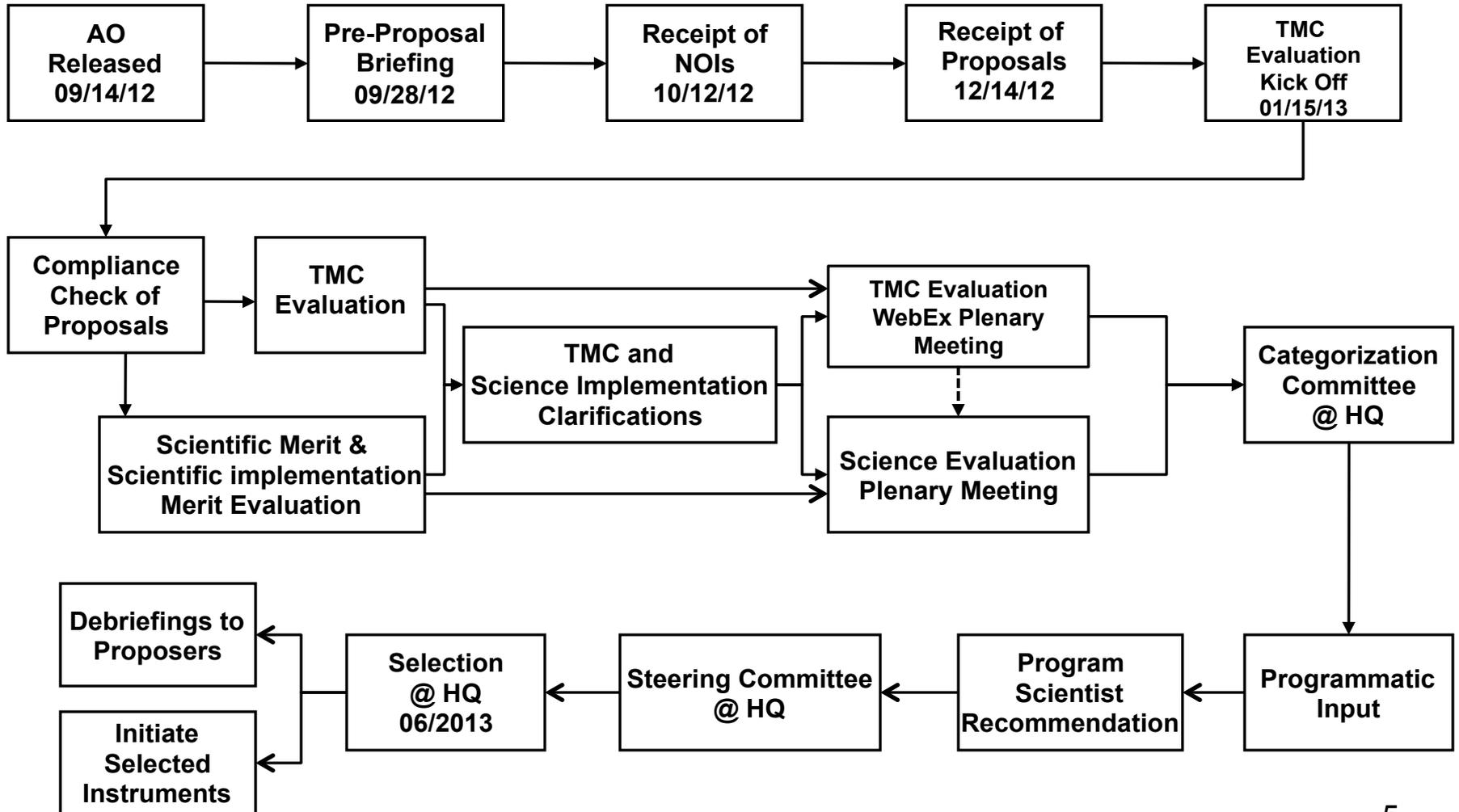
- All proposals are to be treated fairly and equally.
- Merit is to be assessed on the basis of material in the proposal.
- Ratings shall reflect the written strengths and weaknesses.
- Everyone involved in the review process is expected to act in an unbiased objective manner; advocacy for particular proposals is not appropriate.

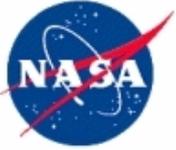


# Evaluation Panel Organization

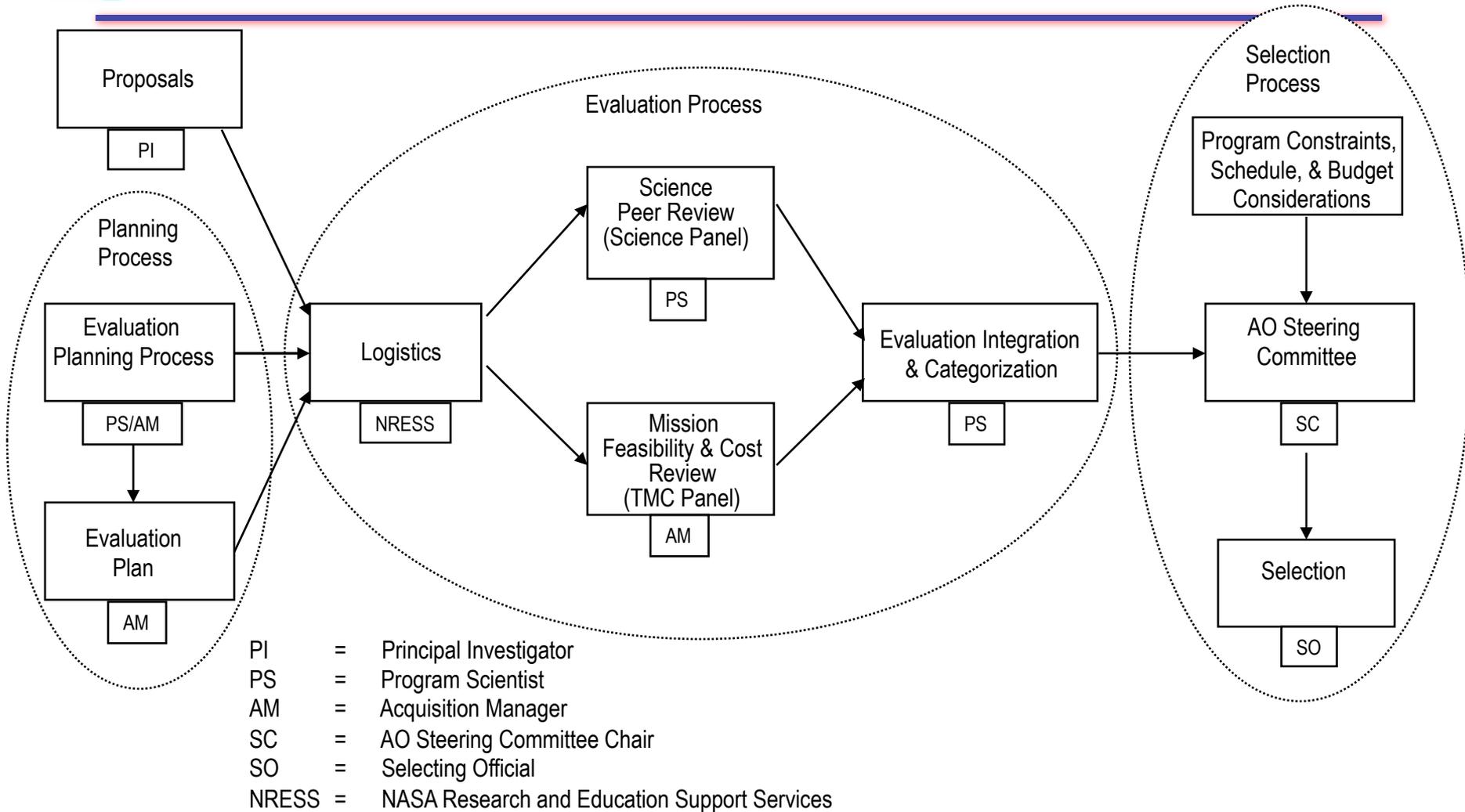


# Proposal Evaluation Flow





# Step One Evaluation Responsibilities

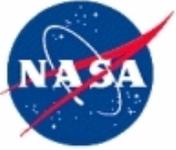




## Conflicts of Interest (COI)

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- NRESS will cross-check all the science evaluation panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational Conflict of Interest (COI) exists.
  - Cornell Technical Services (CTS) will cross-check all TMC evaluation panel members against the lists of personnel and organizations identified in each proposal submitted to determine whether any organizational COI exists.
  - Additionally, all evaluators must divulge any other financial, professional, or potential personal conflicts of interest, and whether they work for a profit-making company that directly competes with any profit-making proposing organization.
  - All Civil Service evaluators must file a Form OGE 450 or SF278 which must be submitted to Office of General Counsel for review for financial conflicts of interest.
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## Conflicts of Interest (COI)

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- All known conflict of interest issues are documented and a COI Mitigation Plan has been developed to minimize the likelihood that this will arise as an issue in the evaluation process. Any potential COI issue is discussed with the Explorer Program Scientist and the SMD Deputy Associate Administrator for Research and documented in the COI Mitigation Plan. All determinations regarding possible COIs that arise will be logged as an appendix to the COI Mitigation Plan.
  - If any previously unknown potential conflict of interest arises during the evaluation, the conflicted member(s) will be notified to stop evaluating proposals immediately, and the Panel Chair will be notified immediately. Any actually conflicted member(s) will be immediately removed from the evaluation process, and steps will be taken, expeditiously, to remove, mitigate, or accept any actual or potential bias imposed by the conflicted member(s).
  - Members of the Science and TMC panels are prohibited from contacting anyone outside their panel for scientific/technical input, or consultation, without the prior approval of the Responsible Official.
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## Proprietary Data

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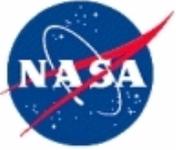
- All proposal and evaluation materials are considered proprietary.
  - Viewing of proposal materials will be only on a need-to-know basis.
  - Each evaluator will sign a Non-Disclosure Agreement (NDA) that must be on file at NRESS prior to any proposals being distributed to that evaluator.
  - All proposal materials will be numbered and controlled, and a record will be maintained as to which evaluator has what materials.
  - Evaluators are not permitted to discuss proposals with anyone outside the Evaluation Team.
  - All proprietary information that must be exchanged between evaluators will be exchanged *via* the secure NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), *via* the secure Remote Evaluation System (RES), secure WebEx or *via* encrypted email, FedEx, fax, or regular mail. Weekly teleconferences among TMC evaluators will be conducted *via* secure telephone lines.
  - Proposal materials will be collected from evaluators when the evaluation process is complete. Some copies will be archived in the NRESS and SOMA vaults; all other proposal materials will be destroyed.
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## Evaluation Ground Rules: General

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- All Proposals will be reviewed to uniform standards established in the AO, and without comparison to other Proposals.
- All evaluators will be peers of the proposers in the areas that they evaluate.
- Specialist Evaluators (to provide special technical expertise to the TMC Panel) and non-panel/mail-in Reviewers (to provide special science expertise to the Science Panel) may be utilized, respectively, based on need for expertise in a specific technology or science that is proposed.



# Evaluation Criteria and Selection Factors

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- Evaluation Criteria from SALMON-2 AO NNH12ZDA006O:
    1. Intrinsic Science, Exploration, or Technology Merit of the Proposed Investigation (section 7.2.2);
    2. Experiment Science, Exploration, or Technology Implementation Merit and Feasibility of the Investigation (section 7.2.3);
    3. TMC Feasibility of the Investigation Implementation, including Cost Risk (Section 7.2.4).
  - Weighting: the first criterion is weighted approximately 40%; the second and third criteria are weighted approximately 30% each.
  - Other Selection Factors:
    - NASA SMD cost;
    - Programmatic factors.
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## Evaluation Criteria and Selection Factors

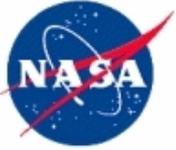
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- Selection Factors from Section 6.2 of PEA L:
- The Selection Official may take into account a wide range of programmatic factors in deciding whether or not to select any proposals and in selecting among top-rated proposals, including, but not limited to,
  - planning and policy considerations,
  - available funding,
  - programmatic merit and risk of any proposed partnerships,
  - and maintaining a programmatic balance across the mission directorate(s).



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# Compliance Checklist SALMON-2 AO Appendix F



# Compliance Criteria

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## Administrative:

1. Proposal submitted through NSPIRES on time
2. Meets page limits
3. Meets general requirements for digital file format (single searchable, bookmarked PDF, less than 25MB)
4. Meets general requirements for display format and completeness (maximum 55 lines text/page, maximum 15 characters/inch – approximately 12 point font, 1 inch margins)
5. Required appendices included; no additional appendices
6. Budgets are submitted in required formats
7. All individual team members who are named on the cover page indicate their commitment through NSPIRES
8. All export-controlled information has been identified



# Compliance Criteria

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## Science, Exploration, or Technology:

9. Addresses solicited science, exploration, or technology programs
10. Requirements traceable from objectives to measurements to instruments to mission
11. Baseline investigation and threshold investigation defined



# Compliance Criteria

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## Technical:

12. Complete spaceflight mission (Phases A-F) proposed
  13. Team led by a single PI
  14. Includes commitment for E/PO (Yes, per PEA L 4.6)
  15. PI-Managed Mission Cost within cost cap
  16. Co-Investigator costs in budget
  17. Launch date prior to launch deadline
    - the launch date for a Partner MO is not constrained (PEA L 4.4.2)
    - Small Complete Mission launch date to be no later than December 31, 2018 (PEA L 4.4.2)
  12. Includes table describing non-U.S. participation
  13. Includes letters of commitment from funding agencies for non-U.S. participating institutions
  14. Includes letters of commitment from all U.S. organizations offering contributions
  15. Includes letters of commitment from all major partners
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# Compliance Checklist SALMON-2 AO PEA L



# PEA L - Compliance Criteria

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## Additional Requirements for Partner MO Investigations PEA L 4.5.1:

1. All proposed partner MO investigations requiring flight on the ISS must also provide a Letter of Acknowledgement from the NASA Space Station Payload Office
2. A Partner MO hosted by a PI-led mission from a program other than the Explorer Program must include a Letter of Commitment from the PI of the host mission endorsing the partnership

## Additional Requirements for Small Complete Mission of Opportunity Investigations PEA L 4.5.2:

1. All proposed small complete mission investigations, with the exception of investigations requiring flight on the ISS or small complete missions flown on high-altitude scientific balloons, must also provide a Letter of Commitment from the program or agency providing access to space
  2. Investigations requiring flight on the ISS must provide a Letter of Feasibility from the NASA Space Station Payloads Office
  3. Investigations requiring flight on LDBs or ULDBs must provide a Letter of Feasibility from the NASA Balloon Program Office
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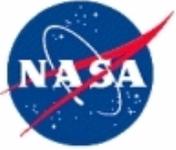
# Science Evaluation



# Science Panel Composition and Organization

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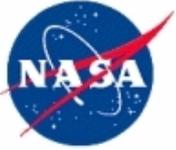
- The Discipline Scientist leads the Science Panel.
  - Science evaluators are typically, but not exclusively, recruited from the academic, governmental, and industrial research communities.
  - The Science Panel evaluates Intrinsic Science Merit and Experiment Science Implementation Merit and Feasibility.
  - The science evaluation will be implemented *via* one Science Panel, but sub-panels may be employed, depending on the number and variety of proposed investigations.
    - Any sub-panel will be led by a NASA Civil Servant, with a co-chair from the scientific community.
    - Sub-panels may have an Executive Secretary.
  - Each proposal will be reviewed by assigned panel members.
    - The Lead Reviewer for each proposal will lead the discussion.
    - A Supporting Reviewer will take notes on the discussion.
  - The TMC Panel may provide comments and questions to the Science Panel.
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# Science Panel Procedures

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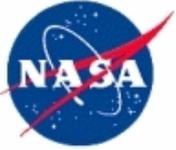
- Each member of the Science Panel will review Proposals as directed by the Chair.
  - If special science expertise is required, the Science Panel may utilize non-panel/mail-in reviewers to assist with one or more proposals.
  - Non-panel/mail-in reviewers will evaluate only those parts of proposals pertinent to their scientific specialties.
- Each proposal will be discussed by the reviewers in a telecon.
  - Each reviewer will provide an individual review prior to the telecon.
  - The telecon will discuss the proposal and the reviews by the individual reviewers including non-panel reviewers.
  - Following the telecon, the Lead Reviewer captures/synthesizes individual evaluations including discussion and will generate the Draft Evaluation including draft findings.
  - The draft findings form the basis for the clarification of draft major weaknesses.



# Science Panel Procedures

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- A Science Panel Plenary will be held upon completion of Science Evaluation for all proposals.
  - The Science Panel will compile all of the findings for each proposal.
  - For each proposal, the Chair or designated Lead Reviewer will lead the discussion, summarize the proposed investigation, and document the results.
  - The clarifications provided by the PIs will be considered and the findings will be adjusted if warranted.
  - If warranted, the panel may reconsider evaluations at the Plenary.
  - Evaluations of all proposals are reviewed during the Science Panel Plenary to ensure that standards have been applied uniformly and in an appropriate and fair manner.
  - The Lead Reviewer captures/synthesizes Panel evaluations.



# Science Panel Products

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For each proposal, the Science evaluation will result in:

- Form A
  - Proposal title, PI name, and submitting organization;
  - Proposal summary
  - Based on findings, Scientific Merit adjectival ratings from each evaluator, ranging from “Excellent” to “Poor”;
  - Summary rationale for the median rating;
  - Narrative findings, identified as major or minor strengths or weaknesses; comments to PI, comments to NASA;
- Form B
  - Proposal title, PI name, and submitting organization;
  - Based on findings, an Implementation Merit and Feasibility of the Investigation adjectival ratings from each evaluator, ranging from “Excellent” to “Poor”;
  - Summary rationale for the median rating;
  - Narrative findings, identified as major or minor strengths or weaknesses; comments to PI; comments to NASA.



# Science Panel Evaluation Factors

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## Criterion A: Intrinsic Science Merit of the Proposed Investigation:

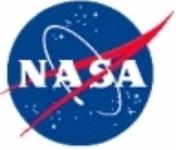
- Factors from SALMON-2 AO section 7.2.2
  - Factor A-1. Compelling nature and priority of the proposed investigation's science goals and objectives
  - Factor A-2. Programmatic value of the proposed investigation
  - Factor A-3. Likelihood of science, exploration, or technology success
  - Factor A-4. Science, exploration, or technology value of the Threshold Investigation



## Science Panel Evaluation Factor A-1

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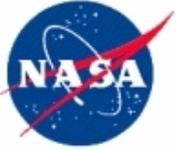
Compelling nature and priority of the proposed investigation's science goals and objectives. This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect program, Agency, and National priorities; the potential impact of the investigation on program, Agency, and National science objectives; and the potential for fundamental progress, as well as filling gaps in our knowledge relative to the current state of the art.



## Science Panel Evaluation Factor A-2

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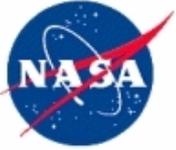
Programmatic value of the proposed investigation. This factor includes the unique value of the investigation to make science progress in the context of other ongoing and planned missions; the relationship to the other elements of NASA's programs; how well the investigation may synergistically support ongoing or planned missions by NASA and other agencies; and the necessity for a space mission to realize the goals and objectives.



## Science Panel Evaluation Factor A-3

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Likelihood of science success. This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring success.



## Science Panel Evaluation Factor A-4

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Science value of the Threshold Investigation. This factor includes the intrinsic value of the Threshold Investigation using the standards in the first factor of this section and whether that value is sufficient to justify the proposed cost of the investigation.



# Science Panel Evaluation Factors

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## Criterion B: Experiment Science Implementation Merit and Feasibility of the Investigation:

- Factors from SALMON-2 AO section 7.2.3
  - Factor B-1. Merit of the instruments and investigation design for addressing the science, exploration, or technology goals and objectives
  - Factor B-2. Probability of technical success
  - Factor B-3. Merit of the data and/or sample analysis plan
  - Factor B-4. Science, exploration, or technology resiliency
  - Factor B-5. Probability of investigation team success
  - Factor B-6. Merit of any Science-Exploration-Technology Enhancement Options (SEOs), if proposed



## Science Panel Evaluation Factor B-1

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Merit of the instruments and investigation design for addressing the science goals and objectives. This factor includes the degree to which the proposed investigation will address the goals and objectives; the appropriateness of the selected instruments and investigation design for addressing the goals and objectives; the degree to which the proposed instruments and investigation can provide the necessary data; and the sufficiency of the data gathered to complete the science investigation.



## Science Panel Evaluation Factor B-2

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Probability of technical success. This factor includes the maturity and technical readiness of the instruments; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team – both institutions and individuals – to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the investigation design.



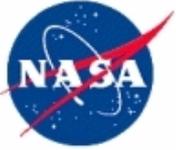
## Science Panel Evaluation Factor B-3

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Merit of the data and/or sample analysis plan. This factor includes the merit of plans for data and/or sample analysis, data archiving, and/or sample curation to meet the goals and objectives; to result in the publication of discoveries in the professional literature; and to preserve data and samples of value to the research and development community.

Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software useable to the entire research and development community; assessment of adequate resources for physical interpretation of data;

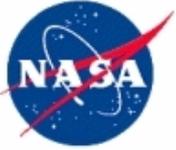
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## Science Panel Evaluation Factor B-3 cont'd

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an assessment of the planning and budget adequacy and evidence of plans for the preliminary evaluation and curation of any returned samples; reporting science results in the professional literature (*e.g.* refereed journals); and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its impact.



## Science Panel Evaluation Factor B-4

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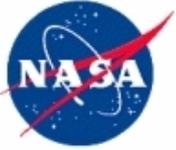
Science resiliency. This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Investigation to the Threshold Investigation in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.



## Science Panel Evaluation Factor B-5

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Probability of investigation team success. This factor will be evaluated by assessing the experience, expertise, and organizational structure of the investigation team and the experiment design in light of any proposed instruments. The role of each Co-Investigator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is who do not have a well defined and appropriate role may be cause for downgrading of the proposal.



## Science Panel Evaluation Factor B-6

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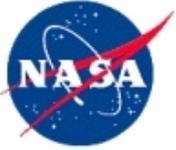
Merit of any Science Enhancement Options (SEOs), if proposed. This factor includes assessing the appropriateness of activities selected to enlarge the impact of the investigation; the potential of the selected activities to enlarge the impact of the investigation; and the appropriate costing of the selected activities. The peer review panel will inform NASA whether the evaluation of the proposed SEO(s) impacted the overall rating for experiment implementation merit and feasibility. Lack of an SEO will have no impact on the proposal's overall rating for experiment implementation merit and feasibility.



## Science Evaluation Products: Strengths and Weaknesses

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- **Major Strength:** A facet of the implementation response that is judged to be of superior merit and can substantially contribute to the ability of the project to meet its scientific objectives.
  - **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its scientific objectives.
  - **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 merit.
  - **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 merit.
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# Form A and B Grade Definitions

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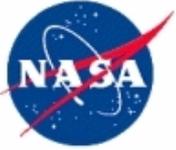
## Form A and B Grade Definitions

- **Excellent:** A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
- **Very Good:** A fully competent proposal of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any weaknesses.
- **Good:** A competent proposal that represents a credible response to the AO, having neither significant strengths nor weakness and/or whose strengths and weaknesses essentially balance.
- **Fair:** A proposal that provides a nominal response to the AO, but whose weaknesses outweigh any perceived strengths.
- **Poor:** A seriously flawed proposal having one or more major weaknesses (e.g., an inadequate or flawed plan of research, or lack of focus on the objectives of the AO).



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# TMC Evaluation



# TMC Panel Composition and Organization

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- The Acquisition Manager, who is a Civil Servant in the Science Office of Mission Assessments (SOMA) at Langley Research Center, leads the TMC panel.
  - SOMA works directly for NASA Headquarters and is firewalled from the rest of LaRC.
- TMC evaluators are a mix of the best non-conflicted contractors, consultants, and Civil Servants who are experts in their respective fields.
  - All evaluators read every proposal.
  - Evaluators provide ratings of proposals as well as findings.
- Additionally, specialist evaluators may be called upon in cases where technical expertise that is not represented on the panel is needed.
  - Specialist evaluators evaluate only those parts of a proposal that are specific to their particular expertise.
  - Specialist evaluators provide only findings; they do not provide ratings.



# TMC Panel Evaluation Factors

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## Criterion C: TMC Feasibility of the Investigation Implementation, Including Cost Risk:

- Factors from SALMON-2 AO section 7.2.4
  - 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
  - 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 Panel Evaluation Factor C-1

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Adequacy and robustness of the instrument implementation plan. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet investigation requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology and the adequacy of backup plans to ensure success within the proposed cost and schedule when technologies having a TRL less than 6 are proposed.

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## TMC Panel Evaluation Factor C-2

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- Adequacy and robustness of the investigation design and plan for operations. This factor includes an assessment of the overall investigation design and investigation architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), and the concept for operations (including communication, navigation/tracking/trajectory analysis, and ground systems and facilities). This factor includes investigation resiliency – the flexibility to recover from problems during both development and operations – including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Investigation. This factor will be applied only to the extent that it is appropriate for the proposals solicited by the applicable PEA.
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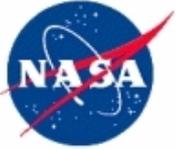


## TMC Panel Evaluation Factor C-3

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Adequacy and robustness of the flight systems. This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.) This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, launch operations, and entry/descent/landing. This factor includes the plans for the development and use of new technology and the adequacy of backup plans to ensure the success of the investigation when technologies having a TRL less than 6 are proposed.

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## TMC Panel Evaluation Factor C-3 cont'd

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The maturity and technical readiness of the spacecraft, subsystems, and operations will be assessed. The adequacy of the plan to mature systems within the proposed cost and schedule, the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks, and the likelihood of success in developing any new technologies will be assessed. This factor will be applied only to the extent that it is appropriate for the proposals solicited by the applicable PEA.

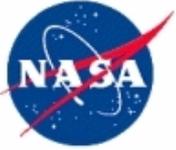


## TMC Panel Evaluation Factor C-4

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Adequacy and robustness of the management approach and schedule, including the capability of the management team. This factor includes: the adequacy of the proposed organizational structure and WBS; the management approach including project level systems engineering; the roles, qualifications, and experience of the PI, PM, other named key management team members, and implementing organization, investigation management team, and known partners; the commitment, spaceflight experience, and relevant performance of the PI, PM, other named key management team members, and implementing organization, investigation management team, and known partners against the needs of the investigation; the commitments of partners and contributors; and the team's understanding of the scope of work covering all elements of the investigation, including contributions.

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## TMC Panel Evaluation Factor C-4 cont'd

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Also evaluated under this factor is the adequacy of the proposed risk management approach, including any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The approach to any proposed descoping of investigation capabilities will be assessed against the proposed Baseline Investigation. The plans for managing the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors, as documented in Letters of Commitment, and the adequacy of contingency plans for coping with the failure of a proposed cooperative arrangement or contribution. This factor also includes assessment of proposal elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of launching by the proposed launch date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project.

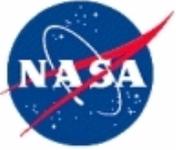
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## TMC Panel Evaluation Factor C-5

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- Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes proposal elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the investigation, including contributions). Proposals will be evaluated for the adequacy of the cost reserves and whether proposals with inadequate cost reserves demonstrate a thorough understanding of the cost risks. This factor also includes an assessment of the proposed cost relative to estimates generated using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.
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# Student Collaboration

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Section 4.6 of PEA L – SALMON-2 Required Specifications for PEAs - affirms that proposals may define a Student Collaboration (SC) that is a separate part of the proposed investigation and that Requirements 71 and 72 of the SALMON-2 AO, section 5.7.2, apply to PEA L.

Requirement 71. If a proposal contains a SC, the proposal shall demonstrate that the proposed SC is clearly separable from the proposed Baseline and Threshold Investigations, to the extent that the SC will not impact the investigation in the event that the SC is not funded; that the SC fails during flight operations; or that the SC encounters technical, schedule, or cost problems during development.

Requirement 72. If a proposal contains a SC, the proposal shall identify the funding set aside for the SC; this funding may be outside the PI-Managed Mission Cost up to the student collaboration incentive or as specified in the applicable PEA, and any SC costs beyond the student collaboration incentive shall be within the PI-Managed Mission Cost.



# Student Collaboration

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Per the SALMON-2 AO section 5.7.2, there is no minimum and no maximum allowable cost for a SC. NASA is providing a student collaboration incentive that is defined to be 1% of the PI-Managed Mission Cost Cap. Contributions to the SC are permitted. The proposed NASA cost of the SC, up to the student collaboration incentive, may be outside of the PI-Managed Mission Cost. If the SC costs NASA more than the student collaboration incentive, then the rest of the NASA cost of the SC must be within the PI-Managed Mission Cost.

Also, per the SALMON-2 AO section 5.7.2, a proposed SC will be evaluated only for its impact on mission feasibility. The merit of the proposed SC will be evaluated later, as part of the reviews leading to KDP-B.

Per the SALMON-2 AO section 7.2.4, Student Collaboration proposals, if any, will be evaluated only for the impact they have on TMC feasibility to the extent that they are not separable; student collaboration proposals will not be penalized for any inherent higher cost, schedule, or technical risk, as long as the student collaboration is shown to be clearly separable from the implementation of the Baseline Investigation. The intrinsic merit of student collaborations will not be evaluated at this time



# Education and Public Outreach

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PEA L Section 4.6, SALMON-2 Required Specifications for PEAs states that “Section 5.7.1 of the SALMON-2 AO states that the PEA will specify whether an Education and Public Outreach program that is consistent with SMD policy is required. This PEA so states, and Requirements 68, 69, and 70 of the SALMON-2 AO apply to this PEA.”

Requirement 68. Proposals shall not designate an E/PO lead and shall not include a plan for a core E/PO program.

Requirement 69. If the PEA requires an E/PO program for selected investigations, proposals shall identify the funding set aside for the implementation of a core E/PO program; this funding shall be at least the minimum allowable core E/PO program cost and shall be included in the PI-Managed Mission Cost.

Requirement 70. If the PEA requires an E/PO program, and unless specified otherwise in the PEA, proposals shall include the following statement of commitment from the PI (see Appendix B, Section I.2, for additional details): “I understand the NASA requirements for E/PO and I am committed to carrying out a core E/PO program that meets the goals described in the Explanatory Guide to the NASA Science Mission Directorate Educational and Public Outreach Evaluation Factors document. I will submit a preliminary E/PO plan no later than KDP-B if this proposal is selected.”

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## Education and Public Outreach

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Section 5.7.1 of the SALMON-2 AO states that the minimum allowable core E/PO program cost is defined to be 1% of the PI-Managed Mission Cost Cap. Investigations must designate at least the minimum allowable core E/PO program cost for implementation of the core E/PO program. There is no maximum allowable cost for the core E/PO program; however, the funding for the core E/PO program must be included in the PI-Managed Mission Cost. Core E/PO activities may continue for one year following end-of-prime-mission to allow for the incorporation of the results of the mission investigation into the core E/PO program.



# TMC Evaluation Sub-Factors

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- **Instruments**

- Instrument Design and Interface
- Design Heritage
- Environment Concerns
- Technology Readiness
- Instrument Systems Engineering
- Hardware/Software Design
- Plans for Achieving Instrument Acceptance

- **Investigation Design and Operations**

- Science Operations
- Ground Systems and Facilities
- Telecom
- Investigation Resiliency

- **Management and Schedule**

- Roles, Qualifications and Experience of PI, PM, and Other Key Management Members
- Project Management and Systems Engineering
- Organizational Structure and Work Breakdown Schedule (WBS)
- International Participation
- Risk Management, Including Mitigation and De-scope Plan, and Decision Milestones
- Project-Level Schedule, Margins, and Tools

- **Cost**

- Basis of Estimate (BOE)
- Cost Realism, Completeness, and Consistency
- Cost Reserves by Phase
- Application of Heritage
- Comparison with TMC Estimates (Including Parametric Model and Instrument Complexity Index)
- Cost Management Tools

- **Flight Systems** (as applicable)

- Hardware/Software Design
- Design Heritage
- Spacecraft Systems Engineering
- Design Margins (Excluding Launch Mass)
- Qualification and Verification
- Assembly, Test, and Launch Operations
- Mission Assurance
- Development of a New Technology

- **Student Collaboration Comments**

- Impact on Mission Feasibility



## TMC Panel Product: Form C

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For each proposal, the TMC evaluation will result in a Form C that contains:

- Proposal title, PI name, and submitting organization;
  - An adjectival risk rating from each evaluator of “LOW Risk”, “MEDIUM Risk” or “HIGH Risk” for the TMC Feasibility of the Mission Implementation, Including Cost Risk that is derived based on the findings;
  - Summary rationale for the median risk rating;
  - Narrative findings, identified as major or minor strengths or weaknesses, including cost analysis;
  - Comments to the PI, comments to NASA, comments to the Science Panel.
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# TMC Evaluation Product: Findings

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Major and minor strengths and weaknesses are defined as follows:

- **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.

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## TMC Evaluation Product: Risk Ratings

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Based on the narrative findings, each proposal will be 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 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 practices. 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.

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

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## TMC Cost Analysis in Support of the Form C

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- Initial cost analyses will be accomplished on the basis of information provided in the proposals (consistency, completeness, proposed basis of estimate, contributions, use full cost accounting, maintenance of reserve levels, and cost management, etc.).
  - Cost will be evaluated with one cost model and checked with an instrument complexity index.
  - Cost threats, risks, and risk mitigations will be analyzed.
  - Cost realism (a.k.a. “cost risk”) is based on models, analogies, heritage, and grass roots information from proposals.
    - Cost Realism is reported as an adjectival rating, ranging from “LOW Risk” to “HIGH Risk” on a five-point scale.
  - Cost Evaluation Summaries and draft Forms C will be completed to the same level of detail prior to the Plenary.
  - During the TMC Plenary, the entire panel will participate in Cost deliberations:
    - All information from the entire evaluation process will be considered in the final cost assessment.
  - Significant findings from the Cost Evaluation Summaries will be documented in the Cost and Schedule Factor on Form C and considered in the Form C grade.
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# Cost Risk Definitions

Cost Risk	Definition
LOW	<p><b><i>Cost Envelope is adequate – expect success.</i></b></p> <ul style="list-style-type: none"> <li>- The proposer's estimate (<i>with reserves</i>) agrees closely with the work, staffing, and schedule proposed, fits within the program cap and any other budget constraints, and is verified by TMC independent analysis.</li> <li>- The proposed cost reserve is adequate to address cost threats identified by TMC, and to fund unexpected needs.</li> <li>- The resource management plan indicates strong, active management of resources throughout implementation.</li> </ul>
LOW/ MEDIUM	<p><b><i>Cost Envelope is somewhat tight, but project should succeed.</i></b></p> <ul style="list-style-type: none"> <li>- TMC identified one or more significant cost threats or weaknesses with regard to the proposer's estimate, cost reserves, and/or resource management. Overall impact of identified threats and weaknesses should be manageable.</li> <li>- TMC independent analysis verifies proposer's costs.</li> </ul>
MEDIUM	<p><b><i>Cost Envelope is tight. Success requires diligent oversight of resources.</i></b></p> <ul style="list-style-type: none"> <li>- TMC identified one or more significant cost threats or weaknesses with regard to the proposer's estimate, cost reserves, and/or resource management. Cost impact of threats may be underestimated by proposer. Overall impact of identified threats and weaknesses should be manageable.</li> <li>- TMC independent analysis verifies some or most of proposer's costs.</li> </ul>
MEDIUM /HIGH	<p><b><i>Cost Envelope is very tight. It is likely the project will require more funding.</i></b></p> <ul style="list-style-type: none"> <li>- TMC identified one or more major cost threats or weaknesses with regard to the proposer's estimate, cost reserves, and/or resource management. Cost impact of threats appears underestimated by proposer. Overall impact of identified threats and weaknesses will be challenging to manage within funding and/or schedule constraints.</li> <li>- TMC independent analysis could not verify significant elements of proposer's costs.</li> </ul>
HIGH	<p><b><i>Project exceeds the Cost Envelope and is expected to require substantially more funding.</i></b></p> <ul style="list-style-type: none"> <li>- TMC identified one or more major cost threats or weaknesses in the proposer's estimate, cost reserves, and/or resource management. Overall impact of identified threats and weaknesses exceeds proposed resources and/or available resources to cover them. Threats are not acknowledged, or are underestimated by proposer.</li> <li>- TMC independent analysis could not verify proposer's costs.</li> </ul>

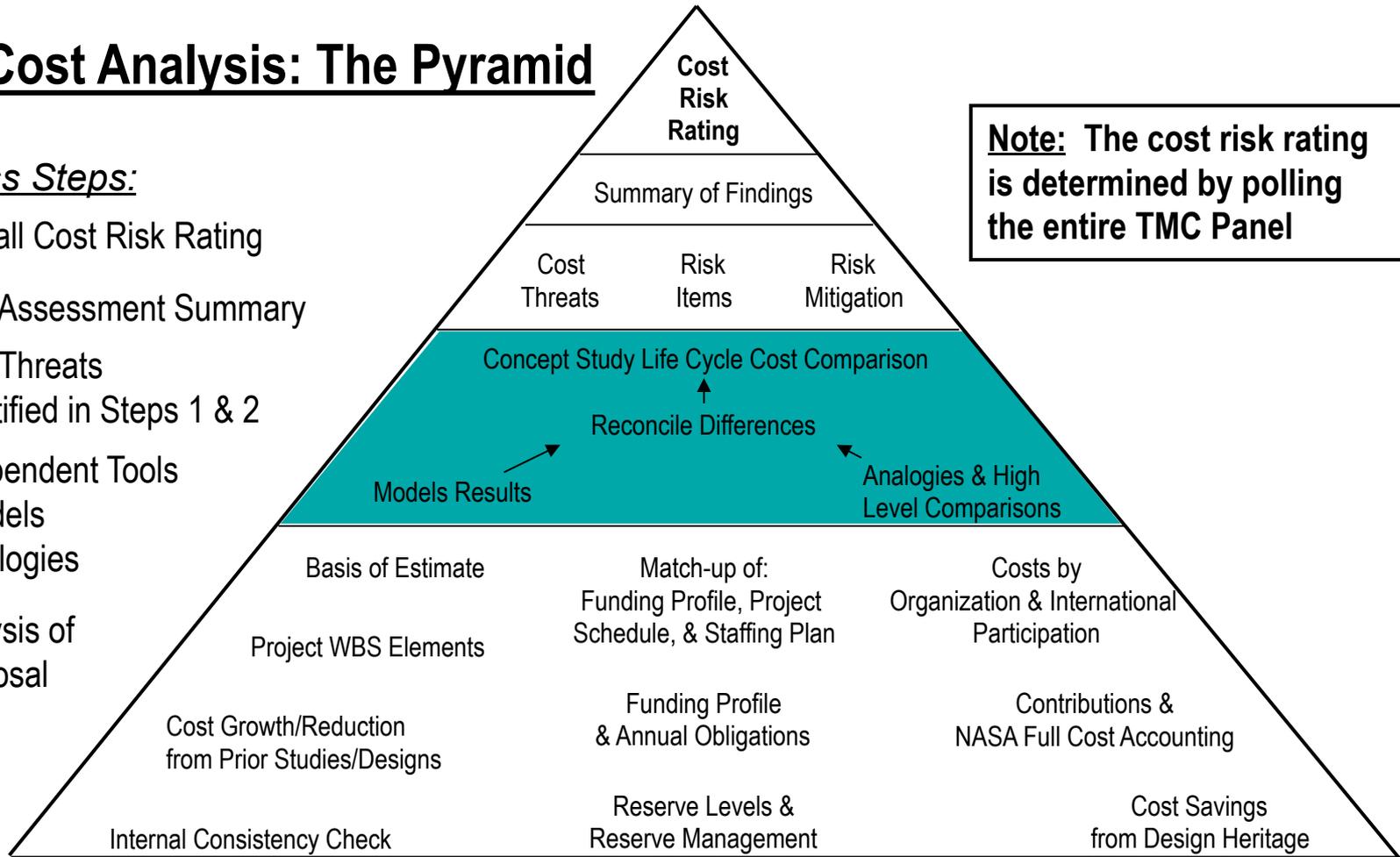


# TMC Evaluation Process

## TMC Cost Analysis: The Pyramid

### Process Steps:

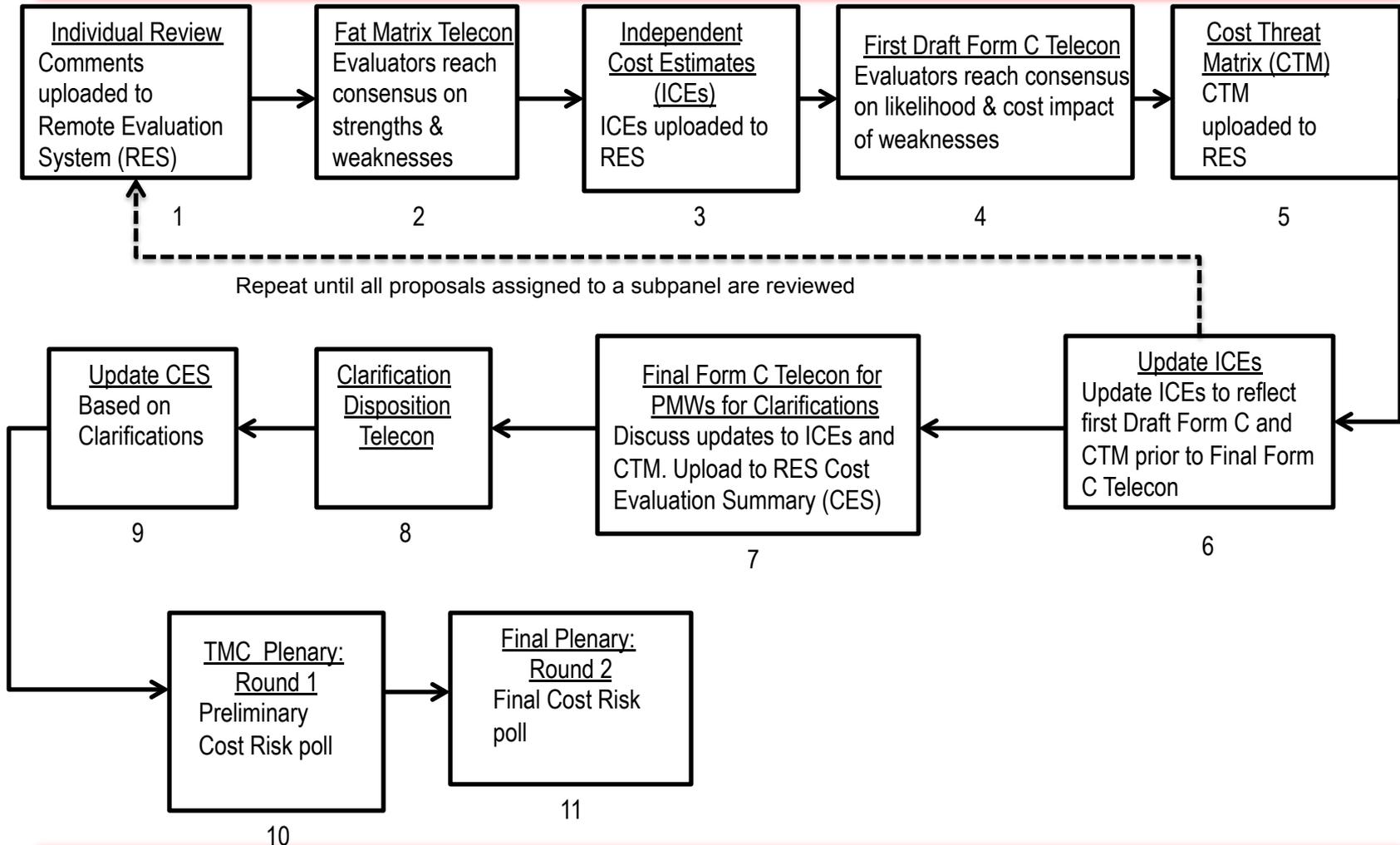
5. Overall Cost Risk Rating
4. Cost Assessment Summary
3. Cost Threats identified in Steps 1 & 2
2. Independent Tools
  - Models
  - Analogies
1. Analysis of Proposal



**Note:** The cost risk rating is determined by polling the entire TMC Panel



# TMC Cost Evaluation Process





# TMC Cost Evaluation Process

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- A guiding principle for the TMC evaluation process is that individual reviews will occur first and individual evaluation comments will be entered into the Remote Evaluation System (RES) prior to multi evaluator discussions to the extent that this is feasible. This principle is being implemented as described below for cost related comments and products on the evaluation.
  - 1. Each Cost Analyst enters cost findings in the RES. The cost evaluator reads the assigned proposal and uses a model to generate a preliminary Independent Cost Estimate (ICE) and a set of cost findings.
  - 2. Criterion C Panel review of individual comments. The cost evaluator and all other Criterion C evaluators participate in a Fat Matrix Telecon (FMT). In this telecon all individual comments entered in the RES are discussed for all evaluation Criterion C Factors. The preliminary ICEs are not discussed during the FMT.
  - 3. Generate Version 1 of ICE based on Criterion C Panel discussion. After the FMT, each cost evaluator will generate an ICE based only on the assumptions and discussion from the FMT. The ICE WBS elements as reported in the Cost Evaluation Summary (CES) will be rounded to the nearest \$1M. These estimates will be presented at the first Draft Form C telecons to all Criterion evaluators. No changes to the ICEs (generated based on the FMT) will be made until after listening to discussions with all evaluators at the first Draft Form C telecon.
  - 4. ICEs presented at first Draft Form C Telecon. A Draft Form C telecon includes participation of all Criterion C evaluators where all major and minor strengths or weaknesses are discussed. The Version 1 ICEs for each proposal will be presented. The likelihood and cost impact, if any, of each weakness is discussed. The Instrument Level of Difficulty (LDI) will be discussed.
  - 5. Cost threat matrix. Subsequent to the first Draft Form C telecon, a cost threat matrix is developed for each proposal that reflects the discussion of the Criterion C Panel on the likelihood and impact of significant weaknesses. This is posted to the RES for all Criterion C evaluators to access.
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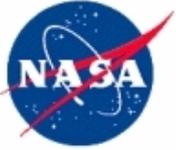
# TMC Cost Evaluation Process

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6. Update ICEs based on first Draft Form C telecon. The cost analyst will update their ICEs to reflect the first Draft Form C discussions and the cost threat matrix discussions. If possible, cost threats with a likelihood > 80% will be included in the ICE. The likely total cost impact of cost threats not included in the ICE will be calculated by multiplying their mean likelihood by their mean impact and totaling those products.
  7. Review of ICE, cost threat matrix, and LDI at second Draft Form C Telecon. Discuss updates to ICE, the cost threat matrix, and LDI. Upload to RES Cost Evaluation Summary – which includes the cost threat matrix, the ICE, and LDI for each proposal– for all Criterion C evaluators to access.

Cost Findings Sent to Proposer. Statements which represent the cost threat matrix will be included in the weaknesses sent to proposers for clarification in order to provide the proposer an opportunity to clarify any misunderstanding. Statements describing significant cost findings based on the ICE will be sent to the proposer in order to provide the proposer an opportunity to clarify any misunderstanding.

    - ICE related cost findings will be treated in a consistent manner across all proposals.
    - If the proposers estimate for any WBS element are outside the error range of the average ICE, the proposer will be sent a clarification comment stating that the proposers estimate for that WBS element could not be validated.
    - Cost related findings which may substantiate a weakness will be sent to the proposer for clarification.
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# TMC Cost Evaluation Process

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8. Clarification Disposition. A Clarification Disposition Telecon is held with all evaluators. Dispositions may affect the ICE, LDI, or CTM.
9. Update CES based on Clarification. Based on the review by the entire Criterion C Panel of the disposition of clarifications, the CTM, ICE, LDI or cost findings may need to be updated. Cost threats with a likelihood > 80% will be updated if they have been included in the ICE. The likely total cost impact of cost threats not included in the ICE will be updated.
10. Final Plenary: Round 1. In Round 1, all major strengths or weaknesses are discussed. Minors are reviewed only as an exception. Each proposal's cost threat matrix, ICE, and LDI are reviewed. A preliminary Cost Risk Poll for each proposal is held during Round 1. Each proposal's cost threat matrix and ICEs will be updated to reflect the Round 1 discussions.
11. Final Plenary: Round 2. In Round 2, all major strengths or weaknesses are discussed. Each proposal's cost threat matrix and the ICE are reviewed, with a focus on any Round 1 based updates. A Final Cost Risk Poll for each proposal is held during Round 2. Each proposal's cost threat and the ICEs will be updated to reflect the Round 2 discussions.

ICE = Independent Cost Estimate

LDI = Level of Difficulty Index

CES = Cost Evaluation Summary

CTM = Cost Threat Matrix



# 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 Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations.”
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The cost threat matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.

		Cost Impact (CI, % of PI-Managed Investigation cost to complete Phases A/B/C/D)					How cost threat was included in the ICE
		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%)						

Note: For each proposal the percentages in the above table will be converted to dollars by the cost estimator.



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## Request for Clarification



# Evaluation: Clarifications from Proposers

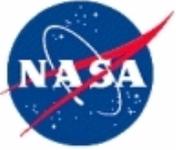
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NASA will request clarification of potential major weaknesses in the TMC Feasibility of the Investigation Implementation and the Science Implementation Merit that have been identified by the evaluation panels for those criteria. NASA will not request clarification for the Science Merit.

- NASA will request such clarification uniformly, from all proposers.
- All requests for clarification from NASA, and the proposer's response, will be 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 major weaknesses will receive an email informing them.
- 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 major weakness is addressed.
  - Noting that the major weakness is not addressed in the proposal.
  - Stating that the major weakness is invalidated by information that is common knowledge and is therefore not included in the proposal.
  - Stating that the analysis leading to this potential major weakness 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 or outside of the proposal.

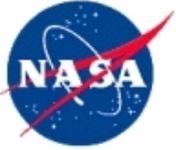
The PI will be given at least 24 hours to respond to the request for clarification. Any response that goes beyond a clarification will be deleted and will not be shown to the evaluation panel.

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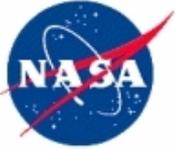
# Classification



# Categorization

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- Upon completion of the evaluations, the results will be presented to the Categorization Committee, an *ad hoc* subcommittee of the SMD AO Steering Committee composed solely of Civil Servants and appointed by the SMD Deputy Associate Administrator.
- This committee will consider the peer review results and, based on the evaluations, will categorize each proposal according to procedures required by NFS 1872.403-1(e). The categories are defined as:
  - Category I. Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AO's objectives, and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and data that can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.



## Categorization (continued)

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- Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.
- Category III. Scientifically or technically sound investigations which require further development. Category III investigations may be funded for development and may be reconsidered at a later time for the same or other opportunities.
- Category IV. Proposed investigations that are recommended for rejection for the particular opportunity under consideration, whatever the reason.



# Evaluation Process Conclusion

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Once Categorization has been completed, the Evaluation is considered ended unless found deficient by a subsequent review.

After selection is announced, a Transition Briefing will be provided by the Evaluation Team to Civil Servants in the Program Office and at Headquarters who have implementation responsibilities.