



2018 Heliophysics Science Mission of Opportunity Pre-Proposal Conference

SALMON-3 PEA-M *Science Merit & Science Implementation Merit Evaluation Overview*

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Heliophysics Science Requirements

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- All investigations proposed in response to this solicitation must support the NASA Heliophysics Science Program Objective and Goals, and must be implemented by Principal Investigator (PI) led investigation teams.
- The NASA strategic objective addressed by the Heliophysics Science Program is to understand the Sun and its interactions with Earth and the solar system, including space weather.
- The NASA Science Mission Directorate (SMD) Heliophysics Division (HPD) is addressing this strategic objective by conducting Heliophysics investigations designed to address the following science goals:
 - Explore the physical processes in the space environment from the Sun to the Earth and throughout the solar system
 - Advance our understanding of the connections that link the Sun, the Earth, planetary space environments, and the outer reaches of our solar system
 - Develop the knowledge and capability to detect and predict extreme conditions in space to protect life and society and to safeguard human and robotic explorers beyond Earth.



Science Evaluation Overview

NASA Science Goals and Objectives

- Further information on NASA's strategic objective may be found in NASA Policy Directive (NPD) 1001.0B, *NASA 2014 Strategic Plan*.
- Further information on the goals and objectives of NASA's Heliophysics program may be found in
 - 2014 Science Plan for NASA's Science Mission Directorate;*
 - Our Dynamic Space Environment: Heliophysics Science and Technology Roadmap for 2014-2033 and*
 - Solar and Space Physics: A Science for a Technological Society - 2013 NRC Decadal Strategy for Solar and Space Physics*



Heliophysics Science Mission of Opportunity

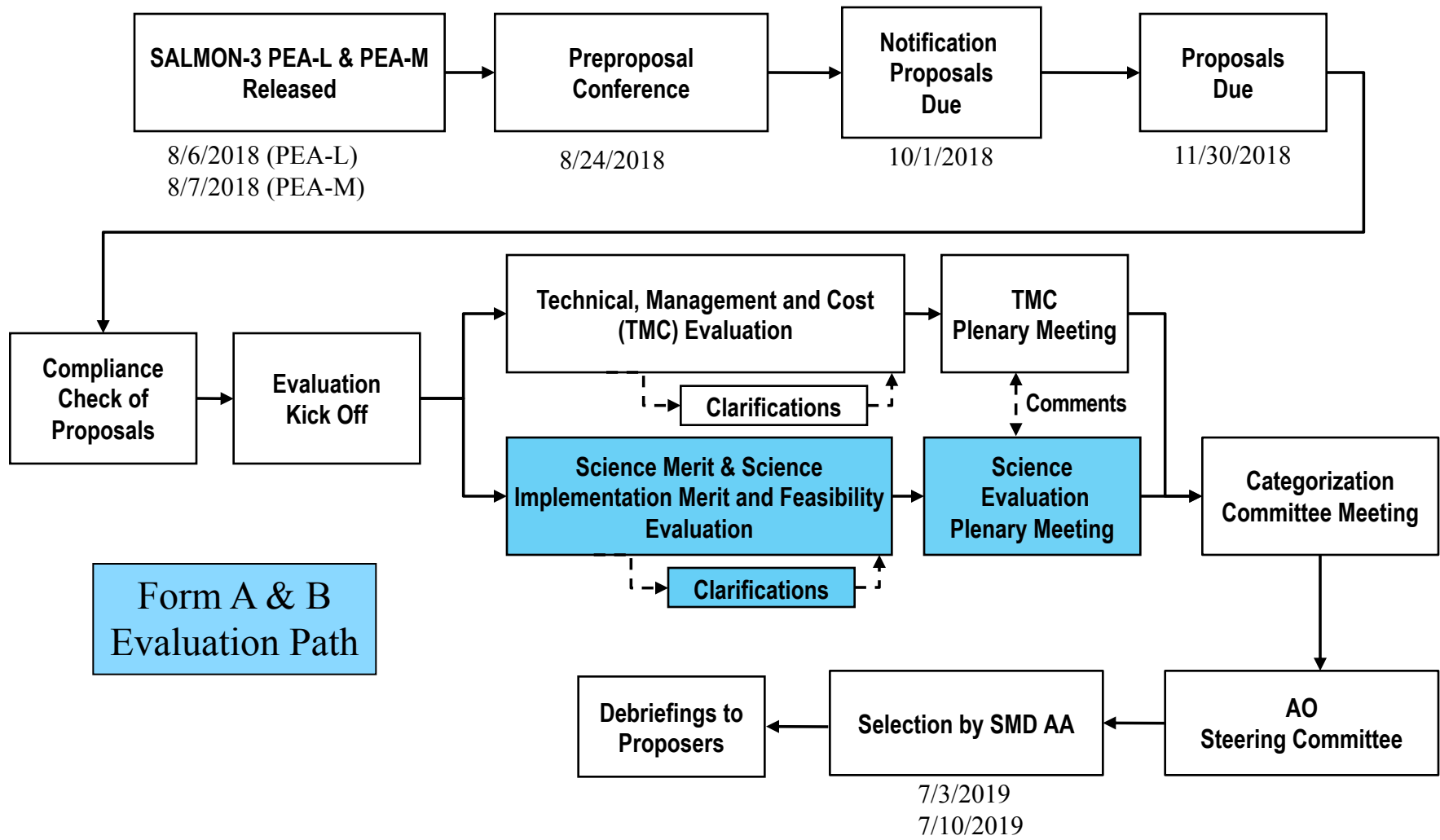
Science Merit & Science Implementation Merit Evaluation

Two Requirements Documents:

- 1) PEA-M
- 2) SALMON-3 AO



Evaluation Path Form A&B





Science-Related Requirements: SALMON-3 PEA-M

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Requirement M-15: Proposals shall address appropriate science questions relevant to the NASA heliophysics science objectives and goals described in Section 2 of PEA -M

Requirement M-16: Each proposal shall clearly define its science question or questions, shall demonstrate how the science questions map into high-level science requirements, and shall show how the science requirements subsequently map into measurement, data, instrument, and mission requirements.

Requirement M-17: Each proposal shall clearly state the baseline and threshold requirements for the mission and the baseline and threshold mission lifetime.

Requirement M-18: Proposals shall be for complete investigations including Phases A–F.

Requirement M-19: Proposal shall fully describe the requirements for calibration and validation of the instruments and the data returned.



Data Analysis, Management and Archiving Requirements: SALMON-3 PEA-M

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Requirement M-1: A Data Analysis Plan including approaches for data retrieval, validation, and preliminary analysis shall be described. The technology and any science products (e.g., flight data, ancillary or calibration data, theoretical calculations, higher order analytical or data products, laboratory data, etc.) shall be identified, including a list of the specific data products and the individual team members responsible for the data products.

Requirement M-2: A Data Management and Archive Plan, including approaches for the release of peer-reviewed publications, the release of the research data that underlie the results and findings in peer-reviewed publications, and the archiving of all technology and any science products shall be described. The technology and any science products shall be identified, including a list of the specific data products and the individual team members responsible for the data products. The Data Management and Archive Plan shall be in compliance with requirements and the guidelines in the *NASA Plan for Increasing Access to the Results of Scientific Research*. The Data Management and Archive Plan shall identify the appropriate NASA data archive and the standards to be used. It shall include an estimate of the raw data volume and the data latency by product for submission of raw and reduced data, to the data archive, in physical units accessible to the science community.

The combination of requirements M1 and M2 supersede Requirement B-23 in Appendix B of the SALMON-3 AO.



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In the event of an apparent conflict between the PEA-M and the SALMON-3 AO guidelines, the order of precedence is:

1. the PEA-M,
2. then the SALMON-3 AO,
3. then SALMON-3 Appendix B,
4. then SALMON-3 Appendix A.



Investigation Evaluation Criteria

- SALMON-3 AO
 - A. **Scientific Merit of the Proposed Investigation (Section 7.2.2);**
 - B. **Scientific Implementation Merit and Feasibility of the Proposed Investigation (Section 7.2.3);**
 - C. TMC Feasibility of the Proposed Mission 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.
- Evaluation Forms:
 - Form A for Criterion A
 - Form B for Criterion B
 - Form C for Criterion C
- Other Selection Factors (Section 7.3):
 - Programmatic factors
 - PI-Managed Mission Cost



Form A: Scientific Merit Evaluation Factors

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- The information provided in a proposal will be used to assess the intrinsic scientific merit of the proposed investigation.
- Scientific merit will be evaluated for the Baseline Science Mission and the Threshold Science Mission.
 - Science enhancement options beyond the Baseline Science Mission will not contribute to the assessment of the scientific merit of the proposed investigation.
- Four (4) separate scientific merit factors will be evaluated



Scientific Merit Evaluation Factors

- **Factor A-1. Compelling nature and scientific 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 scientific 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.
- **Factor A-2. Programmatic value of the proposed investigation.**
 - This factor includes the unique value of the investigation to make scientific progress in the context of other ongoing and planned missions; the relationship to the other elements of NASA's science 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.
- **Factor A-3. Likelihood of scientific 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 scientific success.
- **Factor A-4. Scientific value of the Threshold Science Mission.**
 - This factor includes the scientific value of the Threshold Science Mission using the standards in the first factor of this section and whether that value is sufficient to justify the proposed cost of the mission.
- **Factor A-5. Merit of any Science-Exploration-Technology Enhancement Options (SEOs), if proposed.** This factor includes assessing the potential of the selected activities to enlarge the impact of the investigation. Although evaluated by the same panel as the balance of Intrinsic Merit factors, this factor will not be considered in the overall criterion rating.



Form B:

Scientific Implementation Merit & Feasibility

- The information provided in a proposal will be used to assess merit of the plan for completing the proposed investigation, including the scientific implementation merit, feasibility, resiliency, and probability of scientific success of the proposed investigation.
- Five (5) science implementation merit and feasibility factors are evaluated for each proposal.
- One additional science implementation merit and feasibility factor will be evaluated for those proposals including Science Enhancement Options (SEO).
 - The inclusion of SEO is not required for proposals submitted for two step selection.



Evaluation Factors B-1 to B-3: Scientific Implementation Merit & Feasibility

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- **Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.**
 - This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data; and the sufficiency of the data gathered to complete the scientific investigation.
- **Factor B-2. Probability of technical success.**
 - This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; 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 mission design.
- **Factor B-3. Merit of the data analysis, data availability, and data archiving plan.**
 - This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives of the investigation; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis of value to the science 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 usable to the entire science community; assessment of adequate resources for physical interpretation of data; reporting scientific results in the professional literature; and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.



Evaluation Factors B-4 to B-6: Scientific Implementation Merit & Feasibility

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- **Factor B-4. Science resiliency.**

- This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission 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.

- **Factor B-5. Probability of science team success.**

- This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator and collaborator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is and/or collaborators who do not have a well defined and appropriate role may be cause for downgrading during evaluation.
- ***PEA-M Modification:*** *In this Factor, “Probability of investigation team success,” the scientific expertise of the PI will be evaluated but not his/her experience with NASA missions*

- **Factor B-6. Merit of any science enhancement options (SEOs), *if proposed***

- This factor includes assessing the appropriateness of the selected activities to enlarge the impact of the mission and the costing of the selected activities. Although evaluated by the same panel as the balance of Implementation Merit factors, this factor will not be considered in the overall criterion rating.



Science Evaluation Products: Findings

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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.



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 weaknesses 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).



Evaluation Clarifications

- NASA will request clarification of Potential Major Weaknesses (PMWs) identified by the evaluation panels in:
 1. the TMC Feasibility of the Proposed Mission/Investigation Implementation and
 2. the **Scientific Implementation Merit and Investigation**.
- 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 potential major weaknesses will receive an email informing them.
- The form of the clarifications is strictly limited to five types of responses:
 1. Identification of the locations in the proposal (page(s), section(s), line(s)) where the potential major weakness is addressed
 2. Noting that the potential major weakness is not addressed in the proposal.
 3. Stating that the potential major weakness is invalidated by information that is common knowledge and is therefore not included in the proposal.
 4. Stating that the analysis leading to the potential major weakness is incorrect and identifying a place in the proposal where data supporting a correct analysis may be found.
 5. Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside 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.



Questions?



All questions pertaining to the Science MO proposals must be addressed to:

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