2018 Heliophysics Technology Demonstration (TechDemo) Mission of Opportunity (MO) Solicitation

[PEA-L NNH17ZDA004O-HPTDMO]

Pre-Proposal Conference
Technology Evaluation Overview

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TechDemo Objectives and Goals

TechDemo Objectives and Goals

The goal of the Heliophysics TechDemo MO is to demonstrate and mature, through spaceflight, technologies that enable new heliophysics science investigations or enhance the ability for heliophysics science investigations to be executed with fewer resources, with lower risk, and/or with significantly higher scientific return.

- Demonstration of mid-TRL technologies are sought that enable significant advances in NASA's Heliophysics Science Objectives and Goals.
- All investigations proposed in response to this solicitation must support the goals and objectives of the Heliophysics Technology Demonstration Mission of Opportunity.
- Proposals must be for Small Complete Missions (SCMs), and must be implemented by Principal Investigator (PI) led investigation teams.

TechDemo Objectives and Goals

Proposal Merit

- Proposal merit will be determined by the magnitude of the heliophysics science advancements enabled by the proposed TechDemo investigation.

- Initiation of a future mission achieving the science advancements enabled by the TechDemo investigation must be technically and scientifically feasible within the next 15 years.

Heliophysics Science Objectives and Goals

- The NASA Strategic Objective for Heliophysics Research is to "Understand the Sun, Earth, Solar System, and Universe".

- In response to the above strategic objective, the Science Mission Directorate (SMD) conducts heliophysics investigations addressing the following science goals:
  - Explore the physical processes in the space environment from the Sun, 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; and
  - 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.

- Resource documents for NASA Heliophysics Science Goals
  - *2014 Science Plan for NASA's Science Mission Directorate*
  - *Our Dynamic Space Environment: Heliophysics Science and Technology Roadmap for 2014-2033*
  - *Solar and Space Physics: A Science for a Technological Society - 2013 NRC Decadal Strategy for Solar and Space Physics*

TechDemo Mission of Opportunity Technology Evaluation

Two Requirements Documents:

1) PEA-L
2) SALMON-3 AO

TechDemo Technology Requirements

Requirement L-3: Proposals shall clearly identify the Heliophysics Science Objectives and Goals, described in Section 2.1 of the PEA, that the technology would address and the Heliophysics Science investigations that the technology would enable or enhance.

Requirement L-4: Proposals shall clearly show how the scope of the investigation is necessary for the proposed technology demonstration.

Requirement L-5: Proposals shall clearly state the high-level science requirements that flow from the Heliophysics Science Objectives and Goals to be addressed, show how those science requirements map into the technology requirements, and how the technology would fulfill those requirements. This requirement supersedes Requirement 16 of the SALMON-3 AO.

TechDemo Technology Requirements

Requirement L-6: Proposals shall include Data Plans to calibrate (both preflight and in-flight), analyze, publish, and archive the data returned, and shall demonstrate, analytically or otherwise, that sufficient resources have been allocated to carry out the Data Plans within the proposed investigation cost. This requirement, in combination with Requirement L-2, supersedes Requirement 17 of the SALMON-3 AO.

Requirement L-7: Proposals shall clearly state the mission requirements, including lifetime, to achieve the Baseline and Threshold Investigations.

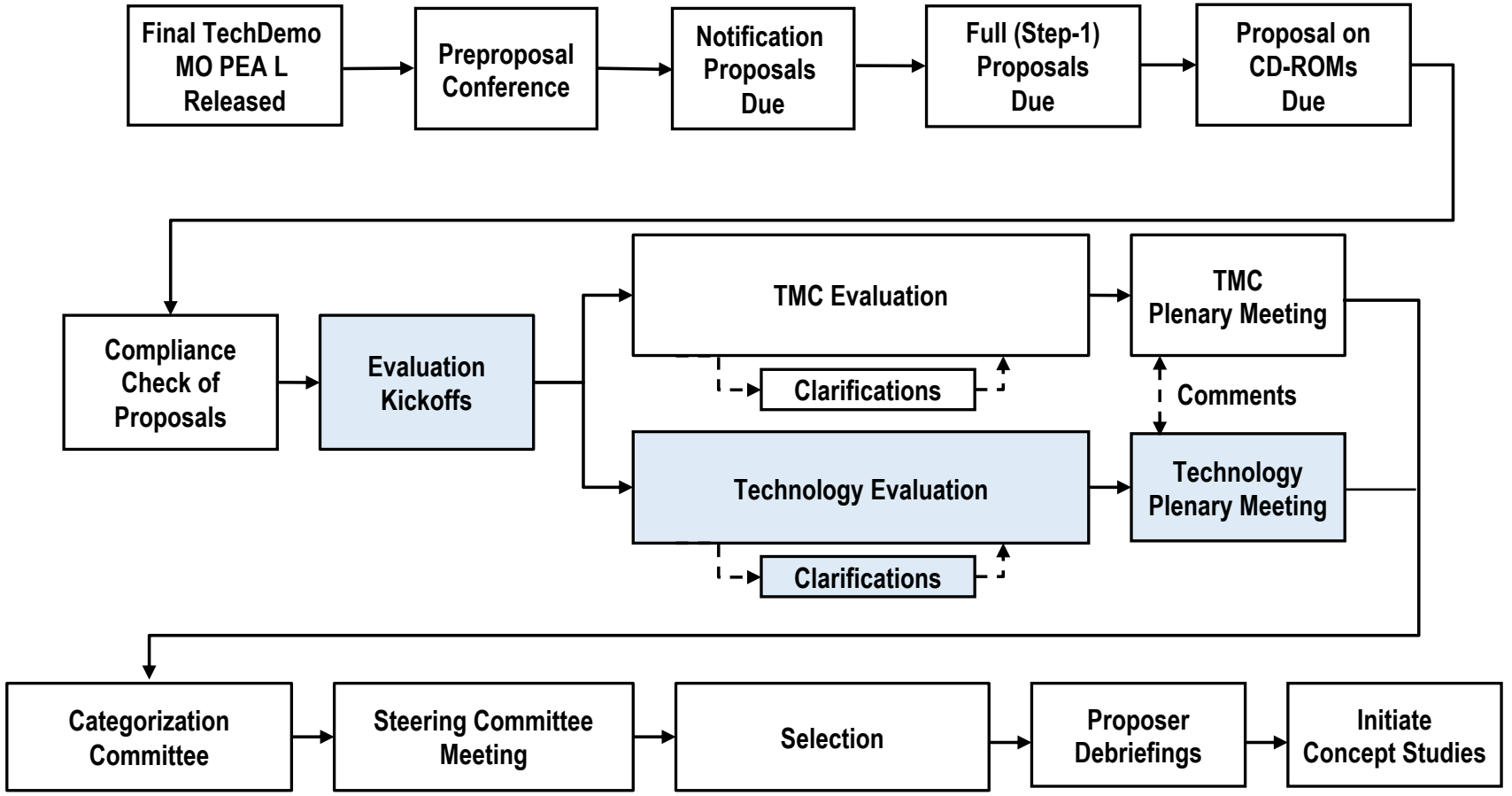
Requirement L-11: Investigations that propose to demonstrate technologies that are below TRL 5 at time of proposal submission shall include a plan for the maturation of the systems containing the technologies to TRL 5 by no later than PDR. For the purposes of this PEA, no back-up plan is needed. Systems that do not include a technology demonstration shall adhere to Requirement 35 of the SALMON-3 AO.

TechDemo MO

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

1. The PEA-L,
2. Then the SALMON-3 AO
3. Then the SALMON-3 Appendix B,
4. Then the SALMON-3 Appendix A.

Solicitation, Evaluation and Selection Flow



Investigation Evaluation Criteria

- 2018 Heliophysics TechDemo MO and SALMON-3 AO
  A. Intrinsic Technology Merit of the Proposed Investigation (Section 7.1.1 of PEA-L);
  B. Technology Implementation Merit and Feasibility of the Proposed Investigation (Section 7.1.2 of PEA-L);
  C. TMC Feasibility of the Proposed Investigation Implementation (Section 7.1.3 of PEA-L).

- 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 of SALMON-3):

– Programmatic factors
– PI-Managed Mission Cost

Technology Evaluation

- Proposals will be evaluated according to the evaluation criteria set forth in Sections 7.1.1, 7.1.2, and 7.1.3 of the PEA, which supersede the criteria given in Section 7.2 of the SALMON-3 AO. These changes are described in this presentation.
- Half-step ratings will not be used for the Criteria A and B adjectival ratings.

Technology Evaluation (continued)

- Proposal Merit
  - As described in Section 7.1 of the PEA, proposal merit will be determined by the magnitude of heliophysics science advancements enabled by the proposed TechDemo investigation. Whether the targeted science advancement is achieved during the TechDemo investigation, or during some future mission within the specified timeframe, will not be a factor in the evaluation criteria. Scientifically useful data collected in the course of demonstration of the enabling capability of proposed technology(ies), as well as subsequent analysis and interpretation of any such data, will be considered in the evaluation of proposed Baseline and Threshold Investigations to the extent that they specifically facilitate the demonstration.
- Investigations Targeting Further Scientific Return
  - From PEA Section 5.2.4: “Any investigation targeting further scientific return from a mission—beyond that needed to validate the enabling capacity of the proposed technology(ies)—should propose the associated activities as an SEO.”

Technology Evaluation Factors and Exceptions to SALMON-3

Factors A-1 to A-6. Intrinsic ~~Science, Exploration, or~~ Technology Merit of the Proposed Investigation.

- Factor A-1. Compelling nature***,*** ~~and~~ priority***, and value*** of the proposed investigation's ~~science, exploration, or~~ technology goals and objectives. This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect the program, Agency, and national priorities; the potential impact of the investigation on program, Agency, and national ~~science, exploration, or~~ technology objectives; and the potential for fundamental progress, as well as filling gaps in our knowledge relative to the current state of the art. ***Specifically, the value of the technology goals are determined with respect to the heliophysics science missions these goals enable***.
- Factor A-2. Programmatic value of the proposed investigation. This factor includes the unique value of the investigation to make science~~, exploration, or~~ ***and*** technology 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 ***and proposed*** missions by NASA and other agencies ***within the next 15 years***; and the necessity for a space mission to realize the goals and objectives.

Technology Evaluation Factors and Exceptions to SALMON-3

Factors A (continued)

- Factor A-3. Likelihood of ~~science, exploration, or~~ technology 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.
- Factor A-4. ~~Science, exploration, or~~ Technology 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.
- 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.
- ~~Factor A-6. Merit of any PI-developed Technology Demonstration Opportunities (TDOs), if proposed.~~

Factors B-1 to B7. Experiment ~~Science, Exploration, or~~ Technology Implementation Merit and Feasibility of the Proposed Investigation.

- Factor B-1. Merit of the ~~instruments and~~ investigation design for addressing the ~~science, exploration, or~~ technology 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~~ ***technology*** 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, exploration, or~~ technology investigation ***and meet its goals and objectives***.
- Factor B-2. Probability of technical success. This factor includes the maturity and technical readiness of the ~~instruments~~ ***technology to be demonstrated*** or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the ~~instruments~~ ***technology to be demonstrated*** 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 development of new technology to be demonstrated***; 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~~ ***technology*** within the investigation design.

Factors B (continued)

- Factor B-3. Merit of the data analysis, data availability, and data archiving plan ~~and/or sample analysis plan~~. This factor includes the merit of plans for data ~~and/or sample~~ analysis~~,~~ ***and*** data archiving~~, and/or sample curation~~ to meet the goals and objectives of the investigation; 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 usable to the entire research and development community; assessment of adequate resources for physical interpretation of data; an assessment of the planning and budget adequacy ~~and evidence of plans for the preliminary evaluation and curation of any returned samples~~; reporting science~~, exploration~~, or technology 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.
- Factor B-4. ~~Science, exploration, or~~ Technology 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.

Technology Evaluation Factors and Exceptions to SALMON-3

Factors B (continued)

- Factor B-5. 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~~ ***technology***. ***The scientific expertise of the PI will be evaluated but not his/her experience with NASA missions.*** The role of each Co-Investigator and collaborator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is or collaborators who do not have a well-defined and appropriate role may be cause for downgrading of the proposal during the evaluation. ***Comments about the managerial experience of the PI, and whether appropriate mentoring and support tools are in place, will be made to the Selection Official but these comments shall not impact the "Experiment Implementation Merit" rating.***
- Factor B-6. Merit of any Science~~-Exploration-Technology~~ 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.
- ~~Factor B-7. Merit of PI-developed Technology Demonstration Opportunities (TDOs), if proposed.~~

Technology Panel Products: Form A

For each proposal, the Technology evaluation will result in two forms, Forms A and B:

Form A

- Proposal title, PI name, and submitting organization;
- Proposal summary;
- The Intrinsic Technology Merit of the Proposed Investigation adjectival ratings from each evaluator, ranging from “Excellent” to “Poor”;
- Summary rationale for the median rating;
- Narrative findings supporting the adjectival rating in the form of specific major or minor strengths or weaknesses;
- Comments to PI, Comments to NASA (optional)

Technology Panel Products: Form B

For each proposal, the Technology evaluation will result in two forms, Forms A and B:

Form B

- Proposal title, PI name, and submitting organization;
- The Experiment Technology Implementation Merit and Feasibility of the Proposed Investigation adjectival ratings from each evaluator, ranging from “Excellent” to “Poor”;
- Summary rationale for the median rating;
- Narrative findings supporting the adjectival rating in the form of specific major or minor strengths or weaknesses;
- Comments to PI, Comments to NASA (optional)

Technology Evaluation Products: Findings

- **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 technology objectives.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technology 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.

Evaluation Clarification Process

NASA will request clarifications of Potential Major Weaknesses (PMWs) identified by the Technology Evaluation panel in the first two criteria: Intrinsic Technology Merit of the Proposed Investigation, Experiment Technology Implementation Merit and Feasibility of the Proposed Investigation. NASA will request such clarification uniformly from all proposers.

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

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

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 or research or lack of focus on the objectives of the AO).

References

TechDemo MO Reference Material

2018 Heliophysics TechDemo MO Acquisition Page

The 2018 Heliophysics TechDemo MO acquisition home page available at https://soma.larc.nasa.gov/stp/tdmo/, will provide updats and any addenda during the solicitation process. The contents of the acquisition page include the following:

- Links to the TechDemo MO draft and final PEA
- FBO announcement
- Community Announcements
- Program Library
- Technology Fair
- Teaming Interests
- TechDemo Q&As
- Preproposal Conference

Questions?

All further questions pertaining to the TechDemo PEA-L MUST be addressed to:

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