Listing of 2018 Heliophysics TechDemo MO PEA Significant Changes from Draft PEA

1: Sections 1.1, 1.2. 5.1, 5.3.6, and 5.6.1 – Clarifies the use of one or two ports on the ESPA Grande, and that alternative IMAP EELV configurations will not be offered.

Section 1.1:

Final PEA:

(Added) … Accommodation on the EELV Secondary Payload Adapter (ESPA) Grande will be provided at no cost to proposers.

Section 1.2:

Draft PEA:

Access to space for the solicited TechDemo investigations will be provided by NASA in the form of a secondary payload opportunity on the ESPA that is planned for the IMAP mission; integration costs to the IMAP ESPA will be funded by NASA. Information regarding the ESPA can be found in the *Mission Specific ESPA System Interface Specification* document, found in the TechDemo Mission of Opportunity Program Library at https://soma.larc.nasa.gov/stp/tdmo/tdmo-library.html (hereafter referred to as the Program Library). Investigations requiring access to space other than the IMAP launch are not solicited.

Final PEA:

Access to space for the solicited TechDemo investigations will be provided by NASA in the form of a secondary payload opportunity on one or two ports of the EELV Secondary Payload Adapter (ESPA) Grande that is planned for the IMAP mission. Investigations requiring access to space other than the IMAP launch are not solicited.

Section 5.1:

Draft PEA:

Only Small Complete Missions (SCMs) are solicited by this MO PEA. Access to space for all SCMs proposed in response to this PEA will be as a secondary payload for the IMAP mission. Payload accommodations on the ESPA accompanying IMAP will be provided by NASA. Any alternative configurations (e.g., a second ESPA) may be considered subject to compatibility with the IMAP launch and operational constraints. All costs associated with alternative configurations must be either contained within the PIMMC or contributed.

Final PEA:

Only Small Complete Missions (SCMs) are solicited by this MO PEA. Access to space for all SCMs proposed in response to this PEA will be provided as a secondary payload on the IMAP mission. Payload accommodations on the ESPA Grande accompanying IMAP will be provided by NASA.

Section 5.3.6:

Draft PEA (Section 5.3.1):

> The NASA-provided TechDemo SCM flight opportunity is in the form of a secondary payload, termed Multi-Mission Payload (MMP), on the IMAP ESPA. MMP accommodations are described in the *Rideshare User's Guide* (May 2016), which can be found in the Program Library. Rideshare Mission Assurance (RMA) is a process to control and mitigate the risks to the primary mission and other MMPs. Guidelines for this process are discussed in the *Mission Specific ESPA System Interface Specification* document found in the Program Library. All investigations shall be compliant with the *Mission Specific ESPA System Interface Specification* document.
>
> Requirement tbd-11. For investigations to launch on the IMAP ESPA, proposals shall clearly demonstrate compliance to the ESPA requirements, as given in the *Mission Specific ESPA System Interface Specification* document found in the Program Library.
>
> Requirement tbd-12. Proposals shall define applicable Rideshare Mission assurance processes and describe implementation.

Final PEA:

> The TechDemo PEA-provided access to space is in the form of a secondary payload, termed Rideshare Payload (RPL), on the IMAP ESPA Grande. Information regarding the ESPA Grande can be found in the *NASA's Mission Specific Evolved Expendable Launch Vehicle Secondary Payload Adapter (ESPA) System Interface Specification (SIS) For Heliophysics Missions of Opportunity* document (hereafter referred to as the *ESPA SIS*), found in the Program Library. RPL accommodations are described in the *Evolved Expendable Launch Vehicle Rideshare User's Guide* (May 2016), which can be found in the Program Library. Rideshare Mission Assurance (RMA) is a process to control and mitigate the risks to the primary mission and other RPLs. Guidelines for this process are discussed in the *ESPA SIS* document found in the Program Library.
>
> Requirement L-12. For investigations to launch on the IMAP ESPA Grande, proposals shall clearly demonstrate compliance to the ESPA Grande requirements and enveloping characteristics, as given in the *ESPA SIS* document found in the Program Library.
>
> Requirement L-13. For investigations launching on the IMAP ESPA Grande, proposals shall utilize one or two ESPA Grande ports. Investigations requiring two ports shall comply with the ESPA SIS for *each* port.
>
> Requirement L-14. Proposals shall define applicable Rideshare Mission assurance processes and describe implementation.
>
> The IMAP ESPA Grande provides a standard interface for the TechDemo investigations. This ESPA Grande will not provide propulsion, power, or other spacecraft support beyond the standard ESPA Grande deployment process, which will not occur until the IMAP mission has been deployed. Specific details of the ESPA Grande interface can be found in the *ESPA SIS* document found in the Program Library.

Section 5.6.1:

Draft PEA (Section 5.7.1):

> Access to space via a rideshare on the IMAP launch vehicle will be provided by NASA; integration costs to the IMAP ESPA will be funded by NASA and do not need to be included within the PIMMC.

Final PEA:

> Access to space via a rideshare on the IMAP launch vehicle will be provided by NASA; integration costs to the IMAP ESPA Grande will be funded by NASA and do not need to be included within the PIMMC.

2: Section 1.1 – Programmatic Overview

Draft PEA:

> Proposal merit will be determined by the magnitude of heliophysics science advancements enabled by the proposed TechDemo investigation. The timeframe to initiate a future mission achieving the science advancements enabled by the TechDemo investigation must be expected technically and scientifically during the next 15 years. The TechDemo investigation might inform the mission recommendations of the next heliophysics decadal study by raising the TRL of a key technology to the point it is no longer considered a defining risk to those missions. However, significant science advancement is also possible within the TechDemo investigation itself. 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.

Final PEA:

> Proposal merit will be determined by the magnitude of 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 (see Factors A-1 and A-2). The TechDemo investigation might inform the mission recommendations of the next heliophysics decadal study by raising the TRL of a key technology to the point it is no longer considered a defining risk to those missions. However, significant science advancement is also possible within the TechDemo investigation itself. 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.
>
> (Added) This opportunity is open to high risk, high reward investigations. The PEA specifically enables this by superseding SALMON-3 with a lower TRL requirement at PDR, a waiver of technology development backup plans, and an allowance of higher expenditure of costs prior to the Preliminary Design Review (PDR). The evaluation process for the TMC Feasibility of the Proposed Investigation Implementation criterion itself will not change. Instead, recommendations to the Selection Official will more heavily weigh the return from investigations over risk ratings than has historically been the case for SMD science investigations.

3: Sections 1.3 and 5.3.1 - Step-1 selections

Draft PEA:

> Section 1.3:
> … As the outcome of the first step evaluation, NASA intends to fund no more than three MO investigations to proceed to a nine-month Phase A concept study. In the second step, NASA will conduct an evaluation of the Phase A Concept Study Reports. From this evaluation, NASA expects to down-select one or more MOs to proceed into Phase B and subsequent mission phases.
>
> Section 5.4.1:
> … NASA intends to select no more than three Step-1 proposals for Phase A study and evaluation. … As the outcome of Step-2, NASA may continue one or more investigations into the subsequent phases of mission development for flight and operations.

Final PEA:

> Section 1.3:
> … As the outcome of the first step evaluation, NASA expects to fund two or more MO investigations to proceed to a nine-month Phase A concept study. In the second step, NASA will conduct an evaluation of the Phase A Concept Study Reports. From this evaluation, NASA expects to down-select one or two MOs to proceed into Phase B and subsequent mission phases.
>
> Section 5.3.1:
> … NASA expects to select two or more Step-1 proposals for Phase A study and evaluation. … As the outcome of Step-2, NASA may continue one or two investigations into the subsequent phases of mission development for flight and operations.

4: Sections 4.3 and 4.4 - Data policies and requirements and intellectual property

The Final PEA Sections 4.3 and 4.4 reflect updates to SALMON-3 Section 4.4. The Final PEA Sections 4.3 and 4.4 combined supersede SALMON-3 Section 4.4 and replace Draft PEA Sections 4.3 and 5.9.1.

5: Section 5.2 – Investigation Requirements

Draft PEA:

> As stated in Section 2.2 of this PEA, the goal of the Heliophysics Technology Demonstration MO is to demonstrate, via spaceflight, technologies that enable new heliophysics science investigations or enhance the ability for heliophysics science missions to be executed with fewer resources, with lower risk, and/or with significantly higher scientific return. A technology to be demonstrated may be flight hardware (e.g., sensors and detectors, platform technologies, systems, and components), flight software, or any combination thereof. The timeframe to initiate a future mission achieving the science advancements enabled by the TechDemo investigation must be expected technically and scientifically during the next 15 years.
>
> Proposals must clearly define the science investigations that the proposed technology would enable or enhance, the value of the science, and their traceability to the NASA Heliophysics Science Objectives and Goals (see Requirement tbd-8). Proposals do not need to solve or answer

a science question within the scope of the TechDemo investigation itself, but must demonstrate technology maturation that will enable missions as described above.

Final PEA:

As stated in Section 2.2 of this PEA, the goal of the Heliophysics TechDemo MO is to demonstrate, via spaceflight, technologies that enable new heliophysics science investigations or enhance the ability for heliophysics science missions to be executed with fewer resources, with lower risk, and/or, especially, with significantly higher scientific return. A technology to be demonstrated may be flight hardware (e.g., sensors and detectors, platform technologies, systems, and components), flight software, or any combination thereof. 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.

Proposals must clearly define the science investigations that the proposed technology would enable or enhance, the value of the science, and their traceability to the NASA Heliophysics Science Objectives and Goals (see Requirement L-3 and Requirement L-5). Proposals do not need to solve or answer a science question within the scope of the TechDemo investigation itself —although this may be achieved in some investigations. However, all responsive proposals must demonstrate technology maturation during the investigation that will enable mission advancement as described above.

6: Sections 5.2.1 and 5.2.2 - Scope and traceability requirements

Draft PEA:

Section 5.2.1, Requirement tbd-6. Proposals shall demonstrate technologies required to achieve the NASA Heliophysics Science Objectives and Goals described in Section 2.1 of this PEA.

Section 5.2.2, Requirement tbd-8. Proposals shall clearly define the Heliophysics Science Objectives and Goals that the technology would address and the Heliophysics Science investigations that the technology would enable or enhance.

Section 5.2.2, Requirement tbd-9. 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.

Final PEA: (Draft PEA Requirements tbd-6 and tbd-8 were merged to form Final PEA Requirement L-3.)

Section 5.2.1, Requirement L-3. Proposals shall clearly identify the Heliophysics Science Objectives and Goals, described in Section 2.1 of this PEA, that the technology would address and the Heliophysics Science investigations that the technology would enable or enhance.

Section 5.2.2, 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.

(Added) 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.

7: Section 5.2.4 – Science Enhancement Option

Final PEA:

(Added) 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. These activities will include science that is not directly related to or necessary for the demonstration of the proposed technology(ies) and/or required measurements that extend past the end of the Baseline Investigation. Examples of further scientific return from a mission not necessary to validate the enabling capacity of the proposed technology include extended mission operations to achieve new science results or the use of data obtained from the technology demonstration to advance science objectives outside of those motivating the technology demonstration.

Note that validation of the enabling capacity of proposed technology(ies) will be interpreted broadly and may, for example, include evaluation of a new observable as well as the development of novel mission operations unique to the proposed technology(ies).

8: Section 5.3.2 - Calibration and validation requirements

Draft PEA (Section 5.4.2):

Requirement tbd-15. Proposals shall fully describe the requirements for calibration and validation of the technology to be demonstrated, the instruments and systems, and the data returned.

Final PEA:

Requirement L-9. Proposals shall fully describe the requirements for calibration and validation of the technology to be demonstrated, the instruments and systems, and the data returned. This requirement supersedes SALMON-3 Requirement 30.

9: Section 5.3.3 - Payload risk classification

Draft PEA (Section 5.4.3):

… The payloads are designated as Class D as defined in NPR 8705.4.

Final PEA:

… Payloads are designated as Streamlined Class D (Risk Classes are defined in NPR 8705.4, available in the Program Library).

(Added) NASA's Science Mission Directorate has defined a new approach to managing Class-D investigations that are less than $150M, not including launch services. The *NASA Science Mission Directorate (SMD) Class-D Tailoring/Streamlining Decision Memorandum* describes the approach that has been approved by SMD leadership to guide the implementation of Streamlined Class D investigations. This Memorandum, along with other Class-D policy and guideline documents, are in the Program Library. All TechDemo investigations solicited by this PEA will be considered to be Streamlined Class-D investigations and thus must use the principles, guidelines, and approaches described in the documents.

(Added) Streamlined Class-D Investigations must identify those requirements not specifically identified as already being tailored in the *NASA Science Mission Directorate (SMD) Class-D Tailoring/Streamlining Decision Memorandum* and described in NPR 7120.5E that are proposed for adjustment, provide a rationale for each adjustment, and describe any cost, schedule, and/or other benefits that would be realized should one or more of the adjustments be accepted by NASA. Note that these adjustments reflect potential modifications to the baseline investigation, to be addressed after down-selection. The panel evaluating the third evaluation criterion, "Technical, Management, and Cost" (TMC) Feasibility of the Proposed Investigation Implementation, will provide comments to the Selection Official on the proposed adjustments and their justifications. These comments will not be considered for the TMC Feasibility of the Proposed Investigation Implementation risk rating but may be considered in the selection decision.

(Added) Requirement L-10. Proposals shall identify any requirements not specifically identified as already being tailored that are proposed for adjustment, include the rationale for the adjustment, and describe the cost, schedule, and/or other benefits that would be realized should one or more of the adjustments be accepted by NASA.

10: Section 5.3.4 - TRL

Final PEA:

(Added) The SALMON-3 Requirement B-46 refers to the PEA library for TRL examples regarding demonstrations of system level TRL in a relevant environment. This document, *System Level TRL 6 Examples*, along with the two additional documents *An Example for Demonstrating Systems Level TRL* and *Assessment of TRL in AO-Based Evaluations and Common Causes of Major TRL Weaknesses* can be found in the Program Library. Note these documents are geared towards providing guidance for the TRL 6 system level requirement, but should be beneficial as well for the TRL 5 by PDR system level requirement.

11: Section 5.5.1 - Communications and Outreach Program Plan

Final PEA:

(Added) No information on a Communications and Outreach Program Plan is required for the Step-1 proposal. …

12: Section 5.5.2 - Student Collaboration (SC)

Final PEA:

(Added) … ; however, the following supersedes the fourth paragraph of the section:

The objective of an SC is enhancement of student research experience through collaborative work associated with a specific NASA spaceflight mission. This is not to be confused with a Scholarship or Fellowship, where the sole objective is the training/development of a particular student. This flight mission SC is not one of the specific opportunities for NASA Scholarships and Fellowships. OMB Uniform Guidance, 2 CFR Part 200.466: Scholarships and student aid, clarifies the difference between a Scholarship or Fellowship and the allowable compensation of a student research assistant employed under an SC.

13: Section 5.6.3 - Inflation

Draft PEA (Section 5.7.3):

… For years after FY 2019, this number must be inflated.

Final PEA:

… Although not required for proposals, for years after FY 2019, this number must be inflated.

14: Section 5.8 - Classified materials

The Final PEA Section 5.8 reflects updates to SALMON-3 Section 5.9.4. The Final PEA Section 5.8 supersedes SALMON-3 Section 5.9.4 and replaces Draft PEA Section 5.9.2.

15: Section 6.1.2 - Notification proposal

Draft PEA:

… (a) Name, address, telephone number, e-mail address, and institutional association(s) of the PI and Project Manager. …

The technology objectives of the proposed mission and the investigators cannot be changed between submissions of the Notification and the Full Proposals.

Final PEA:

… (a) Name, address, telephone number, email address, and institutional association(s) of the PI and Project Manager, and Project System Engineer (if named). …

The technology objectives of the proposed mission and the PI, Co-I, and institutions cannot be changed between submissions of the Notification and the Full Proposals.

16: Section 6.2.1 - Proposal submission

Draft PEA:

Requirement tbd-27. All proposals must identify any export-controlled material in the proposal as instructed in Section 5.9.3 of the SALMON-3 AO; in addition, (a) the export-controlled material must be printed in a red font or enclosed in a red box as described in the required

statement in Requirement 99 of the SALMON-3 AO, and (b) an electronic version of the proposal, in PDF format, with the export-controlled material redacted but otherwise identical to the full unredacted version, must be included on the proposal CD-ROM.

Requirement tbd-28. … and two extra pages are allocated for all proposed Science Enhancement Options combined in the Technology Sections (D and E). …

Final PEA:

Requirement L-32. All proposals shall identify any export-controlled material in the proposal as instructed in Section 5.9.3 of the SALMON-3 AO; in addition, the export-controlled material shall be printed in a red font or enclosed in a red box as described in the required statement in Requirement 99 of the SALMON-3 AO.

A revised version of the SALMON-3 *Proposal Structure and Page Limits* table is included in this section.

Requirement L-33. … The two extra pages allocated in the *Proposal Structure and Page Limits* table for proposed Science Enhancement Options (SEOs) in the Technology Sections (D and E) are for all SEOs *combined*. …

17: Section 7.1 – Evaluation Factors

Final PEA:

(Added) As described in Section 1.1 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.

(Added) Half-step ratings will not be used for the Criteria A and B adjectival ratings.

18: Section 7.1.1 - Evaluation criteria, Factor A

Draft PEA:

Factor A-2. … This factor includes the unique value of the investigation to make technology progress in the context of other planned missions; …

Final PEA:

Factor A-2. … This factor includes the unique value of the investigation to make science and technology progress in the context of other planned missions; …

19: Section 7.1.2 - Evaluation criteria, Factor B

Draft PEA:

> The information provided in a proposal will be used to assess the merit of the plan for completing the proposed investigation, including the implementation merit, feasibility, resiliency, and probability of success of the proposed investigation. …
>
> Factor B-4. Investigation Resiliency. …

Final PEA:

> The information provided in a proposal will be used to assess the merit of the plan for completing the proposed investigation, including the experiment implementation merit, feasibility, resiliency, and probability of technology success of the proposed investigation. …
>
> (Added to Factor B-3) ... 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; reporting science 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. Technology Resiliency. …
>
> (Added to Factor B-5) … The *scientific* expertise of the PI will be evaluated but not his/her experience with NASA missions. … Comments about the managerial experience of the PI, and whether appropriate mentoring and support tools are in place, will be made to the Selecting Official but these comments shall not impact the "Experiment Implementation Merit" rating.

20: Section 7.1.3 - Evaluation criteria, Factor C

Final PEA:

> (Added) Factor C-4 is amended to delete evaluation of the PI's spaceflight experience. The capability of the management team will be evaluated as a whole, as opposed to assessing the capabilities of each of the Key Team Members independently. Comments about the managerial experience of the PI, and whether appropriate mentoring and support tools are in place, will be made to the Selecting Official but these comments shall not impact the "Technical, Management, and Cost Feasibility" rating.

21: Section 7.2 – Selection Process

Final PEA:

> (Added) As was described in Section 1.1 of this PEA, this opportunity is uniquely open to high risk, high reward investigations. Therefore, for this PEA, recommendations to the Selection Official will more heavily weigh the return from investigations over risk ratings than has historically been the case for SMD science investigations.

22: Section 7.3 - Implementation activities

Final PEA:

(Added) A PI-led Team Masters Forum is not planned for investigations selected under this PEA.

23: Section 7.3.3 - Down-selection

Draft PEA:

… Any substantial changes to investigation contained in the Phase A Concept Study Report will result in its re-evaluation: if no substantial changes are found to have been made to the investigation, the Step-1 evaluation of the first criterion will be maintained.

Final PEA:

… Any substantial changes to the investigation's objectives contained in the Phase A Concept Study Report will result in the re-evaluation of the intrinsic merit of the proposed investigation: if no substantial changes are found to have been made to the investigation's objectives, the Step-1 evaluation of the first criterion will be maintained.