Listing encompassing IMAP AO Significant Changes from Draft AO

1: ESPA ring usage: The language on usage of the ESPA ring and its related opportunity has been clarified in the Foreword and in Section 5.9.6.

Draft AO:
Taking advantage of the expected launch vehicle capability, the Heliophysics Division plans on providing an Evolved Expendable Launch Vehicle Secondary Payload Adapter (ESPA) ring as a ride-along with the IMAP launch that will aid addressing Heliophysics science objectives and will serve the needs of SMD-wide technology demonstration. However, usage of the ESPA ring is not solicited through this AO, but through a Technology Demonstration Mission of Opportunity that will be released by the end of calendar year 2017. IMAP proposals submitted through this AO must not depend on use of the ESPA ring.

Final AO:
Taking advantage of the expected launch vehicle capability, the Heliophysics Division plans on providing an Evolved Expendable Launch Vehicle Secondary Payload Adapter (ESPA) ring as a ride-along with the IMAP launch that will aid in addressing Heliophysics science objectives and will serve the needs of SMD-wide technology demonstrations. However, usage of the ESPA ring is not solicited through this AO, but through two "Small Complete Mission" Stand Alone Missions of Opportunity (SALMON) that will be released no later than early calendar year 2018. IMAP proposals submitted through this AO may not use the ESPA ring.

2: Table of Contents: Appendix G of the Draft AO (Requirements Crosswalk) has been removed. Appendix H (Certifications) now moved up to Appendix G.

3: Added clarifying language regarding NASA's option of selecting partial investigations (that was spelled out in Appendix A, Section II):

(Added in Foreword) NASA reserves the right to descope or add an investigation after selection.

(Added in Section 2.4) NASA reserves the right to select only a portion of a PI's investigation or to invite a subset of his/her investigation to participate under the umbrella of another PI-led investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point.

4: Clarifying language added to Requirement 3 regarding Notification and Full Proposals

Draft AO:
Requirement 3. Proposals submitted in response to this solicitation shall be submitted electronically no later than the Electronic Proposal Submittal Deadlines.

Final AO:

Requirement 3. Proposals submitted in response to this solicitation shall be submitted electronically no later than the Electronic Proposal Submittal Deadlines. Submission of the Notification Proposal shall identify all investigators, the proposed science objectives, general architecture, a list of instruments, and identification of new technologies that may be employed as part of the mission (see Section 6.1.2). The science objectives of the proposed mission, and investigators cannot be changed between submissions of the Notification Proposal and the Full (Step-1) Proposal.

5: Clarified language regarding PI-Managed Mission Cost in Section 4.3.1:

Draft AO:
Examples of costs to be included in the PI-Managed Mission Cost, as applicable, unless contributed, are: development activities (e.g., instrument development, spacecraft development, management, software, testing); launch services outside of the standard services provided by NASA; Student Collaborations in excess of the student collaboration incentive (see Section 5.5.3); subcontracting costs, including fees; science Co-Is and all other personnel required to conduct the investigation, analyze data and publish results, and deliver data in an acceptable format to an approved archive; insurance; NASA-provided telecommunications, tracking, and/or navigation support; any program/project-specific costs (e.g., curation of returned samples); and all labor, including contractor and Civil Servant (NASA and non-NASA).

Final AO:
Examples of costs to be included in the PI-Managed Mission Cost, as applicable and unless contributed, are: development activities (e.g., instrument development, spacecraft development, management, software, testing); launch services outside of the standard services provided by NASA; Student Collaboration, IMAP Active Link Incentive for Real Time (I-ALIRT), and Technology Demonstration Opportunity (TDO) in excess of the respective associated incentives (see Sections 5.5.3, 5.9.4, and 5.9.5); subcontracting costs, including fees; science Co-Is and all other personnel required to conduct the investigation, analyze data and publish results, and deliver data in an acceptable format to an approved archive; insurance; NASA-provided telecommunications, tracking, and/or navigation support; any program/project-specific costs (e.g., curation of returned samples); and all labor, including contractor and Civil Servant (NASA and non-NASA).

6: Clarified language regarding Total Mission Cost in Section 4.3.2 and in the Glossary:

Draft AO:
Total Mission Cost is defined as the PI-Managed Mission Cost (see Section 4.3.1), plus the Student Collaboration costs up to the student collaboration incentive (see Section 5.5.3), plus any additional costs that are contributed or provided in any way other than through the Solar Terrestrial Probes Program (see Section 5.6.7). The Total Mission Cost will define the total value of the baseline investigation, not including the cost of standard launch vehicle and launch services.

Final AO:

Total Mission Cost is defined as the PI-Managed Mission Cost (see Section 4.3.1) plus the Student Collaboration costs up to the associated incentive (see Section 5.5.3), any I-ALIRT costs up to the associated incentive (Section 5.9.4), any TDO costs up to the associated incentive (see Section 5.9.5), and any additional costs that are contributed or provided in any way other than through the Solar Terrestrial Probes Program (see Section 5.6.7). The Total Mission Cost will define the total value of the baseline investigation, not including the costs of DSN Aperture Fees, and standard launch vehicle and launch services, or other costs only included in the Enhanced PI-Managed Mission Cost (see Section 4.3.3).

7: Clarified language on Software IV&V in Section 4.5.1:

Draft AO:
The NASA Chief of Safety and Mission Assurance (CSMA) has the authority to select software projects to which Independent Verification and Validation (IV&V) shall be applied, as defined in NASA-STD-8739.8, Standard for Software Assurance, and NPR 7150.2B, NASA Software Engineering Requirements. All Category 1 and those Category 2 missions with a payload risk classification A or B will require IV&V to be performed. It is expected that the NASA IV&V Center will provide this function at no cost to the PI team. If the PI team proposes a Category 2, Class C mission, IV&V should still be performed, but may be provided externally. If the PI team uses the NASA IV&V Center in the Risk Class C case, it is expected to be paid for out of the PI-managed mission cost. …

Final AO:
The NASA Chief of Safety and Mission Assurance (CSMA) has the authority to select software projects to which Independent Verification and Validation (IV&V) shall be applied, as defined in NASA-STD-8739.8, Standard for Software Assurance, and NPR 7150.2B, NASA Software Engineering Requirements. Category 2 missions with a payload risk classification B will require IV&V to be performed. It is expected that the NASA IV&V Center will provide this function at no cost to the PI team. If the PI team proposes a Category 2, Class C mission, IV&V should still be performed, but may be provided externally. If the PI team uses the NASA IV&V Center in the Risk Class C case, it is expected to be paid for out of the PI-managed mission cost. Therefore, PI teams that propose Category 2, Class C missions must budget for IV&V service as part of the PI-managed mission cost. …

8: Added subsection numbering under Section 5.1.5

9: Clarified language on New Technologies/Advanced Engineering Developments in Section 5.2.3

Draft AO:
This AO solicits flight missions, not technology or advanced engineering development projects. Investigations are generally expected to have mature technologies, with systems at a Technology Readiness Level (TRL) of 6 or higher when proposed. For the purpose of TRL assessment, systems are defined as level 3 WBS payload developments (i.e., individual instruments) and level 3 WBS spacecraft elements (e.g., electrical power system); see Figure 3-7 of the NASA WBS Handbook, NASA/SP-2010-3404, which can be found in the Program Library. TRLs are

defined in NPR 7123.1B NASA Systems Engineering Processes and Requirements, Appendix E, which can be found in the Program Library as well.

Final AO:
Pertaining to the baseline mission, this AO solicits flight missions, not technology or advanced engineering development projects. Investigations are generally expected to have mature technologies, with systems at a Technology Readiness Level (TRL) of 6 or higher when proposed. For the purpose of TRL assessment, systems are defined as level 3 WBS payload developments (i.e., individual instruments) and level 3 WBS spacecraft elements (e.g., electrical power system); see Figure 3-7 of the NASA WBS Handbook, NASA/SP-2010-3404, which can be found in the Program Library. TRLs are defined in NPR 7123.1B NASA Systems Engineering Processes and Requirements, Appendix E, which can be found in the Program Library as well.

10: Language in Requirement 43 in the Mission Category and Payload Risk Classification Section (Section 5.2.8) clarified.

Draft AO:
Requirement 43. Based on the criteria for mission categorization in NPR 7120.5E and risk classification in NPR 8705.4, proposers shall propose a mission categorization and risk classification for their proposed mission. Proposers shall incorporate appropriate work effort and support in their proposals accordingly.

Final AO:
Requirement 43. Based on the criteria for mission categorization in NPR 7120.5E and risk classification in NPR 8705.4, proposers shall propose a risk classification (either Class B or Class C, with or without tailoring) for their proposed Category 2 mission. Proposers shall justify their choice of payload risk classification (with or without tailoring) and incorporate appropriate work effort and support in their proposals accordingly.

11: Section reference in Requirement 82 (Section 5.7.2) fixed.

Draft AO:
Requirement 82. …The required elements of a Letter of Commitment for a contribution are given in Section 0. …

Final AO:
Requirement 82. …The required elements of a Letter of Commitment for a contribution are given in Section 5.8.1.1. …

12: In response to LSP review, Section 5.9.3 was changed slightly (removing "the nominal cost for" nonstandard services).:

Draft AO:
… There will nominally be a charge against the PI-Managed Mission Cost for any launch services beyond the standard launch services offered. Detailed information on launch vehicle

performance options, including a description of standard launch services and the nominal costs for nonstandard services, is provided in the *ELV Launch Services Information Summary* document in the Program Library.

Final AO:
… There will nominally be a charge against the PI-Managed Mission Cost for any launch services beyond the standard launch services offered. Detailed information on launch vehicle performance options, including a description of standard launch services and nonstandard services, is provided in the *ELV Launch Services Information Summary* document in the Program Library.

13: In response to a request from the community, the evaluation of the TDO opportunity has been significantly modified and clarified. The modification was made in Section 5.9.5, Requirement 102.

Draft AO:
Requirement 102. This section, which shall not exceed five pages in length, shall describe any proposed utilization of technology with the purpose of technology demonstration for future Heliophysics missions. At a minimum, this description shall address the following topics to the extent that they are not addressed in the body of the proposal:

1) Demonstration of the offerors' understanding of the chosen technology, as well as their understanding of inherent risks associated with its use.

2) Description of technology demonstration implementation plan with respect to utilization of the chosen technology. At a minimum, this shall include:

a. Description of any required flight hardware development and integration plans for producing flight qualified hardware/software.

b. If any fallbacks/alternatives exist and are planned, description of the cost, schedule, and performance liens they will impose on the baseline design, as well as the decision milestones for their implementation.

3) Description of the application, appropriate use, and benefits of the technology in the proposed investigation, including description of how this technology could enhance the proposed investigation's science return and/or that of future Heliophysics missions.

4) Description of how the offeror would engage with the NASA STP program offices' intention to have insight into the flight hardware development, IV&V testing and results, flight development lessons learned, and performance data obtained during flight for the chosen technology.

Final AO:
Requirement 102. This section, which shall not exceed five pages in length, shall describe implementation and risks of the TDO, and how maturation of the TDO may create new capabilities for IMAP and/or future Heliophysics missions that may enhance their science return. At a minimum, this description shall address the following topics:

1) Demonstration of TDO implementation with respect to integration and testing of flight qualified hardware, if applicable.
2) Demonstration of the understanding of any inherent risks associated with the TDO. Also, address how no risks will be posed to either baseline or threshold mission success.
3) Plan for demonstration of the technology.
4) Description of the benefits of the proposed TDO, including description of how this technology may have continuing applicability to future Heliophysics missions.
5) Provision of a cost estimate for implementing the TDO. Include a discussion of the estimating techniques used to develop the cost estimate.

14: Clarified language of Factor B evaluation of Student Collaboration and TDO in Section 7.2.3 (following Factor B-7).

Draft AO:
… Student Collaboration and Technology Demonstration proposals will not be penalized in Step 1 for any inherent higher cost, schedule, or technical risk, as long as the Student Collaboration and Technology Demonstration are shown to be clearly separable from the implementation of the Baseline Science Mission.

Final AO:
… Student Collaboration and Technology Demonstration proposals will not be penalized in Step 1 for any inherent higher cost, schedule, or technical risk, as long as the Student Collaboration and Technology Demonstration are shown to be clearly separable from the implementation of the Baseline and Threshold Science Mission.

15: An equivalent clarification was made regarding language of Factor C evaluation of Student Collaboration and TDO in Section 7.2.4 (Following Factor C-5).

TDO clarification:

Draft AO:
The Factor C evaluation will not consider I-ALIRT or TDO to be part of the Baseline Science Mission implementation. However, a separate evaluation of the feasibility of the proposed I-ALIRT and TDO implementation will be performed. The TDO has to be shown to be clearly separable from the implementation of the Baseline Science Mission.

Final AO:
The Factor C evaluation will not consider I-ALIRT or TDO to be part of the Baseline Science Mission implementation. However, a separate evaluation of the feasibility of the proposed I-ALIRT and TDO implementation will be performed. The TDO has to be shown to be clearly separable from the implementation of the Baseline and Threshold Science Mission.

Student Collaboration clarification:

Draft AO:

Student Collaboration proposals will be evaluated only for the impact they have on overall TMC mission feasibility to the extent that they are not separable; Student Collaboration proposals will not be penalized in Step 1 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 mission.

Final AO:
Student Collaboration proposals will be evaluated only for the impact they have on overall TMC mission feasibility to the extent that they are not separable; Student Collaboration proposals will not be penalized in Step 1 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 and Threshold Science Mission.

16: The last paragraph in Section 7.4.5 contained an error (extra verbiage from non-applicable proposal option that had to be removed) that is now fixed.

Draft AO:

The contract or other funding mechanism for further formulation and implementation will conform to all applicable Federal and NASA procurement requirements. A Draft Model Contract for Phase B/C/D/E formulation and implementation, which includes the clause "Advanced Agreement to Add Additional Phases," is available in the Program Library.

Final AO:
The contract or other funding mechanism for further formulation and implementation will conform to all applicable Federal and NASA procurement requirements. A Draft Model Contract for Phase B/C/D/E formulation and implementation is available in the Program Library.

17: Requirement B-4 reference to Requirement B-54 updated to B-53 due to removal of Requirement 51 (see below)

18: Requirements B-5 and B-6 erroneously referenced Requirement B-77. Now both point to correct reference, Requirement B-74.

19: Requirement B-8 changed to include requirement of PI and AOR signatures as required in the Standard AO.

Draft AO:
Requirement B-8. The Graphic Cover Page shall contain, at a minimum, the following information and elements displayed on the cover page of the proposal:
- The proposal title;
- The name of the proposing organization;
- The name of the PI;
- The name and title of an official who is authorized to commit the proposing organization through the submission of the proposal; and

Optionally, the Graphic Cover Page may also contain:

- Any illustrations or graphic elements of the proposer's choice (or none); and
- Any additional information of the proposer's choice that is nonproprietary and that does not provide additional content beyond what is in the proposal (or none).

Final AO:
Requirement B-8. The Graphic Cover Page shall contain, at a minimum, the following information and elements displayed on the cover page of the proposal:
- The proposal title;
- The name of the proposing organization;
- The name of the PI;
- The name and title of an official who is authorized to commit the proposing organization through the submission of the proposal;
- The signature of the PI and the authorizing official, and

Optionally, the Graphic Cover Page may also contain:
- Any illustrations or graphic elements of the proposer's choice (or none); and
- Any additional information of the proposer's choice that is nonproprietary and that does not provide additional content beyond what is in the proposal (or none).

20: Requirement B-35 f) (Flight Software) clarified/simplified regarding logical lines of code.

Draft AO:
(f) Flight software, including (i) logical lines of code by Computer Software Configuration Item (CSCI), (ii) description of the functionality for each CSCI, (iii) code counts categorized as either New, Modified, Full Reuse, or Auto-generated, (iv) development method (spiral, waterfall, agile, etc.), and (v) development language.

Final AO:
(f) Flight software, including (i) an estimate of the number of logical lines of code by Computer Software Configuration Item (CSCI), (ii) description of the functionality for each CSCI, (iii) code counts categorized as either New, Modified, Full Reuse, or Auto-generated, (iv) development method (spiral, waterfall, agile, etc.), and (v) development language.

21: Appendix B, Section H (Cost and Cost Estimating Methodology): Requirement 51 merged with Requirement 50 (Requirement 51 was erroneously created as it was originally part of Requirement 50). All subsequent requirement numbers in Appendix B are reduced by 1 (old Requirement B-52 is new Requirement B-51 etc.). Links to these requirements have been fixed, including in Appendix F (Compliance Checklist).

22: Section J.8 reference to and Appendix D Library Document title updated (corrected document title for NPR 8715.6B)

Draft AO:
The following references are available in the Program Library:
- NPR 8715.6B, *NASA Procedural Requirements for Limiting Orbital Debris*; and
- NASA-STD-8719.14, *NASA Process for Limiting Orbital Debris*.

Final AO:
The following references are available in the Program Library:
- NPR 8715.6B, *NASA Procedural Requirements for Limiting Orbital Debris and Evaluating the Meteoroid and Orbital Debris Environments*; and
- NASA-STD-8719.14A, *NASA Process for Limiting Orbital Debris*.

23: Tables B3a and B3b updated (e.g., FY numbers by mission phase) in Appendix B, Section J.14 and in the Document Library

24: Glossary entry for Notification Proposal added.

25: Added I-ALIRT to Acronym List

26: Clarified language of first two table entries in Appendix F (Compliance Checklist – Administrative):

Draft AO:
1. Electronic Proposals received on time
2. Proposal on CD-ROM received on time

Final AO:
1. Electronic Notification and Full (Step-1) Proposals received on time
2. Full (Step-1) Proposal on CD-ROM received on time

27: Added Section 5.9.7
Added (mostly empty) Section 5.9.7 on Technology Infusion.

28: Clarified Language on personal letters of commitment in Section 5.8.2

Draft AO:
No Personal Letters of Commitment are required in the Step-1 proposal. No Institutional Letters of Commitment are required for individuals in the Step-1 proposal, unless the individual's effort is contributed, the individual is part of the Proposal Team, and the individual is not a collaborator.

Final AO:
No Personal Letters of Commitment are required in the Step-1 proposal. No Institutional Letters of Commitment are required for individuals in the Step-1 proposal, unless the individual's effort is contributed.

29: Sample Exploded Diagram updated (Appendix B, Section J.4)

Removed box on (contributed) launch vehicle from diagram.

30: Clarified applicability of Student Collaboration (Foreword, page i)

Draft AO:
NASA is strongly committed to offering hardware experience to early-career scientists. NASA requires proposals to include a Student Collaboration. A Student Collaboration incentive will be provided.

Final AO:
Student Collaborations (SC) provide aspiring undergraduate (as well as advanced high school and, on an exceptional basis graduate) students opportunities for an authentic research experience that increases their interest in scientific and technical careers and enthusiasm for space exploration, while equipping them with engineering and science skills. NASA requires proposals to include a Student Collaboration opportunity. A Student Collaboration incentive will be provided.

31: Clarified partial selection option (Foreword, page i)

Language regarding partial selections from Appendix A, Section II is now also included in the Foreword:

Final AO:
NASA reserves the right to select only a portion of a PI's investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point.