



Solar Terrestrial Probes #5

Interstellar Mapping and Acceleration Probe (IMAP) Pre-Proposal Conference

Conference Goals

Arik Posner

IMAP Program Scientist

NASA Headquarters

August 25, 2017



The Solar Terrestrial Probes Program has released the iMAP Announcement of Opportunity:

- **2017 Interstellar Mapping and Acceleration Probe (iMAP) Announcement of Opportunity (2017 iMAP AO) – NNH17ZDA0070**
- The iMAP AO was amended on August 17, 2017.



Conference Goals



Goals today are to:

- Provide an overview of the 2017 IMAP AO (as amended).
- Provide an overview of the evaluation, categorization, and selection process for the IMAP AO.
- Address questions.



Conference Goals - Agenda



10:00	Welcome and Introductions	Elsayed Talaat, NASA HQ
10:05	Conference Goals	Arik Posner, NASA HQ
10:10	IMAP Science Objectives	Arik Posner, NASA HQ
10:15	Overview of the Solicitation	Joe Smith, NASA HQ
10:45	IMAP Incentives	Arik Posner, NASA HQ
10:50	Science Evaluation	Arik Posner, NASA HQ
11:20	Technical, Management, and Cost Evaluation	Andrea Salas, NASA LaRC
12:00	Break	
12:50	Launch Services	Jim Hall, NASA KSC
1:10	STP Program Overview	Mike Delmont, NASA GSFC
1:30	International Cooperation at NASA	Dennis Mcsweeney, NASA HQ
1:50	Export Control Compliance	Juan Santos, NASA HQ
2:00	Questions & Answers	All
2:15	Wrapup	All



Questions

- Answers to questions received prior to the conference are included in presentations and/or being addressed on the Q&A web site.
- Questions submitted today will be addressed as time permits and as appropriate answers can be generated.
- Please submit your questions in writing so that we may best understand your intent. WebEx users, please submit questions via the WebEx chat lines to user “**Ask questions here**”.
- Questions may also be sent to Arik Posner at:
arik.posner@nasa.gov
- Questions may be submitted until 14 days before the (full) proposal due date. Questions and answers will be posted at the IMAP Acquisition site: **<https://soma.larc.nasa.gov/STP/IMAP/>**



Solar Terrestrial Probes #5

Interstellar Mapping and Acceleration Probe (IMAP) Pre-Proposal Conference

IMAP Science Objectives

Arik Posner

IMAP Program Scientist

NASA Headquarters

August 25, 2017

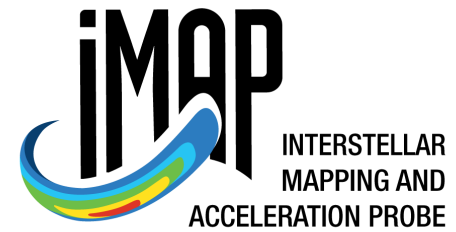


IMAP Science Objectives



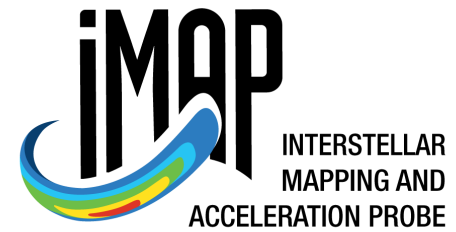
Requirement 1: Proposals shall describe a science investigation that addresses a preponderance of the IMAP science objectives listed in Section 2.4, stating the choice of science objectives for the proposed investigation and clearly justifying the choice of those science objectives.

Requirement 2: Proposals shall describe the traceability between the science objectives of the investigation to a) the IMAP science objectives stated above; and b) at least one of the Decadal Survey Science Goals



IMAP Science Objectives

- Advance understanding of the temporal and spatial evolution of the boundary region in which the solar wind and the interstellar medium interact.
- Identify and advance understanding of processes related to the interactions of the magnetic field of the Sun and the local interstellar medium.
- Improve understanding of the composition and properties of the local interstellar medium.
- Identify and advance understanding of particle injection and acceleration processes near the Sun, in the heliosphere and heliosheath.



Proposed Science Objectives

- Investigation must address a preponderance (superiority in influence or number) of IMAP Science Objectives.
- The IMAP science objectives are not listed in priority order.
- NASA recognizes that the IMAP science objectives may include more scope than can be accomplished in the IMAP cost cap. Those responding to this opportunity should choose among the IMAP science objectives and defend those choices.
- The proposal should include a justification of the choice of science objectives that makes clear why the set of selected science objectives addresses a preponderance of the IMAP science objectives.



Science Goals of the 2013 NRC Decadal Survey

- Determine the origins of the Sun's activity and predict the variations in the space environment.
- Determine the dynamics and coupling of Earth's magnetosphere, ionosphere, and atmosphere and their response to solar and terrestrial inputs.
- Determine the interaction of the Sun with the solar system and the interstellar medium.
- Discover and characterize fundamental processes that occur both within the heliosphere and throughout the universe.



Solar Terrestrial Probes #5

Interstellar Mapping and Acceleration Probe (IMAP) Pre-Proposal Conference

Overview of the Solicitation

Joe Smith

IMAP Program Executive

NASA Headquarters

August 25, 2017



Outline

- Overview of the solicitation
 - 2017 IMAP AO

Important Note: The solicitation is based on – but incorporates a large number of changes relative to – the evolving Standard AO, including both policy changes and changes to proposal submission requirements. All proposers must read the solicitation carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within.



The Heliophysics Division Solar Terrestrial Probes Program has released the IMAP AO:

•**2017 Interstellar Mapping and Acceleration Probe (2017 IMAP AO) – NNH17ZDA007O**

for the purpose of soliciting proposals for an investigation to be implemented through the Solar Terrestrial Probes Program. All investigations proposed in response to this solicitation must support the goals and objectives of the Solar Terrestrial Probes Program, must be implemented by Principal Investigator (PI) led investigation teams, and must be implemented through the provision of **complete spaceflight missions**.



Proposal Opportunity Period and Schedule

Notification Proposal Due	September 11, 2017
Proposal Submission Deadline 11:59 pm EST	October 30, 2017
Letters of Commitment due (w/ proposal)	October 30, 2017
Deadline for Receipt of Proposal on CD-ROM at 5:00 p.m. EST	November 3, 2017
Step 1 Selections announced (target)	May 2018
Initiate Phase A Concept Studies (target)	June 2018
Phase A Concept Study Reports due (target)	June 2019
Down-selection of Investigation(s) for flight (target)	November 2019
Launch Readiness Date	NLT December, 2024

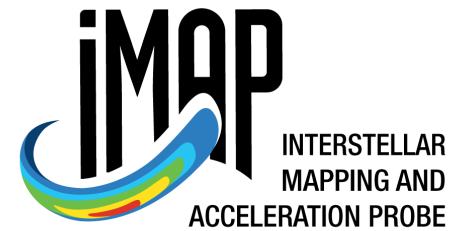


2017 IMAP AO is based on the SMD Standard AO template.

- **Requirements** are identified, numbered, and specific.
 - There are 107 requirements in the 2017 IMAP AO main body
 - When Sections do not levy requirements they do not have numbered requirements.
- **Evaluation Factors** are identified, numbered, and specific.
 - 6 for Science Merit, 4 Impact Overall Rating (OR)
 - 7 for Scientific Implementation Merit and Feasibility (5 Impact OR)
 - 5 for Technical, Management, and Cost (TMC) Feasibility
- Appendix B has numbered **requirements on Proposal Preparation**
 - There are 77 specific requirements for the format and content of Step 1 proposals [some Appendix B requirements have more than one part]



IMAP AO Highlights – cont'd



- The PI-Managed Mission Cost cap is \$492M in Fiscal Year (FY) 2017 dollars, not including any contributions.
- NASA will provide standard launch services that are outside the PI-Managed Mission Cost. Any non-standard launch services will count against the PI-managed mission cost.
- Alternative access to space may not be proposed.
- “...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...”



- The selected mission is intended to launch no later than December of calendar year 2024.
- NASA intends to select two investigations to enter Phase A concept studies. However, if warranted by the evaluation process, NASA reserves the right to select through a single step.
- Proposers selected through this AO will be awarded a contract to conduct a Phase A concept study with a duration of ~ 12 months. The cost of the Phase A concept study is capped at \$2.5M FY 2017 dollars.



Requirement 4: In addition to electronic submission, two CD-ROMs containing the proposal and relevant files described in Section 6.2.3 must be submitted. Proposals on CD-ROMs submitted in response to this solicitation shall be delivered no later than the Deadline for Receipt of Proposal on CD-ROMs and shall be delivered to the address for submittal of proposals given in Section 6.2.3.

The address for delivery of CD-ROMs (Requirement 105):

NASA Research and Education Support Services

2345 Crystal Drive, Suite 500

Arlington, VA 22202

Telephone for commercial delivery: 202-479-9030

NASA will notify proposers that their proposals have been received.

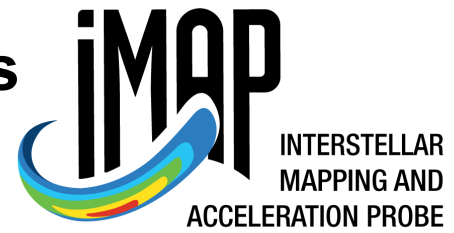


Requirement 3: Proposals submitted in response to this solicitation shall be submitted electronically no later than the Electronic Proposal Submittal Deadline. Submission of the Notification Proposal shall identify all investigators, the proposed science objectives, general mission architecture, a list 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.



Notification Proposal replaces Notice of Intent

- **Section 6.1.2 provides description**
- Submitted electronically at <http://nspires.nasaprs.com/>
 - Registration on the NSPIRES website is required for all identified team members, and the proposing organization, to submit the Notification Proposal.
 - Proposers who experience difficulty in using the NSPIRES site should contact the Help Desk by e-mail at nspires-help@nasaprs.com for assistance.
- Due September 11, 2017, by 11:59 pm eastern time
- Science objectives of the proposed mission, and investigators cannot be changed between submissions of the Notification and the Full Proposals.
 - The Notification Proposal is a prerequisite for submission of a Full Proposal, but it does not commit the offerors to submit a Full Proposal later.

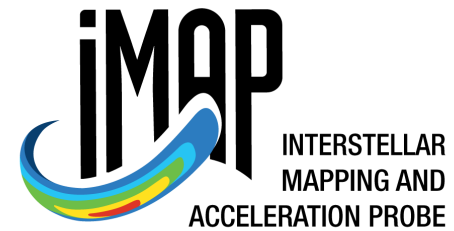


Section 5.4.2

- **A Co-Investigator (Co-I) is defined as an investigator who plays a necessary role in the proposed investigation and whose services are either funded by NASA or are contributed by his/her employer.**
- **Every Co-I must have a role that is required for the successful implementation of the mission, and the necessity of that role must be justified. The identification of any unjustified Co-I's may result in the downgrading of an investigation and/or the offer of only a partial selection by NASA.**

Requirement 58. Proposals shall designate all Co-I's, describe the role of each Co-I in the development of the mission, and justify the necessary nature of the role.

Requirement 59. Proposals shall identify the funding source for each Co-I. If funded by the Solar Terrestrial Probes Program, costs shall be included in the PI-Managed Mission Cost. If contributed, the costs shall be included in the Total Mission Cost.



Section 5.4.3

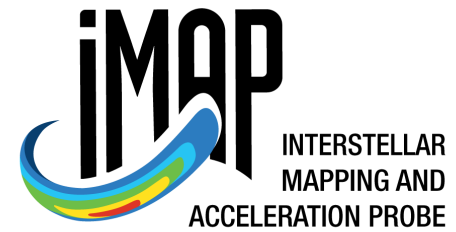
- **A collaborator is an individual who is less critical to the successful development of the mission than a Co-I.**
 - must not be funded through the proposal
 - may be committed to provide a focused contribution to the project for a specific task, such as data analysis.
- **If funding support is requested in the proposal for an individual, that individual must not be identified as a collaborator, but must be identified as a Co-Investigator or another category of team member.**

Requirement 60. Proposals shall identify and designate all collaborators, and describe the role of each collaborator in the development of the mission.

Requirement 61. Proposals shall identify the funding source for each collaborator; the costs shall be included in the Total Mission Cost.



Contributions



Section 5.6.7

- May include, but are not limited to labor, services, and/or contributions to the instrument complement or the spacecraft,
- The sum of contributions of any kind to the entirety of the investigation is not to exceed one-third (1/3) of the proposed PI-Managed Mission Cost
- Will not be counted against the PI-Managed Mission Cost, but they must be included in the calculation and discussion of the Total Mission Cost
- Contributions of non-U.S. nuclear power sources are prohibited
- Does not alleviate the responsibility of the PI and management team to exert penetrating and timely oversight – PI remains accountable



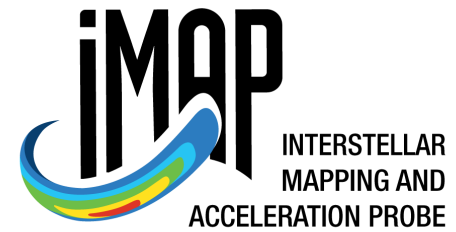
Advanced Multi-Mission Operating System (AMMOS)



Section 5.2.10

- AMMOS comprises a set of tools and services that support the operations of robotic flight missions
 - Catalog at <http://ammos.jpl.nasa.gov/>
- AMMOS may be proposed, as appropriate. AMMOS tools and services and their long-term sustaining engineering are fully funded by NASA, and are provided by NASA free of charge to all missions. Only mission-unique adaptations to the AMMOS must be funded by missions. Use of applicable AMMOS tools is expected, although not required. Points of contact and cost information for these services may be found on the AMMOS website specified above.
- Any mission operations tools or services to be developed by the investigation, and their sustaining engineering, will be described and budgeted in the proposal.

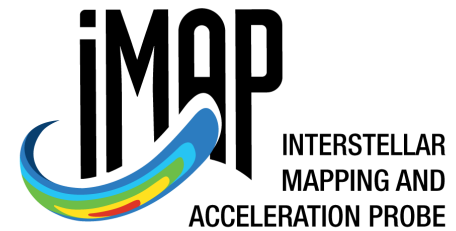
Requirement 45. If a ground/operations system solution other than the AMMOS or mission-unique adaptations to the AMMOS is proposed, it shall be described and budgeted for in the proposal.



Section E.4

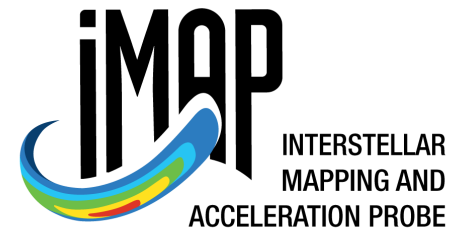
Requirement B-23. A schedule-based end-to-end data management plan, including approaches for data retrieval, validation, preliminary analysis, and archiving shall be described.

- science products..., including a list of the specific data products and the individual team members responsible for the data products...
- identify the appropriate NASA data archive and the formats and standards to be used
- include an estimate of the raw data volume and a schedule for the submission to the data archive of raw and reduced data in physical units accessible to the science community
- in compliance with terms and conditions stated in the NASA Plan: Increasing Access to the Results of Scientific Research or a justification shall be provided that this is not necessary given the nature of the work proposed. The data management plan (DMP) (see Section 4.4.1) shall be addressed as part of the Data Plan.



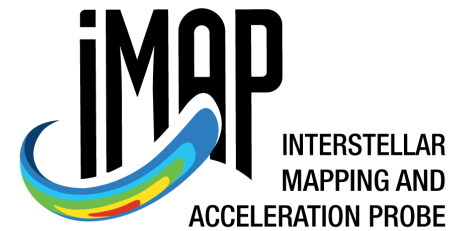
Section E.4

Requirement B-24. The data plan shall describe and define a set of key parameter data that cover the most essential measurements of each scientific instrument at a resolution that is appropriate for intercomparisons with investigations on other Heliophysics system observatory spacecraft. Care shall be taken in defining products that are easy to use by scientists who are not team members. These key parameters shall be delivered to a data archive within 6 months of acquisition.



Science Enhancement Options

- Activities such as extended missions, guest investigator programs, general observer programs, participating scientist programs, interdisciplinary scientist programs, and/or archival data analysis programs, where appropriate, have the potential to broaden the scientific impact of investigations. Such optional activities may be proposed as Science Enhancement Options (SEOs).
- Costs for proposed SEO activities must be defined, but will not count against the PI-Managed Mission Cost cap. Funding for SEO activities prior to Phase E should be minimized.
- As these proposed activities are optional and are not included within the cost capped baseline investigation, the science enabled by SEO activities is not considered as part of the scientific merit of the proposed investigation.
- See IMAP AO section 5.1.6, Requirements 21-23.



Education and Public Outreach

Section 5.5.2

- The IMAP AO does not require an Education program. However, NASA may impose E/PO requirements during, or subsequent to, the Phase A concept study phase.
- Communications and Outreach Program is required.
 - Will be negotiated and funded directly through a NASA center
 - Plan must be developed during Phase B



Solar Terrestrial Probes #5

Interstellar Mapping and Acceleration Probe (IMAP) Pre-Proposal Conference

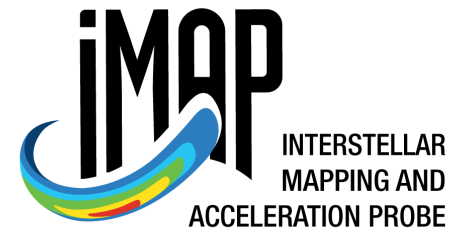
IMAP Incentives

Arik Posner

IMAP Program Scientist

NASA Headquarters

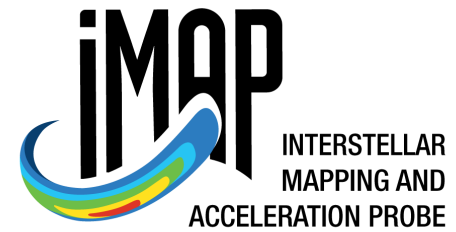
August 25, 2017



The Heliophysics Division has budgeted for three incentives in conjunction with IMAP:

- **Student Collaboration (SC)** - \$5M in FY 2017 \$
- **IMAP Active Link Incentive for Real Time (I-ALIRT)** – \$3M in FY 2017 \$
- **Technology Demonstration (TDO)** - \$5M in FY 2017 \$

The incentives are outside the PI managed mission cost. If higher costs are proposed, they shall be within the PI managed mission cost.



Student Collaboration

- Proposals are **required** to define a Student Collaboration (SC) that is a separate part of the proposed investigation.
- The SC provides a hands-on experience for students that focuses on the unique demands of instrument development, flight systems, environments, and operations, and on the opportunity to acquire early knowledge of systems engineering techniques.
- Student Collaboration proposals will be evaluated only for the impact they have on mission feasibility. The proposed SC shall be clearly separable from the proposed Baseline and Threshold Science Mission investigations, to the extent that the SC will not increase the mission development risk.
- The merit of student collaborations will not be evaluated at this time.
- See IMAP AO section 5.5.3, Requirements 62 and 63



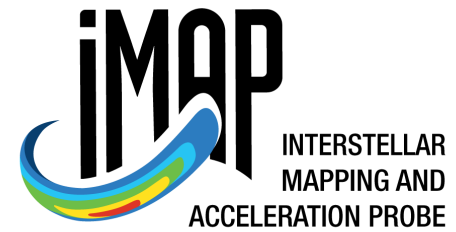
The IMAP AO has been amended on 8/17/2017. The IMAP SC Document has been added to the IMAP Program Library.

- Main change to the AO through the amendment: SC is flexible on graduate student participation:

Student Collaborations (SC) provide current or aspiring graduate or undergraduate students, including advanced high schoolers, 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.

Question on ambiguous AO language on stipends/tuition, Section 5.5.3, page 33 is clarified in IMAP SC Document:

“An IMAP SC is distinguished from traditional assistantships, scholarships, fellowships or internships based on the level of hands-on experience in the IMAP spaceflight project. An IMAP SC therefore must not be proposed to provide whole year or multi-year tuition and stipends.”



IMAP Active Link Incentive for Real Time

- The 2013 NRC *Decadal Survey* recognizes that the routine provision of space weather data from Heliophysics science missions is invaluable to the research and operational communities.
- The *Decadal Survey* recommends the IMAP mission for such a capability.
- NASA offers – independent from the proposed mission architecture – the IMAP - Active Link Incentive for Real-Time (I-ALIRT).
- NASA would support development of hardware and software for use onboard the IMAP spacecraft.
- The I-ALIRT incentive does not provide funds for the operations of ground stations.
- See IMAP AO, Section 5.9.4, Requirement 99

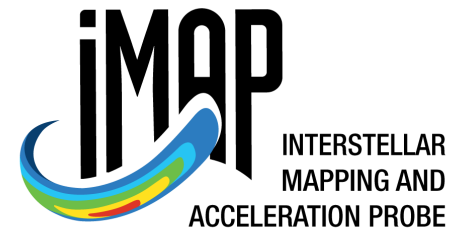


Technology Demonstration Opportunity (1)

- NASA is encouraging the introduction of new technologies.
- A proposed Technology Demonstration may have a TRL of less than 6 when proposed, but must not be required by either the Baseline or the Threshold Science Mission.
- Proposers may choose to define a TDO that may be an instrument, investigation, new technology, hardware, or software that may be demonstrated on either the flight system or ground system.
- Any TDO must use innovative technological approaches that may have continuing applicability to future Heliophysics missions.
- A TDO may not include the demonstration of a radioisotope power system
- TDO may not be proposed in conjunction with the ESPA ring through this AO.



IMAP Incentives – TDO (2)



- Encouraged is the demonstration of technologies that have received or currently are receiving support from NASA/SMD instrument and technology development programs.
- Information on and links to current and past abstracts of funded projects from Heliophysics instrument and technology development programs can be found in the IMAP program library.
- Contributions to the TDO are permitted.
- If a TDO is proposed, the Scientific Merit (Factor A-6), Implementation Merit (Factor B-7), and the TMC Feasibility (Form C) will be evaluated independent of the Baseline and Threshold Missions, except for separability from and impact to the mission.
- See IMAP AO, Section 5.9.5, Requirements 100 - 102



Solar Terrestrial Probes #5

Interstellar Mapping and Acceleration Probe (IMAP) Pre-Proposal Conference

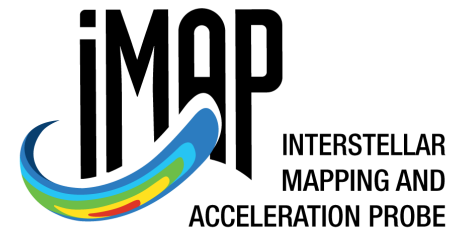
Science Evaluation

Arik Posner

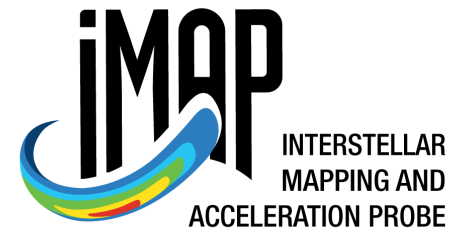
IMAP Program Scientist

NASA Headquarters

August 25, 2017



- All investigations proposed in response to the IMAP solicitation must support the goal(s) and objectives of the Solar Terrestrial Probes Program, and must be implemented by Principal Investigator (PI) led investigation teams.
- The NASA Heliophysics strategic objective 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 research objectives:
 - 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.



IMAP Science Objectives

- Advance understanding of the temporal and spatial evolution of the boundary region in which the solar wind and the interstellar medium interact.
- Identify and advance understanding of processes related to the interactions of the magnetic field of the Sun and the local interstellar medium.
- Improve understanding of the composition and properties of the local interstellar medium.
- Identify and advance understanding of particle injection and acceleration processes near the Sun, in the heliosphere and heliosheath.



Science Goals of the 2013 NRC Decadal Survey

- Determine the origins of the Sun's activity and predict the variations in the space environment.
- Determine the dynamics and coupling of Earth's magnetosphere, ionosphere, and atmosphere and their response to solar and terrestrial inputs.
- Determine the interaction of the Sun with the solar system and the interstellar medium.
- Discover and characterize fundamental processes that occur both within the heliosphere and throughout the universe.



Requirement 1: Proposals shall describe a science investigation that addresses a preponderance of the iMAP science objectives listed in Section 2.4, stating the choice of science objectives for the proposed investigation and clearly justifying the choice of those science objectives.

Requirement 2: Proposals shall describe the traceability between the science objectives of the investigation to a) the iMAP science objectives stated above; and b) at least one of the Decadal Survey Science Goals



Requirement 6: Proposals shall describe a science investigation with goals and objectives. The objectives of the science investigation shall address a preponderance of the iMAP science objectives described in Section 2.4.

Requirement 7: Proposals shall demonstrate how the proposed investigation will fully achieve the proposed science objectives.

Requirement 8: Proposals shall clearly state the relationship between the proposed science objectives, the data to be returned, and the instrument complement to be used in obtaining the required data (see Appendix B, Section D, for additional detail).



Requirement 9: Proposals shall include a plan to calibrate (both preflight and inflight), analyze, publish, and archive the data returned, and shall demonstrate, analytically or otherwise, that sufficient resources have been allocated to carry out that plan within the proposed mission cost. The data plan shall discuss and justify any data latency period (see Appendix B, Section E, for additional detail). The data plan shall be in compliance with terms and conditions stated in the NASA Plan: *Increasing Access to the Results of Scientific Research* or a justification shall be provided that this is not necessary given the nature of the work proposed (see Section 4.4.1).



Requirement 10: Proposals shall state the proposed science objectives and their required measurements at a level of detail sufficient to allow an assessment of the capability of the proposed mission to make those specific measurements and whether the resulting data is necessary and sufficient to achieve these objectives (see Appendix B, Sections D and E, for additional detail).

Requirement 11: Proposals shall describe the proposed instrumentation, including a discussion of each instrument and the rationale for its inclusion in the proposed investigation.



Requirement 12: Proposals shall specify only one Baseline Science Mission and only one Threshold Science Mission.

Requirement 13: Proposals shall not identify any descopes or other risk mitigation actions that result in the mission being unable to achieve the Threshold Science Mission objectives.

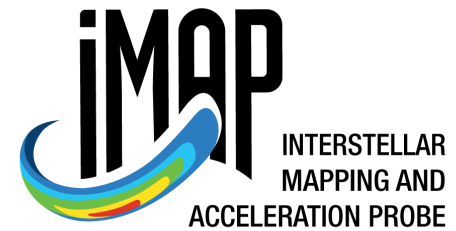


In the event of an apparent conflict between the IMAP AO and the IMAP AO Appendices, the order of precedence is:

1. the IMAP AO,
2. then the IMAP AO Appendix B,
3. then the IMAP AO Appendix A.



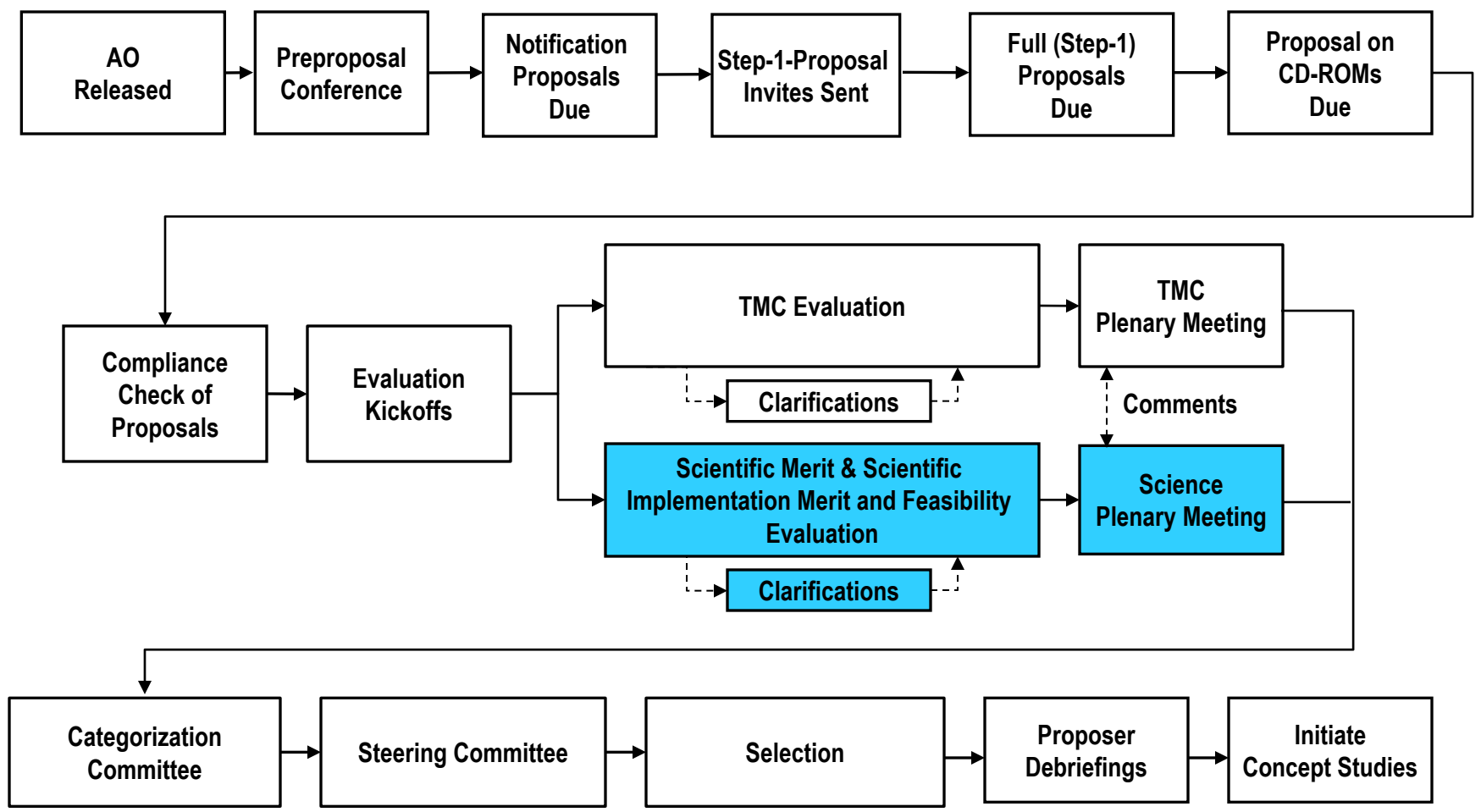
Science Evaluation Criteria



- 2017 IMAP AO (NNH17ZDA0070):
 - 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



Science Evaluation Flow





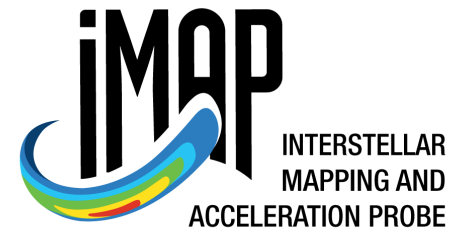
Science Evaluation Criteria – Form A



- 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. Neither do the iMAP Active Link Incentive for Real Time, Student Collaboration, or Technology Demonstration Opportunity.
- Four (4) separate scientific merit factors will be evaluated.



Science Evaluation Criteria – Form A



- **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.



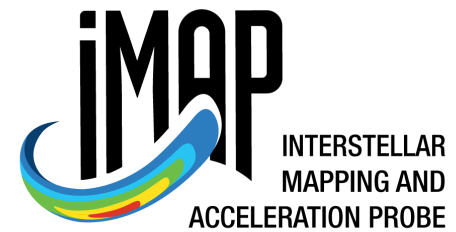
Science Evaluation Criteria – Form B



- 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.
- Scientific Implementation Merit and Feasibility of Science Enhancement Options, iMAP Active Link Incentive for Real Time, and Technology Demonstration Opportunity will not be considered in the overall criterion rating.
- Student Collaboration proposals will be evaluated only for the impact they have on science implementation feasibility to the extent that they are not separable.
- Five (5) separate scientific merit factors will be evaluated.



Science Evaluation Criteria – Form B (B-1 and B-2)



- **Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.**

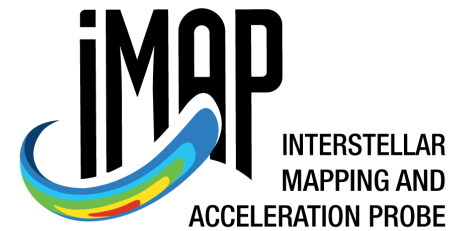
- This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data; and 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.



Science Evaluation Criteria – Form B (B-3 and B-4)



- **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 analysis and/or sample analysis, data archiving, and/or sample curation 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 samples 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; an assessment of the planning and budget adequacy and evidence of plans for the preliminary evaluation and curation of any returned samples; reporting scientific 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 science impact.
- **Factor B-4. Science Resiliency.**
 - This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to de-scoping 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.



Science Evaluation Criteria – Form B (B-5)



- **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.



- **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.



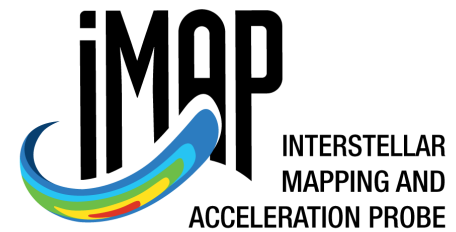
Science Evaluation – Grade Definitions



- **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).



Science 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 Implementation,
 2. The **Scientific Merit of the Proposed Mission Implementation**
 3. the **Scientific Implementation Merit and Feasibility of the Proposed Mission Implementation** .
- 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 or outside of the proposal.