



2016 Heliophysics Small Explorer (SMEX) & Mission of Opportunity (MO) Solicitations

Pre-Proposal Conference

Technical, Management, and Cost Evaluation

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Outline

- Technical, Management, and Cost (TMC) Evaluation
- SMEX AO & SALMON-2 AO PEA-Q Common Highlights
- SMEX AO Highlights
- SALMON-2 PEA-Q Highlights
- References
- Questions



Glossary

2016 Heliophysics
SMall EXplorer &
Mission of Opportunity

AO	Announcement of Opportunity
MO	Mission of Opportunity
PEA	Program Element Appendix to SALMON-2
SALMON-2	Second Stand-Alone Mission of Opportunity Notice
SMEX	Small Explorers
TMC	Technical, Management, and Cost



TMC Evaluation



TMC Evaluation

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Evaluation criteria

- Science Merit of the Proposed Investigation
- Science Implementation Merit and Feasibility of the Proposed Investigation
- **TMC Feasibility of the Proposed Mission Implementation, Including Cost Risk**

Weighting: The first criterion is weighted approximately 40%; the second and **third criteria are weighted approximately 30% each.**

TMC Evaluation: The purpose of the TMC evaluation is to assess the likelihood that the submitted mission or investigations' technical and management approaches can be successfully implemented as proposed, including an assessment of the likelihood of the completion within the proposed cost and schedule.



TMC Evaluation

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TMC Evaluation criteria

TMC evaluation criteria are stated in the AO Sections 7.2.4:

- SMEX AO, “TMC Feasibility of the Proposed Mission Implementation, Including Cost Risk”
- SALMON-2 AO, “TMC Feasibility of the Investigation Implementation, including Cost Risk”

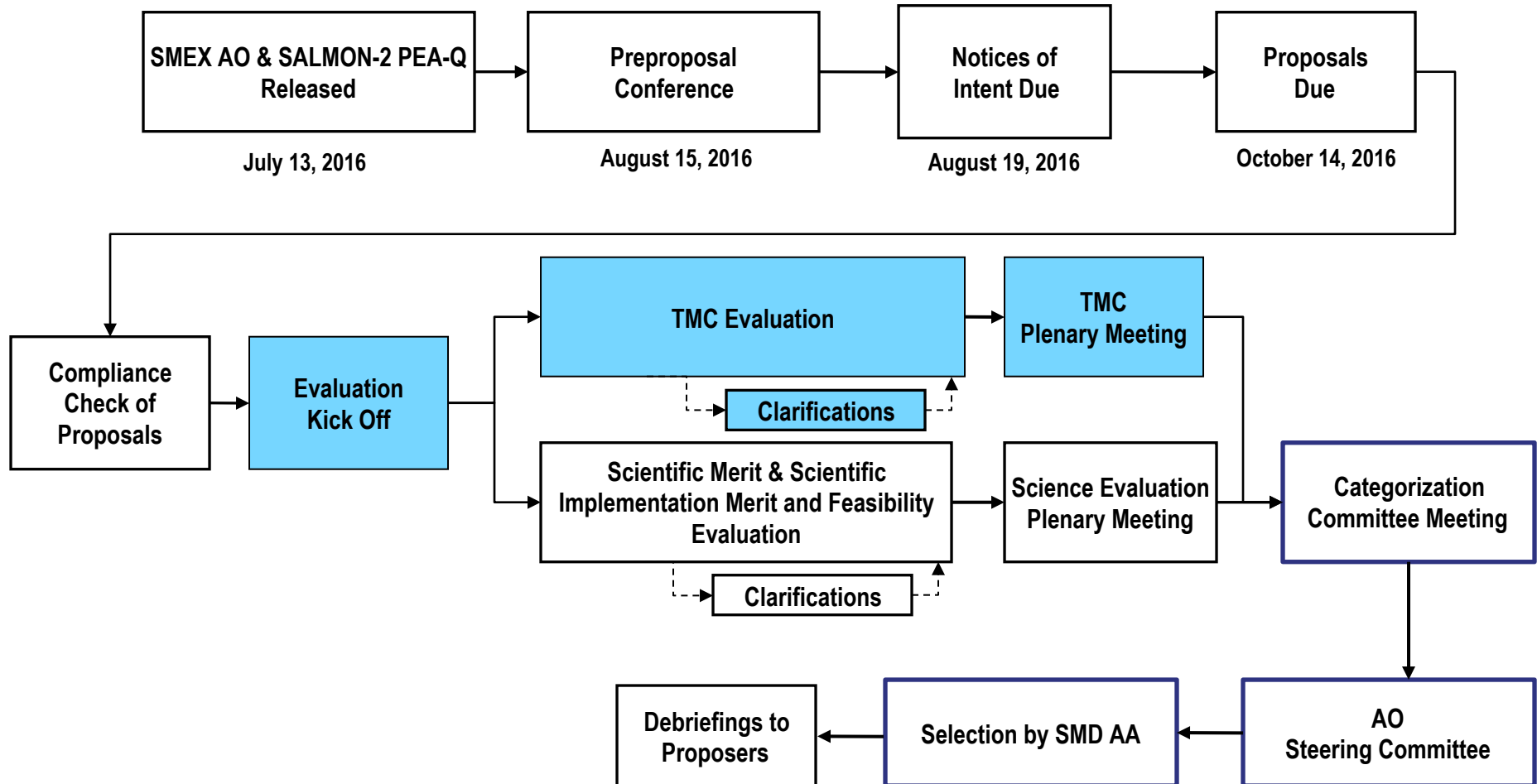
Note: The 2016 Heliophysics Explorer Mission of Opportunity (MO) solicitation is Program Element Appendix (PEA) Q to the SALMON-2 AO. **Those proposing to the Heliophysics MO must read both the SALMON-2 AO and the Heliophysics MO PEA Q carefully, and proposals must comply with the requirements, constraints, and guidelines contained within both of these documents.**



Evaluation, Categorization, and Selection Process

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Proposal Evaluation Flow





TMC Evaluation

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TMC Evaluation Factors

The following are highlights of the criteria listed in the SMEX AO, Section 7.2.4, “TMC Feasibility of the Proposed Mission Implementation, Including Cost Risk” and **SALMON-2 AO, Section 7.2.4, “TMC Feasibility of the Investigation Implementation, including Cost Risk.”**

The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule. The factors for feasibility of investigation implementation include the following, **as applicable for the investigation being proposed.**

Factor C-1. Adequacy and robustness of the instrument implementation plan.

Factor C-2. Adequacy and robustness of the mission (**investigation**) design and plan for operations.

Factor C-3. Adequacy and robustness of the flight systems.

Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.

Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.



TMC Evaluation

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TMC Evaluation Principles

- **Basic Assumption: Proposer is the expert on his/her proposal.**
 - Proposer's task is to provide evidence that the investigation implementation risk is low.
 - TMC panel's task is to try to validate proposer's assertion of low risk.
- Risk is to be assessed on the basis of material in the proposal. All Proposals are evaluated to identical standards and not compared to other proposals.
- TMC Panels consist of evaluators who are non-conflicted experts in the areas of the proposals that they evaluate.
- TMC Panels develop findings for each proposal - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).
- The Cost Analysis is integrated into overall risk.
- Proposal Risk Assessment:
 - Proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.



TMC Evaluation

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There are three possible Risk Ratings: LOW, MEDIUM, HIGH

TMC Evaluation - The purpose of the TMC evaluation is to assess the likelihood that the submitted missions or investigations' technical and management approaches can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

LOW Risk: There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.

MEDIUM Risk: Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.

HIGH Risk: One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.



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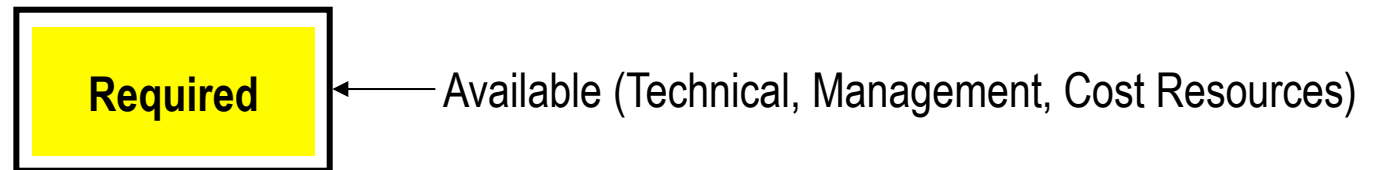
TMC Envelope Concept

Envelope: Contains all TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

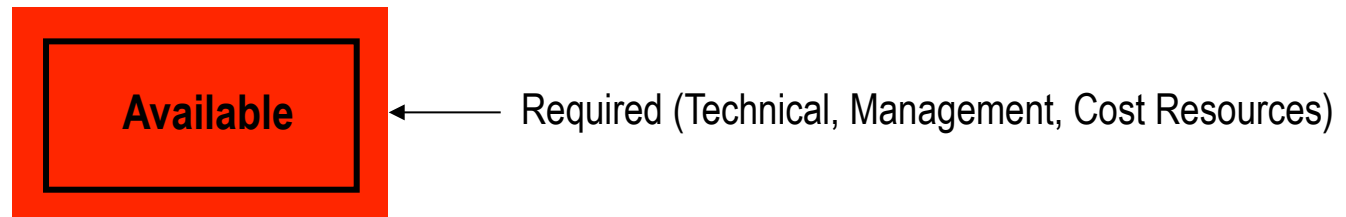
LOW Risk: Required resources fit well within available resources.



MEDIUM Risk: Required resources just barely inside available resources.



HIGH Risk: Required resources DO NOT fit inside available resources.





TMC Evaluation

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TMC Evaluation Findings

Major and minor strengths and weaknesses are defined as follows:

- **Major Strength:** A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost.
- **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 risk.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.
- **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 risk.

Note: Findings that are considered “as expected” are not documented.



TMC Evaluation

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TMC Evaluation Clarifications

- NASA will request clarification of Potential Major Weaknesses (PMWs) in the TMC Feasibility of the Proposed Mission/Investigation Implementation and the Scientific Implementation Merit and Investigation Feasibility that have been identified by the evaluation panels for those criteria.
- 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 a few types of responses:
 - Identification of the locations in the proposal (page(s), section(s), line(s)) where the potential major weakness is addressed
 - Noting that the potential major weakness is not addressed in the proposal.
 - Stating that the potential major weakness is invalidated by information that is common knowledge and is therefore not included in the proposal.
 - 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.
 - Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside or outside of the proposal.

The PI will be given at least 24 hours to respond to the request for clarification. Any response that goes beyond a clarification will be deleted and will not be shown to the evaluation panel.



Common highlights from 2016 Heliophysics SMEX AO and SALMON-2 PEA-Q



5.2.3 New Technologies/Advanced Engineering Development, SMEX AO (5.3.4 in SALMON-2, 4.6.1 in PEA-Q)

This AO solicits flight missions, not technology or advanced engineering development projects. Proposed investigations are generally expected to have mature technologies, with systems at a Technology Readiness Level (TRL) of 6 or higher. 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);

Proposals with a limited number of less mature technologies and/or advanced engineering developments are permitted as long as they contain a plan for maturing systems to TRL 6 by no later than PDR and adequate backup plans that will provide mitigation in the event that the systems cannot be matured as planned.

Requirement 23. (SMEX AO) Proposals that use systems currently at less than TRL 6 shall include a plan for system maturation to TRL 6 by no later than PDR and a backup plan in the event that the proposed systems cannot be matured as planned (Requirement B-36 provides additional detail regarding TRL).

Requirement Q-21. (PEA-Q) Language same as Requirement 23 of the SMEX AO (Requirement Q-45 provides additional detail regarding TRL).



5.8.3 Classified Materials, SMEX AO (5.10.3 Classified Proposal Appendix regarding Heritage, SALMON-2)

In order to increase the capabilities of investigations proposed in response to this AO while minimizing the development and operations risks within the PI-Managed Mission Cost Cap, proposers may choose to leverage technology that was developed by other institutions and agencies as well as technology developed by NASA and NASA-funded partners. It is recognized that some technology relevant to proposed missions may have classified heritage.

Proposals that propose the use of hardware with classified heritage may provide a classified proposal appendix to NASA to allow validation of classified heritage claims. The classified appendix regarding heritage may include Letters of Validation for classified heritage claims from technology development sponsors. The proposer is responsible for determining what information is classified and what information is unclassified; any classified information provided to NASA must be handled appropriately.

Please let NASA know ASAP if you plan to submit a Classified Heritage Appendix.



6.1.2 Notice of Intent to Propose, SMEX AO & SALMON-2

To assist the planning of the proposal evaluation process, NASA strongly encourages all prospective proposers to submit a Notice of Intent (NOI) to propose, before the NOI submittal deadline specified in the applicable PEA. Material in a NOI is deemed confidential and will be used for NASA planning purposes only. Submission of a NOI is not required for the submission of a proposal to this solicitation.

- AO and PEA-Q amendments will be announced to all subscribers to the SMD general information email list in NSPIRES. Proposers should also check the solicitation pages for other updates, including FAQs.
- NOIs will help the evaluation teams to plans and secure the services of well qualified evaluators earlier in the evaluation cycle.
- Include the names and affiliations of as many team members as possible.



2016 Heliophysics SMEX AO Highlights



1.1, 5.6.2 and 7.4; Two-step competitive process

- Proposals submitted in response to this AO will be selected for flight nominally through a **two-step competitive process**.
- Proposals submitted in response to this AO will undergo the first step evaluation.
 - As the outcome of the first step evaluation, NASA intends to fund approximately two or three SMEX investigations to proceed to an 11 month Phase A concept study capped at \$1.25 million Fiscal Year 2017 dollars.
- In the second step, NASA will conduct an evaluation of the Phase A concept study reports. From this evaluation, NASA expects to downselect one SMEX investigation to proceed into Phase B and subsequent mission phases.



5.6 Cost Requirements

The PI-Managed Mission Cost is defined in Section 4.3.1 of the AO. The AO Cost Cap for an Heliophysics Small Explorer mission is \$165 million Fiscal Year (FY) 2017 dollars, including access to space but not including any contributions. 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.

- NASA-provided launch services may be proposed at a charge of \$50 million in FY 2017 dollars against the PI-Managed Mission Cost.
- Proposers may propose alternative access to space, including contributed launch services. A charge to the PI-Managed Mission Cost of \$2.0 million will be levied on non-NASA launch services for the NASA launch vehicle monitoring functions and advisory services.
- NASA will provide accommodations on the ISS, as well as transportation to the ISS, at a charge of \$50 million in FY 2017 dollars against the PI-Managed Mission Cost.



2016 Heliophysics SALMON-2 PEA-Q Highlights



1.3 Overview of this Program Element Appendix

- Proposals submitted in response to this PEA will be selected for flight nominally through a **two-step competitive process**.
- Proposals submitted in response to this PEA will undergo the first step evaluation.
 - As the outcome of the first step evaluation, NASA intends to fund one or more MO investigations to proceed to an 11 month Phase A concept study capped at \$400K Fiscal Year 2017 dollars.
- In the second step, NASA will conduct an evaluation of the Phase A concept study reports. From this evaluation, NASA expects to downselect one or two MOs to proceed into Phase B and subsequent mission phases.



4.2 Types of Mission of Opportunity

Two Mission of Opportunity types may be proposed in response to this solicitation:

- (1) Partner Missions of Opportunity (PMOs), includes CubeSats
- (2) Small Complete Missions (SCMs)

SCMs are ISS payloads, commercial hosted payloads, CubeSats or suborbital class (Super Pressure Balloon (SPB), Long Duration Balloon (LDB) or Suborbital Reusable Launch Vehicle (sRLV)) investigations.

See Section 5.1 of the SALMON-2 AO for complete descriptions of these types of MOs as well as constraints and requirements for proposals.



4.5.1 Cost Requirements and Constraints

The PI-Managed Mission Cost is defined in Section 4.3.1 of the SALMON-2 AO.

Except for suborbital-class missions (high-altitude scientific balloon missions and missions on sRLVs), the PI-Managed Mission Cost Cap for an Heliophysics Explorer Mission of Opportunity, including all mission phases and the cost of accommodation on and/or delivery to the host mission, if applicable, is \$55 million in Fiscal Year (FY) 2017 dollars.

The PI-Managed Mission Cost Cap is \$35 million in FY 2017 dollars for suborbital-class missions.

Each selected investigation is PI-Managed, and the PI will be responsible for defining and controlling the costs within the proposed budget for each phase of the investigation. Costs associated with NASA arranged access to space (CubeSats that use CubeSat Launch Initiative (CSLI), suborbital rides, and investigations requiring flight to the ISS) will be outside the constrained PI-Managed Mission Cost.



4.5.1 Cost Requirements and Constraints – continued

Final funding profiles (Phases A-F) for all selected investigations will be negotiated between the Explorer Program and the selected investigation teams. The inability of NASA to accommodate the requested funding profile may be a reason for non-selection of a proposal.

Requirement Q-7. Proposals shall identify the funding source for each collaborator; the costs shall be included in the Total Mission Cost.

Requirement Q-14. Proposals shall include detailed plans and budgets for Phases A-F for costs that are within the PI-Managed Mission Cost.

Requirement Q-15. Proposals shall justify the adequacy of the proposed cost reserves. Proposals shall include a minimum of 25% of unencumbered cost reserves against the cost to complete and shall demonstrate an approach to maintaining required unencumbered cost reserves through subsequent development phases.



4.5.2 Schedule Requirements and Constraints

For PMOs, the proposing PI must provide evidence that the sponsoring organization intends to fund the primary host mission and that the NASA commitment for U.S. participation is required by the sponsoring organization prior to March 2020. The launch date itself for a PMO is not constrained.

For Small Complete Mission (SCM) MOs, proposers must specify the launch readiness date in the proposal, which is to be no later than August 2022. Explorer SCM MO investigations with an anticipated launch readiness date requirement later than August 2022 should be proposed in response to a subsequent opportunity.

Requirement Q-16. Proposals shall include a detailed development schedule (including integration plans) and an associated cost that for a SCM with a launch readiness date no later than August 2022, or for PMOs is consistent with the documented launch and operations schedule of the primary host mission.



4.5.2 Schedule Requirements and Constraints – continued

Proposers should be aware that it may be necessary for NASA to adjust the launch date and definition phasing of selected investigations from that proposed in order to conform to the available Explorers Program budget profile and/or NASA's ability to negotiate a launch opportunity to the International Space Station, for a high-altitude scientific balloon mission, for launch opportunities on reusable launch vehicles, or for CubeSat launches; therefore, the degree of launch date flexibility must be indicated in the proposal.

For balloon missions planned for launch from Antarctica during the December 2022 - January 2023 campaign, "launch readiness" per this requirement is considered to be one and the same as being at the Columbia Scientific Balloon Facility (CSBF) and ready to complete pre-deployment integration and testing with the CSBF support systems. June is the normal month for pre-deployment integration and testing at the CSBF for Antarctic balloon missions, which in the case of this MO, must be no later than August 2022.



PEA-Q Highlights

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- The Heritage Appendix will be limited to 30 pages. This supersedes page B-2 of the SALMON-2 AO.
- Requirement Q-47 further clarifies proposal heritage claims presented in Requirement B-70 of the SALMON-2 AO
 - **Requirement Q-47.** If a proposal claims any heritage from which the proposed investigation derives substantial benefit, this appendix shall discuss each element to an appropriate level of granularity (e.g., component, assembly, subsystem) to clearly separate the heritage element from other elements of the design.
- Requirement Q-41 supersedes Requirement B-4 of the SALMON-2 AO and clarifies the information requested on page limits.
 - **Requirement Q-41.** Proposals shall conform to the page limits specified in the *Proposal Structure and Page Limits* table. Two extra pages each are allotted for each additional separate, non-identical science instrument... Different instruments on identical spacecraft buses will only be allotted extra pages for additional non-identical science instruments; no extra pages will be allotted for additional non-identical flight elements.



PEA-Q Highlights

2016 Heliophysics
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- Deferred from SALMON-2 AO for this Step One of the Two Step proposal process.
 - Section 4.5.1 *Independent Verification and Validation*
 - Section 4.5.4 *Conjunction Assessment Risk Analysis*
 - Section 5.3.10 *End-of-Mission Spacecraft Disposal*
 - Requirement B-21 regarding a schedule-based end-to-end data management plan.
 - Request for costs in RY dollars
- This PEA does not require an Education and Public Outreach program.

READ the PEA-Q and the SALMON-2 AO closely!



References



SMEX and MO Reference Material

2016 Heliophysics
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2016 Heliophysics SMEX and MO Acquisition Page

The 2016 Heliophysics Explorer SMEX and MO acquisition home page is available at <http://explorers.larc.nasa.gov/HPSMEX/>

The contents of the web site include the following:

- Links to SMEX and MO pages
- 2016 Heliophysics SMEX and MO major milestones
- Community announcements
- FBO
- Teaming interest
- Preproposal conference



SMEX Reference Material

2016 Heliophysics
SMall EXplorer &
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2016 Heliophysics SMEX Acquisition Home Page

The 2016 Heliophysics SMEX Acquisition Home Page available at <http://explorers.larc.nasa.gov/HPSMEX/SMEX/index.html>, will provide updates and any addenda during the solicitation process. The contents of the SMEX acquisition page include the following:

- Links to the NSPIRES for access to the solicitation
- Program library
- Evaluation plan
- Q&A

2016 Heliophysics SMEX Program Library

The Library provides additional regulations, policies, and background information. The Library is accessible at <http://explorers.larc.nasa.gov/HPSMEX/SMEX/programlibrary.html>



MO Reference Material

2016 Heliophysics
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2016 Heliophysics Explorer MO Acquisition Home Page

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- Q&A

2016 Heliophysics Explorer MO Program Library

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- Use Table B3b template in the program library to develop cost funding profile.



Questions?



**All further questions pertaining to the SMEX AO or PEA-Q
MUST
be addressed to:**

**Dr. Daniel Moses
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NASA Headquarters
Washington, DC 20546
hq-explorers@nasa.gov
(subject line to read “SMEX AO” or “PEA-Q”, as applicable)
202.358.0558**