



2019 Astrophysics 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-3 AO PEA O Highlights
- SMEX AO Highlights
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- References
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Glossary

AO	Announcement of Opportunity
SALMON-3	Stand-ALone Mission of Opportunity Notice-3
PEA	Program Element Appendix to SALMON-3
TMC	Technical, Management, and Cost
MO	Mission of Opportunity



TMC Evaluation



TMC Evaluation

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Evaluation criteria

- Science Merit of the Proposed Investigation
- Science Implementation Merit and Feasibility of the Mission or Investigation
- **TMC Feasibility of the Mission or Investigation Implementation**

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 following sections.

- SMEX AO, Section 7.2.4, “TMC Feasibility of the Proposed Mission Implementation”
- SALMON-3 AO, Section 7.2.4, “TMC Feasibility of the Investigation Implementation”

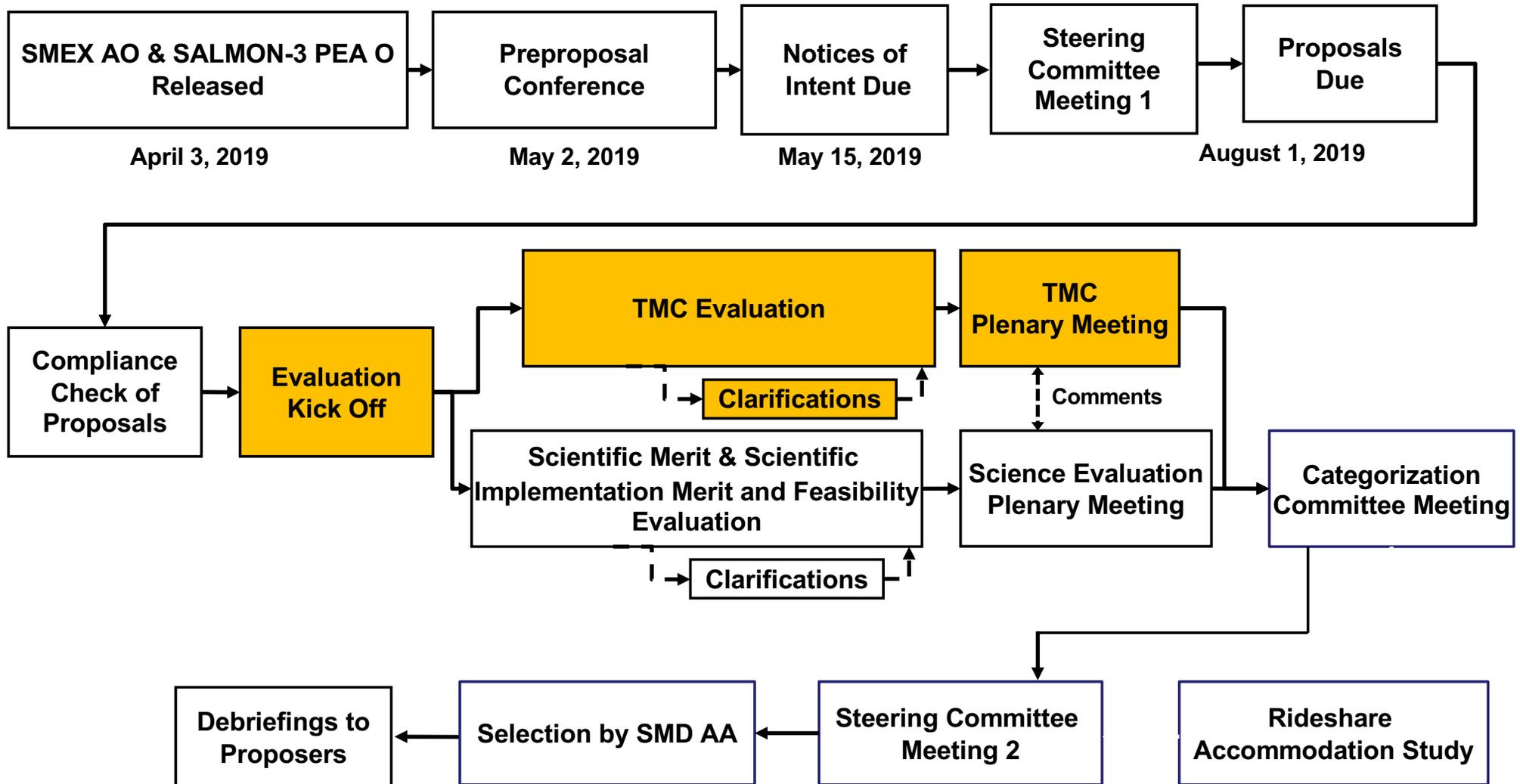
Note: The 2019 Astrophysics Explorer Mission of Opportunity (MO) solicitation is Program Element Appendix (PEA) O to the SALMON-3 AO. **Those proposing to the Astrophysics MO must read the SALMON-3 AO and the Astrophysics MO PEA O carefully, and proposals must comply with the requirements, constraints, and guidelines contained within these documents.**



Evaluation, Categorization, and Selection Process

2019 Astrophysics Explorers SMEX and Mission of Opportunity

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 and SALMON-3 AO, Section 7.2.4 – TMC Feasibility of the Proposed Mission or 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 or investigation design and plan for mission 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.
- Merit 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.



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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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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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Clarifications

- NASA will request clarification of potential major weaknesses identified during the evaluation process of the Science Merit of the Proposed Investigation, the Science Implementation Merit and Investigation Feasibility, and the TMC Feasibility of the 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 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 in 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.



TMC Evaluation

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Common Causes of Major Weaknesses References

- Technology Readiness Level:
 - *Assessment of TRL in AO-Based Evaluations and Common Causes of Major TRL Weaknesses*
 - Located in Program Libraries
- Management:
 - *Common Management Major Weaknesses in Step One Proposals*
 - Located at SOMA website:
<https://soma.larc.nasa.gov/tmcII/ManagementFindingsStudy-to-post-R3.pdf>



Highlights from 2019 Astrophysics SMEX AO and SALMON-3 PEA O that are Common to Both



5.2.3 New Technologies/Advanced Engineering Development, SMEX AO (5.3.5 in SALMON-3, 5.3.4 in PEA O)

The AO and PEA solicit science 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) – **see the SMEX and MO Program Libraries for specific examples**

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.

SMEX: AO – Requirement 24 and Requirement B-37

MO: SALMON-3 AO – Requirement 35 and Requirement B-46



5.8.4 Classified Proposal Appendix regarding Heritage **(5.8.2 in PEA O)**

If a proposer chooses to submit a classified appendix regarding heritage, the requirements on content, format, and length are the same as, but independent from, those for the unclassified appendix regarding heritage included in the proposal (see Appendix B, Section J.12, for further details) with the exceptions that Letters of Validation and cost bases of estimate may be included in the classified appendix regarding heritage.

NASA allows three options for proposers to support heritage claims from classified programs: 1) delivery to NASA of a classified appendix regarding heritage, 2) “delivery in place” of a classified appendix regarding heritage, and subject to possible restriction 3) sponsor verification of the heritage claims derived from classified programs.

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



The Heritage Appendix will be limited to 30 pages.

- The page limits are specified, for both the SMEX AO and the SALMON-3 AO, in Appendix B, Proposal Structure and Page Limits table
- If there is a classified heritage appendix, its pages will count towards the 30 page limit.

6.1.2 Notice of Intent to Propose (also 6.1.2 in the PEA O)

- To facilitate planning of the proposal evaluation process, NASA requires all prospective proposers to submit a Notice of Intent (NOI) to propose.
- NOIs will help the evaluation teams to plans and secure the services of well qualified evaluators earlier in the evaluation cycle.
- Include the names of as many team members as possible



5.9.2.2 AO- and PEA-provided Rideshare Access to Space SMEX AO (PEA O 5.1)

- AO- and PEA-provided access to space is expanded to include rideshare on ESPA or ESPA Grande to Low Earth Orbit (LEO) or Geostationary Transfer Orbit (GTO), including the IMAP mission if space is available
- Information on the ESPA and ESPA Grande can be found in the both the SMEX and MO Program Libraries
- **Rideshare Accommodation worksheets required for proposals utilizing LEO/GTO rideshare access to space**
 - **SMEX AO** – Requirement 95
 - **PEA O** – Requirement O-6
- Rideshare Accommodation worksheet template provided in the Program Library.
- Table shall be provided in electronic form, and in the experiment implementation section (Section E) of the proposal. This table must summarize information from other sections of the proposal, and not provide new information; it will not be considered during the evaluation and does not count towards the proposal page limit.



Cislunar & Lunar Gateway Opportunities (SMEX AO 5.9.2.4 and PEA O 5.1.2.5)

Documents related to cislunar and lunar Gateway opportunities are in both the SMEX and MO Program Libraries. **Documents in the Program Library may be updated**, but no later than 30 days before the proposal due date. Proposers are responsible for checking for updates.

Investigations on ISS (5.9.2.3 in SMEX AO and 5.1.2.4 in PEA O)

Investigations requiring flight on or deployment from the ISS must provide a Letter of ISS Technical Interface and Resource Accommodation Feasibility Assessment from the NASA International Space Station Research Integration Office (Requirement 96 in SMEX AO and Requirement O-7 in PEA)



2019 Astrophysics SMEX AO Highlights



4.1.4 Mission Category and Payload Risk Classification

- Category 3 missions (per NPR 7120.5E) with Class D payloads (per NPR 8705.4).
- Missions proposed for this AO are not eligible for Class D streamlining.

5.6 Cost Requirements and Constraints

- The PI-Managed Mission Cost is defined in Section 4.3.1 of the AO.
- The AO cost cap for an Astrophysics Small Explorer mission is \$145 million in Fiscal Year (FY) 2020 dollars, not including the cost of the Expendable Launch Vehicle (ELV), ESPA rideshare access to space, transportation to ISS or any contributions.
- Any launch services beyond the standard launch services offered must be funded out of the PI-Managed Mission Cost.
- Contributed launch services cannot be proposed or considered under this AO.



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 one or more SMEX investigations to proceed to an 9 month Phase A concept study capped at \$2 Million Fiscal Year 2020 (FY) dollars (Section 5.6.2).
- 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.



2019 Astrophysics SALMON-3 AO PEA O Highlights



1.3 Overview of this Program Element Appendix, Two-step competitive process

- 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 a 9-month Phase A concept study capped at \$500K Fiscal Year 2020 (FY2020) dollars. Phase A
- 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 more MOs to proceed into Phase B and subsequent mission phases.



5.1 Types of Mission of Opportunity

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

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

SCMs that may be proposed to make use of PEA-provided access to space include those utilizing a small launcher, rideshare payloads, and investigations hosted on the ISS or the lunar Gateway.

See Section 5.1 of both the SALMON-3 AO and PEA O 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-3 AO.

The PEA O Cost Caps are listed and described in Requirement O-15. The Cost Cap includes all mission phases and the cost of accommodation on and/or delivery to the host mission, if applicable.

- \$75M in Fiscal Year (FY) 2020 dollars is the PI-managed Mission Cost cap for "full" (not SmallSats) Small Complete Missions and Partner Missions of Opportunity.
- \$35M in FY 2017 dollars is the PI-managed Mission Cost cap is for SmallSats, and for CubeSats to be deployed to cislunar space.

Requirement O-16. Proposals shall include detailed plans and budgets (in FY2020\$) for Phases A-F for costs that are within the PI-Managed Mission Cost.



5.4.1 Schedule Requirements and Constraints

For Partner MOs, 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 December 2023. The launch date itself for a Partner MO 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 May 2025.

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 profiles and/or NASA's ability to negotiate a launch opportunity to the International Space Station or the lunar Gateway; therefore, the degree of launch date flexibility must be indicated in the proposal.



5.3.3 Mission Category and Risk Classification

- This PEA solicits proposals for science investigations designated as Category 3 missions as defined in NPR 7120.5E, *NASA Space Flight Program and Project Management Requirements*, with payloads are designated as Class D as defined in NPR 8705.4, *Risk Classification for NASA Payloads*
 - possible exception of PMOs, hosted payloads, and investigations deployed from another spacecraft, where the designation may be driven by the host mission's risk classification requirements, which must be specified in the proposal.
- All Class-D 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 NASA Science Mission Directorate (SMD) Class-D Tailoring/Streamlining Decision Memorandum, along with other Class-D policy and guideline documents in the Program Library.



7.1 Scientific/Technical Evaluation Factors

- Proposals will be evaluated according to the evaluation criteria set forth in Section 7.2 of the SALMON-3 AO, with the exception of Factors B-5 and C-4 for Streamlined Class-D missions, which are amended to delete evaluation of the PI's spaceflight experience.
- In 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 "Investigation Implementation Merit" rating.
- In Factor C-4, 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.



PEA O Highlights

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- Deferred from SALMON-3 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
 - **Requirements B-58 to B-60** for costs in RY dollars
 - **Section 5.3.13, App. B J-7** Orbital Debris and Disposal
 - **Section 5.3.7 of PEA-O** Space Systems Protection
 - Requirement PEA O-1 on data plan: amendment in process
 - Section 5.2.5 of SALMON-3 Science Enhancement Option
- This PEA does not include an Education and Public Outreach program
- PEA Section 8.1, option from Section 5.3.10 of SALMON-3 on permitted uses of radioactive material clarified in Q&A

READ the PEA O and the SALMON-3 AO closely!



References



SMEX and MO Reference Material

2019 Astrophysics
Explorers SMEX and
Mission of Opportunity

2019 Astrophysics SMEX and MO Acquisition Page

The 2019 Astrophysics Explorer SMEX and MO acquisition home page is available at <http://explorers.larc.nasa.gov/2019APSMEX/>

The contents of the web site include the following:

- Links to SMEX and MO pages
- 2019 Astrophysics SMEX and MO major milestones
- Community announcements
- FBO
- Teaming interest
- Preproposal conference



SMEX Reference Material

2019 Astrophysics
Explorers SMEX and
Mission of Opportunity

2019 Astrophysics SMEX Acquisition Home Page

The 2019 Astrophysics SMEX Acquisition Home Page available at <http://explorers.larc.nasa.gov/2019APSMEX/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

2019 Astrophysics SMEX Program Library

The Library provides additional regulations, policies, and background information. The Library is accessible at <http://explorers.larc.nasa.gov/2019APSMEX/SMEX/programlibrary.html>



MO Reference Material

2019 Astrophysics
Explorers SMEX and
Mission of Opportunity

2019 Astrophysics Explorer MO Acquisition Home Page

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

2019 Astrophysics Explorer MO Program Library

The Library provides additional regulations, policies, and background information. The Library is accessible at <http://explorers.larc.nasa.gov/2019APSMEX/MO/programlibrary.html>. Use Table B3b template in the program library to develop cost funding profile.



Questions?



**All further questions pertaining to the SMEX AO or PEA O
MUST
be addressed by email to:**

**Dr Linda Sparke
Astrophysics Explorers Program Scientist
Science Mission Directorate
NASA Headquarters
Washington, DC 20546
linda.s.sparke@nasa.gov
(subject line to read "SMEX AO or PEA O as applicable")**