



National Aeronautics and
Space Administration

Writing Level 1 and Level 2 Requirements

Astrophysics Explorers Program 2026 Small Explorer (SMEX)

Pre-Proposal Conference

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AO Context and Definitions



AO Context and Definitions

1. Unlike traditional opportunities, this AO requires proposers to develop and submit both L1 and driving L2 requirements.
 1. [Req. 15] Proposals shall provide a set of proposed Level 1 science requirements that will achieve the objectives of the Science Investigation.
 2. [Req. 16] Proposals shall provide the driving Level 2 project requirements that will guide the design and development of the mission.
2. For Level 1 Requirements, the AO provides the following:
 1. Level 1 Requirements identify the mission, science, and programmatic requirements necessary to achieve the proposed science investigation as well as any constraints that are imposed on the project.
3. For driving Level 2 Requirements, the AO does not provide a specific expectation. Instead, the purpose of the combined set of Level 1 and driving Level 2 Requirements is provided as:
 1. The Level 1 science and Level 2 project requirements specify requirements and constraints on science data collection, mission and spacecraft performance, prime mission lifetime, budget, schedule, launch vehicle, and any other requirements or constraints that need to be controlled.
4. Guidance to help proposers understand the expectations for driving Level 2 project requirements is available in the program library
[\[https://explorers.larc.nasa.gov/APSMEX26/SMEX/pdf_files/Guidance%20Driving%20Requirements%20Appendix%20Pre-Phase%20A%20Proposals%20-%20Final.pdf\]](https://explorers.larc.nasa.gov/APSMEX26/SMEX/pdf_files/Guidance%20Driving%20Requirements%20Appendix%20Pre-Phase%20A%20Proposals%20-%20Final.pdf)

Level 1 Science Requirements



Level 1 Science Requirements

1. Level 1 requirements should define the scientific determinations and/or results that are necessary for completion of each Science Objective.
2. Level 1 requirements should be agnostic to mission implementation details.
3. Level 1 requirements should be written to permit decomposition into measurement requirements.
4. Indicators of good Level 1 requirements
 1. The requirements represent the scientific results that the community would accept as demonstration that the mission's proposed Science Objectives have been met.
 2. The requirements make sense even if the data were available from a source external to the proposed mission.
 1. The implementation agnostic expectation should preclude the requirements from caring about the source of the data
 3. The requirements can be decomposed into definitions of the capabilities required to satisfy them.
 1. These capabilities include mission implementation specifics such as measurement capabilities, observing time and target selection, mission lifetime, and orbit constraints.
5. Additional guidance on defining and crafting Level 1 requirements can be found in Jared Leisner's presentation from the PI Launchpad Sessions [<https://science.nasa.gov/researchers/pi-launchpad-sessions/>]

Driving Level 2 Project Requirements



Driving Level 2 Project Requirements

1. What constitutes a Level 2 requirement has significant variability between implementation organizations.
2. To address this issue, the guidance provided in the program library generalizes driving Level 2 requirements to the following:
 1. “...driving requirements are defined as those which directly impact cost, schedule, and/or technical performance characteristics of the mission.”
 2. This definition speaks to the types of requirements rather than specifying the level. It is anticipated that some driving requirements would be categorized as Level 3 requirements within some proposing organizations.
3. The guidance document available in the program library provides examples of the types of requirements that are often driving requirements.
 1. Examples are grouped into instrument, spacecraft, mission design, operations, and ground system factors.
 2. Given the AO’s expectations ground system maturity, driving requirements within this factor are limited to those that have the potential to significantly affect the other factors.
 1. Examples include level of automation and target of opportunity support.
4. Driving Level 2 requirements should define any relaxation that is allowed when transitioning to the Threshold Mission.

Important Notes from the Guidance Document

1. Driving requirements will vary from mission to mission. What constitutes a driving requirement for one mission concept will not necessarily be a driving requirement for another.
2. The set of driving Level 2 requirements should sufficiently constrain the design space such that a concept design which satisfies those requirements within the proposed resources (technical, cost, and schedule) would be deemed feasible by an external reviewer.
 1. These requirements often directly flow from the Level 1 requirements but may also represent design and implementation decisions that have already been made as part of concept development.
3. The set of driving Level 2 requirements establish a baseline set of performance measures against which the proposed mission concept will be evaluated.
 1. The Technical, Management, and Cost (TMC) evaluation panel evaluates whether the required performance for key aspects of the investigation can be achieved with supporting elements of the project meeting their required performance. Current Best Estimate (CBE) performance estimates highlight existing margin in the design that may be consumed during development and therefore are not sufficient to demonstrate satisfaction of requirements.
4. The examples provided in the guidance document to illustrate potential driving requirements do not represent a comprehensive set of potential driving requirements. It is likely that some missions proposed to this opportunity will have driving requirements that are not identified in the provided examples.
5. The page limit for the appendix is intended to provide a constraint on the overall level of detail that can be included.
 1. The driving requirements appendix is not intended to include all of the content that would normally be found in a Mission Definition Requirements Agreement (MDRA).
 2. The TMC will not issue weaknesses when requirements that are not considered to be driving are included.
 3. The TMC will not issue strengths for the development and inclusion of non-driving requirements.

