

Call for Proposals

2022 Planetary Mission Senior Review

July 9, 2021; revised December 16, 2021

1. Overview

NASA's Planetary Science Division (PSD) conducts periodic review of missions approaching the end of their authorized funding (End-of-Mission, EOM) to assess the value and opportunity of funding additional operations. The normal cadence for mission reviews is every three years.

PSD will hold its next Planetary Mission Senior Review (PMSR) in early 2022 to evaluate proposals requesting extended operations for FY23 through FY25. Missions that will reach the end of their current Prime Mission or Extended Mission (EM) operations by the end of FY22 will be reviewed at this PMSR.

The following missions will be reviewed at the 2022 PMSR:

| Mission | Current EOM |
|------------------------------------|--------------------|
| InSight | December 2022 |
| Lunar Reconnaissance Orbiter (LRO) | September 2022 |
| Mars Odyssey (ODY) | September 2022 |
| Mars Reconnaissance Orbiter (MRO) | September 2022 |
| Mars Science Laboratory (MSL) | September 2022 |
| MAVEN | September 2022 |
| New Horizons (NH) | September 2022 |
| OSIRIS-REx (OREx) | September 2023 |

The OREx mission will be reviewed at this PMSR, ahead of its nominal schedule, in order to evaluate opportunities for spacecraft operations after the Sample Return Capsule has been released from the spacecraft. OREx should submit a proposal which describes an encounter with the asteroid Apophis in 2029-2031. The proposal should cover the time period FY23-FY31, including cruise, encounter, and closeout.

2. Proposal Content

Proposals should focus on the contents of the proposed EM. Each proposal is limited to 40 pages, on 8.5" x 11" paper, with 1" margins. Multiple-page foldouts are counted as multiple pages. Font for the main text and captions must be 12-point or larger. For text within figures and tables, the font size must be legible without magnification. Expository text necessary for the proposal may not be located solely in figures or tables, or their captions.

- i. Title Page (not in page limit)
- ii. Table of Contents (not in page limit)
 1. Executive Summary
 2. Current Mission Status
 3. Historical Accomplishments (c.f. Table 1, Appendix A)
 4. Proposed Extended Mission Science Objectives
 5. Science Traceability Matrix (c.f. Table 2, Appendix A)
 - The STM should link the goals and questions in the Decadal Survey to the goals, science objectives, and measurements to be taking during the EM.
 - If substantial portions of a proposed EM are focused on research that addresses science goals of multiple NASA SMD divisions, the proposal may include the relevant goals of other divisions in this table and the associated discussion.
 6. Proposed Extended Mission Programmatic Objectives (optional)
 - This may include activities such as data relay for other NASA or international missions; science which advances the goals of NASA directorates beyond SMD; international cooperation; or other significant non-science activities.
 7. Technical Plan to Meet Objectives
 8. Management Plan
 - Project organization and roles and capabilities of key personnel
 - Key personnel include PI / Project Scientist, Deputy PI / Deputy Project Scientist, Project Manager, and Science Team Leads / Investigation PIs.
 - Risk analysis
 - Include risks due to operations and spacecraft health, and the implications for operations and science
 9. Data Archiving
 - Summary of past archiving and performance with the PDS
 - Summary of data usage by the broader community, based on reported PDS data usage statistics, the number of publications citing mission data or linking to Digital Object Identifiers (DOIs) of mission data, or other usage statistics.
 10. Professional Development Plan
 11. Budget and Descope
 - Budget should include a table by WBS Level II per FY, and should include the previous three years (FY20/21/22) and the EM.
 12. Overguide (OG) Request (optional; 4 page limit; does not count against 40-page limit)

- This section should clearly state the benefit to NASA of the OG(s), in terms of additional science, additional data, reduced risk, or other benefits. The main 40-page proposal must stand alone without the OG section; the main proposal may refer briefly to the OG section but not describe it in detail. This section should include a clear description of the budget of the OG(s), and a budget table in the same format as the main proposal for the years covered by the OG.

An appendix (no page limit) should be included, consisting of:

A1. Acronym List

A2. References

A3. Team Publications

- List of relevant journal publications where the primary author is or was on the team, with summary table listing total publication counts per year.

A4. External Publications

- List of relevant journal publications where the primary author is not or was not on the team, with summary table listing total publication counts per year

A5. Science Team

- Name, role, and affiliation of science team members who will have substantive involvement during the EM, with very brief descriptions of their science focus during the EM (e.g., 'Martian atmospheric chemistry'). Proposals should identify team members at or above the level of postdoc. Individuals not yet identified may be listed generally; e.g. 'TBD' or '3 postdocs - ice geology.' For completeness, proposals should identify any individuals currently serving as part of a separately funded NASA Participating Scientist Program (PSP). The intent is to demonstrate that the expertise of the science team is aligned with the science proposed. Individuals who will only be serving in a de minimis role should not be listed.

A6. Project Data Management Plan (PDMP)

- Letter of concurrence from PDS node(s) should follow the PDMP text.

3. Proposal Content Notes

Professional Development Plan (PDP)

NASA has a strong interest in developing the leadership and management skills of scientists who aspire to serve in leadership roles on future missions. Given the long cadence of planetary missions, it is important that developmental activities for future leaders be incorporated into the planning and decision processes for extended missions. NASA encourages proposals to include plans for training the next generation of mission leaders, such as future PIs / Project Scientists, Instrument PIs / Leads, and Science Team leaders. The PDP should identify roles and mentors for individuals to be trained, and describe a plan to build their skills and experience.

Budget Guidelines and Descopes

Each mission will submit a proposal that assumes a Guideline budget, with optional Descopes and/or Overguides. The budgets will be developed cooperatively between the mission and the mission's assigned Program Executive (PE) and Program Scientist (PS).

Missions are also encouraged to identify possible descopes to their proposed EM plan. These descopes should be set to allow meaningful cost savings to NASA by substantively reducing the scope of the science investigation, and/or of mission operations. These descopes may increase the risk of the mission. Depending on the nature of the descopes, the proposal may present these descopes as independent options, or cumulatively.

Missions may optionally make the case for one or more overguide (OG) requests, which offer to perform additional activities at a budget above the guideline EM budget. OG requests are optional and must be of exceptional merit. Multiple OG requests may be listed within this section; the proposal should make clear any interdependencies between them.

For missions that expect to terminate during the EM timeframe, missions should assume six months of funding for science evaluation and closeout. The budget to support this closeout should be included and described in the proposal.

For missions that contain international contributions funded by non-NASA sources (e.g., instrument operations or science analysis), the proposal should describe clearly the contribution which any foreign partners will commit to the EM.

Project Data Management Plan (PDMP)

The PDMP should follow the same format as each mission's current PDMP. The PDMP should be updated to reflect each mission's current status and practices, and describe data management through proposed mission closeout.

Missions must archive all science data to NASA's Planetary Data System (PDS). Science data includes information that lead to scientific publication and are reflective of the data sets used by the mission team. Examples of science data may include calibration data, derived data products, mission planning documents, user guides, and ancillary data used for science investigations.

All data acquired during the proposed EM must be archived in PDS4 format. If the mission is not currently delivering data in PDS4 format, the mission must include a plan on how it will start delivering data in this format. This plan should be coordinated with the lead PDS node(s) for the mission, and the mission's budget should include any costs associated with PDS4 deliveries of new data. If costs to deliver mission data in PDS4 are to be supported outside the mission (e.g. by the

PDS Node), the mission proposal should provide such a statement supported in a letter from the PDS. Missions may continue to deliver new data products in PDS3 format concurrent with PDS4, in order to support existing users.

Missions are encouraged, but not required, to develop a plan to deliver previous mission data, originally submitted in PDS3 format, to the PDS in PDS4 format. This may be accomplished in collaboration with the PDS node, and if so should be noted in the letter from the PDS node. This optional portion may be described in the PDMP and if needed may be listed in the Overguide section of the proposal.

Missions are encouraged, but not required, to develop a plan to archive new and/or existing mission science analysis codes, data pipeline codes, and other scientifically relevant software to a publically accessible archive, which may be the PDS. This optional portion may be described in the PDMP and if needed may be listed in the Overguide section of the proposal.

NASA's *Science Information Policy for the Science Mission Directorate* (2021) provides details on requirements and best practices for archiving mission data. The PDMP should justify the reason for any variances from this policy.

Missions must include a letter from the PDS node(s) indicating their concurrence to the proposed PDMP.

Proposal Content - Exclusions

Communications plans are not being evaluated as part of the PMSR. Missions that are selected for extensions may be subjected to a separate SMD communications review at a later date, as described in NASA's *Policy and Requirements for SMD Communications for Flight Missions (SPD-26B)*. Although a communications plan is not being solicited for the PMSR, the proposed EM budget should include a communications budget based on activities described in each mission's existing communications plan and anticipated in the future EM.

4. Spacecraft Capabilities and Health

Proposals must be consistent with the expected operational capabilities of the spacecraft. The proposal should clearly indicate the status of all consumables and limited-lifetime items (e.g., battery cycles; thruster pulses), as well as the expected depletion of those resources during the proposed EM. Operational limitations (e.g., power; requirements for data relay) should be clearly described, and any significant impact due to expected spacecraft health or instrument degradation should be clearly described.

5. Proposal Submission

Proposals will be submitted through NASA's NSPIRES proposal system. Proposals will be submitted as a single PDF file containing all of the required components. No Notice-of-Intent (NOI) or Step-1 proposal is required. A redacted budget is not required.

6. Review Panel

NASA will assemble a review panel for each mission consisting of Subject Matter Experts (SMEs). The panel membership will consist of leading authorities with relevant expertise in science, engineering, mission operations and data archiving drawn from government, academia, and industry. Each mission will be reviewed by a separate panel led by a Panel Chair; individual panelists may serve on one or more panels. Two Review Chairs -- one for Mars missions, and one for OREx, LRO, and NH -- will serve as panelists on all of their respective panels.

Proposals will be evaluated on criteria related to scientific merit and technical capability by the review panels. Each mission will be evaluated independently, and missions will not be compared with each other by the review panels.

In advance of the review, the panels will give the mission teams written questions based on the proposals. The mission teams will answer these questions at the oral presentation, which may be held virtually.

Each mission may provide NASA with a list of up to five suggested reviewers, and a list of up to three reviewers that should not be used. Suggested reviewers are most likely to be useful to NASA if they have minimal conflicts-of-interest with the missions under review during PMSR22.

In order to help NASA identify conflicted reviewers, each mission must provide NASA with a list of all science team members and their institutions at the level of Co-I and above, including those currently funded and those expected to be funded in the EM, before submission of the proposal (see Schedule).

7. Oral Presentation

Mission teams will make an oral presentation to the review panel. The presentation for each mission will be structured as follows:

- 15 minutes for EM proposal overview
- 5 minutes for updates since submission of the proposal
- 60 minutes to respond to panel's written questions
- 30 minutes for panel discussion (mission not present)
- 30 minutes for additional oral Q&A as needed

The review is not intended to provide a full oral presentation of the proposal contents. Presenters should assume the panel is familiar with the proposal, allowing the team and panel to focus on questions.

Each mission must supply NASA with a complete list of up to five presenters in advance of the presentation (see Schedule). No other team members may observe the presentation.

The role of the PE and PS at the panel will be limited to being present during panel discussions to answer programmatic questions posed by panelists.

8. Evaluation Criteria

Proposals will be evaluated based on factors related to both the proposed EM, and the performance of the mission and team in the previous cycle. These criteria are classified as Primary and Secondary; the Primary criteria each carry a greater weight in the overall evaluation than the Secondary criteria. The evaluation criteria to be used are as follows.

Primary Criteria

- Scientific merit of the proposed investigations to be undertaken during the EM.
- Responsiveness of the proposal to goals described in the Decadal Survey *Vision and Voyages for Planetary Science in the Decade 2013-2022* (2011).
 - Missions originally proposed before the 2011 Decadal Survey may optionally also refer to goals in *New Frontiers in the Solar System: An Integrated Exploration Strategy* (2003).
 - Missions which include substantial cross-divisional content, and identify goals from those divisions, may also be evaluated relative to those respective goals.
- Capability of the spacecraft to achieve proposed science.
- Merit of programmatic objectives.
 - The PMSR will evaluate separately the objectives of relevance to PSD, and those of relevance to other divisions or directorates at NASA, and may assign different weights to each.
- Scientific productivity of the mission team in the previous cycle.
- Performance in archiving data to the PDS in the previous cycle.

Secondary Criteria

- Extent to which the science community beyond the mission science team utilizes data and conducts published research.
- Scientific merit of observations to be taken and archived to the PDS, for future use by the scientific community.
- Science value.
 - The PMSR will not perform a detailed cost analysis of each proposal. However, the panels may assess in broad terms the science return of the mission relative to its overall cost. The panels may also assess the relative science return of descope options presented at different budget levels.

- Demonstrated capabilities, experience, and expertise of key personnel.
- Expected effectiveness of the proposed PDP in training future leaders.
- Thoroughness and appropriateness of the PDMP.

9. Review Findings

A *Final Report* of all reviewed missions will be written by the Review Chairs. The *Final Report* and individual mission evaluations will be delivered to the NASA PSD Director. The PSD Director will develop a response to the findings and notify in order:

- SMD Associate Administrator
- Individual missions
- Planetary Science Advisory Committee (PAC) chair
- The community, via a white paper on *NASA Response to the 2022 Planetary Mission Senior Review*.

For those missions that are selected for mission extensions, a plan and budget will be approved for the extended mission period, with preliminary direction for future years. The missions will be provided with a Letter of Direction containing decisions and directions. The mission's SME evaluation will be attached.

The *Final Report* will be posted publicly. The individual SME evaluations of each mission may be posted at the discretion of the Division Director. The final report and SME evaluation will be given to each mission in advance of their public posting.

If any missions are proposed for termination, a communication plan will be established with NASA leadership, the Office of Communications, the Office of Legislative Affairs, and other stakeholders.

All public documents, including the *Call for Proposals*, the *Final Report*, and the *NASA Response*, will be posted on the Lunar and Planetary Institute (LPI) website at <https://www.lpi.usra.edu/NASA-academies-resources/> .

10. Schedule

The following schedule is planned for the 2022 PMSR.

| | |
|---|---------------------|
| Draft Call for Proposals Issued to Missions | 8-Jun-2021 |
| Draft Call Comment Due | 25-Jun-2021 |
| Final Call Released | 9-Jul-2021 |
| Guideline Budgets to Missions | 9-Jul-2021 |
| List of Mission Team Members, Presenters, and Suggested and Non-suggested Reviewers Due to NASA (*) | 1-Sep-2021 |
| Proposals Due | 18-Jan-2022 |
| Questions to Missions (Panel Week 1) | 4-Feb-2022 |
| Questions to Missions (Panel Week 2) | 11-Feb-2022 |
| Panel Week 1: MAVEN / ODY / MSL / MRO | Week of 21-Feb-2022 |
| Panel Week 2: InSight / NH / OREx / LRO | Week of 28-Feb-2022 |
| Panel Findings due to NASA | 1-Apr-2022 |
| NASA Response and Direction to Missions | 15-Apr-2022 |

(*) To be submitted via email to PMSR Lead / Deputy Lead. List of presenters may be modified later with NASA concurrence.

11. Contact Information

For questions related to budget or planning, missions should contact their designated PS or PE at NASA HQ.

For questions related to the PMSR process or proposal format, please contact:

PMSR Lead Henry.Throop@nasa.gov
PMSR Deputy Lead Lindsay.Hays@nasa.gov

12. References

1. NASA Strategic Data Management Working Group. *Strategy for Data Management and Computing for Groundbreaking Science 2019-2024*. December 2019.
2. National Academy of Sciences. *New Frontiers in the Solar System: An Integrated Exploration Strategy*. 2003.
3. National Academy of Sciences. *Vision and Voyages for Planetary Science in the Decade 2013-2022*. March 2011.
4. NASA SMD. *Policy and Requirements for SMD Communications for Flight Missions*. SMD Policy Document SPD-26B. May 2020.
5. NASA SMD. *Science Information Policy for the Science Mission Directorate*. SMD Policy Document SPD-41. June 2021.

Appendix A. Templates

Table 1. Template for Mission Accomplishments

| # | Objective | Status | Comments |
|---|-----------|---|----------|
| 1 | | Completed; Not Completed; Expected to be Completed | |
| 2 | | | |
| 3 | | | |

This table should include Level 1 science objectives from the current mission cycle.

Table 2. Template for Science Traceability Matrix

| # | Decadal Survey Goal / Objective | Decadal Survey Question | EM Science Goal | EM Science Objective | Measurements | Instruments | Comments |
|---|---------------------------------|-------------------------|-----------------|----------------------|--------------|-------------|----------|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |

Change History

- **16-Dec-2021 Minor edits**
 - Appendix 5 wording revised to include some non-funded team members

- **9-Jul-2021 Final Call released**
 - Missions may propose budget overguides
 - PDMP section rewritten
 - New data must be delivered in PDS4 format
 - Removed requirement to archive software
 - Programmatic Relevance changed to a Primary evaluation criterion
 - InSight added
 - OREx extended mission plan and timeframe specified
 - Many other changes and clarifications in response to comments

- **8-Jun-2021 Draft Call released for comment**