

August 5, 2024

Astrophysics Division Senior Review 2025 -- Final Call for Proposals

To: MSFC/ S. O’Dell, Project Scientist, Chandra X-ray Observatory
CXC/ P. Slane, Director, Chandra X-ray Center
GSFC/ E. Hays, Project Scientist, Fermi Gamma-ray Space Telescope
GSFC/ J. Wiseman, Project Scientist, Hubble Space Telescope
AURA/ J. Lotz, Director, Space Telescope Science Institute
MSFC/ P. Kaaret, PI, IXPE
GSFC/ K. Gendreau, PI, NICER
JPL/ D. Stern, Project Scientist, NuSTAR
CIT/ F. Harrison, PI, NuSTAR
GSFC/ B. Cenko, PI, Neil Gehrels Swift Observatory
MIT/ G. Ricker, PI, TESS
GSFC/ A. Youngblood, Project Scientist, TESS
GSFC/ R. Burns, Project Manager, TESS
GSFC/ K. Weaver, US Project Scientist, XMM-Newton

From: NASA HQ/L. S. Sparke, Program Scientist, APD, SMD
NASA HQ/J. Letchworth, Program Executive, APD, SMD

Subject: Call for Proposals – 2025 Senior Review of Astrophysics Division Operating Missions

1. Senior Review background

NASA’s Science Mission Directorate (SMD) regularly conducts independent, comparative reviews of its operating missions. NASA uses the findings from these reviews to define an implementation strategy and give programmatic direction to the missions and projects concerned, for the next five fiscal years.

1.1 Governance

This review process is consistent with Section 304(a) of the NASA Authorization Act of 2005 (P.L. 109-155), and the NASA Transition Authorization Act of 2017 (P.L. 115-10), which modifies Section 51 U.S.C. §30504 to read:

(a) Assessments. —

(1) In general. —

The Administrator shall carry out triennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that exceed their planned missions’ lifetime.

(2) Considerations. —

In conducting an assessment under paragraph (1), the Administrator shall consider whether and how extending missions impacts the start of future missions.

(b) Consultation and Consideration of Potential Benefits of Instruments on Missions. —

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When deciding whether to extend a mission that has an operational component, the Administrator shall—

- (1) consult with any affected Federal agency; and
- (2) take into account the potential benefits of instruments on missions that are beyond their planned mission lifetime.

(c) Reports. —

The Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives, at the same time as the submission to Congress of the Administration’s annual budget request for each fiscal year, a report detailing any assessment under subsection (a) that was carried out during the previous year.

1.2 Purpose

The NASA Astrophysics Division (APD) will host its next Senior Review (SR) of operating missions in 2025. The Senior Review assesses proposals for funding to continue operations of missions in the extended operations phase. The purpose of the review is to assist NASA in maximizing the scientific productivity and operating efficiency of the Astrophysics Division mission portfolio within the available funding. NASA will use the findings from the Senior Review to:

- Provide programmatic direction to the missions and projects concerned for FY26, FY27 and FY28; and
- Issue initial funding guidelines for FY29 and FY30 (to be revisited in the 2028 Senior Review); and
- Understand where any funding that becomes available in excess of the in-guide budgets could most effectively be applied.

NASA actions resulting from this Senior Review could include maintaining the status quo; significantly restructuring the project; or terminating an ongoing science mission.

2. Process for the 2025 Senior Review

The process for the 2025 Senior Review will be similar to that of the 2022 Senior Review with one major exception. All missions will be reviewed by a single panel.

The following missions will be included in the 2025 Senior Review:

- Chandra X-ray Observatory (Chandra)
- Fermi Gamma-ray Space Telescope (Fermi)
- Hubble Space Telescope (Hubble)
- Imaging X-ray Polarimetry Explorer (IXPE)
- Nuclear Spectroscopic Telescope Array (NuSTAR)
- Neil Gehrels Swift Observatory (Swift)
- Transiting Exoplanet Survey Satellite (TESS)
- X-ray Multi-Mirror Mission-Newton (XMM-Newton)

Neutron Star Interior Composition Explorer (NICER) has been excluded from this Senior Review due to the recent mission and International Space Station (ISS) investments to repair

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damage to several sunshades of x-ray concentrators. The damage created light leak paths that reduced observation capabilities during daylight. The NICER Light Leak Repair (NICER-LLR) will be conducted during a planned Extra-Vehicular Activity from ISS in November 2024, returning it to nearly full capacity. NICER will be reviewed after a suitable period once its repaired characteristics are understood. Assuming a successful repair, NICER will be invited to the 2028 Senior Review.

Each mission under review may provide NASA with a list of up to five suggested reviewers, with 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 any mission under review.

2.1 Schedule

Draft Call for Proposals Issued	July 11, 2024
Preproposal Conference	July 25, 2024
Comments on draft call due to NASA	July 29, 2024
Final Call for Proposals Issued	August 5, 2024
Preproposal Material Delivery	August 12, 2024
Senior Review Proposals Due	December 12, 2024
Kick-Off Panel Meeting	Week of December 16, 2024
Panel Meetings	February 2025
Initial Outbrief to APD Director	NLT February 28, 2025
Senior Review Panel Report Delivered to NASA	NLT March 14, 2025
NASA Response and Letter of Direction for each mission	March 2025 ahead of PPBE
Publication of Senior Review Panel Report	March 2025

Preproposal material must be received by August 12, 2024, at 11:59 PM Eastern Time.

- The list of organizations that would be allotted mission funding under any of the proposed budget plans (Section 6.4), and any list of suggested reviewers, shall be delivered to the Program Executive through NASA encrypted email (preferred) or another encrypted channel by agreement with the Program Executive.

Proposals must be received by December 12, 2024, at 11:59 PM Eastern Time.

- The proposal, including all appendices except the budget, shall be submitted as a single file in machine-readable PDF format through the NSPIRES website.
- The mission budget shall be formatted as a single Excel workbook according to the Budget Template provided and shall be delivered to the Program Executive through NASA encrypted email (preferred) or another encrypted channel by agreement with the Program Executive.

2.2 Charge to the panel

The Senior Review panel will:

- Rate each mission on the three review criteria listed in Section 7,
- Rate the additional science return of the proposed mission overguide requests, and

- Assess risks (both hardware and operations) that may affect the mission’s ability to return science in the Senior Review period.

3. Scope of Senior Review proposals

Each mission that is invited to the Senior Review shall submit a proposal outlining how its science investigations will benefit the Astrophysics Division’s research objectives. The SMD Science Plan “SCIENCE 2020-2024: A Vision for Scientific Excellence” identifies three overarching questions for Astrophysics:

- How does the universe work?
- How did we get here?
- Are we alone?

These three questions form the basis of the three astrophysics science themes and map onto the 2020 Astrophysics Decadal Survey. Each project should demonstrate in the Senior Review, how its activities can contribute to the vision of the Astrophysics Division, the goals of the SMD Science Plan, and the priorities of the 2020 Astrophysics Decadal Survey.

3.1 Limitations on Scope

Consistent with the previous Senior Review, education, including science activation, is no longer a part of the operating missions’ budgets, and any education activities funded by SMD outside of the operating missions’ budgets should not be included in the proposal and will not be reviewed.

4. Mission extension paradigm

Under this call, the budgets for mission extensions beyond the prime mission lifetime (in NPR 7120.5 parlance, Prime Phase E) will support, at a lower funding level, activities required to maintain operations and continue to produce meaningful and significant science data, which is adequately described and accessible to the researcher. When a mission has completed its Prime Phase E, the NASA Astrophysics Division may accept higher operational risk, lower data collection efficiency, and instrument/mission degradation due to aging. Some instruments may be turned off, or run only in an unsupported mode, with no observing time devoted to calibration and no updates on the relevant data-processing and analysis software. The operations paradigm may change significantly – this may include accepting higher latency, or moving away from many small General Observer programs towards community-driven surveys for which data are immediately made public.

In an extended mission, priority is given to maintaining understanding of the instrument performance, to monitoring progress towards accomplishing the science objectives, and to building inclusive scientific environments that support a growing research community in making the best scientific use of NASA’s Astrophysics missions. It is assumed that, along with this reduced funding profile and greater risk, the cost to implement will be lower than that of Prime Phase E.

5. Instructions to proposers

5.1 *Prioritized mission objectives*

For this review, projects are required to submit plans containing a set of Prioritized Mission Objectives (PMOs) for FY26-FY28, with a possible extension to FY29-FY30. These PMOs should elucidate the scientific, technical, and/or budgetary priorities for the upcoming five-year planning cycle and allow the Senior Review Panel to make a comparative analysis of divergent mission needs and priorities for allocating available funding. That analysis will allow NASA flexibility in planning within a dynamic budgetary environment. The PMOs will also allow subsequent Senior Reviews to assess the success of each mission in achieving its stated goals and provide reporting inputs for the Agency.

For missions that are primarily driven by General Observer/General Investigator (GO/GI) investigations, the PMOs should focus on stewardship and efficiency. A project may opt to state as a PMO the expected science return of one or more current or future ‘key projects,’ and/or the expected science return from other discretionary allocations of observing time.

5.2 *Proposal Focus Areas*

Proposals should address the following focus areas with reference to the PMOs identified for FY2026-FY30:

1. The promise of future impact and productivity, based on the scientific merit of the project, its unique capabilities, and its relevance to the vision of the Astrophysics Division, the goals of the SMD Science Plan, and the priorities of the 2020 Astrophysics Decadal Survey. Missions with GO/GI programs should discuss the promise of those programs. Missions with multiple instruments should address the future impact and productivity of each one;
2. Mission achievements since the 2022 Senior Review, and impact of past scientific results as evidenced by publications and citations (and other means), showing how these demonstrate the potential for future progress;
3. Plans to create an inclusionary environment across the project, within project leadership and the project’s user community. Preparation for the future by succession planning, by providing training, mentoring and leadership opportunities to expand the skills of project staff, and by broadening the community of users and training a diverse community of astronomers to make effective use of space-based astrophysics data;
4. Broad accessibility, usability, and utility of the mission data, considered both as a unique mission, and in synergy with other missions in the Astrophysics portfolio, focusing on the cost efficiency, collection, archiving, and distribution of data, software, and publications;
5. Progress made toward achieving the PMOs identified in the 2022 Senior Review proposal (for missions that were subject to the 2022 Senior Review);
6. Level and quality of observatory stewardship (e.g., maximizing the scientific return while minimizing the costs and risks); and
7. Spacecraft / Platform and instrument health and safety. List mission risks and proposed mitigations. Projects should explain what degradation has occurred since FY22, and how that has affected the quality and quantity of science observations.

5.3. Required sections

The proposal shall contain the following sections: the content of each is discussed in Section 6 below.

- 1) Science and Implementation
- 2) Technical (including Health and Safety)
- 3) Management
- 4) Budget
- 5) Project Data Management
- 6) Appendices

The combined sections may be preceded by a single cover page, but otherwise should not exceed 30 pages (including figures, figure captions, tables, and other graphics), except for the proposals for Chandra and Hubble, which should not exceed 40 pages. Not included in the page limit are the appendices (see Section 6.6). Letters of endorsement are not needed for the Senior Review and should not be included.

All pages are to be formatted for 8.5 x 11-inch paper, single-spaced, with 0.75 inch margins using a minimum of 11 point Regular Arial font style (including for figure captions). Other standard machine-readable fonts may be used, provided that the number of characters per horizontal inch and the number of lines per vertical inch does not exceed that for single-spaced Regular Arial font. The pdf submission must consist only of printable text and figures, with no embedded animations, video, etc. The entire proposal, except budget spreadsheets, must be submitted electronically in PDF format; the budget must be submitted using the provided Excel format (which may be expanded upon as needed).

Should the home institution require signatures, please prepare these as a cover letter to the proposal. Copies of this submittal letter will not be used in the review but will be retained within the Astrophysics Division. Sufficient proposal identifiers including the project name and names of key writers or presenters shall be placed at the top of the first page.

5.3.2. Previous Senior Review proposals/reviews:

2022 Senior Review proposals will be made available to the panel. For Chandra and Hubble, proposals to the 2024 Operations Paradigm Change Review (OPCR) will be made available, and for IXPE, the Mission Success Progress Review proposal and findings. The 2025 Senior Review proposal may explicitly address sections in these earlier proposals, but the submitted 2025 proposal should remain a self-contained document.

5.3.3. Non-public documentation

Current and past review proposals, and material in the mission presentations to the panel, will be treated as confidential non-public material, and will be provided to the Senior Review panel under a non-disclosure arrangement.

6. Detailed proposal content

The following sections provide guidance for the material to be included in the proposal.

6.1. *Science and implementation section*

This section should describe how the proposed project operations during FY26 through FY28 will contribute to the state of knowledge of the discipline, and to achieving the recommendations of the 2020 Astrophysics Decadal Survey, including those for the state of the profession. Projects should address the following: As your mission ages, what are the most important legacy science observations yet to be taken? This section should describe how the project maintains an inclusive scientific environment, as well as training a diverse community of astronomers to make effective use of the mission data. This section should cover items 1-5 of the focus areas listed in Section 5.2.

6.1.1 *Additional requirements for Chandra and Hubble*

Proposals for the Chandra and Hubble missions must observe the constraints from Section 6.4.3.1 of the 2024 OPCR Call for Proposals.

6.2. *Technical section*

The section should begin with a discussion of the overall technical status of the components of the mission. This description should include the spacecraft or platform, instruments, and ground system including the spacecraft or platform control center and science center(s). The discussion should summarize the health of the components and point out limitations arising from degradation, aging, use of consumables, limited life items, obsolescence, etc., explaining how changes since FY22 have affected the quality or quantity of science data. This section should also describe limitations based on reliance on other infrastructure that is undergoing significant changes, such as the Space Communications infrastructure. This Section should address project risks and proposed mitigations.

Any external technical support to Instrument Teams or other groups should be described and justified in detail. Projects are also instructed to show, in an appropriate summary manner, the anticipated ‘in kind’ support from NASA-funded sources other than the project’s in-guide budget. These ‘in kind’ sources include use of high-end computational facilities, tracking support from the NASA tracking networks, and support from the multi-mission infrastructure projects at AFRC, ARC, GSFC, MSFC, JPL, and elsewhere. Representations of direct or in-kind technical support from international partners, from other US Government agencies, or non-Government institutions should be provided separately, for informational purposes. This section should cover item 7 of the focus areas listed in Sec 5.2.

6.3. *Management section*

This section should address the suitability of the mission’s operating model (e.g., governance, science team, instrument team(s)) to meet the proposed scientific goals, along with any plans to further improve the efficiency of science and mission operations over the next three to five years. This section should include contributions to achieving any relevant recommendations of the 2020 Astrophysics Decadal Survey, including those on the state of the profession, and to developing a more inclusive environment, as noted in the SMD Science Plan. Proposals should provide a

narrative self-assessment of the level and quality of observatory stewardship and discuss the project's plans to prepare for the future by providing leadership and development opportunities to expand the skills of project staff. Where a Principal Investigator or other key personnel plan to resign during the period FY26-FY28, this section may include a succession plan nominating a candidate successor or replacement. This section should cover items 3 and 6 of the focus areas listed in Sec 5.2.

6.4. Budget section

The budget narrative should begin with a list of organizations that would be allotted mission funding under any of the proposed budget plans. This information is required to check whether potential panelists might have financial conflicts of interest.

Labor, major equipment, and other expenses for the project budget must be explained in sufficient detail to determine the merit and incremental cost of each proposed task. Labor costs should be explicitly sub-categorized as Civil Servant or Contractor. The proposed cost must represent the entire value of the project expenditures. Missions are asked to separate the costs of obtaining, validating, calibrating, and archiving data from costs of completing scientific investigations with the data obtained.

Each project should provide a plan for at least the first and second of the following three budget scenarios: in-guide, under-guide, and over-guide missions.

6.4.1 An “in-guide” plan (required)

Projects must present a plan for a budget consistent with the funding levels set in the budget guidelines that will be provided separately to each project.

6.4.2 An “under-guide” plan (required)

Projects must present a unique under-guide plan and budget that would allow for continued operations at a level below their in-guide budgets. The under-guide plan should identify a minimum budget amount together with what the mission considers to be the best science return available for that cost. The under-guide plan may include significant changes to the operations paradigm – for example, reducing GO observing time in favor of community-driven surveys for which data is immediately made public, or operating some instruments in an unsupported mode. **By identifying such a minimum acceptable funding level, the project is indicating that any further reduction is untenable, and that the project should be terminated rather than be funded at a level lower than the under-guide level.** The description of this plan should address the reduced scope, the difference in science return, and the added risk (technical, spacecraft health and safety, etc.), compared to the in-guide plan.

6.4.3 An “over-guide mission” plan (optional)

Projects may present an over-guide plan(s) and budget if the proposed in-guide budget poses a significant risk to the continued operations of the mission. The proposed over-guide budget should be included with full cognizance of the very tight fiscal constraints that NASA faces. In other words, this over-guide request should be a carefully considered request with appropriate justification, and not a maximal request. For each over-guide scenario proposed, the budget

section should explicitly detail the use of the additional requested funds. The description of this scenario should address the risks posed by following the in-guide budget, how those risks are mitigated in the over-guide plan, and the added scope and science return compared to the in-guide scenario.

The added return should be clearly connected to the additional budget required (over the in-guide amount) so that the reviewers can evaluate none, some, or all of the added return, and estimate the budget required for partially funding any added scope.

For each of the “under-guide” and “over-guide” mission scenarios proposed, the project is required to indicate changes to the Prioritized Mission Objectives (PMOs).

6.4.4 Additional budget requirements

The website for this Call for Proposals provides the mandatory budget summary form with instructions and definitions. The budget spreadsheet provides tables for instrument team budgets; each proposal may include additional details in a format determined by each project.

Projects are required to submit a budget spreadsheet for each of the “in-guide,” “under-guide,” and “over-guide” mission scenarios they propose, for the period under consideration in this Senior Review. The budget should be itemized, as required in the spreadsheet, and described and justified in full detail in the technical/management/budget section.

6.5. Project Data Management

Each project should provide a project data management plan as part of the proposal, explaining how the project is making scientifically useful data, software, publications, and other information produced by the project accessible. The 2021 Science Information Policy for the Science Mission Directorate (SPD-41; 2021) provides details on requirements and best practices for archiving mission information.

SMD policies require scientific data to be findable, accessible, interoperable, and reusable (FAIR). Projects are encouraged, but not required to, submit plans to further enhance the accessibility of the information being produced by the projects. These plans should be included in the over-guide section of the budget.

6.6. Required appendices

The following appendices are required and do not count against the proposal page limit, but the first 3 items are limited to 30 pages in total.

- References.
- A full designated list of all acronyms used in proposal.
- An online bibliography of recent publications with their number of refereed citations. The proposal should contain the URL to this bibliography. The Astrophysics Division recommends that the bibliography should be listed in sequence with the most recent refereed publications first. The bibliography should contain, as a minimum, the most recent (two to three years) papers, although it may list all papers for the lifetime of the mission. It is not required to list papers to American Astronomical Society (AAS)

meetings, conferences, workshops, PhD theses, etc. If needed, these should be listed separately from the listing of the refereed papers.

- Standard budget(s) in the mandatory excel-spreadsheet format, using the template available through the website for this Call for Proposals.

7. Review criteria

All proposals will be assessed against the following criteria:

Criterion A: scientific merit (50% weighting)

Factor A-1: Expected scientific output and science productivity over the requested funding period, given the costs.

Factor A-2: Quality of collection, archiving, distribution, and usability of the mission data and science analysis software.

Criterion B: relevance and responsiveness to objectives of the Astrophysics Division (25% weighting)

Factor B-1: Relevance to research objectives and focus areas described in the SMD Science Plan and the 2020 Astrophysics Decadal Survey.

Factor B-2: Relevance to NASA's core value of Inclusion, and alignment to SMD Science Plan Strategy 4.1. Specifically, the quality of plans for building and maintaining an inclusive environment within the project team and the project user community.

Factor B-3: For missions that were included in the 2022 Senior Review, progress toward achieving PMOs in the 2022 Senior Review proposal and towards addressing any findings from that Review.

Criterion C: technical capability and management (25% weighting)

Factor C-1: Overall operating cost and cost efficiency of the mission's operating model for proposed scientific goals.

Factor C-2: Health of the spacecraft and instruments, and suitability of the mission's operating model (e.g., governance, science team, instrument team, inclusion, etc.) to maximize its scientific return.

For each of the three criteria above, the following scale will be used to map the number and significance of the strengths and weaknesses to an adjectival description as below. Half-step grades may be used (e.g., Excellent/Very Good).

Adjectival rating	Basis
Excellent	A thorough and compelling proposal of exceptional merit with respect to the criterion under review, as documented by numerous or significant strengths and with no major weaknesses.
Very Good	A competent proposal of high merit with respect to the criterion under review, whose strengths fully out-balance any weaknesses and none of those weaknesses constitute fatal flaws.
Good	A competent proposal that represents a credible response with respect to the criterion under review, whose strengths and weaknesses essentially balance each other.
Fair	A proposal that provides a nominal response to with respect to the criterion under review, and whose weaknesses outweigh any strengths.
Poor	A seriously flawed proposal having one or more major weaknesses that constitute fatal flaws.

8. Panel meetings and timing

The review panel will meet by teleconference and in-person in the DC area; each mission will be invited to give a presentation via teleconference.

After the submission of proposals, the Senior Review panelists may have further questions or requests for clarification. NASA will moderate these questions and requests and expects to send them to the proposing teams at least one week before the mission’s videoconference presentation.

Each mission will be allotted time for a videoconference presentation to the panel. To minimize the burden on projects while allowing for adequate expertise and support to be present, no more than five people may represent any one of the projects. These individuals must be direct representatives of the project itself, and not external affiliates. Others may attend but may not speak.

The project presentations should include any significant updates, such as significant science results obtained since proposal submission; but the main purpose is to provide a forum for questions from panelists and answers from the projects.

Each mission will be allotted 90 minutes for an oral presentation to the panel, except that the Chandra and Hubble teams will be allotted 120 minutes. During each presentation, the project representatives should plan on using no more than half of the allocated time for their prepared presentation, reserving half for questions and answers.

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The panel will produce a first draft of its report before the end of its final meeting and give the APD Director a “snapshot briefing” at the end of that meeting. The panel may then take an additional two weeks to finalize and submit the reports to the APD Director.

9. NASA response

The NASA APD Director will develop a response to the Report of the Senior Review Panel. NASA HQ will ensure that key officials in participating international space agencies or other U.S. government agencies that are partners in a proposing mission are contacted and apprised of NASA’s decisions resulting from the Senior Review.

The APD Director will notify the following parties in sequence:

1. SMD Associate Administrator
2. Individual missions
3. The public, via the Panel Report and the NASA Response published on the website linked below.

A Letter of Direction will provide each mission with their individual direction (including continuation/termination decision) before the public report is posted.

Each of the projects will then submit back to NASA HQ their plan for complying with the new guidance and instructions.

10. Further Information

10.1 2025 Senior Review website, to contain strategic/policy documents and other inputs

- Excel workbook template for budget submission
- SCIENCE 2020-2024: A Vision for Scientific Excellence (the SMD Science Plan)
- 2020 Astrophysics Decadal Survey
- 2021 Science Information Policy for the Science Mission Directorate (SPD-41)

10.2 Points of Contact

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