Hubble and Chandra Operating Paradigm Change Review

1. Background

The NASA Astrophysics Division (APD) hosts two of the agency's longest lived science missions, the Hubble Space Telescope (HST), launched in 1990, and the Chandra X-ray Observatory (CXO), launched in 1999. The APD seeks to explore new operational paradigms for both missions that would result in significantly reduced costs from previous levels while continuing to enable useful science investigations.

2. Purpose

The APD will host an Operations Paradigm Change Review (OPCR) of the CXO and HST missions in 2024. The OPCR will assess proposed options for approaches to continue operations of missions in the extended operations phase, with reduced funding, as proposed in the FY2025 President's Budget. The purpose of the review is to assist NASA in assessing the potential for useful scientific productivity and operating efficiency of the HST and CXO missions under the current and future budget realities. NASA will use the findings from the OPCR to:

- Define an implementation approach consistent with astrophysics strategic objectives,
- Prioritize the operating model(s),
- Provide programmatic direction to the missions and projects concerned for FY25, FY26 and FY27; and
- Issue initial funding guidelines for FY28 (possibly to be revisited in the 2025 Senior Review).

NASA actions resulting from the OPCR could include authorizing a mission to; maintain the status quo; restructure the project; or terminate an ongoing science mission.

3. Request for Options

This Call describes the objectives and process for the review and contains instructions for the submission of options and presentations (virtual) to the review panel.

Any questions should be directed to:

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3.1 Scope of OPCR Options

Each mission invited to the OPCR shall submit a package providing no more than 4 options outlining how its science investigations will continue to benefit the Astrophysics Division's research objectives.

These objectives and focus areas are described in the SCIENCE 2020-2024: A Vision for Scientific Excellence (the SMD Science Plan) and the 2020 Astrophysics Decadal Survey. As described in this Request for Options, the three review criteria are: (1) technical capability, management and science productivity given the costs (2) relevance and responsiveness to the Astrophysics Division's strategic goals, and (3) achievable science merit. Detailed instructions for the package are provided in the following Sections 4 though 6 below.

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) may support, at a lower funding level, activities required to operate and produce meaningful science data, which is adequately described and accessible to the researcher. The NASA Astrophysics Division will accept suboptimal mission conditions, such as higher operational risk, lower data collection efficiency, instrument/mission operations reductions and reduced grant funding. Priority is given to maintaining understanding of the observatory performance and monitoring progress towards accomplishing the possibly reduced science objectives, while maintaining an inclusive scientific environment. NASA HQ authorizes the reduction or elimination of General Observer grant funding for either mission as a component of proposed options.

The reduced funding profile is lower than that of prior Phase E extended operations years. Options can include sources of other funding to accomplish extended mission science (e.g., the NASA Astrophysics Data Analysis Program). It should be noted that the APD sponsors several competitive programs that support basic research, theory, and data analysis.

5. Schedule for the 2024 OPCR (TBR)

Review Activities	Date
Request for Options issued	March 20, 2024
Packages due	April 19, 2024
Panel meeting (week of)	May 6, 2024
Panel report delivered to NASA	May 17, 2024

6. Instructions to Missions

6.1 Options Preparation Instructions

There are three overarching Astrophysics questions identified in the SCIENCE 2020-2024: A Vision for Scientific Excellence (the SMD Science Plan):

- 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 within the Astrophysics portfolio was chosen for its ability to shed insight into these areas. Each mission should demonstrate in the OPCR Panel, therefore, how its rescoped operations 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.

6.2 Options Focus Areas

Options chart packages need to discuss the project's potential for advancing NASA's science objectives during the FY25 to FY28 timeframe employing methods and ways that may differ from prior operational scenarios. The package should address, for each option proposed, the following focus areas for the next five-year planning cycle:

1. Scientific merit of the changed scope of the project, its unique capabilities and relevance to the vision of the Astrophysics Division, the goals of the SMD Science Plan, and the priorities of the 2020 Astrophysics Decadal Survey under the reduced capabilities proposed.
2. The future impact and productivity of the proposed operational scenarios (due to uniqueness of capabilities, wavelength coverage, etc.).
3. Any impacts to the broad accessibility, usability, and utility of the information, 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.
4. Level and quality of observatory stewardship and what reductions, if any, arise in each option (e.g., maximizing the scientific return while minimizing the costs);
5. Spacecraft/Platform and instrument health and safety. List mission risks, especially those that mark departures from historical mission risk postures, and potential mitigations.

6.3 Options Budget Constraint

Consistent with the 2022 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 will not be reviewed as part of the OPCR.

6.4. Required Sections

The Options chart package shall contain the following sections for up to four proposed scenarios of reduced capability operations:

- Science and Implementation (Section 6.2 areas 1-3)
- Technical (including Health and Safety) (Section 6.2 areas 4 and 5)
- Management (including contractual implications, if any, in the proposed options) (Section 6.2 area 4 and 5)
- Budget allocations within the project and consistent with guidelines

The Combined sections should not exceed 80 pages (including figures, figure captions, tables, and other graphics). Explanatory text may be added to the PowerPoint presentation in the Notes section of a slide. Letters of endorsement are not needed for the OPCR and should not be included.

All pages are to be formatted as PowerPoint charts with fonts no smaller than 14 pt (figure captions excepted). The entire package, except budget spreadsheets, must be submitted electronically in PowerPoint 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 package. Copies of this submittal letter will not be used in the review but will be retained within the Astrophysics Division.

6.4.1 Previous Senior Review Proposals/Reviews

The 2022 Senior Review proposals and review committee reports will be made available to the panel.

6.4.2 Non-Public Documentation

Any non-public documents will be provided to the review panel under a non-disclosure arrangement.

6.4.3 Instructions for the Options Section

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

6.4.3.1. Science and Implementation Section

This section should focus on how the reduced science objectives will contribute to the state of knowledge of the discipline, their relevance to the research objectives and focus areas. This section should describe the focus areas noted in Section 6.2. A brief one- or two-page summary of science highlights from the past year may be included.

All HST project options for changing operations paradigms shall retain the NASA Hubble Fellowship Program at current yearly cohort levels and shall continue to support the ability for the science staff at the Space Telescope Science Institute to conduct independent research.

All CXO project options shall exclude any funding strictly for continuing Guaranteed Time Observer science research. NASA recognizes some guaranteed time holders also perform functional duties for the CXO and this funding is necessary for the operation of the facility. Additionally, the CXO shall continue to support the ability for the science staff at the Chandra X-ray Center to conduct independent research.

6.4.3.2. Technical Section

The section should begin with a summary of the overall technical status of the components of the mission. This 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 because of degradation, aging, use of consumables, obsolescence, etc. This section should outline any increased risks to the observatory hardware in the proposed operating scenarios.

6.4.3.3. Management Section

This section should address the changes of the mission's operating model (e.g., governance, science team, instrument team(s)) to meet the reduced budgets and proposed scientific goals, as well as contributions to achieving any relevant recommendations of the 2020 Astrophysics Decadal Survey, including the state of the profession as applicable.

6.4.3.4. Budget Section

This section should discuss the proposed budgets. Labor, major equipment, and other expenses for the in-guideline budget must be listed 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, including project expenditure, expenses paid by the Center, tracking networks (DSN, TDRSS, etc.) and tail circuits.

Projects must present at least one option with a budget consistent with the funding levels set in the President's Budget released March 2024. This option must propose an in-guide plan, which follows the NASA Astrophysics budget guideline for the period under review. If an option is provided for mission close out this option should include a budget for the orderly ending of mission operations.

6.5 Submission Deadline

The packages will be uploaded electronically in PowerPoint format to the NASA Box website (https://nasagov.box.com/s/7ulgv5t5njobovhvvszkngd5ra28untq) and must be received by April 19, 2024, at 11:59 PM EST.

6.6 Further Information Required for the Review Panel Deliberations

After the submission of Packages, members of the Review panel may have further questions or requests for clarification. NASA will moderate these questions and requests and expects to send them to the teams at least one week before the start of the review panel meeting.

7. Panel Instructions

7.1 Review Criteria

All packages will be assessed against the following criteria:

Criterion A: Scientific Merit (50% weighting)

Factor A-1: Strength of the proposed changed scientific scope and impact of the mission for each option.

Factor A-2: Expected scientific output and science productivity of the option given the costs over the requested funding period.

Factor A-3: Quality of information collection, archiving, distribution, and usability of the option.

Criterion B: Relevance and Responsiveness (10% weighting)

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

Factor B-2: Identification of the impacts to the agency's goal of increasing diversity of thought that might arise for the option and quality of any plans to mitigate those impacts.

Criterion C: Technical Capability, Management and Science Productivity Given the Costs (40% weighting)

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

Factor C-2: Risks for the spacecraft and instruments, and suitability of the mission’s new operating model(s) (e.g., governance, science team, instrument team, inclusion, diversity of thought and backgrounds represented) to maximize its scientific return for each option. [Note:

notional plans for external contributions are not part of the evaluation criteria.]

The following scale from NASA's usual proposal reviews will be used to map the number and significance of the strengths and weaknesses to an adjectival description for each of the three criteria above:

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

7.2 Panel Charge

Use the above criteria to individually assess each project option over the period (FY25, FY26 and FY27) and the extended period (FY28) as described in Section 7.1.

Prepare a report with findings, which will be used by the Astrophysics Division to assist in its preparation of an implementation strategy for the Astrophysics portfolio of operating missions for FY25 through FY28.

8. The Review Panel Agenda

Each mission will be allotted 180 minutes for an oral presentation to the panel. During each presentation, the project representatives should plan on using two hours of the allocated time for their prepared presentation and reserving 60 minutes for questions and answers. To minimize the burden on projects, while also 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. The project presentations should accomplish several objectives, in decreasing priority order:

- To provide a forum for questions from panelists and answers from the projects.
- To provide any significant updates, e.g., science results obtained since proposal submission.
- To re-emphasize the highlights of the proposals, bearing in mind that the proposals have been read in detail by all panelists.

The Review Panel will meet for three days (not necessarily contiguous) and follow this agenda:

Day 1: Instructions, program background, logistics (writing assignments, etc.), and a discussion of conflicts of interest and the procedures to minimize their impacts. Begin assessments of mission packages.

Day 2: Project presentations, plus questions and answers;

Day 3: Complete project presentations (if needed). Continue assessments and write draft report;

8.1. Panel Deliverables

The panel is required to produce an outline of its report before the end of the meeting. The panel may then take an additional two weeks to finalize and submit its report to the Astrophysics Division.