

National Aeronautics and Space Administration

Headquarters

Washington, DC 20546-0001



July 17, 2019

Reply to Attn of: SMD/ Director, Astrophysics Division

SUBJECT: NASA Response to the 2019 Astrophysics Senior Review of Operating Missions

Background

The NASA Science Mission Directorate (SMD) conducts comparative reviews of operating missions within each division to maximize the scientific return from these missions within finite resources. The Senior Review, held every three years, assists NASA in maximizing the scientific productivity from its operating missions within a constrained budget. This 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.* —

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.

These reviews of operating missions are NASA's highest form of peer review, as the subject is not a single science investigation, or even a single space mission, but rather a

portfolio of operating missions. The reviews of operating missions are referred to as Senior Reviews, in recognition of the high level of the peer review.

NASA uses the findings from the Senior Review to:

- Prioritize the operating missions and projects;
- Define an implementation approach to achieve astrophysics strategic objectives;
- Provide programmatic direction to the missions and projects concerned for FY20, FY21 and FY22; and
- Issue initial funding guidelines for FY23 and FY24 (to be revisited in the 2022 Senior Review).

Missions in the 2019 Astrophysics Senior Review for Astrophysics include strategic missions, Principal Investigator-led Explorers missions, and foreign-led missions in which the U.S. is a minor partner (the NASA Senior Review assesses only U.S. funding for foreign-led missions). The 2019 Astrophysics Senior Review included the following astrophysics missions (in alphabetical order):

- Chandra X-ray Observatory (Chandra);
- Fermi Gamma-ray Space Telescope (Fermi);
- Hubble Space Telescope (Hubble);
- Neil Gehrels Swift Observatory (Swift);
- Neutron Star Interior Composition Explorer (NICER);
- Nuclear Spectroscopic Telescope Array (NuSTAR);
- Transiting Exoplanet Survey Satellite (TESS); and
- X-ray Multi-Mirror Mission-Newton (XMM-Newton) (ESA mission).

The Stratospheric Observatory for Infrared Astronomy (SOFIA) airborne observatory was omitted from the 2019 Astrophysics Senior Review per Congress's request.

The 2019 Astrophysics Senior Review adopted a multi-level review structure, in which three panels (one for Chandra, one for Hubble, and one for the remaining missions) report to a Senior Review Subcommittee, which has been established as a subordinate group to the Astrophysics Advisory Committee, consistent with the Charter of the Astrophysics Advisory Committee and compliant with the Federal Advisory Committee Act (FACA) of 1972 (P.L. 92-463). The Report of the 2019 Senior Review Subcommittee, along with supporting documentation from the review, may be accessed at <https://science.nasa.gov/astrophysics/2019-senior-review-operating-missions/>.

NASA Response

The report of the Senior Review Subcommittee emphasizes that the eight missions in the Senior Review “constitute a portfolio of extraordinary power,” and noted that “the complementary nature of these missions makes the overall capability of the portfolio more than the sum of its parts.” The Subcommittee also found that the missions “present an appropriate balance between the broadly capable Great Observatories and the smaller scale

missions that have unique capabilities in particular domains.” The report of the Senior Review Subcommittee contains recommendations that NASA continue to operate and support all eight of these missions.

NASA used the prioritized rankings and individual recommendations of the 2019 Senior Review report to make the following decisions for each of the missions in the Senior Review. The missions are presented in alphabetical order.

Summary of NASA decisions

- Chandra X-ray Observatory: extension is approved.
- Fermi Gamma-ray Space Telescope: extension is approved.
- Hubble Space Telescope: extension is approved.
- Neutron Star Interior Composition Explorer: first extension beyond prime mission is approved.
- Nuclear Spectroscopic Telescope Array: extension is approved.
- Neil Gehrels Swift Observatory: extension is approved.
- Transiting Exoplanet Survey Satellite: first extension beyond prime mission is approved.
- X-ray Multi-Mirror Mission-Newton (XMM-Newton) (ESA mission): extension is approved.

For all missions, the extension is for FY20-FY22. Although planning guidance and budgets are provided for FY23 and beyond, as part of NASA’s annual budget formulation process, decisions on extensions beyond FY22 will be informed by the 2022 Senior Review.

These decisions are contingent on the Astrophysics Division receiving the funding requested in the FY 2020 President's Budget Request. Additionally, some adjustments will need to be made within the Astrophysics Division budget to accommodate all operating missions.

Detailed NASA decisions for each mission

Chandra X-ray Observatory

The Chandra mission is directed to plan against a slightly augmented budget in order to (a) increase grant support to the U.S. astronomical community, and (b) maintain operational effectiveness that is becoming compromised by inflationary erosion. The Chandra mission will be invited to the 2022 Astrophysics Senior Review.

Fermi Gamma-ray Space Telescope

The Fermi mission extension is approved with the reduced funding that was proposed by the Project. The Fermi mission will be invited to the 2022 Astrophysics Senior Review.

Hubble Space Telescope

The Hubble mission is directed to continue planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget

formulation process. The Hubble mission will be invited to the 2022 Astrophysics Senior Review.

Neil Gehrels Swift Observatory

The Senior Review report recommends funding for increased automation. The Swift mission extension is approved, and is directed to plan against a slightly augmented budget to increase automation for Targets of Opportunity and UV light curve generation. The Swift mission will be invited to the 2022 Astrophysics Senior Review.

Neutron Star Interior Composition Explorer (NICER)

The Senior Review report noted that a funded Guest Observer program is its highest priority for additional funding. NICER is authorized to pass from its prime mission into an extended mission. NICER is directed to continue its funded Guest Observer program and to enhance its response to Targets of Opportunity. The NICER mission will be invited to the 2022 Astrophysics Senior Review.

Nuclear Spectroscopic Telescope Array (NuSTAR)

The NuSTAR mission extension is approved, and the mission is directed to phase out the legacy science program by the end of FY20 and instead allocate that funding to Guest Observer grants for the U.S. astronomical community. The NuSTAR mission will be invited to the 2022 Astrophysics Senior Review.

Transiting Exoplanet Survey Satellite (TESS)

The Senior Review report noted that a funded Guest Observer program is a high priority for additional funding. TESS is authorized to pass from its prime mission into an extended mission, with a slight budget augmentation to enhance support of the U.S. astronomical community through its Guest Observer program. The TESS mission will be invited to the 2022 Astrophysics Senior Review.

X-ray Multi-Mirror Mission-Newton (XMM-Newton) (ESA mission)

Although the Senior Review report discusses increased funding for the Guest Observer program, it deems this increased funding to be less important than other potential budget augmentations for operating missions. The XMM-Newton mission extension is approved with no changes to its budget. The XMM-Newton mission will be invited to the 2022 Astrophysics Senior Review.



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