STScI | SPACE TELESCOPE SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

HST Senior Review Preparations

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STUC meeting, Nov. 6, 2017

The Purpose of NASA's Senior Review

Congressionally mandated

- Independent, comparative reviews of operating missions to maximize the scientific return from these missions within finite resources
- NASA uses the findings from the Senior Review to define an implementation strategy and give programmatic direction to the missions and projects concerned through the next four fiscal years.

This established practice was codified in the NASA Authorization Act of 2005 (Public Law 109-155), Section 304(a): "The Administrator shall carry out biennial 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 have exceeded their planned mission life time."

from NASA response to 2016 Senior Review for Astrophysics Operating Missions

HST in the Senior Review

History

- 2012 was first Senior Review for Hubble
  - 9 missions (incl. HST) reviewed in full panel
  - Info and panel report: https://science.nasa.gov/astrophysics/2012-Senior-Review-Operating-Missions/
- 2014
  - Separate panel each for HST, Chandra; full review
  - Info and panel report: https://science.nasa.gov/astrophysics/2014-Senior-Review-Operating-Missions/
- 2016
  - Separate panel each for HST, Chandra; “Delta” review
  - Info and panel report: https://science.nasa.gov/astrophysics/2016-Senior-Review-Operating-Missions

HST in the Senior Review

Report covers a broad range of topics related to scientific results, use of resources

- Scientific results
- Scientific productivity
- Observatory operations
- Science operations
- Budget & staffing

The important scientific return of HST, along with good stewardship of resources in both mission operations and science operations, have been called out in all three of the Senior Reviews in which Hubble has participated.

HST in the Senior Review

From NASA's response to the 2016 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 2018 Astrophysics Senior Review. Current planning is that the 2018 Senior Review for Hubble will be another incremental review, not a full review.

Next Senior Review

Changed to 3 year cadence; next review expected 2019

EXTENDING SCIENCE

NASA's Space Science Mission Extensions and the Senior Review Process

Committee on NASA Science Mission Extensions

Space Studies Board

Division on Engineering and Physical Sciences

A Report of

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

Recommendation: NASA should conduct full Senior Reviews of science missions in extended operations on a 3-year cadence. This will require a change in authorizing language, and NASA should request such a change from Congress. The Earth Science Division conducts annual technical reviews. The other divisions should assess their current technical evaluation processes, which may already be sufficient, in order to ensure that the divisions are fully aware of the projected health of their spacecraft, while keeping these technical reviews moderate in scope and focused on changes since the preceding review. (Chapter 3)

One Hundred Fifteenth Congress of the United States of America

AT THE FIRST SESSION

Begun and held at the City of Washington on Tuesday, the third day of January, two thousand and seventeen

An Act

To authorize the programs of the National Aeronautics and Space Administration, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SEC. 513. ASSESSMENT OF SCIENCE MISSION EXTENSIONS.

Section 30504 of title 51, United States Code, is amended to read as follows:

"§ 30504. Assessment of science mission extensions

"(a) ASSESSMENTS.—

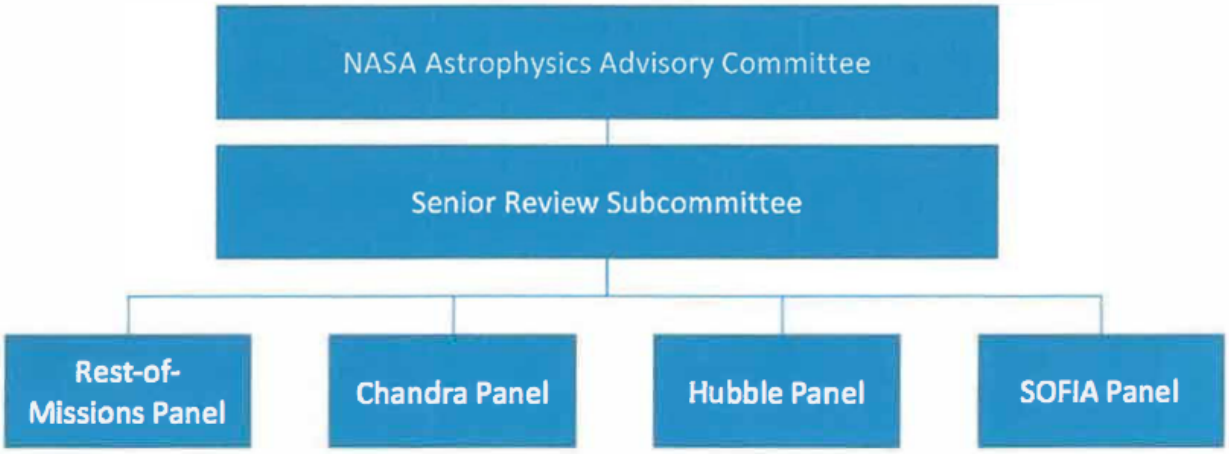
"(1) IN GENERAL.—The Administrator shall carry out triennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that exceed their planned missions' lifetime.

Next Senior Review

Changed to 3 year cadence; next review in 2019

Unclear about whether next review will be a full or delta review

New reporting format



Next Senior Review

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Timeline expected:

- Request for Proposals from HQ spring/summer 2018
- HST-P & STScI work on proposal fall 2018
- Red team review Nov./Dec. 2018
- Proposal due Jan. 2019
- Site visit Feb-March-April 2019
- Report comes out June-ish

Next Senior Review: STUC input

2016 Hubble panel recommended developing higher level prioritized mission objectives to more fully represent the scope of science available to the user community

We would like to involve members of the STUC in this, as representatives of the user community

- Review prioritized mission objectives
- STUC chair member of red team review

Prioritized Mission Objectives

Each review has required description of Prioritized Mission Objectives

- Broken up into science objectives (2014, 2016 shown here) and technical mission objectives (2014 shown here)

Table 4.1: Technical Mission Objectives

1) Keep Hubble's instruments and subsystems healthy and safe so that great science can continue out to 2020 or beyond.
2) Mitigate known instrument or system degradation in a manner consistent with maximizing science.
3) Identify and, if practical, implement operational efficiencies that reduce costs without compromising science, or enable new science within the current cost profile.

Table 1.3: High-priority Mission Science Objectives

2014 Prioritized Mission Science Objectives and Number		2016 Prioritized Mission Objectives	Hubble Strategic Objectives: UV Initiative	Hubble Strategic Objectives: JWST Prep Science	NASA Objectives: NASA SMD Science Plan	NASA Objectives: New Worlds, New Horizons	Proposal Section
	2016 Status: First Results	New Community-driven Objectives					
2.1 Measure Hubble Constant (H_0) to 1% precision	Published (2016)	Map galaxy formation at the cosmic dawn and high noon (2.3, 2.4)*		✔	A2	1	2.1
2.2 Characterize SN Ia evolution at $z > 1.5$ to constrain dark energy equation of state	Published (2014)	Map star formation and gas in the Milky Way and nearby galaxies (2.6, 2.9)*	✔	✔	A2	1	2.2
2.3 Map cluster dark matter and observe structure in high-redshift galaxies	Published (2014)	Explore the diversity of exoplanet atmospheres and their host stars (2.7)*	✔	✔	A3	2	2.3
2.4 Measure cosmic variance and galaxy evolution at high redshift	Published (2016)	Watch the dynamical and chemical evolution of the outer planets and their satellites (2.8)*	✔		A2 A3	2	2.4
2.5 Detect isolated, stellar-mass black holes	Initial results	New Community-enabling Objectives					
2.6 Map the star-formation history of M31	Published (2014)	Extend master catalog of sources observed by Hubble (2.10)*			A1 A2	3	2.5
2.7 Measure water vapor in exoplanet atmospheres	Published (2014)	Enhance spectroscopic science return of Hubble archives (2.10)*	✔		A1, A2	2	
2.8 Explore the solar system and find new constituents	Published (2014)	Create full-depth mosaics on all fields imaged by Hubble (2.10)*			A1, A2	2 3	
2.9 Explore circumgalactic and intergalactic environments	Published (2014)	Enable new archive queries through target-oriented access (2.10)*	✔		A1 A2	3	
2.10 Create a Hubble Source Catalog	Version 1 released	Expand science through mission support and joint programs (2.1–2.9)*	✔	✔	All	All	2.6

** Follows on from the numbered 2014 High-priority Mission Objectives.*

Chandra SR2014 Prioritized Mission Objectives

PMO1 Continue Chandra's scientific excellence and impact in accord with the top level NASA goals

PMO2 Engage the science community by providing complete, well-calibrated science data products and analysis tools and by making Chandra data and documentation available worldwide

PMO3 Ensure the health and safety of the Observatory through continuous monitoring, use of proven procedures by highly trained staff, carefully considered and tested responses to anomalies, and proactive planning to increase operational efficiency and anticipate problem.

Finding of panel: "The PMOs were somewhat generically defined and not specific to Chandra; in future reviews, the inclusion of PMOs written with specific metrics to measure success could serve as a useful tool for strategic planning of the Observatory.

Potential New Prioritized Mission Objectives

PMO1	Keep Hubble's instruments and subsystems healthy and safe so that great science can continue out to 2020 and beyond (*2025?*)
PMO2	Mitigate known instrument or system degradation in a manner consistent with maximizing science
PMO3	Identify and if practical, implement operational efficiencies that reduce costs without compromising science, or enable new science within the current cost profile. (*balance operational efficiencies and scientific excellence within the current cost profile?*)
PMO4	Maximize the unique UV scientific capabilities of Hubble
PMO5	Enable pathfinding science for JWST by utilizing Hubble's unique resources
PMO6	Support high-profile community-driven science as established through peer scientific review
PMO7	Enhance scientific discoveries through improved archive interfaces and experiences


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