

# Astrophysics



## First Response to Midterm Assessment

NAC Astrophysics Subcommittee

October 3, 2016

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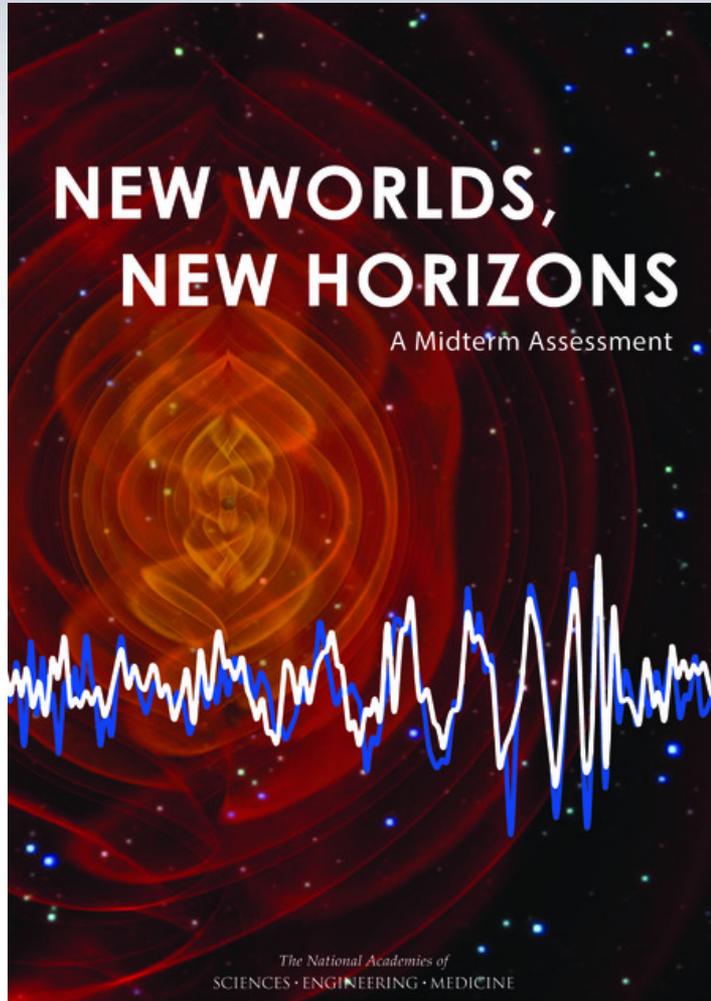
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This presentation will be posted at  
[http://science.nasa.gov/science-committee/subcommittees/  
nac-astrophysics-subcommittee/](http://science.nasa.gov/science-committee/subcommittees/nac-astrophysics-subcommittee/)

# Midterm Assessment Report



Released August 15, 2016



- NASA recognizes and appreciates the excellent job that was done by the Committee for the Review of Progress Toward the Decadal Survey Vision in New Worlds, New Horizons in Astronomy and Astrophysics
  - It is clear that the Committee understood the NASA issues and the planned NASA program.
  - In all cases where the Committee states a finding, a recommendation, or just an opinion, the Committee clearly articulates its rationale and references.
  - This is a very clear report, and the Committee's meaning is unambiguous.
- It will take NASA a while to formulate a complete response to the Report, and it will take NASA an entire budget cycle to make any substantive changes in our program.

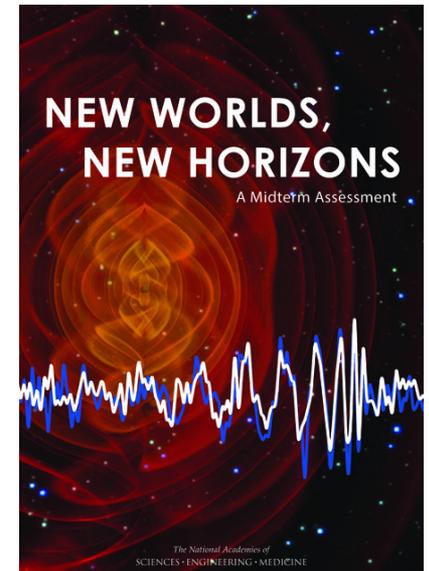
<http://www.nap.edu/download/23560>

# Midterm Assessment Report – Program Balance

- “Despite a challenging budget environment, NASA-APD has maintained a balanced portfolio through the first half of the decade and, with the assumption of successful completion of an ambitious Explorer schedule, will do so during the second half of the decade as well. This stability, however, has been preceded by a decline in individual investigator funding during the last part of the previous decade.” (Finding 4-14)

## NASA Initial Response:

- Agreed.



# Midterm Assessment Report – WFIRST



- “At the currently estimated cost, NASA’s decision to add a coronagraph to ... WFIRST is justifiable within the scientific goals of NWNH. The broader societal interest in the possibility of life beyond Earth is also compelling. However, an increase in cost much beyond the currently estimated \$350 million would significantly distort the science priorities set forth by NWNH.” (Finding 4-4)
- “Prior to KDP-B, NASA should commission an independent technical, management, and cost assessment of WFIRST, including a quantitative assessment of the incremental cost of the coronagraph. If the mission cost estimate exceeds the point at which executing the mission would compromise the scientific priorities and the balanced astrophysics program recommended by [NWNH], then NASA should descope the mission to restore the scientific priorities and program balance by reducing the mission cost.” (Recommendation 4-1)

## NASA Initial Response:

- NASA plans to conduct an independent TMC assessment of WFIRST prior to KDP-B.
- NASA will manage WFIRST and the overall astrophysics portfolio to maintain program balance.

# Midterm Assessment Report – Euclid



- “NASA’s investment in Euclid ... is a significant augmentation of the dark energy science program budget beyond the level envisioned by NWNH and by the [NRC Euclid Report].” (Finding 4-7)
- “In the remainder of the decade, NASA should treat support of Euclid participation beyond the existing commitments to ESA as lower priority than support of the Explorer program, gravity wave technology development, and X-ray technology development.” (Recommendation 4-2)

## NASA Initial Response:

- NASA will treat growth in Euclid elements beyond hardware (US science center, support for US science team) as lower priority.
- NASA will discuss with the CAA whether this means that no funded Euclid GO program can be initiated for the US community.

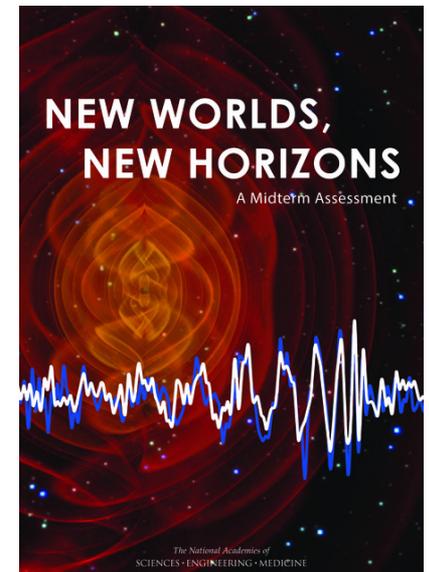
# Midterm Assessment Report – Explorers



- “NASA’s Astrophysics Division should execute its current plan, as presented to the committee, of at least four Explorer Announcements of Opportunity during the 2012-2021 decade, each with a Mission of Opportunity call, and each followed by mission selection.”  
(Recommendation 4-3)

## NASA Initial Response:

- Agreed.



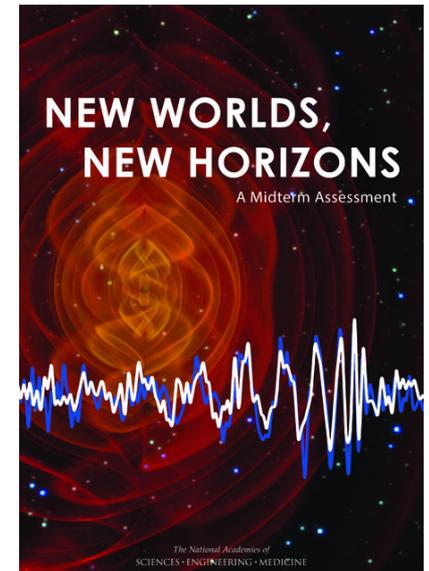
# Midterm Assessment Report – Athena



- “NASA should proceed with its current plan to participate in Athena, with primary contributions directed toward enhancing the scientific capabilities of the mission.” (Recommendation 4-5)

## NASA Initial Response:

- Agreed.



# Midterm Assessment Report – LIS



- “Results of the LPF mission have demonstrated the feasibility of many of the key technologies needed to carry out a space gravitational wave mission, and ESA has selected a gravitational wave theme for the L3 large mission opportunity. These developments address two of the main conditions identified in NWNH for U.S. participation in a gravitational wave mission.” (Finding 4-10)
- “The current planned decadal investment in NWNH-recommended [exoplanet] technology development and precursor science exceeds the level envisioned in NWNH.” (Finding 4-11)
- “The committee believes that NASA’s continued development of coronagraph and starshade technology at a modest level for mission design, scope, and capability is a positive step and that this activity would be profitably evaluated by the next decadal survey. However, given the substantial advances already enabled by WFIRST coronagraph development, the committee assigns higher priority to supporting adequate gravitational wave technology development than to further exoplanet technology development beyond WFIRST.” (Page 4-18)

# Midterm Assessment Report – LISA



- “NASA should restore support this decade for gravitational wave research that enables the U.S. community to be a strong technical and scientific partner in the ESA-led L3 mission, consistent with LISA’s high priority in NWNH. One goal of U.S. participation should be the restoration of the full scientific capability of the mission as envisioned by NWNH.” (Recommendation 4-4)

## NASA Initial Response:

- NASA has begun discussions with ESA about a larger role for the U.S. in the L3 mission. ESA is open to a larger role for the U.S., subject to their established constraints on international partnerships (international contributions limited to 20%, all international contributions require a European backup).
- NASA has begun discussions within the Administration on committing to a larger role for the U.S. in the L3 mission. Any changes in out-year planning are subject to the limitations of the out-year planning budget, i.e., no new money.
- NASA is reviewing options for L3-relevant technology investments through the SAT and other programs.
- NASA is reviewing options for reduced funding of exoplanet technology development beyond the WFIRST coronagraph.

# Midterm Assessment Report – New Worlds Technology



- “The current planned decadal investment in NWNH-recommended technology development and precursor science exceeds the level envisioned in NWNH.” (Finding 4-11)
- “NASA’s support of an Extreme Precision Doppler Spectrograph capability helps address a key need identified in NWNH for exoplanet science and precursor investigations in advance of a large exoplanet mission.” (Page 4-17)
- “The committee believes that NASA’s continued development of coronagraph and starshade technology at a modest level for mission design, scope, and capability is a positive step and that this activity would be profitably evaluated by the next decadal survey. However, given the substantial advances already enabled by WFIRST coronagraph development, the committee assigns higher priority to supporting adequate gravitational wave technology development than to further exoplanet technology development beyond WFIRST.” (Page 4-18)

## NASA Initial Response:

- NASA is reviewing options for reduced funding of exoplanet technology development beyond the WFIRST coronagraph.

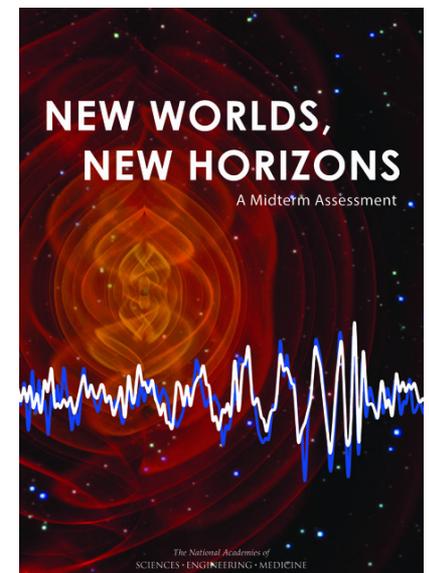
# Midterm Assessment Report – Inflation Probe Technology



- “The Inflation Probe Technology Development program is well aligned with the recommendations of NWNH, with NASA, NSF, and DOE supporting technology development and precursor science. Third-generation ground-based efforts and a suborbital program are taking place, targeting CMB B-mode polarization. The proposed CMB-S4 program would push the limits of what can be achieved from the ground and advance understanding of the technology and science requirements for a possible future space mission.” (Finding 4-12)

## NASA Initial Response:

- Agreed.



# Midterm Assessment Report – Small Activities



- “NASA’s implementation of NWNH’s recommended small-scale activities has been mixed. Some recommended augmentations have not occurred and there have been cuts in some programs recommended for augmentation. Other programs, in particular the suborbital and exoplanet areas, have seen increases in excess of what was recommended by NWNH.” (Finding 4-13)
  - The committee could not identify funding for non-exoplanet UV/O technical developments as recommended for a future ultraviolet space telescope. [p.4-20]
  - The \$2 million per year augmentation of laboratory astrophysics augmentation has not occurred, and funding in this area is flat or slightly down. [p.4-20]
  - The current NASA contribution [to TCAN] is \$1.5 million per year, while the recommended level was \$5 million per year. [p.4-20]
  - This drop of 26 percent [in GO programs] in inflation-adjusted dollars has had a major impact on the support of the community and is likely a major contributor to a sharp drop in proposal success. [p.4-21]
  - A constant level of funding in the ADAP program has not kept pace with the growth in the volume of archival data available. [p.4-21]
  - NASA has used the SAT program to support technology development directed at future strategic missions. Specific initiatives have focused on exoplanet, CMB, gravitational wave, and X-ray science, in addition to optics and detector development. Total funding over the first half of the decade has exceeded \$64 million. ...Funding for Suborbital program has also been well supported. [p.4-21]

NASA Initial Response: Increases in R&A have not been targeted.

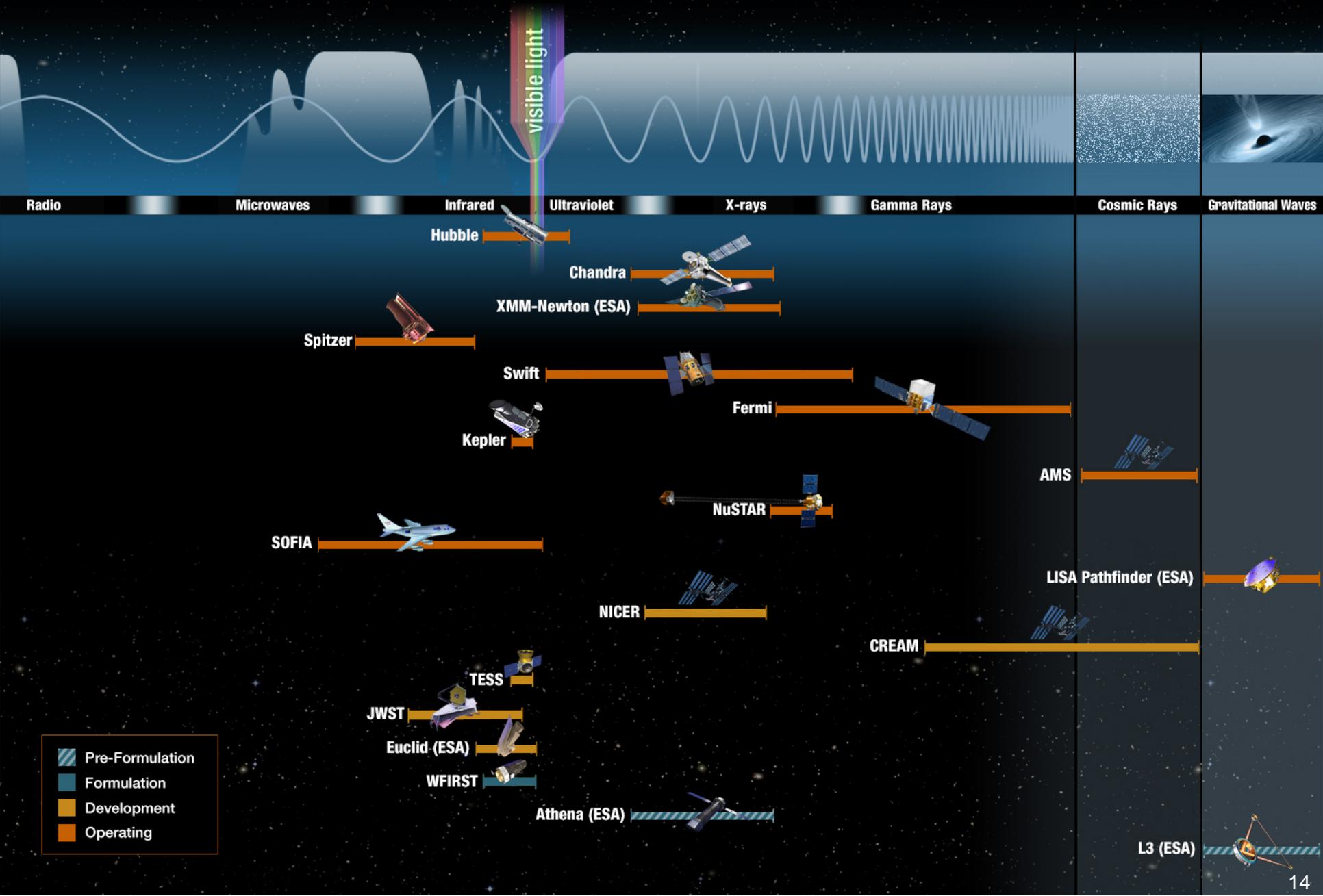
# Responding to the 2010 Decadal Survey

## Responding to the Midterm Assessment



Prioritized Recommendation	NASA plans (partial list)
<b>LARGE ACTIVITIES</b>	
WFIRST	In Phase A, launch in mid-2020s
Explorers	Executing 4 AOs per decade
LISA	Partnering on ESA's space-based gravitational wave observatory; <b>increased contribution</b>
IXO	Partnering on ESA's Athena x-ray observatory
<b>MEDIUM ACTIVITIES</b>	
Exoplanet technology	WFIRST coronagraph, <b>reductions being considered for</b> starshade and coronagraph technology development <b>beyond WFIRST</b>
Inflation Probe technology	3 balloon-borne technology experiments
<b>SMALL ACTIVITIES</b>	
R&A augmentations	R&A up 20% since FY10
Mid-TRL technology	Initiated Strategic Astrophysics Technology program; <b>focused on identified missions</b>
Suborbital missions	Initiated super pressure balloon capability

# Astrophysics Mission Portfolio 2016



-  Pre-Formulation
-  Formulation
-  Development
-  Operating