

Office of Inspector General

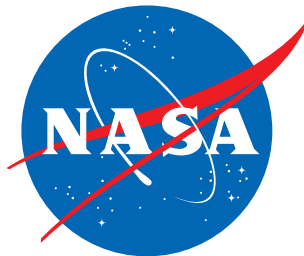


NASA's Role in the Decadal Survey Process



October 19, 2026

IG-27-001



Office of Inspector General

To report fraud, waste, abuse, or mismanagement, contact the [NASA OIG Hotline](#) or call at 800-424-9183 or 800-535-8134 (TDD). You can also write to NASA Inspector General, P.O. Box 23089, L'Enfant Plaza Station, Washington, DC 20026. The identity of each writer and caller can be kept confidential, upon request, to the extent permitted by law.

To suggest ideas or request future audits, contact the [NASA OIG Office of Audits](#).

NOTICE:

Pursuant to PL 117-263, section 5274, non-governmental organizations and business entities identified in this report have the opportunity to submit a written response for the purpose of clarifying or providing additional context to any specific reference. Comments must be submitted to HQ-Section5274Submissions@nasa.gov within 30 days of the report issuance date and we request that comments not exceed 2 pages. The comments will be appended by link to this report and posted on our public website.

We request that submissions be Section 508 compliant and free from any proprietary or otherwise sensitive information.

RESULTS IN BRIEF

NASA's Role in the Decadal Survey Process



October 19, 2026

IG-27-001 (A-25-07-00-SARD)

WHY WE PERFORMED THIS AUDIT

NASA enlists the National Academies of Sciences, Engineering, and Medicine (NASEM) in conjunction with the science community to help identify and prioritize leading-edge scientific questions and the observations required to answer them. One of the principal means by which NASA's Science Mission Directorate (SMD) engages NASEM and the science community in this task is through the decadal surveys. NASA contracts with NASEM to perform decadal surveys and provide recommendations identified by representatives of the scientific community on key issues in Earth and space science research for the Agency to consider over the subsequent decade. For the latest decadal survey cycle, SMD spent about \$16 million on task orders for the Astrophysics, Biological and Physical Sciences, Earth Science, Heliophysics, and Planetary Science divisions' decadal surveys covering the time period 2017 to 2033.

Congress also views the decadal surveys as critical and has directed NASA to contract with NASEM to conduct these surveys and use the survey recommendations to support the Agency's priorities. NASA and Congress have historically supported the top priority recommendations of decadal surveys. Although NASA sponsors the development of these surveys, the process is independent of Agency management and allows the priorities and recommendations to be determined by scientific community consensus under the NASEM decadal survey process.

In this audit we examined whether NASA exercises the appropriate input and oversight of its efforts related to NASEM's decadal survey process and outcomes. Specifically, we evaluated NASA's role in the decadal survey process, assessed whether the Agency exercises due diligence over NASEM's process, and analyzed NASA's overall costs and value associated with decadal surveys. We performed work at NASA Headquarters and interviewed and gathered data from managers and staff of SMD and each of its five divisions. We also interviewed and gathered data from NASEM leadership and staff as well as other personnel within the scientific community.

WHAT WE FOUND

Congress, NASEM, and NASA deeply value the decadal surveys. For over six decades, NASA has leveraged the decadal surveys to gain independent, consensus-driven scientific assessments and recommendations. However, NASA's approach to managing the decadal survey process has generally been hands-off in practice and by design, mostly out of concern for preserving the independence of the subsequent recommendations. This design and approach have resulted in limited pathways for communication between NASA and NASEM, which then results in unaddressed concerns across the SMD divisions. Specifically, concerns mostly related to rigid requirements and NASEM's fixed execution of its decadal survey process that often takes 2 years to complete. In particular, NASA receives limited information or interim progress updates prior to the Agency receiving a prepublication version of the report—that can be over 700 pages in length—with often fewer than 10 days to read and review it prior to publication. Division officials consistently reported concerns with inflexible processes, unrealistic budget expectations, and unactionable recommendations. For example, one SMD division received 4 recommendations in their 2010s survey compared to 26 recommendations in their 2020s survey. In addition to a greater number, the division received more complex and multifaceted recommendations requiring a greater amount of analysis to respond to and implement while operating with a similar staff and budget.

We also determined that NASA is missing opportunities for more tailored, realistic, and actionable decadal surveys. Inadequately negotiated statements of task did not contain performance metrics, and the lack of lessons learned limited

NASA's ability to clearly communicate what it wants to NASEM. This lack of adequate communication contributed to unaddressed cross-division concerns and to surprising and unrealistic recommendations. For example, in the latest Biological and Physical Sciences decadal survey, NASEM provided recommendations for two research campaigns that require \$100 million to \$400 million each per year for 10 years. The cost for just one of these campaigns for one year exceeds the division's entire annual budget, which was \$85 million for fiscal year 2023. According to an SMD official, the division was surprised by these recommendations and ultimately opted to tackle these campaigns "piecemeal." These misalignments can have protracted impacts, such as damaging NASA's reputation, creating unfair expectations, and harming the outlook for projects.

Further, NASA does not track the progress SMD divisions have made with implementing decadal survey recommendations, particularly in such a way that provides timely information for decision-makers or improvements of future NASEM recommendations. SMD division officials gave various explanations for not tracking recommendation implementation. Multiple division officials identified the decadal survey midterm assessment conducted by NASEM as the primary method for tracking and monitoring implementation of recommendations. However, NASEM officials stated they do not view themselves as accountability managers, and we believe waiting 5 years to review recommendation status limits NASA's ability to assess and respond more agilely to technological developments or changes.

The Agency is also not fully accounting for costs associated with the decadal survey process, including mission concept study expenditures and the time spent working on decadal survey tasks. NASA funds mission concept studies performed by the science community to help refine mission designs, assess technical readiness, and identify potential risks. SMD was able to provide cost data for 28 mission concept studies from the Astrophysics, Heliophysics, and Planetary Science divisions with a total cost of approximately \$76 million during their last decadal survey cycle—nearly 5 times the approximately \$16 million spent on the task orders to conduct the last five division decadal surveys. While mission concept studies are clearly important to the decadal survey process, understanding these costs is equally critical for SMD to determine whether it is effectively utilizing resources in a constrained budget environment.

Lastly, despite a long history and increasing SMD divisional participation, NASA does not have consistent internal processes for supporting the development and management of decadal surveys. SMD lacks the formal guidance, routine lessons learned, and sufficient resources needed to standardize common processes and share best practices across the directorate. Without consistent and adequate internal processes, NASA is not effectively sharing best practices, preserving institutional knowledge, or creating more streamlined and efficient processes across SMD.

WHAT WE RECOMMENDED

To improve NASA's role and oversight of its efforts related to NASEM's decadal survey process, we recommended the Associate Administrator for Science Mission Directorate (1) ensure all decadal survey task orders and statements of task include performance metrics and deliverables for progress, (2) coordinate with NASEM to identify a means to provide interim reports and potential recommendations during development of the decadal survey, (3) coordinate with NASEM to identify ways to streamline decadal survey development and the report timeline, (4) coordinate with NASEM to develop a plan and conduct routine formal lessons learned, (5) account for mission concept study costs and any other SMD division costs associated with the decadal survey process, (6) track and make available to SMD division personnel that work closely with NASEM the status of decadal survey recommendations, (7) develop SMD-wide guidance to prepare for and respond to NASEM decadal surveys, and (8) develop a formalized plan to internally capture knowledge and establish formal routine lessons learned activities following the completion of each decadal survey.

We provided a draft of this report to NASA management who concurred with our recommendations and described planned actions to address them. We consider management's comments responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions.

**For more information on the NASA
Office of Inspector General and to
view this and other reports visit
<https://oig.nasa.gov/>.**

TABLE OF CONTENTS

Introduction.....	1
Background	2
The Design of the Decadal Survey Process and NASA’s Approach Limits Opportunities for Communication and Engagement	8
While Decadal Surveys Are Valued, SMD Divisions Identify Significant Process Concerns and Rigid Requirements.....	8
External Constraints and Bilateral Practices Create Limited Pathways for Communication Between NASA and NASEM	11
NASA Is Missing Opportunities for More Tailored, Realistic, and Actionable Decadal Surveys	14
NASA Is Not Comprehensively Capturing Progress, Costs, and Resources Required for the Decadal Survey Process	16
Majority of Decadal Survey Recommendations Are Not Tracked	16
SMD Not Fully Accounting for Mission Concept Study Costs Associated with Decadal Surveys	18
SMD Does Not Track Staff Resources Used to Prepare for and Respond to Decadal Surveys	19
NASA Lacks Consistent and Adequate Internal Processes for Supporting Decadal Survey Development.....	21
NASA Lacks Consistent and Adequate Internal Processes to Prepare for and Respond to Decadal Surveys	21
Lack of Guidance, Lessons Learned, and Resources Prevent SMD from Standardizing Processes and Sharing Best Practices.....	22
Conclusion	25
Recommendations, Management’s Response, and Our Evaluation	26
Appendix A: Scope and Methodology	28
Appendix B: National Academies Decadal Survey Recommendations	30
Appendix C: Management’s Comments.....	35
Appendix D: Report Distribution	39

Acronyms

BLISS	Bioregenerative Life Support Systems
FACA	Federal Advisory Committee Act
IDIQ	indefinite-delivery, indefinite-quantity
JWST	James Webb Space Telescope
MATRICES	Manufacturing Materials and Processes for Sustainability in Space
NASEM	National Academies of Sciences, Engineering, and Medicine
OIG	Office of Inspector General
SMD	Science Mission Directorate
TRACE	Technical Risk and Cost Evaluation
WBS	Work Breakdown Structure

INTRODUCTION

NASA enlists the National Academies of Sciences, Engineering, and Medicine (NASEM) in conjunction with the science community to help identify and prioritize leading-edge scientific questions and the observations required to answer them.¹ One of the principal means by which NASA's Science Mission Directorate (SMD) engages NASEM and the science community in this task is through the decadal surveys. Decadal surveys provide a scientific consensus on key questions posed by NASA and other federal agencies. NASA contracts with NASEM to perform decadal surveys and provide recommendations identified by representatives of the scientific community on key issues in Earth and space science research for the Agency to consider over the subsequent decade, including when planning future missions.

Congress also views the decadal surveys as critical and has directed NASA to contract with NASEM to conduct these surveys and use the survey recommendations to support the Agency's priorities through its authorization acts in 2008 and 2022, respectively.² Most recently, the proposed NASA Reauthorization Act of 2026 directs the Agency to contract with NASEM to conduct a survey specifically for aeronautics research and development.³ NASA and Congress have historically supported the top priority recommendations of decadal surveys. Although NASA sponsors the development of these surveys, the process is independent of Agency management and allows the priorities and recommendations to be determined by scientific community consensus under the NASEM decadal survey process.

The decadal surveys clearly influence the shaping of NASA's future endeavors. Based on decadal survey report recommendations that NASEM provides, NASA has invested billions of dollars on missions, such as the Nancy Grace Roman Space Telescope and Mars Sample Return.⁴ This audit examines whether NASA exercises the appropriate input and oversight of its efforts related to NASEM's decadal survey process and outcomes. See Appendix A for details of the audit's scope and methodology.

¹ NASEM are private, nonprofit institutions that provide independent, objective analysis and advice to solve complex problems and inform public policy decisions related to science, technology, and medicine. While the NASEM name for the broader organization did not start until 2015, for the purposes of this report, we are using NASEM to refer to all iterations of the organization.

² National Aeronautics and Space Administration Authorization Act of 2008, Pub. L. No. 110-422 (2008), and CHIPS and Science Act of 2022, Title VII National Aeronautics and Space Administration Authorization Act, Pub. L. No. 117-167 (2022).

³ The NASA Reauthorization Act of 2026 was passed by the House Science, Space, and Technology Committee and is awaiting a floor vote with the full House.

⁴ The Nancy Grace Roman Space Telescope, launched in 2026, is an observatory that will have the capability to block starlight and directly see distant planets outside of our solar system. The Mars Sample Return campaign involves multiple missions to collect samples from Mars and return them to Earth in the early 2030s. However, in 2025, NASA released its fiscal year 2026 budget request that proposed canceling the mission.

Background

NASA and NASEM share a long-standing relationship dating back to 1958 when NASEM established the Space Science Board, later renamed the Space Studies Board in 1989.⁵ In 1964, NASEM published *Ground-Based Astronomy: A Ten-Year Program*, a report that became known as the first decadal survey for NASA's Astrophysics Division. This report only covered ground-based astronomy and was more limited in scope and content than recent NASEM reports. NASEM has produced an astrophysics decadal survey roughly every 10 years since that time, with the first formal decadal survey published in 2001.⁶

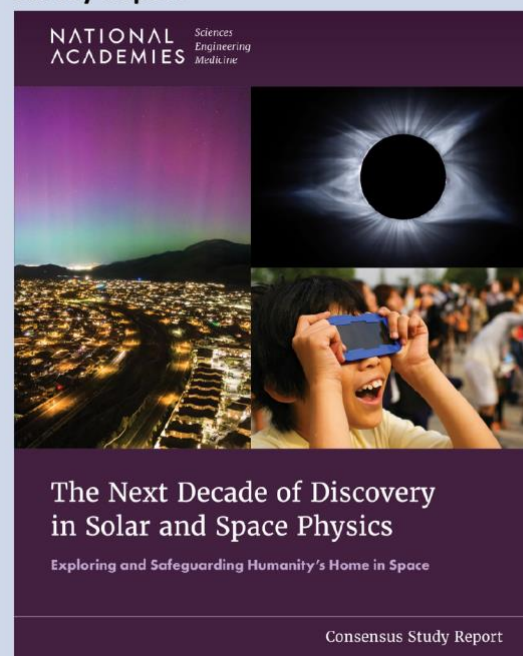
In 2005, Congress mandated that NASEM review and assess NASA's science programs at 5-year intervals.⁷ In 2008, Congress directed NASA to request NASEM to conduct periodic independent assessments, known as decadal surveys, of its science programs.⁸ Congress required these surveys to include recommended priorities for research and programmatic areas as well as independent cost and technical readiness assessments for recommendations whenever possible. The 5-year reviews became known as decadal survey midterm assessments.

Due to the scientific and technical overlap between the scope of responsibility for NASA and other government agencies in scientific research, the Agency often works with partners, such as the National Science Foundation and National Oceanic and Atmospheric Administration, to sponsor the decadal surveys. Such partnerships help ensure coordination and collaboration across the government to advance scientific and technical fields.

According to SMD officials, decadal surveys provide detailed insights into how best to set strategic priorities and mission directives for the next decade across key scientific disciplines that align with SMD's Astrophysics, Biological and Physical Sciences, Earth Science, Heliophysics, and Planetary Science divisions. These surveys play a crucial role in shaping NASA's future science objectives, reflecting a broad consensus within the scientific community on the most pressing and promising areas of research.

Along with the priorities identified by science community experts, the survey reports may include recommendations for specific missions along with a suggested mission timeline and the estimated cost to achieve the mission. Table 1 lists examples of NASEM-recommended missions in recent decadal surveys.

Cover of the 2024 Heliophysics Decadal Survey Report



Source: NASEM.

⁵ The Space Science Board was established in 1958 to lead space research interests and responsibilities for NASEM.

⁶ National Research Council, *Astronomy and Astrophysics in the New Millennium* (2001). The National Research Council was the research arm of the National Academy of Sciences, and in 2015, the institution became the National Academies of Sciences, Engineering, and Medicine.

⁷ The National Aeronautics and Space Administration Authorization Act of 2005, Pub. L. No. 109-155 (2005).

⁸ Pub. L. No. 110-422.

Table 1: Examples of Missions or Observables NASA Developed Based on Decadal Survey Recommendations by NASEM

Decadal Survey Science Focus	Decadal Survey Period	Resulting NASA Missions or Observables
Astrophysics		
Pathways to Discovery in Astronomy and Astrophysics for the 2020s	2023-2032	Habitable Worlds Observatory
New Worlds, New Horizons in Astronomy and Astrophysics	2012-2021	Nancy Grace Roman Space Telescope
Biological and Physical Sciences		
Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research	2023-2032	Commercially Enabled Rapid Space Science
Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era	2011-2021	Rodent Research Facility on the International Space Station
Earth Science		
Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space	2017-2027	Earth System Observatory suite
Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond	2007-2016	Soil Moisture Active Passive
Heliophysics		
The Next Decade of Discovery in Solar and Space Physics: Exploring and Safeguarding Humanity's Home in Space	2024-2033	Solar Polar Orbiter
Solar and Space Physics: A Science for a Technological Society	2013-2022	Geospace Dynamics Constellation
Planetary Science		
Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology	2023-2032	Mars Sample Return
Vision and Voyages for Planetary Science in the Decade 2013-2022	2013-2022	Europa Orbiter

Source: NASEM.

NASA's Internal Decadal Survey Process

NASA contracts with NASEM for a wide range of activities, including the decadal surveys, using an umbrella indefinite-delivery, indefinite-quantity (IDIQ) contract, which has a maximum value of \$32 million.⁹ Each SMD division decadal survey is conducted as an individual task order under this umbrella IDIQ contract.¹⁰ For the last decadal survey cycle, the cost of the survey varied by SMD division

⁹ Federal Acquisition Regulation, Title 48 of the Code of Federal Regulations, defines an IDIQ contract as one that "provides for an indefinite quantity, within stated limits, of supplies or services during a fixed period. The Government places orders for individual requirements."

¹⁰ Individual task orders are official requests under an existing contract for specific services. Individual task orders may include a statement of task, which provides additional information detailing the scope of work.

and ranged between \$2.4 million and \$3.6 million.¹¹ See Table 2 for a breakout of contract costs per division for their most recent survey.¹²

Table 2: NASEM Contract Costs for Most Recent SMD Decadal Surveys

SMD Division	Publication Date	Decadal Survey Title	Contract Cost
Astrophysics	11/4/2021	Pathways to Discovery in Astronomy and Astrophysics for the 2020s	\$2,473,105
Biological and Physical Sciences	9/12/2023	Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research	\$3,490,008
Earth Science	1/5/2018	Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space	\$3,581,178
Heliophysics	12/5/2024	The Next Decade of Discovery in Solar and Space Physics: Exploring and Safeguarding Humanity’s Home in Space	\$3,240,000
Planetary Science	4/19/2022	Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology	\$3,243,344
Total Cost			\$16,027,635

Source: NASA Office of Inspector General (OIG) presentation of Agency data.

Along with the contract task order, each SMD division prepares a separate statement of task for their specific decadal survey task order, which can take up to a year to prepare and must be negotiated with NASEM and any additional sponsoring agencies. Statements of task are brief, typically 1 or 2 pages of requested scientific areas of focus and may include a performance period. After completing these negotiations, NASA’s role decreases as NASEM proceeds with its independent process, such as selecting the decadal survey committee members from the scientific community who will lead the assessment and development of recommendations.¹³

In addition, SMD provides “kickoff” presentations to decadal survey committee members. These kickoff presentations offer high-level division background information and considerations for use during the decadal survey process. Kickoff presentations are informational only and are not contractually binding. Following the kickoff presentations, SMD is minimally involved with the decadal survey process, only responding to technical, document, or data requests from NASEM, until the final report is received—typically about 24 months later. Shortly before publication, SMD receives a courtesy notice and prepublication copy of the report. Following the release of the report, SMD reviews recommendations; determines concurrence, partial concurrence, or nonconcurrence with the recommendations; and integrates recommendations into division strategic plans. In the last cycle of decadal surveys, NASA

¹¹ For the purposes of this report, we focused on the most recent cycle of decadal surveys, which includes *Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space* (2017-2027), *Pathways to Discovery in Astronomy and Astrophysics for the 2020s* (2023-2032), *Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research* (2023-2032), *Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology* (2023-2032), and *The Next Decade of Discovery in Solar and Space Physics: Exploring and Safeguarding Humanity’s Home in Space* (2024-2033).

¹² For the purposes of this report, we only reviewed the costs of the most recent decadal survey for each division. The last cycle of surveys provided strategic plans, spanning roughly the 2020s to 2030s, for five SMD divisions.

¹³ The decadal survey committee is responsible for the overall conduct of the decadal study, aggregating and adjudicating the recommendations of various thematic panels, and drafting a report of its top-level conclusions and recommendations.

received 160 recommendations. See Appendix B for a sample list of recommendations by SMD division.¹⁴

Mission Concept Studies

NASA funds mission concept studies performed by the science community to help refine mission designs, assess technical readiness, and identify potential risks. Some of these studies are used by NASA and NASEM during the decadal survey process to explore the viability of proposed missions. According to an SMD official, a mission concept study provides a point design for the mission that allows low-fidelity cost and schedule estimates to be performed. The intent of this process is to ensure that only the most scientifically valuable, technically feasible, and cost-effective missions advance toward full development and eventual launch. NASA solicits mission concept studies from the scientific community through a variety of ways, including Research Opportunities in Space and Earth Science, and then selects certain proposals for further development.¹⁵ The mission concept studies can span multiple years and cost up to \$15 million per study. The studies are then led by external entities within the science community, such as academic institutions, or directed to NASA centers in certain cases.

Both NASA-funded and non-NASA funded mission concept studies may be submitted by principal investigators or, in some cases, by NASA officials as a reviewed collection to NASEM for evaluation.¹⁶ NASEM then selects some of the mission concept studies for a Technical Risk and Cost Evaluation (TRACE), which NASEM contracts with the Aerospace Corporation to perform.¹⁷ TRACE evaluations are not a separate task order, but are incorporated into the cost of the SMD divisions' decadal survey task order.

The Astrophysics, Heliophysics, and Planetary Science divisions each place value on the results of mission concept studies as these divisions conduct flagship missions—the highest costing, largest, and most ambitious strategic science missions. Mission concept studies can provide insight into the opportunity costs for potential flagship missions, which seek to answer critical science questions, enabling better strategic decision-making. Earth Science Division staff stated that the studies were performed in preparation for the last Earth science decadal survey, but the continued utility of them is unclear as the division and the decadal survey are moving away from missions to ultimately prioritizing

¹⁴ In the last cycle of decadal surveys conducted for SMD divisions, NASEM also provided 20 recommendations to other federal agencies. Some of the recommendations are collaborative, directed to both NASA and a partner agency, such as the National Science Foundation. These collaborative recommendations are included in Appendix B.

¹⁵ Research Opportunities in Space and Earth Science is SMD's primary omnibus solicitation for research, which is made up of different calls for proposals—each with its own topic and due date—and is conducted annually using a competitive, peer review process. NASA classifies mission concept studies into three categories: competed, committee, and strategic. Competed mission concept studies are selected through competition prior to the start of the decadal survey. These studies are funded by NASA and led primarily by members of the scientific community but can be led by NASA centers. Committee mission concept studies are requested specifically by a NASEM subcommittee and are typically conducted by NASA centers. Finally, strategic mission concept studies are conducted at the request of an SMD division for large, flagship projects, such as the Habitable Exoplanet Observatory and the Large UV/Optical/IR Surveyor. These two studies became the basis for the Habitable Worlds Observatory mission, which is a large infrared/optical/ultraviolet space telescope designed specifically to search for signs of life on planets orbiting other stars.

¹⁶ A principal investigator is a lead scientist or engineer responsible for the end-to-end scientific, technical, and budgetary management of a NASA-funded mission or research project and is accountable to NASA for overall mission success.

¹⁷ TRACE is a technical readiness and cost evaluation process typically used to assess early development mission concepts. The Aerospace Corporation performs TRACE evaluations of decadal survey committee-selected NASA mission concepts that align with the survey's highest-priority science goals. The intent is to increase the cost realism of proposed missions and facilitate cost comparisons among missions. The Aerospace Corporation is an independent, nonprofit corporation that performs objective technical analyses and assessments for government, civil, and commercial customers.

designated observables.¹⁸ The Biological and Physical Sciences Division has not conducted a mission concept study but expressed interest in doing so.

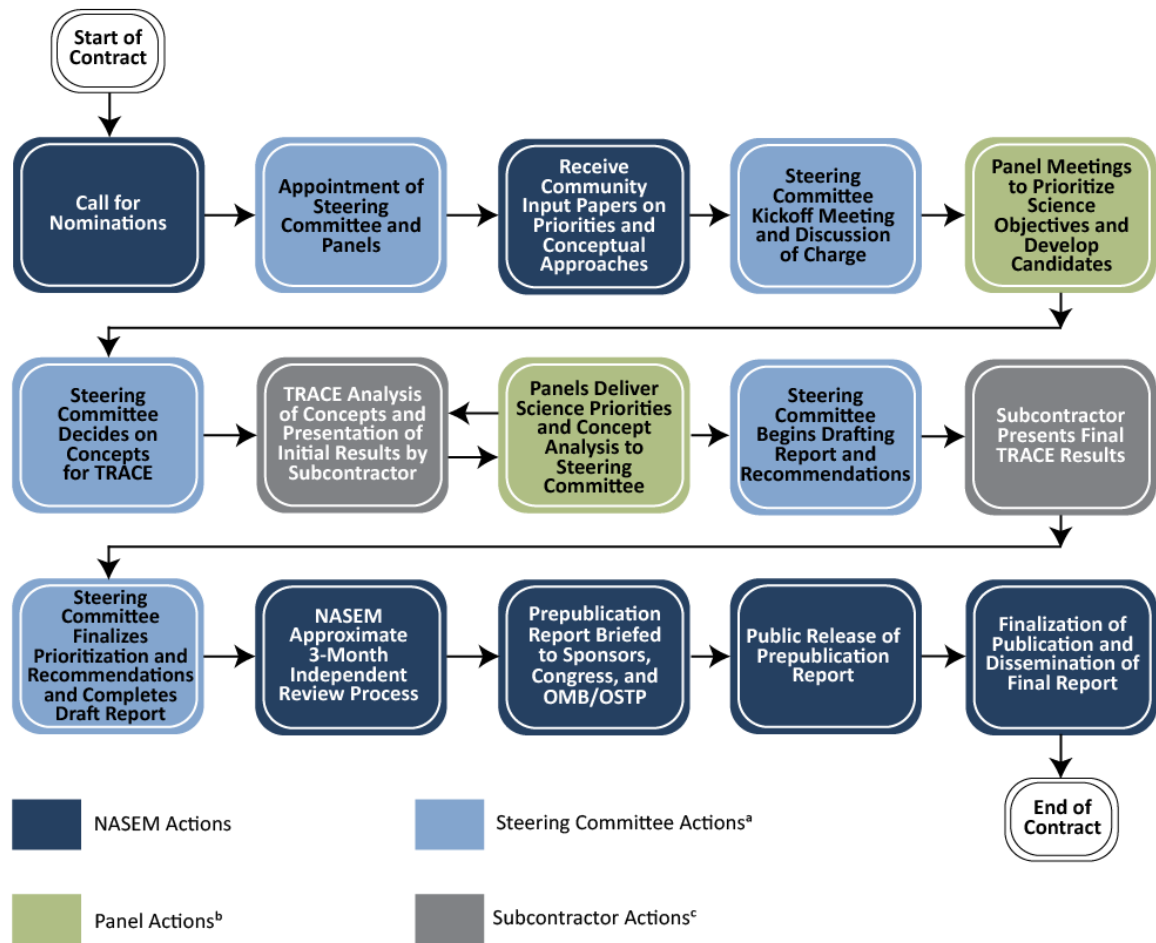
NASEM Decadal Survey Process

Following NASA's statement of task, NASEM begins its extensive independent decadal survey process, which takes approximately 24 months to complete. The process involves several steps, including information gathering, meetings, and teleconferences of the survey committee and its supporting panels; consultation with contractors; and report preparation, review, finalization, and dissemination.

During this process, NASEM emphasizes the importance of inviting science community input and engagement through white papers as well as the independent TRACE process, which produces initial project cost estimates. Figure 1 outlines the overall decadal survey process from the start of the contract to public release of the report.

¹⁸ The 2018 Earth Science decadal survey included a recommendation to implement cost-capped medium- and large-size missions and observing systems to address the five "Designated" observables—Aerosols; Clouds, Convection, and Precipitation; Mass Change; Surface Biology and Geology; and Surface Deformation and Change.

Figure 1: NASEM Decadal Survey Process Flowchart



Source: NASA OIG presentation of information from NASEM.

Note: Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP).

^a The steering committee typically consists of 15 to 20 senior members of the relevant scientific discipline community who have collective expertise in the scientific, programmatic, technical, and policy issues related to the decadal survey's activities.

^b Panels are organized by NASEM and the steering committee to cover the various thematic topics of the scientific discipline. Panels typically have 10 to 15 members with specific expertise in some key subset of the decadal survey's range of responsibility. These panels allow for the involvement of a large cross section of science community members.

^c A subcontractor performs the TRACE analysis. Historically, the Aerospace Corporation has been the subcontractor.

Following the release of the decadal survey, NASEM conducts a midterm assessment approximately 5 years later. In these published midterm assessments and subsequent decadal surveys, NASEM reviews NASA's progress on achieving priorities and recommendations identified in prior decadal surveys.

THE DESIGN OF THE DECADAL SURVEY PROCESS AND NASA'S APPROACH LIMITS OPPORTUNITIES FOR COMMUNICATION AND ENGAGEMENT

While Congress, NASEM, and NASA deeply value the decadal surveys, the design of the decadal survey process and the Agency's approach have limited NASA's ability to communicate information and provide feedback to NASEM regarding the process. Both external constraints and internal practices create limited pathways for communication between NASA and NASEM. As a result, NASA is missing opportunities for more tailored, realistic, and actionable surveys.

While Decadal Surveys Are Valued, SMD Divisions Identify Significant Process Concerns and Rigid Requirements

For over six decades, NASA has leveraged the decadal surveys to gain independent, consensus-driven scientific assessments and recommendations. In that time, the surveys have expanded from covering the scientific disciplines of one SMD division to five; from a modest 125-page report to multiple detailed 700-page, or more, reports; and from being Agency elected to congressionally mandated.

Congress routinely references the decadal surveys and encourages NASA to implement the survey recommendations. The recommendations are often perceived as playing a dual role as a "sword and shield," by rallying support within the science community and Congress as well as protecting recommended projects against budget cuts. A senior NASA official stated, "decadal [surveys have] been providing a clear road map for the previous five decades on how to fund space science."

A senior NASA official stated, "decadal [surveys have] been providing a clear road map for the previous five decades on how to fund space science."

Throughout our audit, interviewees of SMD, NASEM, and the scientific community emphasized the deep value of the decadal surveys. NASA officials described the surveys as "critical," "strategic," and the "gold standard" for broad comprehensive scientific planning. Decadal survey recommendations are highly anticipated by both the scientific community and NASA and thoughtfully integrated into SMD division strategic priorities and budget requests. Much of the merit of the surveys stems from the consensus achieved through the NASEM process and the resulting non-NASA driven independent recommendations.

NASA's approach to managing the decadal survey process has generally been hands-off in practice and by design, mostly out of concern for preserving the independence of the subsequent recommendations. However, this design and approach have also resulted in limited pathways for communication between NASA and NASEM, which then results in unaddressed concerns across the SMD divisions mostly related

to rigid requirements and NASEM’s fixed execution of its decadal survey process. Division officials consistently reported concerns with inflexible processes, unrealistic budget expectations, and unactionable recommendations.

Inflexible processes. Although details may vary by scientific discipline, all decadal surveys follow a standard approximately 24-month process. All divisions identified this lengthy report production timeline as less than ideal. One SMD official described the current timeline as “problematic,” especially in the current fast-paced and changing priorities environment. According to SMD division officials, it takes approximately a year to review and integrate applicable recommendations into division strategic plans. At that point, about 3 years may have passed since the decadal survey process began and the division will likely already be preparing for the decadal survey midterm assessment, having implemented few, if any, recommendations.

While all decadal surveys provide a 10-year perspective, some division officials expressed interest in more agile surveys, which could provide more frequent and timely recommendations. As SMD officials observed, this could allow NASA to better account for and more quickly respond to the rapid change and shifts in technology, commercial markets, and administrative priorities.

Throughout the decadal survey process, SMD does not receive specific interim updates or information from NASEM regarding survey deliberations and potential recommendations. As part of the IDIQ contract, NASEM is only required to provide reports that include high-level information on all NASEM activities, such as dates for upcoming public meetings. These high-level reports do not, however, include information such as potential recommendations. SMD has minimal opportunity to provide feedback to NASEM before the survey is made public. SMD officials reported routinely receiving fewer than 10 days to read the prepublication copy of the report—that can often be over 700 pages in length—prior to public release of the final report. Table 3 shows prepublication review times reported by each SMD division during the last cycle of decadal surveys. This short time frame creates significant work for staff and substantially limits opportunities to identify errors before the report is finalized and published. One division official recounted identifying a significant technical error during their short preview, which required correction and delayed publication of the final report.

Table 3: Decadal Survey Prepublication Review Provided by NASEM

SMD Division	Decadal Survey	Page Length of Report	Number of Days for Prepublication Review
Astrophysics	Pathways to Discovery in Astronomy and Astrophysics for the 2020s	629	3
Biological and Physical Sciences	Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research	323	1
Earth Science	Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space	717	7
Heliophysics	Next Decade of Discovery in Solar and Space Physics: Exploring and Safeguarding Humanity’s Home in Space	790	3
Planetary Science	Origins, Works, and Life: A Decadal Strategy for Planetary Science and Astrobiology	737	5

Source: NASA OIG presentation of Agency data.

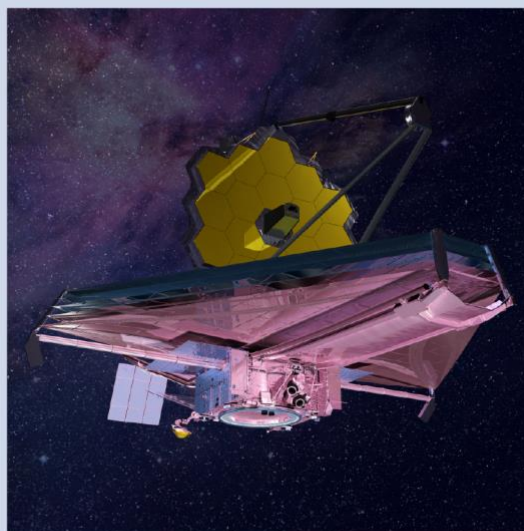
Unrealistic budget expectations. According to an SMD senior official, the biggest misalignment between NASA and NASEM has been related to the Agency’s budget. Although accounting for NASA budget projections was specified in the statements of task we reviewed, all divisions reported concerns that NASEM and the resulting decadal surveys often do not fully represent the budget realities of the Agency and the potential cost of missions.

NASEM’s decadal survey process relies on volunteers from the scientific community to staff committees and panels. Multiple divisions include specific budget information in their kickoff presentations for these committees. According to SMD officials, these volunteers do not typically have a deep understanding of the complex federal budget process. As one SMD official stated, decadal surveys are “documents of optimism from the community.” For example, in the most recent planetary science decadal survey, the report acknowledged the possibility of cost growth and insufficient budget for Mars Sample Return.¹⁹ In that scenario, the report recommended NASA request more funding from Congress if SMD found the project was to exceed a specific dollar threshold—an unrealistic recommendation demonstrating the committee’s lack of understanding of the federal budget process.²⁰

Similarly, several division officials reported that the decadal survey estimated costs to achieve a scientific objective often do not reflect the final mission design and underestimate actual mission costs and timelines. Early cost estimates are notoriously tricky, regardless of who performs them. Costs often increase as NASA develops the mission and resolves technical complexities and uncertainties. However, these early cost estimates from NASEM are often viewed as “accurate” or “realistic” by the scientific community and Congress. These perceptions can impact assessments of cost growth as missions develop and could potentially lead to mission cancellations.

One notable example is the James Webb Space Telescope (JWST), which was recommended by the 2001 astronomy and astrophysics decadal survey as the top priority for the decade.²¹ This survey estimated JWST would cost \$1 billion and be ready to launch in 2008. It was not until 2009 that NASA established a cost baseline of approximately \$5 billion, 5 times the NASEM estimate, and a launch date of June 2014. In response to criticism of continued cost growth, the NASA administrator at the time argued increased costs often stemmed from the “undercosting” by NASEM’s

Illustration of the James Webb Space Telescope



Source: NASA, European Space Agency, Canadian Space Agency, Northrop Grumman.

¹⁹ NASEM, *Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology* (2023).

²⁰ NASEM estimated the Mars Sample Return missions would cost \$5.3 billion overall. Two years later, NASA estimated these missions would cost approximately \$10 billion, almost double the initial NASEM estimate, with the samples returning to Earth in the early 2040s, a decade later than NASEM estimated. In 2026, NASA canceled the mission due to budget constraints and technological challenges.

²¹ NASEM, *Astronomy and Astrophysics in the New Millennium* (2001). This decadal survey recommended the development of the Next Generation Space Telescope, which was later renamed the James Webb Space Telescope. Between the decadal survey recommendation and the launch of JWST in 2021, the telescope underwent numerous design changes, which included overcoming weight constraints and launch limitations.

original estimates. In 2011, NASA established a cost baseline of approximately \$8 billion and a new launch date of October 2018. This cost growth, along with schedule delays, jeopardized the future of JWST, with Congress considering cancellation. During budget deliberations, congressional testimony highlighted the significant cost growth from the original decadal survey estimate. Ultimately, JWST cost approximately \$10 billion, 10 times the decadal survey estimate, and launched in December 2021, 13 years later than initially envisioned in the decadal survey.

Unactionable recommendations. The actionability of the decadal survey recommendations varies within a single report, between SMD divisions, and between cycles of decadal surveys. For example, one SMD division received 4 recommendations in their 2010s survey compared to 26 recommendations in their 2020s survey. In addition to a greater number, the division received more complex and multifaceted recommendations requiring a greater amount of analysis to implement while operating with a similar staff and budget. Another division official observed that a previous decadal survey contained recommendations “so far beyond what was possible within budgets that it was not executable.” Multiple SMD officials described recommendations as “optimistic” or “aspirational,” which may require decades to implement or new technological advancements.

Multiple divisions also reported a disconnect between the advice requested by NASA on scientific prioritization and the recommendations ultimately received from NASEM on how to implement specific missions. SMD officials described some decadal survey reports as veering from giving NASA scientific objectives to telling NASA what missions it should conduct and how to develop them to accomplish a scientific goal. This can occur when mission concept studies or white papers are overly explicit in mission design and both the scientific community and commercial industry become heavily invested in a specific design, potentially setting up NASA with unrealistic expectations.

External Constraints and Bilateral Practices Create Limited Pathways for Communication Between NASA and NASEM

NASA has limited pathways for communication due to both inflexible external constraints and inadequate bilateral practices.

Inflexible external constraints. By law, NASA must enter into periodic agreements with NASEM to conduct independent assessments, known as decadal surveys, a requirement that effectively precludes the Agency from competing the procurement.²² The same law requires, whenever possible, independent life-cycle cost estimates and technical readiness assessments of missions assessed in the decadal surveys, effectively limiting NASA’s options to address any concerns regarding the accuracy and usefulness of NASEM cost estimates of recommended missions. Although a fixed 10-year schedule is not mandatory, decadal surveys have traditionally occurred at decade intervals because federal law directs NASA to solicit “on a periodic basis” NASEM’s recommendations for research and programmatic priorities “over the next decade.” As a result, NASA has adopted a de facto 10-year cycle that aligns each new survey with the planning horizon established by its predecessor.

In addition, NASEM operates under a distinct statutory framework. The Federal Advisory Committee Act (FACA) governs committees, including NASEM, that provide advice to federal agencies, but NASEM is

²² Pub. L. No. 110-422.

exempted from most requirements of FACA.²³ Instead, under Section 15 of FACA, NASEM is subject only to a tailored set of provisions rather than the full suite of committee management and public access requirements that apply to typical advisory committees. For example, FACA ordinarily requires committees to provide public notice of meetings and allow the public to attend. However, Section 15 of FACA exempts NASEM from these requirements, allowing NASEM to host closed, non-public meetings.

These statutory and regulatory carve outs create a fundamentally different dynamic between NASA and NASEM than with traditional contractors or typical advisory committees. For example, SMD officials reported NASA cannot employ traditional oversight mechanisms to NASEM, such as financial penalties due to nonperformance or delays. Similarly, NASEM has been unwilling or unable to accept certain statements of task requirements or feedback on their processes from NASA. This is due to NASEM's rigid stance on maintaining its independence under Section 15 of FACA and NASA's acceptance of that stance.

During our interviews, NASEM independence was used frequently to explain current processes or practices. For example, a NASEM official explained that a change to a contract requirement, such as a shorter production timeline, could jeopardize NASEM's independence. Historically, SMD has accepted NASEM's stance on independence. However, SMD staff stated that they are trying to recalibrate and establish a more standard contracting relationship with NASEM. SMD leadership emphasized it is not asking anything from NASEM that they do not ask from another independent contractor.

Inadequate bilateral practices. Pathways for NASA to communicate and provide feedback to NASEM are highly limited, with those included in the statement of task being the only official routine method cited by SMD officials. Division staff develop the statement of task and negotiate the content with NASEM to establish decadal survey committee tasks and requirements. After the statement of task, SMD's role is limited to responding to technical questions and data requests submitted by the decadal survey committees. Consequently, the statement of task is effectively SMD's singular opportunity to direct the conduct of the decadal survey committees.

Based on our review of statements of task from the last cycle of decadal surveys, SMD is not consistently negotiating standard requests or requirements for decadal surveys across the SMD divisions. The statements of task contain few to no specific deliverables for NASEM to complete. For example, only two of the five statements of task we reviewed specifically identify a published report as the explicit deliverable. These two statements of task also included additional details and deliverables, such as a prepublication version of the report, briefing packages, and quarterly updates. The other three statements of task reference a report in passing, but do not contain explicit deliverables.

While most of the statements of task include performance schedules, only one statement of task included a deadline for NASEM to meet. One statement of task was one page with no defined deliverables or deadlines. While all divisions identified unrealistic budget expectations as a concern with decadal survey recommendations, only two of the five statements of tasks emphasized the need for budget considerations. Four of the five statements of task included language requesting decision rules, which may account for budget projections.²⁴ However, this language was brief and caveated with "where appropriate." None of the statements of task included performance standards or metrics, such

²³ FACA, 5 U.S.C. Chapter 10.

²⁴ Decision rules are guidance on adjusting the prioritization and implementation of recommendations to accommodate reasonable projected budget deviations or changes in activities' urgency.

as timeliness for prepublication review drafts or even the final decadal survey report. See Table 4 for a comparison of elements in the most recent statements of task from the last cycle of decadal surveys.

Table 4: Elements in Statements of Task by SMD Division

SMD Division	Page Length of Statement of Task	Budget Considerations	Decision Rules	Clear Deliverables	Deadlines
Astrophysics	1	No	Where appropriate	No	No
Biological and Physical Sciences	2	No	Where appropriate	No	No
Earth Science	4	Yes	No	Yes	Yes
Heliophysics	8	Yes	Where appropriate	Yes	No
Planetary Science	1.5	No	Where appropriate	No	No

Source: NASA OIG presentation of Agency data.

When asked if additional details or requirements could be added to the statements of task, such as deliverables or deadlines, SMD officials asserted additional requirements were either unnecessary, unenforceable, or unacceptable to NASEM. For example, one official said statements of task did not need to stipulate the report as a deliverable as it was the “obvious” deliverable. According to another official, their division attempted to negotiate additional details, but NASEM refused to negotiate, accepting only a statement of task with less detail and requirements. This sentiment was echoed by a NASEM official who cautioned that certain statement of task requirements, such as a deadline, could be a risk to NASEM’s independence. However, other NASEM officials expressed openness to the inclusion of deliverables and deadlines in future statements of task. Notably, SMD recently issued a contract task order with a statement of task for the upcoming Earth science decadal survey, which included a shorter production timeline.

When pressed, multiple SMD officials stated they not only believed NASEM would not accept certain standard contract requests, but also questioned what recourse was available to SMD to hold NASEM accountable. However, we found that NASEM has accepted statements of task with deadlines and deliverables on at least three occasions. In addition, in 2015, NASEM developed its own comprehensive lessons learned report on space science decadal surveys, which affirmed the importance of a strong statement of task.²⁵ This report highlighted the value of statements of task that are attentive to the needs of sponsoring agencies, explicit with directions for the consideration of budgetary scenarios and existing programs, and inclusive of agency preferences.

Within SMD and NASEM, there are inconsistent expectations and understandings regarding the statements of task. The IDIQ contract clearly outlines minimum requirements, including performance standards and the delivery schedule for task orders. However, the statements of task lack standardized elements and do not consistently meet the minimum requirements for preparing a task order as outlined by the IDIQ contract. Further, the contract stipulates that in the event of conflicts between the requirements of the task order and the contractor’s approved task plan, the task order prevails.

²⁵ NASEM, *The Space Science Decadal Surveys: Lessons Learned and Best Practices* (2015).

Along with the statement of task, lessons learned for each decadal survey would offer an opportunity to provide feedback between SMD and NASEM regarding the decadal survey process. Neither SMD nor NASEM conduct routine bilateral lessons learned. In 60 years of decadal surveys, we found one documented instance in 2015 of formal lessons learned between SMD and NASEM. Similar to the decadal survey, this lessons learned involved a statement of task, lengthy timeline, and detailed report. Notably, the lessons learned report acknowledged the importance of adapting the survey process to meet the needs of the individual SMD divisions, a tendency to over-define mission concepts, and cost estimating challenges.

During our review, both SMD and NASEM leadership expressed interest in formal lessons learned. However, it is unclear whether NASEM would require a separate task order for a lessons learned or would accept a lessons learned debrief as part of a routine decadal survey statement of task. While detailed comprehensive lessons learned serve a vital purpose, SMD and NASEM would benefit from routine “after-action” type lessons learned as part of the standard decadal survey process. Routine lessons learned allow for real-time feedback and inform future planning, benefiting subsequent decadal surveys across the directorate.

NASA Is Missing Opportunities for More Tailored, Realistic, and Actionable Decadal Surveys

Inadequately negotiated statements of task and the lack of lessons learned limit NASA’s ability to clearly communicate what it wants to NASEM. This lack of adequate communication contributes to unaddressed cross-division concerns.

For example, inadequate communication contributed to surprising and unrealistic recommendations for the Biological and Physical Sciences Division. In 2022, the division initiated its second decadal survey, requesting a strategy that included research campaigns for the first time. NASEM provided recommendations for two campaigns, Bioregenerative Life Support Systems (BLISS) and Manufacturing Materials and Processes for Sustainability in Space (MATRICES).²⁶ Each campaign requires \$100 million to \$400 million per year for 10 years. The cost for just one of these campaigns for one year exceeds the division’s entire annual budget, which was \$85 million for fiscal year 2023. According to an SMD official, the division was surprised by these recommendations and ultimately opted to tackle these campaigns “piecemeal.”

Experiment to Grow Vegetables on the International Space Station



One element of the BLISS campaign involves the provision of high-quality food in the space environment. Future long-duration space missions will require crewmembers to grow their own food, so understanding how plants respond to microgravity is an important step toward that goal. This photo shows the Veg-03 experiment, which uses a Veggie plant growth facility on the International Space Station to grow and harvest mixed greens on-orbit and return the samples to Earth for testing.

Source: NASA.

²⁶ The BLISS campaign will build and understand the systems needed to provide high-quality food, refresh air and water, process waste, and enable the creation of space environments sustainable for long periods of time independent of Earth. The MATRICES campaign will seek to understand and harness the physical processes by which materials and complex fluids can be repeatably used in space to enable sustainable exploration and circular production life cycles for the built environment on Earth and in space.

These misalignments can have protracted impacts, such as damaging NASA's reputation, creating unfair expectations, and harming the outlook for projects. NASA is often measured against NASEM recommendations. When recommendations are not implemented in accordance with NASEM direction, especially when projects significantly exceed budget realities, mission cost estimates, or timelines, this can be viewed as poor project management on NASA's part.

NASA IS NOT COMPREHENSIVELY CAPTURING PROGRESS, COSTS, AND RESOURCES REQUIRED FOR THE DECADAL SURVEY PROCESS

NASA does not track the progress SMD divisions have made with implementing decadal survey recommendations, particularly in such a way that provides timely information for decision-makers or improvements of future NASEM recommendations. The Agency is also not fully accounting for costs associated with the decadal survey process, including mission concept study expenditures and the time spent working on decadal survey tasks. NASA is not comprehensively tracking the recommendations, costs, or time allocation because the SMD divisions are not required to track recommendation progress or account for resources spent on decadal surveys. As a result, in an increasingly constrained and unknown budget environment, NASA cannot fully determine the value of its efforts in the decadal survey process.

Majority of Decadal Survey Recommendations Are Not Tracked

Following the public release of a decadal survey, division officials review the recommendations and provide a response that often explains the division’s intent regarding implementing each of them. The accepted recommendations are then integrated into the division’s strategic plan. SMD is not required to accept or implement any decadal survey recommendation, unless it is later directed to by Congress. While recognizing the decadal survey recommendations reflect what the science community believes to be the most critical scientific priorities, SMD must also consider congressional laws and administrative priorities when developing its strategic plans. During its last cycle of decadal survey reports, NASEM provided NASA 160 recommendations covering a wide range of topics, including technology investments, mission cadence, and research strategies. Table 5 lists the recommendations by SMD division, and a sample of individual recommendations can be found in Appendix B.

Table 5: NASEM Decadal Survey Recommendations

SMD Division	Number of the Most Recent Decadal Survey Recommendations
Astrophysics	24
Biological and Physical Sciences	25
Earth Science	14
Heliophysics	26
Planetary Science	71
Total	160

Source: NASA OIG presentation of Agency data.

Of the five SMD divisions, only Astrophysics reported to us they track progress with its decadal survey recommendation implementation. The division also provides this information on a public website. According to a division official, the decadal survey recommendations are used as quantifiable metrics to track the division's progress as a benchmark for success. This official also indicated recommendation tracking is a tool used to hold itself accountable to the decadal survey and, by extension, the scientific community. This official further stated that by formally tracking recommendations, NASA can make strategic decisions on how to approach remaining priorities to which it has committed.

Officials from other SMD divisions indicated formal tracking was unnecessary, suggesting the final decadal survey or staff memory could be used as references. However, these are not reliable methods for tracking progress, especially given the number, complexity, and length of time between recommendations. SMD officials stated that some progress is tracked through annual reports to the NASEM standing committee, the annual Agency budget process, and midterm assessments. However, the midterm assessments only occur every 5 years and the other processes do not track all recommendations provided by NASEM. Instead, these processes are limited to recommendations associated with mission formulation or development, specifically identified for annual reports or annotated in the budget process.

We believe it is important that NASA maintains up-to-date information on the status of recommendations to gauge the efficiency of resource allocation, provide budgetary information to lawmakers, and improve the feasibility and practicability of future decadal survey recommendations. Additionally, actively tracking the progress of implementing recommendations could support division officials that work closely with NASEM in their preparation for decadal survey midterm assessments.

SMD division officials gave various explanations for not tracking recommendation implementation. Multiple division officials identified the decadal survey midterm assessment conducted by NASEM as the primary method for tracking and monitoring implementation of recommendations. However, NASEM officials stated they do not view themselves as accountability managers, and we believe waiting 5 years to review recommendation status limits NASA's ability to assess and respond more agilely to technological developments or changes. Without more frequent formal tracking, SMD cannot readily determine progress, identify gaps, or share updates with the scientific community and the public.

Tracking and assessing progress are foundational principles established in NASA's Governance and Strategic Management Handbook.²⁷ Specifically, Planning, Programming, Budgeting, and Execution requires the establishment of metrics and performance indicators to determine how progress toward program and project goals will be monitored and reported. Currently, SMD does not provide clear expectations or guidance that requires SMD divisions to track recommendations. While SMD management expects the divisions to track the progress of their own initiative, we do not believe this expectation was clearly understood by the majority of divisions.

²⁷ NASA Policy Directive 1000.0C, *NASA Governance and Strategic Management Handbook* (January 29, 2020).

SMD Not Fully Accounting for Mission Concept Study Costs Associated with Decadal Surveys

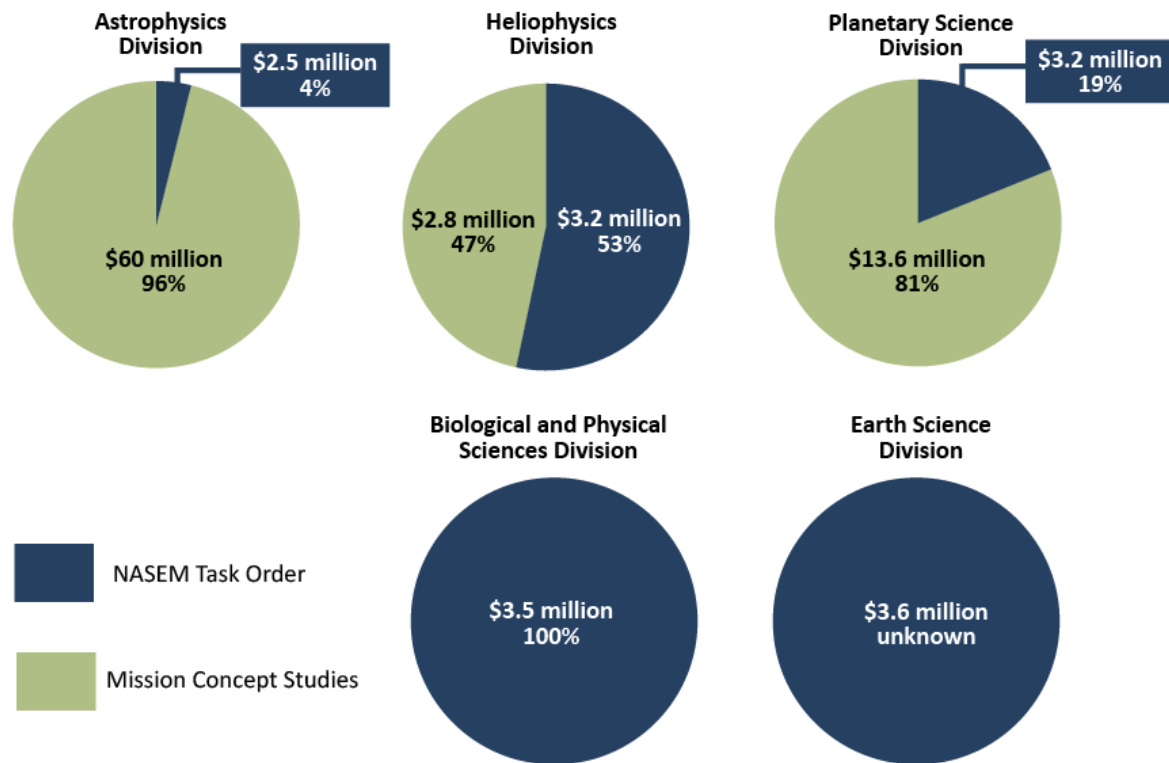
Although SMD and NASEM use mission concept studies extensively to prepare for the decadal survey process and assess possible mission recommendations, we found that SMD does not have a comprehensive tracking system in place to account for mission concept study costs. Mission concept studies are a valuable tool for NASA's mission development efforts and have resulted in some of NASA's most ambitious missions, such as the Habitable Worlds Observatory and Mars 2020 Perseverance Rover.²⁸ Mission concept studies make up a significant portion of the pre-work conducted by NASA leading up to the decadal survey. For example, one division began work on its mission concept studies 3 years prior to the beginning of the decadal survey process. While SMD leadership acknowledged the importance and significant level of effort required for mission concept studies, when asked about the cost to conduct decadal surveys, they referred to the contract costs.

As discussed previously, four of the five SMD divisions have conducted mission concept studies in preparation for the decadal survey process. While comprehensive records were not readily available for all divisions, three of the four SMD divisions that have conducted mission concept studies were able to provide records. The fourth division could not provide the cost of their mission concept studies associated with the decadal surveys when requested. SMD officials stated that inadequate records retention and the age of records contributed to this lack of accounting. Factors for this include a lack of guidance for tracking these costs and the departure of relevant SMD staff that worked on the last cycle of decadal surveys.

SMD was able to provide cost data for 28 mission concept studies from the Astrophysics, Heliophysics, and Planetary Science divisions with a total cost of approximately \$76 million during their last decadal survey cycle—nearly 5 times the approximately \$16 million spent on the task orders to conduct the last five division decadal surveys. While mission concept studies are clearly important to the decadal survey process, understanding these costs is equally critical for SMD to determine whether it is effectively utilizing resources in a constrained budget environment. See Figure 2 for a breakout of the contract costs and mission concept study costs by SMD division associated with conducting the last cycle of decadal surveys.

²⁸ The Habitable Worlds Observatory is a telescope designed to search for signs of life on planets orbiting other stars. The Mars 2020 Perseverance Rover, launched in 2020, has been searching for signs of ancient microbial life on Mars since 2021.

Figure 2: Proportion of Task Order Costs Against Reported Costs of Mission Concept Studies by SMD Division



Source: NASA OIG presentation of Agency data.

Note: The Biological and Physical Sciences Division has never conducted a mission concept study. The Earth Science Division conducted mission concept studies in the last cycle of decadal surveys, but SMD reported those costs are unknown.

SMD Does Not Track Staff Resources Used to Prepare for and Respond to Decadal Surveys

Division staff spend a significant amount of time doing pre-work for each decadal survey, which in some cases begins years in advance. This pre-work includes supporting science community-developed mission concept studies, supporting field studies at NASA centers, and developing the statements of task. Following the statement of task, SMD staff develop kickoff presentations and respond to technical and data requests from NASEM. Fulfilling these requests can be very labor intensive and time sensitive. In addition, multiple divisions officials reported significant efforts to anticipate recommendations. One division official described how the division would meet, identify possible recommendations, and create a “big decision tree.” Once recommendations were published, the division would review their preemptive decision tree, removing or adjusting their action plan as needed.

Following the release of the decadal survey report, although not a formal or congressionally directed requirement, SMD officials respond to the recommendations in writing. The time dedicated to responding to these recommendations can be extensive. According to one division official, they dedicate their entire staff, approximately 25 employees, to responding to the decadal survey after public release. The official estimated that the division allocated 20 hours per month for 6 months to respond to decadal survey recommendations. Another division official indicated that the science community expected an immediate response to the decadal survey recommendations after SMD had only a week to review the report.

SMD does not account for these labor efforts when determining the cost of the decadal surveys. NASA documents employee time through the web-based Time and Attendance Distribution System. This system uses different Work Breakdown Structure (WBS) codes to track employee time and leave. SMD does not have a separate WBS code for working on a decadal survey. Instead, there is a single WBS code for all regular work completed by an employee. Without a separate WBS code, SMD cannot readily track the amount of time SMD division staff spend preparing for the decadal survey process and responding to decadal survey recommendations.

We believe there may be opportunities to better assess and utilize the budget and staff resources needed for the decadal survey process, which could help SMD make better funding decisions in an environment where the past two presidential budget requests have proposed significant annual resource cuts.

NASA LACKS CONSISTENT AND ADEQUATE INTERNAL PROCESSES FOR SUPPORTING DECADAL SURVEY DEVELOPMENT

Despite a long history and increasing SMD divisional participation, NASA does not have consistent internal processes for supporting the development and management of decadal surveys. SMD lacks the formal guidance, routine lessons learned, and sufficient resources needed to standardize common processes and share best practices across the directorate. Without consistent and adequate internal processes, NASA is not effectively sharing best practices, preserving institutional knowledge, or creating more streamlined and efficient processes across SMD.

NASA Lacks Consistent and Adequate Internal Processes to Prepare for and Respond to Decadal Surveys

Decadal survey approaches and expertise vary significantly across the SMD divisions. Some variation in execution is reasonable as each division supports different scientific disciplines with different goals and priorities. For example, the Heliophysics and Planetary Science divisions conduct flagship missions, such as the Parker Solar Probe and Europa Clipper, respectively, which may require a higher level of investment than divisions focused on smaller missions.²⁹ Similarly, some variation in expertise is expected as the workforce naturally cycles. However, there are common expectations and processes for the development and management of the decadal surveys across the directorate. We found NASA lacks consistent and adequate internal processes to prepare for and respond to decadal surveys.

Division staff primarily rely on “unofficial support” within the directorate to develop and manage the decadal survey process, such as conversations with colleagues and management, review of previous related files, and their previous experience, if any, working on decadal surveys. This approach is contingent on the availability of colleagues and management, accessibility of files, and limited opportunities—once every 10 years—to gain experience. Divisional and staff experience is variable. For example, the Astrophysics Division has extensive experience conducting decadal surveys with their first occurring in 1964. This enduring experience produces a division more seasoned and prepared to conduct and respond to decadal surveys. Comparatively, the Biological and

A division staff member stated, “there was no formal process, which would have been helpful as I was thrown into the deep end of the pool.”

²⁹ The Parker Solar Probe, launched in 2018, provides unprecedented observations of the Sun, the only star we can study up close. It is the first spacecraft to fly through the corona—the Sun’s upper atmosphere. The Europa Clipper orbiter, launched in 2024 and expected to arrive in 2030, is the first mission designed to conduct a detailed study of Jupiter’s moon Europa.

Physical Sciences and Earth Science divisions only began conducting decadal surveys in the 2000s. These divisions have less resident experience to reflect on and pull from as they prepare and respond to their decadal surveys.

Along with the divisional experience, staff experience varies with six of the eight division officials we interviewed reporting they did not have prior experience supporting the decadal survey as the primary point of contact. One inexperienced staff member described becoming the decadal survey point of contact as “overwhelming.” Another stated, “there was no formal process, which would have been helpful as I was thrown into the deep end of the pool.” Each division’s primary point of contact plays a pivotal role, leading the development of the statement of task, fielding technical and data requests from NASEM, and coordinating responses to recommendations. Without clear processes, division and staff are further limited in gaining decadal survey experience.

Currently, staff responsible for the decadal survey process rely on old files used or developed during a previous decadal survey. Typically, staff review previous statements of task, both in their division and across the directorate. Beyond these handfuls of documents, staff did not report accessing any additional written materials. While reviewing previous statements of task is a useful practice, these documents do not provide insight into required or recommended statements of task elements or lessons learned from previous statements of task nor do these documents provide clear information on responsibilities, expectations, and best practices. In addition, there is no central depository for shared files. One division staff member noted that their files could be accessed as “everything is on the servers.” However, this access is questionable as it is contingent on record retention, file permissions, and searchability of possibly thousands of files. In addition, while likely useful, these files have not been assessed and reviewed by SMD to determine accuracy, duplicability, or applicability.

In place of a formal process and tools, such as written guidance, all staff reported consulting with other staff in their division, other divisions, and SMD leadership. Consulting colleagues and management, both formally and informally, is a useful practice. However, SMD’s current practice primarily relies on informal processes. For example, SMD does not have a decadal survey working group.³⁰ Decadal survey points of contact are reliant on the availability and variable experience of their colleagues and management.

Lack of Guidance, Lessons Learned, and Resources Prevent SMD from Standardizing Processes and Sharing Best Practices

SMD lacks the formal guidance, routine lessons learned, and sufficient resources needed to standardize shared processes and share best practices across the directorate.

Guidance. Under NASA’s governance framework, the Agency emphasizes the importance of its policies and processes to ensure mission success.³¹ One foundational principle is technical excellence, which relies on two fundamental responsibilities: (1) personal accountability and (2) organizational

³⁰ A working group is a group of people chosen by an organization, such as a government, to study a particular problem or situation and provide recommendations based on its findings. NASA uses working groups to acquire input, independent evaluation, and advice from the scientific community on topics such as the effects of solar radiation on astronauts exploring the Moon, developing recommendations derived from NASA’s Earth science data systems, and providing guidance for the maturation of the Habitable Worlds Observatory.

³¹ NASA Policy Directive 1000.0C.

responsibility to provide the proper training, tools, and environment. SMD leadership has a responsibility to provide proper tools, such as written guidance, to its divisions to ensure the efficient and effective development of the decadal surveys. Currently, SMD does not provide sufficient formal or standardized guidance to the divisions on the decadal survey process, including expectations, kickoff presentations, report milestones, and timelines. The lack of formal guidance and clear internal processes impact the efficiency of the decadal survey process, resulting in unclear expectations and requirements, duplicability of efforts, and missed opportunities.

This is particularly pronounced in the development of statements of task and the responses to decadal survey recommendations. As discussed earlier, statements of task are the most pivotal document created by NASA and negotiated with NASEM. While all statements of task are reviewed by SMD leadership and management, there is no formal guidance or template for preparing a statement of task. Without written guidance, staff do not have a clear understanding of the statement of task elements that are required, recommended, or negotiable. This lack of understanding contributes to staff not including or negotiating essential elements, such as deliverables and deadlines, in the statements of task, potentially impacting the quality of the decadal survey recommendations.

Following the publication of decadal survey reports, each division responds to the recommendations. Three of the eight division officials we interviewed affirmed it was SMD policy to respond to these recommendations. However, staff reported various timelines and expectations regarding responses. These responses ranged from acknowledgement of receipt to denoting NASA's concurrence, partial concurrence, or nonconcurrence of each recommendation. When asked to provide the SMD policy, officials stated no such policy existed. Subsequently, SMD officials located an expired 2007 SMD policy, which did provide guidance on responding to NASEM recommendations. Without current, written, and formal directions, division staff relied on word-of-mouth guidance, which was incorrect.

Notably, other practical guidance documents do exist in the directorate. Three of the eight division decadal survey officials we interviewed reported developing personal tools and guidance for the decadal survey process. These include how-to documents, templates, and spreadsheets. However, these tools were not shared SMD-wide. In the absence of formal guidance, multiple individuals created their own guidance and tools, resulting in duplicative efforts and a wasted opportunity for other staff to benefit from these helpful tools to better manage and execute their work.

Lessons Learned. As is the case externally between NASA and NASEM, SMD does not conduct formal internal lessons learned with its division staff assigned to support the development of the decadal survey. According to division staff, there is no direction or expectation from SMD leadership to ensure routine lessons learned are captured and shared. This lack of lessons learned is inconsistent with NASA's policy to effectively manage Agency technical, program, and project management knowledge to identify, retain, utilize, and share knowledge in order to continuously improve the performance of NASA in implementing its mission.³² Consequently, SMD is missing an opportunity to effectively share best practices, preserve institutional knowledge, and create more streamlined and efficient processes across the directorate.

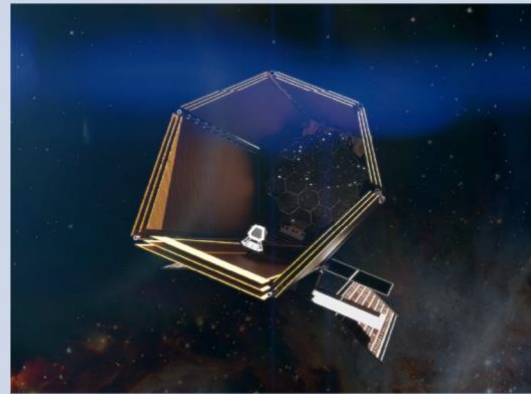
For example, four of the five SMD divisions used NASA-funded mission concept studies, conducted by the science community, to help prepare for their last decadal survey. Mission concept studies enable early engagement with the scientific community and enrich decadal survey committee and panel discussions during the decadal survey process. Each division has a different process for developing these

³² NASA Policy Directive 7120.6A, *Knowledge Policy for Programs and Projects w/Change 1* (December 16, 2019).

studies. While a uniform process is not necessarily advisable, divisions have not efficiently shared lessons learned or implemented best practices.

According to SMD officials, the use and quality of mission concept studies can impact the actionability of decadal survey recommendations. One division official highlighted the success of their mission concept study process, which involved a brainstorming workshop followed by the solicitation and limited selection of mission concept studies. For example, NASA funded a mission concept study for the Habitable Exoplanet Observatory, a space telescope intended to search for Earth-like planets. The decadal survey committee merged this mission concept study with other studies and recommended the Habitable Worlds Observatory in the 2020 astrophysics decadal survey.³³ Currently, NASA is developing the Habitable Worlds Observatory mission, a telescope designed to search for signs of life on planets orbiting other stars.

Illustration of the Habitable Worlds Observatory



Source: NASA.

Conversely, an official from a different division reported the adverse impact of initiating mission concept studies too late into the decadal survey process to be considered. While the decadal survey committees are under no obligation to select a mission concept study as a recommendation, mission concept studies help identify current capabilities, explain parameters, and test feasibility.

Following the completion of a decadal survey, lessons learned would provide essential opportunities for SMD to review its processes and outcomes. Lessons learned would also allow SMD to identify inefficiencies and develop improvements for future decadal surveys. This is especially critical for an expansive and consequential endeavor like the decadal survey that occurs only periodically. Not only would these lessons learned be applicable for the division but also could be applied much sooner by a different division preparing for an upcoming decadal survey. For example, one division staff emphasized the impact of independently observing and modifying another division's successful mission concept study process to meet their division's needs, stating that this "saved weeks of work."

Resources. SMD leadership readily affirmed the importance of both guidance and formal lessons learned. In 2023, the directorate contracted with Booz Allen Hamilton to conduct a comprehensive assessment of the internal decadal survey process and recommend process improvements. Similar to our findings, this lessons learned document recommended the development of a handbook and opportunities, such as a working group, to share best practices. SMD leadership identified a lack of staff as the primary barrier to performing these critical tasks. Currently, primary points of contact perform their decadal survey duties in conjunction with their regular duties. In addition, a recent reorganization at the Agency significantly reduced the number of staff in SMD.

³³ The Habitable Exoplanet Observatory was a concept study for a mission to directly image planetary systems around Sun-like stars. Large UV/Optical/IR Surveyor was a concept study for a mission to search for habitable worlds and signs of life outside our solar system. These two studies became the basis for the NASA mission, Habitable Worlds Observatory.

CONCLUSION

The decadal surveys provide valued insights and recommendations identified by the science community in research and exploration on Earth and in space for NASA to consider when planning future missions. Congress and the public rely on information contained in the decadal surveys, including projected cost and schedule data for NASA programs and projects. Accordingly, NASA's role in decadal survey development is important to ensure science priorities and NASEM recommendations ultimately support and inspire NASA with its mission of driving advances in science, technology, aeronautics, and space exploration.

The design of and NASA's approach to the decadal survey process results in ineffective engagement with NASEM. Deference to NASEM's strict and lengthy review time frames, largely without interim communication or updates, leaves NASA in a position to respond to recommendations rapidly and often inefficiently. Statements of task used to direct decadal survey reviews are poorly developed and include inconsistent requirements, which in turn limit NASA's ability to communicate information and feedback to NASEM during the review period. The result is often recommendations that are overly complex and do not accurately reflect technological or budgetary realities. The combination of an inflexible process and unrealistic science or funding expectations have, at times, resulted in unactionable sets of recommendations that NASA must still attempt to respond to and Congress often embraces.

We also believe that SMD can improve its internal processes related to the decadal surveys. The Agency is not fully accounting for costs associated with the process, including mission concept study expenditures and the time spent working on survey tasks. In an increasingly constrained and unknown budget environment, NASA cannot fully determine the value of its efforts and therefore is lacking critical information required for informed decision-making. In addition, SMD lacks formal guidance, routine lessons learned, and the sufficient resources needed to standardize common processes and share best practices across the directorate. Without consistent and adequate internal processes, NASA is not effectively sharing best practices, preserving institutional knowledge, or creating more streamlined and efficient decadal survey processes.

RECOMMENDATIONS, MANAGEMENT'S RESPONSE, AND OUR EVALUATION

To improve NASA's role and oversight of its efforts related to NASEM's decadal survey process, we recommended the Associate Administrator for Science Mission Directorate:

1. Ensure all decadal survey task orders and statements of task include performance metrics and deliverables for progress and completed decadal survey reports.
2. Coordinate with NASEM to identify a means to provide interim reports and potential recommendations during development of the decadal survey and allow additional time for prepublication review of decadal survey reports.
3. Coordinate with NASEM to identify ways to streamline decadal survey development and the report timeline.
4. Coordinate with NASEM to develop a plan and conduct routine formal lessons learned, to the extent practical, following the completion of decadal surveys.
5. Account for mission concept study costs and any other SMD division costs associated with the decadal survey process, to the extent practical, to better inform budgetary decision-making.
6. Track and make available to SMD division personnel that work closely with NASEM the status of decadal survey recommendations, to the extent practical, to ensure accountability and strategic decision-making and improve the feasibility and practicability of future decadal recommendations.
7. Develop SMD-wide guidance to prepare for and respond to NASEM decadal surveys.
8. Develop a formalized plan to internally capture knowledge and establish formal routine lessons learned activities following the completion of each decadal survey.

We provided a draft of this report to NASA management who concurred with our recommendations and described planned actions to address them. We consider management's comments responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions.

Management's comments are reproduced in Appendix C. Technical comments provided by management and revisions to address them have been incorporated as appropriate.

Major contributors to this report include Ray Tolomeo, Science, and Research Technology Audits Director; Adrian Dupree, Assistant Director; Matt Anderson; Sarah Hughes; Sashka Mannion; and Lauren Suls.

If you have questions or wish to comment on the quality or usefulness of this report, contact Laurence Hawkins, Audit Operations and Quality Assurance Director, at 202-358-1543 or laurence.b.hawkins@nasa.gov.

 Digitally signed by
Kathryn Sheehey
Date: 2026.10.16
13:27:39 -04'00'

Kathryn D. Sheehey
NASA OIG Senior Official

APPENDIX A: SCOPE AND METHODOLOGY

While we performed this audit from September 2025 through September 2026, it was temporarily suspended during the government shutdown that occurred from October 1 to November 12, 2025. The audit was performed in accordance with generally accepted government auditing standards, which require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In this report, we evaluated NASA's role in the NASEM decadal survey process. Specifically, we assessed the input and oversight NASA has of its efforts to NASEM's decadal survey process and the Agency's overall cost and value associated with decadal surveys.

To evaluate the input and oversight NASA has of its efforts related to NASEM's decadal survey process, we interviewed officials from SMD, each SMD division, the NASA contracting office, and NASEM to gain an understanding of roles and responsibilities, internal and external processes, and survey development and management. We reviewed and analyzed the documents listed in the paragraph below, and others including task orders and statements of tasks for each decadal survey, the IDIQ contract between NASA and NASEM, the SMD Decadal Survey Assessment produced by Booz Allen Hamilton, and NASEM's *Space Science Decadal Surveys: Lessons Learned and Best Practices* (2015) to determine expectations, requirements, processes, and practices regarding the execution of the decadal survey process.

To evaluate NASA's overall costs and value associated with decadal surveys, including time allocation, we interviewed officials from SMD, each SMD division, NASEM, and the Jet Propulsion Laboratory's cost estimating team. We also reviewed mission concept study cost data provided by SMD to calculate the total cost of the last cycle of decadal surveys. We interviewed officials from each SMD division to determine if there is a system or guidance in place for tracking the progress made in implementing decadal survey recommendations. We also reviewed the decadal surveys, midterm assessments, and NASA's written responses to the decadal surveys to determine the number of recommendations provided to NASA.

Finally, we reviewed federal and NASA criteria, policies, procedures, and supporting documentation; prior audit reports; external reviews; and other documents relevant to NASA's role in NASEM's decadal surveys. The documents we reviewed included the following:

- Federal Advisory Committee Act, 2024, Pub. L. No. 117-286 (2024)
- NASA Policy Directive 1000.0C, *NASA's Governance and Strategic Management Handbook* (January 29, 2020)
- NASA Policy Directive 7120.6A, *Knowledge Policy for Programs and Projects w/Change 1* (December 16, 2019)
- National Aeronautics and Space Administration Authorization Act of 2008, Pub. L. No. 110-422, Title XI (2008).

Assessment of Data Reliability

The findings and conclusions of this report do not rely on computer-generated data.

Review of Internal Controls

We assessed internal controls associated with NASA's role in NASEM's decadal survey process, addressing the Agency's input and oversight of its efforts related to NASEM conducting decadal surveys for SMD's Astrophysics, Biological and Physical Sciences, Earth Science, Heliophysics, and Planetary Science divisions and the Agency's overall costs associated with decadal surveys. We identified that NASA's role limits its ability to communicate information and provide feedback to NASEM regarding the decadal survey process. We also identified that NASA is not fully accounting for costs associated with the decadal survey process. Furthermore, we identified that NASA does not have consistent internal practices for supporting the development of decadal surveys. Control weaknesses are identified and discussed in this report. Our recommendations, if implemented, will improve those identified weaknesses.

Prior Coverage

During the last 10 years, the NASA Office of Inspector General has given congressional testimony and issued two reports of significant relevance to the subject of this report. Congressional testimony and reports can be accessed at <https://oig.nasa.gov/congressional-testimony/> and <https://oig.nasa.gov/audits/auditReports.html>, respectively.

Advancing Scientific Discovery: Assessing the Status of NASA's Science Mission Directorate Portfolio ([CT-24-002](#), March 21, 2024)

NASA's Heliophysics Portfolio ([IG-19-018](#), May 7, 2019)

NASA's Earth Science Mission Portfolio ([IG-17-003](#), November 2, 2016)

APPENDIX B: NATIONAL ACADEMIES DECADAL SURVEY RECOMMENDATIONS

NASEM provided NASA 160 decadal survey recommendations during the last cycle of surveys it conducted for NASA's SMD. Below is a sample of five recommendations for each SMD division—Astrophysics, Biological and Physical Sciences, Earth Science, Heliophysics, and Planetary Science. In these decadal surveys, some of the recommendations were directed to both NASA and a partner agency, such as the Department of Energy and National Science Foundation. See the respective decadal survey for each SMD division (reports hyperlinked below) for a full list of the recommendations.³⁴

Astrophysics Division

[2023 Astrophysics decadal survey](#): *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*

Below is a sample of five recommendations from that survey:

- NASA, NSF, and DOE should implement a cross-agency committee or working group tasked with establishing a consistent format and policy for regularly collecting, evaluating, and publicly reporting demographic data and indicators pertaining at a minimum to outcomes of proposal competitions.
- NASA, DOE, and NSF should consider including diversity—of project teams and participants—in the evaluation of funding awards to individual investigators, project and mission teams, and third-party organizations that manage facilities. Approaches would be agency-specific, and appropriate to the scale of the projects.
- The astronomy community should, through the American Astronomical Society in partnership with other major professional societies (e.g., American Physical Society, American Geophysical Union, International Astronomical Union), work with experts from other experienced disciplines (such as archaeology and social sciences) and representatives from local communities to define a Community Astronomy model of engagement that advances scientific research while respecting, empowering and benefiting local communities.
- The astronomy community should increase the use of remote observing, hybrid conferences, and remote conferences, to decrease travel impact on carbon emissions and climate change.
- The National Science Foundation, NASA, and the Department of Energy should release data on proposal success rates on an annual basis, and should track metrics that allow them to analyze statistically what is being supported.

³⁴ The sample of recommendations in this report are verbatim from how they appear in the decadal surveys. These recommendations use several acronyms that are not established in this report or within the recommendations. Those are NSF (National Science Foundation), DOE (Department of Energy), SOFIA (Stratospheric Observatory for Infrared Astronomy), NOAA (National Oceanic and Atmospheric Administration), USGS (U.S. Geological Survey), European Space Agency (ESA), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and Near-Earth Object (NEO).

Biological and Physical Sciences Division

2023 Biological and Physical Sciences decadal survey: *Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research*

Below is a sample of five recommendations from that survey:

- To retire many of the key scientific questions by the end of the decade, NASA should establish support for the Biological and Physical Sciences Program to levels that reflect the current national need and to build the science community in size, diversity of technical expertise and lived experience, and capability to reach the science goals of the nation, toward levels that are an order of magnitude above the current funding and well before the end of the decade.
- Because the nation benefits from global leadership in space science and technology, and given the emergence of commercial platforms that can be tasked to the nation's science, NASA should:
 - (a) Seek significant funding increases for biological and physical sciences with new monies or through rebalancing the portfolio across the Science Mission Directorate, and in coordination with other U.S. government agencies, as the community needs to grow significantly in size to reach the science goals of the nation;
 - (b) Actively engage commercial spaceflight firms, using science funding as a driver and with all due haste, to ensure that science needs are met with clear priority, guaranteeing that national science needs are enabled along with those of potential commercial customers using those platforms; and
 - (c) Ensure that the funded science community fully engages diversity and inclusivity in the pursuit of the nation's space exploration science priorities.
- NASA should work with other U.S. government agencies and other nations' space agencies to coordinate research resources toward the key scientific questions, as relevant to multiple agency missions.
- Because key questions identified in this study benefit from access to multiple spaceflight-related platforms, the Biological and Physical Sciences Program should:
 - (a) Coordinate funding opportunities with the Space Technology Mission Directorate such that access to the range of spaceflight and spaceflight-related platforms is efficiently employed to answer key science questions, especially those questions that inform technology development for space exploration; and
 - (b) Maintain a foundational approach to science, building through a strong, vibrant program of ground-based, suborbital, orbital, lunar, martian, and beyond missions.
- To maintain research campaign momentum, NASA should require external advisory committees to evaluate research campaign team progress and emergent technologies annually.

Earth Science Division

2018 Earth Science decadal survey: *Thriving on our Changing Planet: A Decadal Strategy for Earth Observation from Space*

Below is a sample of five recommendations from that survey:

- Earth science and applications are a key part of the nation’s information infrastructure, warranting a U.S. program of Earth observations from space that is robust, resilient, and appropriately balanced. NASA, NOAA, and USGS, in collaboration with other interested U.S. agencies, should ensure efficient and effective use of U.S. resources by strategically coordinating and advancing this program at the national level, as also recommended in the 2007 Earth Science and Applications from Space (ESAS) decadal survey.
- NASA should manage development costs for each flight program element (including the Program of Record committed to prior to this report), and for each project within the Designated program element, so as to avoid impact to other program elements and projects.
 - (a) Innovative cost reduction, through programmatic or technological advances and partnerships, should be sought and incentivized where possible.
 - (b) By the time of the Midterm Assessment, NASA should report on steps it has taken (e.g., use of innovative approaches or partnerships) to ensure cost-effective development in each program element, and if or how these steps translate to increased science opportunity across the program.
 - (c) NASA should consult its standing scientific advisory committees if the project cost of the Program of Record is expected to grow to consume more than \$3.6 billion in the FY 2018-2027 decade, if more than one mission in this decadal survey is delayed more than 3 years, or upon premature loss of a mission in the Program of Record or one required to make the measurements of this decadal survey.
 - (d) When appropriate, cost-effective, and consistent with recommended cost caps, NASA should consider instrument and mission designs that can increase science/applications return by combining Targeted Observables having common measurement technologies.
- NASA—with NOAA and USGS participation—should engage in a formal planning effort with international partners (including, but not limited to ESA, EUMETSAT, and the European Union via its Copernicus Program) to agree on a set of measurements requiring long-term continuity and to develop collaborative plans for implementing the missions needed to satisfy those needs. This effort to institutionalize the sustained measurement record of required parameters should involve the scientific community, and build on and complement the existing domestic and international Program of Record.
- NASA, NOAA, and USGS should reduce barriers to applied uses of remote-sensing research and seek innovative ways to accelerate the transition of scientific research into societal benefits.
- NASA, NOAA, and USGS should continue to advance data science as an ongoing priority within their organizations in partnership with the science/applications communities by (1) identifying best practices for data quality and availability; (2) developing data architecture designs that are effective and agile; and (3) exploring new data storage/dissemination strategies to facilitate more interdisciplinary collaborations.

Heliophysics Division

[2024 Heliophysics decadal survey](#): *The Next Decade of Discovery in Solar and Space Physics: Exploring and Safeguarding Humanity's Home in Space*

Below is a sample of five recommendations from that survey:

- National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) space weather research programs (such as NSF's Advancing National Space Weather Expertise [ANSWERS] and Research toward Societal Resilience and NASA's Heliophysics Space Weather Programs) should be targeted to prioritized space weather goals.
- As part of an overall increase in the Heliophysics Division budget, the National Aeronautics and Space Administration should grow the spaceflight element of the Space Weather Program to support larger stand-alone space weather demonstration missions with a cost cap comparable to the Heliophysics Small Explorers (i.e., approximately \$150 million in fiscal year 2024).
- NASA should consider space weather enhancements for all National Aeronautics and Space Administration (NASA) missions during preformulation and should look for opportunities to include space weather enhancements on other federal agency missions. Such investments could be realized through the NASA Heliophysics Space Weather Program.
- Funding agencies should expand the reach of solar and space sciences in education by expanding the definition of the National Science Foundation's "broader impacts/societal impacts" and the National Aeronautics and Space Administration's "broadening impacts" to specifically include developing solar and space science educational materials aimed at K–12 and college students.
- If there is insufficient funding to accomplish the entire research strategy, then NASA should implement decision rules in the following order:
 - (a) First, delay the start of the Living With a Star (LWS) Solar Polar Orbiter reference mission, and then
 - (b) Delay the start of the Solar Terrestrial Probes (STP) Links reference mission;
 - (c) Delay the Space Weather budget augmentation for space weather demonstration missions;
 - (d) Delay the announcement of opportunity for the next Explorer/Mission of Opportunity (but revert to the 3-year cadence after budget conditions become favorable again);
 - (e) Delay implementation of the community science modeling program;
 - (f) Delay the augmentation of the Heliophysics Research Program;
 - (g) Delay the development, implementation, or launch of the Dynamical Neutral Atmosphere–Ionosphere Coupling (DYNAMIC) STP mission; then
 - (h) Delay the development, implementation, or launch of the Geospace Dynamics Constellation (GDC) LWS mission.

Planetary Science Division

[2023 Planetary Science decadal survey](#): *Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology*

Below is a sample of five recommendations from that survey:

- The highest scientific priority of NASA's robotic exploration efforts this decade should be completion of Mars Sample Return as soon as is practicably possible with no increase or decrease in its current scope.
- Mars Sample Return (MSR) is of fundamental strategic importance to NASA, U.S. leadership in planetary science, and international cooperation and should be completed as rapidly as possible. However, its cost should not be allowed to undermine the long-term programmatic balance of the planetary portfolio. If the cost of MSR increases substantially (≥ 20 percent) beyond the \$5.3 billion level adopted in this report or goes above ~ 35 percent of the Planetary Science Division budget in any given year, NASA should work with the Administration and Congress to secure a budget augmentation to ensure the success of this strategic mission.
- NASA should maintain the Mars Exploration Program, managed within the Planetary Science Division, that is focused on the scientific exploration of Mars. The program should develop and execute a comprehensive architecture of missions, partnerships, and technology development to enable continued scientific discovery at Mars.
- Subsequent to the peak-spending phase of Mars Sample Return, the next priority medium class mission for the Mars Exploration Program should be Mars Life Explorer.
- The Planetary Science Division should execute a strategic program to accomplish planetary science objectives for the Moon, with an organizational structure that aligns responsibility, authority, and accountability.

APPENDIX C: MANAGEMENT'S COMMENTS

National Aeronautics and Space Administration

Office of the Administrator
Mary W. Jackson NASA Headquarters
Washington, DC 20546-0001



Reply to Attn of: Science Mission Directorate

TO: Deputy Assistant Inspector General for Audits

FROM: Deputy Associate Administrator for Science Mission Directorate

SUBJECT: Agency Response to OIG Draft Report, "NASA's Role in the Decadal Survey Process" (A-25-07-00-SARD)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report entitled, "NASA's Role in the Decadal Survey Process" (A-25-07-00-SARD), dated September 4, 2026.

In this draft report, the OIG found the design of the decadal survey process and NASA's approach have limited the Agency's ability to communicate information and provide feedback to the National Academies of Sciences, Engineering, and Medicine (NASEM) regarding the process. The OIG also found that NASA is not comprehensively tracking the progress, costs, and resources required for the decadal survey process, including mission concept study expenditures and the time spent working on decadal survey tasks. Further, the OIG found that NASA does not have consistent internal processes for supporting the development and management of decadal surveys, such as formal guidance, routine lessons learned, and sufficient resources needed to standardize common processes and share best practices across the Science Mission Directorate (SMD).

NASA appreciates the OIG section titled - "The Design of the Decadal Survey Process and NASA's Approach Limits Opportunities for Communication and Engagement." NASA values the independence of the NASEM Space Studies Board (SSB) in the decadal survey process. However, the independence of the decadal survey process and Federal contracting rules narrow the scope of appropriate Agency feedback. Feedback from NASA on draft decadal survey materials is limited to alignment with the requirements of the Statement of Task. SMD looks forward to engaging with NASEM on opportunities to improve collaboration in the future.

The OIG makes eight recommendations addressed to the Associate Administrator for SMD to improve NASA's role and oversight in the NASEM decadal surveys. Specifically, the OIG recommends the following:

Recommendation 1: Ensure all decadal survey task orders and statements of task include performance metrics and deliverables for progress and completed decadal survey reports.

Management's Response: NASA concurs with this recommendation. NASA acknowledges that setting explicit performance metrics and schedule milestones could offer potential benefit. However, the variety of discipline-specific needs precludes the adoption of uniform or 'one-size-fits-all' performance metrics for each decadal survey Statement of Task (SoT), so NASA will tailor each SoT to the needs of the specific discipline. NASA values the independence of the NASEM SSB in the decadal survey process. SMD will confer with NASEM SSB staff and leadership to develop performance metrics and schedule milestone requirements to future decadal surveys' SoT.

Estimated Completion Date: June 30, 2027.

Recommendation 2: Coordinate with NASEM to identify a means to provide interim reports and potential recommendations during development of the decadal survey and allow additional time for prepublication review of decadal survey reports.

Management's Response: NASA concurs with this recommendation. NASA values the independence of the NASEM SSB in the decadal survey process. NASA also acknowledges the potential benefit of periodic overviews or vector checks over the course of the decadal survey period, and recognizes that monitoring progress through milestones would require periodic check-ins. SMD will confer with NASEM SSB staff and leadership to discuss adding requirements for interim reporting to future decadal surveys' Statements of Task.

Estimated Completion Date: June 30, 2027.

Recommendation 3: Coordinate with NASEM to identify ways to streamline decadal survey development and the report timeline.

Management's Response: NASA concurs with this recommendation. NASA values the independence of the NASEM SSB in the decadal survey process. SMD will confer with NASEM SSB staff and leadership to identify and consider options for streamlining future decadal surveys' development timelines while retaining compliance with statutory requirements.

Estimated Completion Date: June 30, 2027.

Recommendation 4: Coordinate with NASEM to develop a plan and conduct routine formal lessons learned, to the extent practical, following the completion of decadal surveys.

Management's Response: NASA concurs with this recommendation. NASA values the independence of the NASEM SSB in the decadal survey process. As acknowledged in OIG's report, in 2012, NASEM brought together participants and stakeholders from its previous four decadal surveys for a "Lessons Learned in

Decadal Planning in Space Science” workshop. At SMD’s request, NASEM subsequently convened a committee to evaluate the issues that surfaced during the workshop and generate a “Survey of Surveys” report of lessons learned to improve the survey process, which was published in 2015. SMD will request that the NASEM SSB convene a follow-on, lessons-learned workshop in the Spring of 2027 and publish its results.

Estimated Completion Date: October 31, 2027.

Recommendation 5: To the extent practical, account for mission concept study costs and any other SMD division costs associated with the decadal survey process to better inform budgetary decision-making.

Management’s Response: NASA concurs with this recommendation. SMD will examine the feasibility of options for tracking costs associated with decadal survey processes (including the costs associated with staff time). If applicable and practical options are identified, SMD will incorporate them.

Estimated Completion Date: May 31, 2028.

Recommendation 6: To the extent practical, track and make available to SMD division personnel that work closely with NASEM the status of decadal survey recommendations to ensure accountability and strategic decision-making, and improve the feasibility and practicability of future decadal recommendations.

Management’s Response: NASA concurs with this recommendation. As noted in OIG’s report, NASA considers the content within decadal surveys, such as science objectives and prioritized observables, state of the profession assessments, and recommendations in Agency strategic planning efforts alongside Congressional direction and administration priorities. However, unlike Congressional direction, NASEM decadal survey recommendations do not impart binding or authoritative direction to the Agency. NASA carefully balances implementation of decadal survey recommendations with evolving administration priorities and Congressional appropriations throughout a decade. Each SMD Division reports semi-annually on its progress in mission formulation and development to the NASEM standing Committee for their discipline within the Agency as part of the annual Agency budget process and provides tracking of progress against prior decadal recommendations as part of materials presented to their midterm committees. SMD will refine internal guidance to ensure Division personnel assigned to decadal survey initiatives are appropriately informed of Agency implementation of previous NASEM decadal survey recommendations.

Estimated Completion Date: October 31, 2027.

Recommendation 7: Develop SMD-wide guidance to prepare for and respond to NASEM decadal surveys.

Management's Response: NASA concurs with this recommendation. SMD will update, revalidate, and re-issue its previously issued, now-expired internal Science Policy Directive guidance for responding to NASEM decadal surveys. SMD will also refine its existing lessons learned materials into internal guidance for preparing for NASEM decadal surveys.

Estimated Completion Date: October 31, 2027.

Recommendation 8: Develop a formalized plan to internally capture knowledge and establish formal routine lessons learned activities following the completion of each decadal survey.

Management's Response: NASA concurs with this recommendation. SMD will adapt existing lessons learned processes for application to decadal surveys. SMD will issue internal guidance requiring participation in lessons learned activities following completion of decadal surveys.

Estimated Completion Date: October 31, 2027.

We have reviewed the draft report for information that should not be publicly released. As a result of this review, we have not identified any information that should not be publicly released.

Once again, thank you for the opportunity to review and comment on the subject draft report. If you have any questions or require additional information regarding this response, please contact Luc Riesbeck at luc.h.riesbeck@nasa.gov or (202) 957-9022.

Mark
Clampin

Digitally signed by Mark
Clampin
Date: 2026.10.09
12:25:48 -04'00'

Dr. Mark Clampin
Deputy Associate Administrator for Science Mission Directorate

APPENDIX D: REPORT DISTRIBUTION

National Aeronautics and Space Administration

Administrator
 Deputy Administrator
 Chief of Staff
 Associate Administrator for Science Mission Directorate
 Director, Astrophysics Division
 Director, Biological and Physical Sciences Division
 Director, Earth Science Division
 Director, Heliophysics Division
 Director, Planetary Science Division

Non-NASA Organizations and Individuals

Office of Management and Budget
 Deputy Associate Director, Energy, Science, and Water Division
 Government Accountability Office
 Director, Contracting and National Security Acquisitions
 National Academies of Sciences, Engineering, and Medicine

Congressional Committees and Subcommittees, Chair and Ranking Member

Senate Committee on Appropriations
 Subcommittee on Commerce, Justice, Science, and Related Agencies
 Senate Committee on Commerce, Science, and Transportation
 Subcommittee on Aviation, Space, and Innovation
 Subcommittee on Science, Manufacturing, and Competitiveness
 Senate Committee on Homeland Security and Governmental Affairs
 House Committee on Appropriations
 Subcommittee on Commerce, Justice, Science, and Related Agencies
 House Committee on Oversight and Government Reform
 Subcommittee on Government Operations
 House Committee on Science, Space, and Technology
 Subcommittee on Investigations and Oversight
 Subcommittee on Research and Technology
 Subcommittee on Space and Aeronautics

(Assignment No. A-25-07-00-SARD)