

# NASA

## Office of Inspector General

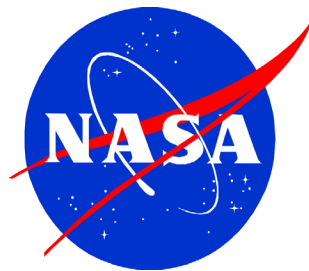


# Audit of NASA's Science, Technology, Engineering, and Math Engagement



April 25, 2024

IG-24-010



## Office of Inspector General

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# RESULTS IN BRIEF



## Audit of NASA's Science, Technology, Engineering, and Math Engagement

April 25, 2024

IG-24-010 (A-23-04-00-MSD)

### WHY WE PERFORMED THIS AUDIT

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NASA's success relies substantially on attracting and retaining a skilled and diverse workforce, including those in science, technology, engineering, and mathematics (STEM) occupations. At the end of 2023, approximately 63 percent of NASA employees worked in science and engineering occupations. According to the Bureau of Labor Statistics, between 2021 and 2031, jobs that require STEM skills will grow at a faster rate than other jobs. As an Agency dependent on skilled STEM workers, NASA remains at risk from a shortage of such staff due to increased competition for talent from the growing commercial space industry. Given the critical importance of a robust STEM workforce and anticipated future demands, NASA is deeply invested in cultivating the next generation of STEM professionals. To this end, NASA's Office of STEM Engagement (OSTEM) has a crucial role in advancing STEM education by enhancing STEM literacy; increasing diversity, equity, and inclusion in STEM; and preparing the future workforce.

OSTEM coordinates STEM engagement activities across NASA organizations, providing strategic guidance and direction. The office oversees the Agency's STEM engagement functions consisting of internships and fellowships, learning opportunities for students in and out of school, educator support, and grants and cooperative agreements to educational institutions. Additionally, OSTEM leads the STEM Engagement Council and manages four projects: the Minority University Research and Education Project; National Space Grant College and Fellowship Project; the Established Program to Stimulate Competitive Research (EPSCoR); and the Next Generation STEM Project. Collaborating with Mission Directorates and Centers, OSTEM develops STEM content and funds engagement activities.

NASA's STEM engagement efforts have faced significant challenges over the past two decades, including shifting administration priorities, declining budgets, and high turnover in leadership. For example, the President's budget request proposed eliminating the office for fiscal years (FY) 2018 through 2021, but Congress continued funding. In recent years, OSTEM has achieved greater stability, with consistent leadership and proposed budget increases since FY 2022. For FY 2023, OSTEM managed a \$143.5 million budget.

In this audit, we assessed whether NASA is effectively implementing STEM engagement activities and outreach efforts to meet strategic goals and objectives. To complete our work, we interviewed Agency officials from OSTEM, NASA Centers, and Mission Directorates. We reviewed documents from other federal agencies to benchmark their processes and procedures to advance STEM goals. Finally, we judgmentally sampled 20 OSTEM awards and tested them against agency grant and cooperative agreement criteria.

### WHAT WE FOUND

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OSTEM is making progress managing and coordinating a diverse group of STEM engagement activities across the Agency and continues to operate against a backdrop of uncertainty, with its efforts challenged by a history of budget cuts and proposed elimination of the office. However, we identified several areas for improvement in OSTEM operations. First, OSTEM's performance goals are unclear and lack robust metrics, making it difficult to correlate goals to outcomes or measure success. Additionally, defining STEM engagement activities can be challenging in a STEM-focused agency like NASA, and this can result in incomplete tracking of STEM engagement spending. We found OSTEM does not collect comprehensive cost or obligation data that would benefit decision-makers. OSTEM is developing a system called STEM Gateway to better track and provide oversight and transparency of the Agency's STEM activities. However, not all Mission Directorates plan to use the system, which will significantly impact the completeness of STEM engagement data

that NASA reports to Congress and other stakeholders. We also found the project plans for OSTEM's four projects generally included 15 of the 23 selected requirements but that risk assessments were incomplete and 8 other requirements were absent. Furthermore, we identified issues with OSTEM's monitoring of grants and cooperative agreements, including missing documentation in the grant and cooperative agreement files, insufficient post-award monitoring, and incomplete grant closeouts. Similarly, OSTEM does not track grant subrecipients, relying on prime recipients to ensure subrecipients are aware of award terms and conditions.

We found that NASA may not be directing funding for EPSCoR according to the project's design. EPSCoR aims to help institutions in eligible jurisdictions build capabilities and enhance their ability to secure federal research and development funding. NASA currently uses National Science Foundation criteria to determine which jurisdictions are eligible for EPSCoR funding, but several of these jurisdictions successfully compete for NASA research and development grant funding and already have competitive aerospace research capabilities. For example, NASA, by using National Science Foundation EPSCoR eligibility, is funding four NASA EPSCoR jurisdictions—Alabama, Hawaii, New Hampshire, and Oklahoma—that receive more than 0.75 percent of all NASA grants and cooperative agreements. Similarly, some jurisdictions not eligible under the National Science Foundation criteria do not compete as effectively for NASA funding. OSTEM officials explained they were not aware of the potential flexibilities governing NASA's EPSCoR jurisdictions and the use of the National Science Foundation jurisdictions for EPSCoR stemmed from a long-standing practice. In our view, NASA may be missing opportunities to invest limited resources in less competitive jurisdictions, and we estimate that \$12.6 million could be put to better use within EPSCoR over the next 5 years.

Finally, OSTEM is missing opportunities to target NASA's future workforce more directly. In 2021, NASA identified 19 mission critical workforce needs, including 12 in STEM fields. Despite identification of these critical needs, we found OSTEM could better align its engagement activities to help build the pipeline for NASA's future workforce and to advance NASA's missions. Instead, OSTEM designs engagement activities that focus on getting students interested in STEM nationally as opposed to NASA's specific needs. OSTEM also has limited engagement activities targeting future skilled technical workers—such as current and future community college or trade school students—and instead focuses mainly on K-12, undergraduate, and graduate-level programs. As the leader for the Agency's STEM engagement functions, OSTEM is uniquely positioned to use its expertise and resources to help address the Agency's future workforce needs.

## WHAT WE RECOMMENDED

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We made seven recommendations to improve NASA's STEM engagement activities. To the Associate Administrator for STEM Engagement, we recommended re-evaluating OSTEM's performance goals; developing a procedure to ensure OSTEM tracks and reports funding for all STEM engagement activities; applying relevant policy requirements to project plans; and developing a process to ensure mandatory reporting and monitoring for grants. We also recommended that the Administrator re-evaluate EPSCoR jurisdictions to ensure effective and equitable distribution of Agency funds. Finally, we recommended the Deputy Administrator require NASA organizations to capture STEM engagement activities in STEM Gateway and collaborate to identify NASA's critical workforce needs and target STEM engagement activities accordingly.

We provided a draft of this report to NASA management who concurred or partially concurred with our recommendations and described planned actions to address them. While the Agency disagreed with developing a plan to increase engagement activities aimed at skilled and technical workers as part of Recommendation 7, they will enhance career awareness activities aimed at these occupations. Our report emphasizes the impact a shortage of skilled technical workers would have on meeting NASA's mission, and we therefore encourage NASA to continue evaluating how their STEM engagement activities can further target skilled technical occupations. We consider management's comments responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions.

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# Acronyms

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ARMD	Aeronautics Research Mission Directorate
CoSTEM	Committee on Science, Technology, Engineering, and Math
DOD	Department of Defense
EPSCoR	Established Program to Stimulate Competitive Research
ESDMD	Exploration Systems Development Mission Directorate
FFATA	Federal Funding Accountability and Transparency Act of 2006
FY	fiscal year
GAO	Government Accountability Office
GCAM	NASA Grants and Cooperative Agreements Manual
GLOBE	Global Learning and Observations to Benefit the Environment
MSU	Montana State University
MUREP	Minority University Research and Education Project
NOAA	National Oceanic and Atmospheric Administration
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
NSF	National Science Foundation
NSSC	NASA Shared Services Center
OCHCO	Office of the Chief Human Capital Officer
OIG	Office of Inspector General
OMB	Office of Management and Budget
OSTEM	NASA Office of STEM Engagement
R&D	research and development
S&E	science and engineering
SEC	STEM Engagement Council
SMD	Science Mission Directorate
SOMD	Space Operations Mission Directorate
STEM	science, technology, engineering, and mathematics
STMD	Space Technology Mission Directorate
TRP	Technical Requirements Package
WBS	work breakdown structure

# INTRODUCTION

At NASA, attracting and retaining a highly skilled and diverse science, technology, engineering, and mathematics (STEM) workforce with varied technical and management skills is critical to the Agency's success. As of December 2023, NASA has 18,316 civil service employees working at its facilities nationwide, with approximately 63 percent working in science and engineering (S&E).<sup>1</sup> NASA is working to diversify its workforce, including those in STEM occupations, and has committed to recruiting and engaging talent with a variety of skills, capabilities, and backgrounds.

Approximately 7 percent of the U.S. labor force is made up of STEM occupations. The Bureau of Labor Statistics projects that between 2021 and 2031, jobs that require STEM skills will grow at a faster rate than other jobs. The STEM workforce includes individuals at all education levels who work in S&E, S&E-related, and middle-skill occupations.<sup>2</sup> According to the National Science Foundation, the United States no longer leads the world in science and engineering publications, patent activities, and many states have low concentrations of STEM workers. In addition, the STEM workforce has historically struggled with diversity. A Pew Research Center study found that STEM jobs have seen uneven progress in increasing gender, racial, and ethnic diversity with Black/African Americans, Hispanics, and women underrepresented.

As an agency dependent on skilled STEM workers to accomplish its mission, NASA remains at risk from a shortage of such staff as competition for talent increases with the growth of the commercial space industry. Given the need for a skilled STEM workforce and projected future needs, NASA has a vested interest in the nation's future STEM professionals. To this end, NASA's Office of STEM Engagement (OSTEM) is responsible for advancing progress toward the federal strategy of STEM education goals by enhancing STEM literacy; increasing diversity, equity, and inclusion in STEM; and preparing the STEM workforce for the future.

In this audit, we assessed whether NASA is effectively implementing STEM engagement activities and outreach efforts to meet the Agency's strategic goals and objectives. To complete our work, we interviewed Agency officials from OSTEM, Centers, and Mission Directorates. We reviewed documents from other federal agencies to benchmark their processes and procedures to advance STEM education goals. Finally, we judgmentally sampled 20 OSTEM awards and tested them against agency grant and cooperative agreement policy guidance criteria. Details of the audit's scope and methodology are outlined in Appendix A.

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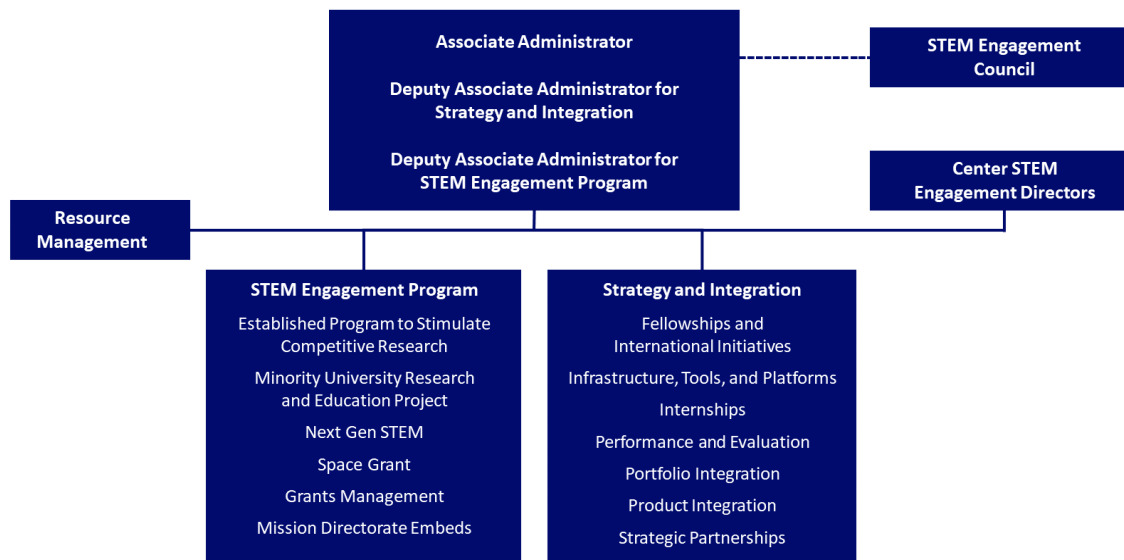
<sup>1</sup> Of the 11,591 NASA civil service employees working in S&E fields, 102 have no degree; 3 an associate degree; 4,791 a bachelor's degree; 4,266 a master's degree; and 2,429 a doctorate.

<sup>2</sup> Middle-skill occupations include a range of occupations that require a high level of scientific and technical knowledge and do not require a bachelor's degree for entry. Middle-skill STEM occupations are primarily in construction trades, installation, maintenance, and production.

# Background

OSTEM is responsible for coordinating STEM engagement efforts and activities across NASA organizations, including at Headquarters, the Centers, and five Mission Directorates.<sup>3</sup> The office leads the Agency’s STEM engagement function and provides strategic guidance and direction in partnership with the Agency’s Mission Directorates. OSTEM is led by an Associate Administrator who reports to NASA’s Deputy Administrator. As shown in Figure 1, OSTEM has two divisions: Strategy and Integration and the STEM Engagement Program. The Strategy and Integration division is responsible for developing educational tools that measure performance and for evaluating outcomes, tracking metrics, and managing internships and strategic partnerships. The STEM Engagement Program is responsible for managing the congressional appropriation of four STEM engagement projects and includes Mission Directorate embeds—representatives from the Mission Directorates that act as a bridge between their organization and OSTEM to achieve Agency-wide STEM engagement goals.<sup>4</sup> For fiscal year (FY) 2023, OSTEM managed a \$143.5 million budget, a 4.7-percent increase over FY 2022.

**Figure 1: OSTEM Organizational Chart**



Source: NASA

As the roadmap for the Agency’s STEM engagement work, the *NASA Strategy for STEM Engagement, 2020-2023* was published in 2020.<sup>5</sup> This roadmap is designed to drive requirements and alignment of all STEM engagement efforts. The document includes three STEM Engagement goals:

- STEM Engagement Goal 1.0: Create unique opportunities for a diverse set of students to contribute to NASA’s work in exploration and discovery.

<sup>3</sup> Mission Directorates include Aeronautics Research, Exploration Systems Development, Science, Space Operations, and Space Technology.

<sup>4</sup> Aeronautics Research Mission Directorate, Exploration Systems Development Mission Directorate, and Space Operations Mission Directorate have embedded positions.

<sup>5</sup> NASA, [NASA Strategy for STEM Engagement, 2020-2023](#) (April 29, 2020).



- STEM Engagement Goal 2.0: Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA’s people, content, and facilities.
- STEM Engagement Goal 3.0: Attract diverse groups of students to STEM through learning opportunities that spark interest and provide connections to NASA’s mission and work.

OSTEM also leads the STEM Engagement Council (SEC), the Agency’s governance body overseeing NASA’s STEM engagement functions and activities. Established in 2018, the SEC is tasked with ensuring a comprehensive strategy and coordinated Agency-wide approach to develop and deliver NASA’s STEM engagement efforts. Core membership of the SEC includes the Associate Administrator for STEM Engagement, the Deputy Associate Administrator for the STEM Engagement Program, Deputy Associate Administrator for Strategy and Integration, and representatives from the Mission Directorates, Centers, Office of Communications, Office of Legislative and Intergovernmental Affairs, as well as extended members from organizations such as the Office of the Chief Scientist and Office of the Chief Human Capital Officer. The SEC establishes annual priorities for the Agency STEM engagement portfolio, but Mission Directorates and NASA Centers maintain authority over their investments.

OSTEM’s activities include fellowships and internships; student learning opportunities (challenges and competitions); informal education; out-of-school learning activities; educational products, tools, and platforms; educator support; and competitive awards to educational institutions for research and development (R&D) and institutional support. According to OSTEM, in FY 2022, STEM engagement activities engaged over 78,000 educators and approximately 798,000 students and reached 333,000 other participants through NASA STEM engagement activities and educational content. OSTEM also awards grants and cooperative agreements in support of the STEM Engagement Program. The program’s activities, solicitations, and grant awards are driven by Mission Directorate priorities, relevant laws, administration priorities, and NASA’s *Strategy for STEM Engagement*. NASA’s STEM engagement activities are funded in one of three ways: (1) fully funded and led by OSTEM; (2) a cost-sharing agreement between OSTEM and another NASA organization (e.g., the Aeronautics Research Mission Directorate); or (3) fully funded and led by a NASA organization.

OSTEM is developing a system called STEM Gateway that is intended to provide oversight and transparency to the Agency’s STEM engagement activities. The system is designed to consolidate several key OSTEM functions, including reporting on performance metrics; communicating STEM engagement opportunities (e.g., internships, fellowships, experiential learning activities); receiving applications and making selections; monitoring internal management of engagements; and interacting with selected participants. With the implementation of STEM Gateway, OSTEM is replacing an outdated performance management system that was the focus of several findings and recommendations in a 2015 Office of Inspector General (OIG) report on NASA’s Office of Education.<sup>6</sup>

OSTEM also works with other federal agencies including the Committee on Science, Technology, Engineering, and Mathematics (CoSTEM) and the National Space Council’s STEM and Workforce Sub-Interagency Space Policy Committee.<sup>7</sup> CoSTEM was established in 2011 to coordinate federal programs and activities in support of STEM education. CoSTEM members develop and assess STEM education activities to ensure effectiveness and to reduce duplicative efforts. CoSTEM established a

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<sup>6</sup> NASA OIG, *NASA’s Education Program* ([IG-16-001](#), October 19, 2015).

<sup>7</sup> CoSTEM and the National Space Council’s STEM and Workforce Sub-Interagency Space Policy Committee comprise representatives from several departments and agencies. They also include representatives from councils and organizations under the Executive Office of the President.

5-year plan for STEM education (2018 to 2023) with the vision of a future where all Americans have lifelong access to high-quality STEM education and the United States is the global leader in STEM literacy, innovation, and employment.<sup>8</sup> The strategy focused on three goals: (1) Build Strong Foundations for STEM Literacy; (2) Increase Diversity, Equity, and Inclusion in STEM; and (3) Prepare the STEM Workforce for the Future. The next strategic plan update is scheduled to be published in 2024. OSTEM also works with the STEM and Workforce Sub-Interagency Space Policy Committee whose goal is to develop and facilitate the coordination and implementation of federal actions to grow and strengthen the space workforce.

## OSTEM History and Budget Uncertainty

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Multiple law and NASA organizational changes have affected the funding and priorities for OSTEM. For over two decades, NASA's STEM engagement efforts have faced significant challenges, including shifting priorities, declining budgets, and high turnover in leadership, with 11 Associate Administrators between 2002 and 2018. In 2002, in preparation for the Vision for Space Exploration strategy, NASA's education activities were elevated to an Agency-level organization, led by an Associate Administrator.<sup>9</sup> Other legislative activities affected NASA STEM engagement including the America COMPETES Reauthorization Act, signed in 2010, which stated that NASA should develop and maintain educational programs to increase student interest in STEM, improve public literacy in STEM, and provide curriculum and support materials.<sup>10</sup> Additionally, in 2011, the White House's Office of Science and Technology Policy established CoSTEM to coordinate federal programs and activities in support of STEM education as called for by the COMPETES Act of 2010. In 2013, President Obama's administration proposed federal government reorganization of STEM education. As a result, some NASA Mission Directorate STEM education investments were eliminated.

Prior to 2018, OSTEM was named the NASA Office of Education, and the responsibilities of STEM engagement activities shifted back and forth between the Centers and Headquarters. Starting in 2017, the Agency began establishing a governance model for its STEM activities, achieving several systemic, programmatic, and operational milestones, including establishing the SEC in 2018 and publishing the *NASA Strategy for STEM and Public Engagement (2018-2020)*.<sup>11</sup> However, the President's budget for FY 2018 proposed eliminating the office for the first time, and these proposals continued through FY 2021. Despite these proposed eliminations, Congress provided full funding for the office.

In 2019, the Agency formally established OSTEM, and it has been led by one Associate Administrator for the past 7 years. Through NASA's Mission Support Future Architecture Program initiative, the Agency transitioned several mission support organizations, including OSTEM, to an enterprise-level operating model in 2020. The transition moved OSTEM from Center-focused to Agency-focused STEM engagement initiatives. Whereas previously, 10 separate offices served regional areas, now NASA's Center-based OSTEM personnel report to Headquarters as an enterprise service, serving the entire

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<sup>8</sup> CoSTEM, *Charting a Course for Success: America's Strategy for STEM Education* (December 2018).

<sup>9</sup> Announced in 2004, the Vision for Space Exploration was the George W. Bush administration's policy to explore space and extend a human presence across the solar system. The policy set three goals: completing the International Space Station by 2010, developing and testing a new spacecraft, and returning to the moon by 2020.

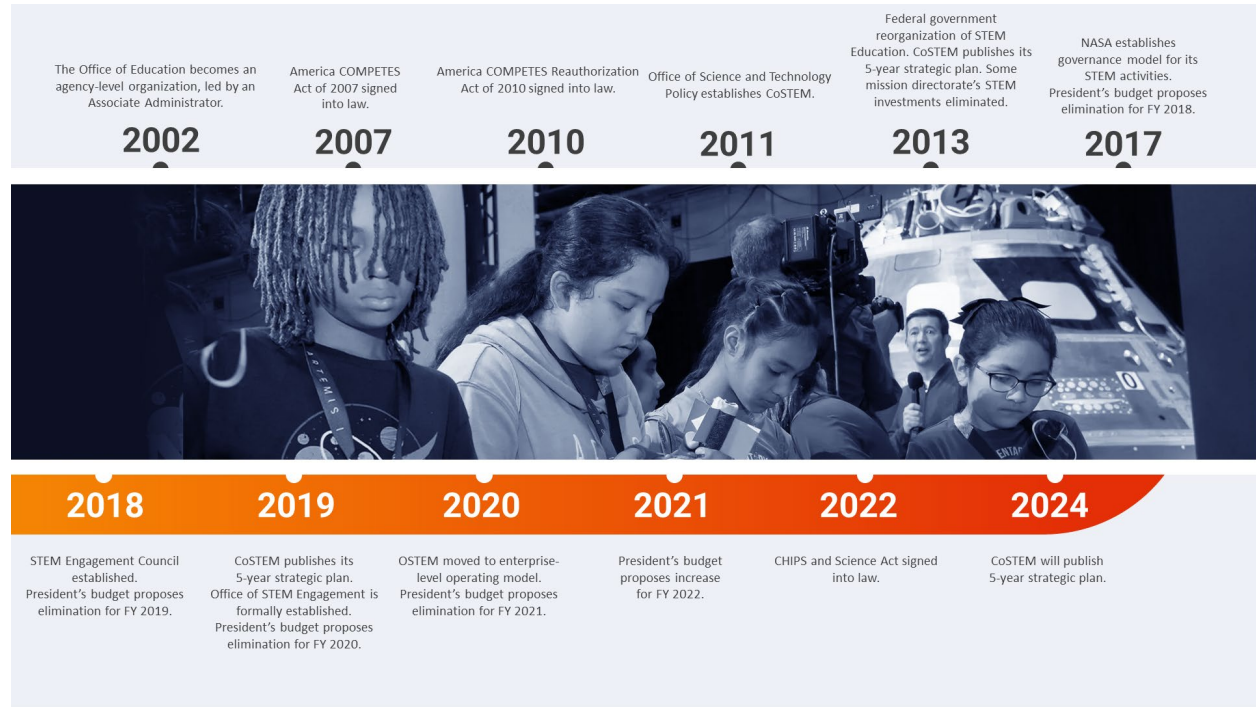
<sup>10</sup> The America COMPETES Reauthorization Act of 2010, Pub. L. No. 111-358 (2011).

<sup>11</sup> NASA, *Strategy for STEM and Public Engagement, 2018-2020* (2018).

United States. In 2022, through the CHIPS and Science Act, Congress directed the NASA Administrator to establish OSTEM to advance progress toward the STEM education goals of the United States.<sup>12</sup>

See Figure 2 for a timeline of select changes impacting the office.

**Figure 2: Timeline of Select Changes Affecting the Office of Education and OSTEM 2002-2024**

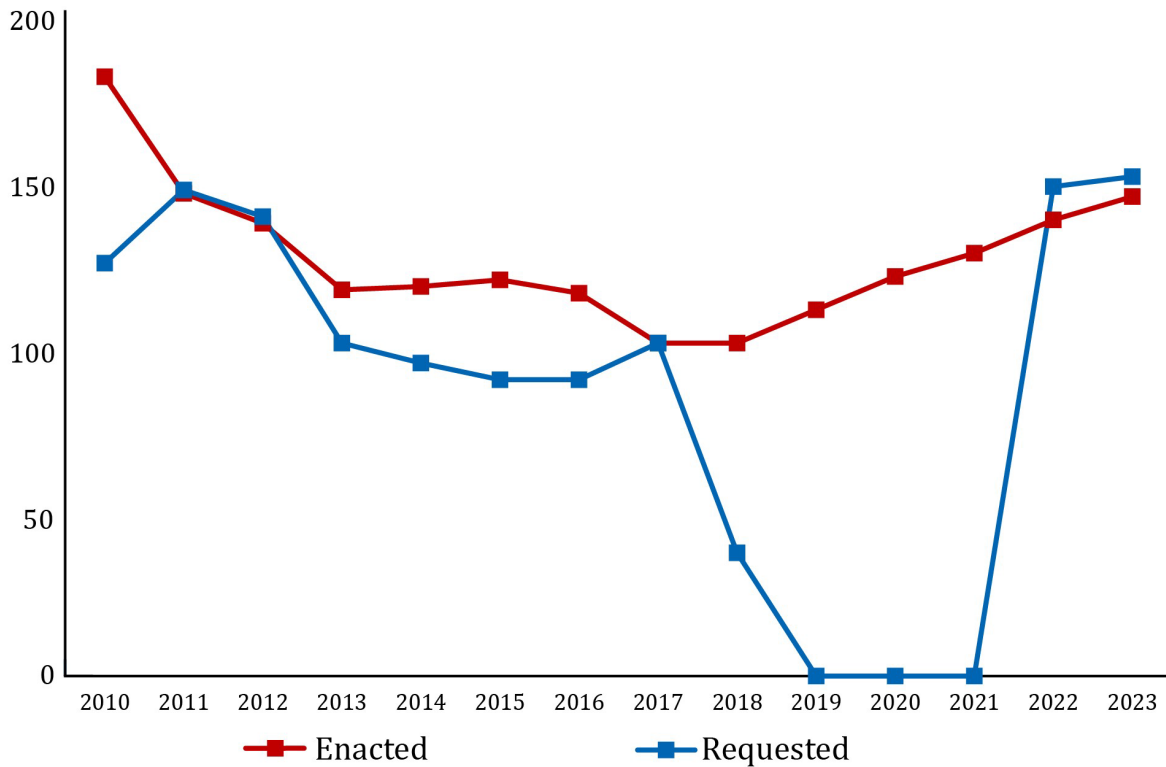


Source: NASA OIG representation of select Office of Education and OSTEM events.

Since 2022, the President's budget request has proposed increases for OSTEM, including \$157.8 million for FY 2024. However, Congress funded OSTEM below the requested amount during this same period. Moreover, OSTEM's budget uncertainty continued in FY 2024 as some proposed appropriations would have eliminated funding for two OSTEM projects. Figure 3 shows NASA's Office of Education and OSTEM budgets, requested and enacted, from 2010 through 2023.

<sup>12</sup> CHIPS and Science Act, Pub. L. No. 117-167 (2022).

**Figure 3: NASA’s Office of Education and OSTEM Budgets (in millions), 2010-2023**



Source: NASA

Note: From FY 2018 through 2021, proposed funding for the Office of Education/OSTEM was eliminated. FY 2018 proposed a nominal amount for closeout activities of the office.

## OSTEM Projects

The majority of OSTEM funding is dedicated to four projects within the STEM Engagement Program:

- Minority University Research and Education Project (MUREP) provides financial assistance via competitive awards to minority-serving institutions. These institutions recruit and retain underrepresented and underserved students, including women and girls and people with disabilities, into STEM fields. Funding for MUREP in FY 2023 was \$45.5 million.
- National Space Grant College and Fellowship Project (Space Grant) is a network of colleges and universities working to expand opportunities for Americans to understand and participate in NASA’s aeronautics and space projects. Space Grant is a workforce development project composed of 52 consortium members who fund fellowships, internships, and scholarships for students pursuing careers in STEM. The project members also participate in curriculum enhancement and faculty development and administer education projects in their states. Funding for Space Grant in FY 2023 was \$58 million.<sup>13</sup>
- Established Program to Stimulate Competitive Research (EPSCoR) creates partnerships with government, higher education, and industry. EPSCoR provides seed funding to enable

<sup>13</sup> The National Space Grant College and Fellowship Act, Pub. L. No. 100-147 (1987), directed NASA to establish the National Space Grant College and Fellowship Program.

jurisdictions to make lasting improvements in a region's infrastructure and R&D capacity. Twenty-five states, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, and Guam currently participate, and six federal agencies, including NASA, conduct EPSCoR or EPSCoR-like programs. NASA funding for EPSCoR in FY 2023 was \$26 million.<sup>14</sup>

- Next Generation STEM Project (Next Gen STEM) is an integrated portfolio of grants, partnerships, activities, educational products, and student engagement opportunities designed to connect NASA's missions, programs, people, and STEM content primarily to a K-12 student audience. Funding for Next Gen STEM in FY 2023 was \$14 million.

From FY 2018 to FY 2022, OSTEM averaged 535 active grant and cooperative agreements per year with over \$86.2 million spent. Grant monitoring serves as the primary mechanism for NASA to ensure that recipients comply with applicable federal laws, rules, regulations, program guidance, and requirements. The NASA Grants and Cooperative Agreements Manual (GCAM) is NASA's policy guide to NASA grant officers, technical officers, program managers, and all other award-management personnel to implement government-wide and NASA-specific regulations for awarding and administering grants and cooperative agreements.

All OSTEM grant and cooperative agreements are processed, awarded, managed, and administered by the NASA Shared Services Center (NSSC). NSSC is responsible for awarding and administering grants and cooperative agreements to nonprofit organizations; processing successor grant awards; awarding and administering unsolicited and single-source proposals resulting in a grant or cooperative agreement; and receiving all annual and final reports from recipients. Although the NSSC issues and administers all awards, OSTEM technical officers manage the programmatic, scientific, and technical aspects of OSTEM program awards. The GCAM requires program offices, in this case OSTEM, to identify funding; solicit, evaluate, and select proposals; and monitor awards to ensure performance goals are met and deliverables are achieved.

NASA's STEM engagement efforts are structured around NASA's mission and capabilities. The four OSTEM projects work closely with NASA's Mission Directorates and Centers. Generally, OSTEM brings STEM engagement expertise, while Mission Directorates and Centers provide NASA-specific content and technical expertise. The Mission Directorates further support OSTEM by providing subject-matter experts, speakers, and technical advisors. Figure 4 shows the matrix of STEM engagement activities related to human space flight (those within the Exploration Systems Development Mission Directorate (ESDMD) and Space Operations Mission Directorate (SOMD)). Although not shown below, similar funding relationships apply to STEM engagement activities for the Science Mission Directorate (SMD), Space Technology Mission Directorate (STMD) and Aeronautics Research Mission Directorate (ARMD).

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<sup>14</sup> The NASA Authorization Act for FY 1993, Pub. L. No. 102-588 (1992) directed NASA to establish EPSCoR. In addition to NASA, five other federal agencies administer EPSCoR: Department of Energy, Department of Agriculture, Department of Defense, the National Institutes of Health, and the National Science Foundation. The last two agencies have the largest EPSCoR programs.

**Figure 4: NASA OSTEM and Human Space Flight Related STEM Engagement Activities as of FY 2023**



Source: NASA

OSTEM coordinates with Mission Directorates through its four projects. For example, MUREP and SMD’s Earth Science Division jointly produce and fund the Ocean Biology and Biogeochemistry activity to increase the capacity of minority-serving institutions in Earth science and climate-related research by connecting them with SMD experts on key climate issues. Likewise, EPSCoR relies on Mission Directorate experts to staff grant review panels, and Next Gen STEM’s Moon team collaborates with Mission Directorates to create lessons for students in fifth to eighth grade that are engaging as well as technically sound. As part of the Space Grant Artemis Student Challenges, NASA awarded approximately \$2.4 million in grants to six universities to administer student activities aligned with the Artemis campaign.<sup>15</sup> OSTEM leads the student challenges with cost-sharing support from the Mission Directorates that lead NASA’s Artemis efforts. For example, one challenge involves developing a lunar/Martian lander using existing technology while another develops resources and materials to enable spacecraft to transfer from Earth orbit to Earth-lunar orbit, and later on to Mars.

<sup>15</sup> The Artemis campaign seeks to return humans to the Moon’s surface in 2026 before sending crewed missions to Mars in the 2030s.

# NASA'S STEM ENGAGEMENT EFFORTS ARE EVOLVING BUT REQUIRE MORE SPECIFIC GOALS AND IMPROVED OVERSIGHT OF GRANTEES

NASA's OSTEM is making progress managing and coordinating a diverse group of STEM engagement activities across the Agency. However, OSTEM continues to operate against a backdrop of uncertainty, with its efforts challenged by a history of budget cuts and proposed elimination of the office. Nevertheless, OSTEM can improve in several areas: clarity in performance goals; tracking all activity spending; establishing and sustaining the STEM engagement system; creating complete project plans; improving award monitoring; and tracking grant subrecipients. We also identified a need for NASA to re-evaluate the jurisdictions eligible to receive EPSCoR funds, resulting in \$12.6 million over 5 years that could be put to better use within EPSCoR. Addressing these issues will help OSTEM continue its positive trajectory in supporting federal STEM education priorities and improve strategic alignment of the Agency's STEM engagement.

## OSTEM's Performance Goals are Unclear and Lack Robust Metrics

The OSTEM performance goals in the *NASA 2022 Strategic Plan* are unclear and not sufficiently defined to be understood throughout the NASA STEM community, including members of the SEC, Mission Directorates, and Centers.<sup>16</sup> NASA produces a strategic plan every 4 years to outline the long-term direction for Agency activities.<sup>17</sup> Because of proposed elimination of STEM engagement activities and funding in the President's budget requests for FYs 2018 through 2021, NASA did not include OSTEM in its *2018 Strategic Plan*. As a result, OSTEM developed its own strategy in 2018 and published an updated version in 2020.<sup>18</sup> Three performance goals were developed as part of the *NASA Strategy for STEM Engagement*, published in 2020 and, as shown in Figure 5, the three performance goals were later incorporated in the *NASA 2022 Strategic Plan*.

Federal criteria require clearly defined performance goals; specifically, goals and indicators should reflect analysis of an agency's problems and opportunities to advance its mission, factors affecting outcomes, agency capacity, and priorities.<sup>19</sup> While we are encouraged by NASA incorporating OSTEM goals in the Agency's *2022 Strategic Plan*, in our view it is difficult to correlate OSTEM's performance goals to separate outcomes because the goals are very similar, as Figure 5 illustrates. All three goals are

<sup>16</sup> In the *NASA Strategy for STEM Engagement*, OSTEM refers to their goals as strategic goals. These goals were subsequently adopted as performance goals in the *NASA 2022 Strategic Plan*, as part of NASA's Performance Planning and Reporting processes. For the purposes of this report, we will use the term performance goals.

<sup>17</sup> NASA, [2022 Strategic Plan](#), (March 28, 2022).

<sup>18</sup> NASA, *Strategy for STEM and Public Engagement, 2018-2020*; [NASA Strategy for STEM Engagement, 2020-2023](#).

<sup>19</sup> Office of Management and Budget (OMB) Circular A-11, *Preparation, Submission, and Execution of the Budget* (August 11, 2023).

focused on developing opportunities for students to partake in education activities at NASA. However, because the goals are so similar, it is difficult to differentiate how OSTEM projects could achieve one specific goal when a project could accomplish all three goals with one activity. Additionally, the indicators used to track progress toward a goal or target within a timeframe could be interchangeable and, therefore, make it difficult to attribute outcomes and assess impacts of each individual performance goal.

**Figure 5: NASA STEM Engagement Strategic Objectives and Similar Goals (as of January 2024)**

**NASA Strategic Objective 4.3**  
Build the next generation of explorers. Engage students to build a diverse future STEM workforce.

**NASA STEM Engagement Goals**

1. Create **unique opportunities** for a **diverse set of students** to contribute to **NASA's work** in exploration and discovery.
2. Build a **diverse** future STEM workforce by engaging **students** in authentic **learning experiences** with **NASA's people, content and facilities**.
3. Attract **diverse groups of students** to STEM through **learning opportunities** that spark interest and provide connections to **NASA's mission and work**.

Source: NASA OIG representation of Agency STEM engagement goals.

OSTEM officials acknowledged the performance goals may appear similar but stated that they are applied differently. These officials stated that the first goal concentrates on student participation in OSTEM projects like Space Grant, the second goal ensures that all parts of NASA are contributing through internships, and the third goal focuses on sparking interest in STEM. While this may be the intent, such differences are not clear in the goals themselves.



To help better understand the purpose of NASA’s STEM engagement goals, we reviewed the STEM goals of two other federal agencies. The Department of Defense (DOD) STEM organization’s mission is to inspire STEM talent through opportunities to enrich the current and future DOD workforce. The National Oceanic and Atmospheric Administration (NOAA) Office of Education’s mission is to inspire the nation’s use of science toward improving ocean and coastal stewardship, increasing safety and resilience to environmental hazards, and preparing a future workforce to support NOAA’s mission. We found these agencies’ goals are more clearly defined, with distinct themes for each goal.

#### DOD and NOAA STEM Goals

DOD STEM strategic goals focus on specific themes:

- Community engagement
- Workforce
- Underserved communities
- Efficiency/Effectiveness

NOAA education goals highlight five focus areas:

- Science-informed society
- Conservation
- Readiness/Responsiveness
- Future workforce
- Organizational excellence

Because the SEC establishes priorities for the Agency’s STEM engagement portfolio, we surveyed SEC members to gauge their understanding of NASA’s STEM performance goals and OSTEM’s collaboration with stakeholders.<sup>20</sup> We found that officials within NASA’s STEM community struggle with the similarity of the performance goals and STEM definitions. Specifically, 75 percent of respondents believed that the STEM engagement performance goals were “very similar” or “somewhat similar” to each other. One survey respondent commented that “STEM engagement” is not a well-understood term and that it is open to interpretation. Another commented that it has been a struggle to find the role of NASA in STEM education and to measure the impact of NASA’s STEM engagement investments. While over 80 percent of the respondents stated that they had a “clear” or “very clear” understanding of the goals, an SEC member noted that STEM can be very difficult to define and that it is something the Agency has struggled to define for many years. Unclear goals make it difficult to assess the impact and outcomes of STEM engagement activities across the Agency, and NASA would benefit from performance goals that have separate focus areas and indicators that clearly align with those areas. The SEC is facilitating the development of a STEM implementation plan, which they plan to align with the new Federal Strategy for STEM Education that will be published in 2024. According to OSTEM officials, the implementation plan will further explain how performance goals will be met in the *NASA Strategic Plan*.

In addition to the goals being similar, we also found that the metrics used to measure impacts are not robust. OSTEM’s Performance and Evaluation function, which is part of the Strategy and Integration division, conducts performance assessments to determine progress in meeting the goals. In FY 2022, OSTEM achieved 100 percent of its OSTEM performance goals based on the metrics in the *NASA Volume of Integrated Performance*.<sup>21</sup>

Federal requirements state that agencies are expected to set ambitious goals that push them to achieve significant performance improvements beyond current levels.<sup>22</sup> The GPRA Modernization Act requires

<sup>20</sup> We surveyed 25 SEC members and received 8 survey responses.

<sup>21</sup> NASA’s *Volume of Integrated Performance* is published annually to comply with the performance reporting and accountability requirements described in the Government Performance Results Act Modernization Act, Pub. L. No. 111-352 (2011). The information reported on in the *Volume of Integrated Performance* aligns with the *NASA 2022 Strategic Plan*.

<sup>22</sup> OMB A-11.

performance goals to include a performance indicator, target, and time period and be expressed in an objective, quantifiable, and measurable form.<sup>23</sup> We found that the indicators and targets set by OSTEM for two out of three performance goals are not ambitious. For example, in FY 2022, the target for the first performance goal was 1,800 paper presentations and publications resulting from higher education students' engagement in STEM engagement investments. OSTEM exceeded this goal with a total of 3,413 peer-reviewed publications, technical papers, and presentations. In our view, exceeding the target by almost 90 percent indicates OSTEM is not setting sufficiently robust targets to achieve metrics beyond current performance levels.

Additionally, the indicators and targets for the second performance goal are based on meeting or exceeding national averages for student diversity for internships. In FY 2022, NASA exceeded the national averages in three of four diversity categories. It is unclear if exceeding those national averages is an ambitious goal for NASA based on previous internship demographics or if they are simply maintaining the status quo. In our opinion, targets for this performance goal could be more insightful if they were based on historical NASA internship and engagement participant data rather than national averages. By focusing on historical NASA data, OSTEM could measure how NASA internship demographics change over time and adjust recruitment strategies as necessary.

## NASA Does Not Track All Agency STEM Engagement Spending

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OSTEM creates an annual planning document that collects information on the Agency's STEM engagement activities through a manual data call. This document includes descriptions of activities, participant types, and primary sponsors, but does not include spending data for all activities. For FYs 2023 and 2024, OSTEM is individually or jointly responsible for 46 STEM engagement activities.<sup>24</sup> OSTEM also tracks 48 primarily Mission Directorate activities, for a total of 94 Agency STEM engagement activities. These counts vary year to year as does the level of financial and management responsibility between OSTEM, Centers, and the Mission Directorates. While OSTEM tracks 23 categories of data, such as the type of beneficiary and number of participants for each of the 94 STEM activities, the office has elected to focus on identifying areas of overlap and opportunities for collaboration rather than tying funding to specific STEM engagement activities across the Agency. See Appendix B for a list of the data categories OSTEM tracks.

OSTEM is unable to fully meet its responsibility to report quality information for NASA's STEM portfolio because its annual aggregation of STEM engagement activities does not have cost or obligation data, critical pieces of information that would benefit decision-makers. As highlighted in a report by the Government Accountability Office (GAO), metrics promote greater public awareness regarding the effectiveness of the nation's STEM education programs.<sup>25</sup> Including investment data in NASA's STEM engagement activities would improve transparency and provide Congress and other stakeholders a more complete picture of the Agency's efforts.

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<sup>23</sup> Pub. L. No. 111-352.

<sup>24</sup> In March 2022, the SEC approved the activities for FYs 2023 and 2024.

<sup>25</sup> GAO, *Science, Technology, Engineering, and Mathematics Education: Actions Needed to Better Assess the Federal Investment* ([GAO-18-290](#), March 23, 2018).

While OSTEM does not track funding for all STEM engagement activities, some financial information is now reported because Congress indicated that the ability to associate activities with investments informs its oversight function. The America COMPETES Reauthorization Act of 2010 directs the CoSTEM Director to transmit an annual report to Congress that includes a description of STEM education programs, activities, and the levels of funding for each participating federal agency.<sup>26</sup> Table 1 shows the data NASA reports through CoSTEM that appears as a list of STEM education investments and funding levels provided to the Office of Management and Budget (OMB) during its 2022 data call on federal STEM education programs.

**Table 1: Selected NASA Data from CoSTEM FY 2022 Report to OMB (in millions of dollars)**

Name of Investment	FY 21 Actual	FY 22 Estimate
MUREP	\$38.0	\$43.0
Space Grant	51.0	54.5
Next Gen STEM	12.0	13.5
Robotics Alliance Project	4.0	4.0
Science Activation	45.6	50.6
The Global Learning and Observations to Benefit the Environment (GLOBE) Program	6.9	6.9

Source: CoSTEM 2022 Annual Report.

Note: OSTEM’s EPSCoR is not reported in the CoSTEM annual report. Robotic Alliance, Science Activation, and GLOBE are SMD activities.

There are three interrelated reasons that NASA is not capturing all STEM engagement cost information. First, some Mission Directorates do not identify STEM engagement funds separately from other mission funding. Secondly, as SEC members indicated in our survey, there are challenges in defining and identifying what is or is not a STEM engagement activity when the Agency’s mission is science focused. Finally, Mission Directorates are hesitant to identify STEM engagement funding information, given past budget cuts to these activities.

Mission Directorate officials stated that collecting cost and obligation data can be challenging because in some cases the STEM engagement funding is intermixed with other mission activities, and there are no distinct work breakdown structure (WBS) codes in the financial accounting system to use for STEM engagement activities. The purpose of a WBS is to subdivide the project’s work content into manageable segments to facilitate planning and control of cost, schedule, and technical content, which allows flexibility in tracking costs and obligations. All NASA projects have the capability of subdividing the work content to the coding level necessary for management and insight, yet not all Mission Directorates are tracking STEM engagement costs. Table 2 below shows the Mission Directorates’ current tracking of these costs.

<sup>26</sup> Pub. L. No. 111-358.

**Table 2: STEM Engagement Activity and Cost Tracking by Mission Directorate (as of October 2023)**

Mission Directorate	STEM Engagement Activity Obligation and Cost Tracked	Notes
ARMD	No	No specific WBS code related to STEM engagement activities in financial system.
STMD	Partial	Only some activities have a WBS code in financial system.
SMD	Partial	Only some activities have a WBS code in financial system. The three activities reported to CoSTEM have WBS codes and are tracked. <sup>a</sup>
ESDMD and SOMD	Yes	Amounts can be provided and do have their own WBS code for tracking in financial system.

Source: OIG analysis of NASA information.

<sup>a</sup> Science Activation, Robotics Alliance, and GLOBE are specifically mentioned in the annual budget request and are in the CoSTEM report with funded amounts.

Some Mission Directorate officials noted that even if they used WBS codes specific to STEM activities, they face additional challenges identifying distinct STEM activities as opposed to routine NASA activities. Because of the nature of NASA’s work, there is not always a clear delineation between activities supporting national STEM education priorities and the Agency’s mission. As one Mission Directorate official stated, “everything we do is STEM related.” While we acknowledge that separating STEM engagement activities from NASA’s mission can be challenging, NASA’s Mission Support Future Architecture Program defined STEM engagement as all of NASA’s efforts to attract, engage, and educate students and support educator institutions. Similarly, Congress stated in the 2022 NASA Authorization Act that a STEM activity is an opportunity for inspiring public engagement in STEM and increasing the number of students pursuing STEM degrees and careers.<sup>27</sup> Moreover, NASA has shown an ability to make these delineations by identifying at least 94 such activities.

We found that the primary reason that funds are not tracked is that Mission Directorates believe that there is a risk of losing funds if STEM engagement activities are specifically identified. These fears are founded on historical and current budget instability for STEM programs, including the 4 years between FYs 2018 through 2021 when OSTEM’s budget faced proposed reduction or elimination in the President’s budget request. OSTEM budget uncertainty has contributed to reduced transparency into NASA’s STEM engagement spending.

## **STEM Gateway Will Not Reach Its Full Potential Without Participation from All NASA STEM Engagement Partners**

OSTEM is transitioning from a primarily manual process of collecting and reporting STEM engagement activities data to an automated system—STEM Gateway. During the initial development of STEM Gateway, OSTEM worked with STEM engagement managers to understand their needs and to identify core functions. OSTEM is required to coordinate STEM engagement efforts and activities across the

<sup>27</sup> Pub. L. No. 117-167.

core functions. OSTEM is required to coordinate STEM engagement efforts and activities across the Agency, including NASA Headquarters, Mission Directorates, and NASA Centers. Specifically, OSTEM must coordinate and administer its four main projects and any STEM engagement activity the Administrator considers appropriate.<sup>28</sup> According to the NASA Deputy Administrator, STEM Gateway is the key to assessing OSTEM's performance. The STEM Gateway system is made up of five primary components; four are currently online, and one is partially available. The system is expected to be fully functional by FY 2025. OSTEM officials estimate the system will cost approximately \$3.3 million per year over the next 5 years for operations and maintenance.

MUREP and Space Grant are piloting STEM Gateway functionality with available system components. MUREP used the universal application system to receive applications and registrations for internships and college and pre-college experiences. In the next Space Grant solicitation, all 52 Space Grant consortium members will be required to use STEM Gateway for their annual performance reporting. Although STEM Gateway is in its early stages, OSTEM anticipates projects will benefit from the increased performance and evaluation data that the system collects. OSTEM's Performance and Evaluation Team is using STEM Gateway to aggregate data and metrics for current engagements. According to the NASA Deputy Administrator, STEM Gateway is at the forefront of NASA's collaborative business processes that are designed to improve partnerships within the agency.

However, even with the capability to measure, track, and aggregate STEM engagement activities and participation data across the Agency, OSTEM does not have direct authority to require NASA organizations to use STEM Gateway. Four Mission Directorates (ARMD, ESDMD, SOMD, and STMD) plan to use the system to capture their STEM engagement activities and investments, however, SMD officials explained they do not plan on using STEM Gateway now or in the future. SMD officials have stated that there are very few functions within STEM Gateway they could use, and they do not believe it is practical for their mission needs.

SMD electing not to use STEM Gateway will significantly impact the completeness of the STEM engagement data that NASA reports to Congress and other stakeholders. Federal agencies are required to share how they are maximizing outcomes of federal STEM education investments and activities.<sup>29</sup> As noted previously, in its 2022 annual report to CoSTEM, NASA reports on six STEM engagement projects: (1) MUREP; (2) Next Gen STEM; (3) Space Grant; (4) GLOBE; (5) Robotics Alliance Project; and (6) Science Activation. Three of these projects—GLOBE, Robotics Alliance Project, and Science Activation—are funded by SMD (see Table 2). Since SMD has stated they will not use STEM Gateway, only three of the six major STEM engagement projects will be tracked in the STEM Gateway system. This is significant given that SMD's Science Activation budget was \$50.6 million in FY 2022, comparable to the amount received by Space Grant (\$54.5 million in FY 2022) and MUREP (\$43 million in FY 2022). Because this significant STEM engagement investment will not be included in STEM Gateway, the system will not accurately reflect the status of all the Agency's STEM engagement activities.

Additionally, OSTEM does not intend to use STEM Gateway to monitor financial information for STEM engagement activities Agency wide. Without adequate insight into Agency STEM engagement spending along with all STEM engagement activity data being captured, the public and decision-makers will not be able to fully assess the efficiency and effectiveness of NASA's STEM engagement investments. The lack of spending information could inhibit the functionality and usefulness of the new STEM Gateway

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<sup>28</sup> Pub. L. No. 117-167.

<sup>29</sup> CoSTEM, *Charting a Course for Success: America's Strategy for STEM Education*.

system. For example, the system could potentially allow for comparative advanced metrics that include activity output per investment dollars, but only if that data is available. OSTEM management should be in a position to communicate complete and accurate funding data for the Agency's STEM engagement activities so decision-makers, including Congress, can make decisions on national investments. In our opinion, if all NASA organizations used STEM Gateway to track the Agency's STEM engagement activities, the system would provide greater transparency and oversight of these investments. Without collecting spending and other data from all participants in STEM Gateway, NASA STEM engagement metrics and outcomes are not complete or as impactful.

## OSTEM Project Plans Are Missing Key Elements

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To help manage its STEM engagement activities, OSTEM created a Program Plan and four Project Plans, one for each project. Using these plans, OSTEM documented its approach to planning, tracking progress, and accomplishing STEM engagement objectives. Because there is no definitive NASA project management policy specific to OSTEM projects, OSTEM tailored the Agency's project management requirements, designed for research and technology programs, to apply to its program and four projects.<sup>30</sup>

We found the four project plans for EPSCoR, Next Gen STEM, MUREP, and Space Grant generally included 15 of the selected 23 requirements and applicable elements to manage the projects and underlying activities. See Appendix A for how we selected these 23 requirements from the policy directive.<sup>31</sup> We reviewed a selection of requirements found in project plans, including a strategic acquisition process, establishing cost and schedule estimates, defining and tracking outputs, independent reviews, and ensuring awardees are following procedures. However, we noted that risk assessments were incomplete, and eight other requirements were largely absent. OSTEM tailored the project plans to meet the specific aims of its projects, but they did not justify or document their decisions on what changes were made to certain requirements or why eight of the requirements we selected were not included.

The project plans were missing one critical element in the risk assessments. Risk assessments are NASA's formal processes for managing risk with clear accountability for risk acceptance by the responsible authoritative individual with signed documentation of the rationale and concurrence. All four projects identified risks and documented their risk assessments; however, although budget was shown as a top risk, none of the projects developed a response strategy or included the risk within the project's risk matrix. In our opinion, if budget is a top risk, it should be assessed and have a risk response, especially given the history of OSTEM's budget uncertainty over the years. A risk response may range from complete acceptance to some mitigation of risk with triage under various scenarios, to proactive steps that could reduce the risk, or some combination of these steps.

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<sup>30</sup> OSTEM primarily used NASA Procedural Requirement (NPR) 7120.8A, *NASA Research and Technology Program and Project Management Requirements* (September 14, 2018). Other applied project policies include NPR 7123.1D, *NASA Systems Engineering Processes and Requirements* (July 5, 2023); and NPR 7120.7A, *NASA Information Technology Program and Project Management Requirements* (August 17, 2020).

<sup>31</sup> NASA Policy Directive (NPD) 7120.4E, *NASA Engineering and Program/Project Management Policy* (June 26, 2017), provides the statements of policy, principles, and responsibilities for program and project management that are expanded on in project management NPRs.

In addition, we identified eight missing requirements from the policy directive related to life-cycle reviews, software, technical standards to assess performance—such as metrics, training, dissenting opinions—and the lessons learned process:

- Three requirements were related to how NASA projects and programs are managed based on a phased life cycle with key decision points, where readiness is assessed by a decision authority and reviewed by a governing management council. The underlying activities of OSTEM projects are in different phases of the life cycle, and not documenting the projects' readiness to move forward can create ambiguity in the application of NASA requirements.
- The four project plans we reviewed did not always note a software engineering approach. Specifically, project plans did not indicate how the projects will use or develop STEM Gateway.
- Four projects noted the criticality of metrics, but three of the four did not describe their metrics, where they are captured, or how they are shared. Technical requirements, such as metrics, are critical for management to assess awardee performance and ensure quality throughout the project life cycle.
- Four project plans noted federally mandated security training. However, the plans did not record any other critical training types such as project management and grant oversight.
- One project plan included information on the dissenting opinions process. A dissenting opinion process typically includes lessons learned and internal processes/plans disagreements and is part of the Agency's culture. Projects must describe the process to evaluate and share lessons learned as part of the dissenting opinions process. This is an important control to ensure efficiency and effectiveness of the award process. Moreover, this process ensures project members know how to raise concerns and feel comfortable doing so.

As a mission support function, OSTEM does not frequently develop project plans. The missing requirements are a result of tailoring existing policies to develop an OSTEM-specific project plan. By not including all required and applicable NASA project management policy, OSTEM runs the risk of project plans not having the information needed to properly plan, track progress, accomplish objectives, and complete life-cycle reviews. Each of these elements contribute to oversight of the OSTEM projects.

## **OSTEM Could Improve its Monitoring of Cooperative Agreements and Grant Awards**

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OSTEM could better monitor its grants and cooperative agreements. We identified deficiencies in the pre-award, post-award, and closeout phases. Specifically, for the pre-award phase, 6 of the 20 awards we reviewed did not satisfy the Technical Requirements Package (TRP) requirement (see Appendix C for a list of the 20 awards selected).<sup>32</sup> The TRP includes solicitation documents such as technical evaluations and successful proposals and must be submitted by the technical officer at least 35 calendar days prior to the requested award date. During our initial testing, four awards had packages that were submitted late. In one instance, we found a MUREP fellowship award period of performance started 17 days before the TRP was submitted by the program office. In addition, two awards had missing

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<sup>32</sup> TRP's submission to the NSSC must include: a copy of the Notice of Funding Opportunity; a copy of the proposals selected for award (including the detailed budget); a budget justification; a copy of the selection statement and technical or peer evaluation document; and a funded purchase request.

proposals in the grant file. After we raised questions, OSTEM provided the missing required documents for the two awards.

We also identified a lack of post-award monitoring. OSTEM technical officers are responsible for reviewing and approving award recipients' annual performance reports, providing feedback, and working with the NSSC to provide programmatic input on requests for any changes to the award such as key personnel changes and no-cost extension requests. The technical officer must also ensure that the performance report is submitted in a timely manner (due 60 days before the end of the reporting period). We found that 7 out of 17 applicable awards were missing at least 1 required annual performance report.<sup>33</sup> After our testing, OSTEM officials located all but one of the missing required annual performance reports. Of the reports provided, the submission date could not be validated on reports for two of the awards, and one report was submitted over a year late.

Additionally, 4 out of 17 awards had a no-cost extension executed after the award expired. A no-cost extension is a supplement used to extend the grant beyond the expiration date at no additional cost to the government to assure adequate completion of the original scope of work. No-cost extensions must be submitted at least 10 days before the award's expiration. In one case, an EPSCoR recipient requested a no-cost extension 3 days after the period of performance expired and the award file was sent to closeout. Over 3 months later, the technical officer called NSSC and stated that the extension should be issued since the grant recipient was making progress. The supplement was then expedited as the recipient had been incurring costs while the award was expired.

After an award expires, technical officers are responsible for reviewing and approving the required final performance report. A final performance report is used as part of the grant closeout process to submit project outcomes in addition to the information submitted on annual performance reports. We found that four out of seven awards eligible for closeout activities either included documents submitted after the 120-day requirement or had no documents submitted at all.<sup>34</sup> When we made OSTEM officials aware of these issues, they identified and provided the missing required final performance reports. However, of the reports provided, the submission date could not be validated on one of the awards, and one was submitted after the 120-day requirement. Space Grant officials acknowledged the need to improve their closeout process and are addressing the issue by implementing a "Health Tracking Matrix." This matrix will assist Space Grant officials in tracking awardee compliance to closeout requirements and allowing the project to hold consortiums accountable for missing key reporting dates.

NASA has struggled with grant closeouts regardless of grant type. For example, in FY 2022, the financial statement auditors reported that although NASA is improving the efficiency of grant closeout procedures each year, final grant closeout procedures continue to be performed in an untimely manner.<sup>35</sup> Likewise, in 2023 we identified NASA's oversight and management of grants and cooperative agreements as one of NASA's top management challenges.<sup>36</sup> The report highlights the issue of

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<sup>33</sup> In our sample, 17 of the 20 awards were deemed applicable to conduct post-award monitoring testing. Two awards were canceled prior to the reporting requirement, and one award was issued too recently to assess.

<sup>34</sup> To be eligible for closeout testing, the award period of performance had to expire at least 120 days prior to the date we received grant documents from NSSC.

<sup>35</sup> Ernst & Young, *NASA Notice of Finding and Recommendation Further Enhancements Surrounding Grant Closeout Procedures are Required* (NFR No. 2022 Grant-02, November 5, 2022).

<sup>36</sup> NASA OIG, [2023 Report on Top Management and Performance Challenges](#) (November 2023).



payments being made on awards after the end of the period of performance and grants that remained open over a year after the expiration date.

Based on our testing, we concluded that OSTEM lacks a standardized process that consistently tracks grant award deliverables to ensure they are being submitted in a timely manner. For example, NextGen STEM officials stated that while they have generally relied on the NSSC to communicate deadlines to the awardee, this communication has become less frequent. In contrast, Space Grant, MUREP, and EPSCoR had various ways of monitoring, such as incrementally funding awards, monthly activity reports, and automated reminders to recipients. Without a standardized process to ensure technical officers are actively monitoring the award, there is a risk that recipients are not using award funds for their intended purpose. Lack of monitoring also makes it difficult for OSTEM to verify that projects are performed in line with approved project plans and that recipients are making adequate progress towards goals and objectives. Finally, award files that have not been closed out properly or in a timely manner could result in funding not being available for other Agency priorities and can lead to improper payments.

In 2023, OSTEM created a new grants manager position after identifying opportunities to improve grants management. The grants manager stated that OSTEM has implemented multiple continuous improvement initiatives, acknowledged the lack of standardization across the four projects, and agreed that a standard operating procedure would likely benefit OSTEM in overall monitoring efforts.

## NASA Does Not Track OSTEM Grant Subrecipients

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NASA does not track OSTEM grant subrecipients, and OSTEM projects had varied levels of awareness of subrecipient compliance with required terms and conditions. NASA's GCAM requires award recipients that issue first-tier subawards above \$30,000 to report those subawards in the Federal Funding Accountability and Transparency Act (FFATA) Subaward Reporting System.<sup>37</sup> Recipient information in the system is ultimately transferred to USAspending.gov (USAspending) for public display.<sup>38</sup> For OSTEM grant awards, this requirement is part of a grantees' signed terms and conditions. The prime awardee must file a FFATA subaward report by the end of the month after they award any subgrant greater than or equal to \$30,000. According to the GCAM, if a recipient issues a subaward, then they are responsible for monitoring the subaward and ensuring that the subaward recipient complies with all applicable federal statutes, regulations, and award terms and conditions.

However, we found that the OSTEM data for subaward grant recipients in USAspending was unreliable.<sup>39</sup> Subawards were listed in 7 of the 20 initial grant award packages we tested, however, more than half of those awards did not have subaward data in USAspending.<sup>40</sup> OSTEM projects rely on the prime recipients to ensure that the subrecipient is aware of award terms and conditions. Annual

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<sup>37</sup> As per 2 C.F.R Part 200 (2013) a subaward means an award provided by a pass-through entity to a subrecipient for the subrecipient to carry out part of a federal award received by the pass-through entity. It does not include payments to a contractor or payments to an individual that is a beneficiary of a federal program. The Federal Funding Accountability and Transparency Act of 2006 (FFATA), Pub. L. No. 109-282 (2006). FFATA reporting in the Federal Funding Accountability and Transparency Act Subaward Reporting System can be found at <https://www.fdrs.gov/>.

<sup>38</sup> USAspending is the official, publicly available database of federal spending information, including information about federal awards such as contracts and grants.

<sup>39</sup> For more information on data reliability, see Appendix A.

<sup>40</sup> Three of the 20 awards tested did not have subawards listed in their initial grant packages, however subawards were listed in USAspending. In addition, 10 awards did not have subawards listed in their grant award packages and did not have subawards listed on USAspending.

reporting for some projects may have some subrecipient information but, like the initial award package, these are in a text report form that is not available for data analytics nor reconciliation into USAspending.

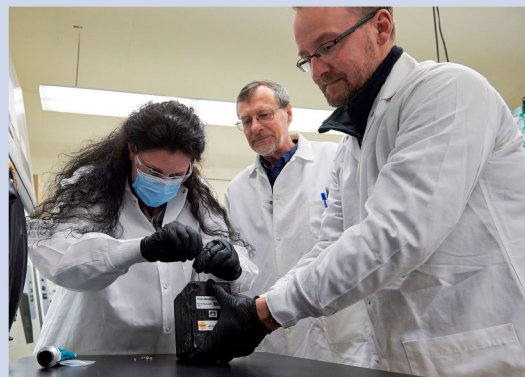
Tracking subrecipients has long been a challenge in the federal government. In May 2023, GAO reported challenges related to the timeliness, completeness, and accuracy of grant data, including subaward data, on USAspending.<sup>41</sup> While this is a government-wide challenge, OSTEM does not monitor nor encourage grantee compliance with FFATA requirements. For example, EPSCoR officials explained they were unaware of the FFATA requirement and were concerned that it may add additional work for grantees. However, NASA’s terms and conditions require reporting of subawards. Each of the grant files we reviewed contained a signed Certification of Compliance wherein the awardee agrees to accept and comply with terms and conditions as required by the GCAM, and NSSC attached those terms and conditions or cited them by reference. As such, OSTEM should be taking steps to better ensure subrecipient compliance with reporting requirements.

## NASA’s EPSCoR Jurisdiction Eligibility Needs Re-Evaluation

EPSCoR was established at the National Science Foundation (NSF) in 1978 to address congressional concerns about an “undue concentration” of federal R&D funding in certain states. The program was designed to help institutions in eligible states build infrastructure, research capabilities, and training and human resource capacities to enable them to compete more successfully for open federal R&D funding awards. NSF’s EPSCoR includes 25 states, Puerto Rico, the U.S. Virgin Islands, and Guam for a total of 28 jurisdictions currently eligible to participate. Six federal agencies, including NASA, are conducting EPSCoR or EPSCoR-like programs. NASA uses NSF jurisdictions to determine eligibility, but some other agencies make their own determinations.

NASA’s EPSCoR grants are intended to serve as a catalyst for states to become more competitive for NASA aerospace funding. For example, Montana State University (MSU) leveraged their Department of Chemical and Biological Engineering and partner organizations to win EPSCoR funding in 2021 with an experiment entitled “Microgravity Demonstration of a Novel In-Space Food Production System.” This project will demonstrate if a nutritionally dense fungus can be grown in space. The fungus was discovered by MSU and developed by a private company to use biological waste and little water to rapidly grow. The results of the experiment may foster additional

**MSU researchers prepare the experiment for flight to the International Space Station**



Credit: MSU

<sup>41</sup> GAO, *Grants Management: Observations on Challenges with Access, Use, and Oversight* ([GAO-23-106797](#), May 2, 2023).

opportunities to advance this technology for space and possibly a sustainable technical capability within Montana.<sup>42</sup>

### The MSU experiment before being installed on the International Space Station



*The payload tested the growth of an edible fungus in a weightless environment.*

Source: NASA

The Experimental Program to Stimulate Competitive Research on Space and Aeronautics Act authorized EPSCoR for NASA in FY 1993 and describes the rules and intent of Congress. NASA’s EPSCoR project starts with NSF “infrastructure,” but eligibility is decided by the Administrator and should be based on a state’s ability to compete for NASA research grants. There are additional laws that mainly address NSF, but also impact NASA’s EPSCoR. Two of these are the America COMPETES Reauthorization Act of 2010 and the American Innovation and Competitiveness Act of 2017.<sup>43</sup> These Acts note that the main goal of NSF’s EPSCoR is to leverage talent across the nation and build capacity and capabilities. The Acts also emphasize that managing agencies should consider alignment to agency priorities, long-term investments

to build capacity, and new ways to monitor and evaluate awards. More recently, the CHIPS Act stated that NSF should lock their jurisdiction eligibility for 5 years and determine if new eligibility criteria should be developed.<sup>44</sup>

A jurisdiction can compete for NSF EPSCoR funding if (1) it has a commitment to develop its research capacity and improve the quality of STEM research and (2) its 5-year portion of NSF funding equals or falls below 0.75 percent of the total 5-year NSF budget. The methodology allows a jurisdiction to remain in the program for up to 5 years if its funding exceeds the 0.75 percent threshold but remains less than 0.8 percent. Although NSF EPSCoR eligibility is limited to jurisdictions that received 0.75 percent or less of total NSF research funding, NASA does not have an agreed-upon threshold since the Agency uses NSF’s eligible jurisdictions.

Using NSF’s 0.75 percent threshold, we compared NASA’s award amounts per jurisdiction as a percentage of total NASA grants award amounts over a 5-year period, 2018 to 2022. We did not include EPSCoR awards in the calculation. We used NSF’s 0.75 percent as a proxy for how successful a jurisdiction is in competing for NASA grant funding. We then identified if those jurisdictions were receiving EPSCoR funds.

We found that NASA may not be directing EPSCoR funding according to the project’s intent and design—to help develop new academic research enterprise directed toward long-term, self-sustaining, nationally competitive capabilities in aerospace research. NASA, by using NSF EPSCoR eligibility, is funding four NASA EPSCoR jurisdictions—Alabama, Hawaii, New Hampshire, and Oklahoma—that receive more than 0.75 percent of all NASA grants and cooperative agreements (see Table 3). By using

<sup>42</sup> The technology capitalizes on the unique growth characteristics of a fungus isolated from a geothermal spring in Yellowstone National Park, named strain MK7. Strain MK7 is a Federal Drug Administration safe food ingredient and is now available to the U.S. public as a food product line.

<sup>43</sup> Pub. L. No. 102-588; Pub. L. No. 111-358; The American Innovation and Competitiveness Act, Pub. L. 114-329 (2017).

<sup>44</sup> Pub. L. No. 117-167.

NSF criteria on NASA’s funding profile, we found that these four states appear to successfully compete for NASA’s R&D grant funding and, as such, already have competitive aerospace research capabilities.

**Table 3: Average Grants and Cooperative Agreements Compared to the Average EPSCoR Obligations by Jurisdiction (2018 to 2022)**

Jurisdiction	Five-year Average NASA Awards	Percentage of Total NASA Grants	Five-year Annual Average EPSCoR Award	Funds Put to Better Use (over 5 years)
Alabama	\$31,523,395	2.75%	\$948,245	\$4,741,225
Hawaii	21,600,443	1.88	316,933	1,584,663
New Hampshire	14,214,615	1.24	554,587	2,772,935
Oklahoma	13,151,134	1.15	702,924	3,514,618
<b>Total Funds Put to Better Use</b>				<b>\$12,613,442<sup>a</sup></b>

Source: NASA OIG analysis of Business Objects (BOBJ) data.

Note: Average annual NASA award is less the EPSCoR amount.

<sup>a</sup> The jurisdictions’ historical average EPSCoR grant was multiplied by 5 years to calculate funds put to better use in future periods.

Each of the four states exceed both 0.75 percent and 0.8 percent criteria NSF uses for jurisdictions to remain eligible for EPSCoR funding. In our discussions with OSTEM management, they were not aware of the potential flexibilities built into the law governing NASA’s EPSCoR jurisdictions. The use of the NSF jurisdictions for EPSCoR stemmed from a long-standing practice. A separate NASA process for determining when jurisdictions are sufficiently mature in their aerospace research and development capabilities may also identify when jurisdictional eligibility criteria may need reevaluation. By not leveraging flexibilities available to the Agency to consider alternative criteria, NASA may be missing opportunities to invest limited resources in underserved or less competitive jurisdictions. To this end, we estimate that over \$12.6 million could be put to better use over the next 5 years within EPSCoR. Appendix D provides additional discussion of funds put to better use.

For example, there are six jurisdictions that have not been able to participate in EPSCoR because they are above NSF thresholds, but that do not compete as effectively for NASA funding, as they are below 0.75 percent for all NASA grant awards (see Table 4). Given their implied competitive capability with NSF funding already, some institutions within these jurisdictions may be at a tipping point for self-sustaining capabilities to compete for NASA-related R&D funding.

**Table 4: Jurisdictions Not Eligible for EPSCoR but Receiving Below-Threshold Average Grants and Cooperative Agreements (2018 to 2022)**

Jurisdiction	Five-year Average NASA Awards	Percentage of Total NASA Grants	Five-year Annual Average EPSCoR Award
Connecticut	\$5,901,529	0.51%	0
Minnesota	6,801,942	0.59	0
North Carolina	8,188,694	0.71	0
Oregon	7,299,981	0.64	0
Tennessee	6,076,906	0.53	0
Utah	6,485,551	0.56	0

Source: NASA OIG analysis of BOBJ data.

Note: Average annual NASA award is less the EPSCoR amounts.

There are also jurisdictions that are currently EPSCoR eligible but receive the least amount of NASA awards overall, as shown in Table 5 below. For these jurisdictions, EPSCoR funds, on average, represent a quarter to almost half of their total annual NASA grant funding. By this general measurement, these jurisdictions could be considered most in need of EPSCoR funds to reach competitive levels of NASA research capability.

**Table 5: Lowest Average Grants and Cooperative Agreements compared to the Average EPSCoR Obligations by Jurisdiction (2018 to 2022)**

Jurisdiction	Five-year Average NASA Awards	Percentage of Total NASA Grants	Five-year Annual Average EPSCoR Award
Virgin Islands	\$381,473	0.03%	\$268,499
Vermont	838,739	0.07	853,912
Nebraska	1,160,035	0.10	621,722
Wyoming	1,280,834	0.11	534,753
South Dakota	1,466,643	0.13	534,228

Source: NASA OIG analysis of BOBJ data.

Note: Average annual NASA award is less the EPSCoR amounts.

In January 2021, Executive Order 13985 stated the federal government should pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.<sup>45</sup> The Order requires each agency to assess whether, and to what extent, its programs and policies perpetuate systemic barriers to opportunities and benefits for people of color and other underserved groups. Likewise, in GAO’s August 2022 report on NSF’s EPSCoR, jurisdiction officials described ways EPSCoR helped broaden participation by providing funding to target outreach to students and faculty from

<sup>45</sup> Executive Order 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* (January 20, 2021).

underrepresented groups for research and job opportunities.<sup>46</sup> NASA has an opportunity to reevaluate jurisdictional eligibility to compete for grants under EPSCoR to better ensure equitable distribution of Agency funds.

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<sup>46</sup> GAO, *National Science Foundation: Better Reporting Could Give More Visibility into Gains in States' Research Competitiveness* ([GAO-22-105043](#), August 11, 2022).

# OSTEM IS MISSING OPPORTUNITIES TO FURTHER DEVELOP NASA'S FUTURE STEM WORKFORCE

OSTEM provides an array of STEM experiences and opportunities to immerse students in NASA's missions and projects, yet the STEM engagement activities are not focused on the Agency's critical workforce needs. Additionally, OSTEM has limited engagement activities that target skilled technical workers. Instead, OSTEM mainly focuses on K-12, undergraduate, and graduate level educational programs, whereas skilled technical trades and community colleges receive limited engagement. As an agency dependent on a skilled STEM workforce, NASA is facing a shortage of mission critical staff as competition for talent increases with the growth of the commercial space industry and other technology fields. OSTEM views it as their responsibility to reach as many students and educators as possible and not to focus specifically on NASA's future workforce needs.

## OSTEM Engagement Efforts Could Better Target NASA's Critical Workforce Needs

In 2021, NASA identified 19 mission critical workforce needs, including 12 in STEM fields.<sup>47</sup> Because OSTEM designs engagement activities that focus on getting students interested in STEM nationally as opposed to NASA's specific needs, the office did not realign its engagement activities to target NASA's mission critical technical occupations to help build the pipeline for NASA's future workforce. NASA's Strategic Workforce Planning policy requires the Associate Administrator for STEM Engagement to ensure that student programs align with future workforce competency or discipline area requirements and that they augment the pipeline for the future workforce.<sup>48</sup> Similarly, NASA's *Strategy for STEM Engagement 2020-2023* describes an OSTEM goal to design a portfolio of NASA STEM engagement opportunities to contribute toward meeting Agency workforce requirements and serving the nation's aerospace and relevant STEM needs.<sup>49</sup>

OSTEM coordinates STEM engagement activities with NASA's five Mission Directorates and other Headquarters organizations that fund STEM engagement efforts, but Mission Directorates do not formally coordinate or communicate their workforce needs with OSTEM. For example, ARMD officials

### Mission Critical Technical Occupations

- Aerospace Engineer
- Astrophysicist
- Computer Engineer
- Electrical Engineer
- Electronics Engineer
- General Engineering
- Materials Engineer
- Mechanical Engineer
- Medical Officer
- Physical Scientist
- Physicist
- Safety Engineering

Source: NASA

<sup>47</sup> Of the 19 mission critical areas that were identified, 12 technical occupations and 7 administrative occupations met the full criteria of a mission-critical occupation based on the NASA Flexibility Act of 2004 authorities.

<sup>48</sup> NPD 3010.1B, *Strategic Workforce Planning* (February 11, 2022).

<sup>49</sup> NASA, *Strategy for STEM Engagement, 2020-2023*.

stated they work with OSTEM, but they do not provide a list of needed skillsets. Directorate officials stated that even though there are discussions with STEM about workforce needs, a more intentional workforce development process could be beneficial and should be considered for the future. Likewise, SOMD and ESDMD explained there is no formal workforce planning process in place that includes OSTEM, however, there are informal meetings where workforce needs are discussed.

According to OSTEM officials, NASA's workforce needs are addressed primarily through internships. OSTEM coordinates internship opportunities with Mission Directorates and the Office of the Chief Human Capital Officer (OCHCO). These internships are designed to expose students to NASA and STEM through mission-specific tasks but may not address NASA's mission-critical workforce needs. By contrast, DOD STEM cultivates and develops future STEM talent in support of the national security mission. According to the Director of DOD STEM, the Agency emphasizes preparing individuals to enter the DOD workforce through recruitment and re-skilling their current workforce. For instance, DOD offers a SMART Scholarship Program to attract and develop future scientists and engineers, while providing opportunities for its current workforce to pursue advanced degrees in STEM.<sup>50</sup> Ultimately, DOD STEM aims to inspire students to consider careers within DOD's defense laboratories and engineering centers, ensuring a continuous pipeline of talent equipped to contribute to the national security mission.

NASA coordinates its workforce planning efforts amongst OCHCO, Mission Directorates, and Centers. At the Agency level, OCHCO leads and integrates these workforce planning activities. Generally, Mission Directorates identify workforce needs, and Centers provides the capability. Typically, OSTEM is not involved in this process. Prior to 2021, OCHCO communicated workforce plans to senior leadership without formal documentation. In December 2021, NASA's OCHCO issued a 2022 Annual Workforce Plan, and an updated plan was expected by the end of 2023. However, as of December 2023, OCHCO was uncertain when the updated plan would be released. According to OCHCO officials, as OSTEM develops its engagement activities and expands work experiences to students, there is an opportunity for those activities to better align to NASA's future workforce needs.

OSTEM, however, does not view their role or responsibility as including activities targeted at NASA's workforce needs. OSTEM's view of building the next generation STEM workforce includes maintaining a focus on engaging students and supporting educators and educational institutions. Officials noted that OSTEM devotes its efforts where NASA sees an opportunity to partner with other agencies, like the Department of Education. For example, in May 2023, NASA and the Department of Education signed a Memorandum of Agreement to enhance and expand the agencies' longstanding partnership that encourages students from diverse backgrounds to pursue an interest and a career in STEM and space industries. Additionally, according to OSTEM officials, it is difficult to address specific skillsets because the demand can change quickly.

While NASA's workforce remains dynamic, OSTEM is missing an opportunity to address mission-critical workforce gaps. According to NASA's Psyche Independent Review Board, conducted in 2022, the Jet Propulsion Laboratory is experiencing difficulty attracting and retaining the workforce it needs, especially in critical areas such as systems engineering; guidance, navigation, and control; flight software; and avionics.<sup>51</sup> The OIG has repeatedly reported on similar staffing issues in past reviews of

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<sup>50</sup> The SMART Scholarship builds future leaders in 24 STEM disciplines and is the largest education and workforce development initiative under the DOD STEM Program. Scholarship recipients receive hands-on experience at one of over 200 DOD facilities during their internships and apply this knowledge as early career professionals.

<sup>51</sup> NASA, [Psyche Independent Review Board Report](#) (November 4, 2022).



projects at the Jet Propulsion Laboratory, and we are concerned that other Centers may face the same challenge.<sup>52</sup> For example, Goddard Space Flight Center faces a heavy workload with large projects such as the On-orbit Servicing, Assembly, and Manufacturing 1 Mission; Nancy Grace Roman Space Telescope; and the Capture, Containment, and Return System for the Mars Sample Return mission, all of which are competing for a limited technical workforce as each prepares for launch in the next 3 to 5 years.

With nearly 40 percent of the Agency's science and engineering workforce nearing retirement, NASA must attract, engage, and prepare a diverse STEM workforce pipeline to meet its future needs. Utilizing OSTEM's expertise and resources to align its engagement activities with the Agency's future workforce needs is a worthwhile and necessary endeavor.

## OSTEM Provides Limited Engagement Activities toward Skilled Technical Workers

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The future of American space exploration hinges, in part, on a robust, diverse skilled technical workforce. OSTEM, however, is missing an opportunity to increase its support for the skilled technical workforce, whether employed directly by NASA or indirectly through its contractors, who are vital to accomplishing NASA's missions. The STEM workforce includes two categories of individuals: those who have attained a bachelor's degree or higher and skilled technical workers with a high level of knowledge in a technical domain, but who do not have a bachelor's degree. OSTEM activities mainly focus on K-12, undergraduate, and graduate-level educational programs with limited engagement efforts aimed at community colleges and trade schools that focus primarily on skilled technical workers. According to NASA's SEC Charter, the Agency is responsible for ensuring a comprehensive strategy and coordinated Agency-wide approach to develop and deliver the Agency's STEM engagement efforts. These efforts should contribute to the development of a highly qualified future STEM workforce with the technical skills needed to advance NASA's mission.

OSTEM can play a crucial role by expanding existing programs and reaching students in high schools by inspiring them to pursue technical training at community colleges or trade schools, building a pipeline of skilled workers for the future. The Agency employs specialized skilled technical workers such as scuba divers, welders that support programs and projects, and technical personnel who work on launch services. Also, Langley Research Center is one of the only NASA locations that has an apprentice program. According to the National Science and Technology Council's report, *America's Strategy for STEM Education*, the federal government is encouraged to prepare the STEM workforce—both college-educated STEM practitioners and those working in skilled trades that do not require a 4-year degree—for the future.<sup>53</sup> Studies have shown that community colleges are a pathway into many parts of the STEM workforce and play an important role in broadening participation amongst groups historically underrepresented in STEM, including those in rural areas. OSTEM has three engagement activities focused on community colleges that are not exclusive to only students who attend community

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<sup>52</sup> We have highlighted these workforce issues since 2018 in multiple reports including: NASA OIG, *NASA's Surface Water and Ocean Topography Mission* ([IG-18-011](#), January 17, 2018); *Management of NASA's Europa Mission* ([IG-19-019](#), May 29, 2019); and *NASA's Planetary Science Portfolio* ([IG-20-023](#), September 16, 2020).

<sup>53</sup> CoSTEM, *Charting a Course for Success: America's Strategy for STEM Education*.

college, but also available to students who attend undergraduate and graduate institutions.<sup>54</sup> NASA's Marshall Space Flight Center (Marshall) is an example where NASA is making efforts to target technical workers. Marshall participates in the NASA Community College Aerospace Scholars program and conducts activities at local community colleges. Marshall officials collaborated with Drake State Community and Technical College, a historically Black community college offering technical programs like welding and IT services. OSTEM has also collaborated with Mission Directorates and Centers to enhance its outreach efforts for technical workers. While these three engagement activities are commendable, OSTEM has an opportunity to improve its overall strategy to target community colleges and trade schools.

For the past decade, NASA has been scaling down its technical workforce in favor of a professional, civil service workforce and relying increasingly on contractors to provide skilled workers. While NASA's skilled technical civil service workforce is shrinking, these skills are still needed to accomplish the Agency's mission. According to OSTEM officials, NASA does not have enough skilled technicians available to serve as intern or apprenticeship mentors; however, in our view, these are vital skills that the Agency needs to maintain.

Technical skilled work is now mostly performed by contractors, with NASA civil servants providing oversight. Mission Directorate officials stated that technical skilled contractors often go unaccounted for within NASA's workforce structure, but they are crucial to NASA's success and function. The Department of Labor notes that the space workforce cannot exist without diverse, highly skilled technicians. In addition to astronauts and engineers, there is both an urgent and emergent need for skilled technical workers who build, test, and maintain critical equipment.<sup>55</sup> Therefore, NASA needs to acquire and maintain a skilled technical workforce to deal with changes within the science industry. To accomplish this, OSTEM can enhance its engagement activities to reach students directly out of high school to pursue higher education at a community college or trade school.

The administration has recognized the urgency of this situation, launching a coalition with space companies to boost the technical workforce. In September 2022, the White House announced a commitment to inspire, prepare, and employ the space workforce. As part of this commitment, the Vice President announced a new coalition of space companies that will focus on increasing the space industry's capacity to meet the rising demand for the skilled technical workforce. This coalition focuses on attracting, training, and creating employment opportunities particularly for people from backgrounds traditionally underrepresented in STEM jobs. OSTEM is aware of this coalition and can support this effort by collaborating with NASA and industry leaders to attract, train, and employ diverse talent.

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<sup>54</sup> NASA Community College Aerospace Scholars, MUREP for American Indian Alaska Native STEM Engagement, and First Nations Launch.

<sup>55</sup> Department of Labor, *A Place in Space: Opportunities for Workforce Development in the Space Sector* (September 9, 2022).

# CONCLUSION

NASA's Office of STEM Engagement actively seeks to attract a diverse group of students, create unique learning opportunities, and build a diverse future STEM workforce to contribute to NASA's exploration and discovery endeavors. OSTEM manages a wide range of STEM engagement activities, including internships, fellowships, student learning opportunities, and competitive awards.

OSTEM has accomplished a range of activities including awarding grants and cooperative agreements to fund universities conducting critical research aimed at developing space exploration technologies while benefiting those institutions and students. However, we identified several areas for improvement in OSTEM's operations, including establishing clearly defined performance goals, improving their tracking of spending and activities, conducting more rigorous award monitoring (including tracking subrecipients), and better targeting EPSCoR funding. Additionally, NASA faces a potential workforce shortage due to increasing competition for talent in the commercial space industry and other technology fields. The Agency's workforce challenges will require sustained attention and commitment to address. However, OSTEM's engagement activities could better address the Agency's critical workforce needs and target skilled technical workers. As the leader for the Agency's STEM engagement functions, OSTEM is uniquely positioned to leverage its expertise and resources to help address the Agency's future workforce needs.

To continue supporting federal STEM education priorities and lead strategic alignment of the Agency's STEM engagement, OSTEM must further improve coordination of STEM activities across the Agency. This will ensure continued progress in achieving its mission and supporting the Agency's STEM workforce needs.

# RECOMMENDATIONS

To continue improving the Agency's STEM engagement activities, we recommended the Associate Administrator for STEM Engagement:

1. Re-evaluate the OSTEM performance goals to ensure they are distinct and well correlated with outcomes.
2. Develop a procedure to ensure OSTEM tracks and reports funding for all Agency STEM engagement activities.
3. Determine and apply relevant NASA project management policy requirements to existing project plans or record their exclusion and appropriately address budget risk in project plans, including planning for various funding scenarios.
4. Develop a standardized grant process that ensures mandatory performance reporting and that expiration dates are tracked and monitored to meet requirements and develop practices to ensure grant recipients are reporting subrecipient awards over \$30,000 as required.

In addition, we recommend the Administrator:

5. Re-evaluate jurisdictions eligible for EPSCoR funds to ensure effective and equitable distribution of Agency funds.

Finally, we recommended the Deputy Administrator:

6. Require all NASA organizations capture STEM engagement activities in STEM Gateway.
7. Require OCHCO, Mission Directorates, and Centers collaborate to identify and incorporate critical Agency workforce needs when developing future STEM engagement activities and develop a plan that increases the number of STEM engagement activities aimed at skilled trade occupations.

We provided a draft of this report to NASA management who concurred or partially concurred with all of our recommendations and described planned actions to address each recommendation. We consider management's comments to these recommendations responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions. For Recommendation 7, the Agency partially concurred and agreed to identify and incorporate critical Agency workforce needs when developing future STEM engagement activities. However, NASA disagreed with developing a plan to increase the number of STEM engagement activities aimed at skilled trade occupations because, according to the Agency, "there are very rare opportunities for NASA civil service employment for individuals with those skills." Instead, the Agency stated OSTEM will enhance career awareness activities to include technician and skilled trade occupations by featuring trade and technical professionals in the "Surprisingly STEM" videos and connecting subject matter experts with students using virtual classroom connections through the NextGen STEM project.

Given that a skilled STEM technical workforce is critical to the success of NASA missions, we encourage the Agency to continue enhancing its engagement efforts and develop a more focused plan to increase and ensure sustained engagement activities targeting these occupations. Our report emphasizes how a shortage of skilled technical workers could impact NASA's ability to accomplish its mission. In our opinion, OSTEM is uniquely positioned to increase visibility of skilled trade occupations not traditionally considered STEM. Highlighting these occupations can bring more opportunities to diverse communities while also addressing future workforce needs of both NASA and the nation. Despite limited resources for STEM engagement, OSTEM may be able to tap into an ecosystem of industry partners and students eager to participate.

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

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Major contributors to this report include Tekla Colón, Mission Support Audits Director; Julia Eggert, Assistant Director; Tara Halt; Jobenia Parker; Tracy Robinson; John Schultz; and Andrew Wallach. Courtney Daniels provided editorial and graphics assistance. Jeremy Brown provided survey and data mining assistance, and Theresa Thompson provided legal assistance.

If you have questions about this report 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](mailto:laurence.b.hawkins@nasa.gov).

George A. Scott  
Acting Inspector General

## APPENDIX A: SCOPE AND METHODOLOGY

We performed this audit from January 2023 through March 2024 in accordance with generally accepted government auditing standards. Those standards 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.

The objective of this audit was to determine and evaluate whether NASA is effectively implementing STEM engagement activities and outreach efforts to meet its goals and objectives. Specifically, we assessed if (1) OSTEM outreach efforts are meeting performance goals, including increasing diversity, and how the Agency measures success; (2) OSTEM is appropriately managing STEM funds and providing adequate oversight; and (3) OSTEM is coordinating effectively with NASA Mission Directorates and other stakeholders to develop plans to meet future workforce needs.

To accomplish our objectives, we reviewed federal laws; NASA policies, procedures, and supporting documentation; prior audit reports; external reviews; and other documents related to STEM. We interviewed Agency officials from OSTEM's including the Associate Administrator and project managers, officials from the OCHCO, Centers, and Mission Directorates, and representatives from various agencies on CoSTEM. We reviewed documents from other federal agencies to benchmark their processes and procedures to advance STEM goals.

For project plan reviews, we selected 23 of the requirements within the policy directive because not all the policy directives applied to OSTEM projects.<sup>56</sup> For example, we excluded "safety engineering," which requires projects to design, develop, fabricate, test, manage, operate, and dispose of NASA's vehicles, systems, and assets in a manner that protects all people, environments, and high-value equipment and property from harm. This requirement is not likely to apply to the OSTEM educational grant-making processes.

To determine whether OSTEM is appropriately managing STEM funds and performing the proper oversight, we developed a testing methodology for OSTEM grants and cooperative agreements. The sample population included all grants and cooperative agreements with activity since FY 2018 with funds that passed through OSTEM. We judgmentally selected 20 grants to test based on risk factors such as periods of performance exceeding three years, multiple award actions, and high dollar values.<sup>57</sup> To ensure a proportional number of awards was selected for testing among the four OSTEM projects, we determined each project's percentage of total of awards issued and each project's percentage of total obligation (see Appendix C for awards selected). We tested each award against the GCAM and project

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<sup>56</sup> NPD 7120.4E. We selected the following 23 requirements. High level (2): strategic acquisition and apply project management NPRs. Project management principles (15): phased life cycle, decision authority at key decision points, Management Council reviews, cost and schedule estimates, trained project management, system engineering processes, requirements establishment, software, assessing performance from requirements, dissenting opinions, risk, independent reviews, compliance assessments, training, and knowledge management. Manager level (6): classify according to policy and procedures, select competent providers, provider plans, lessons learned process, capability assessments, and [grantee] data identification.

<sup>57</sup> A judgmental (i.e., nonstatistical) sampling includes gathering a selection of items for testing based on professional judgment, expertise, and areas of risks.

plan requirements based on the three phases of the award life cycle: pre-award, post-award, and closeout.

## Assessment of Data Reliability

We assessed the validity and reliability of grant and cooperative agreement data extracted from NASA's financial system by (1) relying on the results of financial audits; (2) testing required data elements such as comparing column totals to other sources; and (3) interviewing agency officials knowledgeable about the data and comparing it to agency-supplied data sets. We determined that the BOBJ data was sufficiently reliable for the purposes of this report.

We assessed the validity and reliability of grant and cooperative agreement data for subrecipients extracted from USAspending by (1) comparing column totals and grant counts to BOBJ; (2) reconciling grant package documentation to USAspending queries; and (3) discussing data controls with NASA project management. We determined that the USAspending subrecipient data was not sufficiently reliable for the purposes of this report. Our recommendation regarding data quality, if implemented, may improve this identified weakness.

## Review of Internal Controls

We reviewed internal controls that were significant within the context of the overall objective of NASA's management of its OSTEM program. Specifically, we assessed whether NASA's current STEM engagement goals are being met through how the Agency is managing the projects, grant processes, information gathering, communications, and monitoring of procedures according to the internal control components and underlying principles as per *Standards for Internal Control in the Federal Government*.<sup>58</sup> Internal control weaknesses were identified and discussed in this report. Our recommendations, if implemented, will improve those identified weaknesses.

However, because our review was limited to these internal control components and underlying principles, it may not have disclosed all internal control deficiencies that may have existed at the time of this audit.

## Prior Coverage

During the last 10 years, the NASA Office of Inspector General and Government Accountability Office have issued 12 reports of significant relevance to STEM Engagement, DEIA, and future workforce challenges. Reports can be accessed at <https://oig.nasa.gov/audits/auditReports.html> and <https://www.gao.gov>, respectively.

### ***NASA Office of Inspector General***

*NASA's Management of the Artemis Supply Chain* ([IG-24-003](#), October 19, 2023)

[2023 Report on Top Management and Performance Challenges](#) (November 2023)

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<sup>58</sup> [GAO-14-704G](#).

*Management of NASA's Europa Mission* ([IG-19-019](#), May 2019)

*NASA's Surface Water and Ocean Topography Mission* ([IG-18-011](#), January 17, 2018)

*NASA's Education Program* ([IG-16-001](#), October 19, 2015)

### ***Government Accountability Office***

*High Risk Series: Efforts Made to Achieve Progress Need to be Maintained and Expanded to Fully Address All Areas* ([GAO-23-106203](#), April 20, 2023)

*Grants Management: Observations on Challenges with Access, Use, and Oversight* ([GAO-23-106797](#), May 2, 2023)

*National Science Foundation: Better Reporting Could Give More Visibility into Gains in States' Research Competitiveness* ([GAO-22-105043](#), August 11, 2022)

*NASA Lunar Programs: Improved Mission Guidance Needed as Artemis Complexity Grows* ([GAO-22-105323](#), September 8, 2022)

*Science, Technology, Engineering, and Mathematics Education: Actions Needed to Better Assess the Federal Investment* ([GAO-18-290](#), March 23, 2018)

*Diversity in the Technology Sector: Federal Agencies Could Improve Oversight of Equal Employment Opportunity Requirements* ([GAO-18-69](#), November 30, 2017)

*Women in STEM Research: Better Data and Information Sharing Could Improve Oversight of Federal Grant-making and Title IX Compliance* ([GAO-16-14](#), December 14, 2015)



# APPENDIX B: STEM ENGAGEMENT DATA TRACKED BY OSTEM

OSTEM annually updates their planning document that manually collects information on the Agency's STEM engagement activities. OSTEM tracks nearly 40 pieces of information for every activity, and we categorized those into 23 types below.

**Table 6: STEM Activity Manual Data Capture Categories**

Count	Field Name
1	Organization
2	Center
3	Program / Project
4	Activity Name
5	Description
6	Primary Type of Program, Project, Activity
7	Secondary Type of Program, Project, Activity
8	Virtual Learning
9	Beneficiaries Education Level
10	Estimated number of Primary Participants (by FY)
11	Estimated number of Secondary Participants (by FY)
12	Mission Drivers
13	Design Principles Applied
14	Artemis tie
15	Website link
16	External Funding Sources
17	Physical Location
18	Partner(s)
19	NASA Points of Contact
20	Other Comments
21	Strategy for STEM Engagement Linkage
22	Participation Pool
23	Primary Sponsor and Source of Support

# APPENDIX C: LIST OF GRANTS SELECTED FOR REVIEW

Table 7 identifies the 20 OSTEM awards that were selected and tested as part of our judgmental sample. Listed are the project associated with the award, the grant/cooperative agreement number, and the awardee.

**Table 7: Grants Selected for Testing**

Project	Grant/Cooperative Agreement Number	Awardee
EPSCoR	80NSSC19M0145	University of Arkansas System
EPSCoR	80NSSC17M0040	University of Kentucky
EPSCoR	80NSSC18M0023	University of Alabama – Huntsville
EPSCoR	80NSSC19M0053	University of Mississippi
EPSCoR	80NSSC18M0032	Oklahoma State University
EPSCoR	NNX15AM74A	College of Charleston
Space Grant	NNX15AJ18H	University of Alabama – Huntsville
Space Grant	80NSSC20K1870	New Jersey Institute of Technology
Space Grant	80NSSC21K0109	Louisiana State University and A&M College
Space Grant	80NSSC20K0990	Regents of the University of Colorado
Space Grant	80NSSC22K1567	Georgia Tech Research Corporation
Next Gen STEM	80NSSC18K1219	Arizona Science Center
Next Gen STEM	80NSSC18K1225	Fairchild Tropical Garden
Next Gen STEM	80NSSC18K0043	DNC Parks and Resorts at KSC
Next Gen STEM	80NSSC23M0078	Universities Space Research Association
MUREP	80NSSC20K1456	New Mexico State University
MUREP	NNX15AU32H	Trustees of Dartmouth College
MUREP	80NSSC21M0367	Secor Strategies, LLC
MUREP	80NSSC19M0200	California State University, Northridge (The University Corporation)
MUREP	80NSSC18K1703	Florida International University

Source: NASA

## APPENDIX D: FUNDS PUT TO BETTER USE

NASA's EPSCoR was established by Congress to help colleges and universities in areas that were unable to compete successfully for NASA research opportunities. Congress stated it was important for the future of the United States that all geographic areas of the nation increase research capacity. During our review of NASA's OSTEM we estimated that over \$12.6 million could be put to better use over the next 5 years within EPSCoR.<sup>59</sup> NASA may be directing limited resources to stimulate aerospace research capabilities in jurisdictions that are already competitive. This occurred because the Agency has adhered to NSF jurisdictions instead of leveraging the flexibilities made available to the Agency by Congress.

To determine a jurisdiction's ability to compete for NASA research grants, we averaged the total NASA grant funding a jurisdiction received and compared that to the average EPSCoR grant funding a jurisdiction received using the following methodology. Like NSF's process, we looked at NASA's award amounts per jurisdiction as a percentage of total NASA award amounts—less the EPSCoR awards over a 5-year period, 2018 to 2022. We used NSF's 0.75-percent share of total Agency grant funding, less NASA EPSCoR funds, as a proxy for how successful a jurisdiction is in competing for NASA grants. If a jurisdiction is over this percentage of funding, we considered them to be competitive, and if they are under the threshold, in our view, they would be better candidates for EPSCoR funding. We identified already competitive jurisdictions that were receiving EPSCoR funding. Conversely, we also identified less competitive jurisdictions that were not receiving EPSCoR funding.

NASA is funding four NASA EPSCoR jurisdictions—Alabama, Hawaii, New Hampshire, and Oklahoma—that already receive more than 0.75 percent of all NASA grants and cooperative agreements. We took the average EPSCoR amount received by these states and multiplied it over five future periods to calculate an estimated \$12.6 million in funds put to better use. Table 8 summarizes the funds put to better use identified during our audit and discussed in this report.

**Table 8: Average Grants and Cooperative Agreements Compared to the Average EPSCoR Obligations by Jurisdiction (2018 to 2022)**

Jurisdiction	Five-year Average NASA Awards	Percentage of Total NASA Grants	Five-year Annual Average EPSCoR Award	Funds Put to Better Use
Alabama	\$31,523,395	2.75%	\$948,245	\$4,741,225
Hawaii	21,600,443	1.88	316,933	1,584,663
New Hampshire	14,214,615	1.24	554,587	2,772,935
Oklahoma	13,151,134	1.15	702,924	3,514,618
<b>Funds Put to Better Use</b>				<b>\$12,613,442</b>

Source: NASA OIG analysis of BOBJ data.

Note: Average annual NASA award is less the EPSCoR amounts.

<sup>59</sup> Funds put to better use are funds that could be used more efficiently if the Agency takes action to implement and complete the recommendations made by the OIG.

As shown in Table 9, funds put to better use are funds that could be used more efficiently if the Agency takes action to implement and complete the recommendations made by the OIG. By reevaluating NASA’s EPSCoR jurisdictions, grant funds received by jurisdictions that already receive a significant amount of NASA grant funding outside of EPSCoR could be put to better use in other jurisdictions that have not yet demonstrated an aerospace research capability or are not yet competitive for NASA R&D grants.

**Table 9: Summary of Funds Put to Better Use**

Issue	Recommendation Number	Funds Put to Better Use <sup>a</sup>
Re-evaluate EPSCoR Jurisdiction Eligibility	5	\$12,613,442

Source: NASA OIG analysis.

<sup>a</sup> Funds put to better use are funds that could be used more efficiently if the Agency takes action to implement and complete the recommendations made by the OIG.

# APPENDIX E: MANAGEMENT'S COMMENTS

National Aeronautics and Space Administration

**Mary W. Jackson NASA Headquarters**  
Washington, DC 20546-0001



Reply to Attn of: Office of STEM Engagement

TO: Assistant Inspector General for Audits  
FROM: Associate Administrator for STEM Engagement  
SUBJECT: Agency Response to OIG Draft Report, "Audit of NASA's Science, Technology, Engineering, and Math (STEM) Engagement" (A-23-04-00-MSD)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report entitled, "Audit of NASA's Science, Technology, Engineering, and Math (STEM) Engagement" (A-23-04-00-MSD), dated March 18, 2024.

In this draft report, the OIG noted that the Office of STEM Engagement (OSTEM) is making progress managing and coordinating a diverse group of STEM engagement activities across the Agency and continues to operate against a backdrop of uncertainty, with its efforts challenged by a history of budget cuts and proposed elimination of the office. The OIG cited areas for improvement including grantee oversight and capturing STEM engagement data across the Agency.

The OIG makes seven recommendations designed to continue improving the Agency's STEM engagement activities.

Specifically, the OIG recommends the Associate Administrator (AA) for OSTEM:

**Recommendation 1:** Re-evaluate the OSTEM performance goals to ensure they are distinct and well correlated with outcomes.

**Management's Response:** NASA concurs with this recommendation. The current goals are established in the NASA 2022 Strategic Plan and will be re-evaluated during the next Agency strategic planning cycle. The associated metrics and targets for the current goals will continue to be developed and approved annually through the Agency Performance Planning and Reporting processes led by the Office of the Chief Financial Officer (OCFO) Strategic Insights and Budget Division.

**Estimated Completion Date:** Completion date will be aligned to the schedule for the development of the next NASA Strategic Plan. NASA anticipates establishing a working group for the next NASA Strategic Plan in the Fall/Winter of 2024 and plans to publish

the next NASA Strategic Plan in February 2026 or concurrent with the fiscal year 2027 President's Budget Request rollout in March 2026.

**Recommendation 2:** Develop a procedure to ensure OSTEM tracks and reports funding for all Agency STEM engagement activities.

**Management's Response:** NASA concurs with this recommendation. OSTEM will evaluate the current annual STEM engagement portfolio process and will use the soon-to-be-established NASA STEM Engagement Board (STEM Board) to consider this recommendation. The STEM Board is scheduled to replace the current governance body, the STEM Engagement Council, in June 2024, and will focus on Agency-level strategy, planning, and assessment. As part of those responsibilities, the STEM Board will advise on identifying appropriate guidelines, thresholds, and scope for identifying and tracking STEM engagement investments. In alignment with the STEM Board guidance, OSTEM will work with organizations to develop the operational methods and procedures for internal tracking of Agency STEM engagement activities. OSTEM will coordinate the Agency response and continued adherence to the Office of Management and Budget and Office of Science and Technology Policy guidelines and fiscal thresholds for external reporting of STEM engagement investments.

**Estimated Completion Date:** The STEM Board approved operational procedures will be developed by December 31, 2024.

**Recommendation 3:** Determine and apply relevant NASA project management policy requirements to existing project plans or record their exclusion and appropriately address budget risk in project plans, including planning for various funding scenarios.

**Management's Response:** NASA concurs with this recommendation. OSTEM will conduct a review of the existing program and four project plans, and update or revise, as necessary. The four projects include the National Space Grant College and Fellowship Project, Minority University Research and Education Project, the Established Program to Stimulate Competitive Research (EPSCoR), and NextGen STEM. The plans will continue to utilize and tailor NASA Procedural Requirement 7120.8A, NASA Research and Technology Program and Project Management Requirements, as the basic framework, and notations will be made of sections or components that will be excluded. Budget risks will be appropriately addressed.

**Estimated Completion Date:** Updated program and project plans will be in place by July 30, 2024.

**Recommendation 4:** Develop a standardized grant process that ensures mandatory performance reporting and that expiration dates are tracked and monitored to meet requirements and develop practices to ensure grant recipients are reporting subrecipient awards over \$30,000 as required.

**Management's Response:** NASA concurs with this recommendation. OSTEM will develop a standardized process to ensure that mandatory grant and cooperative agreement

performance reporting and expiration dates are tracked and monitored. OSTEM will work with the NASA Shared Services Center (NSSC) to ensure that the process leverages processes already in place as well as the new efforts being launched in 2024. This past year, OSTEM established a new Grants Manager position and is developing a Technical Officer Handbook, outlining responsibilities, training requirements, reporting deadlines, and guidance on tracking and monitoring performance reporting.

It should also be noted that NASA identifies Federal Funding Accountability and Transparency Act (FFTA) Subaward Reporting requirements in the grant/cooperative agreement award Terms and Conditions. Furthermore, the NSSC sends recipients a FFTA Subaward Reporting System<sup>1</sup> email reminder to file reports on an annual basis. OSTEM will build upon these communications by highlighting this requirement when a new awardee comes onboard and periodically throughout the period of performance for multi-year awards via webinars and meetings such as reverse site visits.

**Estimated Completion Date:** The standardized process will be in place by September 30, 2024.

Additionally, the OIG recommends the NASA Administrator:

**Recommendation 5:** Re-evaluate jurisdictions eligible for EPSCoR funds to ensure effective and equitable distribution of Agency funds.

**Management's Response:** NASA concurs with this recommendation. It should be noted that NASA already takes steps to ensure effective and equitable distribution of EPSCoR funds by offering a range of competitive funding opportunities including research awards, research infrastructure development awards, rapid response research awards, mission-aligned awards with the International Space Station, and the collaborative Research Infrastructure Improvement: Research Fellows awards in collaboration with the National Science Foundation. OSTEM will conduct an analysis of the jurisdiction award data in comparison to the findings of the OIG audit team. OSTEM will consult with the Office of Legislative and Intergovernmental Affairs, OCFO, and the Office of the General Counsel regarding results of the data award analysis and the requirements in Public Law 102-588, Title III, "Experimental Program to Stimulate Competitive Research on Space and Aeronautics," pertaining to eligibility prior to making any changes to EPSCoR eligibility.

NASA will determine whether it agrees or disagrees with the dollar value of funds put to better use identified in Appendix D of the report and will subsequently communicate its management decision to the OIG.

**Estimated Completion Date:** The re-evaluation of jurisdictions will be completed by November 30, 2024.

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<sup>1</sup> <https://www.fsrs.gov/>

Finally, the OIG recommends the NASA Deputy Administrator:

**Recommendation 6:** Require all NASA organizations capture STEM engagement activities in STEM Gateway.

**Management's Response:** NASA concurs with this recommendation. OSTEM will use the soon-to-be-established STEM Board to consider this recommendation. In alignment with the STEM Board guidance, OSTEM will work with organizations to utilize STEM Gateway to report, as appropriate, quantitative and qualitative end-of-year performance data, which could include summary participant/recipient data, institutional awards, research and development products, and a summary of accomplishments and highlights. OSTEM leadership will ensure that organizations are aware of the enhanced capabilities (e.g., application/registration process and selection processes) available in STEM Gateway to capture richer uniquely identifiable participant data.

There are financial implications that will be considered as part of this recommendation. Reporting in STEM Gateway includes licenses for platform usage and access to STEM Gateway dashboards. Expanding the number of users accessing the system increases the costs to the Agency, and usage will be appropriately managed by OSTEM.

**Estimated Completion Date:** A STEM Board guidance memo regarding capturing STEM engagement activities in STEM Gateway will be sent to all NASA organizations by December 31, 2024.

**Recommendation 7:** Require the Office of the Chief Human Capital Officer (OCHCO), Mission Directorates, and Centers collaborate to identify and incorporate critical Agency workforce needs when developing future STEM engagement activities and develop a plan that increases the number of STEM engagement activities aimed at skilled trade occupations.

**Management's Response:** NASA partially concurs with this recommendation.

NASA agrees with the portion of the recommendation to collaborate to identify and incorporate critical Agency workforce needs when developing future STEM engagement activities. It should be noted that NASA STEM engagement opportunities already inherently align to critical Agency workforce needs. For example, mentors develop internship opportunities that connect students' experiences to NASA work content, and student challenges, competitions, and research experiences provide students opportunities linked to NASA mission priorities and future work.

OCHCO reports progress on Mission Critical Occupation (MCO) hiring and staffing targets annually in support of the President's Management Agenda Workforce Priority. This report reflects the occupational areas important for NASA in the near future and may provide insight for the soon-to-be-established STEM Board regarding disciplines and areas of study aligned to the MCOs. The report will be provided annually to the AA for OSTEM for utilization in the STEM Board's annual portfolio planning process.



NASA does not agree with the portion of the recommendation to increase the number of STEM engagement activities aimed at skilled trade occupations. Since, as the OIG report points out, NASA has scaled down its technician workforce, there are very rare opportunities for NASA civil service employment for individuals with those skills and they are not identified by OCHCO as MCOs.

However, NASA leaders recognize that the technician and skilled trade occupations are a critical part of the aerospace workforce, and that we can enhance our communication and awareness about the importance of these positions. Currently, NASA offers opportunities targeted for skilled trades and community colleges including High School Students United with NASA to Create Hardware, a program which provides project-based learning opportunities for students to design and fabricate real work products for NASA, and NASA Community College Aerospace Scholars, a program which provides a three-tiered structure focused on engineering design. NASA also produced three episodes of the Small Steps, Giant Leaps podcast<sup>2</sup> featuring NASA and contractor trade and technical professionals, and three episodes of the Surprisingly STEM video series<sup>3</sup> featuring technicians in non-traditional occupations.

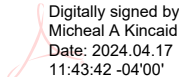
OSTEM will enhance career awareness activities to include technician and skilled trade occupations through development of additional Surprisingly STEM episodes featuring trade and technical professionals and conduct follow-on Virtual Classroom Connections through the NextGen STEM project to connect these subject matter experts with students.

**Estimated Completion Date:** OCHCO will provide the final 2024 MCO report to the AA for OSTEM upon completion, and annually thereafter. The 2024 report should be completed by December 31, 2024.

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 Lisa Stewart at (202) 358-1067.

Micheal A  
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Michael A. Kincaid  
Associate Administrator for STEM Engagement

<sup>2</sup> <https://appel.nasa.gov/podcast/>

<sup>3</sup> <https://plus.nasa.gov/series/surprisingly-stem/>

# APPENDIX F: REPORT DISTRIBUTION

## National Aeronautics and Space Administration

Administrator  
 Deputy Administrator  
 Chief of Staff  
 Chief Human Capital Officer  
 Associate Administrator, Aeronautics Research Mission Directorate  
 Associate Administrator, Exploration Systems Development Mission Directorate  
 Associate Administrator, Mission Support Directorate  
 Associate Administrator, Science Mission Directorate  
 Associate Administrator, Space Operations Mission Directorate  
 Associate Administrator, Space Technology Mission Directorate  
 Associate Administrator, Office of STEM Engagement  
 Deputy Associate Administrator, Office of STEM Engagement, STEM Engagement Program  
 Deputy Associate Administrator, Office of STEM Engagement, Strategy and Integration

## Non-NASA Organizations and Individuals

Office of Management and Budget  
     Deputy Associate Director, Climate, Energy, Environment and Science Division  
  
 Government Accountability Office  
     Director, Contracting and National Security Acquisitions  
     Director, Education, Workforce, and Income Security Issues  
  
 Montana State University

## Congressional Committees and Subcommittees, Chairman and Ranking Member

Senate Committee on Appropriations  
     Subcommittee on Commerce, Justice, Science, and Related Agencies  
  
 Senate Committee on Commerce, Science, and Transportation  
     Subcommittee on Space and Science  
  
 Senate Committee on Health, Education, Labor, and Pensions  
  
 Senate Committee on Homeland Security and Governmental Affairs  
  
 House Committee on Appropriations  
     Subcommittee on Commerce, Justice, Science, and Related Agencies  
  
 House Committee on Education and the Workforce  
  
 House Committee on Oversight and Accountability  
     Subcommittee on Government Operations and the Federal Workforce

House Committee on Science, Space, and Technology  
Subcommittee on Investigations and Oversight  
Subcommittee on Space and Aeronautics

**(Assignment No. A-23-04-00-MSD)**