

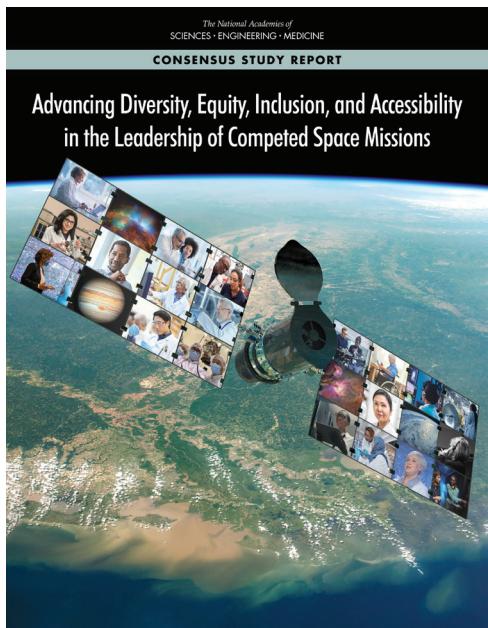


May 2022

Consensus Study Report

HIGHLIGHTS

Advancing Diversity, Equity, Inclusion, and Accessibility in the Leadership of Competed Space Missions



Fostering diverse and inclusive teams that are highly skilled, innovative, and productive is critical for maintaining U.S. leadership in space exploration. In recent years, NASA has taken steps to advance diversity, equity, inclusion, and accessibility (DEIA) in their workforce by releasing its equity action plan, emphasizing how diverse and inclusive teams help maximize scientific returns, and requiring DEIA plans as part of announcements of opportunities. To further its efforts to advance DEIA, the Agency requested the National Academies undertake a study to evaluate ways NASA can address the lack of diversity in space mission leadership.

Advancing Diversity, Equity, Inclusion, and Accessibility in the Leadership of Competed Space Missions outlines near and long-term actions NASA can take to make opportunities for leadership and involvement in competed space missions more accessible, inclusive, and equitable. Report recommendations range from changes to the mission proposal process to investments in STEM education and career pathways.

The report makes 15 recommendations for advancing DEIA within NASA's Science Mission Directorate (SMD) divisions that support competed space mission programs. However, many of the report's recommendations could also be applied broadly to research at NASA and other federal agencies and institutions, leading to a more diverse research workforce. Read or download the full report at <https://nap.edu/26385>.

OVERSIGHT OF DEIA IMPLEMENTATION AT NASA

For NASA SMD to increase DEIA in competed missions, a cultural change is needed to continue to promote newer mindsets, policies, and practices. The NASA Advisory Council (NAC) has the opportunity to set the tone from the highest levels of the Agency and ensure that broadening participation in space missions remains a critical focus. Therefore, the report recommends that *NASA should empanel an ongoing NAC committee specifically focused on DEIA to directly advise top NASA leadership*.

PROPOSAL PROCESS AND REVIEW

NASA's competed space missions are selected from proposals submitted in response to a public Announcement of Opportunity (AO). Mission team formation and concept development often occur years before an AO is released and require significant resources from proposers and institutions. This process is opaque, often personality-driven, and influenced by "who knows whom" in the community, which directly impacts the diversity of the Principal Investigator (PI) candidate pool.

The report recommends that *NASA work to make the pre-proposal process transparent and accessible and use its own resources to expand support for pre-proposal and proposal efforts for diverse, external PIs.*

One demanding component of the mission proposal process is a site visit at the proposing institution. Over time, such site visits have grown in scale, requiring institutional resources. The report recommends that *NASA reconsider requirements for site visits, eliminate unnecessary elements, and disallow supplemental funding that may result in inequities across teams.*

NASA has taken steps to require DEIA plans as part of the competed mission AOs. However, DEIA criteria are not evaluated consistently and systematically, making it challenging to identify barriers in the mission proposal process. The report recommends that *NASA SMD should require AOs to describe how DEIA dimensions are key for mission success, establish scorable proposal criteria for DEIA, and provide training so that reviewers can appropriately evaluate them. The report also recommends that NASA engage with DEIA experts to implement the new requirements in ways that broaden participation of underrepresented groups in missions and establish processes to continually measure the impact of the new requirements on NASA's DEIA goals.*

DATA COLLECTION, ANALYSIS, AND REPORTING

Inadequate data gathering, monitoring, and reporting are critical barriers to NASA's understanding of the demographics of its proposer pool, its ability to identify and eliminate barriers in the mission proposal process, and its ability to measure improvements. Therefore, the report recommends that *NASA Headquarters should develop a systematic and transparent process to track proposal submissions and selections and seek professional statistical expertise to set in place the needed infrastructure. Additionally, it should generate an annual report on dimensions such as funding rates and diversity in participation in PI-led missions and grants. The report should be delivered to the DEIA subcommittee of the NAC as well as made publicly available.*

The lack of demographic data is not limited to NASA proposals. There is a strong need for demographic data on participation in the earth and space sciences across the whole career pathway to regularly assess the state of the profession, from undergraduate programs to the professional workforce. Therefore, the report recommends that *NASA SMD should provide funding for professional organizations (e.g., American Institute of Physics, American Astronomical Society, etc.) to systematically carry out surveys of the space sciences workforce. Such surveys would inform the Agency of the level of participation from different demographic groups as well as barriers and opportunities for advancement along the entire career pathway.*

TRAINING AND MENTORING POTENTIAL PRINCIPAL INVESTIGATORS

Preparation for competed mission leadership starts early in an earth and space science career. Training and mentorship opportunities are valuable tools for developing a diverse pool of future mission leaders. Given the range of institutional and interpersonal factors that can act as barriers for potential proposers, the responsibility for an individual's success as a future leader of a competed space mission should rest primarily at the organizational level.

Acquiring the necessary information about proposing and navigating the informal pre-proposal process presents critical challenges to aspiring PIs, particularly for those from less-resourced institutions (e.g., Non-PhD-granting academic institutions and Historically Black Colleges and Universities (HBCUs)), where a high concentration of women physics faculty and Black and Hispanic/Latinx physics faculty are employed. Therefore, the report recommends that *NASA should expand and increase the frequency of training programs that are aimed at encouraging women and historically minoritized communities to become more involved in mission leadership.*

Mentoring and access to collaborative networks that include experienced PIs are critical for those submitting competed mission proposals. However, women and racially minoritized space scientists report less access to mentors, less access to networks, and lower quality relationships with their doctoral advisors and senior colleagues. Inequitable access to high-quality mentoring relationships is a barrier to increasing diversity in the leadership of competed space missions. The report recommends that *NASA should help aspiring PIs gain leadership experience and connect with individuals with mission experience for mentorship. This could include integrating aspiring PIs as mentees in roles on mission teams, encouraging aspiring PIs to gain leadership experience via lower-cost mission opportunities such as suborbital rockets/balloons or cubesats, and expanding networking opportunities to connect aspiring and experienced PIs.*

INVESTMENT IN CAREER PATHWAYS FOR UNDERREPRESENTED GROUPS

The very low overall retention (~11%) in space science disciplines during undergraduate training, and the accompanying racial/ethnic disparity, is currently a central “pinch point” that restricts the size and diversity of the pool of PhD scientists for future NASA mission leadership. NASA needs long-term, sustained investment in effective activities that inspire, educate, train, and mentor, to ensure that the current small pool of scientists of color has every opportunity to engage in NASA mission-related work and leadership.

The report recommends that *NASA SMD, in collaboration with NASA’s Office of STEM Engagement (OSTEM), provide consistent and adequate funding for STEM initiatives that are explicitly centered on DEIA, address recruitment and retention challenges in the earth and space sciences, and support and expand opportunities for individuals from underrepresented groups.* These investments should reflect a pathways approach spanning the academic and career continuum from post-secondary through post-PhD years to establish flexible and robust education-to-career trajectories into the earth and space sciences workforce and ultimately into PI-led missions. A systematic process should also be put in place to document measurable impacts of these investments.

HBCUs, Hispanic Serving Institutions (HSIs), other Minority Serving Institutions (MSIs), and Non-PhD-granting academic institutions, have played a critical role in educating and employing a disproportional number of women and racially minoritized populations in the space sciences. However, historical underinvestment in the space science research infrastructure at HBCUs and other MSIs has limited the capacity at these institutions to compete for a NASA space mission. Currently, programs such as NASA’s Minority University Research and Education Project (MUREP) are helping to engage underrepresented communities in STEM and develop the research infrastructure of MSIs in areas of strategic importance to NASA’s mission. Further partnerships among NASA SMD, OSTEM, and MSIs, as well as with other federal agencies (such as recent partnerships with the National Science Foundation), would help advance the important work already underway at MSIs while strengthening participation from underrepresented groups in missions.

The report recommends that *NASA reinvest in talent development programs in partnership with MSIs, increase engagement via research opportunities for students and early-career researchers, and provide funding to support mission-related work and activities as a means of enhancing research capacity at HBCUs, HSIs, and other MSIs. NASA should also finance collaborations between MSIs and NASA Centers and/or Research 1 universities currently active in space missions.*

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