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# First Steps Toward Improving DoD STEM Workforce Diversity

Response to the 2012 Department  
of Defense STEM Diversity Summit

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Prepared for the Office of the Secretary of Defense

Approved for public release; distribution unlimited

The research described in this report was prepared for the Office of the Secretary of Defense (OSD). The research was conducted within the RAND National Defense Research Institute, a federally funded research and development center sponsored by OSD, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community under Contract W74V8H-06-C-0002.

**Library of Congress Cataloging-in-Publication Data** is available for this publication.

ISBN: 978-0-8330-8101-8

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## Summary

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On August 18, 2011, the President issued Executive Order 13583, “Establishing a Coordinated Government-Wide Initiative to Promote Diversity and Inclusion in the Federal Workforce.” The Department of Defense (DoD), in response to the order, soon released an organizational diversity and inclusion strategic plan addressing workforce diversity, workplace inclusion, and force sustainability. In turn, leaders from DoD’s Research and Engineering (ASD[R&E]) and the Office of Diversity Management and Equal Opportunity (ODMEO) sought to further support the President’s order in ways specific to DoD’s science, technology, engineering, and mathematics (STEM) workforce. These leaders convened a two-day conference, the DoD Diversity STEM Summit, on November 1, 2012.

Over the course of the Summit, senior executives from DoD, federal agencies, the private sector, and academia presented on and discussed issues related to the diversity of the DoD STEM workforce. Participants described existing initiatives and proposed new ideas to increase STEM participation overall and of underrepresented groups specifically.

ODMEO asked researchers from the RAND Corporation to support Summit efforts by responding to the proceedings with actionable recommendations. Over the course of the Summit, several key questions emerged:

- How can DoD begin to better position itself to establish a diverse STEM workforce?

- What do demographic trends suggest about DoD's current STEM workforce?
- What are DoD and partners doing to increase diversity in the STEM workforce and what else can be done?

The RAND team synthesized the information presented at the Summit as well as conversations following each presentation to answer these questions and offer a number of possible process-related recommendations that DoD can take as a first step toward its STEM workforce diversity goals.

### **How Can DoD Begin to Better Position Itself to Establish a Diverse STEM Workforce?**

A number of STEM- and diversity-related policies have gone into effect over the past decade. For example, the 2007 America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act, or America COMPETES Act (P.L. 110-69), broadly targets the nation's current and projected need for more STEM workers to effectively respond to a globally competitive world. America COMPETES was reauthorized in 2010 (P.L. 111-358) to provide funding for research, development, and education in STEM areas until 2013. Additionally, the intention to increase minority representation across all federal organizations, including DoD, is articulated in Executive Order 13583. The order instructs leaders of federal agencies to make changes in the ways in which minority groups are recruited, hired, promoted, and retained. STEM skills are specifically referred to in the U.S. Office of Personnel Management, Office of Diversity and Inclusion's *Government-Wide Diversity and Inclusion Strategic Plan 2011* and in the *DoD STEM Strategic Plan: FY 2013–FY 2017*.

Our initial review of these policies suggests they are being driven in part by several assumptions:

- That there is a need for talented and innovative STEM workers to meet 21st century global challenges.

- That the nation’s demographic makeup is changing and will continue to change.
- That the federal workforce, including DoD, must be inclusive and reflect the demographics of the country it serves.

This report does not evaluate the first and third assumptions, but the review of current STEM- and diversity-related national and DoD policy suggests that there are substantial grounds on which to base further action. ASD(R&E) and ODMEEO may consider leveraging these policies separately or together as the organizations move forward in developing the diversity of the STEM workforce.

## **What Do Demographic Trends Suggest About DoD’s Current STEM Workforce?**

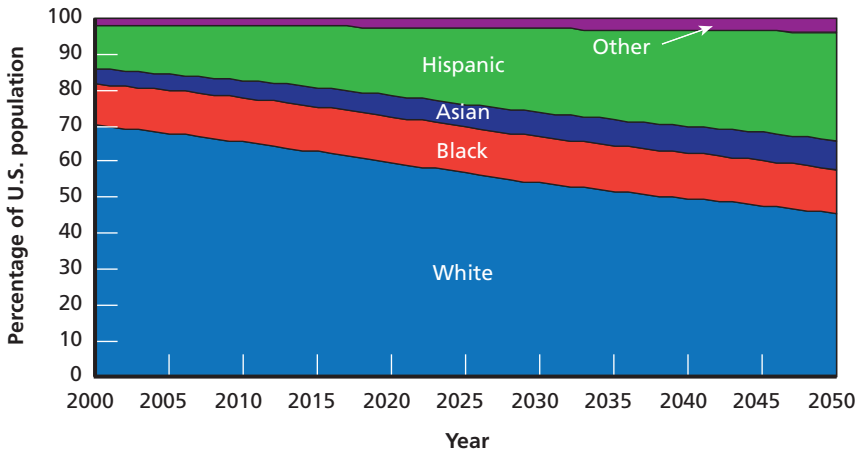
The Census Bureau’s 2008 National Population Projections demonstrate that the United States is in the midst of a major demographic shift. These projections show that the nation’s population is becoming significantly more Hispanic and less white, non-Hispanic. Figure S.1 graphically illustrates this shift: The Census Bureau estimates that in 2000, whites not of Hispanic origin (referred to hereafter as whites) made up about 70 percent of 18–65-year-olds, and the bureau projects that in 2050 they will make up less than 45 percent, with Hispanics increasing from 12 percent to 30 percent. The proportion of Asians is also projected to increase, from about 4 percent in 2000 to about 8 in 2050.<sup>1</sup> These projections rely on various assumptions about future mortality, birth rates, and migration.

Figure S.2 shows the current composition of 23–29-year olds, the proportion of those who have college degrees in a STEM field, and the proportion of those who have college degrees (in any field) and work in a STEM occupation. Notably, Hispanics make up 20 percent of the

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<sup>1</sup> The “other” group, in the census data as well as in the American Community Survey (ACS) data shown later in the report, includes both non-Hispanics who are multiracial and non-Hispanics who are American Indian, Alaskan Natives, or Native Hawaiian or other Pacific Islander.

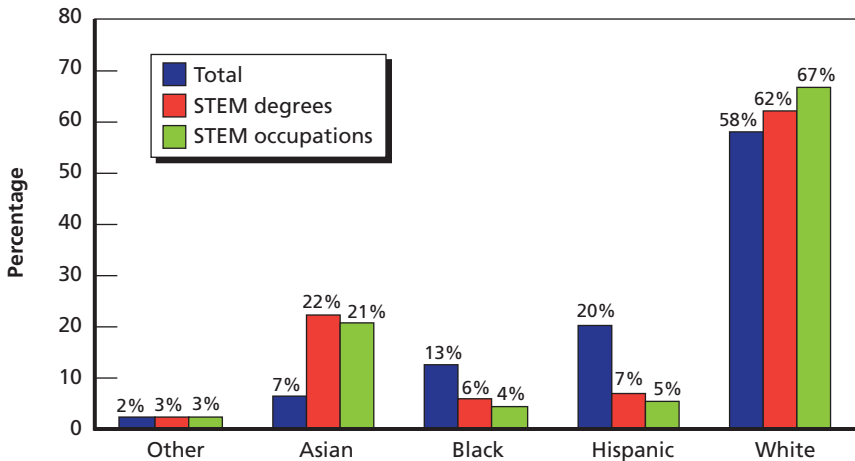
**Figure S.1**  
**Census Projections, 2000–2050, 18–65-Year-Olds**



SOURCE: Based on authors' computations with 2008 Census projections data (U.S. Census Bureau, 2008).

RAND RR329-S.1

**Figure S.2**  
**2010 Percentage of 23–29-Year-Olds in Overall Population, Among STEM Degree Holders, and Among Those with College Degrees in STEM Occupations, by Race/Ethnicity**



SOURCE: Based on authors' computations with 2010 ACS data (Ruggles et al., 2010).

RAND RR329-S.2



overall young adult population but only 7 percent of those with degrees in STEM fields, and only 5 percent of those with a college degree who work in a STEM occupation. Similarly, black young adults make up 13 percent of the overall population but only 6 percent of those with degrees in STEM fields, and only 4 percent of those with a college degree who work in a STEM occupation.

The significantly lower representation of Hispanics among those with a STEM degree and among those in the STEM workforce, coupled with the rapidly growing Hispanic population, presents a major challenge to DoD's efforts to make its STEM workforce racially representative of the nation. Without significant convergence among rates of STEM participation by racial/ethnic group, the gap between the proportion of Hispanics in the working-age population and the proportion of STEM workers who are Hispanic will grow significantly.

Currently, the DoD STEM workforce closely parallels the citizen STEM workforce in terms of racial/ethnic composition, indicating that the factors affecting the composition of the overall STEM workforce are also affecting DoD STEM hiring (see Figure S.3).<sup>2</sup> This similarity suggests that it may be difficult for DoD to hire a STEM workforce that is significantly more racially diverse than the overall STEM workforce.

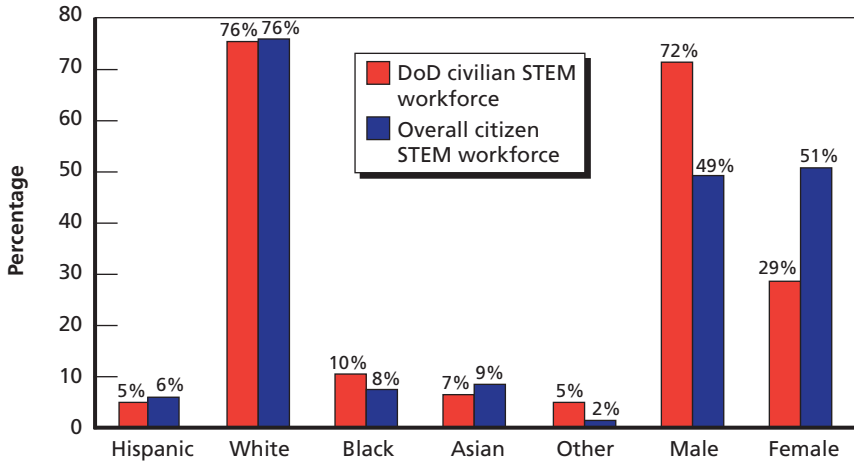
## **What Are DoD and Partners Doing to Increase Diversity in the STEM Workforce, and What Else Can Be Done?**

Our initial comparison of DoD STEM outreach activities conducted across the United States suggests that the goals and intended participants of these efforts vary greatly. Some of the programs aim to get STEM students into the DoD hiring pipeline, while others have

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<sup>2</sup> The overall STEM workforce, using the DoD definition, which includes health practitioners, is more than half female, whereas the DoD civilian STEM workforce is only 29 percent female. We attribute this to the fact that health practitioners make up over half of citizen STEM workers, and women make up a large majority of that group. In contrast, we believe that health practitioners constitute much less than half of the DoD STEM workforce, although we do not have data to support this speculation.

**Figure S.3**  
**Overall STEM Citizen Workforce and DoD Civilian STEM Workforce, by Race/Ethnicity**



SOURCE: Based on authors' computations with 2010 ACS data (Ruggles et al., 2010) and with DoD-provided data.

NOTE: For an explanation of the methodology behind this graph, including the gender disparities between the DoD STEM workforce and the overall STEM workforce, see Chapter Three.

RAND RR329-S.3

broader goals, such as community outreach. Many efforts provide educational support. Programs such as SeaPerch, the Navy's robotics competition, are designed to increase school-age children's interest in STEM and problem-solving skills. Other educational programs, such as the Air Force's Teachers Materials Camp, supports school curriculum development. Several programs directly "feed" into the DoD workforce. Notable in this category is the Science, Mathematics, And Research for Transformation (SMART) Scholarship program, which awards scholarships to students in certain STEM fields in return for postgraduate employment with DoD.

However, review of the programs suggests a need for greater goal articulation and alignment as well as program assessment. Program goals, associated costs, and minority participation were unclear or unknown to presenters and to the program leaders we consulted with after the summit, or this information was just not shared with us. From

the information we did gather, we found that (1) program goals may overlap in some cases and (2) there is no uniform measurement used to determine how successful these programs are in reaching out to different demographic groups or in achieving other goals, such as improved academic performance or pipelines to federal service. Once the DoD STEM diversity goals are articulated, assessment will be necessary to determine which programs are achieving desired outcomes.

## Recommendations

Given that this report is only an initial response to Summit proceedings, we recommend first and foremost that DoD clearly articulate which aspects of diversity it wishes to prioritize and establish a common set of specific goals to pave the way toward reaching desired outcomes. After these outcomes are expressed, the organization will be better positioned to analyze whether current practices are effective and to explore changes to make practices more effective. Over the course of the Summit, for example, speakers focused primarily on racial/ethnic diversity, and gender diversity to a lesser extent. In response, in this report we focus primarily on the representation of racial/ethnic and gender categories in the STEM workforce and how current DoD outreach programs target those groups. However, other categories of diversity, such as religious background, national origin, and skill sets, are included in definitions of diversity throughout various DoD policy documents. These categories were seldom mentioned over the course of presentations and discussions, which is reflected in our response. Briefly stated, a clearer articulation of diversity goals is necessary to maximize the effectiveness of later steps.

The initial findings, especially those related to program assessment, suggest a second overarching recommendation: that DoD work toward coordinating efforts across the organization to reach its STEM-diversity workforce goals. By *coordination*, we refer to the synchronization of organizational efforts, including the efforts of DoD as well as supporting agencies and external stakeholders, to improve effectiveness

and efficiency and reduce costs through program sharing and minimization of overlap.

We offer the following managed-change plan to bring together the various efforts designed to promote a diverse workforce, including the STEM workforce. We recommend that DoD take action incrementally and in order: in the short term (1–12 months), mid term (1–3 years), and long term (4+ years).

### **Short Term**

***Recommendation 1: Articulate DoD STEM and diversity goals and align policies and practices within the DoD STEM community toward achievement of these goals.***

DoD's current definition of diversity is broad and, as such, is useful for defining diversity according to organizational strategy:

Diversity is all the different characteristics and attributes of the DoD's Total Force, which are consistent with our core values, integral to overall readiness and mission accomplishment, and reflective of the nation we serve. (U.S. Department of Defense, Science, Technology, Engineering, and Mathematics [STEM] Executive Board, 2012, p. 3)

However, the definition needs to be translated into a more specific tactical definition that DoD STEM leaders can use for designing policy and setting goals. It may not be possible to effectively focus on every possible aspect of diversity implied or explicitly mentioned in DoD policy documents. Relatedly, the Office of the Secretary of Defense and the services have many programs without clearly articulated goals or assessment of their returns on investment. In the new era of fiscal responsibility, it is essential that members of the DoD STEM community come together under a set of clear strategic objectives, including operationalizing what they mean by diversity, articulating clear goals, and focusing their resources on meeting those goals. In this report, we offer an option for collecting information to compare various efforts, focusing largely on racial/ethnic diversity. This comparison of different efforts in terms of goals, intended participants, and other factors may help improve overall efforts as well as reduce overlap.

***Recommendation 2: Establish closer working relationships between ASD(R&E) and ODMEEO in the short term and between AT&L and P&R in the long term.***

Both ASD(R&E) and ODMEEO recently finalized and published DoD strategic plans in their policy domains (STEM and diversity, respectively). Currently, both organizations are developing their implementation plans, which is the opportune time for both organizations to closely align their plans to maximize the impact of their efforts. ASD(R&E) and ODMEEO should consider building partnerships between the larger DoD organizational components, Acquisition, Technology, and Logistics (AT&L) and Personnel and Readiness (P&R), for maximum impact.

***Recommendation 3: Focus on building a pipeline to DoD employment.***

Both ASD(R&E) and ODMEEO sponsor a number of outreach activities and internships. They and their service partners should consider co-sponsoring outreach activities and coordinating internships for better return on investment. More importantly, DoD should develop closer links from outreach to internships, from scholarship to hiring.

**Mid Term**

***Recommendation 4: Expand strategic initiatives to include the Total Force.***

As DoD implements its STEM strategic plan, it should consider expanding the scope of certain programs to include all members of the Total Force—including not only active and reserve components, but also civil servants and contractors. Identifying programs from one component that could be successfully implemented in other components may help DoD to realize its STEM strategic goal.

***Recommendation 5: Engage the Military Personnel Policy (MPP) and Civilian Personnel Policy (CPP) offices to overhaul recruiting of STEM professionals for all components.***

The National Academies expressed concerns in 2012 that DoD is not the employer of choice among the most talented STEM professionals (National Research Council, 2012, pp. 116–117). AT&L and

P&R should consider whether transforming aspects of DoD personnel policies could help DoD to achieve its STEM goals. ASD(R&E) and ODMEO may serve as catalysts for this organizational transformation, which will prepare DoD to meet emerging STEM needs and become an employer of choice of top STEM talents, and also engage with other DoD offices that set and implement personnel policy.

***Recommendation 6: Establish specific goals for the representation of minorities and women in the STEM applicant pool.***

Having goals is an important part of organizational change efforts. To meet its goal of increasing the representation of minorities and women among STEM workers, we recommend that DoD articulate specific outcomes so that leaders will know what to work toward and DoD will be able to self-evaluate and change its strategy and goals in response to results. Because of legal limitations, setting goals for the number of hires or employees is not feasible. However, one potential option is to set goals for the applicant pool for DoD jobs and programs. For example, the goal might be that the applicant pool for specific jobs mirror the demographics of its occupation in the overall labor market, perhaps based on the sort of census data analysis we perform in this report. It is possible that those standards are already being met in terms of racial/ethnic diversity, since the racial/ethnic composition of STEM workers within DoD already mirrors fairly closely the racial/ethnic composition of citizen STEM workers in the overall labor market. Another potential goal might be that the applicant pool for specific jobs mirror some weighted average of the demographics of the overall working-age population and the relevant labor market. We are not recommending a particular goal, but rather suggesting that DoD develop some type of measurable outcome, which will allow internal or external stakeholders to evaluate progress toward the articulated goals.

**Long Term**

***Recommendation 7: Establish formal ties between policies and practices of AT&L and P&R (ASD[R&E] and ODMEO).***

Improving the diversity of the DoD STEM workforce cannot be done overnight. To see measurable changes, DoD must institutionalize closer

coordination and collaboration between ASD(R&E) and ODMEO, as well as create innovative policies and practices that streamline recruiting, hiring policies, and practices between AT&L and P&R.

## Going Beyond DoD

### Short Term

***Recommendation 8: Consider establishing the Defense Diversity and STEM Advisory Council, representing the defense STEM “ecosystem,” with expanded mandate to provide oversight and advise the Secretary of Defense.***

In the course of the Summit, presenters and audience members referred to a STEM “ecosystem” that includes DoD and “the entire system supporting it, including the labs and industry.” It was suggested this ecosystem could produce opportunity and enhance diversity and inclusion, and as such yield “hybrid forms of new innovation” to ensure the nation’s competitiveness. We suggest that DoD consider establishing a Defense Diversity and STEM Advisory Council that has expertise in a number of personnel-related areas, such as recruitment, diversity management, and STEM training. Such a council can give recommendations and feedback as the organization works toward fulfilling its workforce goal.

***Recommendation 9: Be an agent for a national campaign.***

DoD should consider acting as a catalyst to reach its own goal by engaging with external stakeholders in a national campaign to improve the diversity of its STEM workforce. Given DoD’s size and visibility, as well as the centrality of STEM to its overall mission and its significant interactions with other STEM employers within both the government and the private sector, the organization may be able to influence a national campaign. Before engaging in a full campaign, however, analysis on the cost-effectiveness of support and participation should be conducted.

## Mid Term

### ***Recommendation 10: Work with industry and academia to increase diversity within STEM professions.***

The National Academies (2012) pointed out the importance of the industrial suppliers of DoD to meet the STEM challenges. Defense industry leaders such as Lockheed Martin presented evidence of success at the Summit. We suggest that DoD consider working together with industry and academia to increase diversity within STEM professions overall in order to fulfill its workforce goal.

### ***Recommendation 11: Support and track success of national campaign to improve diversity within the STEM workforce.***

In the medium term, DoD should continue taking a role in promoting STEM careers and education with other partners to increase the diversity of the national STEM workforce. Measuring and tracking the success of STEM-diversity programs will also be important for evaluating the performance of those programs and revamping them as needed.

## Long Term

### ***Recommendation 12: Enable the Defense Diversity and STEM Advisory Council to monitor policies and practices to increase the diversity of the STEM workforce.***

The effort to improve the diversity of DoD's STEM workforce must endure over the long term, and thus the Defense Diversity and STEM Advisory Council should be empowered to monitor and assess DoD efforts and advise the Secretary of Defense on how to improve STEM policies and practices.

### ***Recommendation 13: Sustain efforts to improve the diversity of the overall STEM workforce.***

In the long run, DoD may be able to meet its STEM-diversity goals by sustaining efforts to increase diversity within its own STEM workforce, as well as continuing to contribute to national efforts to improve the diversity of the overall STEM workforce.