

Veterans' Education for Engineering and Science

Report of the National Science Foundation Workshop on Enhancing the Post 9/11 Veterans Educational Benefit April 2009



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McLean, VA
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Executive Summary

In August 2009, the U.S. Department of Veterans Affairs (VA) will launch a new program of educational benefits for veterans of the U.S. armed forces who served on active duty after September 10, 2001. The program greatly expands the post-secondary educational benefits available to those veterans. At the same time, experts are concerned about the adequacy of the future U.S. engineering and science workforce. On April 27, 2009, in a speech to the National Academy of Sciences, President Obama called for major investments in attracting students to science and engineering, because science is now “more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before.” The post-9/11 veterans educational benefit creates an opportunity for the United States to expand its technical workforce while serving those who served.

Post-9/11 veterans include a diverse and qualified pool of future talent for the nation’s engineering and science employers. Ushering them into technical fields as work-force ready engineers and scientists will require a community of partnerships among the veterans themselves, the nation’s educational institutions, technology firms, the government’s technical and scientific organizations, and others.

To help form those partnerships and generate ideas on how to encourage post-9/11 veterans to use the new benefit toward educational opportunities that lead to careers in science and technology, NSF’s Division of Engineering Education and Centers sponsored a workshop on April 13-14, 2009. The workshop brought together a diverse group of professionals from academia and business along with several government officials and NSF program officers. This report describes the workshop and outlines its recommendations. It also explores the new veterans benefit and examines the population it will serve. The following paragraphs summarize the workshop’s main recommendations.

Workshop Recommendations

The principal conclusion of the workshop deliberations was that the NSF and other federal science and engineering agencies should create an education/career development program focused on getting veterans into science and technology careers. NSF and the other federal agencies have long experience sponsoring education research and activities. NSF already has grant programs that fund students’ research experiences. The cost to expand and enrich such programs is a small fraction of the cost of the post-9/11 veterans educational benefit. Yet by expanding it, the community could engage a significant number of veterans with the potential to pursue careers in fields of science and technology.

The workshop members generated a host of recommendations; the most important are summarized below:

1. **Customize Education for Veterans.** Universities and community colleges should develop new associate, bachelors and graduate level degree pathways for veterans in engineering and science. The workshop members emphasized the opportunities for specialized study at the masters and PhD levels because of the educational attainment and leadership characteristics that many new veterans will bring from their time in military service.
2. **Scale to the Need.** The federal funding agencies, including NSF, should support enough institutions so as to a) impact a significant number of veterans and b) provide a diverse and geographically dispersed set of schools for veterans to select from. The workshop members estimated that support for about 100 schools would be sufficient as a basis for starting a program and for determining the benefits that can actually be derived from a program relative to accomplishing the dual objectives of education and career development. Recognizing the number of veterans who return to pursue associate degrees, the 100 schools should include a suitable number of community colleges as well as four-year colleges and universities, and the programs at the community colleges should suitably support both those veterans who will continue on for higher degrees and those who will go on to start their new careers immediately after graduation.

The NSF should seek to develop a pilot program with a four-year budget in the range of \$100 million to \$150 million. A program of this size would provide on average \$1 million to \$1.5 million for each of 100 educational institutions which should provide the incentive for institutions to develop education and career development programs that incorporate features of the sort described in Recommendation number 3 below.

The NSF program should also require that participating educational institutions gain supplemental financial support from their industry partners to further assure that the career development aspects of the program receive sufficient investment. Other federal agencies engaged in engineering and science endeavors should explore modifications to their internship programs that would enable them to increase their ability to partner with educational institutions by providing internship and research opportunities to veterans. As results are derived from the pilot program, NSF should work with the myriad of industry and government stakeholder groups that have interests in the program to appropriately broaden the program to achieve its full potential. This could involve multiple government organizations as well as industry taking on broader responsibilities for various aspects of the program, including increasing the availability of internship and research opportunities available, increasing the number of schools that are supported, and increasing the number of companies involved and their investments in the program.

3. Features of an exemplary education and career development program for veterans include:
 - a. Providing year-round, start- to-finish program support for veteran students;
 - b. Supplementing the 36 months of academic support provided through the new GI bill with internship and research activities;
 - c. Encouraging innovative ways to integrate the support services that veterans will need and help the veterans to take advantage of them.
 - d. Cultivating external relationships established for the veterans that are intended to directly impact their career opportunities
 - e. Celebrating the special attributes of veterans that recognize their unique attributes as a community of interest;
 - f. Institutionalizing the organizational model that is put in place to oversee and direct the integrated program being offered; and
 - g. Planning for how to sustain the program after the termination of federal grant support.

4. Transition Points. The program should be organized to support the educational transition from the military to the civilian environment as seamlessly as possible. For example, the NSF should account for the fact that veterans' service training experiences are more likely to receive transfer of credit at the associate degree level than at the bachelors degree level, thereby offering an advantage to proposals that envision the integration those educational offerings that start with an associate degree program at a two-year college and permit a relatively seamless integration with a related bachelors degree program.

5. Urgency. With the post-9/11 veterans' educational program starting in August 2009, there is no time to waste. NSF should take immediate actions to gain support for starting the recommended enhancement program, and target February 1, 2010, as the award date for the first round of new grants to be awarded under the new program. This will permit educational institutions to get their new programs up and running in a timely and practical manner, and for veterans to learn about the new programs in science and technology that will be made available to them.

6. Outreach. The NSF should take the lead, working in concert with the educational community, the VA, the DOD, business firms, and government organizations focused on science and technology, to develop the mechanisms for communicating with veterans regarding this special opportunity. In the period between the initiation of the recommended new program and the actual start of new programs at educational institutions, the NSF should initiate activities to:
 - a. Develop the various communities of interest into becoming program-focused stakeholder communities;

- b. Establish the mechanisms for reaching out to veterans in the most productive ways, using the capabilities and interests of the individual stakeholder communities to maximum advantage;
 - c. Fund the development of standard materials about the new program opportunities that can be used by all stakeholder groups as part of their individual outreach efforts; and
 - d. Define the network of Internet portals and websites that will allow stakeholders to operate as an integrated team, including developing presentation standards for promotional materials presented to veterans.
7. Data and Evaluation. While the workshop members were able to use existing data to make first-order estimates regarding the potential for supporting various numbers of veterans and for building up the future science and technology workforce, this subject is too important to continue to operate without supporting data to allow more direct predictions and evaluations of the effectiveness of the recommended new program. The NSF should define and fund an activity to define, efficiently collect and assess the necessary data that needed for predictions and evaluations of the new program's potential and actual outcomes. This effort should produce initial results that can start to be used when the pilot program implementation begins in 2010.
8. Potential Employers. National laboratories, companies, and not-for-profit organizations that seek to employ veterans with engineering and science degrees should join in this education effort now. These organizations stand to benefit in the future as the veterans participating in the NSF program become available for hire. They should develop partnerships with educational institutions and students to provide the student veterans with some of the needed financial and personnel support. Through mentoring and internships, potential employers should take an active role in educating veterans and supporting their growth and development. The post-9/11 veterans educational benefit can also be a resource for existing employees who wish to return to school for advanced degrees.

Many of today's service members have an interest in and talent for technical fields. The post-9/11 veterans' educational benefit will open the door to college for many of these people. Unfortunately, interest and talent do not always translate into careers in engineering and science. Only a small percentage of recent veterans have taken technical jobs. The enhancement program in engineering and science outlined in this report will help to draw veterans into technical fields of study and enrich their educational experience. The program will also help them to start their new careers in engineering and science. The community of partners that supports veterans' education can encourage veterans to pursue their interests, work to their potential, enhance their abilities and help them to get started on their new careers. The NSF should take the lead in developing this program and the network of partners to support it, drawing on its experience in developing engineering education programs and working with educational institutions to carry them out.

Introduction and Background

In August 2009, the U.S. Department of Veterans Affairs (VA) will launch a new program of educational benefits for veterans of the U.S. armed forces who served on active duty after September 10, 2001. The program, mandated under the Post-9/11 Veterans Educational Assistance Act of 2008, greatly expands the post-secondary educational benefits available to post-9/11 veterans.¹ The VA estimates that the new program (sometimes referred to as the New GI Bill) will cost about \$76 billion over a ten-year period.² A brief summary of the program is provided in Appendix A.

At the same time, there is a coming shortage in the U.S. engineering and science workforce. The cause is a downward trend in student interest in engineering and science and the expected retirement of large numbers of engineers and scientists during the coming decade. Today a large proportion of engineering and science graduates of American universities are not U.S. citizens.³ The new veterans benefit offers an unparalleled opportunity for the United States to expand its technical workforce while serving those who served.

Post-9/11 veterans offer the nation's engineering and science employers a diverse and pre-qualified pool of future talent. The vast majority of those who serve in the enlisted ranks of the nation's armed services are high school graduates with strong cognitive aptitudes. Most members of the officer corps hold four-year or advanced college degrees. Many of those who serve today are interested in technical careers and equipped to succeed in them. They have experience managing technical systems and solving complex problems. They know how to work in teams and how to lead.

An opportunity exists to develop programs that will usher post 9-11 veterans into technical fields and shape them into workforce-ready engineers and scientists. In order to be successful, a set of partnerships will be required, including the veterans themselves, the nation's educational institutions, technology firms, and the government's technical and scientific organizations. Recognizing this opportunity, the Division of Engineering Education and Centers of the National Science Foundation (NSF) sponsored a workshop to discuss how best to approach this opportunity. The workshop meeting occurred on April 13-14, 2009, in the offices of the MITRE Corporation in McLean, VA. The workshop had five objectives:

- Develop ideas for customizing educational programs in engineering and science to attract veterans and enrich their educations;
- Develop concepts for building and sustaining a community of partners, including the VA and DOD, institutions of higher learning, business and government science and technology organizations, and others who will work together to improve opportunities in engineering and science for post-9/11 veterans;

¹ Title V of Public Law 110-252, June 30, 2008.

² Statement of Keith Wilson, Department of Veterans Affairs, at NSF GI Bill Workshop, April 14, 2009.

³ National Science Board, *The Science and Engineering Workforce: Realizing America's Potential* (National Science Foundation, August 14, 2003), pp. 7-10.

- Develop approaches to coordinate community efforts to make post-9/11 veterans aware of this special program;
- Develop a rough estimate of the cost of an enhancement program and identify possible resource partners and what they might contribute; and
- Discuss how to initiate a start-up program quickly, to be ready as soon as possible after the post-9/11 benefit goes into effect.

This report describes the conduct of the workshop and outlines its recommendations in three areas:

- Programs to enrich the educational experience for veterans in engineering and science;
- Networks of veterans, educators, government, and business that can improve the educational experience for veterans and grow the U.S. workforce in engineering and science;
- Various types of resources and levels of spending that will be needed to support a quick-start, pilot education enrichment program and potential resource partners to help support it.

The Size and Composition of the Expected Population Of Post-9/11 Veterans.

This section describes the population of veterans likely to use the new benefit.

The new benefit will attract large numbers of veterans. More than one-half million of the nation's 23.4 million living veterans used VA educational benefits in fiscal year (FY) 2008.⁴ The VA estimates that some 2.1 million of today's veterans served for at least 30 days on active duty after September 10, 2001.⁵ Because the new benefit is substantially more generous than the current one, a higher percentage of eligible veterans are expected to use it than use today's programs. VA anticipates a marginal increase of as many as 125,000 new applicants for benefits in August 2009, with numbers growing in future years. As in past years, most of them are likely initially to pursue two-year or four-year degrees (see figure 1).

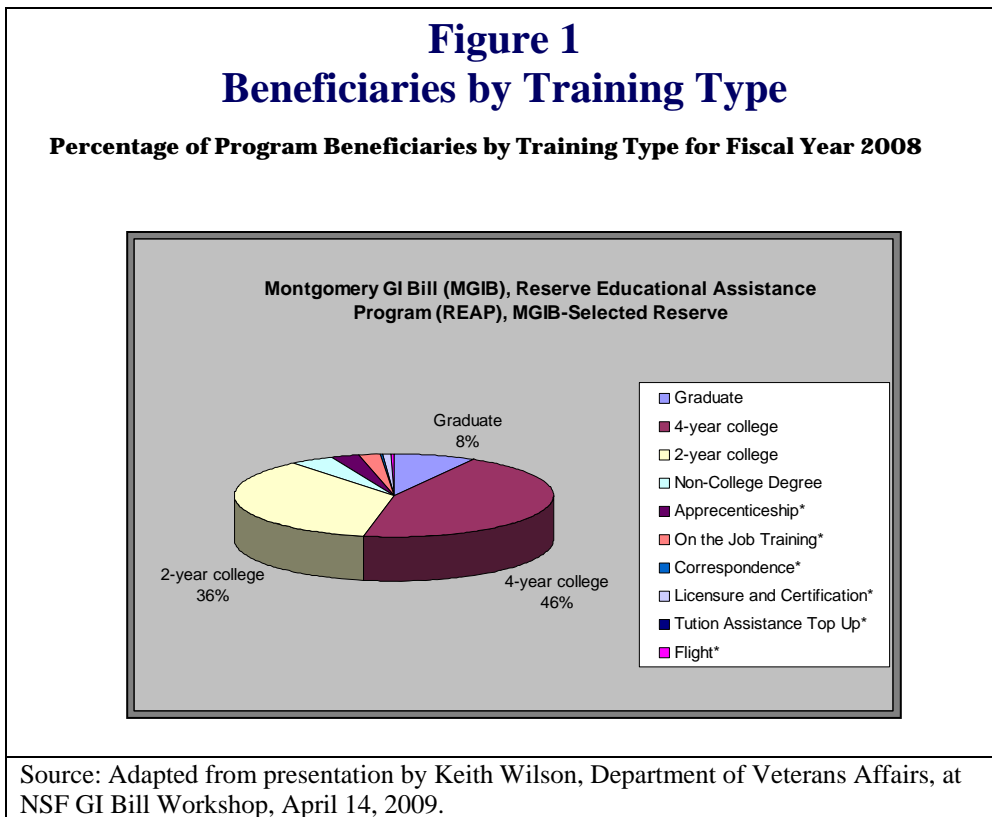
The veterans who will use the new benefit will be a diverse group, reflecting the characteristics of those currently serving in the all-volunteer force. Today, more than 14 percent of active-duty service members are women, thirty percent come from racial minorities and ten percent are Hispanic.

Post-9/11 veterans are also older on average than the typical college entrant. Eligibility for the full post-9/11 benefit generally requires three years of active-duty service, so most

⁴ National Center for Veterans Analysis and Statistics, "VA Benefits & Health Care Utilization" (Updated 10/27/08) (http://www1.va.gov/vetdata/docs/4X6_fall08_sharepoint.pdf).

⁵ Statement of Keith Wilson, Department of Veterans Affairs, at NSF GI Bill Workshop, April 14, 2009.

of the veterans using the new benefit will be at least 20 years old. More than one-quarter of all members serving in the active component today are at least 35 years old.⁶



The majority will likely be married and/or have children. Today’s service members marry younger and have children earlier than their civilian counterparts.⁷ About half of active-duty men and women in uniform today are married, and nearly 60 percent have families.⁸ They are accustomed to receiving a broad array of family services and support, including health care, through their military employer. They are likely to expect similar help from schools and civilian employers. Veterans with families are likely to treat schooling as a job. This means they will generally bring a sense of purpose that non-veteran classmates may lack. It also means that they may need programs that provide financial support and educational opportunities throughout the 12-month year, rather than on the typical 9-month academic schedule.

⁶ Authors’ calculations based on Office of the Undersecretary of Defense, Personnel and Readiness, “Population Representation in the Military Services, Fiscal Year 2007,” Tables B-15 and B-22 (www.defenselink.mil/prhome/PopRep2007).

⁷ Cindy Williams (ed), *Filling the Ranks: Transforming the U.S. Military Personnel System* (Cambridge, MA: The MIT Press, 2004), p. 336.

⁸ *Ibid*, p. 23.

The vast majority of post-9/11 veterans who use the new benefit will be U.S. citizens. Some 98 percent of today's military personnel are citizens. U.S. Citizenship and Immigration Services offers an expedited application and naturalization process for the two percent of service members who are not.⁹

Some post-9/11 veterans have injuries and may require disability accommodation to attend school and participate in enrichment activities. As of October 1, 2008, the DOD reported 842 amputees as a result of the wars in Iraq and Afghanistan. About 350,000 veterans are currently compensated for post-traumatic stress disorder; the incidence of traumatic brain injury is also significant.¹⁰ Crafting coordinated programs to meet the special needs of veterans with disabilities and integrate the support services available to all student veterans will be important.

An important problem in any consideration of the characteristics of veterans is the paucity of data available about them. The DOD collects information about the racial and ethnic backgrounds, physical and mental fitness, educational backgrounds, and occupational proclivities of its recruits, but does not report such information as service members depart. The VA tracks the number of individuals it serves and the amount of money it spends for educational benefits, but does not keep records of the educational programs those veterans enter or complete. The Department of Labor reports on the number of individuals employed in various fields, but relating those figures to the employment choices and prospects of veterans is not always easy. A new pilot program will require more consistent tracking and analysis of data on veterans in order to be a useful basis for the design and establishment of future follow-on efforts.

The veterans using the new benefit will offer substantial technical talent. The all-volunteer military attracts individuals with strong aptitude and good levels of education. Entrants to the enlisted force take a battery of tests, including the Armed Forces Qualification Test (AFQT), a test of cognitive aptitude. Sixty-seven percent of active-duty enlisted recruits in 2007 scored at or above the median on that test. In 2007, more than 93 percent of active-duty enlisted members were high school diploma graduates. Another six percent held GEDs.¹¹ Many enlisted members already have a year or more of college.¹² They may also have experience in the military that qualifies them for additional college credits. Many post-9/11 veterans of the enlisted force will want to start at two-year colleges. Others will choose to go directly to four-year degree programs.

⁹ Gerry J. Gilmore, "Military Recruits Non-citizen Health Care Workers, Linguists," American Forces Press Service News Article, December 5, 2008; U.S. Citizenship and Immigration Services, "Naturalization Process for the Military" (www.uscis.gov).

¹⁰ National Center for Veterans Analysis and Statistics, "VA Benefits & Health Care Utilization" (Updated 10/27/08) (http://www1.va.gov/vetdata/docs/4X6_fall08_sharepoint.pdf).

¹¹ "Population Representation in the Military Services, Fiscal Year 2007," Table B-18 (www.defenselink.mil/prhome/PopRep2007).

¹² In 1999, 74 percent of active-duty enlisted members reported that they had one or more years of college; 12 percent had associates degrees; 8 percent had bachelors degrees; and 1 percent had advanced degrees. Congressional Budget Office, "Educational Attainment and Compensation of Enlisted Personnel," February 2004, p. 5.

Nearly 93 percent of the active-duty officer corps in 2007 had at least a four-year college degree. More than 36 percent had education beyond the bachelor's level.¹³ Veteran officers can be ideal candidates for graduate school.

Many of the new veterans will have an interest in and talent for technical fields. Substantial numbers of young people join the military in part because they want to acquire skills that will be useful in the civilian world.¹⁴ Thirty-five percent of enlisted members serve in electronics, communications, medical, or other technical fields.¹⁵ Even those in other military occupations typically receive technical training and use technical equipment in their jobs. For example, an Army air defense artillery specialist operates and maintains electrical systems, repairs electronic or radar equipment, and uses computers and telemetry display systems.¹⁶

Moreover, attaining a degree of technical competence is often important to careers within the military. For example, Army soldiers competing for promotion to the rank of sergeant or staff sergeant receive points toward promotion for approved technical certifications.¹⁷

Still, post-9/11 veterans' interests and talents do not always translate into technical careers after they leave the military. Although seventeen percent of enlisted members serve in communications or electronics fields, only four percent of post-9/11 veterans go into computer and mathematical occupations.¹⁸ Fewer than one percent of young veterans who are employed in the 24 months after their exit from the military work in the information and communications industries. Thirty-five percent work in retail or the entertainment, accommodation, and food service industry.¹⁹ These numbers should change as the post-9/11 educational benefit opens more college doors to veterans.

Conduct of the Workshop

The workshop brought together about three dozen participants representing the stakeholder community surrounding the issues of education and career development for veterans. The participants included educators, business leaders, professional organizations, and representatives from key government organizations (see Appendix B).

¹³ "Population Representation in the Military Services, Fiscal Year 2007," Table B-26 (www.defenselink.mil/prhome/PopRep2007).

¹⁴ Beth Asch, Can Du, and Matthias Schonlau, "Policy Options for Military Recruiting in the College Market: Results from a National Survey" (Santa Monica, CA: Rand, 2004), p. 34.

¹⁵ "Population Representation in the Military Services, Fiscal Year 2007" (www.defenselink.mil/prhome/PopRep2007).

¹⁶ Army description of Air Defense Artillery duties and responsibilities.

¹⁷ U.S. Army Human Resources Command Fact Sheet, "Technical Certification and Promotion Points," April 2006.

¹⁸ James A. Walker, "Employment characteristics of Gulf-War-era II veterans in 2006: a visual essay" (Monthly Labor Review, May 2008, p. 13).

¹⁹ Dan Black, Amer Hasan, Parvati Krishnamurty, and Julia Lane, "The Labor Market Outcomes of Young Veterans" (Chicago, IL: NORC at the University of Chicago, September 2008), pp. 54-56.

In addition to the workshop participants, an Advisory Group was formed consisting of leaders in the stakeholder community who could contribute ideas based on their broad perspective and experience related to initiating new, large-scale initiatives. The Advisory Board members were US Army General John Abrams (Retired), James Duederstadt (President Emeritus of the University of Michigan), and William Wulf (prior President of the National Academy of Engineering). The organizers hoped to begin to forge a community of partnerships within and across the various types of stakeholder organizations, to educate this core group about the post-9/11 veterans' educational benefit and the individuals who will be eligible to receive it, and to craft recommendations for the community of partners that will need to become involved if a successful program is to be developed.

Workshop Participants

Workshop participants came from virtually every region of the country and brought wide diversity. Academic participants were drawn from a mix of two-year, four-year, and graduate-level schools and programs. They ranged from faculty and research staff to department head, dean, president, and vice chancellor. Business leaders came from the information technology and defense sectors, and included human resource managers, program managers, a university relations leader, and two CEOs.

Representatives from professional organizations included the executive director of an organization dedicated to strengthening the U.S. energy workforce and the executive director of a Virginia-based organization that is building up a regional research and development center. In addition to NSF program officers, government representatives included those with an understanding of veterans and their educational benefits and those from technical organizations that might partner with educational institutions to provide employment opportunities. Two political science graduate students attended as rapporteurs.

At least eight of the workshop's participants are themselves veterans of the U.S. armed forces. One participant has significant expertise regarding assistive technologies for persons with disabilities; he is himself a U.S. Army veteran with a spinal cord injury and a director of the Paralyzed Veterans of America Research Foundation. Another is a former U.S. Army general.

Agenda and Content of the Meeting

The workshop included multiple community-building opportunities, presentations, discussions across the full group, and a session with three smaller breakout groups working in parallel (see the agenda at Appendix C). Participants had opportunities to become acquainted and begin developing partnerships during the reception on April 13 and the breaks on April 14.

To create a community of partners to support the NSF initiative, the workshop aimed in part to develop a basic understanding among participants in three areas: the nature of the

post-9/11 veterans educational benefit and how it differs from current GI benefits; the characteristics, skills, and needs of those likely to use it; and the sorts of programs that might attract and support veterans as they return to school. To that end, part of the workshop was devoted to presentations by experts in those areas, followed by question and answer sessions.

Each of the three breakout groups discussed a separate issue. The first group considered programs to enrich the educational experience for veterans in engineering and science. The second explored how to build and sustain networks of educators, veterans, government, business, and professional organizations to improve the educational experience for veterans and grow the U.S. workforce in engineering and science. The third addressed possible ways to widen the base of resource partners for an enhancement program. A workshop participant facilitated each breakout group. Each group drafted recommendations and shared them with all workshop participants following the breakout session. Separate full-group sessions considered the potential size and costs of an NSF initiative and how to get started quickly. The final session was a full-group discussion of results and recommendations.

The next three sections highlight the results and recommendations of the breakout groups and the overall workshop. The Executive Summary pulls the most important of those recommendations into a consolidated blueprint for action.

Programs to Enrich Veterans' Educational Experience

The post-9/11 veterans educational benefit is an opportunity for educational institutions to draw motivated and experienced students into engineering and the sciences. Within the envisioned new pilot program, individual educational institutions will develop new programs tailored to their individual strengths and the needs of their veteran students. A specific institution's customized program for veterans could include offerings at the associate, bachelors, and advanced degree levels. Under the leadership of Domenico Grasso of the University of Vermont, the workshop team developed recommendations to help NSF and educational institutions begin planning these programs. The recommendations address two aspects of new program development: program organization and program content.

The workshop team offered the following six recommendations for programs to enrich the educational experience of veterans in engineering and science.

1. To make the offerings as attractive as possible to veterans, customized programs could be designed to run for the full academic year, permitting veterans to complete their degree objectives with four calendar years of full or partial support.

The VA's benefits are structured on the assumption that veterans will attend school for four nine-month academic years. NSF could fund programs to supplement the VA benefits and provide individual veterans full-year support for four years. Full-year support may prove crucial to veterans, many of whom have families. Such supplementary grants should be used to enrich the educational experience through research and similar opportunities for active learning. The existing Research Experience for Undergraduates Program is a good model for the type of financial support envisioned in this recommendation, both at the undergraduate and graduate level.

2. Educational institutions should design their programs to allow veterans to earn credits for knowledge and skills they acquired as service members. Depending on military occupational specialty (MOS), such credit transfers may be most applicable for associate degree programs. Institutions that offer bachelors degrees tailored to veterans should partner with two-year colleges to the extent possible, so that veterans can earn associate and bachelors degrees sequentially within a coherently organized process.
3. NSF should treat graduate-level programs as a critical element of its enhancement initiative. Masters and PhD programs are most likely to attract veterans of the officer corps, the vast majority of whom already have at least a four-year degree and have experience in leadership roles that will be especially useful in the nation's future engineering and science enterprises. Educational institutions could design new programs at the masters and PhD levels to take advantage of the veterans' experiences and interests and to accelerate the completion of requirements for a degree. The new NSF-sponsored program at Georgia Tech is a good example of an initiative at the PhD level. The development of institutional relationships with military academies may help civilian schools recruit such students and tailor their curricula to them.
4. Institutions should develop agreements with business firms and government-operated science and technology organizations to provide paid internships and research opportunities that are a part of their program for veterans. These opportunities could be available during the summer months, as part of the full-year funding package to be made available to veterans. NSF grants should be awarded to support faculty members in developing and supervising these activities during the summer.
5. Educational institutions should develop programs and support structures to help veterans transition from military service to academia. The nation's two-year colleges already typically offer remedial coursework in mathematics and science. This coursework will be invaluable for veterans whose high school training was inadequate and for those transitioning into college after a years-long break from formal education. Where two-year colleges cannot provide such courses or when veterans directly enter four-year colleges, new programs of this type would be needed.

In addition, educational institutions should work to coordinate the support services that veterans need and value, for example financial aid information, disability services, student veterans organizations, and family support services. Such coordination might be accomplished by establishing a single office of veterans' services that reaches out routinely to other supporting offices on campus, by involving the various offices in quarterly coordination meetings, or through other arrangements tailored to an individual institution and its population of veterans.

6. Faculty members who will spend significant time working with veterans can be provided with special training to help them to anticipate and appropriately respond to veterans' unique needs.

Building and Sustaining Networks of Educators, Veterans, Government, and Business

Under the leadership of Allen Adler of the Boeing Corporation, the workshop considered suggestions for building and sustaining networks of educators, veterans, government organizations, and business firms to improve the educational experience for veterans and grow the U.S. workforce in engineering and science. The organizers and participants see the workshop itself as an important step in that process, because it brought together a community of partners to begin work on the effort.

As post-degree employers, the nation's government organizations and private engineering and technology firms play a crucial role in engineering and science education. They can also help build the nation's engineering and science workforce in other ways. Examples might include partnering with educational institutions to develop methods for attracting post-9/11 veterans into engineering and science fields, helping veterans choose courses of study that appeal to their special skills and interests, supporting project-oriented course offerings, and offering internships and other work experiences to student veterans. Veterans' organizations, including student veterans' associations on campuses, can also help enrich the educational and extracurricular experiences of post-9/11 veterans.

The workshop team found that two distinct network views will be important. One view should reflect the perspectives of service members or veterans as they consider their educational and career choices. This network would help those individuals discover and sort through the programs in engineering and science that will be available through the NSF enhancement initiative. For example, the NSF can integrate appropriate parts of its outreach efforts into the processes already underway through the DOD, the VA, and other government organizations, that assist veterans as they transition from the armed forces to civilian life.

A second network view reflects the perspectives of the program suppliers, including the VA, educational institutions, business firms, and professional organizations. To get the most out of the NSF initiative, those suppliers should integrate their efforts, both to

improve the visibility and value to veterans of the new opportunities and to capitalize on shared interests. For example, as discussed in the previous section, program opportunities can be developed that exploit relationships between educational institutions (for example, between two-year and four-year colleges) as well as between educational institutions and organizations that offer internships and jobs. In turn, industry and professional associations can alert firms to the opportunity to engage in this NSF program. Similarly, associations of educators can provide the same sort of visibility to educational institutions. All of these partners can help themselves by distributing a standard collection of materials about the opportunities provided through the NSF program.

This segment of the workshop produced the following specific recommendations:

1. Service members typically begin planning their post-military careers a year or two before they leave service. Thus the NSF should develop approaches to make service members aware of the NSF program and future opportunities in engineering and science well before they leave service. NSF should explore approaches for accomplishing this through a team effort involving the VA, the Office of Secretary of Defense, and the active and reserve components of the armed forces. NSF should develop solutions that capitalize on the information, access to service members and veterans, and other resources that each of these organizations can provide. Workshop participants believe that minor changes to the post-service career information these organizations already provide to service members can provide the desired visibility for an NSF pilot program.
2. A variety of materials will be needed as part of the outreach process for encouraging veterans to pursue careers and education in engineering and science. These materials could be developed for web-based presentation, to include:
 - a. Videos for website presentation that illustrate, through examples, the rewards of entering into a science or engineering career, highlighting veteran success stories;
 - b. Materials that describe the types of programs available to veterans through the NSF pilot program, with links to sources with more detailed information; and
 - c. Information about the business firms and government and professional organizations that are involved in the NSF program, including the fields in which they work and their offerings to support veterans.
3. The community involved in this effort will need a structured, web-based network to link the websites that provide information to veterans about the opportunities being offered to them. That network should be designed around a relatively small number of portals, through which the remainder of the network's websites can be readily located. The workshop participants recommend that NSF collaborate with DOD, VA, and the Department of Labor to create these portals. As part of the pilot program, NSF should provide the funds to develop and manage the portals.

4. As veterans engage in the individual programs that result from the NSF enhancement initiative, data should be collected on degrees obtained, attrition, employment attained after degree, and other outcomes. The data will allow stakeholders to evaluate the results of their efforts and give NSF a basis for deciding on whether to expand the program and whether to continue it beyond the four-year initial period recommended by the workshop. NSF should establish a process to collect such information online and to conduct periodic analyses to measure progress and outcomes. NSF should also develop the metrics for such data collection efforts, and over time, look to transfer the collection activity to the VA.

Costs of an Enhancement Program and Possible Resource Partners

The programs considered in this report will require significant resources, financial and otherwise. Widening the base of resource partners will allow the enhancement effort to achieve its full potential. This section discusses the types of resources that will be needed, estimates the financial costs of an initial NSF pilot program, and identifies partners that could provide some of the resources needed to support an enhancement program for engineering and science.

Types of Resources Needed

Creating and sustaining programs on campus will cost money. Not all of the resources needed to support the enhancement program are financial, however. For example, a recurrent theme of the workshop was the paucity of data about veterans—their educational levels, the degree programs they enter or complete, their former occupations in the military, the courses, certificates, and degrees they have already undertaken, and their aspirations for the future. Data about individual veterans and cohorts of veterans would be an extremely valuable resource in shaping the enhancement program.

In addition, it is anticipated that a large share of the resources needed to make the program successful will be provided in-kind. For example, public-sector and private-sector employers might offer paid internships and other work-based learning opportunities for veterans in the enhancement program. Community-wide efforts such as building and maintaining a website, gathering and analyzing data, and advertising might also be provided in kind.

Financial Cost of a Start-Up Program

The workshop identified two areas of financial cost: the cost of NSF support to educational institutions and the cost of community-wide efforts such as data gathering and analysis, website development and support, outreach through professional organizations, and advertising through venues targeted to service members and veterans.

The cost of NSF support to educational institutions depends upon the number of educational institutions involved, the number of veteran students engaged, and the nature of support provided. To ensure geographic diversity and reach a significant number and diverse population of veterans, the NSF could consider a pilot program that, on average, provides support to two institutions of higher learning in each state. To have a significant impact, the grant to each school involved will need to be consequential. The workshop estimated that helping about 100 schools to accomplish the objectives of the pilot program will cost between \$100 million and \$150 million over a four-year period. When compared to the estimated \$7.6 billion annual budget for the VA's new veterans educational program, this investment would be relatively small.

A program of this size would provide on average \$1.0 million to \$1.5 million for each institution involved. This would allow NSF to:

- Provide year-round, start-to-finish program support for veteran students entering the four-year degree programs that are required for a bachelors degree in engineering and science;
- For veterans enrolled in engineering and science programs, supplement the 36 months of support provided through the post-9/11 veterans educational program, by paying them to participate in faculty supervised internship and research activities for three months each summer (or outside the academic year); and
- Help stimulate institutions to implement significant program offerings and support services customized for veterans, by offsetting a portion of the costs of such activities.

The workshop did not develop an estimate of the costs of community-wide efforts such as data gathering and analysis, website development and support, outreach through professional organizations, and advertizing through venues targeted to service members and veterans. Those costs will depend upon the specific activities undertaken in each area. They could run from a few hundreds of thousands to several millions of dollars over a four-year period.

Potential Resource Partners

Under the leadership of Robert Bailey, Director of the Center for Advanced Engineering and Research, the workshop explored the potential for partners in the program to participate as resource providers. Some likely partners and the resources they might contribute are as follows:

- Private-sector firms could provide direct financial contributions; in-kind support for community-wide efforts, such as website development and advertising; paid internships for student veterans in laboratories and other research environments; and post-education employment opportunities.
- Not-for-profit companies, such as philanthropic foundations, military and veterans affinity groups, and professional organizations, could provide direct financial

support; help with data collection and analysis; or advertising and outreach to service members and veterans.

- Along with its administration of veterans programs, the VA could, over time, become an important source of data gathering and analysis. The VA may also be able to offer internships and jobs to veterans who undertake careers in engineering and science.
- Federal laboratories could establish budget items focused on providing work-based learning opportunities, summer employment, and post-schooling jobs for veterans enrolled in engineering and science curricula. They could also help with advertising and other outreach efforts to attract veterans into engineering and science.
- Other federal departments could provide data and analyses, financial support, work-based learning opportunities, and post-schooling jobs for veterans enrolled in engineering and science curricula. For example, DOD collects information about service members that could be useful in determining the number of new veterans who might be interested in, and qualified for, careers in engineering or science, or even identifying particular veterans for outreach. The armed services are in a position to provide information about, and access to, service members who intend to leave the military and are inclined toward careers in engineering and science. DOD components can also provide direct financial support for advertising and other outreach, work-based learning opportunities, and post-schooling jobs. The Departments of Commerce and Labor collect census and employment data that can be useful in shaping programs and reaching out to veterans. The Department of Energy could provide internships and other employment.
- State and local governments can also be sources of internships and post-education jobs. State veterans commissions can help with information about, and outreach to, veterans. State workforce commissions can form connections among veterans, educational institutions, and employers.
- Both the military academies and ROTC programs on campuses can be important sources of information and outreach. For example, the service academies annually graduate a significant number of individuals with engineering degrees. They might help identify those individuals as they prepare to leave the service. Academy-trained veterans are eligible for the new VA program and are ideal candidates for engineering graduate programs.
- The educational institutions themselves—two-year, four-year, and graduate-level schools—will be expected to share the financial burden of the initiative with NSF and other members of the community.

Widening the resource base to these other actors will be a crucial element of the NSF initiative and will require the concerted effort of the community of partners that the workshop identified. In particular, as discussed in the previous section, NSF needs to establish the standard materials about the program that would be used by all, and the overall approach for networking among the participants. That will limit confusion among veterans exploring opportunities in engineering and science fields and the organizations working together to provide programs for the veterans. With these materials in hand, the

NSF can help the participating resource providers to self-start and prepare to serve veterans in a timely and cost-effective manner.

Appendix A

Summary of the Post-9/11 Veterans Educational Benefit

The post-9/11 veterans' educational benefit will support veterans of the U.S. armed forces in reaching their educational goals. The program will also assist in their readjustment to civilian life and in the development of a more highly educated and productive workforce.

Basic Eligibility

The new benefit applies to eligible individuals who served in the Army, Navy, Marine Corps, Air Force, Coast Guard, National Oceanographic and Atmospheric Administration, or Public Health Service. To be eligible for the full benefit, members or veterans of the active component or the Guard and Reserve must generally have served at least 36 months on active duty after September 10, 2001. An exception is made for members who are honorably discharged from the military for a service-connected disability. Those individuals are eligible for the full benefit if they served at least 30 continuous days on active duty after September 10, 2001. Individuals who served at least 90 days on active duty after September 10, 2001, are eligible for a portion of the benefit (see table A.1).

Table A.1		
Eligibility for Post-9/11 Veterans Educational Benefit		
Individuals serving an aggregate period of active duty after 9/10/2001	Includes entry level and skills training?	Percentage of maximum benefit
At least 36 months	Yes	100
At least 30 continuous days on active duty (discharged due to service-connected disability)	Yes	100
At least 30 months, but less than 36 months	Yes	90
At least 24 months, but less than 30 months	Yes	80
At least 18 months, but less than 24 months	No	70
At least 12 months, but less than 18 months	No	60
At least 6 months, but less than 12 months	No	50
At least 90 days, but less than 6 months	No	40
Source: Adapted from Department of Veterans Affairs "Letter to veterans explaining the post-9/11 GI Bill benefit," signed by Keith Wilson, Director, VA Education Service.		

Benefits

The maximum basic benefit provides the following for a total period of 36 months (four years based on a nine-month academic year):

- The cost of tuition and fees, not to exceed the most expensive in-state undergraduate tuition at a public institution of higher learning in the state in which the veteran is attending school;
- Monthly housing allowance equal to the basic allowance for housing payable to a service member with the grade of E-5 with dependents, in the same zip code as the school;²⁰ and
- Stipend for books and supplies up to \$1,000 per year.²¹

Yellow Ribbon Program

The VA is establishing a Yellow Ribbon program under which private educational institutions can enter into matching agreements with the VA to fund tuition costs that exceed the most expensive in-state undergraduate tuition at a public institution in the same state. Generally, the VA will match the contribution of the private institution. To participate in the program, the institution must meet specific guidelines currently being developed by the VA.

²⁰ The basic allowance for housing is based on the local cost of housing and is adjusted annually. In the Army, an E-5 is a sergeant.

²¹ This description of benefits is adapted from Department of Veterans Affairs “Letter to veterans explaining the post-9/11 GI Bill benefit,” signed by Keith Wilson, Director, VA Education Service.

Appendix B Workshop Participants

NAME	TITLE	ORGANIZATION	ADDRESS
Abrams, John, Gen (Retd)	CEO, General (Retired)	Abrams Learning & Information Systems, Inc	Washington, DC
Adler, Allen	University Relations	Boeing	Chicago, IL
Adolfie, Laura	Program Manager, SMART (Science, Mathematics and Research for Transformation)	National Defense Education Program, DOD	Washington, DC
Alanna Suda		University of Virginia	Washington, DC
Bailey, Robert	Director	Center for Advanced Engineering & Research	Lynchburg, Virginia
Carter, Tammy	Program Analyst	Office of General Bedke, Wright Patterson AFB	Dayton, OH
Cooper, Rory	Director, Human Engineering Research Laboratories	University of Pittsburgh	Pittsburgh, PA
Donnelly, Laura	Public Affairs	Defense Intelligence Agency	Washington, DC
Engel, Renata	Assoc. Dean of Academic Programs	Penn State	University Park, PA
Friedman, Benjamin	Ph.D. candidate; rapporteur	MIT	Washington, DC
Goldberg, Mary	Human Engineering Research Laboratories	University of Pittsburgh	Pittsburgh, PA
Grasso, Al	CEO	MITRE	Washington, DC
Grasso, Domenico	Dean, College of Engineering and Mathematical Sciences	University of Vermont	Burlington, VT
Gutierrez, Miguel A.	Human Resources	Lockheed Martin	Fort Worth, TX
Harper-Marinick, Maria	Vice Chancellor for Academic and Student Affairs	Maricopa Community Colleges	Phoenix, AZ
Hastings, Daniel	Dean for Undergraduate Education	Massachusetts Institute of Technology	Cambridge, MA
Horowitz, Barry	Chair, Department of Systems & Information Engineering	University of Virginia	Charlottesville, VA
Kemnitzer, Susan	Deputy Director, Division of Engineering Education and Centers	National Science Foundation	Washington, DC
Kenny, Barbara	Program Director, Directorate for Engineering	National Science Foundation	Washington, DC
Laub, Jeffrey W.	Dean, Science, Mathematics and Engineering	Central Virginia Community College	Lynchburg, Virginia
Lopez, Antonio	Professor in Computer Science	Xavier Univ. of Louisiana	New Orleans, LA
Mead, Patricia	Professor, Optical Engineering	Norfolk State University	Norfolk, VA
Nava, Patricia	Chair, Electrical & Computer Engineering, Chair	University of Texas at El Paso	El Paso, TX

Pettibon, Joe	Director, Strategic Research Development and/or Director, Financial Aid	Texas A&M	College Station, TX
Reed, Ron	Director of National Security Law	Microsoft Corporation	Reston, VA
Rosser, Sue V.	Dean, Ivan Allen College of Liberal Arts	Georgia Institute of Technology	Atlanta, GA
Scranton, Richard	Associate Dean - College of Engineering Student Services	Northeastern University	Boston, MA
Sorby, Sheryl	Program Director, Directorate for Education and Human Resources	National Science Foundation	Washington, DC
Soyster, Al	Division Director - Division of Engineering Education & Centers	National Science Foundation	Washington, DC
Steinberg, Laura J.	Dean, LCS College of Engineering and Computer Science	Syracuse University	Syracuse, NY
Talmadge, Caitlin	Ph.D. candidate; rapporteur	MIT	Washington, DC
Taylor, Valerie	Executive Director	Center for Energy Workforce Development	Washington, DC
Tegnelia, Jim	Director	Defense Threat Reduction Agency and US Strategic Command Center for Combating Weapons of Mass Destruction	Albuquerque, NM
Teorey, Toby	Academic Programs Director, (and a veteran)	University of Michigan College of Engineering	Ann Arbor, MI
Weber, Stephen	President	San Diego State University	San Diego, CA
Williams, Cindy	Principal Research Scientist	Security Studies Program, MIT	Cambridge, MA
Wilson, Keith	Director, Education Office	Department of Veterans Affairs	Washington, DC

Appendix C Workshop Agenda

Workshop on Enhancing the Post-9/11 Veterans Educational Benefit The MITRE Corporation, 7515 Colshire Drive, McLean, VA		
Time	Event	Speaker or discussion leader
Monday, April 13		
6:00 pm	Networking reception and introduction to the meeting	All invitees; remarks by Susan Kemnitzer
Tuesday, April 14		
8:00-8:30	Continental breakfast, welcome, and introductions	Susan Kemnitzer, Barry Horowitz, and Cindy Williams
8:30-9:15	Summary of the expanded veterans educational benefit and demographics of recent users of current benefits	Keith Wilson Director, Education Services, Veterans Benefits Administration
9:15-10:00	Developing a culture of appreciation and support for veterans on campus	Stephen Weber, President San Diego State University
10:00-10:15	Coffee break	
10:15-10:30	Challenge to the breakout groups	Barry Horowitz and Cindy Williams
10:30-12:00	Three breakout groups work in parallel --Breakout Group A: Programs to enrich the educational experience for veterans in engineering and science --Breakout Group B: How to build and sustain networks of educators, veterans, government, and business to improve the educational experience for veterans and grow the U.S. workforce in engineering and science --Breakout Group C: Widening the base of resource partners for the enhancement program	--Facilitator: Domenico Grasso --Facilitator: Allen Adler --Facilitator: Robert Bailey
12:00-12:45	Reports from the breakout groups	All participants
12:45-1:45	Networking lunch	
1:45-2:30	Unique skills and needs of post-9/11 veterans	Rory Cooper, Director Human Engineering Research Laboratories University of Pittsburgh
2:30-3:15	Plenary discussion of costs and resources	Led by Barry Horowitz
3:15-3:30	Coffee break	
3:30-4:30	Development of a quick-start plan	Led by Sue Rosser
4:30—5:30	Pulling it all together: integrated results and recommendations	Led by Barry Horowitz and Cindy Williams
5:30	Meeting adjourns	