



WHITE PAPER

BUILDING AWARENESS OF ETETE CAREERS, PATHWAYS, AND ACADEMIC PREPARATION FOR SERVICE MEMBERS: RECOMMENDATIONS FOR NAVIGATING OPPORTUNITIES AND CHALLENGES

Prepared for National Science Foundation (NSF) sponsored, American Society for Engineering Education (ASEE) Workshop: *Advancing Action Plans for Transitioning Post-9/11 Veterans into Engineering Technicians, Engineering Technologists, and Engineers (ETETE)*

19 February 2013

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EXECUTIVE SUMMARY:

The influx of more than 2.4 million post-9/11 veterans into civilian life and the comprehensive education benefit provided by the Post-9/11 GI Bill¹ means that universities are faced with a convergence of historical opportunities to leverage the talent of the “all volunteer force” for postsecondary education—particularly in science, technology, engineering, and mathematics (STEM) fields. Yet, there is a surprising gap between this impressive, technically-trained, and disciplined cohort and postsecondary educational programs and careers in engineering and the STEM fields.²

Drawing from our NSF-funded empirical research to understand these obstacles and opportunities, this White Paper offers analysis and recommendations for multilateral stakeholders to make progress in bridging this gap and in helping servicemembers transition from military experiences to postsecondary engineering education and careers.

On the Cover: Marines March in the 2011 New York Veterans Day Parade, hosted by the United War Veterans Council—the oldest (since 1919) and largest of its kind in the nation. Photo by Sgt. Randall Clinton, Marine Corps Public Affairs Office New York (11.11.2011), available at: dvidshub.net/r/gmrqdl.

KEY DEFINITIONS: We use federal statute and the Current Population Survey (CPS)—jointly sponsored by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics (BLS), the primary sources of labor force statistics for the U.S. population—to define the following terms:

- ❖ **Servicemembers** are members of the uniformed services, as defined in section 101(a)(5) of title 10, United States Code.
- ❖ **Armed forces** means the Army, Navy, Air Force, Marine Corps, and Coast Guard, as defined in section 101(a)(4) of title 10, United States Code.
- ❖ **Veteran**, by statute, is a “person who served in the active military, naval, or air service, and who was discharged or released therefrom under conditions other than dishonorable,” 38 U.S.C. § 101(2); 38 C.F.R. § 3.1(d).
- ❖ **Gulf War-era II era veterans** served on active duty anywhere in the world sometime since September 2001.

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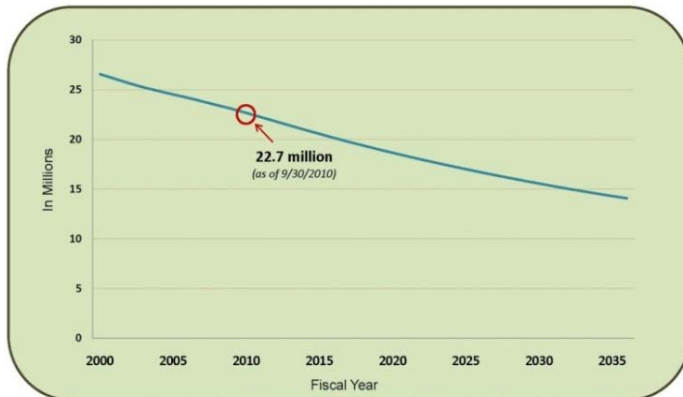


Figure 1. Projected Veteran Population 17 Years & Older: 2000-2036, Vetpop2007

BACKGROUND & INTRODUCTION TO KEY ISSUES:

1.0 Veterans Population Data

According to the U.S. Department of Veterans Affairs (VA) *Veterans Population Data (VetPop2007)*, there are more than 22 million veterans in the United States (Figure 1).³ Within this large group of all living veterans from previous and current U.S. engagements, there are 5.7 million Gulf War veterans, including nearly 1 million women—with service from 2 August 1990 to the present (Figure 2).⁴ Though projections vary, within this group in 2011, there are approximately 2.4 million post-9/11 (Gulf War II) separated servicemembers, about 17 percent of whom are women, many

with a range of immediate post-service concerns, including health needs.⁵ This population is particularly diverse—in ethnicity, gender, background, geographical region, and in experience, background, and training—in ways that offer distinctive promises for postsecondary education and for the engineering and technical sectors (See Figures 4 and 6 below).⁶

2.0 Gap between Post-9/11 Veterans and Post-Service Pathways

Yet, despite these opportunities, few coordinated efforts are underway by stakeholders—across government at the local, state and federal levels, in academia, industry, and across veterans support organizations—that help servicemembers plan and prepare for entry into higher education and STEM careers. In fact, few studies exist that project the number of servicemembers likely to use

[In thousands (22,658 represents 22,658,000). As of September 30. Includes those veterans living outside the United States]

| Age | Total veterans | Wartime veterans | | | | | Peacetime veterans |
|--------------------------------|----------------|--------------------|-----------------------|--------------|-----------------|--------------|--------------------|
| | | Total ¹ | Gulf War ² | Vietnam era | Korean conflict | World War II | |
| Total | 22,658 | 16,866 | 5,737 | 7,526 | 2,448 | 1,981 | 5,792 |
| Under 20 years old | 8 | 8 | 8 | — | — | — | — |
| 20 to 24 years old | 301 | 301 | 301 | — | — | — | — |
| 25 to 29 years old | 768 | 768 | 768 | — | — | — | — |
| 30 to 34 years old | 887 | 887 | 887 | — | — | — | — |
| 35 to 39 years old | 1,023 | 996 | 996 | — | — | — | 26 |
| 40 to 44 years old | 1,461 | 1,033 | 1,033 | — | — | — | 429 |
| 45 to 49 years old | 1,790 | 692 | 692 | — | — | — | 1,098 |
| 50 to 54 years old | 1,922 | 648 | 477 | 189 | — | — | 1,274 |
| 55 to 59 years old | 2,005 | 1,589 | 312 | 1,415 | — | — | 416 |
| 60 to 64 years old | 3,327 | 3,208 | 184 | 3,153 | — | — | 119 |
| 65 to 69 years old | 2,470 | 1,944 | 56 | 1,935 | — | — | 525 |
| 70 to 74 years old | 1,904 | 640 | 16 | 509 | 151 | — | 1,264 |
| 75 to 79 years old | 1,877 | 1,350 | 5 | 188 | 1,270 | 6 | 527 |
| 80 to 84 years old | 1,522 | 1,431 | 1 | 98 | 891 | 637 | 91 |
| 85 years & over | 1,393 | 1,370 | — | 40 | 137 | 1,338 | 23 |
| Female, total | 1,840 | 1,295 | 918 | 251 | 61 | 98 | 545 |

— Represents or rounds to zero. ¹ Veterans who served in more than one wartime period are counted only once in the total. ² Service from August 2, 1990 to the present. Source: U.S. Department of Veterans Affairs, VA Office of the Actuary, *VetPop 2007*, <<http://www1.va.gov/vetdata/>>.

Figure 2. Veterans Living by Period of Service, Age, and Sex, 2010, Vetpop2007.

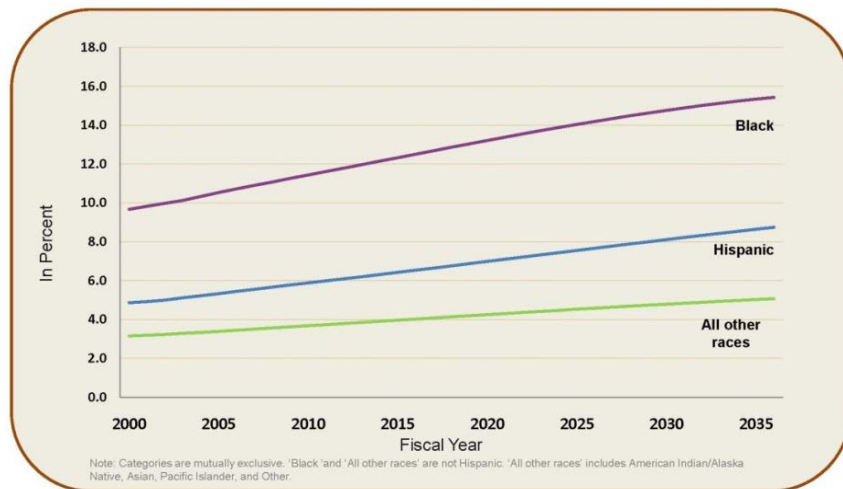


Figure 4. Projected Minority Veteran Population 17 Years and Older: 2000-2036, Vetpop2007.

2000, for instance, has more than doubled from 397,589 to 923,836 in 2011.⁹ Moreover, this estimate does not include military students, the approximately 400,000 students (in 2010) using DoD’s Military Tuition Assistance Program (TA).¹⁰

Without a sound evidentiary basis for understanding veterans’ educational and career goals and needs, it is nearly impossible to develop and implement successful programs that support the transition process, repay veterans for their significance service, and help to ensure that veterans make the best use of benefits they have earned.

3.0 Our Research: Bridging the Gap

To address these issues we draw on our mixed-methods empirical research supported by two National Science Funded (NSF) awards on veterans’ higher educational aspirations

their Post 9/11 GI Bill education benefit, or track veterans’ experiences in higher education and in post-degree careers, including their needs and supports, or even attempt to understand servicemembers’ higher educational aspirations, particularly for engineering and in the STEM fields.⁷

The stakes involved in such efforts are high. It is now generally recognized that veterans are struggling with respect to employment, homelessness, suicide, health, combat stress, among other issues.⁸ Likewise, this gap in post-service pathways is likely to become more pronounced with force-structure downsizing and as veterans increasingly use their benefits over the next decade. Total servicemembers drawing on their educational and training benefits since

1. What are veterans’ higher educational aspirations?
2. Does the Post 9/11 GI Bill influence those educational aspirations?
3. Do servicemembers—active duty & separated—provide a natural pipeline for engineering and STEM fields?
4. What are veterans concerns about higher education?
5. What supports and customized programs might they need?

Figure 5. Research Questions, 2009-13

and needs, with an emphasis on engineering and the STEM fields.¹¹From 2009 to the present, we conducted focus group interviews with over 200 servicemembers, often at base installations, and we currently have collected from both active duty and separated servicemembers nearly 1000 responses to our online survey. At the core of our research is the realization that to make progress in bridging the gap between post-9/11 veterans and STEM educational and career pathways, a greater understanding of servicemembers' perspectives is essential, especially their educational aspirations, experiences, needs, supports, and concerns.

Our research was, thus, designed, first and foremost, to bring into the foreground servicemembers' direct input and perspectives on higher education, transition, and post-service careers—through intensive focus group interviews and an extensive online survey that included a qualitative component. The table (Figure 5), thus, details several of our core research questions.

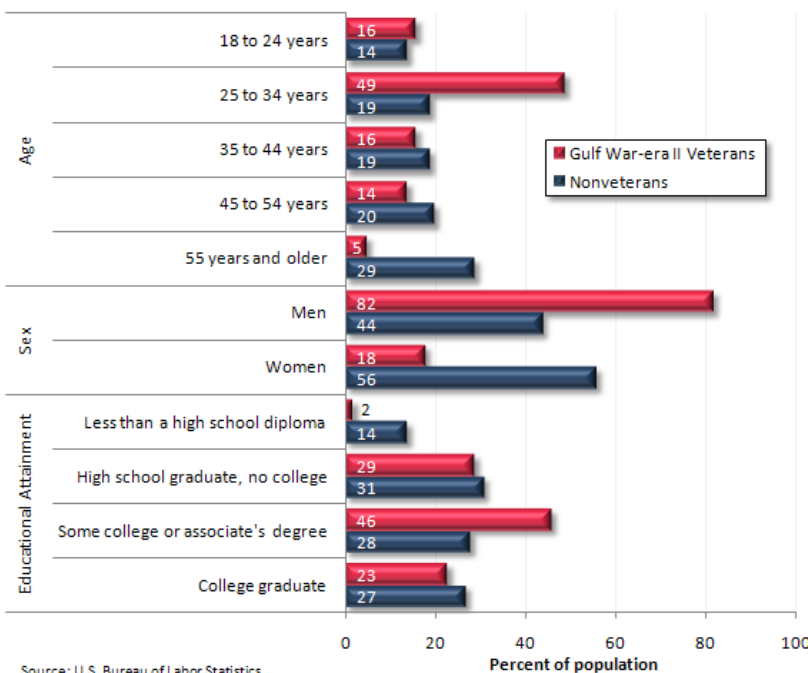
Equally important, we framed our inquiry to prioritize and to make contributions to the following premises, which we believe must be centered in both public discussion and policy debate (outlined in Figure 6) on veterans issues. These include understanding the Post-9/11 GI Bill as a social and public investment—not for veterans alone—but for the U.S. economy, in strengthening and diversifying our technical workforce, in innovating higher educational institutions by supporting new student constituencies, curricula, and programs, and in cultivating new and emergent leaders, particularly in the technical workforce.¹²

Veterans' perspectives and data-driven inquiry are an essential baseline for making progress in post-9/11 veterans' transition and success in higher education and in post-service careers. Ultimately, such efforts, however, must be advanced through sustained and coordinated collaboration with multiple stakeholders committed to bridging this gap and organizations situated directly along the continuum of servicemembers' transition progress, namely: the military, the VA and other government programs, universities, multi-sector employers, community and support organizations, among others.

Figure 6. Research Premises & Theoretical Framework

1. Post-9/11 GI Bill is an **opportunity** not only for veterans but for universities, U.S. society as a whole, and for engineering and the STEM sectors
2. Women and men of U.S. armed forces = **national resource in technical capacity, training, and leadership** → they may form the backbone of future U.S. technical innovation
3. Unprecedented **demographic diversity** of U.S. armed forces → promises diversity for higher education, engineering, and STEM fields
4. Taxpayer's **investment** can transform the U.S. economy, like original 1944 GI Bill: not only in training the nation's workforce and solidifying a middle class, but in enhancing higher education infrastructure and maximize long-term collaboration between government, defense sectors, and STEM fields.

Figure 7 Demographic profile of Gulf War-era II veterans and nonveterans ages 18 years and older, 2009 annual averages



WHAT THE DATA SHOWS: IDENTIFYING CRITICAL GAPS, CHALLENGES, AND OPPORTUNITIES

In this section, we identify, first, the extremely limited empirical picture of servicemembers' post-service experiences to date, including veterans' higher educational aspirations, needs, and concerns. Second, using our own data as one means to begin to fill this gap, we then outline some of the main obstacles that we have discovered in translating veteran talent into educational and career pathways. Finally, we integrate our own observations into a broader overview of research findings on veterans' issues, particularly as this work adds complexity to our conclusions.

1.0 Limited Empirical Picture: What We Don't Know about Veterans' Higher Educational and Career Goals, Needs, and Why

It is nearly impossible to understand veterans' education issues and their implications for STEM—or to make sense of our data—without first grappling with the lack of national data available on servicemembers in their post-service experiences and in higher education, more specifically. While we have addressed this issue elsewhere, suffice it to say here that there are five areas of absent or limited national data collection efforts (For a broader description of available datasets, See Appendix A).¹³

1.1 National Datasets: Five Limitations

In government population information on servicemembers, no research attempts to (1.) rectify discrepancies or synthesize population data on servicemembers across VA (*VetPop*), DoD (*Active Duty Military Personnel*), BLS (*Current Population Survey*), and Census (*American Community Survey*) sources; (2.) reconcile differing demographic information and standards across these datasets; (3.) analyze this data in ways that offer conclusions relevant for veterans' post-service, especially educational, planning needs; (4.) collect information on servicemembers training and education experiences, goals, needs, and concerns, including graduation rates, majors, and career choices;¹⁴ and (5.) offer some measure of qualitative or rich data on post-service experiences, including in education, with an eye toward improving services and needs assessment and planning.¹⁵

These limitations are not insignificant: the VA, for instance, calculates the U.S. veteran population at different totals than does the ACS or CPS: for 2010, totals are respectively 22.7, 22.448, and 22.011.¹⁶ More importantly for our purposes, none of the federal agencies—not DOD, VA, Departments of Education and Labor—collect and report information on educational degree programs, other than limited information on educational attainment levels for veterans, as part of the general labor force.¹⁷ As a recent Department of Education technical report noted, the Integrated Postsecondary Education Data System (IPEDS)—mandated to gather annual data on enrollments, degrees, program completions, graduation rates, faculty, finances, institutional characteristics, etc., from every U.S. college, university, technical and vocational institution receiving Title IV federal student aid—“does not currently capture information on veterans, military service members, or services offered to this student population.”¹⁸ From the perspective of routine studies of educational cohorts, this is a glaring gap. Likewise, we know too little about the demographics of veterans, the diversity of this population, in relation to educational pathways—beyond the fact that veterans are somewhat better educated in earning high-school diplomas and in the “some college/associates degree” categories than nonveterans (Figure 7).

Relatedly, while there is aggregate data on military occupational specialty, no attempts have been made to correlate this information with educational pathways by servicemembers or examine how they fare in these educational programs.¹⁹ For instance, we know from the Labor Department's Bureau of Labor Statistics's (BLS) *Occupational Outlook Handbook, 2012-13: Military Careers* (based on DoD, Defense Manpower Data Center reports), there are potential overlap areas in STEM-based military occupational specialties and higher educational programs that may translate into STEM civilian occupations (See Tables 1 & 2).²⁰

Table 1. Active Duty Enlisted personnel by broad occupational group and branch of military & Coast Guard, Aug. 2011

| Enlisted | Army | Air Force | Coast Guard | Marine Corps | Navy | Total enlisted personnel in each occupation group |
|---|---------|-----------|-------------|--------------|---------|---|
| Administrative occupations | 6,661 | 15,302 | 2,274 | 11,669 | 19,585 | 55,491 |
| Combat Specialty occupations | 129,684 | 639 | 616 | 32,706 | 7,854 | 192,499 |
| Construction occupations | 20,499 | 5,185 | — | 5,067 | 5,206 | 35,957 |
| Electronic and Electrical Equipment Repair occupations | 40,214 | 31,048 | 4,475 | 14,098 | 48,118 | 137,953 |
| Engineering, Science, and Technical occupations | 45,684 | 47,436 | 1,288 | 25,297 | 40,436 | 160,141 |
| Health Care occupations | 31,317 | 15,935 | 693 | — | 24,068 | 72,013 |
| Human Resource Development occupations | 18,974 | 12,532 | — | 8,407 | 4,108 | 44,021 |
| Machine Operator and Production occupations | 5,398 | 6,234 | 1,946 | 2,532 | 9,599 | 25,709 |
| Media and Public Affairs occupations | 8,209 | 6,848 | 122 | 2,381 | 3,854 | 21,414 |
| Protective Service occupations | 27,380 | 34,738 | 2,837 | 9,534 | 11,959 | 86,448 |
| Support Service occupations | 13,109 | 1,483 | 1,218 | 2,119 | 8,032 | 25,961 |
| Transportation and Material Handling occupations | 63,566 | 31,279 | 10,900 | 23,154 | 38,148 | 167,047 |
| Vehicle and Machinery Mechanic occupations | 52,974 | 42,032 | 5,554 | 18,586 | 47,022 | 166,168 |
| Non-occupation or unspecified coded personnel | 3,441 | 13,117 | 1,663 | 1,926 | 606 | 20,753 |
| Possible STEM subtotal | | | | | | 500, 219 |
| Total enlisted personnel for military branch, Coast Guard | 467,110 | 263,808 | 33,586 | 178,476 | 268,595 | 1,211,575 |

SOURCE: U.S. Department of Defense, Defense Manpower Data Center²¹

Table 2. Active Duty Officer personnel by broad occupational group and branch of military & Coast Guard, Aug. 2011

| Officer | Army | Air Force | Coast Guard | Marine Corps | Navy | Total officer personnel in each occupational group |
|--|--------|-----------|-------------|--------------|--------|--|
| Combat Specialty occupations | 19,029 | 3,986 | — | 4,039 | 6,036 | 33,090 |
| Engineering, Science, and Technical occupations | 21,573 | 14,841 | 3 | 3,922 | 9,556 | 49,895 |
| Executive, Administrative, and Managerial occupations | 12,422 | 7,760 | 61 | 2,620 | 7,082 | 29,945 |
| Health Care occupations | 11,092 | 8,917 | — | — | 5,896 | 25,905 |
| Human Resource Development occupations | 2,890 | 2,989 | 19 | 284 | 3,032 | 9,214 |
| Media and Public Affairs occupations | 340 | 297 | 7 | 170 | 270 | 1,084 |
| Protective Service occupations | 3,074 | 1,015 | 1 | 358 | 1,003 | 5,451 |
| Support Service occupations | 1,866 | 685 | 7 | 39 | 928 | 3,525 |
| Transportation occupations | 13,535 | 18,158 | 1 | 6,349 | 11,374 | 49,417 |
| Non-occupation or unspecified coded personnel | 12,168 | 7,088 | 8,381 | 4,296 | 8,375 | 40,308 |
| Possible STEM subtotal | | | | | | 99,312 |
| Total officer personnel for military branch, Coast Guard | 97,989 | 65,736 | 8,480 | 22,077 | 53,552 | 247,834 |

SOURCE: U.S. Department of Defense, Defense Manpower Data Center ²²

In fact, the BLS offers an online tool—the [Military Crosswalk Search](#) tool—to match military with civilian occupations by querying a respondent’s military occupation code (“MOS” for Army & Marines, “Air Force Specialty Code,” Coast Guard & Navy “Ratings”) and translating it into suggested, similar civilian occupations. But there are problems, especially for traditional combat and infantry military occupations: the input MOS 0311, Rifleman (Marines-enlisted), for instance, offers a descriptive output of infantry duties (“Operate weapons and equipment in ground combat operations, such as rifles, machine guns, mortars, hand grenades; locate, construct, camouflage infantry positions and equipment; direct supporting fire; place explosives; basic reconnaissance)—but the program notes “this is a military occupation” and “O*NET does not collect data on military occupations.” While the executive agencies, namely Defense and Labor, are clearly trying to grapple with this pathway problem, these kinds of limitations make it abundantly clear that partnerships with relevant stakeholders along the pathway continuum—namely universities, community veterans organizations, and businesses—are needed. Moreover, despite the fact that the DOD tests, collects, and analyzes performance or ASVAB minimum qualification scores to determine military jobs, we know of no attempts to link these scores to higher education, including STEM, interest areas.

1.2 Bigger Questions: Post-Service Veterans—Lack of Data, Lack of Knowledge, Lack of Concern?

The bigger question is why we do *not* collect this information and what it means.²³ The concern, to put the problem pointedly, is that the choice to collect data is often a statement—a testament—to what we value, what we as a nation have prioritized as an important agenda item. For instance, the NSF is Congressionally-mandated to collect statistical information (section 1863 of Title 42 USC) biennially on the state of the U.S. science and engineering workforce and the educational pipeline to service it, under the premise that such data helps advance U.S. technical competitive advantage globally.²⁴ Without similar, clearly articulated commitments, the needs of veterans may fall through the cracks—despite the best intentions by multiple organizations and constituencies and the significant budgets devoted to veterans, including R&D funding to research veterans issues across the agencies.²⁵

From a practical standpoint, then, without relevant and robust data—including information collection methods that consider research expertise—it is nearly impossible to plan suitable programs or assess existing programs and their implementation, including the GI Bill itself, conduct problem solving to deal with inevitable wrinkles, such as university transfer funds or for-profits misuse of federal student aid rules, or develop the best implementation programs for the heterogeneous population of post-service veterans.²⁶

1.3 Data, Universities, and the Transition Process

With better national data, universities could more effectively partner with businesses and the defense, national security, and veterans communities²⁷—including veterans nonprofit support organizations and local community resources—to develop models in the academic context for successful transition from the military to civilian life,²⁸ with a focus on the role of educational institutions as a key moment and mechanism for facilitating successful transition.

Such partnerships over the transition process could involve assessing how veterans are doing at several pivotal milestone moments in the post-service process: from Transition Assistance Program (TAP)²⁹ counseling and processing, to training and educational program choices and experiences, to career and mentorship experiences. Included in such efforts could be health and wellness support systems, linked with the local VA centers and support organizations, such as *Team Red White and Blue*, geared toward families as well as individuals.³⁰

To be effective and comprehensive, however, such efforts must be coordinated with other significant U.S. public investment initiatives, including current efforts to fill the U.S. labor force’s severe technical shortages in the STEM fields.³¹ In fact many public veterans’ efforts remain segmented, even isolated, such as the Department of Labor’s Veterans’

Employment and Training Service (VETS), which offers employment resources for separating servicemembers—without any educational resources and without links to the VA’s Chapter 31 Vocational Rehabilitation and Employment Program (VREP).³² Coordinating these efforts and public investments not only enhances streamlining, cost-savings efficiencies, and sustainability measures³³—rudimentary public policy standards—but expands the horizon of opportunities for veterans and for the nation in its public investments by linking this existing pipeline of talented and technically-trained veterans with career opportunities in STEM and related sectors, including defense. But without a robust empirical picture of “who veterans are” from an educational perspective, these pathways are nearly impossible to develop, nor can effective links be developed between related U.S. investments in education, the labor market, and the economy. At the most basic level, we cannot conduct outreach to veterans who may not know what careers are available to them without adequate information.³⁴

2.0 Our Findings: Universities on the ‘Frontline’ of the Transition Process

In this section we briefly describe—drawing on our focus group and survey results—five broad categories of findings, which we frame in terms of the following propositions: (1.) universities are at the ‘frontlines’ of the transition process; (2.) military and veterans student populations defy “one size fits all” educational pathways; (3.) lack of STEM “literacy” nationally and among servicemembers amounts to educational and career barriers; (4.) military socialization inculcates professional self-efficacy that academic institutions would be wise to leverage and learn from; (5.) academic institutions and leaders must take a more proactive, coalitionist role in shaping the higher education institutional response to servicemembers as students, including making room for veterans’ on-campus contributions.

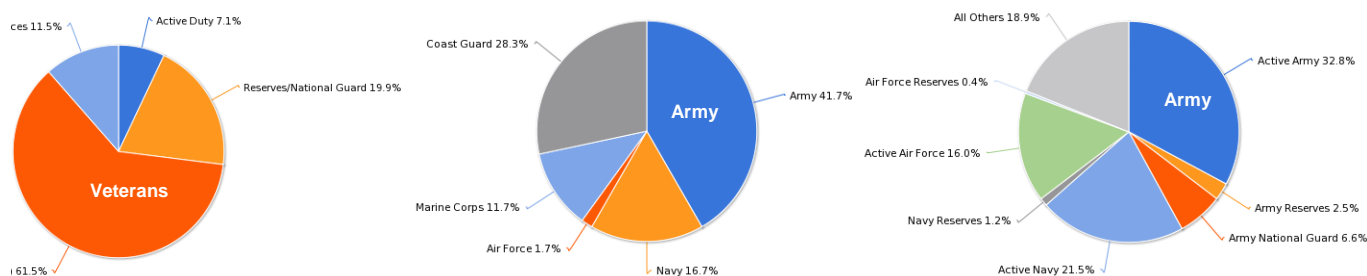
Given space constraints here, we describe some of our relevant survey and qualitative data results to mainly treat engineering and STEM educational pathway issues, some of the subtle barriers implicit in academic culture, and new ways to approach these challenges. We have, further, tried to identify counterintuitive insights from veterans and servicemembers—especially those common responses that may not be featured as prominently in public discussions or scholarly analyses.

2.1 What Did We Learn?

Table 3 (below) describes our survey population, which includes, as the following three graphs show, a majority of veteran respondents, 61.5%, and of those respondents who are still active duty, a majority of Army respondents, at 41%. For veterans, respondents who have separated from the U.S. armed services, Army still predominates—at 32%—but our sample remains quite diverse in service branch and rank (not shown here).

Table 3. Survey Population

| Value | Count | Percent |
|---|------------|---------|
| Active Duty | 59 | 7.1% |
| Reserves/National Guard | 166 | 19.9% |
| Veteran (No reserve service obligation remaining) | 513 | 61.5% |
| Family member or dependent of a member of the U.S. Armed Forces | 96 | 11.5% |
| None of the above | 0 | 0.0% |
| Total | 834 | |



In general, we learned about servicemembers and veterans as postsecondary students, including their knowledge about the Post-9/11 GI Bill, Yellow Ribbon Program, and use of a range of educational benefits.

- Only 53% of respondents, for instance, felt that they had been provided with sufficient information about their GI Bill benefits, and only 29% said they had enough information about the Yellow Ribbon program. These numbers were echoed in the qualitative data.
- Of 830 respondents, 94% planned to use their Post 9/11 GI Bill education benefit—only 3% each said “no” or were “unsure.”

We also learned a great deal about student veterans’ needs, concerns, fears, recommendations, and supports in the academic context.

- Respondents were asked to indicate their preferred method of instruction in the college/university classroom. In weighting their top three options, “seminar classes of 25 or fewer students” scored twice as well as the second-ranked option, “small discussion groups,” and nine times as well as the least favored option, “interactive on-line courses.”
- These responses, when matched with the qualitative data in which participants expressed anxieties regarding the large survey classroom and criticisms of their experience in the online courses, provide a fuller picture of the kind of classroom experience many student veterans are looking for.

We asked both active duty and separated servicemembers many questions about their aspirations for higher education, for engineering and the technical fields more particularly, their post-degree goals and needs, as well as their educational background with respect to education.

- Of 776 respondents, 36% were hoping to attain a 4-year degree, 32% were hoping for a masters, and 15% were expecting to earn a PhD, for instance. Only 9% were looking to complete their education at the vocational or 2 year degree level.
- When asked about which type of college or university respondents attended or planned to attend, the results by 774 respondents were diverse, with Public/State institutions representing the preferred choice at 56%.

| Value | Percent |
|--|---------|
| Public/State college or university | 56.3% |
| Private college or university | 28.9% |
| Private for profit (e.g., American Military University or University of Phoenix) | 3.1% |
| Technical Institute (for example ITT Tech) | 5.2% |
| Community College | 6.5% |

- When we asked respondents to choose their top three “sources of information about education” for aiding in their college/university choice, respondents overwhelmingly rated the college/university’s website as their primary source of information.

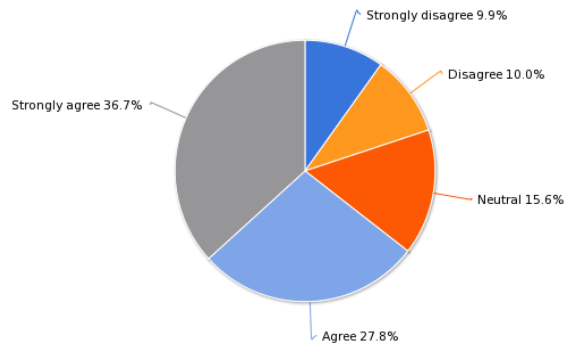
| Item | Overall Rank |
|---|--------------|
| Information from college/university website | 1 |
| Personal network | 2 |
| Personal contact with individual from college/university | 3 |
| Family member or friend familiar with college/university | 4 |
| Information/advertisements targeted to military personnel | 5 |
| Information from teacher or guidance counselor | 6 |
| College guidebooks (Princeton Review, US News & World Report) | 7 |
| Other (Specify below) | 8 |
| Advertisements in online media | 9 |
| Advertisement in local media | 10 |

Last, we learned a great deal about the military itself as an organization, the kind of socialization and training servicemembers received, the traits, values, and emphasis on character that comes with service, and the many experiences that defined obviously talented respondents. We are happy to share our survey instrument and moderator’s guide for focus group interviews.

2.2 Engineering: Veterans Responses

We want to address straight away that our preliminary findings—both from the survey and qualitative data—upended one of our earliest hypotheses: that servicemembers’ technical training would translate smoothly into engineering candidates for bachelors and graduate degrees.

- When asked if they had an interest in engineering as a career or field of study, for instance, 34% of respondents agreed or strongly agreed.
- But when we asked the same question, asking respondents to “rate” their “interest in science or technology as a career or field of study,” this number rose to 64.5% of respondents who agreed or strongly agreed.



- Of those respondents who indicated that they did *not* have an interest in engineering, when asked what would increase their interest, the overwhelming response was more information about potential careers. Information about careers was ranked as far more important than earning potential, information about course requirements, or any other answer.
- When we asked respondents to choose their top three “reasons for [their] interest in engineering, science, or technology,” the top choice were “enjoying technology” and “solving technological problems.”

| Item | Total Score ¹ | Overall Rank |
|--|--------------------------|--------------|
| Enjoy technology | 809 | 1 |
| Enjoy solving technological problems | 611 | 2 |
| Good in math/science | 596 | 3 |
| Career mobility or security | 486 | 4 |
| Potential for making money | 462 | 5 |
| Related to training in military | 326 | 6 |
| Other (Specify Below) | 150 | 7 |
| Family member in field | 111 | 8 |
| Encouraged by others (e.g. family, teachers, counselors) | 98 | 9 |

In the context of the qualitative focus group interviews, participants consistency expressed, by contrast, wanting certification for existing military training—not the postsecondary engineering degree.

2.3 Main Obstacles to Translating Veteran Talent into Career Pathways in Postsecondary Education with an Emphasis on the STEM Fields and Engineering Careers

In many ways, our data suggests that interest in pursuing engineering degrees—if not STEM degrees more generally—by veterans is relatively weak. But according to the NSF’s *Science and Engineering Indicators (2010)*, science and engineering bachelor’s degrees have consistently accounted for roughly one-third of all bachelor’s degrees for the past 15 years.³⁵ While this measure does not address “interest” to pursue the degree, it does suggest that veteran interest is in line with general, longstanding national population estimates for earned engineering degrees. In fact, the armed services may facilitate and draw a pre-existing interest in and aptitude for engineering and technical careers in ways that needs fuller research and exploration.

More troubling, many servicemembers failed to make the connection between their technically-rich military training, experiences, and skill-sets and a career in engineering or the STEM fields. We find this to be a particularly significant gap—and one that was explained to us in far more detail in the qualitative interviews—that may be rectified through collaborative efforts of universities with other partners . We have begun in our own local region (Fort Drum) to attempt to remedy this “missing literacy” about engineering and STEM educational pathways and careers, for instance, but we feel that collaborative, multisectoral, and creative thinking needs to occur across stakeholder partners to address what is a genuine lack of information about engineering and STEM education and career opportunities among the veterans community. While this may also reiterate a national lack of literacy about the prospects of STEM education and careers, we feel a consortium of university leadership in the STEM fields is an optimal way to address this issue.

In many respects, reticence toward engineering and STEM may very well be part and parcel of an overarching anxiety, expressed by servicemembers during the qualitative interviews, about the prospect of attending university and residing on college campuses. While servicemembers in the qualitative interviews continually cautioned us about presuming that college/university was a universal good—reminding us, not everyone wants to, needs to, or should go to college—there are deeper barriers here. Servicemembers expressed a multitude of concerns, challenges, and, frankly, fears, about attending university, which we have addressed elsewhere, but that must be factored into the higher-education leg of the transition process and addressed through support mechanisms on campuses.³⁶

CONCLUSIONS AND RECOMMENDATIONS:

We have organized our recommendations into these categories: innovating organizational partnerships, developing responsive tools, specific recommendations, and the role of universities in advancing servicemembers' post-service educational needs.

We begin with universities because—despite the fact that universities are net beneficiaries of the Post-9/11 GI Bill, both financially and in welcoming talented servicemembers into our student population—our sense is that we have not done enough to foster this population's transition and educational needs or ensure that the over 2.4 million Gulf War II era veterans make the best use of their educational benefits, which after all is a public investment. Perhaps the best indication of this fact is the current anecdotal information from universities starting to emerge that shows concerning veterans' retention rates.³⁷

We have also tried to integrate throughout this section specific recommendations made by student veterans, active duty servicemembers, and military students throughout the course of our discussions and to identify those areas in which additional research is needed.

The role of universities in advancing servicemembers' post-service and educational needs:

The Post-9/11 GI Bill is one of the more significant social investments made in an era of austerity. It offers the promise, much like the original GI Bill of 1944, to reap unexpected, broad-based social and economic advantages well-beyond its targeted audience of U.S. servicemembers. These social benefits are particularly urgent in an era in which U.S. national decline has become a public conversation and questions about U.S. technical global competitive edge are now routine. Yet despite significant public service by veterans and public investment, we have not paid close enough attention in academic settings to the social potential of the GI Bill generally or to the important role of its beneficiaries in university life—including the way in which servicemembers may challenge universities to innovate. The irony is that the GI Bill is an enormously powerful mechanism for harnessing the talent of the all-volunteer force in ways that are very likely to transform higher educational institutions, including STEM, if we in academia can be savvy enough to see the promise of the veterans in our midst.

- ❖ It is time for universities and academic leaders to take a larger, more proactive role in defining this moment, in creating conditions for student veterans' success on campus and beyond, and for rethinking higher education, particularly engineering and technical education, to serve this population.
- ❖ Our approach has been to embrace innovation and to address this development as a dialectical, multi-directional issue: that is, to consider what we can offer veterans, but also what veterans can offer university campuses.
- ❖ University-based research and programmatic initiatives should tackle such items as developing higher education transition models and tools; student veteran recruitment practices and retention rates; elevating and standardizing university-based veterans support services nationally; addressing the academic gap for many enlisted servicemembers who are often 3-5 years out of high school before arriving on university campuses; streamlining VA-to-university administration benefits bureaucracy, including time lags; contending with clashing organizational military and academic cultures and its impacts for first-time students, etc.

ADDITIONAL KEY FINDINGS:

- ❖ With the enabling mechanism of the GI Bill, the armed services offers a pipeline for higher education and, with some outreach efforts, for engineering and STEM.
- ❖ Servicemembers are one of the most diverse populations in all ways—demographically, regionally, in background, experience, and training—in ways that are significant for universities and for U.S. culture as a whole.
- ❖ Motivations for joining the military are relevant to postsecondary success pathways and recommendations (i.e., veterans roadmaps for success) in ways that cry out for research.
- ❖ Higher educational aspirations are inflected by military organizational culture, including branch and rank, but also esprit de corps, networks, and MOS.
- ❖ Military socialization may very well be a good predictor of success in higher education under certain conditions: motivation, discipline, teamwork, leadership, etc.
- ❖ Leadership training allows servicemembers to think from a “team” perspective and exhibit decision-making skills and maturity unsurpassed in civilian life.
- ❖ The U.S. armed forces are organizationally complex, differentiated, and segmented in ways that academic culture needs to understand.

Innovating organizational partnerships:

It is increasingly clear that servicemembers are taking advantage of their Post-9/11 GI Bill education benefits to pursue higher education—even while recent changes in the GI Bill 2.0 may decrease attendance at private universities.³⁸ While many lawmakers predicted the Post 9/11 GI Bill would be an incentive for servicemembers to pursue postsecondary education, few predicted the complexity of the road to a university degree at many levels: physical and mental health,

combat stress and suicide; logistics in administrating benefits; VA back-logs; residency issues for in-state tuition rates; debt³⁹ and quality issues at for-profits and elsewhere. In effect, the multi-layered landscape that defines the military-civilian transition process is necessary for universities to understand, in order to provide community-wide supports and to tailor the university experience to meet these needs and concerns.

- ❖ In this respect, universities and university leaders—particularly in STEM—need to join existing partnerships on veterans’ issues in general, as well as on matters of education.⁴⁰
- ❖ But universities also need to innovate these partnerships by advocating for a “big tent” approach that includes government at all levels (federal, state, local), executive agencies (not only the VA), as well as House and Senate Committees on Veterans Affairs; the private sector, particularly organizations such as JPMorgan Chase that commit to hiring veterans; and veterans support and advocacy (i.e. IAVA) organizations, including local networks and student-centered groups (i.e. Student Veterans Association). STEM-based federal agencies, notably the NSF, DoD, and DARPA have an important role to play in the partner process, in incentivizing research and data collection, but also in developing and funding programs that help link the veterans pipeline from higher education to the STEM, government, defense and security sectors. Indeed, think tanks and professional associations have done much of the ‘heavy lifting’—notably CNAS, IVMF, CAP, ACE, ASEE, AASCU—in undertaking groundbreaking research and programmatic efforts to understand and advance servicemembers’ post-service needs, including in higher education. Universities need to be part of the solution in this endeavor.
- ❖ Additionally, there are too many programs and initiatives that (a.) duplicate others’ efforts; (b.) are not well coordinated in ways that would better serve servicemembers; and (c.) are lacking assessment or data collection means and mechanisms in ways that would improve performance and service. Such efforts are better when joined together.
- ❖ Phil Carter at CNAS has argued for developing a strategic policy and planning community on veterans’ issues to advise government; Mike Haynie at the Institute for Veterans and Military Families (IVMF) and Nick Armstrong at INSCT have, further, called for a ‘whole of government’ National Veterans Strategy.⁴¹ While desperately needed, these policy planning recommendations work best when they rest upon data-driven recommendations and the groundswell of constituencies and services that make up the ‘big tent’ of the veterans community—from programs created at local VA medical centers, to IAVA lobbying, to academic research centers.

Developing responsive tools:

Our focus group participants offered a multitude of recommendations for how universities might prepare for educating veterans and ensure their successful passage through a demanding process. But a question remains: whether universities are up to this daunting task? Indeed, the result of servicepersons’ input is nothing short of a new mission for universities, STEM/engineering education, and academic leadership. It requires stronger government-university-private partnerships, investments in postsecondary educational infrastructure, and greater clarity about the challenges academia is currently facing, as these deflect U.S. global competitive edge.

For many historical reasons, the academy is generally not familiar with military organizational culture or servicemembers and its own habits and norms may often run counter to those of the armed forces. Moreover, well-meaning members of the higher educational community often approach servicemembers in traditional, unidirectional ways, treating student veterans as a group and cohort, for instance, asking how universities might offer supports for incoming veterans—rather than contemplating how servicemembers may make significant and needed contributions to higher education. We believe veterans’ contributions will continue to be significant and not only in such areas as civic duty, leadership, discipline, pragmatism, high standards, perseverance, resilience, collaboration, teamwork, honesty, diversity in backgrounds, real-world experience, etc.

- ❖ In this respect, universities must make more significant contributions to the transition process in research and in developing transition models applicable to the diverse higher education landscape.
- ❖ Likewise, university researchers must begin to assess existing tools and datasets on veterans’ education issues—adding a research-based social science perspective to these resources.
- ❖ Additionally, academic researchers should do more to evaluate and link existing tools—whether ACE’s military transfer credit guide, BLS’s Military Crosswalk Search tool, among others—so that veterans may get maximum utility from these tools. For instance, a dataset of available educational programs could be linked to the civilian occupation results of the Military Crosswalk Search tool.
- ❖ Given the documentation of military occupational specialty, not to mention ASFAB scores, universities could “translate” this information (including military training courses) into multiple suggested pathways for compatible degree majors/minors and resultant career trajectories, as well as developing finely grained “road maps” (per/semester) for success.⁴²

Specific recommendations:

1. Develop recommendations for revising data-collection measures on servicemembers and veterans' educational profile and experiences for relevant agencies i.e., NSF, Departments of Education and Labor, VA, DOD. This group should include university leaders and researchers in this area, federal agencies in their data collection arms (VA, Department of Education and Labor, IEPS), with input by Congressional committees (STEM, Veterans).
2. Develop multivariate military-to-civilian life "transition" models with a focus on the role of educational institutions as a key moment and prong in successful transition—with input from other agencies and organizations.⁴³
3. With better national data, universities could more effectively partner with businesses and the defense, national security, and veterans communities—including veterans nonprofit support organizations—to develop customized programs inside universities and internship/externship programs throughout the course of study and beyond.
4. Develop a university-based brochure for dissemination to the VA and other servicemember-serving agencies (Labor, Education, DoD) capturing the role of educational institutions and their resources as a key moment and mechanism for facilitating successful transition to civilian life.
5. Customize engineering and engineering technology programs for prospective servicemembers populations—online coursework, partial residency, credit for military transfer, group/team work, industry internships, etc.
6. Develop relationships with regional base installations, VA centers, VA support organizations, ROTC chapters, etc., for outreach and network support purposes and for educating academics and professional staff about military culture and servicemembers.
7. Develop modules inside a degree program with a university-wide reach that feature servicemembers' expertise: leadership development, civic contributions, subject matter expertise (Afghanistan transportation systems planning and construction) etc.
8. Develop university outreach efforts (including TAP) targeted for active duty servicemembers who are often hungry for quality information about educational and subsequent career opportunities.
9. Develop a national marketing campaign that explains why STEM/engineering degrees and careers are attractive to servicemembers, with broad-based university participation.
10. Develop research projects on servicemembers in higher education that leverages multivariate stakeholders and public-private partnerships.

APPENDICES:

Appendix A: Limited Existing Military Personnel and Veterans Education Datasets

General Historical and Public Record: Veterans' Affairs, Federal Defense Population and Demographic Statistics, Research Institutes

Key sources for military population at the federal agency level include the following datasets and reports:

- 1) DoD, Defense Manpower Data Center, Statistical Information Analysis Division, Personnel and Military Casualty Statistics (<http://siadapp.dmdc.osd.mil/index.html>)⁴⁴
 - *Active Duty Military Strength by Service* (as of 30 Nov. 2012);
 - *Active Duty Military Personnel by Service by Region/Country* (as of 30 Sept. 2012)
- 2) U.S. Department of Veterans Affairs, *Veteran Data and Information*, The National Center for Veterans Analysis and Statistics (<http://www.va.gov/vetdata/>)
 - *Veteran Demographics*, <http://www1.va.gov/vetdata/index.asp>
 - *The National Survey of Veterans, Active Duty Service Members, Activated National Guard and Reserve Members, Family Members and Survivors*
- 3) U.S. Census Bureau:
 - 2011 American Community Survey (ACS)
 - Current Population Survey (CPS)
 - Survey of Income and Program Participation (SIPP)
 - Decennial census long-form prior to the 2010 Census
 - Statistical Abstract of the United States, National Data Book, National Security and Veterans Affairs (2012)⁴⁵
 - *Survey of Business Owners: Veteran Business Owners and Veteran-Owned Businesses*
- 4) U.S. Bureau of Labor Statistics:
 - Current Population Survey (CPS): *Employment Situation of Veterans (2011)*
 - [2010 Employment Situation of Veterans Report](#)
 - *Employment Characteristics of Gulf War-Era II Veterans in 2006: a Visual Essay*
- 5) Department of Education, National center for Educational Statistics, *Military Service Members and Veterans: A Profile of Those Enrolled in Undergraduate and Graduate Education in 2007–08*
- 6) Library of Congress: *Veterans History Project*
- 7) *Military and Veterans Records at the National Archives*
- 8) Other government reports, including periodic reports to Congressional Requesters from Government Accountability Office (GAO) and Congressional Research Service (CRS):
 - GAO: *Military Personnel: Reporting Additional Servicemember Demographics Could Enhance Congressional Oversight* (Sept 2005)
 - CRS: *Veterans and Homelessness (2012)*; *"Who is a Veteran?"—Basic Eligibility for Veterans' Benefits (2012)*; *The Post-9/11 Veterans Educational Assistance Act of 2008 (Post-9/11 GI Bill): Primer and Issues (2012)*
 - Population Reference Bureau's (PRB) *Population Bulletin: America's Military Population* (Dec 2004)
 - RAND:
 - *The Evolution of the All-Volunteer Force: History and Analysis* (2006)
- 9) NSF National Science Board, Division of Science Resources Statistics (SRS): *Science and Engineering Indicators*
- 10) IAVA's 2012 Member Survey: *The Pulse of our Veteran Membership*⁴⁶
- 11) Pew Research, *Social & Demographic Trends, General Public Survey on Veterans & Generational Change (2011)*⁴⁷

Appendix B: University "Tool Kits"

- (1.) Environmental Evaluation for Veterans Index, or EEVI, available at: http://www.americanprogress.org/wp-content/uploads/issues/2012/04/pdf/student_veterans.pdf
- (2.) American Council of Education (ACE): "Veteran Friendly Toolkit": "Toolkit for Veteran Friendly Institutions," available at <http://vetfriendlytoolkit.org/>.

Appendix C: ASEE, NSF Award 1262094, Division of Engineering Education and Centers (EEC), Norman Fortenberry PI

Supports a workshop for high-level decision makers across government, industry, and academia to explore how to align various groups and stakeholders' interests in helping veterans transition from military service into careers in engineering. The workshop will widely communicate outcomes to policy makers across organizations and produce several archival position papers that can help guide future policy. The broader significance of this project arises from the potential impact on the engineering and STEM workforce. By seeking alignment between military service and academic course work, there may be ways to boost the nation's STEM workforce while drawing on the talent pool represented by veterans. This project

overlaps with NSF's strategic goals of transforming the frontiers through preparation of an engineering workforce with new capabilities and expertise. Additionally NSF's goal of innovating for society is enabled by creating results and research that are useful for society by informing educational policy and practices. Description available at:

<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1262094>

¹ *The Post-9/11 Veterans Assistance Act of 2008*. See Title V of Supplemental Appropriations Act of 2008, Pub.L. 110-252, H.R. 2642 (became law on June 30, 2008), amended Part III of Title 38, United States Code, to include a new Chapter 33, expanding educational benefits for military veterans who have served since September 11, 2001.

² In this report we refer to four overlapping populations with many shared, substantive concerns: (1.) "veterans," as defined in federal law, includes all persons who served in the U.S. armed forces on active duty (even if only in training) and were discharged or released under conditions other than dishonorably, as defined in section 101(2) of title 38, U.S.C.; (2.) Military "servicemembers" includes persons currently serving as part of the active or reserve components of the armed forces and overlaps with veterans as many active and reserve component servicemembers qualify as veterans; (3.) "Student veterans," defined as those receiving education benefits from the U.S. Department of Veterans Affairs. The National Survey of Veterans (2010) documents approximately 8% of active-duty members use their VA educational benefits to pursue a degree; and "military students," which includes active-duty, Reserve, and National Guard servicemembers receiving military Tuition Assistance. Since GI Bill benefits may support this tuition assistance, this means that "student veterans" and "military students" may also overlap. Because these terms—and such notions of "active duty," for instance—are complex, see Christine Scott, "Who is a Veteran?"—Basic Eligibility for Veterans' Benefits," 23 Jan. 2012, Congressional Research Service (CRS) Report for Congress, R42324.

³ U.S. Department of Veterans Affairs (VA), VA Office of the Actuary, VetPop 2007, <<http://www1.va.gov/vetdata/>>. The main data sources for VetPop2007 are: U.S. Census Bureau, *Census 2000* and *American Community Survey (ACS)*; U.S. Department of Defense (DoD), Defense Manpower Data Center (DMDC), *Active Duty and Reserve* and Office of the Actuary, *GORGO projection*. The U.S. Census Bureau data on veterans are collected through the following information sources: ACS; the *Current Population Survey (CPS)*; the *Survey of Income and Program Participation (SIPP)*; and the decennial censuses prior to 2010. See <http://www.census.gov/hhes/veterans/index.html>. VA Office of the Actuary, *Veteran Population Projection Model*, VetPop 2007, <<http://www1.va.gov/vetdata/>>, Table 5L. Also see US Department of Defense (DoD) Manpower Data Center (DMDC) Contingency Tracking System Deployment File, for the OEF/OIF/OND (Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn) Roster: <http://www.virec.research.va.gov/OEF-OIF-OND-Roster/Overview.htm>.

⁴ U.S. Census Bureau, *The National Data Book: 2012 Statistical Abstract, National Security & Veterans Affairs*, Table 521, <http://www.census.gov/compendia/statab/2012/tables/12s0521.pdf>.

⁵ Bureau of Labor Statistics, U.S. Department of Labor, *The Editor's Desk*, Veterans in the civilian labor force, 2011 on the Internet at http://www.bls.gov/opub/ted/2012/ted_20121109.htm (visited January 25, 2013).

⁶ The source for Figure 4 is the VA Office of the Actuary, VetPop 2007, <<http://www1.va.gov/vetdata/>>, Table 5L; the source for Figure 7 is: Bureau of Labor Statistics, U.S. Department of Labor, *The Editor's Desk*, Demographics of Gulf War-era II veterans on the Internet at http://www.bls.gov/opub/ted/2010/ted_20100805.htm (visited January 25, 2013).

⁷ Notice that these reports are largely emerging from the policy/think tank community and only secondarily academic research: Kimberly Griffin and Claire Gilbert, *Easing the Transition from Combat to Classroom Preserving America's Investment in Higher Education for Military Veterans Through Institutional Assessment* (April 2012), Center for American Progress, http://www.americanprogress.org/wp-content/uploads/issues/2012/04/pdf/student_veterans.pdf; Phil Carter, *Upholding the Promise: Supporting Veterans and Military Personnel in the Next Four Years* (Nov. 2012), Center for New American Security (CNAS); J. Steele, N. Salcedo, J. Coley, *Service Members in School: Military Veterans' Experiences Using the Post-9/11 GI Bill and Pursuing Postsecondary Education* (RAND, 2010). See also, Student Veterans of America, "Military to College Guide for Student Veterans," available at www.studentveterans.org.

⁸ See Carter (2012); Kevin Peter Shea, & Sarah Jane Fishback, "Impact of Cumulative Combat Stress on Learning in an Academic Environment," *New Directions for Adult and Continuing Education* 2012.136 (2012): 53-63; Tanelian, T., & Jaycox, L. H. (eds.) (2008). *Invisible Wounds Of War: Psychological And Cognitive Injuries, Their Consequences, And Services To Assist Recovery* (Santa Monica, CA: RAND); M. D., Rudd. J. Goulding & CJ Bryan, "Student veterans: A national survey exploring psychological symptoms and suicide risk," *Professional Psychology: Research and Practice* (2011). 42(5): 354-360.

⁹ National Center for Veterans Analysis and Statistics, Department of Veterans Affairs Education Program Beneficiaries: FY2000 to FY2010 (Department of Veterans Affairs, 2010), available at <http://www.va.gov/vetdata/utilization.asp>.

¹⁰ DoD administered Tuition Assistance Program (TA) and Tuition Assistance Top-Up Program are used for active duty service members, reservists called to active duty, and their spouses; GI Bill benefits can supplement costs not covered by this program. For a description and new rules, see <http://www.dodmou.com/>.

¹¹ See NSF 0948147, *From Battlefield To Classroom: Designing Pathways to Engineering for American GIs* (Oct 2009-30 Sept 2012); NSF 1037777, *Battlefield Perceptions of Engineering: An Institutional Response to Absent Pathways and Missing Engineering Students* (1 Oct 2010-30 Sept 2013), EEC—Engineering Education, NSF Program Officer: Alan Cheville, Primary Investigator (PI): Laura Steinberg.

¹² See Suzanne Mettler, *Soldiers to Citizens: The G.I. Bill and the Making of the Greatest Generation* (Oxford: Oxford University Press, 2005). But some scholars are beginning to scrutinize the assumptions made about the Post 9/11 GI Bill based on the 1944 GI Bill experience. See Melinda R. Tarsi, "From Rights to Repayments: The Framing of the Post-9/11 GI Bill," *Working Paper Prepared for the 2011 American Political Science Association Annual Conference* (Sept 1-4, 2011, Seattle, WA).

¹³ Zoli & Steinberg, *Final Report: From Battlefield To Classroom: Designing Pathways To Engineering For American GIs* (Oct 2009-30 Sept 2012); *Battlefield Perceptions Of Engineering: An Institutional Response To Absent Pathways And Missing Engineering Students* (Oct 2010-30 Sept 2013), 2013; Steinberg & Zoli, "From Battlefield To Classroom: Findings, Barriers, & Pathways To Engineering For Us Servicemembers," NSF, Directorate for Engineering/Division of Engineering Education and Centers (0948147) 10.2009-2.2011

¹⁴ See U.S. Department of Education, National Center for Educational Statistics (NCES)'s National Postsecondary Education Cooperative (NPEC), *Integrated Postsecondary Education Data System (IPEDS)*, the federal reporting system required of all postsecondary institutions that receive federal student financial assistance (Title IV) funds: <http://nces.ed.gov/ipeds/>. Within this body, there is now a recent discussion to collect veterans data: see "Report and Suggestions from IPEDS Technical Review Panel #36: Collecting Data on Veterans," 8-9 Nov. 2012, RTI International (IPEDS contractor), IPEDS Technical Review Panel (TRP), Washington, DC: https://edsurveys.rti.org/IPEDS_TRP/documents/Report%20and%20Suggestions%20of%20TRP36_final.pdf.

¹⁵ See Government Accountability Office (GAO) report, *Military Personnel: Reporting Additional Servicemember Demographics Could Enhance Congressional Oversight* (Sept 2005).

¹⁶ Department of Veterans Affairs, Office of the Actuary, Veteran Population Projections Model (VetPop), 2007, Table 5L; Table 520. Veterans by Selected Period of Service and State: 2010, <http://www.census.gov/compendia/statab/2012/tables/1250521.pdf>; Labor Force Statistics from the Current Population Survey, BLS, 2010 (Annual), data extracted on: January 26, 2013 (5:57:00 AM).

¹⁷ Two interesting, partial exceptions include: (1.) the NSF has apparently begun to collect some limited veterans data in its science and engineering indicator statistics, which we have not yet had time to analyze; and (2.) the Department of Education (DoE) periodically collects veterans information for 'special projects' or by requests from data users. See DoE's National Postsecondary Student Aid Study (NPSAS): *Issue Tables: A Profile of Military Servicemembers and Veterans Enrolled in Postsecondary Education in 2007-08*, which describes military servicemembers and veterans enrolled in undergraduate education at institutions eligible for Title IV federal funding for financial aid from 2007-2008, just prior to the Post-9/11 Veterans Educational Assistance Act's implementation. The NPSAS program is focused on how students finance their education and the Report offers "baseline data" for comparing currently enrolled military undergraduates with their "future counterparts who will enroll." For instance, during the 2007-08 academic year some 660,000 undergraduates were veterans, constituting about 3 percent of all undergraduates, and about 215,000 (or 1% of all undergraduates that year) were military active duty/reserve (ADR) servicemembers. About 329,000 or 38% of all military undergraduates used veterans' education benefits during the 2007-08 academic year. Still, we do not know the correlation between servicemembers' occupational category and veteran and ADR undergraduates and graduate students' choice of educational degree program; nor do we have any basis to make estimations about projected academic discipline interest area, major, or minor, given military training sector. Moreover, we have virtually no equivalent information with respect to veteran and ADR graduate study and degree programs. See A.W. Radford & Jolene Wun, "Issue Tables: A Profile of Military Servicemembers and Veterans Enrolled in Postsecondary Education in 2007-08," U.S. Department of Education, National Center for Education Statistics, NCES 2009-182 (April 2009): 1-2, available at:

<http://nces.ed.gov/pubs2011/2011163.pdf>. Also see, User-Requested Tables Prepared by NCES, "Student Characteristics and Academic Experiences," which treats veterans—but these data are from the pre-GI Bill period: <http://nces.ed.gov/surveys/npsas/tablesaddl.asp>.

¹⁸ See supra note 13. Also see Title IV of the Higher Education Act of 1965, as amended, 20 USC 1094, Section 487(a)(17) and 34 CFR 668.14(b)(19).

¹⁹ Beyond government data, some organizations have begun to explore these issues—but in equally limited terms. See the *Iraq and Afghanistan Veterans of America (IAVA)'s 2012 Member Survey: The Pulse of our Veteran Membership* and the *Pew Research, Social & Demographic Trends, General Public Survey on Veterans & Generational Change (2011)*, available at: <http://iava.org/iavas-2012-member-survey> and <http://www.pewsocialtrends.org/category/datasets/>. Also see, C. Hall Dillon, "Military Training for Civilian Careers (Or: How to Gain Practical Experience while Serving your Country)," *Occupational Outlook Quarterly*, Sept 2007.

²⁰ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2012-13 Edition*, Military Careers, on the Internet at <http://www.bls.gov/ooh/military/military-careers.htm> (visited January 26, 2013). See also the DoD, Defense Manpower Data Center, *Military Career Guide Online*, available at: <http://www.todaymilitary.com/>.

²¹ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2012-13 Edition*, Military Careers, on the Internet at <http://www.bls.gov/ooh/military/military-careers.htm> (visited January 26, 2013).

²² Ibid.

²³ A recent article reported that since "figures on graduation and retention for veterans are spotty," most "colleges don't break out the data," and "the government has not tracked when, or whether, military and veteran students actually graduate," the VA announced in January 2012 a partnership with the independent National Student Clearinghouse and the Student Veterans of America (SVA), an advocacy group, to collect data on veteran students, while federal agencies are "also creating new metrics that reflect military and veteran students' tendencies to attend multiple colleges and to take more than four to six years to graduate." Many see the call for this data stemming from pressure on Congress to reduce the federal deficit, with many of the service branches beginning to cut programs as they face down the prospect of sequestration. The article reports that "since the G.I. Bill took effect in 2009, 877,000 people, mainly veterans and their dependents, have received benefits costing the government \$23.7 billion," and more than \$10 billion is expected to be spent this year on veterans, plus about \$560 million on tuition assistance for active-duty troops." See James Dao, "A Million Strong: Helping Them Through," 1 Feb. 2013, *The New York Times*, <http://www.nytimes.com/2013/02/03/education/edlife/the-complicated-world-of-higher-education-for-troops-and-veterans.html?pagewanted=all>.

²⁴ See section 1863 (j)(1)(2), of Title 42 United States Code: Report to President; submittal to Congress: The [National Science] Board shall render to the President, for submission to the Congress no later than January 15 of each even numbered year, a report on indicators of the state of science and engineering in the United States. (2) The Board shall render to the President for submission to the Congress reports on specific, individual policy matters related to science and engineering and education in science and engineering, as the Board, the President, or the Congress determines the need for such reports.

²⁵ National Science Board, *Science and Engineering Indicators 2012* (Arlington VA: National Science Foundation, NSB 12-01).

²⁶ Goldie Blumenstyk, "Senator Takes Aim at For-Profit Colleges' Reliance on Federal Money and Aggressive Recruiting of Veterans," *The Chronicle of Higher Education*, 22 Jan. 2012. See Title IV of the Higher Education Act (HEA; P.L. 89-329, as amended by P.L. 105-244) authorizing programs providing federal student financial aid to support student attendance at institutions meeting Title IV eligibility requirements. To participate, for-profit institutions must meet several requirements (in Section 102 of the HEA), including deriving at least 10% of revenue from non-Title IV funds. The 90/10 rule was put into effect by the 1998 HEA Amendments (P.L. 105244), replacing the 85/15 rule, authorized by the 1992 HEA Amendments (P.L. 102-235).

²⁷ See National Research Council, *Assuring the U.S. Department of Defense a Strong Science, Technology, Engineering, and Mathematics (STEM) Workforce* (Washington, DC: The National Academies Press, 2012); National Research Council, *Report of a Workshop on Science, Technology, Engineering, and Mathematics (STEM) Workforce Needs for the U.S. Department of Defense and the U.S. Defense Industrial Base* (Washington, DC: The National Academies Press, 2012).

²⁸ For recent treatments of the transition process, see: J.E. Coll and Eugenia L. Weiss, "Transitioning Veterans Into Civilian Life," in *Handbook of Military Social Work* (2013): 281; Robert Ackerman, David DiRamio, and R. Mitchell, "Transitions: Combat Veterans as College Students," *New Directions For Student Services*, no. 126, Summer 2009: 5-14; Douglas Herrmann et al., *Educating Veterans in the 21st Century* (Lexington, KY: Booksurge, 2009); Corey B. Rumann and Florence A. Hamrick, "Supporting Student Veterans in Transition," *New Directions for Student Services* 126 (2009): 25-34; Rich Morin, "The Difficult Transition from Military to Civilian Life," Dec. 8. 2011, Pew Research Center, available at: <http://www.pewsocialtrends.org/2011/12/08/the-difficult-transition-from-military-to-civilian-life/>

²⁹ See Transition Offices Online, available at: <http://www.taonline.com/tapoffice/#>

³⁰ See Team Red, White & Blue with chapters across the US that connects veterans with their local communities through social and athletic events, available at: <http://teamrwb.org/>

³¹ See National Research Council. *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, DC: The National Academies Press, 2007); National Research Council. *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads*. Washington, DC: The National Academies Press, 2011..

³² See Department of Labor, Veterans' Employment and Training Service (VETS), which includes regional offices nationally, available at: <http://www.dol.gov/vets/>. The VAA's Vocational Rehabilitation and Employment Program (VREP) requires at least a 10% disability rating, which is by far from uncommon for post-9/11 veterans: http://vetsuccess.gov/va_vre_and_vetsuccess.

³³ See Joseph E. Stiglitz and Linda J. Bilmes, "Estimating the costs of war: Methodological issues, with applications to Iraq and Afghanistan," in *The Oxford Handbook of the Economics of Peace and Conflict*, eds. Michelle R. Garfinkel and Stergios Skaperdas (Oxford: Oxford University Press, 2012), 275-317; Linda J. Bilmes, "Current and Projected Future Costs of Caring for Veterans of the Iraq and Afghanistan Wars," June 2011, available at: <http://costsofwar.org/sites/default/files/articles/52/attachments/Bilmes%20Veterans%20Costs.pdf>.

³⁴ For important efforts, see L. McBain, Y. Kim, B. Cook, & K. Snead, *From Soldier To Student II: Assessing Campus Programs For Veterans And Service Members* (Washington, DC: American Council on Education, 2012); B. Cook & Y. Kim, *From Soldier To Student: Easing The Transition Of Service Members On Campus* (Washington, DC: American Council on Education, 2009); American Council on Education (ACE, 2008), *Serving Those Who Serve: Higher Education And America's Veterans* (Washington, DC: Author); Education Working Group convened by Servicemembers Opportunity Colleges, *Educational Attainment: Tracking the Academic Success of Servicemembers and Veterans*, July 2012, available at: <http://www.tamus.edu/assets/files/veterans/pdf/symposium-presentations/SOC-EDUCATIONAL-ATTAINMENT-Final.pdf>. Also see, Chris Manglicmot, Ed Kennedy, and David W. Sutherland, *Channeling the "Sea of Goodwill" to Sustain the "Groundswell of Support," Transitioning from Concept to Application (2011)*, available at: http://usarmy.vo.llnwd.net/e2/rv5_downloads/features/soldierforlife/SOGW_Groundswell_of_Support_8SEP2011.pdf

³⁵ National Science Board (NSB), *Science and Engineering Indicators 2010* (Arlington, VA: National Science Foundation, NSB 10-01), chapter 2, "Higher Education in Science and Engineering," 2.4. According to NSB *Science and Engineering Indicators 2008*, 11.2% of bachelors degrees in the U.S. went to engineering students: "Education and employment status and median salary of recent graduates with bachelor's degrees in science, engineering, or health, by major field of degree: October 2008," *Characteristics of Recent Science and Engineering Graduates: 2008*, Detailed Statistical Tables, NSF 12-328, Aug. 2012, <http://www.nsf.gov/statistics/nsf12328/pdf/tab01.pdf>.

³⁶ Zoli, *Post-Service Veterans: Rethinking Education*, The Institute for Veterans and Military Families (IVMF) in cooperation with the Honorable Ann Marie Buerkle, Conference on Engaging Community Support for Veterans, Friday, April 20, 2012, Syracuse, NY 13202.

³⁷ Conversation with Casimir Carey III, US Army War College Fellow, Syracuse University, Institute for National Security and Counterterrorism (INSCT), 30 Jan. 2013, and Peg Stearns, Veterans Resource Center Director, Syracuse University, 15 Nov. 2012; Eileen Jervis and Adam Ormsby, mentioned attrition numbers at approximately 60% or higher during student veterans first two semesters, at a recent presentation, "Health Care for Homeless Veterans: VA's Five-Year Plan to End Homelessness," Seminar Series, 16 Oct. 2012, Syracuse University, NY. There are few academic studies on this issue and it does not appear that the VA or Dept. of Education collects retention data on student veterans.

³⁸ GI Bill 2.0 (which went into effect 1 Aug. 2011) capped tuition and fee rates for those attending a private or foreign school at \$17,500 annually. For the changes, see: http://www.gibill.va.gov/benefits/post_911_gibill/Post911_changes.html

³⁹ Jaclyn Patton, "Encouraging Exploitation of the Military by For-Profit Colleges: The New GI Bill and the 90/10 Rule," *South Texas Law Review* (forthcoming, 2013);

⁴⁰ See Institute for Veterans and Military Families (IVMF) at Syracuse University for this kind of research-centered partnership building work, <http://vets.syr.edu/>. Also see the work of Shiu Kai Chin's group with Kamal Jabbour at the Air Force Research Laboratory-Information Directorate (AFRL) in Rome, NY, described here: Shiu Kai Chin, Erich Devendorf, Sarah Muccio, Fred Wieners, "Developing

the Next Generation of Cyber Leaders," Proceedings of the 16th Colloquium for Information Systems Security Education, Lake Buena Vista, FL, June 11-13, 2012, pp. 34–41.

⁴¹ See *A National Veterans Strategy: The Economic, Social And Security Imperative*, Institute for Veterans and Military Families, Syracuse University/Institute for National Security and Counterterrorism, Syracuse University, February 2013, <http://vets.syr.edu/research/a-national-veterans-strategy/>

⁴² See this overview description of "ASVAB Scores and Military Jobs," per service branch, available at: http://www.military.com/ASVAB/0,,ASVAB_MOS.html

⁴³ Sociological life course analysis is a helpful theoretical frame to understand these processes. See Janet M. Wilmoth & Andrew S. London, eds. *Life Course Perspectives on Military Service* (Routledge, NY: 2013).

⁴⁴ <http://siadapp.dmdc.osd.mil/index.html>

⁴⁵ U.S. Census Bureau, *Statistical Abstract of the United States: 2012* (131st Edition) Washington, DC, 2011; <http://www.census.gov/compendia/statab/>. http://www.census.gov/compendia/statab/cats/national_security_veterans_affairs.html

⁴⁶ <http://iava.org/iavas-2012-member-survey>.

⁴⁷ <http://www.pewsocialtrends.org/category/datasets/>.