FROM BATTLEFIELD TO CLASSROOM:
FINDINGS, BARRIERS, & PATHWAYS TO ENGINEERING FOR US SERVICEMEMBERS

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POST-9/11 GI BILL: OPPORTUNITIES FOR STEM & ENGINEERING

1) Women and men of US armed forces = national resource in technical capacity, military training, leadership and team-play mentality → backbone for future US technical innovation

2) Amazing diversity of US armed forces → diverse pipeline for higher education and STEM fields

3) Critical juncture: newly expanded veterans' benefits enables higher education to serve those who have served, and veterans gain educationally from the new GI Bill

4) Taxpayer's investment can transform US economy, much like original 1944 GI Bill: not only in training the nation's workforce and solidifying the middle class, but in enhancing the higher education infrastructure with new students, programs, curricula, research, teaching, equipment, etc.

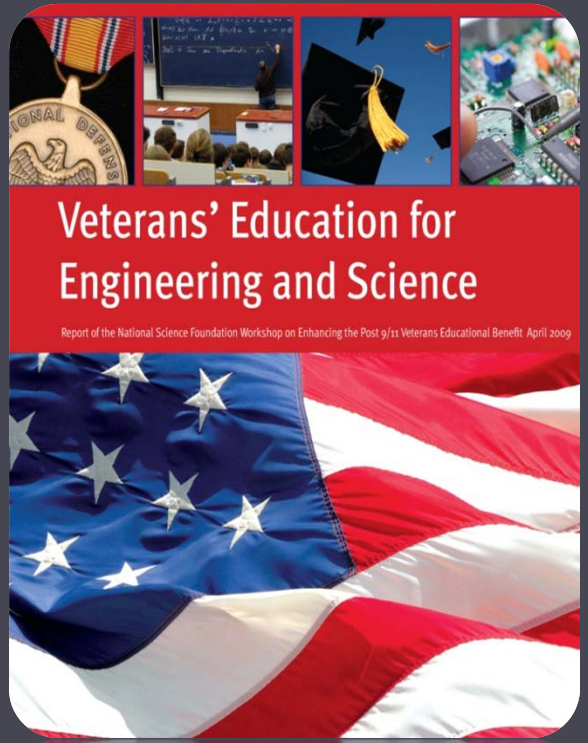
5) Maximize long collaboration between STEM and government defense sectors: innovative technical research drives economic growth and protects national security

HISTORY SPEAKS LOUDLY:
WE KNOW THE 1944 GI BILL…

- Before WWII, college & homeownership were "unreachable dreams"
- Peak year of 1947 veterans accounted for 49% of college admissions
- By Bill's end (1956) 7.8 million of 16 million veterans took education or training programs
- 14 Nobel Prize winners, 91,000 scientists, 67,000 doctors, and 450,000 engineers got their start with GI Bill benefits

- Expanded US postwar economy, especially in STEM
- Delivered the "Greatest Generation": veterans formed the backbone of the postwar era when US became a technological powerhouse & global superpower
- US society reaped benefits: democratization of universities, conversion to a nation of home-owners, expansion of middle class from 10-30%; role of STEM innovation in US economic power

These developments required **2 linked mechanisms**: (1.) the historic 1944 GI Bill which educated 8 million veterans (2.) available, meaningful educational and professional pathways.



Veterans' Education for Engineering and Science

FY 2009 projects supported by the National Science Foundation

Georgia Institute of Technology led by Sue Rosser and Don Giddens #0926620 "Bridge to the Future for GIs: Crucial Education for Operation Rebuild America"

Syracuse University lead by Laura Steinberg #0948147 "From Battlefield to Classroom: Designing Pathways to Engineering for American GIs"

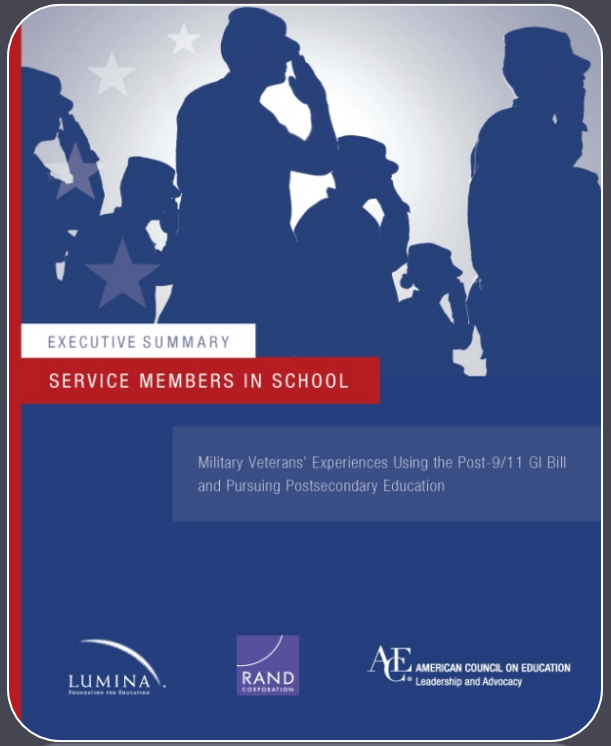
Mississippi State University led by Sarah Rajala #0951441 "A Planning Grant Proposal for Transitioning America's Veterans to Science, Technology, Engineering and Mathematics Academic Programs"

University of San Diego led by Kathleen Kramer #0948070 "Connecting Veterans to Customized Engineering Education"

San Diego State University led by David Hayhurst #0946778 "Transitioning Troops to Engineers: From Military Experience to Civilian Engineering Careers"

Virginia Polytechnic Institute and State University led by Mary Kasarda #0949209 "VETERANS@VT: A Program for Recruiting, Transitioning, and Supporting Veterans to Graduate Programs in Engineering and Beyond to Civilian Careers"

University of Virginia led by Barry Horowitz #0948472 "Development of Expandable and Sustainable Accelerated Masters Degree Programs in Engineering for Post 9/11 Veterans"



We are not alone in these endeavors…

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PASSAGE OF POST-9/11 VETERANS EDUCATIONAL ASSISTANCE ACT OF 2008 (POST-9/11 GI BILL) JUNE 30, 2008 (LAW PROVISIONS ACTIVE 1 AUG 2009): 2 CHANGES (AUG/OCT 2011)

- Largest expansion of benefits since original 1944 GI Bill (much larger investment than 1985 Montgomery GI Bill: 3 years service + $1,200)
- Made all servicemembers (i.e., reserves) who serve a minimum of 90 days active duty after 9/10/2001 eligible for educational benefits
- Full benefit funded 100% of a public 4-year undergraduate degree: 3 years active duty
- Transfer to spouse or children after serving/agreeing to serve 10 years—recognizing military duty has repercussions on family's higher education
- Lowered financial barriers for veterans seeking higher education
- Encouraged higher education institutions to focus on returning veterans (increase outreach, services)
- Matching Yellow Ribbon Program

1. FY 2010, 365,640 veterans using post 9/11 GI benefits
2. Predictions for 2-3 million separated soldiers transitioning out of the services over the next few years
3. 5.5 million Gulf War veterans (service from 2 Aug 1990 to present)

    2.5 million are post 9/11 veterans
4. Current armed forces comprise 2.5 million benefits-eligible military servicepersons: 1.5 million DoD Active Duty and DHS Coast Guard Active Duty members comprise the largest portion of the military force (40.3%), supplemented by 1 million Ready Reserve members (30.4%) and DoD civilian personnel (23.5%)

By the numbers…

1. **Universities/Deans** need to predict numbers, understand student veteran needs, plan programs and supports
2. **Tremendous talent & technical training** in the all volunteer force which, post-service, will be directed toward other fields: LE, MBA, etc.
3. **Challenge: academia lacks familiarity with veterans population** (historically STEM education and DoD innovation were more integrated)→ lost opportunities for universities to play a role in STEM recipients achieving government/public leadership
4. **Innovative approach:** we have too often approached this problem in non-reciprocal, unidirectional terms not as a dialectical issue: what can we offer veterans, but what veterans can offer university campuses: a lot!
   - Civic duty in action (scholarship in action); leadership skills; discipline; excellence; perseverance; team-work; frankness about vulnerabilities in needing supports (PTSD); experience; indisputably, the most diverse institution in the country, etc.

Implications for Higher Education

Research Questions

1. Do active duty servicepersons and separated veterans have an interest in using their Post-9/11 GI Bill benefits to pursue higher education, STEM, engineering? Which degrees?
2. What are their aspirations for engineering fields and career trajectories?
3. What are their needs at universities?
4. How we might support them in these endeavors?

Mixed Methods

Focus group interviews (2 moderators + assistants; 5-15 participants)

- Visited 4 bases
- Scheduled sessions with SU and local college student veterans
- 200+ unique data points
- Requested mix of MOS's, rank, background, technical density
  - Fort Drum (Army): combat troops
  - Fort McGuire (USAF); Fort Dix (USAF) Fort Lakehurst (Navy)
  - Student veterans: 3 sessions at SU; 1 session at OCC

Online survey data currently collected now via the VA's point of contacts:

- 1200 respondents; expectation is to reach several thousand vets

STATE OF KNOWLEDGE

DATA

- **Surprising** little data—at national level, across military branches—investigating servicepersons' (active, separated) educational aspirations, degree programs, completion, post-degree career routes
  - Not Veterans Affairs (VA)
  - Not US Census Bureau/Labor Department
  - Not DoD, Defense Manpower Data Center (DMDC) at the Office of the Secretary of Defense or DoD Personnel & Procurement Statistics
  - Not Dept of Education
- There is **even less data** on servicepersons and veterans' experiences with the new Post-9/11 GI Bill (ACE/Rand 2010)

What did we learn about…

A. Higher educational aspirations; for STEM, engineering
B. Military servicepersons & separated veterans as postsecondary students; Post-9/11 GI Bill use.
C. Veteran student needs and supports in the academic context: their recommendations…
D. Military-inculcated traits, military culture and structure: Predictors of academic success and academic needs? Their talents?
E. Pathways: Educational and Career

A&B: SERVICEMEMBERS' EDUCATIONAL & ENGINEERING ASPIRATIONS, THOUGHTS ON POST-9/11 GI BILL BENEFITS

1) GIs are generally not focused on engineering
2) Military operational specialty (Army: MOS)—lots of specialized, technical training—does not correlate well with technical educational aspirations, specifically engineering, or career goals
3) GIs often reported: disliking their MOS; what they were trained for did not become their job; they liked neither their job nor MOS
4) Education is not necessarily a universal value—enlisted/officer distinction
5) Amazing lack of consciousness about their technical expertise, capacity, and training
6) Streamlining or tracking into very traditional job sectors: Law enforcement

A&B: Servicemembers' Educational & Engineering Aspirations, Thoughts on Post-9/11 GI Bill Benefits:

Air Force (USAF)

- Expectation to get degrees throughout service (i.e., CCAF degrees in Applied Science that track AF job): if business or technical, will use tuition assistant funds; if Bachelors while in USAF will do degree in business or criminal justice or computer networking
- Upon separating, give benefits to dependents, or use benefits to get a degree in something completely different than job in USAF, almost never engineering: Oncology, Finance, Middle Eastern Culture, physicians assistant, MBA (common).

Army (USA)

- Commonly used GI Bill for themselves; often talked about aspirations in terms of "training and certification" rather than degrees; especially true of technicians e.g. mechanics
- On the other hand, many who were technically trained sought to change field upon separation and planned to use their benefit for this: i.e., business admin, veterinary science, culinary arts, music education, law, criminal justice
- Infantry forces often saw little application of their training to the outside world except for military police, so often intended "to start over again" in international business, advertising, criminal justice.

C: STUDENT NEEDS AND IDENTIFIED SUPPORTS

1) Significant anxieties about campus climate and campus life
2) Presume that all veterans have some degree of PTSD
3) Definite opinions about climate, curriculum, learning style and structure they preferred—much of which mimics military structure, culture, and training habits
4) Concerns about time-frame for completing a degree and whether they would like the occupation they ended up with
5) Wanted universities (program specific) to do outreach programs at bases—by the time they were separated it was too late

D: MILITARY-INCULCATED TRAITS, MILITARY CULTURE & STRUCTURE: Predictors of Academic Success and Needs? Their Talents?

- ❑ All aspects of teamwork: team-playing, team building, *esprit de corps*
- ❑ Leadership: training, literacy, knowledge, models
- ❑ Discipline: ability to prioritize, achieve under austere circumstances, bracket emotions, put organizational mission and rules above all else
- ❑ Perseverance
- ❑ Pursuit of excellence
- ❑ Respect for diversity
- ❑ Structure
- ❑ Civic Duty and commitment

D: MILITARY-INCULCATED TRAITS, MILITARY CULTURE AND STRUCTURE: Predictors of Academic Success and Needs? Their Talents?

1) Are these predictors of success? How will they play out in the academy?
2) How can these talents be used in the academy?
3) Many of these traits are valued in the work world; if universities and engineering programs do not recruit veterans and recognize their value, others will:
   - ❑ MBA programs
   - ❑ Technical programs
   - ❑ On line/for profit universities

E: PATHWAYS: EDUCATIONAL AND CAREER

Engineering and science are at a disadvantage for attracting servicepersons

1) Pathways to post-secondary education are pretty well established – do not tend toward engineering
2) Credits are difficult to transfer from training, AA degrees
3) Little online training in engineering available during the period in service
4) Personnel are inculcated with a training, job-occupation, short course approach to education that does not necessarily set them up for undergraduate engineering

RECOMMENDATIONS

1) Modularize higher education on the model of military training framework, and provide hands-on experiences (emphasize inductive reasoning)
2) Create academic visiting professorships for military instructors
3) Universities/colleges need to take responsibility for educating service personnel on these benefits
4) Servicepersons are thirsty for understanding the difference in quality between colleges/universities, degrees, online degrees, etc. Knowledge of academia is extremely limited and limiting:
   - Specifically, help them understand how to plan to get the education they need to transfer into an engineering program
5) Understand what student veterans can offer campus life and the profession long-term

Future Needed Research/Questions we are left with…

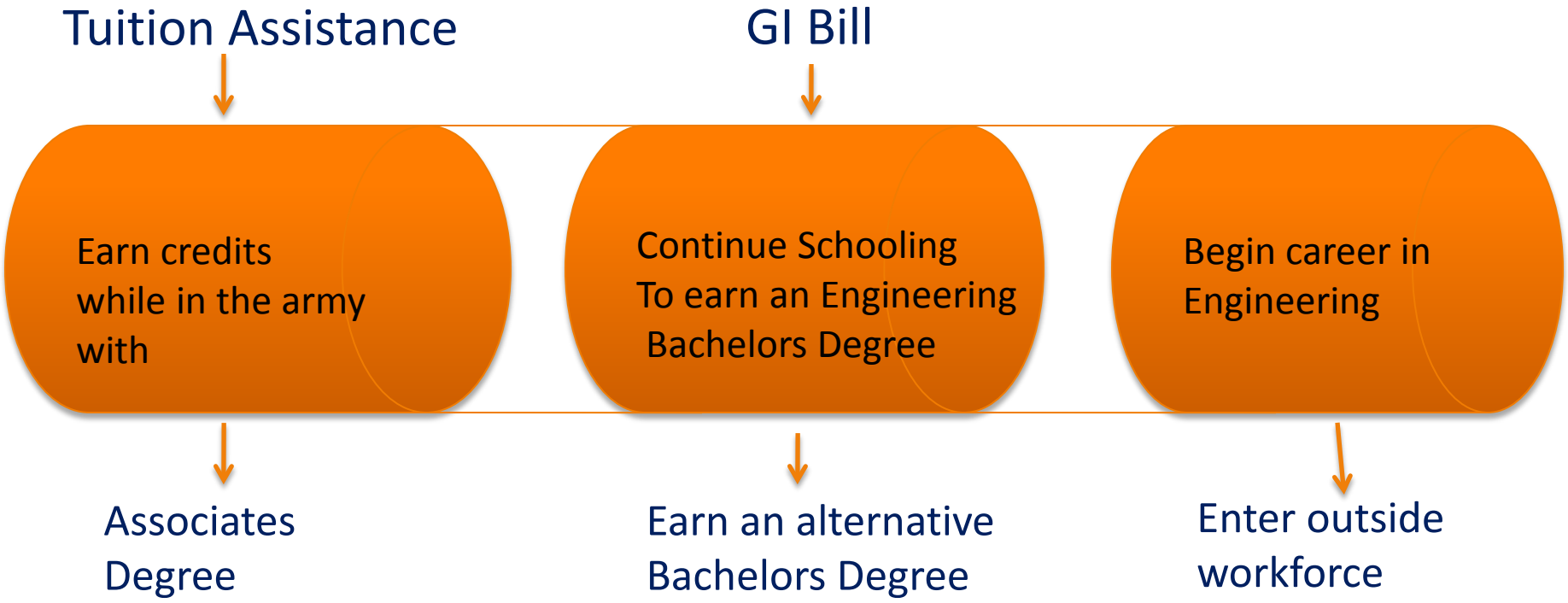
1) How to contend with multifaceted, often cultural barriers for postsecondary engineering or even education in general?
2) How to mitigate campus climate concerns?
   - Military visiting professorships and leadership
   - Redress fears of unknown future, knowing exactly what kind of job the degree gets them—shadow programs/"take your serviceperson to work day"
   - Dying for impartial information – people without an agenda about what would help them educationally?
3) WISE model relevant for researching problems of targeted/supported community (i.e., longitudinal studies, attrition, etc.); understanding how targeted population and its diversity is helpful for campuses
4) Understand what student veterans can offer campus life and engineering long-term: leadership development and skill-sets (particularly in government sector)
5) Diversifying higher education in ways we still do not understand…

Additional Questions (cont.)

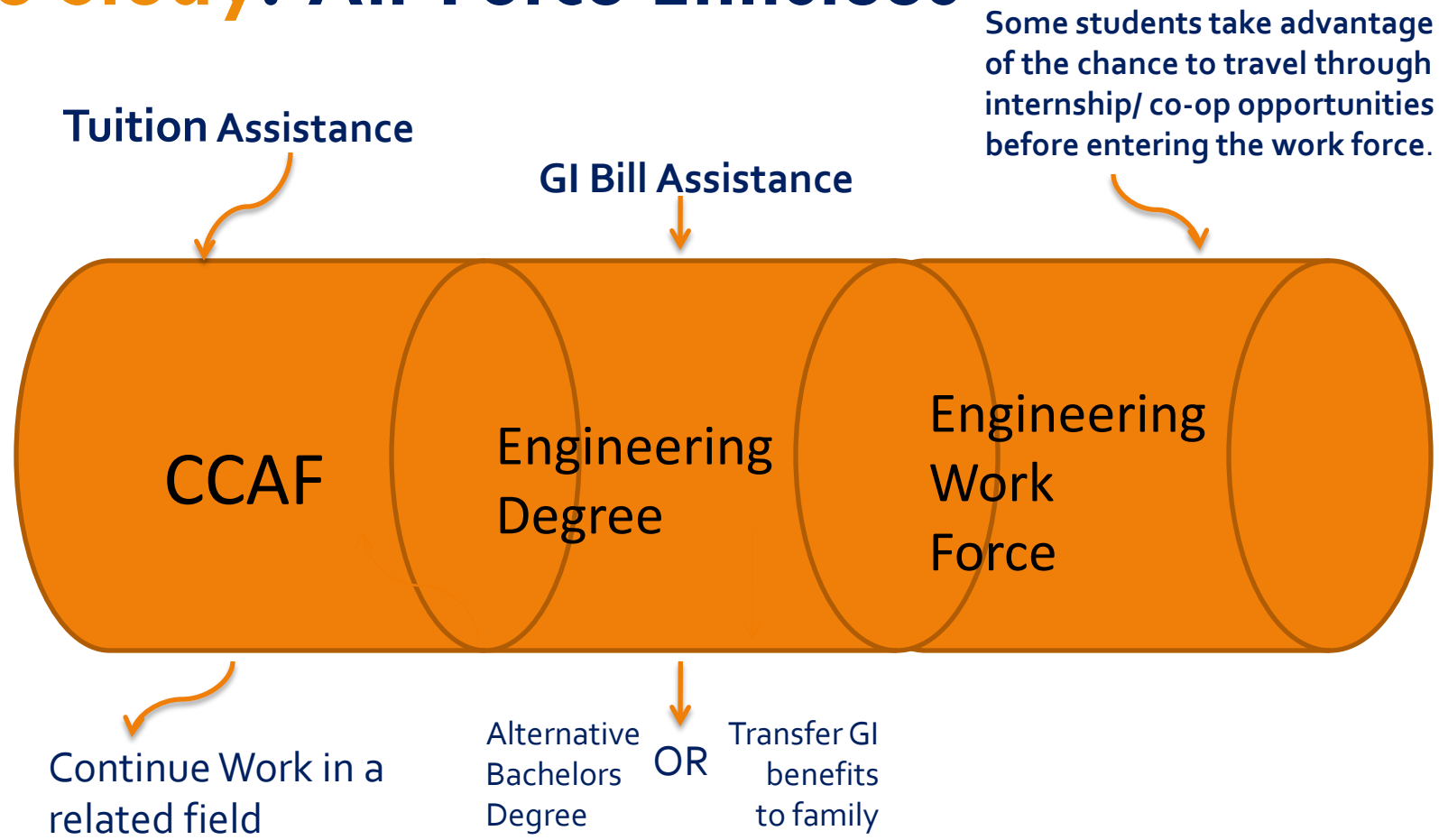
As Universities succeed in integrating servicepersons into university life, STEM, engineering, we can ask:

1. Who is the veteran student?
2. Attrition/degree completion studies on veterans
3. Variables/predictors of success
4. Diversity—a different take?
5. STEM leadership (adding value to universities, government, private sector partnerships)

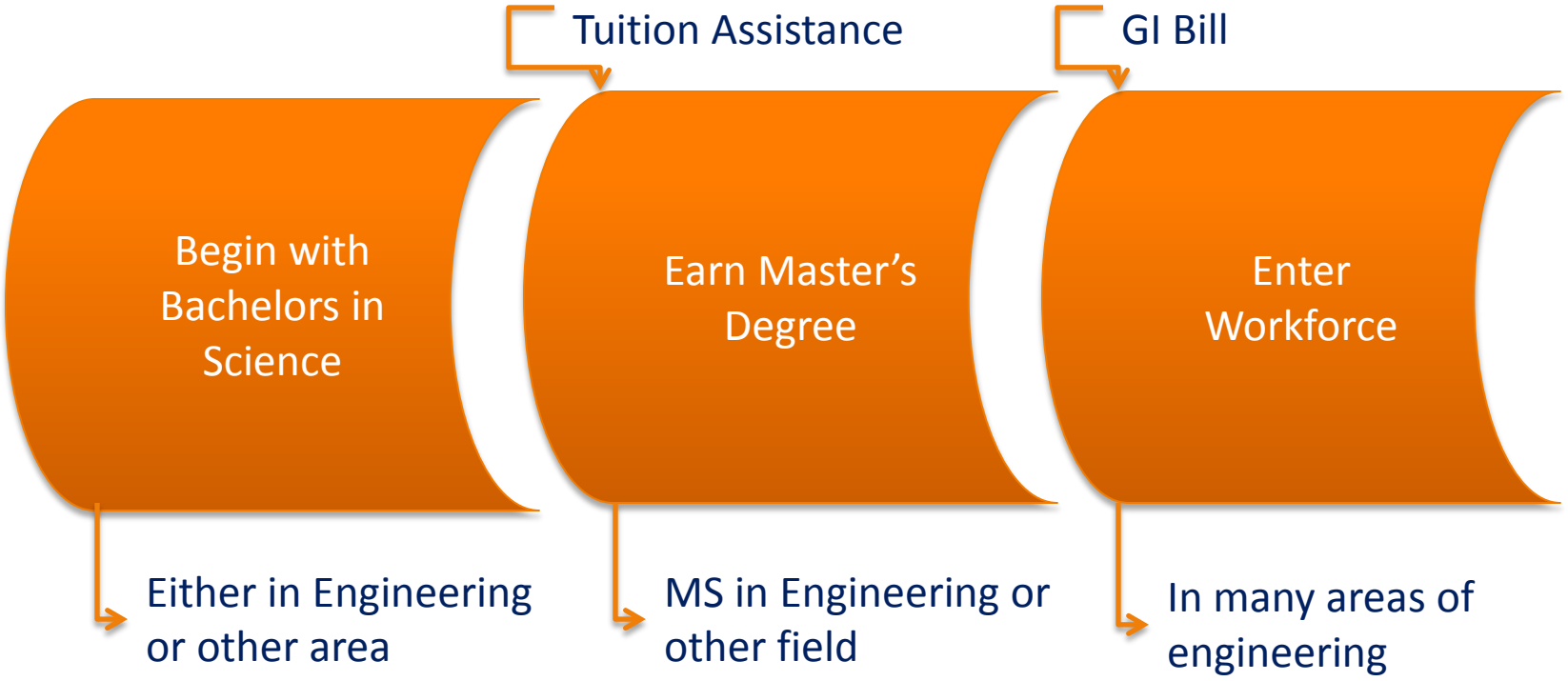
Case Study: Army Enlistees



Case Study: Air Force Enlistees



Case Study: Air Force: Commissioned



*GI Bill can also be transferred to family members