IT STARTS HERE.

AEOP Overview
31 August 2017

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Aviation & Missile Research Development and Engineering Center
U.S. Army Research, Development and Engineering Command (RDECOM)
The National STEM Challenge

• President’s call for an “all-hands-on-deck” approach to STEM
  – Global competitiveness for STEM talent is strengthening
  – STEM talent from traditional U.S. education experiences is not adequately supplying the demand
  – There is an unbalanced representation of our nation’s demographics in STEM fields
  – Critical need for an agile and resilient STEM workforce to prepare for both current and emerging STEM fields

Army Implications

• The Army is critically dependent on a pool of home-grown, STEM literate talent to enter higher education or the workforce which in turn directly support the defense industry and the Army S&T needs

• The Army is concerned not only with the 21% of S&T occupations but with the workforce as a whole, dependent on STEM competencies that are in demand both within and outside traditional STEM occupancies

• The Army is concerned with the unbalanced representation of our Nation’s demographics in STEM fields

• The Army offers a unique and valuable asset to the Federal “all-hands on deck” approach to STEM education (Scientists & Engineers to serve as mentors and well equipped laboratories and research centers)

Mentorship does far more than educating students in fundamental STEM skills, it also teaches them about the culture of science, including the importance of honesty, integrity and objectivity in scientific research
Five priority areas –

- Improve P-12 STEM instruction
- Improve undergraduate STEM education
- Increase and sustain youth and public engagement in STEM
- Better serve groups historically underrepresented in STEM fields
- Design graduate education for today’s STEM workforce

The Department has unique assets that play an important role in the Federal STEM education strategy – our STEM professional workforce and our highly equipped research laboratories.
• America Competes Act Reauthorization of 2010
  – Formation of National Science & Technology Council STEM Committee lead by White House Office of Science and Technology Policy (Co-STEM)

• U.S.C. Title 42, section 6621

• U.S.C. Title 10, section 2192
  – DoD STEM activities to improve STEM education to meet long-term national defense needs
  – Delegated STEM Authority for Army:
    ASD(R&E) > SA > ASA(ALT) > DASA(R&T)
  – RDECOM – Executing Agent on behalf of ASA(ALT)
What is AEOP?

**Vision:** A diverse, agile, highly competent STEM talent pool, representative of our nation’s demographics to supply Army workforce initiatives

**Mission:** Offer students and teachers a collaborative, cohesive, portfolio of Army-sponsored STEM programs that effectively engage, inspire, and attract the next generation of STEM talent through K-through college programs and expose them to DoD STEM careers

**Priorities:**
- STEM Literate Citizenry: broaden, deepen, and diversify the pool of STEM talent in support of our Defense Industrial Base
- STEM Savvy Educators: support and empower educators with unique Army Research and Technology resources
- Develop and implement a cohesive, coordinated, and sustainable STEM education outreach infrastructure across the Army

The Army has a holistic approach to STEM capabilities

AEOP serves to broaden the future talent pool

AEOP aligns to a BBP 3.0 initiative to increase DoD support for STEM education.

Program evaluations are all available online at [http://www.usaeop.com/about/our-impact/](http://www.usaeop.com/about/our-impact/)
The Army has a holistic approach to enhance STEM capabilities.
Camp Invention (K – 5th)

AEOP’s Camp Invention initiative offers Kindergarten through fifth-grade students, especially those from underserved/underrepresented populations, a summer enrichment experience through collaborative learning opportunities administered by local teachers and educators. Camp Invention’s science-based and age-appropriate curricula are comprised of hands-on STEM activities that encourage problem-based learning.
Gains in the Education of Mathematics & Science (GEMS) (5th – 12th grade)

A summer STEM education program that provides students and teachers with hands-on learning experiences in a professional laboratory environment working alongside high school and college-aged mentors, and senior Army scientists and engineers. One- to four-week sessions are hosted at Army laboratories and educational institutions and range from beginning to advanced activities.
Unite (9th – 12th grade)
Promotes college majors and careers in engineering by providing high school students historically underserved and underrepresented in STEM areas with the opportunity to participate in a 3-6 week, hands-on academic and enrichment summer program in engineering. Unite programs are executed at partner universities throughout the United States.
STEM Enrichment Activities for Educators

Research Experience for STEM Educators and Teachers (RESET – Pilot 2016)
RESET is designed to provide teachers and educators from “high need” areas a summer research experience at participating Army Research Laboratories. The goal is to reinforce teachers’ content knowledge through research experience and interactions with Army and DoD scientists and engineers and translate this knowledge and experience into enhanced STEM research curricula.
Competitions

Junior Solar Sprint (JSS) (5th – 8th grade)
An inquiry-based engineering challenge through which students design, build, and race model solar cars. Students develop teamwork and problem solving abilities, investigate environmental issues, gain hands-on engineering skills, and use principles of science and math to get the fastest, most interesting, and best crafted vehicle possible. Online portal provides resources and connections to education standards for teachers, mentors, and students, as they work through the design and build process.
eCYBERMISSION (6th – 9th grade)

A web-based science, technology, engineering and math (STEM) competition for students that promotes self-discovery and enables all students to recognize the real-life applications of science, math and technology. Using the best practices in science and engineering, students form teams of three to four students and propose a solution to a real problem in their communities, competing for state, regional and national awards. National winners receive up to $9,000 each in U.S. Savings Bonds (matured value).
Competitions

Junior Science & Humanities Symposium (JSHS) (9th – 12th grade)

Supports and recognizes high school students as they present their original research pursuits in the sciences, technology, engineering and math, competing for scholarships and awards at both regional and national symposia. Students learn from their interactions with practicing researchers who provide enrichment opportunities at the symposia and discussions that allow participants to look beyond high school to future post secondary education and career development in STEM. National winning researchers receive $12,000 scholarship award.
Apprenticeships (High School & College)

Provides students with hands-on research experiences in both military laboratory and university laboratory settings. Students have the unique opportunity to be mentored and trained by senior Army, or Army-sponsored researchers while conducting real-world research. All students are placed at a laboratory within commuting distance of their residences and receive a stipend for participation. Applications are accepted year round and vary according to each program: Science & Engineering Apprentice Program (SEAP), Research & Engineering Apprenticeship Program (REAP), High School Apprenticeship Program (HSAP), College Qualified Leaders (CQL), and Undergraduate Research Apprenticeship Program (URAP).
Scholarship & Award Opportunities (Undergraduate and Graduate)

The Department of Defense offers many opportunities for students to continue their pursuit of STEM education beyond high school. Additional information on these opportunities can be found at www.usaeop.com/scholarships.

- Science, Mathematics and Research for Transformation (SMART) Defense Scholarship for Service Program
- National Defense Science and Engineering Graduate Fellowship (NDSEG)
AEOP Portfolio

Army Educational Outreach Program Pipeline
~Mentor Centered Programs~

- Camp Invention
- Gains in the Education of Mathematics and Science
- Unite
- Internships / Fellowships
- Stem Enrichment
- Research Experiences for STEM Educators and Teachers
- Junior Solar Sprint
- Junior Science & Humanities Symposium
- eCYBERMISSION
- International Mathematics Olympiad
- Internships / Fellowships
  - Science Engineering Apprentice Program
  - Research Engineering Apprentice Program
  - High School Apprentice Program
- Vivian Burray Marshall Academy
- High School Apprentice Program
- Internships / Fellowships
  - College Qualified Leaders
  - University Research Apprentice Program
- Continuation of Experiences

* Identifies programs that either completely, or have a component, that specifically targets under-served populations
### FY16 AEOP Student Participation

<table>
<thead>
<tr>
<th>Program Name</th>
<th># of Students</th>
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<td>Camp Invention</td>
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<tr>
<td>GEMS</td>
<td>2,427</td>
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<tr>
<td>UNITE</td>
<td>282</td>
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<tr>
<td>RESET</td>
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<td>JSS</td>
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<tr>
<td>eCYBERMISSION</td>
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<tr>
<td>JSHS</td>
<td>5,300</td>
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<td>SEAP</td>
<td>113</td>
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<tr>
<td>HSAP/URAP</td>
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<tr>
<td>REAP</td>
<td>120</td>
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<tr>
<td>CQL</td>
<td>236</td>
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</tbody>
</table>

Programs are also located in America Europe, America Pacific, America Samoa, Guam and the Virgin Islands.

"The health of the Army, and our nation is dependent on our continuing and readily available supply of U.S. STEM Capabilities"

AEOP provided outreach to 39,413 students, 2,096 teachers and 8,040 adult volunteers in FY16

| Total # of Students | 30,992 |
The Army’s STEM education program success is critically dependent on a strong partnership with academic and industry—just as the Army’s research program is critically dependent on a strong relationship with the Defense Industrial Base.
Office of the Assistant Secretary of the Army for Acquisition, Technology and Logistics
Deputy Assistant Secretary of the Army (Research & Technology)
Dr. Thomas Russell

Director for Laboratory Management – Dr. Matthew Willis
AEOP Program Director (Contractor) - Ms. Andrea Simmons

74%*
AMC Research Development & Engineering Command

8%*
MEDCOM Medical Research & Materiel Command

14%*
USACE Engineering Research & Development Centers

3%*
U.S. Army Space & Missile Technical Center

2%*
G1 Army Research Institute

*Org Chart is subsection of Entire Army Structure

Note: Figures may not add due to rounding
Strategic Outreach Initiatives (SOI)

- AEOP’s strategic outreach initiatives aims to increase its participation from underserved and underrepresented populations in STEM by investigating new and innovative ways to form mutually beneficial relationships with like-minded organizations

- Recent Awardees:
  - Bowling Green State University (OH)
  - DC STEM Network, Carnegie Academy for Science Education (DC)
  - EduCare Foundation (Van Nuys, CA)
  - Harmony Public Schools (TX)
  - John Hopkins University (MD)
  - Research Foundation for the State University of New York (NY)
  - Sanford Research (Sioux Falls, SD)
  - Society of Women Engineers (IL)
  - TechBridge (Oakland, CA)
  - Tiger Woods Foundation (Irvine, CA)
  - Washington STEM (WA)

Through the Battelle Cooperative Agreement, AEOP awarded $600K in SOI Grants in 2016
AEOP Evaluations

- Established Institutional Review Board (IRB)
- Established common metrics (aligned with OSTP STEM Data Call)
- Strategic alignment of questions, methods & assessments to Federal/DoD/Army STEM Strategic Plan
- Annual program planning and reports
- Data-driven programmatic changes
- Conduct longitudinal study (alumni)
- Centralized website (Google Analytics)
- Centralized application portal (Cvent)
- Availability of AEOP evaluation reports on public website
AEOP Participants
FY13: 66,484    FY14: 51,772    FY15: 47,191    FY16: 39,413

- 97% of AEOP Alumni are interested in pursuing STEM careers (Longitudinal Studies)
- 52% of Alumni remained connected with their mentor after AEOP experience
- 77% of students reported a greater awareness of and 76% appreciation of DoD STEM research and careers
- 62% indicated that UNITE raised their interest in pursuing a STEM career with DoD
- 81% of students became more aware of DoD STEM research and careers after GEMS participation
- 63% placement rate of students into GEMS programs
- 74% of students indicated learning cutting edge research through REAP apprenticeship

Sample Evaluations Results

GEMS: Gains in Engineering, Math and Science
REAP: Research and Engineering Apprenticeship Program
* Program evaluations are all available online at http://www.usaeop.com/about/our-impact/

“Conduct STEM education research and evaluation to build evidence about promising practices and program effectiveness, use across agencies, and share with the public to improve the impact of the Federal STEM education investment.” – Federal STEM Education 5-Year Strategic Plan
Deliver collaborative and innovative aviation and missile capabilities for responsive and cost-effective research, development and life cycle engineering solutions.

https://www.amrdec.army.mil/amrdec/video/AMRDEC-OverviewVideo.mp4
Who is AMRDEC?EC?

~ 9,408
FY16 Strength

~ 88% of
FY16 Funding = Reimbursable
$2.45B

~ 12% of
FY16 Funding = S&T
$339M

W ho is AMRDEC?EC?

- Aviation and Missile Technologies
- Life Cycle Management
- Research, Technology Development and Demonstration
- Design and Modification
- Systems Integration
- Test and Evaluation
- Qualification
- Aerodynamics/Aeromechanics
- Structures
- Propulsion
- Guidance/Navigation
- Autonomy and Teaming
- Radio Frequency (RF) Technology
- Fire Control Radar Technology
- Image Processing
- Models and Simulation
- Cyber Security

AMRDEC HQ
Redstone Arsenal, AL

Colorado Springs, CO
Ft. Eustis, VA
NASA Langley, Hampton, VA

NASA Ames - Moffett Field, CA
Corpus Christi, TX

Honolulu, HI Schofield Barracks, HI
Total Income
FY16 ($2,795M)

- Army: $2,102M (75%)
- PEO Missiles & Space: $390M
- DARPA: $110M
- Aviation S&T: $160M
- Missile S&T: $179M
- Non-S&T RDTE: $51M
- OMA Mission / OCO (RDECOM): $35M
- AMCOM: $167M
- PEO Aviation: $681M
- Other Army PEOs: $202M
- Other Army: $232M
- SOCOM: $5M
- Navy: $81M
- Air Force: $106M
- Marines: $256M
- Other DoD: $9M
- Non-Govt: $3M
- Vast majority: Aviation and Missile Work
- Non-Govt: $3M
- Other DoD: $9M
- MDA: $256M

As of: 12 OCT 16
Strategic Readiness
Provide aviation and weapons technology and systems solutions to ensure victory on the battlefield
  – Provide valued life cycle engineering expertise and service across the materiel enterprise

Future Force
Develop and mature Science and Technology to provide technical capability to our Army’s (and nation’s) aviation and weapons systems
  – Provide decisive overmatch in aviation and missile technologies – further, faster, more precise
  – Mitigate Army Warfighter Challenges through development and maturation of innovative, adaptive technologies

Soldiers & People
Develop the engineering talent to support both Science and Technology and materiel enterprise
  – Cultivate talent from K-16 in support of Science Technology Engineering and Math (STEM)
  – Mature the engineering workforce into subject matter experts across engineering domains
  – Recruit, manage, train and retain a workforce capable of solving problems and developing technologies to enable the Warfighter
Strategic Roadmap

**Lines of Effort**

**Strategic Readiness**
- Provide aviation and weapons technology and system solutions to ensure the Soldier victory on the battlefield

**Future Force**
- Develop and mature S&T to provide technical capability to our Army’s (and nation’s) aviation and weapons systems

**Soldiers & People**
- Develop the engineering talent to support both S&T and materiel enterprise

**Output**

**Tech Development & Engineering Services**
- Provide innovative S&T/R&D technologies and valued life cycle engineering expertise across the enterprise

**Sustainable Readiness**
- Provide aviation and weapons technology and systems solutions to ensure victory on the battlefield

**Future Force**
- Develop and mature S&T to provide technical capability to Army’s aviation and weapons systems

**Human Dimension/Resource Management**
- Develop the engineering talent to support S&T and materiel enterprise
AMRDEC STEM Education and Outreach

MISSION
Inspire, develop, and attract a future STEM talent pool with the competencies and skill sets essential to maintaining tomorrow’s first-class AMRDEC workforce, while contributing to the development of a diverse career talent pool to meet future National Defense needs.

VISION
Establish AMRDEC as the premier one-stop resource providing effective, vibrant, high-quality educational outreach experiences in K-20 Science, Technology Engineering and Mathematics across the state of Alabama, the Department of Army, Department of Defense and beyond.

INTRODUCTION
The United States Army has long recognized that a scientifically and technologically knowledgeable citizenry is our nation’s best hope for a secure, rewarding, and successful future. STEM Outreach is an organized and concentrated endeavor to reach the populace through interactions and activities purposed to encourage interest and ultimately professions in science, mathematics, and engineering.
The implementation of integrated succession planning, innovative recruitment strategies, coupled with a vibrant education campaign are key enablers to the achievement of workforce development objectives.
AMRDEC’S STEM OUTREACH PROGRAMS FALL UNDER THREE AUSPICIES AS follows:

1. Government STEM Outreach Programs (GSOP):
   - Department of Army:
     - e-CYBERMISSION – Grades 6th-9th
     - GEMS (Gains in the Education of Mathematics and Science) – Grades: 8th – 12th
     - SEAP/CQL (Science and Engineering Apprentice Program/College Qualified Leader) – Ages: 17 and above
     - REAP - Research & Engineering Apprenticeship Program
     - UNITE
   - Department of Energy:
     - Oak Ridge Institute for Science and Education (ORISE)

2. AMRDEC STEM Outreach Experiences (ASOE):
   - AMRDEC Career Exploration Experience (ACE²) – Grades: 8th and above
   - AMRDEC STEM Outreach Cooperative Education Experience (SOCEE) – Collegiate Students
   - AMRDEC Engineers and Scientists in the Classroom (ESIC) – K-16
   - AMRDEC K-16 Technology Tours and Visits (K-16TTV) – Size: 10 to 25 students
   - AMRDEC Virtual Mentoring Program – grades 6 and above
   - STEM College Bus Tours (SOCBT)
   - Radio Frequency Technology Clubs

3. Community Outreach Volunteerism and Collaborations (COVC):
   - Girl’s Science & Engineering Day
   - Adventures in Engineering Day
   - Adventures in AMCOM
   - Readers in the Classroom
   - Science Fair Judging
   - FLL Robotics/BEST Robotics
   - Cross-Cultural Awareness Programs
   - Veterans’ Day Observances
   - Others
## AMRDEC OUTREACH
### STUDENT IMPACT STATISTICS

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<tr>
<th>STUDENTS / VOLUNTEER PARTICIPANTS</th>
<th>FY11</th>
<th>FY13</th>
<th>FY15</th>
<th>FY16</th>
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<td>Total Students</td>
<td>9220</td>
<td>12372</td>
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<td>Teachers</td>
<td>108</td>
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<td>AMRDEC S&amp;E Volunteers</td>
<td>52</td>
<td>65</td>
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<td>PROGRAM / EVENT TITLE/DESCRIPTION</td>
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<td>HOST ORG</td>
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QUESTIONS?