



DoD Research and Engineering Enterprise

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Deputy Assistant Secretary of Defense for Research

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DoD Science and Technology

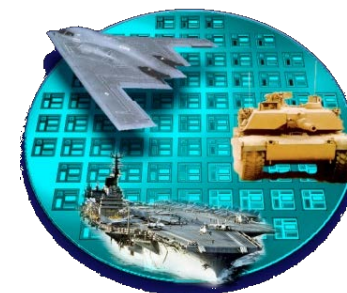
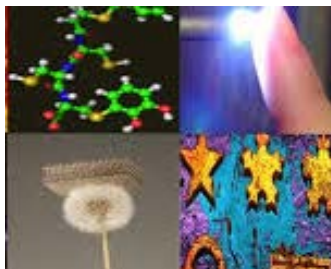


Vision

Sustaining U.S. technological superiority, preparing for an uncertain future, and accelerating delivery of technical capabilities to the warfighter

Mission

Create technological surprise through science and engineering to ensure technological superiority.
Mitigate current and anticipated threats to win the current and future fight.
Provide affordable options for new concepts and extended legacy capabilities through basic sciences and applied and advanced technology.



Science and technology creating revolutionary capabilities to win the fight today and in the future



Enabling a Strategy on Technological Superiority



Looking back:

- Technologies developed by and for the US military
 - Superiority has not been challenged in 40 years
-

Shifting forward:

- Global access to resources, technology and talent
 - Competitors designing capabilities to directly counter US advantage
 - Cost and cycle times adapting
-

Toward a Third Offset Strategy:

- Rapidly engaging in new technology development, innovation, speed, and agility to ensure technological superiority



Science and Technology: A Fundamental Building Block for National Security



- ***Asymmetrically compensating*** for a disadvantage
- ***Changing the competition*** to more favorable footing
- ***Enabling the application of strengths*** to problems that are otherwise unwinnable or winnable only at unacceptable cost
- ***Competitive strategy*** that seeks to maintain advantage over potential adversaries



Science and Technology provides the greatest potential for fundamentally new ways of defending our nation



Science and Technology Creating the Future



- **Artificial Intelligence**
- **Future of Computing**
- **Novel Engineered Materials**
- **Understanding the Human**
- **Emerging Biosciences**
- **Manufacturing Science**



What will you empower us to imagine in the future....



DoD R&E Ecosystem

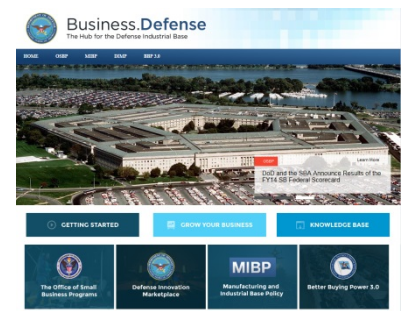


Engaging with all partners to ensure technological superiority

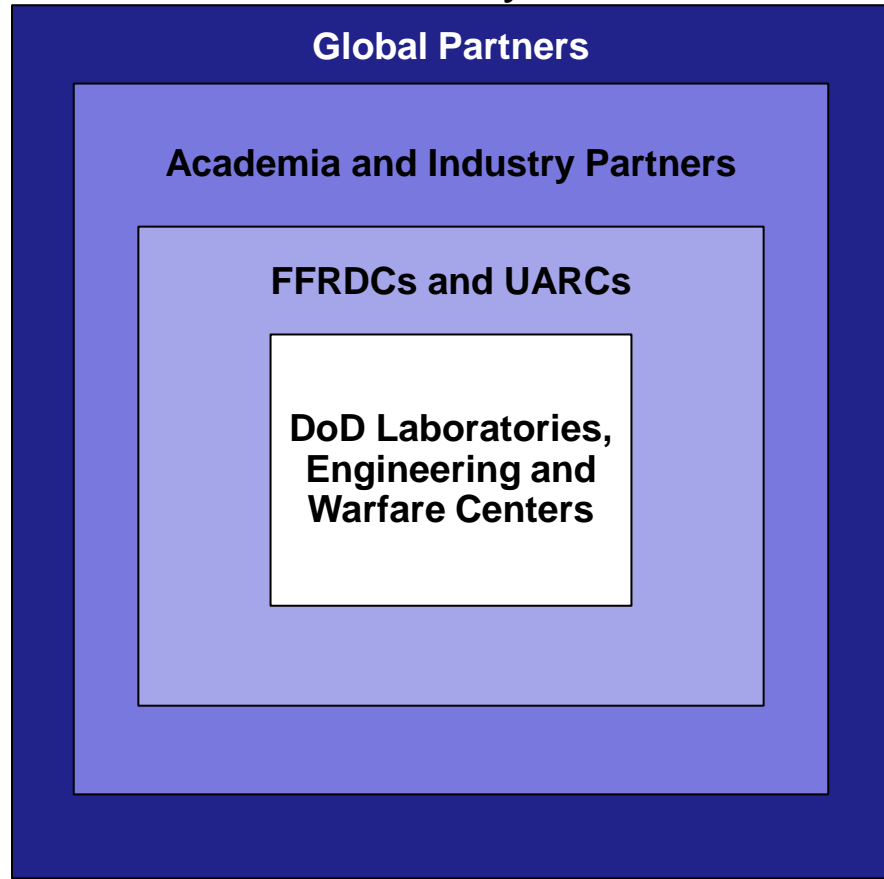
R&E Ecosystem



Win today's fight



Design and acquire for the next fight



Force acceleration of science and engineering – driving ideas to capability



Technology and Communities of Interest (COIs)



Lead innovation and acceleration of advanced concepts and prototypes across multiple domains



Advanced Electronics



Air Platforms



Autonomy*



Biomedical/ASBREM



C4I*



Counter-IED



Counter-WMD*



Cyber*



Electronic Warfare*



Energy and Power Technologies



Engineered Resilient Systems*



Ground and Sea Platforms



Human Systems*



Materials and Manufacturing Processes



Sensors



Space



Weapon Technologies

**COIs that cover the seven DOD S&T Priorities (Data-to-Decisions is found in C4I)*

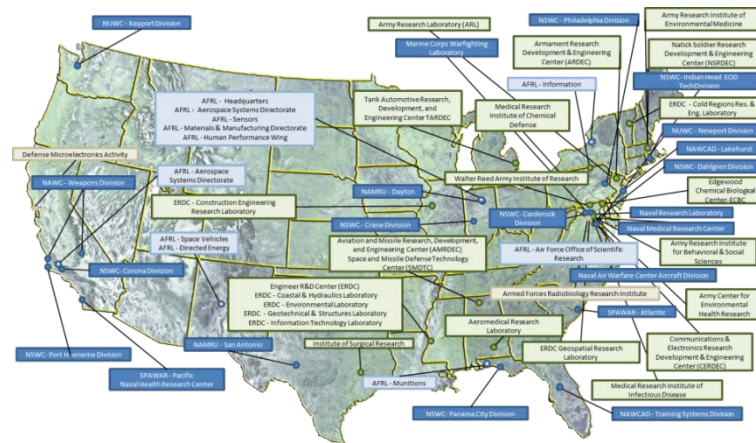


DoD Laboratories



63 Defense labs and engineering centers that provide expertise and insight to enhance our warfighter's capability

- Address the technological needs of the warfighter in support of ongoing operations
- Develop technologically enabled capabilities that establish and preserve U.S. military technological advantage against potential adversaries
- Develop leap-ahead science and technology that offers a long-term disruptive advantage to U.S. forces
- Maintain the capacity of the Department to attract and retain the best and brightest scientists and engineers
- Encourage appropriate relationships with academia and industry to pursue cutting-edge science and technology
- Enhance warfighting capabilities by supporting acquisition programs with technologies that make weapon systems more effective and affordable



Broad Mission Areas

Power Projection

Lethality and Protection

Warfighter Performance

Information Superiority

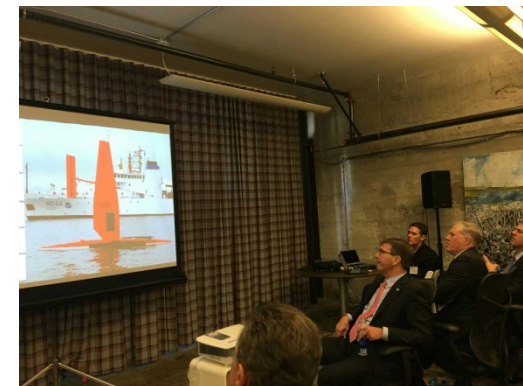


Industry Partnerships



• Defense Innovation Unit Experimental (DIUx)

- Serves as a nexus between innovation ecosystems and the DoD
- Specific objectives of DIUx:
 - Strengthen existing relationships and build new ones,
 - Scout for breakthrough and emerging technologies,
 - Serve as a local hub for the Department of Defense in Silicon Valley



• For Industry, the Defense Innovation Marketplace is:

- A place to learn about DoD R&E investment priorities and technology requirements.
- A source allowing industry to align their IR&D efforts to better support the current and future needs of the warfighter
- A link to specific solicitations, upcoming R&E related events, Communities of Interest, and Technology Interchange Meetings
- A portal to securely share their IR&D projects with S&T/R&D and acquisition personnel they consider their target market



Accelerating the flow of ideas and new technology from venture capitalists, high technology startups, and academia into the DoD



Industry Partnerships



- **IR&D is important to innovation**

- DoD – and industry – benefit from IR&D efforts to address technical challenges – reduce cost, technical and schedule risk early
- IR&D as Market Research: DoD uses the IR&D Secure Portal to find projects that address, mitigate, or improve a DoD technical challenge (potential transition to a program of record)
- Encourages greater contribution to technology related to future defense systems.
- Translates new ideas and technologies into defense capabilities



- **Technology transfers**

- In FY15, over 2,000 cooperative research and development agreements (CRADAs) with private companies or universities and filed nearly 900 patents were filed
- 1,400 DoD CRADAs were with small businesses

Maximize intellectual and tech transfer to accelerate ideas and products to ensure technological superiority



Basic Research

Creating conditions for basic research investments capable of creating high-payoff, transformative scientific breakthroughs for DOD

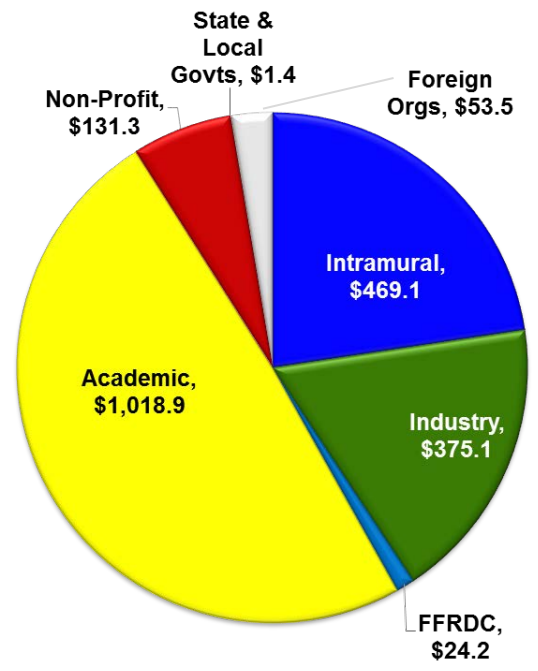
In ASD(R&E), we:

- Provide scientific leadership, oversight, and coherence for the Department's basic research programs
- Facilitate partnerships between scientists to enhance communication and collaboration
- Focus on talent by attracting the nations best scientists and engineers

Basic research focused on:

- Stimulating the initiation or support of promising areas of research, and those with the potential for transformational significance to future defense capabilities
- Building fundamental understanding of the social, cultural, and historical forces that shape regions of the world of strategic importance

Basic Research, \$2,074M
(TY \$ Millions)



Source: NSF Federal R&D Funds Survey for 2014



Basic Research



- **Multidisciplinary University Research Initiative (MURI):** A tri-service DoD program that supports research teams whose efforts intersect more than one traditional science and engineering discipline
 - Efforts are expected to enable more rapid R&D breakthroughs and to promote eventual transition directly to Service applications
 - http://www.acq.osd.mil/rd/basic_research/program_info/muri_partners/
- **National Security Science & Engineering Faculty Fellowships (NSSEFF):** 5-year fellowship with up to \$3M for research with potentially extraordinary outcomes
 - Fund transformative, high-risk basic research in scientific areas of critical importance to DoD
 - Attract the most distinguished, productive, and creative candidates
 - Develop and sustain career-long association between Fellows and DoD
 - Develop a “talent pool” that can study and advise DoD on emerging scientific and technical challenges
 - Educate and recruit next generation researchers to research enterprise in the department including OXRs, and DoD Labs
- **Laboratory University Collaboration Initiative (LUCI):** Funds important research project with government laboratories collaborating with academia
 - Provides support to top DOD Service Lab researchers for collaborations with NSSEFF
 - The program supports high-risk innovative basic research within academia
 - Each researcher selected for the LUCI program will receive \$600,000 over a three-year period to conduct a basic research project in collaboration with a NSSEF Fellow
- **Defense Enterprise Science Initiative (DESI) Concept:**
 - Focuses on use-inspired basic research with industry participants
 - Leverages industry IR&D, and other activities at DoD Laboratories
 - Supports STEM efforts
 - DESI is the only basic research effort that requires a concurrent industry IR&D or DoD lab 6.2+ program



Basic Research



- **Minerva Research Initiative:** Heightened global challenges in social sciences require serious intellectual investment of the sources of conflict, from the ground up
 - Build deep understanding of the social, cultural and political forces that shape regions of the world of strategic interest
 - Connect social science insights and methods to current and future defense leadership to inform tomorrow's key security decisions
 - <http://minerva.dtic.mil/>
- **Service and DARPA Broad Agency Announcements:** A competitive solicitation procedure used to obtain proposals for basic and applied research and that part of development not related to the development of a specific system or hardware procurement
 - <http://www.grants.gov/>
 - <https://www.fbo.gov/>
- **ARL Open Campus:** Open sharing of world-class ARL facilities and research opportunities for all partners, including foreign nationals, to enhance synergistic relationships with the international, academic, and entrepreneur communities
 - Creation of flexible career paths in defense research that allow easy transition between government, academia and industry
 - Increased opportunities for technology advancement and transfer of research knowledge
 - Improved public involvement in defense research to create enhanced understanding of the value and importance of defense science, technology, and exploration
 - <http://www.arl.army.mil/opencampus/>



Global Partners



- **Military to military engagement is organized through a strategic collaboration**
 - Individual Engagements: Australia, India, Japan, Republic of Korea, Singapore, Taiwan, and the United Kingdom
 - Bilateral Engagements:
 - The Technical Cooperation Panel (TTCP)
 - NATO Science and Technology Organisation (NATO-STO)
- **Services leverage their Service-specific international program offices to develop formal and informal scientific collaborations and programs**

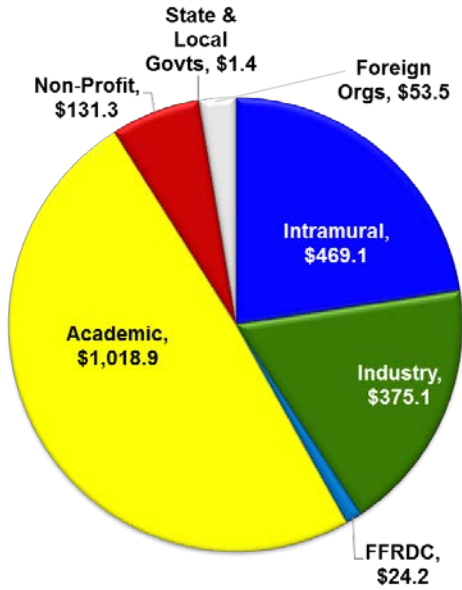




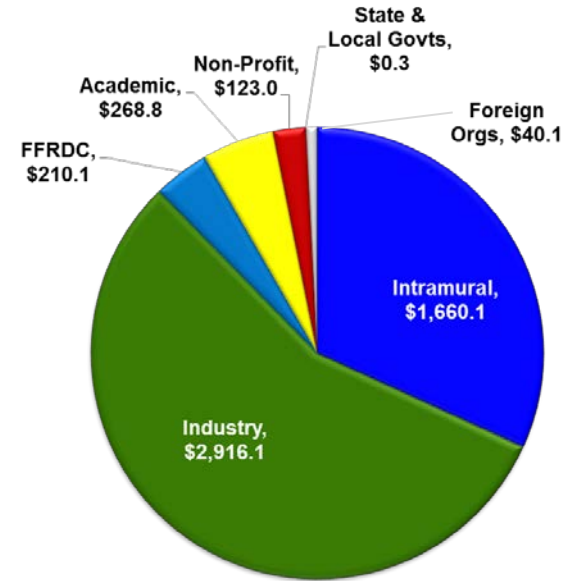
DoD Obligations by Performer in 2014



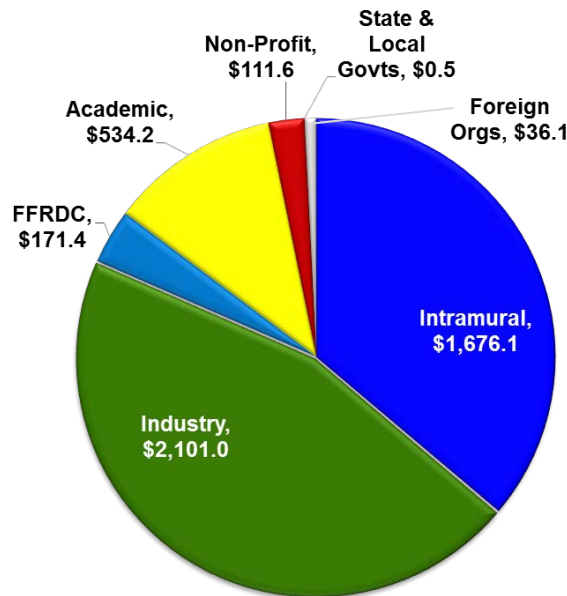
Basic Research, \$2,074M



Advanced Technology Development, \$5,219M



Applied Research, \$4,631M



Total 2014 budget for DoD Science and Technology: \$11,924M



The Future of the Ecosystem: Science, Technology, Engineering and Mathematics (STEM)



Shaping our future force to ensure technological superiority

National Defense Education Program

- Provide education and outreach programs and activities that build the pipeline
- Promote increased participation of underserved groups
- Communicate the value of STEM investments as a critical enabler to the DoD mission



Science, Mathematics, and Research for Transformation (SMART) Scholarship Program

Scholarship-for-Service program designed to produce the next generation DoD S&T Leaders

- Education support covering
 - Full tuition and related education expenses
 - Stipends
 - Health Insurances and book allowances
- Summer Internships (multi-year participants)
- Post-Graduation career opportunities

Military Child Pilot Program

Establishing a department-wide, coordinated effort to create, implement and assess the pilot program to improve the education for military dependents

- Enhance the preparation of dependents of members of Armed Forces for careers in science, technology, engineering, and mathematics
- Develop innovative STEM educational programs for military children, leveraging capabilities of private sector, other federal agencies, and DoD laboratories





Military Child Pilot Program



Purpose

FY2015 NDAA Section 233 -

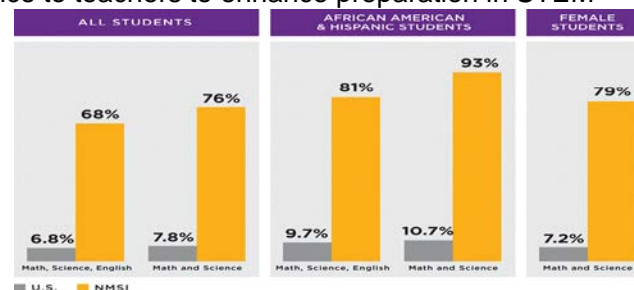
- Enhance the preparation of dependents of members of Armed Forces for careers in science, technology, engineering, and mathematics
- Develop innovative STEM educational programs for military children, leveraging capabilities of private sector, other federal agencies, and DoD laboratories

Accomplishments

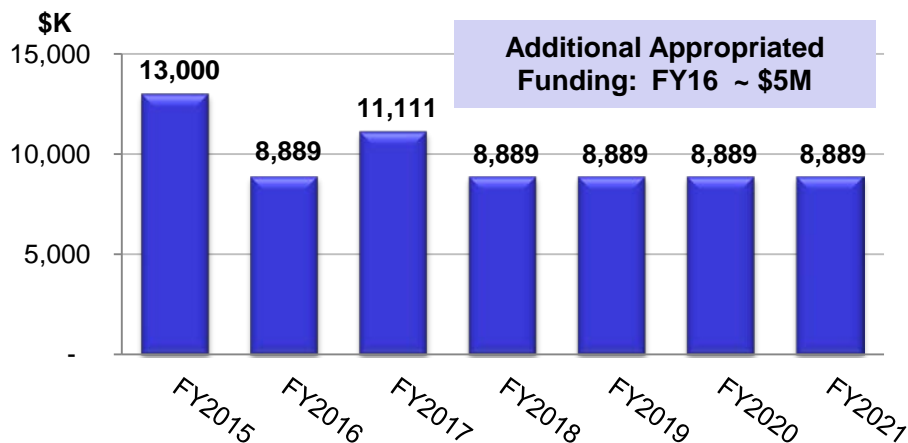
National Math & Science Initiative (NMSI): College Readiness Program (CRP)

- Increases the number of students taking and passing AP math, science, and English exams
- Expands access to traditionally under-represented students
- Enhances the preparation of students for careers in STEM
- Provides assistance to teachers to enhance preparation in STEM

First-Year Increase in Qualifying AP Scores for U.S. and NMSI Schools



Program Budget

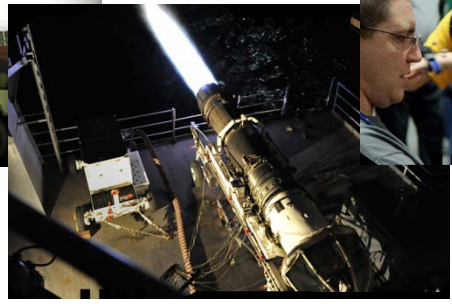
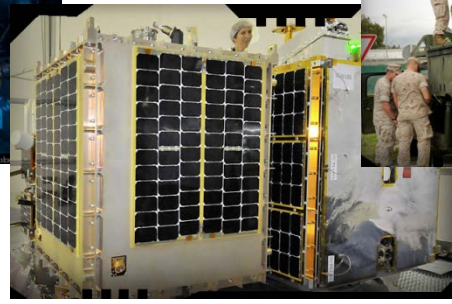
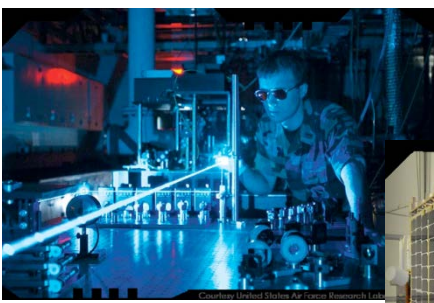
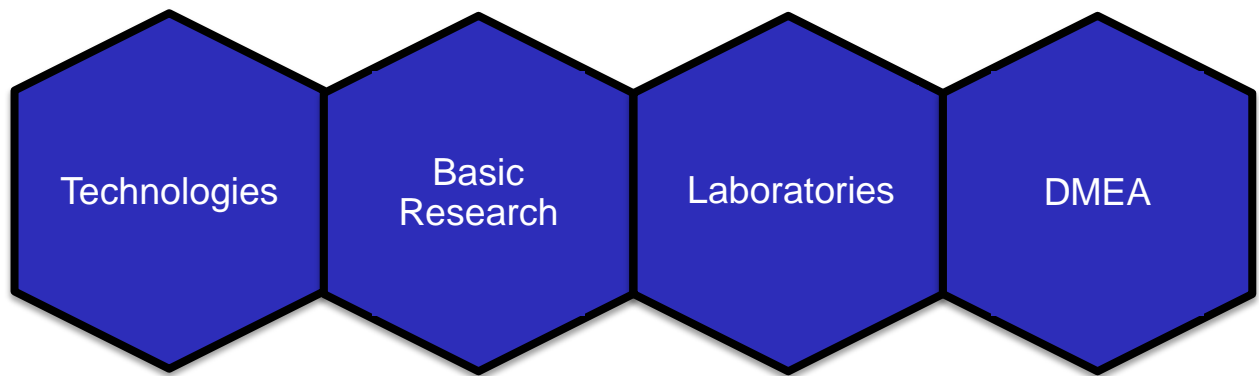


Approach

- Partner with the White House (Office of the Vice President), Federal Agencies (NSF & ED), DoD Components (DoDEA), and public/private sector (NMSI)
- Support national effort through NMSI's CRP reaching 160 schools toward the goal of 200
 - FY15 funds will reach over 18 schools during academic year 2016-2019 across 12 states (not including matching industry funds)
- Develop initiatives leveraging our DoD science and engineering workforce, expertise, and resources to enhance this multiyear record of success in STEM learning for military children.



DoD Research Directorate: Pursuing Sustained Technical Advantage



DoD Research Directorate:

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Defense Innovation Marketplace

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