



The National Academies of
SCIENCES • ENGINEERING • MEDICINE

FEDERAL FACILITIES COUNCIL

Morning Keynote

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DoD Science and Technology Enterprise

2017 Federal Facilities Workshop

*Advancing America's Economy: Building Infrastructure Partnerships
at the National Security Laboratories*

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Crucial to Build Infrastructure Partnerships at the National Laboratories

An Important Mission

- World class, revitalized lab infrastructure allows the U.S. national security labs to deliver innovation that advances America's national security. We need to build and revitalize that infrastructure.
- The U.S. government labs can establish shared infrastructure resources—that is, shared facilities—as part of high impact S&T collaboration. Now more than ever, we need the talent of academia and industry and shared space for collaborative work.
- The huge facility and infrastructure footprint of the U.S. labs has an enormous capacity to benefit the U.S. economy and ordinary Americans across the United States.
- Technology transfer initiatives—basically the commercialization of technologies developed at the labs—also have the potential to spur growth in the U.S. tech industry and deliver new technologies to U.S. consumers.

***Infrastructure is a top priority for
the Administration***

***This is a crucial time to build
infrastructure partnerships at the
National Laboratories***

Four Panels for the Workshop:

- 1. Advancing RDTE capabilities**
- 2. Multiparty Partnerships**
- 3. Economic Impact**
- 4. Fostering Tech Transfer**

Administration Priorities: The Value of Investing in Infrastructure

American Prosperity:

“tremendous job creation in new businesses and industries.”

“Emerging technologies such as autonomous systems, biometrics, energy storage, gene editing, machine learning, and quantum computing may well have the highest potential to drive the economy and create entirely new industries.”

“American leadership in science and technology is critical to achieving this Administration’s highest priorities: national security, economic growth, and job creation.”

From the *Fiscal Year 2019 Administration Research and Development Budget Priorities*

Modernizing & Managing Research Infrastructure:

“Maintaining and modernizing research infrastructure is critical to getting the best value out of R&D Investments”

“Innovative partnership models involving other agencies, state and local governments, the private sector, academia, and international partners can help maximize utilization of underused facilities and lead to sharing the costs of new R&D facilities.”

“In spurring future advances, Federal funding of research and development (R&D) programs and research infrastructure can play a crucial supporting role.”

DoD Science and Technology

Vision

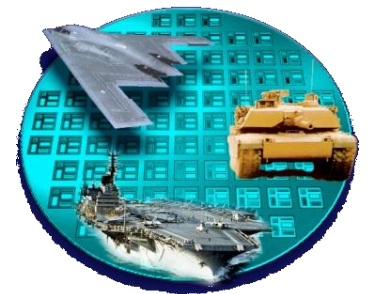
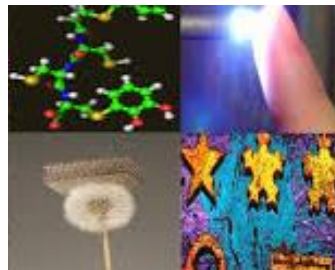
Sustaining U.S. technological superiority, preparing for an uncertain future, and accelerating delivery of technical capabilities to the warfighter

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.

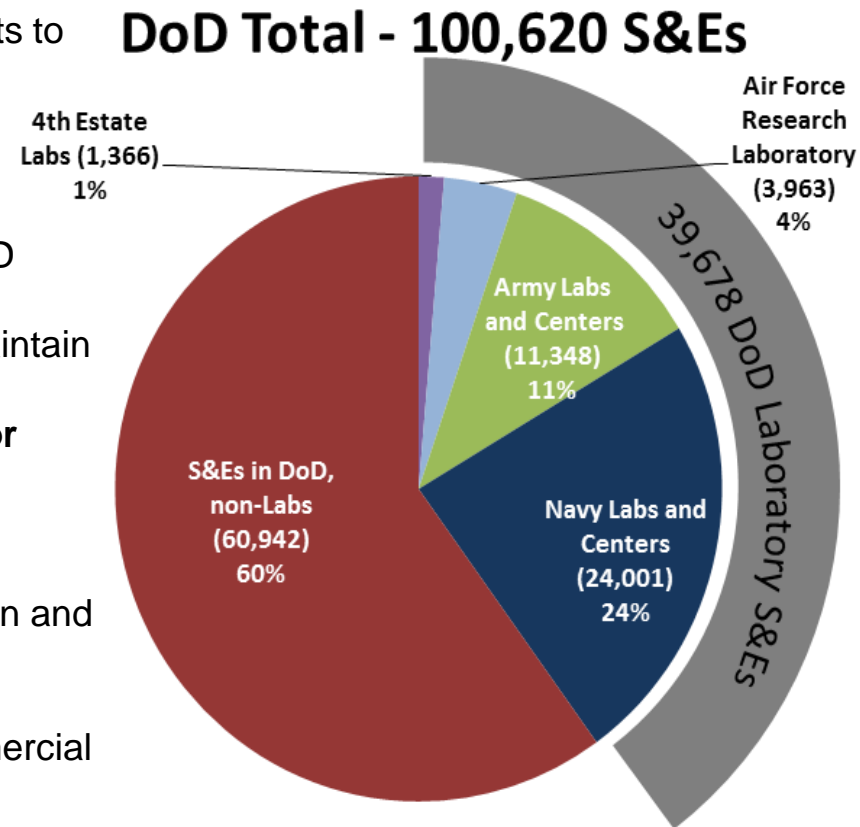


Creating revolutionary capabilities to win the fight today and in the future

DoD Laboratories, Engineering Centers, & Warfare Centers

The in-house Defense Laboratory Enterprise (DLE) employs approximately 40,000 scientists and engineers in 60 laboratories, warfare centers, and engineering centers in 22 states and the District of Columbia.

- **Conduct innovative, forward-looking R&D that supports the warfighter**
 - Focus research and development (R&D) investments to directly support warfighter needs and develop transformative capabilities through discovery and invention to win the future fight
- **Recruit and uphold the best & brightest workforce**
 - DoD personnel are the foundation of innovative R&D
- **Maintain first rate facilities and infrastructure**
 - Invest in infrastructure for future capabilities and maintain critical existing facilities
- **Engage with the academic community & private sector**
 - Stay on the cutting edge of technology
- **Avoid technological surprise**
 - Engage the Intelligence Community to maintain awareness of disruptive technologies; counter known and developing adversarial technological advances
- **Enable technology transfer**
 - Transfer technologies with applications to the commercial sector.



Leveraging the Entire R&E Ecosystem

Engaging with all partners to ensure technological superiority...



Win today's fight

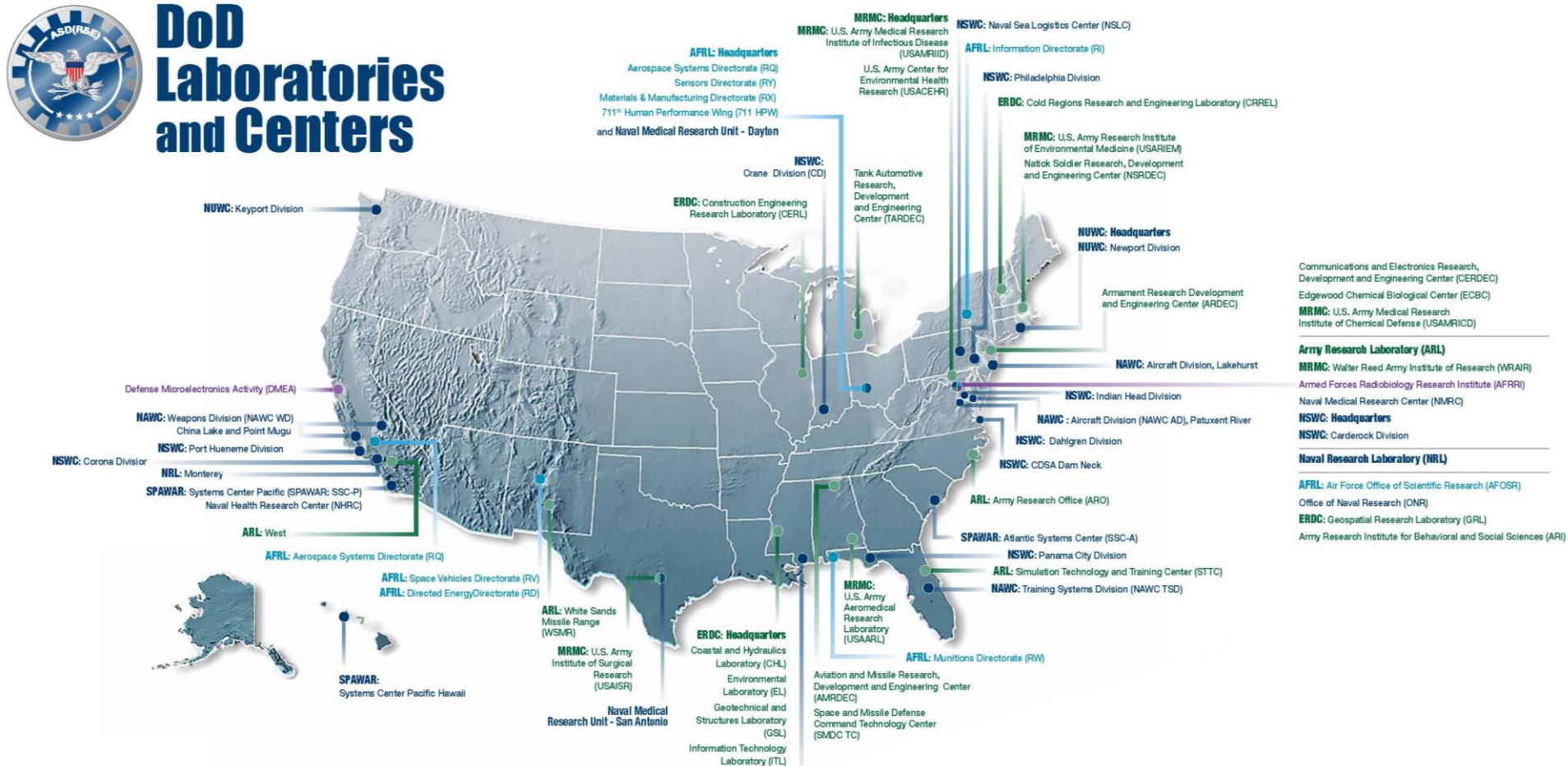


Design and acquire for
the next fight

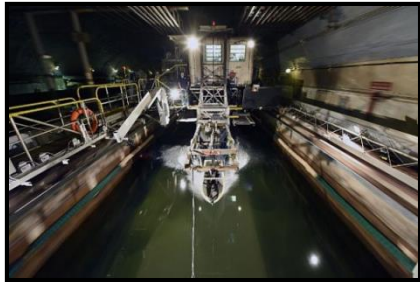


Force acceleration of science
and engineering – driving
ideas to capability

63 Defense laboratories and engineering centers with ~40,000 scientists and engineers in 22 states and the District of Columbia



Unique Infrastructure



NSWC Carderock David Taylor Model Basin & Maneuvering and Seakeeping Basin (MASK)



USARIEM Hypobaric (Altitude) Chamber



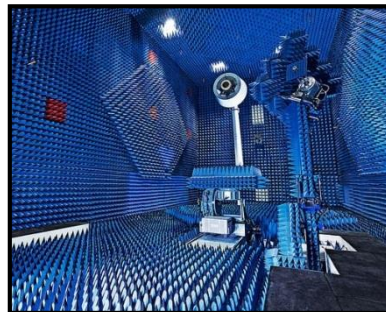
AMRDEC Missile Component Simulation in Real-world EM Environments



ARL Electromagnetic (EM) Vulnerability Assessment Facility



NSRDEC Laser and Electro-optical Test Facility



NSWC Dahlgren Specialized Antenna Anechoic Chamber



AFRL Vertical Wind Tunnel (VWT)



USAF Space Surveillance Telescope (ARL: WSMR)

Industry Partnerships

■ Lightweight Innovations for Tomorrow – Manufacturing Initiative

- Public-private partnership to develop and deploy advanced lightweight materials manufacturing technologies, and implement education and training programs to prepare the workforce
- The mission is to serve U.S. manufacturing by acting as the bridge between basic research and final product commercialization of new, advanced lightweight materials and innovative manufacturing technologies and practices
- Currently, more than \$100 million in technology projects undertaken by its industry and university partners



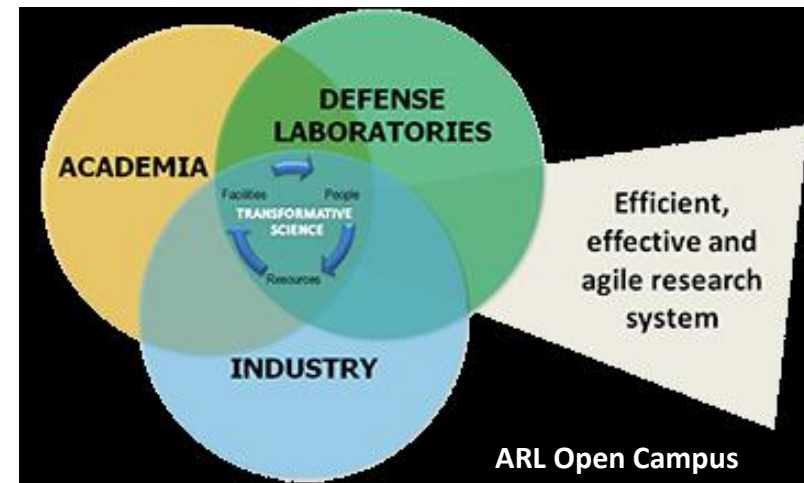
■ Air Force Research Laboratory Intellect to Intellect (i2i) Exchange

- Increase the rate of research and development of technologies relevant to the Air Force and is coordinated with OSD's Defense Innovation Unit - Experimental (DIUX)
- Engages and partners with non-defense orientated commercial partners by tapping into our shared driving desire to solve very hard problems
- Example: Google – AFRL partnership to investigate the use of Google Earth Engine infrastructure to teach AFRL how to process WAMI data at scale.



Integrated Partnerships

- **ARL Open Campus: Open sharing of world-class ARL facilities and research opportunities for all partners, including foreign nationals**
 - 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/>
- **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

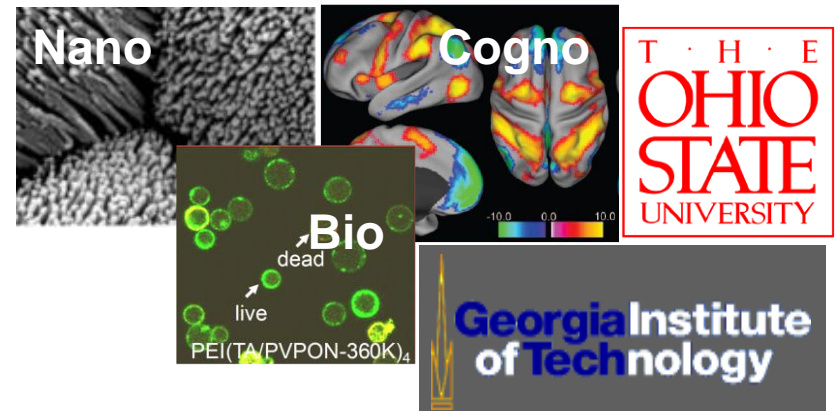


AFRL Maker Hub: One-year pilot project in partnership with the Wright Brothers Institute

- Gives AFRL personnel of all technical skill levels the opportunity to conceive their own ideas and bring them to life in this makerspace, as well as share tricks and tips with fellow AFRL builders
- Encourages collaboration with the local small business community
- <http://www.afrlmakerhub.com/>

Academic Partnerships

- **Air Force Center of Excellence: Partnerships between AFRL and specific universities to make an impact**
 - Northwestern University – Advanced Bio-programmable Nanomaterials
 - GTRI and Ohio State University – Bio-nano-enabled Inorganic/Organic Nanostructures and Improved Cognition



- **NRL Science and Engineering Apprenticeship Program (SEAP) program**
 - Eight-week paid internship opportunity for high-school students
 - Interns gain real-world, hands-on experience and research skills under the guidance of a NRL mentor
 - Research areas have included: corrosion preventive compound analysis, pathogen carriage by fleas in Kenya, manufacturing ball bearings using additive manufacturing, high altitude balloon design, wave energy testing; nanocomposite analysis, and collision avoidance for collaborative Unmanned Aerial Vehicles

Collaborative Research

Bringing together a unique interdisciplinary community of scientists and engineers to advance the state of the art in applied brain and cognitive sciences.

Center for Applied Brain and Cognitive Sciences (CABCS)

- Innovative environment for conducting collaborative applied research focusing on measuring, predicting, and enhancing cognitive capabilities and human system interactions
- Center Capabilities and Resources:
 - Small Unit Ambulatory Virtual Environments (SUAVE) Lab
 - Neuromodulation Lab
 - Electroencephalography (EEG) Lab
 - Exercise Lab
- Accepting proposals for cutting-edge interdisciplinary projects that push the boundaries between basic and applied research
- <http://www.centerforabcs.org/>



Partnering in Different Ways

Engineer Research and Development Center - Cold Regions Research & Engineering Lab (CRREL)

- CERRL solves interdisciplinary, strategically important problems for the US Army Corps of Engineers, Army, Department of Defense, and the Nation
- Building innovative products that support the warfighter, water resources, environment, infrastructure and homeland security
- **Research Areas:**
 - Biogeochemical Sciences
 - Military Terrestrial Science and Phenomenology
 - Polar Science and Engineering
 - Remote Sensing and Geographical Information Science (GIS)
 - Snow and Ice in Temperate and Mountain Regions

Fostering partnerships across government agencies, academia and industry to solve complex problems

Massachusetts Institute of Technology (MIT) Lincoln Laboratory

- Established in 1951 to build the Nation's first air defense system
- **Federally Funded Research and Development Center (FFRDC) in support of tech transfer**
- **Mission Areas:**
 - Space Control
 - Air, Missile, and Maritime Defense Technology
 - Communication Systems
 - Cyber Security and Information Sciences
 - ISR Systems and Technology
 - Advanced Technology
 - Tactical Systems
 - Homeland Protection
 - Air Traffic Control
 - Engineering

Technology in support of national security

TechLink

TechLink helps the Department of Defense to establish licensing and other technology transfer agreements with US industry

- Transfers DoD inventions to industry
- Enables companies to create new products and services
- Stimulates economic development

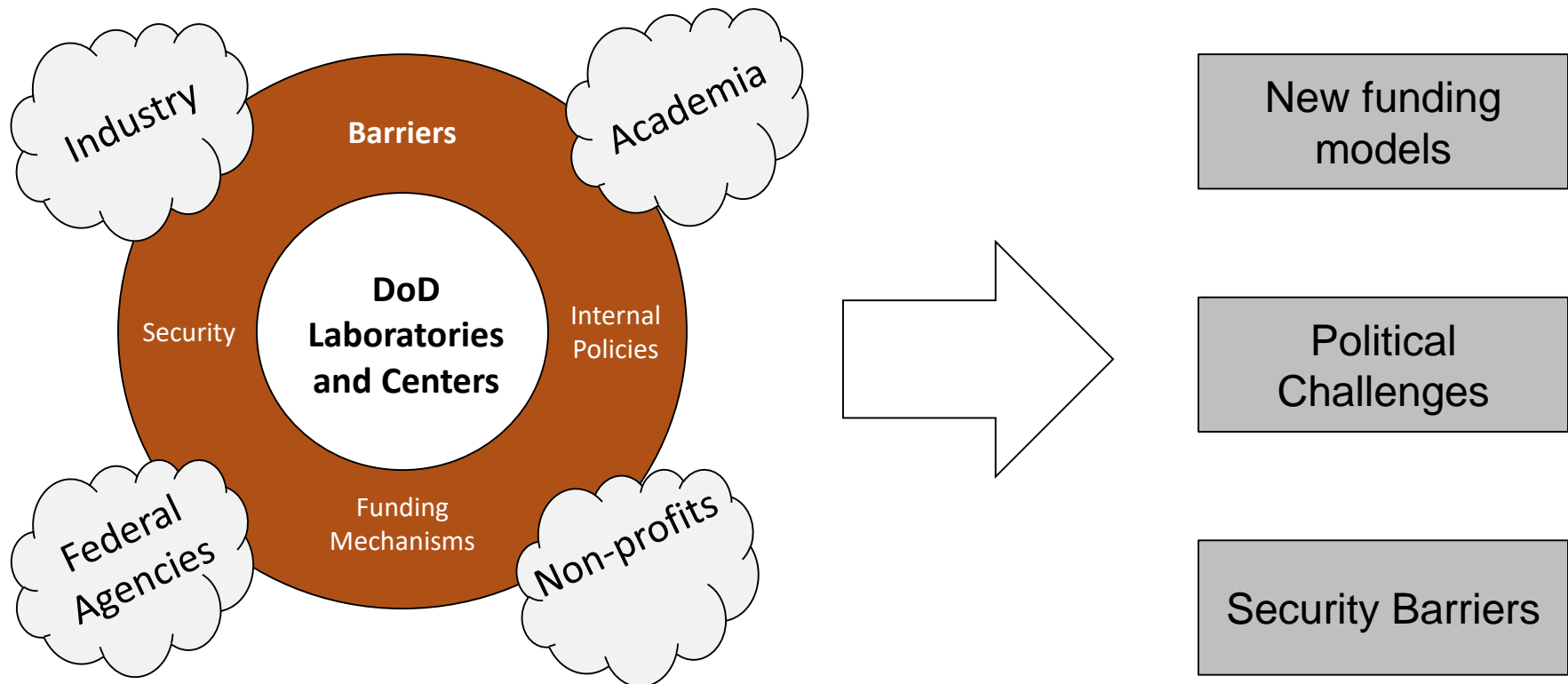


Head Health Challenges



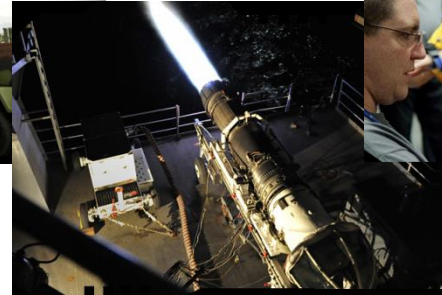
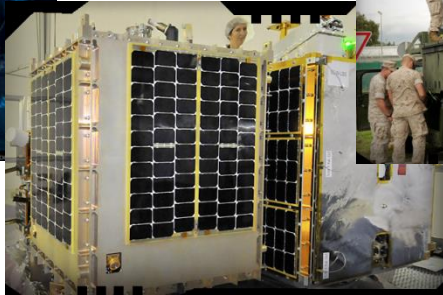
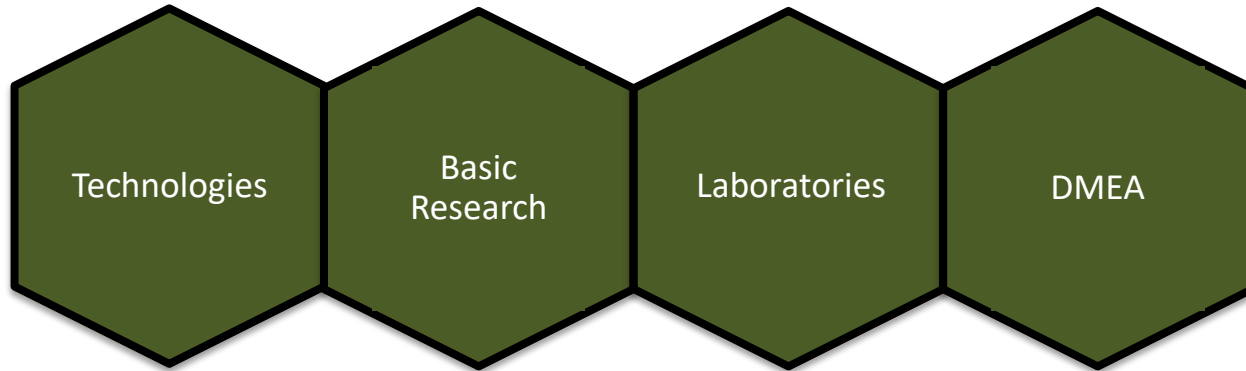
Website: <http://techlinkcenter.org/>

Breaking through the Barriers



What are the options for modernized approaches to facilitate more sharing and collaboration?

DoD Research Directorate: Pursuing Sustained Technical Advantage



DoD Research Directorate:

<http://www.acq.osd.mil/rd/>

Email: melissa.l.flagg.civ@mail.mil

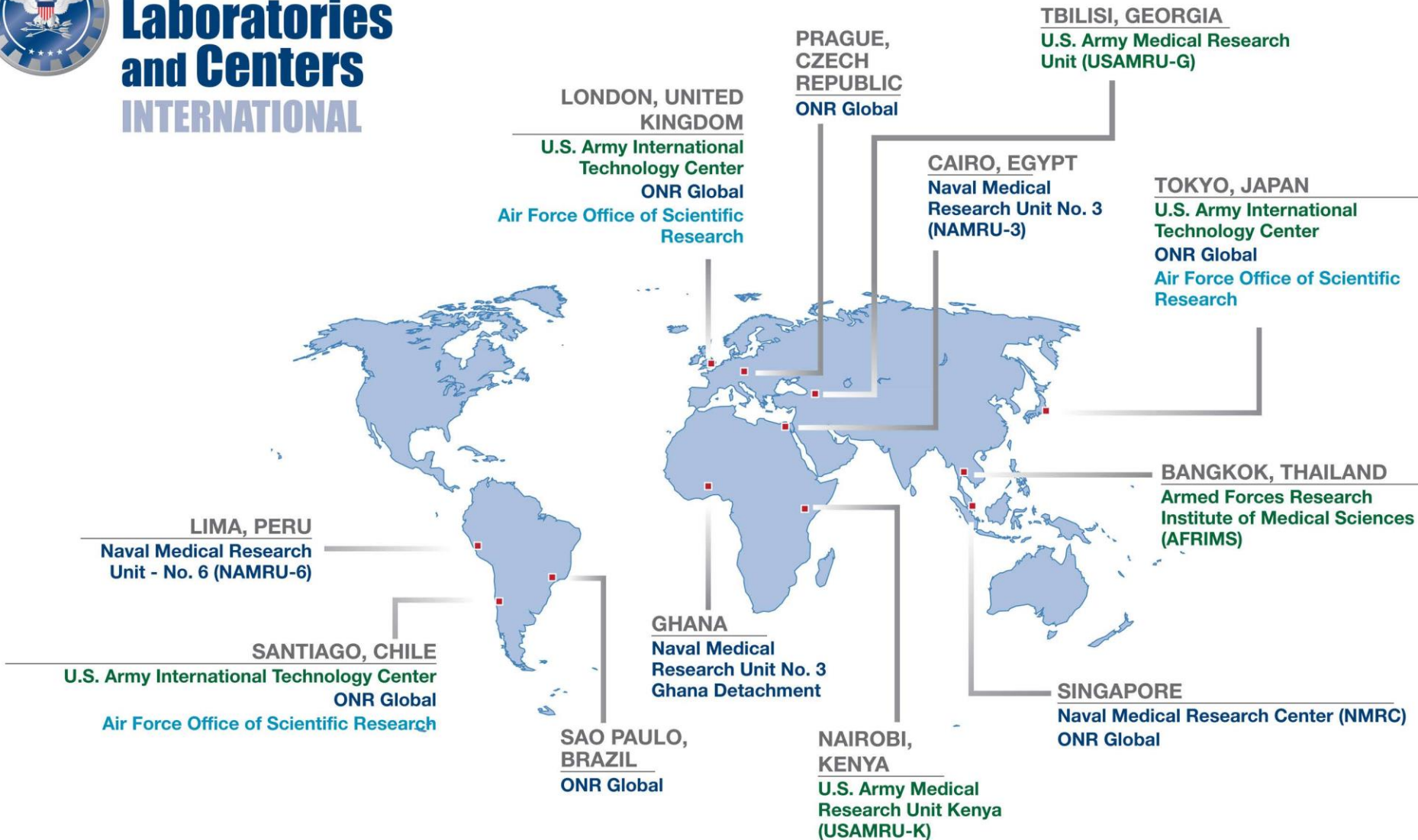
Defense Innovation Marketplace

<http://www.defenseinnovationmarketplace.mil>

Twitter: [@DoDIInnovation](https://twitter.com/DoDIInnovation)

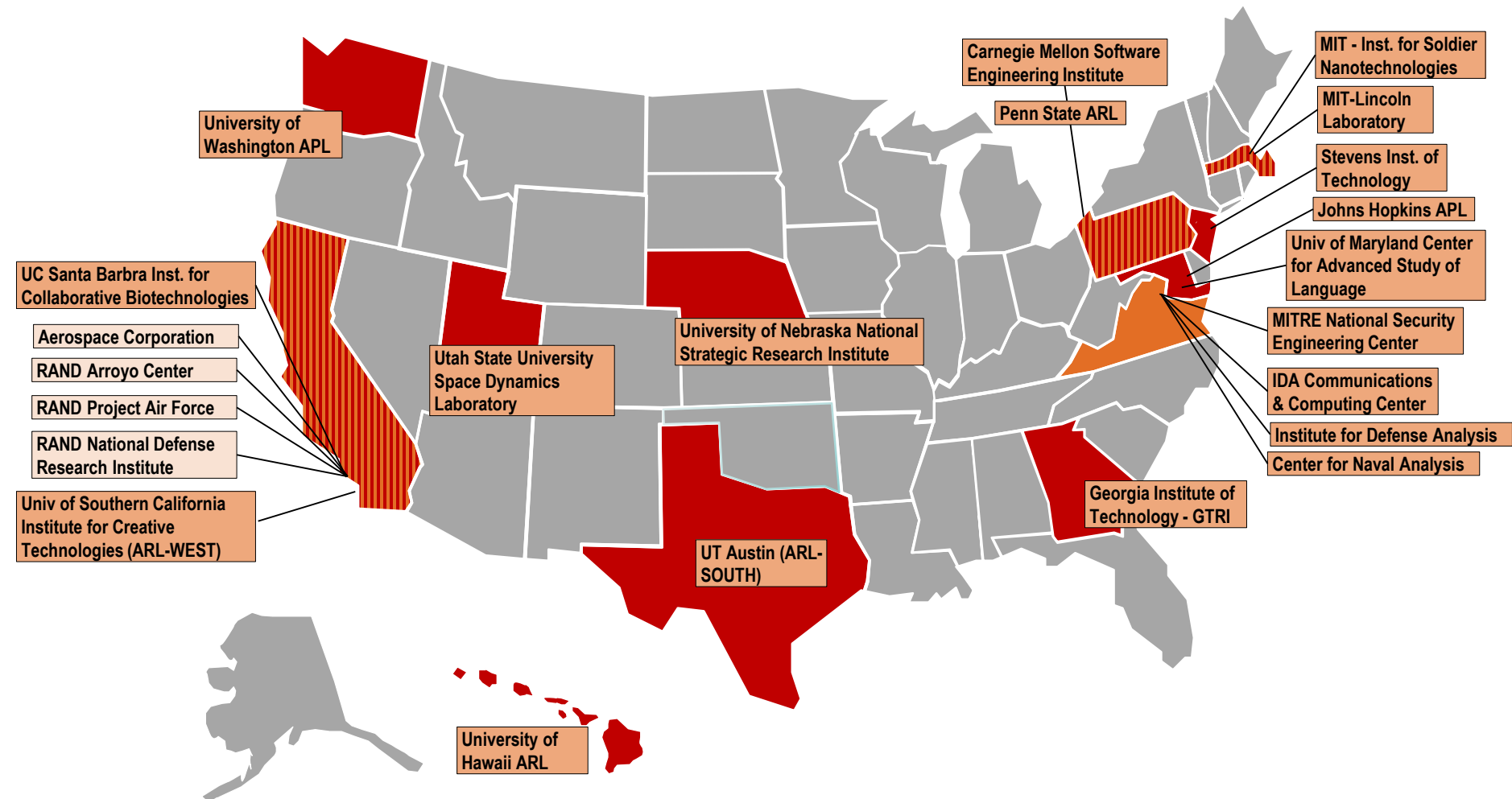


DoD Laboratories and Centers INTERNATIONAL



Locations of UARCs & FFRDCs

- University Affiliated Research Centers (UARCs) are denoted in red
- Federally Funded Research and Development Centers (FFRDCs) are denoted in orange



Research and Development ***— On-going Activities—***

- **Autonomy & Robotics**
- **Artificial Intelligence /
Man-Machine Interface**
- **Micro-electronics**
- **Hypersonics**
- **Directed Energy**
- **Manufacturing**
- **Electronic Warfare**
- **Cyber**
- **Future of Computing**
- **Novel Engineered Materials**
- **Precision Sensing: Time, Space,
Gravity, Electromagnetism**
- **Emerging Biosciences**
 - Synthetic Biology
- **Understanding Human and Social
Behavior**
- **Human Performance**

