



Marine Gunnery Sgt. Joseph Perera of the Marine Warfighting Laboratory guides a robot in the Pentagon Courtyard during the DoD Lab Day. DoD Photo by E. J. Hersom.

Complexity and rapid change characterize today's strategic environment, driven by globalization, the diffusion of technology, and demographic shifts.

—National Military Strategy of the United States, June 2015

Defense Labs

The Innovation Engine for Sustaining Our Quality Edge

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The recently released National Military Strategy (NMS) characterizes the strategic environment as one in which globalized, diffused technology in the hands of not only nation-states, but also violent extremist organizations, is challenging the competitive advantage we have enjoyed for decades. The NMS calls for investment in future capabilities like space, cyber, integrated and resilient Intelligence, Surveillance, and Reconnaissance (ISR), precision

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With all this emphasis on the need for sustaining our quality edge by delivering next-generation programs, the next logical question is where to look in the Department of Defense (DoD) for the innovation and technical excellence we need.



Commandant of the Marine Corps Gen. Joseph Dunford is briefed on the Army Concept for Advanced Military Explosion-Mitigating Land (CAMEL) demonstrator for vehicle occupant protection.

Photo by U.S. Army Research, Development and Engineering Command.

strike, missile defense, autonomous systems and other changes, to retain or increase our fighting edge.

The Long Range Research and Development Planning Program (LRRDPP) and, more broadly, the Defense Innovation Initiative (DII), aim to shape these investments by pursuing leap-ahead technologies that give us this advantage. The DII supports the first pillar of the Force of the Future, Competitiveness through Technological and Operational Superiority, promoted by Secretary of Defense Ashton Carter in his May 6 statement to the Senate Appropriations Defense subcommittee as the key to maintaining and extending “our technological edge over any potential adversary.” Building the force of the future is the responsibility of the acquisition, technology, and logistics (AT&L) communities. The initiatives in Better Buying Power 3.0 (BBP 3.0) challenge AT&L’s leaders to achieve dominant capabilities through technical excellence and innovation. In the Science and Technology (S&T) community, Reliance 21 is the overarching strategic framework for joint planning and coordination of 17 technology areas or Communities of Interest.

DoD Lab Day and Outreach

With all this emphasis on the need for sustaining our quality edge by delivering next-generation programs, the next logical question is where to look in the Department of Defense (DoD) for the innovation and technical excellence we need. One answer lies in a better understanding of the Defense Laboratory Enterprise and how fostering a closer relationship with the DoD acquisition community can speed the flow

of technology, by technology area, from our DoD Labs into acquisition programs. One example of this type of outreach was the inaugural Better Buying Power 3.0-inspired DoD Lab Day. At this event, the DoD Labs presented more than 100 exhibits in the Pentagon Center Courtyard.

“All these things ... allow our warfighters to have the cutting-edge capabilities they really need, and laboratory innovation is at the forefront of that,” said Under Secretary of Defense for Acquisition, Technology, and Logistics Frank Kendall, the host of the May event, at which Deputy Secretary of Defense Robert Work also spoke and presented three military laboratories with a \$45 million award to fund a special project in quantum information science.

There are dozens of DoD Labs and Engineering Centers across 22 states employing more than 38,000 scientists and engineers engaged not only in military-related innovation and technology but also in S&T we have shared to mitigate global disasters, support peacekeeping missions, and even make National Football League helmets more effective. From fighting the Ebola virus to protecting soldiers from traumatic brain injury, the urgency and responsiveness of our scientists and engineers makes them a tremendous resource to every acquisition professional—regardless of the area of concentration.

It’s no wonder the first research and engineering task under BBP 3.0 calls for DoD leaders’ improved ability to understand and mitigate technical risk by increasing the flow of information from the research and engineering community, often

DOD Laboratory and Centers Exhibiting at DoD Lab Day

Army

- Aviation and Missile Research, Development and Engineering Center (AMRDEC)
- Armament Research, Development and Engineering Center (ARDEC)
- Army Research Institute for the Behavioral and Social Sciences (ARI)
- Army Research Laboratory (ARL)
- Communications-Electronics Research, Development and Engineering Center (CERDEC)
- Edgewood Chemical Biological Center (ECBC)
- Engineer Research and Development Center (ERDC)
- Natick Soldier Research, Development and Engineering Center (NSRDEC)
- Space and Missile Defense Command-Technical Center (SMDC-TC)
- Tank Automotive Research, Development and Engineering Center (TARDEC)
- U.S. Army Aeromedical Research Laboratory (USAARL)
- U.S. Army Center for Environmental Health Research (USACEHR)
- U.S. Army Institute of Surgical Research (USAISR)
- U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)
- U.S. Army Research Institute of Environmental Medicine (USARIEM)
- Walter Reed Army Institute of Research (WRAIR)

Navy

- Naval Air Warfare Center Aircraft Division (NAWCAD)
- Naval Air Warfare Center Weapons Division (NAWCWD)

- Naval Medical Research Center (NMRC)
- Naval Research Laboratory (NRL)
- Naval Surface Warfare Center Carderock Division (NSWC Carderock)
- Naval Surface Warfare Center Corona Division (NSWC Corona)
- Naval Surface Warfare Center Crane Division (NSWC Crane)
- Naval Surface Warfare Center Dahlgren Division (NSWCDD)
- Naval Surface Warfare Center Indian Head Explosive Ordnance Disposal Technology Division (NSWC IHEODTD)
- Naval Surface Warfare Center Panama City Division (NSWC PCD)
- Naval Surface Warfare Center Port Hueneme Division (NSWC Port Hueneme Division)

- Naval Undersea Warfare Center Newport Division (NUWC NPT)
- Space and Naval Warfare Systems Command Systems Center Atlantic (SSC Atlantic)
- Space and Naval Warfare Systems Command Systems Center Pacific (SSC Pacific)

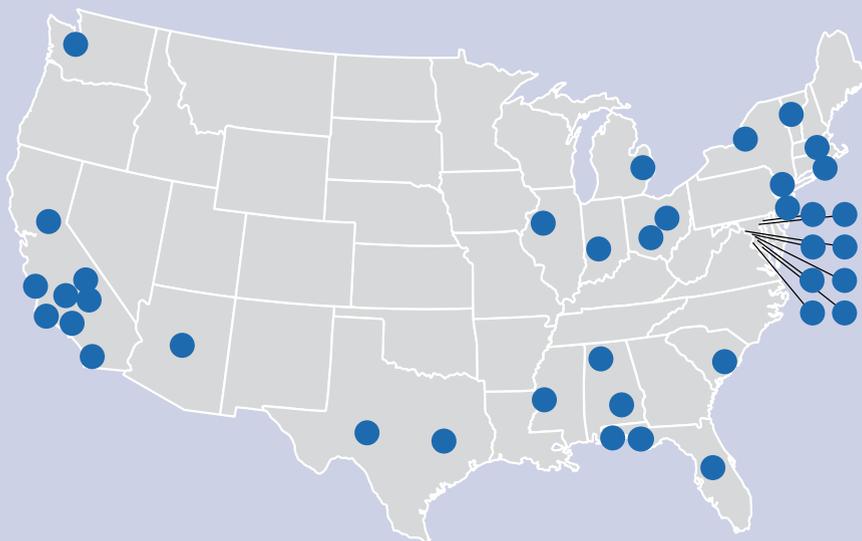
Marine Corps

- Marine Corps Warfighting Lab (MCWL)

Air Force

- Air Force Research Laboratory (AFRL)

Laboratory activities also occur at other sites across the United States, with additional activities internationally. For more information, visit www.acq.osd.mil/rd/laboratories or download the Defense Laboratories eSmartBook App at <http://ow.ly/PIALM>.



referred to as the S&T community, to the acquisition community. Insiders have long debated the “valley of death” that contains untold numbers of technology programs that were conducted with S&T funding but, for whatever reason, could not find homes in acquisition programs. The reasons have been studied extensively, but one finding surfaces repeatedly: The S&T community can and should increase its outreach to the acquisition community. DoD Lab Day was one of the ways we have begun our outreach, but there are many more ways our Labs and warfare centers are engaged with industry and academia, both at home and abroad. Our engagement includes collaborative work with industry, direct funding to university research centers, and/or co-use of development and testing

facilities with other government agencies. We are searching for and bringing in the best ideas from these partnerships with academia and industry to solve our capability gaps and military challenges in all areas, through basic research to advanced system development.

The second task we have been given under BBP 3.0 is to improve the return on investment in our DoD laboratories. The DoD’s in-house laboratories and warfare centers execute about \$30 billion in both direct funding and work for others per year. This initiative will examine the mission, organization, test strategies, cost structure and productivity of the DoD laboratories with the goal of increasing the return

DoD laboratories are places where world-class scientists and engineers are engaged in meaningful work that supports not only the greatest military force on Earth but also making a positive global impact.



Air Force 2nd Lt. Anthony Eastin describes the Battlefield Air Targeting Man-Aided Knowledge (BATMAN) system.

U.S. Air Force Photo by Tech. Sgt. Dan DeCook.

on this significant investment. We are engaging in a yearlong effort to more clearly define metrics, review organizational and funding constructs, and survey customers to ensure that they are getting the best products with the best overall value to the warfighter.

The third task is to increase DoD support for Science, Technology, Engineering and Mathematics (STEM) education and outreach. We are committed to informing DoD leaders, educators, parents and students that DoD laboratories are places where world-class scientists and engineers are engaged in meaningful work that supports not only the greatest military force on Earth but also making a positive global impact now and in the future. Some examples of our best and brightest were our recent Scientists of the Quarter who were honored during the Opening Ceremony of DoD Lab Day. They included:

- Dr. Jeff Long, Naval Research Laboratory, for his work with electrochemical capacitors and validation of advanced nanostructured materials that enhance the performance of military-critical technologies, ranging from electrochemical power sources to separation/filtration to magnetics.
- Dr. Rasha Hammamieh, U.S. Army Center for Environmental Health, for her work in the Post-Traumatic Stress Disorder (PTSD) Systems Biology Exemplar Program that established the basis for an objective molecular panel for PTSD that helps us understand more fully and treat our seriously ill soldiers, sailors, airman, Marines and veterans.
- Dr. Olukayode K. Okusaga, Sensors and Electronic Devices Directorate, U.S. Army Research, Development, and

Engineering Command, Army Research Laboratory, for his work on the development of novel fiber optic communications links that provide alternatives to the Global Positioning System (GPS).

- Daniel A. Uppenkamp, Layered Sensing Exploitation Division, Sensors Directorate, Air Force Research Laboratory, for his work in data analytics and cloud computing.
- Dr. Susan Berggren, Space and Naval Warfare Systems Center Pacific, for her work on Superconducting Quantum Interference Device (SQUID) array modeling and design that will dramatically increase the listening capabilities in the 1 megahertz (MHz) to 10 gigahertz (GHz) range and reduce the physical size of antennas, thereby facilitating their use on Unmanned Aerial Vehicles (UAVs) and streamlining the topside characteristics of Navy ships.

Our ability to maintain and improve the U.S. technological edge also depends, in large part, on the up and coming DoD S&T workforce. Most high school and college STEM students are unaware of the Defense Labs or the opportunities they provide to become part of the next global game-changing technology. DoD Lab Day was a chance for many high school students to experience up close these lab innovations and meet their innovators.

“When researchers are relatable as human beings, students can really see themselves in those same roles, and it pushes them to pursue STEM fields,” says Faith Darling, the STEM Coordinator at the Bullis School in Potomac, Maryland, whose students attended the Pentagon event. According to Dr. Daniel Stabile of Bishop O’Connell High School, Arlington, Virginia, four of that school’s students plan to pursue DoD



Elizabeth Seton High School students from Bladensburg, Maryland, discuss an exhibit at the DoD Lab Day with an engineer from the Army's Construction Engineering Research Laboratory.

Photo by U.S. Army Research, Development and Engineering Command.

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engineering careers as a result of their experience at DoD Lab Day.

DoD Lab Contributions

Even when people are aware of DoD S&T success, they don't often attribute it to the laboratories. "Defense laboratory R&D activities enabled DoD to cut in half the fatality rate of wounded soldiers between Vietnam and recent conflicts in Iraq and Afghanistan. The changes in clinical practice that facilitated this decrease have been transferred for use in civilian trauma centers today," says George Ludwig, Deputy Principal Assistant for Research and Technology, U.S. Army Medical Command, Reserve Medical Corps, and Acting Director of the Defense Laboratories Office. Continued such efforts will help ensure that acquisition professionals find value when they turn to the labs for assistance in building and developing their programs.

The Defense Laboratory Enterprise is grounded in DoD's strategic imperatives. In fact, more than half of the items exhibited at the DoD Lab Day event either already are fielded or expected to be fielded within a year. Through these efforts, we are striving to be the innovation engine that will allow our military to overcome current and future challenges to our security, especially trans-regional networks of sub-state groups like the insurgent ISIL or ISIS ("Islamic State of Iraq and the Levant") that threaten our national interests. Tom Dee, Deputy Assistant Secretary of the Navy for Expeditionary Programs and Logistics Management noted that, "The displays at Lab Day, and the interaction with the Lab personnel, made me wiser about the importance of open architecture and module capability

insertions as we endeavor to expand the opportunities that unmanned systems offer to our future capabilities."

Marine Corps Brig. Gen. Frank Kelley, Acting Deputy Assistant Secretary of the Navy, Unmanned Systems, said he was "blown away" by the CICADA (Close-In Covert Autonomous Disposable Aircraft), a palm-sized air vehicle he had never seen before Lab Day. As a result of his interactions during DoD Lab Day, he arranged to spend an entire day at the Naval Research Laboratory and discussed "what ifs" about demonstration and experimentation. As a result, he is analyzing further how the Navy might integrate these capabilities into Marine and Naval operations and systems. He also was introduced to many other technologies that left him with confidence that the DoD Labs "can be your technological conscience as a program manager, to help you make good decisions."

With the next DoD Lab Day scheduled for 2017, we are focused on using the experience from DoD Lab Day 2015 to improve communications with the acquisition community with the goal of bringing innovation forward sooner. The DoD needs private sector contributions to be sure, but the value of working with DoD Labs is that they understand DoD requirements and the needs of the military. "My message to the acquisition community is to team with the labs," says Kelley. "The labs need to be an integral part of your program—your first stop—when you have a technological challenge." 

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