

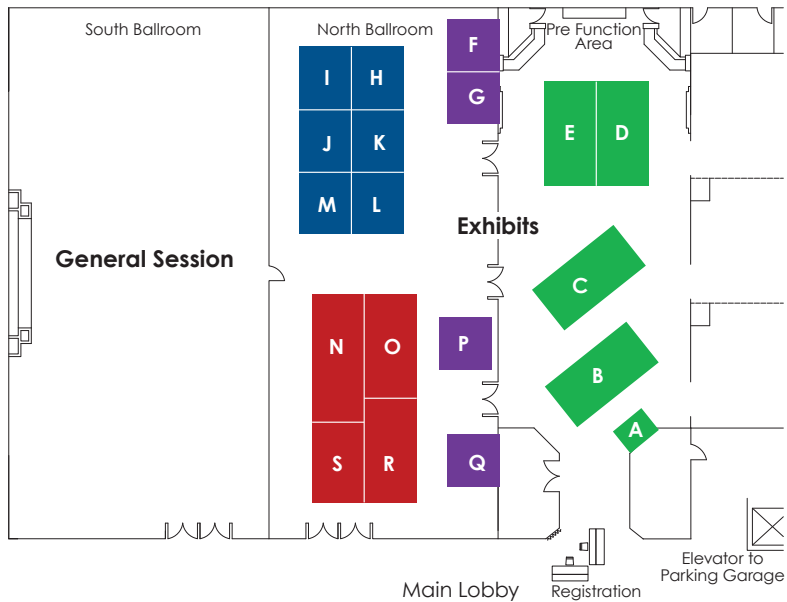


Agenda

Tuesday, September 20, 2016

9:30 am - 6:00 pm	Attendee Registration
10:00 am - 10:10 am	Welcome Remarks Dr. Craig Fields, Chairman, Defense Science Board
10:10 am - 10:30 am	Remarks The Honorable Robert O. Work, Deputy Secretary of Defense
10:30 am - 11:30 am	Artificial Intelligence: What's Real, What's Not and is This the DoD Third Offset? Moderator: The Honorable Zachary J. Lemnios, IBM Mr. David Kenny, IBM Watson Dr. William Mark, SRI International Dr. Robert Popp, NSI, Inc. Professor Manuela M. Veloso, Carnegie Mellon University
11:30 am - 11:40 am	Materials by Design: 3-Dimensional Nano-Architected Metamaterials Professor Julia R. Greer, California Institute of Technology
11:40 am - 12:10 pm	Remarks General Paul J. Selva, Vice Chairman of the Joint Chiefs of Staff
12:10 pm - 2:10 pm	Lunch & Exhibits/Demonstrations
2:10 pm - 2:20 pm	Leveraging Biology for Persistent Undersea Sensing Professor John O. Dabiri, Stanford University
2:20 pm - 2:30 pm	The Flexible Networks of the Human Brain Dr. Danielle S. Bassett, University of Pennsylvania
2:30 pm - 3:30 pm	The New Digital Domain of Espionage and Warfare: Where Are We? What Else Should We Be Doing? Moderator: The Honorable Richard J. Danzig Dr. Dan Geer, In-Q-Tel Mr. James Gosler, DSB Member and Senior Fellow Johns Hopkins Applied Physics Laboratory Mr. Dan Kaufman, Google Advanced Technology and Projects
3:30 pm - 3:50 pm	Break
3:50 pm - 4:00 pm	Defense Applications of Synthetic Biology Dr. Christopher Voigt, Massachusetts Institute of Technology
4:00 pm - 5:00 pm	Biology Today: From Discovery to National Security Moderator: Dr. Arup Chakraborty, DSB Member and Massachusetts Institute of Technology Professor Richard Andersen, California Institute of Technology Professor Kristi Anseth, University of Colorado at Boulder Professor George Church, Harvard University and Massachusetts Institute of Technology Dr. Mark M. Davis, Stanford University School of Medicine and Howard Hughes Medical Institute Investigator Professor James Collins, Massachusetts Institute of Technology
5:00 pm - 5:20 pm	Remarks The Honorable Frank Kendall, Under Secretary of Defense for Acquisition, Technology, and Logistics
5:20 pm - 5:30 pm	Closing Remarks Dr. Craig Fields, Chairman, Defense Science Board
5:30 pm - 6:30 pm	Exhibits/Demonstrations
6:30 pm - 8:30 pm	DSB 60th Anniversary Dinner The Honorable Ashton B. Carter, Secretary of Defense

Exhibits



Harnessing Highly Autonomous Systems

Optimizing Human Health and Performance

Enhancing Sensor Capabilities

Advancing Weapons and Platforms

A Spectrum Collaboration Challenge (SC2)

DARPA MTO (Microsystems Technology Office)

The first of its kind collaborative machine-learning competition to overcome scarcity in the radio frequency (RF) spectrum. In SC2, competitors will reimagine a new, more efficient wireless paradigm in which radio networks autonomously collaborate to dynamically determine how the spectrum should be used moment to moment.

B Low-Cost UAV Swarming Technology (LOCUST)

Office of Naval Research (ONR)

ONR's Low-Cost UAV Swarming Technology (LOCUST) program is developing and demonstrating a scalable system of inexpensive, commoditized, swarming Unmanned Aerial Vehicles (UAVs) to provide disruptive capability against anti-access area denial (A2AD) defenses enabling manned strike operations and localized landing site superiority with reduced cost and risk. This program will develop and deliver the Distributed, Collaborative, Coordinated, & Cognitive (DC3) autonomy science and architecture, command & control (C2) architecture, and a series of modular payloads (sensors, kinetic, and electromagnetic spectrum (EMS)-enabled) providing a robust, scalable, flexible, multi-functional swarming unmanned aerial vehicle (UAV) system providing cross-domain capability, integrated and employable from surface, sub-surface, airborne, and ground manned and other un-manned systems.

C Robotic Servicing of Geosynchronous Satellites (RSGS)

DARPA TTO (Tactical Technology Office)

With no prospects for assistance once in orbit, satellites destined for GEO today are loaded with backup systems and as much fuel as can be accommodated, adding to their complexity, weight and cost. But what if help was just a service call away? (RSGS) program intends to answer that question by developing technologies that would enable cooperative inspection and servicing in GEO and demonstrating those technologies on orbit within the next five years. Under the RSGS vision, a DARPA-developed modular toolkit, including hardware and software, would be joined to a privately developed spacecraft to create a commercially owned and operated robotic servicing vehicle (RSV) that could make house calls in space.

D Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV)

DARPA TTO (Tactical Technology Office)

Unmanned vessel optimized to robustly track quiet diesel electric submarines. While the ACTUV program is focused on demonstrating the ASW tracking capability in this configuration, the core platform and autonomy technologies are broadly extendable to underpin a wide range of missions and configurations for future unmanned naval vessels.

E Cyber Grand Challenge (CGC)

DARPA I2O (Information Innovation Office)

The Cyber Grand Challenge (CGC) seeks to automate this cyber defense process, fielding the first generation of machines that can discover, prove and fix software flaws in real-time, without any assistance. The demo will showcase highlights from the Final Event which was held on August 4, 2016. Software, visualization, scoreboards, and event highlight videos will be on display.

F Ocean Observation Systems

Office of Naval Research (ONR)

The Office of Naval Research, Battlespace Sensing Science and Technology Department, has a long history of developing and funding new technologies for ocean observation. Ocean gliders are an easily deployable and low power approach to doing sustained and geographically wide ranging ocean sampling.

G Power Efficiency Revolution for Embedded Computing Technologies (PERFECT)—Virtual Eye

DARPA MTO (Microsystems Technology Office)

The Virtual Eye cameras take multiple real-time sensor inputs and constructs them into a single 3D view. An attendee can in real time select a virtual point of view and arbitrarily move that point of view within the assembled 3D virtual image to investigate areas of interest and navigate through the constructed 3D scene, including views that are not provided by a single sensor. The vision is to enable a remote military user to virtually investigate and assess remote real time battlefield events incorporating the varied viewpoints of multiple live sensor input streams, providing information not possible from individual sensor images.

H DoD Combat Feeding Research & Engineering

Research, Development & Engineering Command – Natick Soldier Research, Development & Engineering Center (RDECOM – NSRDEC)

The mission of the Department of Defense (DoD) Combat Feeding Research and Engineering Program is to provide an operationally relevant research and development base to deliver solutions for evolving field feeding challenges. The Combat Feeding Directorate of the Natick Soldier Research, Development, & Engineering Center is responsible for the research, development, engineering, integration and technical support for the entire family of operational rations and field feeding equipment. The program is driven by Warfighter recommendations and feedback.

I Warrior Web

DARPA BTO (Biological Technologies Office)

The Warrior Web program seeks to develop the technologies required to prevent and reduce musculoskeletal injuries incurred by warfighters carrying heavy loads over

long distances. The ultimate program goal is a lightweight, comfortable, wearable system that is transparent to the user and provides adaptive and personalized support via mechanical actuation at the joints to reduce the wearer's metabolic cost. The system must have the flexibility to adapt to a wide range of human factors, including gender, height, weight, body shape and composition, gait, physical fitness, cognitive factors, comfort tolerance, and the user's opinions and preferences.

J Battle Air Targeting Man Aided kNOWLEDge (BATMAN)

Air Force Research Laboratory (AFRL)

The Battle Air Targeting Man Aided kNOWLEDge (BATMAN) program was initiated in 2004 after the occurrence of a fratricide incident. At that time, Battlefield Airmen (BA) were encumbered with carrying up to 175 pounds of separate, non-integrated pieces of equipment for missions. The BATMAN program is the Human Machine Interface manager for the Battlefield Air Operations kit—providing a variety technologies for Joint Terminal Air Controllers (JTAC) including Combat Control Teams (CCT), Tactical Air Control Parties (TACP), as well as the Guardian Angel Weapon System personnel comprised of Pararescuemen and Combat Rescue Officers. Combat Weather personnel are also included in BATMAN's technology development efforts.

K Zika Virus Vaccine

U.S. Army Medical Research and Materiel Command (MRMC)

The U.S. Army Medical Research and Materiel Command is developing a Purified Inactivated Zika Virus vaccine in collaboration with the U.S. Department of Health and Human Services, academia and industry to support medical readiness by reducing the clinical burden of infection (congenital and neurological disorders), generate herd immunity, interrupt virus transmission and to reduce risk to Service Members, the Military Health System beneficiaries and the general public.

L Augmented Immersive Team Trainer (AITT)

Office of Naval Research (ONR)

The purpose of Augmented Immersive Team Trainer (AITT) is to enhance force-on-force (FOF) training of call-for-fire and close-air support. Currently, Marines cannot see simulated battlefield effects in the real world, such as munition explosions. Using Augmented Reality (AR) technology, AITT provides Marines the capability to see the simulated battlefield effects overlaid on the real world.

M Hand Proprioception and Touch Interfaces (HAPTIX)

DARPA BTO (Biological Technologies Office)

As part of DARPA's commitment to help restore full and natural functionality to wounded Service members and

veterans, the HAPTIX (Hand Proprioception and Touch Interfaces) program seeks to create a prosthetic hand system that moves and provides sensation like a natural hand. Sensory feedback, especially from the hand, is vitally important for many functions, and HAPTIX seeks to create a sensory experience so rich and vibrant that users would want to wear their prostheses full time. Without this feedback, even the most advanced prosthetic limbs remain numb to users, a factor that impairs the limbs' effectiveness and their wearers' willingness to use them. HAPTIX researchers demonstrate implantable electrodes and the electronics and algorithms needed to decode volitional control signals and encode naturalistic touch and proprioceptive signals. Key technologies displayed will be hardware prototypes—prosthetics, muscle and nerve interfaces, and implantable electronics along with videos and slides depicting use of prototypes.

N Hypersonics/X-51

Air Force Research Laboratory (AFRL)

Hypersonics technology enables flight speeds exceeding Mach 5. It is the AF's vision to develop technology for air-breathing and boost-glide time-critical strike system by the 2020 timeframe and a regional hypersonic platform by the 2030 timeframe. Under the X-51 program key technologies demonstrated include sustained scramjet combustion, use of logistically supportable endothermic fuel, and regeneratively cooled engine structures.

O Hyper Velocity Projectile (HVP)

Office of Naval Research (ONR)

The Hyper Velocity Projectile (HVP) is a next-generation, common-design, low-drag, guided projectile capable of completing multiple missions from various gun systems such as the Navy 5-inch, 155-mm and future railguns. The program will address mission requirements in the areas of naval surface fire support, cruise missile defense, anti-surface warfare and other future naval mission areas. HVP's low-drag, aerodynamic design enables high velocity, maneuverability and decreased time-to-target. These attributes, coupled with accurate guidance electronics, provide low-cost mission effectiveness against current threats and the ability to adapt to air and surface threats of the future. The high-velocity, compact design eliminates the need for a rocket motor to extend gun range.

P Evolution of Night Vision Goggles

Communications-Electronics Research, Development and Engineering Center- Night Vision and Electronic Sensors Directorate (CERDEC NVESD)

As a DoD leader in the development of night vision technologies, CERDEC NVESD continues to improve upon

the capabilities of night vision goggles while also reducing their size, weight, power and cost (SWaP-C). The evolution of night vision goggle technologies will be demonstrated showing the significant reductions in size, weight and power (SWaP) of current and future devices from their predecessors while improving sensor resolution and range. These "leap ahead" technologies greatly improve Soldier maneuverability and situational understanding and are a key component of the Soldier's ability to dominate the battlespace.

Q Evolution of Thermal Weapon Sights

Communications-Electronics Research, Development and Engineering Center- Night Vision and Electronic Sensors Directorate (CERDEC NVESD)

As a DoD leader in the development of electro-optical/infrared technologies, CERDEC NVESD continues to improve the performance of thermal weapon sights while also reducing their size, weight, power and cost (SWaP-C). A progression of thermal weapon sight technologies will be demonstrated showing the significant reductions in size, weight and power (SWaP) of current and future devices from their predecessors while improving sensor resolution and range. These "game-changing" technologies greatly improve Soldier lethality and survivability.

R Directed Energy: Lasers

Air Force Research Laboratory (AFRL)

Objective of this work is to develop Solid State and Fiber laser sources, Optics and Beam Combining with low SWaP and deep magazine for ground based and airborne DE capabilities. Through the OSD Weapons Community of Interest and the High Energy Laser Joint Technology Office, the Directed Energy subgroup coordinates services and DARPA efforts through roadmaps to synergize investments and outcomes.

S Advanced Capability Extended Range Mortar (ACERM)

Office of Naval Research (ONR)

Designed from the ground-up to push the state-of-the-art, the ACERM redefines the capability of an 81mm mortar. Fired from the standard M252 mortar, the ACERM provides precision, with both Global Positioning System (GPS) and Semi-Active Laser (SAL) guidance, range extension to 22 km against both stationary and moving targets. ACERM provides an organic, direct-hit capability at the battalion level and below with increased effectiveness and extended range.

Acknowledgments: The Defense Science Board would like to thank the members of the team who applied their collective expertise to organizing this 60th anniversary commemorative event. Many thanks to Ms. Karen Saunders, Colonel Robert Freeland, U.S. Marine Corps, and Captain Hugh "Mike" Flanagan, U.S. Navy, of the DSB Office for much-needed coordination and outreach; to Dr. Melissa Flagg, Deputy Assistant Secretary of Defense for Research, and to the program managers and performers from DARPA and the DoD Laboratories for providing the exhibits. Finally, this event would not have succeeded without the extraordinary support from Dr. Arati Prabhakar and her team at DARPA for counsel, logistics, and security.