

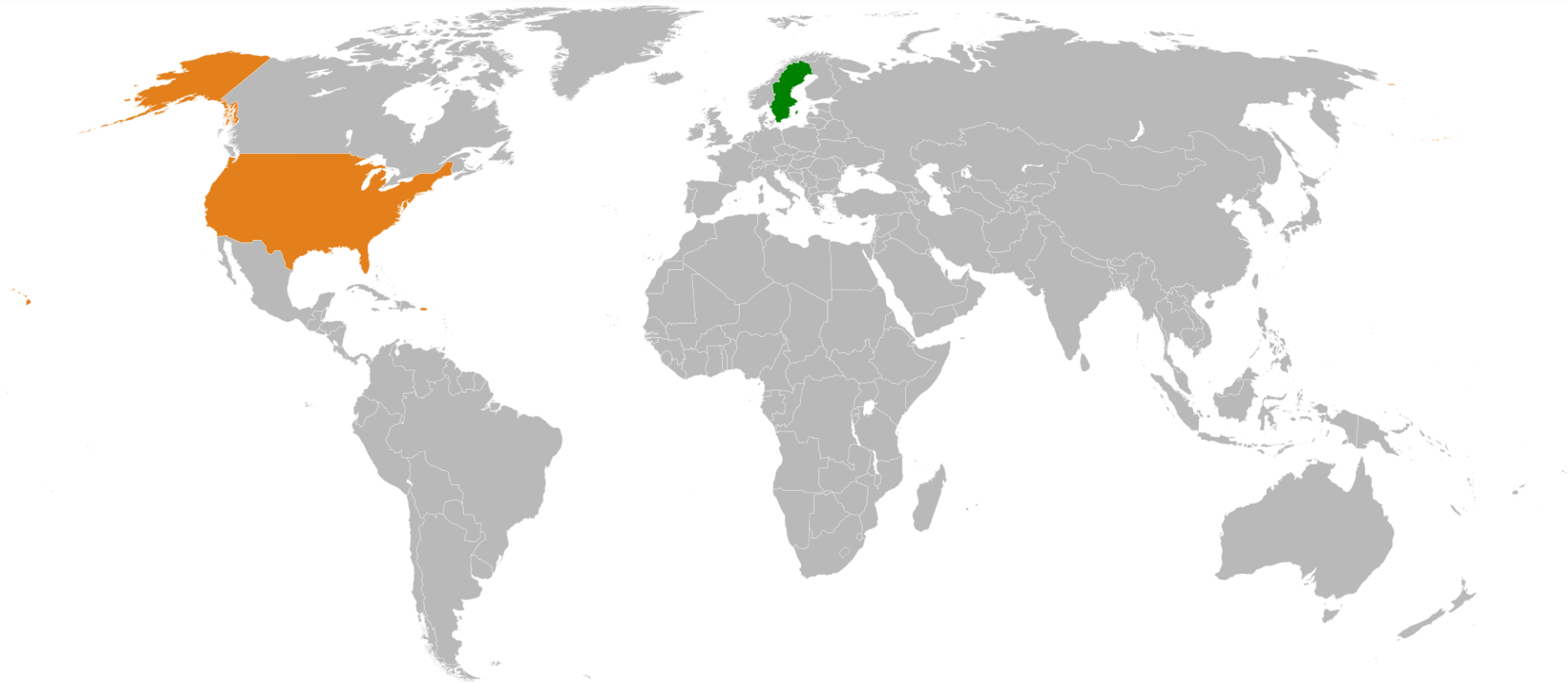


Seminar on Defence Innovation Initiative

13th October 2016

What are the objectives and scope of the Defence Innovation Initiative?

- Introduction of H.E. Mr. Stephen Welby, US ASD, by H.E. Ms. Azita Raji, US Ambassador to Sweden
- Key note presentation by H.E. Mr. Stephen P. Welby, US Assistant Secretary of Defence
- Reflections by RADM Mr. Jonas Haggren, Swedish Armed Forces
- Questions & discussion



International Cooperation to Preserve Technological Superiority

Mr. Stephen P. Welby

Assistant Secretary of Defense for Research and Engineering



Technological Superiority

“We’re taking the long view. We have to, because as we fight today’s fights, we must also be prepared for what might come 10, 20, or 30 years down the road.”

- “We know we must **deal with these challenges across all domains** – and not just the usual air, land and sea, but also in cyber, electronic warfare, and space - where our reliance on technology has given us great strengths and great opportunities but also led to vulnerabilities that adversaries are eager to exploit.”
- “...we are making **increased investments in science and technology, innovating operationally, and building new bridges** to the amazing American innovation system – as we always have, to stay ahead of future threats.”



Secretary Carter
Testimony to the U.S. House
Armed Services Committee
22 March 2016

U.S. Defense Innovation Strategy

Identify and invest in innovative ways to preserve and advance U.S. national security into the 21st century.

- **Knowledge & People** – Integrate leadership development with emerging opportunities and re-think how we develop managers and leaders. Invest in the Force of the Future.

Leveraging Innovation Opportunities



Time to Market



Innovation Enables Strategy



Laboratory to Field



- **Freedom** – Opportunity to have new ideas and freely take actions in pursuit. Freedom to study and prioritize new or unconventional technology that could provide significant, U.S. national security advantages.
- **Risk Tolerance & Persistence** – Development of a new generation of cutting edge and militarily dominant systems cannot be made risk free.
- **Collaboration** – Synergy between multiple tangential technical disciplines is central to innovation.

U.S./Sweden International Agreements

The U.S. and Sweden have a diverse set of international agreements that consists of seven project agreements representing a total investment of \$26,550,000 (USD) per country, as well as 20 information exchange program annexes and 12 memorandums of understanding.

United States Air Force

Agreement	Objective
Nanosatellites and Plug-in-Play Architecture II Project Arrangement	Improve nanosatellites and plug-in-plug architectures
Advanced Propulsion and Power Technology	Advance propulsion and power technologies for aircraft systems

United States Navy

Agreement	Objective
Air Combat Systems Technology	Exchange aerodynamics flight control technology
Naval C4 and Supporting or Interfacing Systems	Exchange R&D information in technology areas of tactical, non-tactical and operational C4, and supporting or interfacing systems

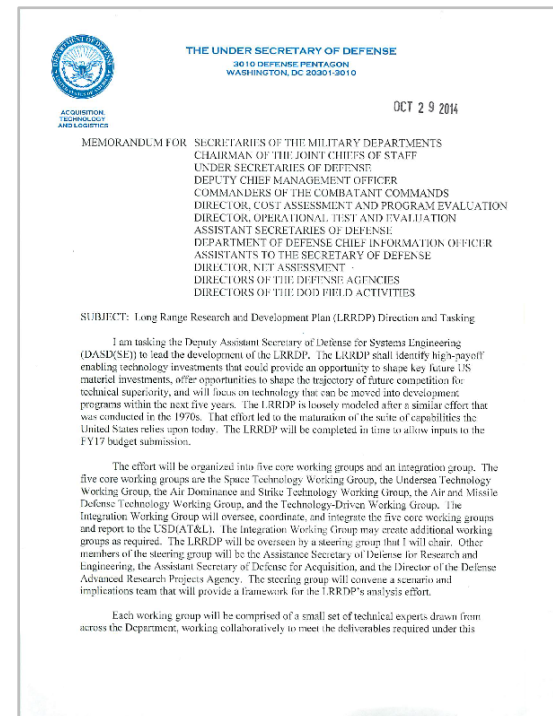
United States Army

Agreement	Objective
Excalibur SD&D	Develop a precision-guided, extended range 155mm artillery projectile
Radar Data Interchange C-RAM	Evaluate software fixes to Swedish-developed radar systems against RAM threats

Long-Range Research and Development Program Plan (LRRDPP)

Study and prioritize new or unconventional technology that could provide significant U.S. national security advantages.

- Reach out to the best and brightest minds inside and outside the U.S. DoD.
Request for Information was issued to:
 - Identify system concepts that will have significant impact in the 2025-2030 timeframe; and
 - Identify the steps the U.S. DoD should be taking today to nurture the technology development required to make those system concepts a reality.
- Large number of responses were received, and all inputs have been reviewed.



Assessment of these inputs are ongoing and feedback is anticipated in the fall of 2016 regarding next steps.

Third Offset – Five Key Areas

Autonomous Learning Systems

- Delegating decision to machines in applications that require faster-than-human reaction times
 - Cyber defense, Electronic Warfare (EW), missile defense

Human-machine Collaborative Decision Making

- Exploiting the advantages of both humans and machines for better and faster **human** decisions
 - “Human strategic guidance combined with the tactical acuity of a computer”

Assisted Human Operations

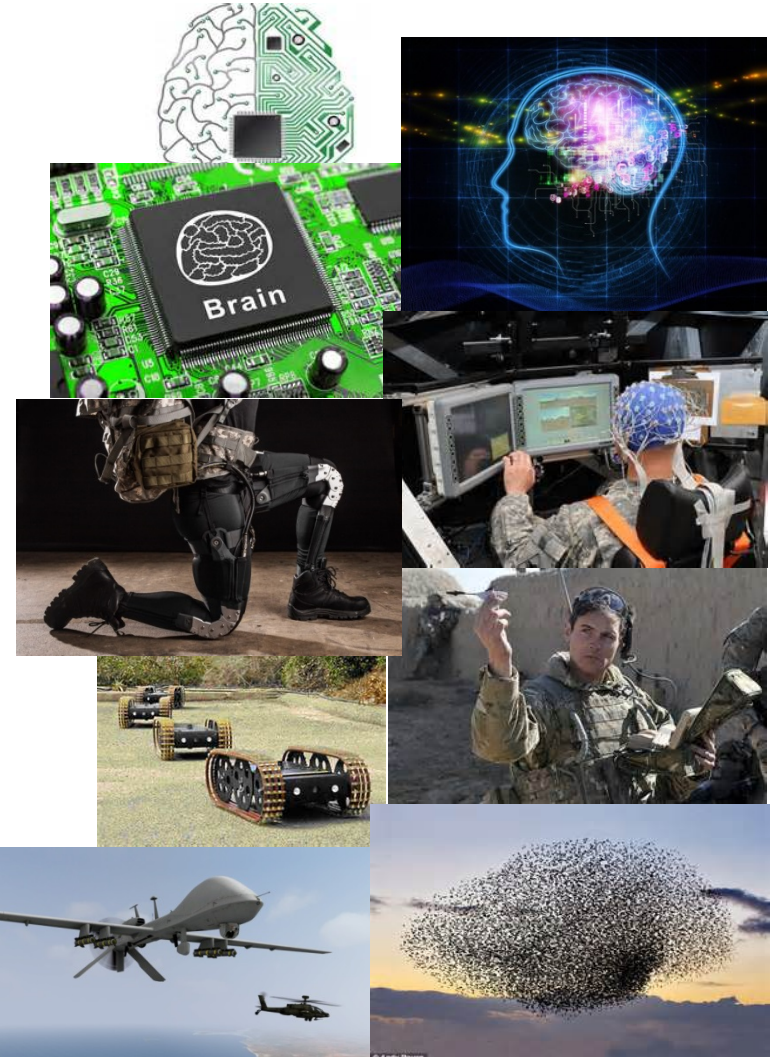
- Helping humans perform better in combat

Advanced Manned-unmanned System Operations

- Employing innovative cooperative operations between manned and unmanned platforms
 - “**Smart swarm**” operations and tactics

Network-enabled, Autonomous Weapons Hardened to Operate in a Future Cyber/EW Environment

- Allowing for cooperative weapon concepts in comms-denied environments



Third Offset Strategy

Technology Approach

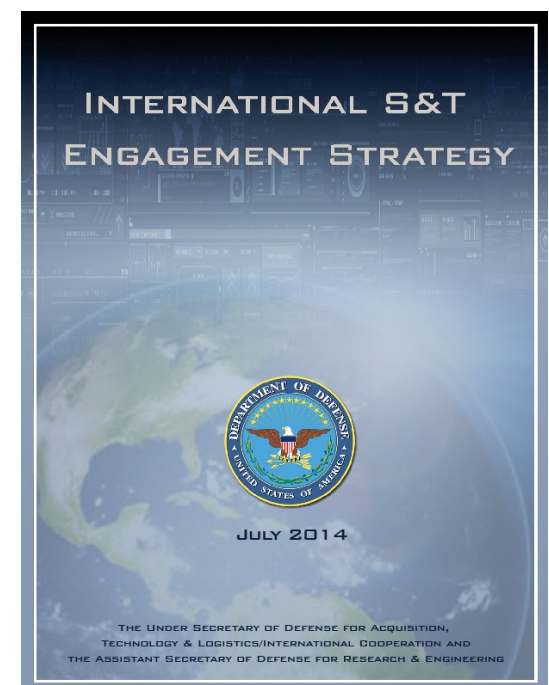
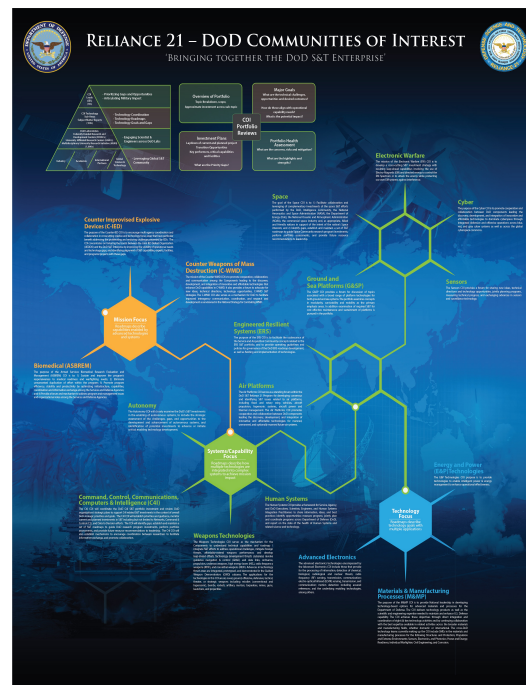
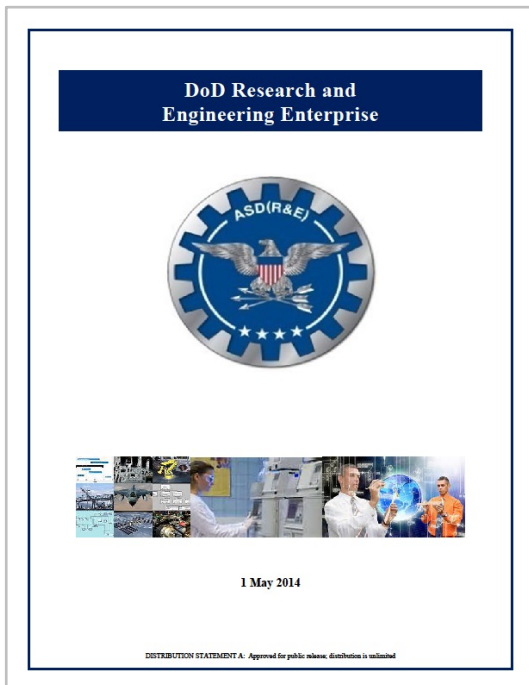
Seeks to deny adversary objectives, and strengthen conventional deterrence by:

- **Leveraging autonomy and artificial intelligence**
 - Get inside an adversary's decision cycle
- **Greatly expanding manned-unmanned combat teaming**
 - Extend our attack surface
- **Re-amplifying our guided-munitions advantage**
 - With 'raid-breaking' capabilities
- **Creating new mass**
 - Disaggregating complex systems to deliver combine effects
- **Developing 'inside-out' and 'over-under' capabilities**
 - Leverage dispersal, sanctuaries, and speed
- **Developing new forms of distributed maneuver**
 - Combining kinetic, EW, cyber



U.S. DoD R&E Framework

In order to preserve technological superiority and defend our nation, we must have a framework that enables information sharing, prioritization of investments, and cross-cutting collaboration.



U.S. DoD R&E Strategy

The United States depends on science, technology and innovative engineering to not only protect the American people but to advance our national interests and to prepare us to meet the challenges of an uncertain future.

– ASD(R&E) Mission

Mitigate current and anticipated threat capabilities.

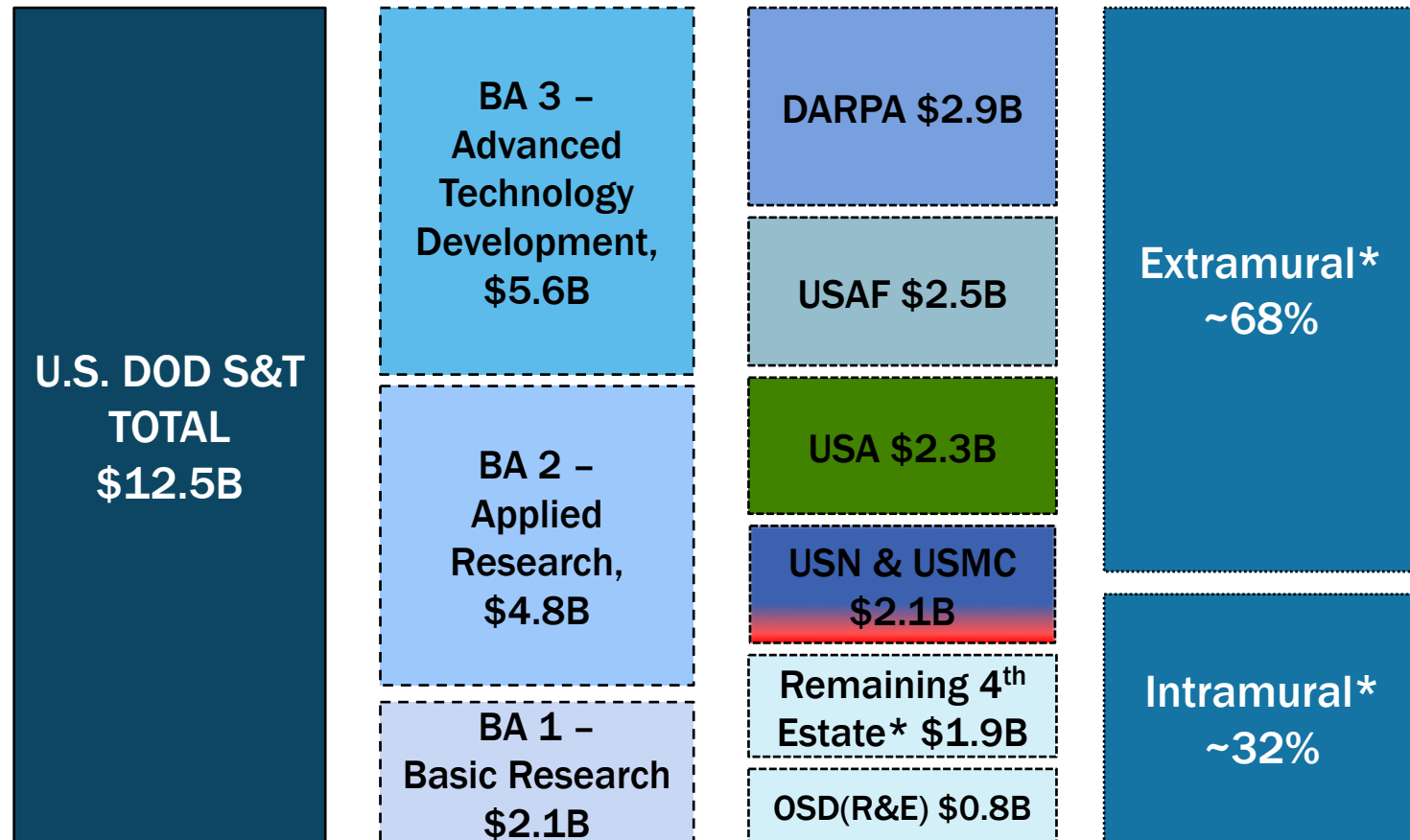
Affordably enable new capabilities in existing military systems.

Create technology surprise through science and engineering.

Investing in science and technology to support the Warfighter.

U.S. DoD PB 2017 S&T Request

Technology Development Budget



*NOTES:

4th Estate includes OSD (NCB, EI&E, DLA, MDA, MIBP, TRMC, Policy, Special Programs), USSOCOM.

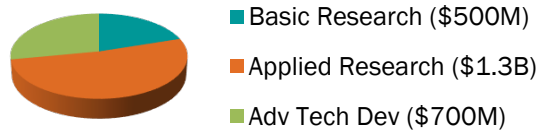
Intramural/Extramural percentage based on FY 2014 NSF Federal Funds Survey for R&D.

Extramural includes: Industry, FFRDC, Academia, Non-Profits, State and Local Governments, Foreign Organizations.

U.S. Service Labs, 4th Estate, and OSD(R&E)

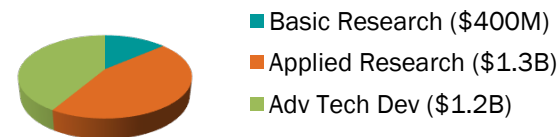
DoD PB 2017 S&T Request

USAF



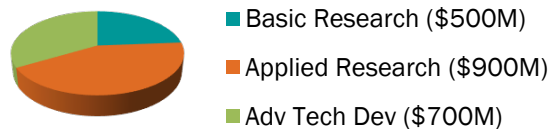
\$2.5 Billion

DARPA



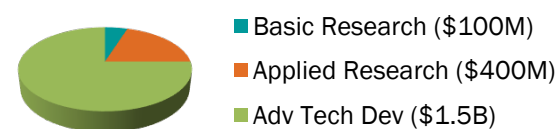
\$2.9 Billion

USN/USMC



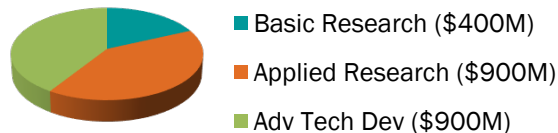
\$2.1 Billion

4th Estate



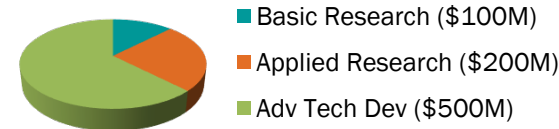
\$1.9 Billion

USA



\$2.3 Billion

OSD(R&E)



\$800 Million

- **4th Estate includes** OSD (NCB, EI&E, DLA, MDA, MIBP, TRMC, Policy, Special Programs), USSOCOM.
- **Intramural/Extramural** percentage based on FY 2014 NSF Federal Funds Survey for R&D.
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Technology and Communities of Interest (COIs)

COIs lead the innovation and the acceleration of advanced concepts and prototypes across multiple domains.



Advanced Electronics



Air Platforms



Autonomy



**Biomedical/
ASBREM**



C4I



Counter-IED



Counter-WMD



Cyber



Electronic Warfare



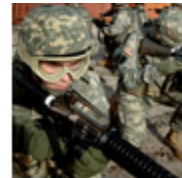
Energy and Power Technologies



Engineered Resilient Systems*



Ground and Sea Platforms



Human Systems



Materials and Manufacturing Processes



Sensors



Space



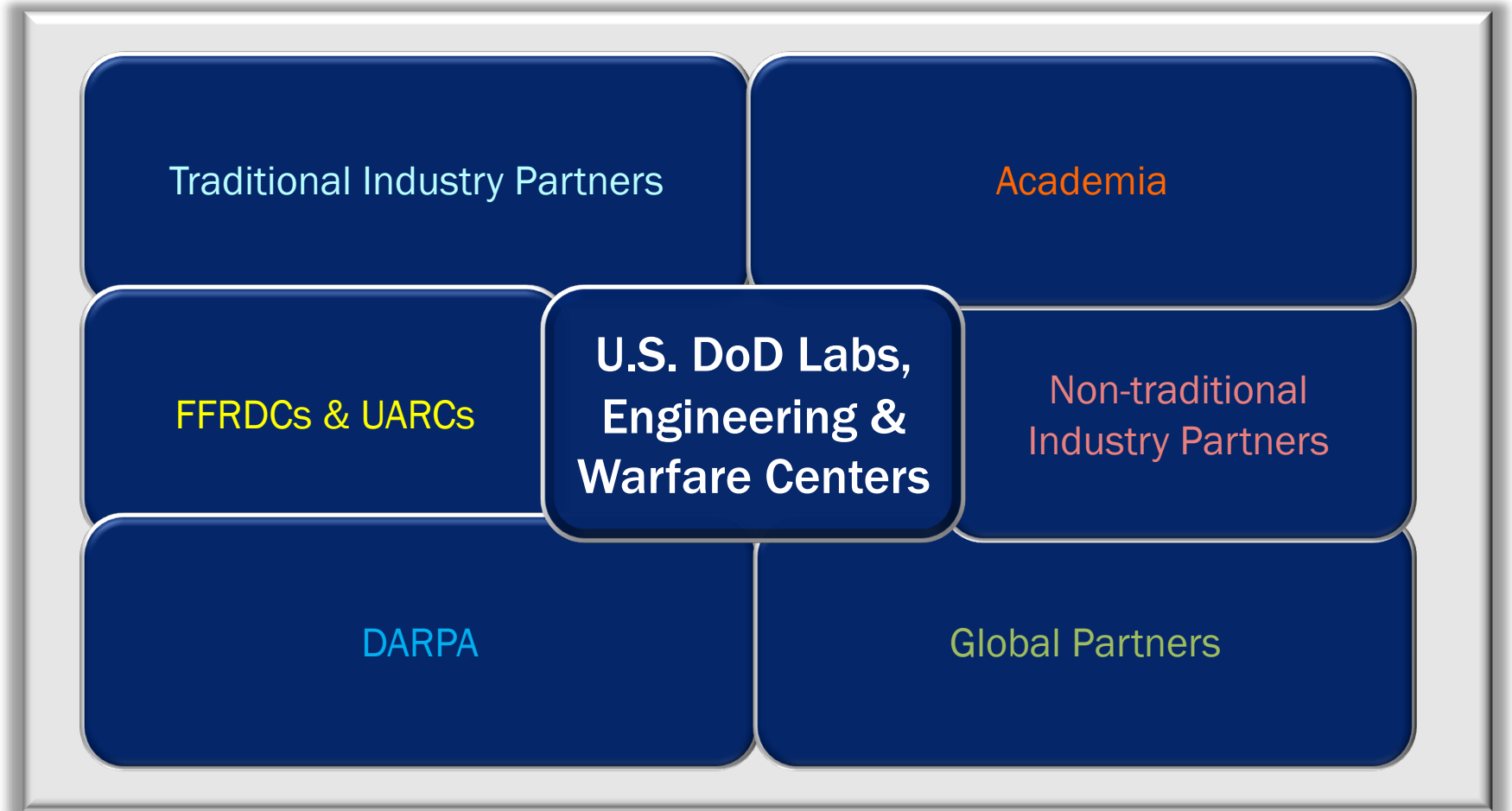
Weapon Technologies

Covers ~75% U.S. S&T Budget, ~90% BA2-BA3

<http://www.defenseinnovationmarketplace.mil>

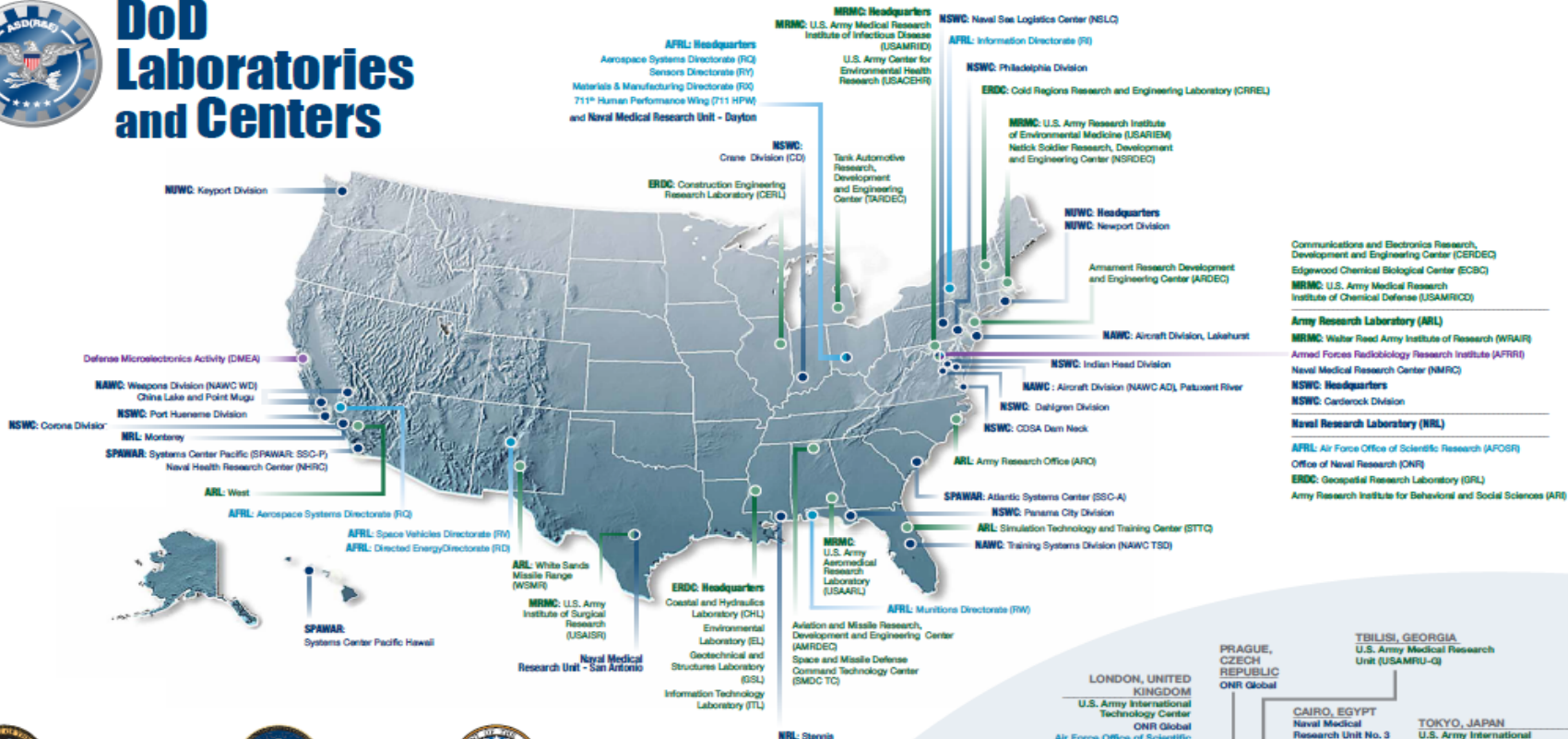
U.S. DoD R&E Ecosystem

Engaging with all partners to ensure technological superiority...





DoD Laboratories and Centers



ARMY



NAVY



AIR FORCE

Laboratories and Centers Authorized by Congress to be Science and Technology Reinvention Laboratories

- Army Research Laboratory (ARL)
- Engineer Research and Development Center (ERDC)
- Edgewood Chemical and Biological Center (ECBC)
- Armament Research and Development Center (ARDEC)
- Natick Soldier Research, Development and Engineering Center (NSRDEC)
- Medical Research and Materiel Command (MRMC)
- Communications Electronics Research, Development and Engineering Center (CERDEC)
- Tank and Automotive Research, Development and Engineering Center (TARDEC)
- Army Research Institute for the Behavioral and Social Sciences (ARIBSS)
- Space and Missile Defense Command Technical Center (SMDC TC)
- Naval Research Laboratory (NRL)
- Office of Naval Research (ONR)
- Naval Sea Systems Command Centers
 - Naval Surface Warfare Centers (NSWC)
 - Naval Undersea Warfare Centers (NAWC)
- Naval Air Warfare Centers (NAWC)
 - Weapons Division (NAWC WD)
 - Aircraft Division (NAWC AD)
- Space and Naval Warfare Centers (SPAWAR)
 - Systems Center Pacific (SSC-P)
 - Systems Center Atlantic (SSC-A)
- Air Force Research Laboratory (AFRL)
 - Materials and Manufacturing (RX)
 - Space Vehicles (RV)
 - Sensors (RY)
 - Information (RI)
 - Aerospace Systems (RQ)
 - Munitions (RW)
 - 711th Human Performance Wing (711 HPW)
 - Directed Energy (RD)
 - Air Force Office of Scientific Research (AFOSR)



60 U.S. Department of Defense laboratories and engineering centers provide expertise and insight to enhance our warfighter's capability .

Better Buying Power (BBP)

Continuous Improvement Process

- **BBP 1.0:** Focused on **Best Practices** and Business Rules
 - Affordability, ‘Should-Cost’, Performance-Based Contracting
- **BBP 2.0:** Focused on **Critical Thinking**, making better business decisions
 - Supplier Incentive Programs, Open Systems Architectures and Risk Reduction
- **BBP 3.0:** Continue Strengthening Our Culture of **Cost Consciousness**, **Professionalism**, and **Technical Excellence**



Focus on Prototyping



Science, Technology, Engineering, and Math

Inspire

Young scientists & engineers

Promote

Diversity & agility of thought

Communicate

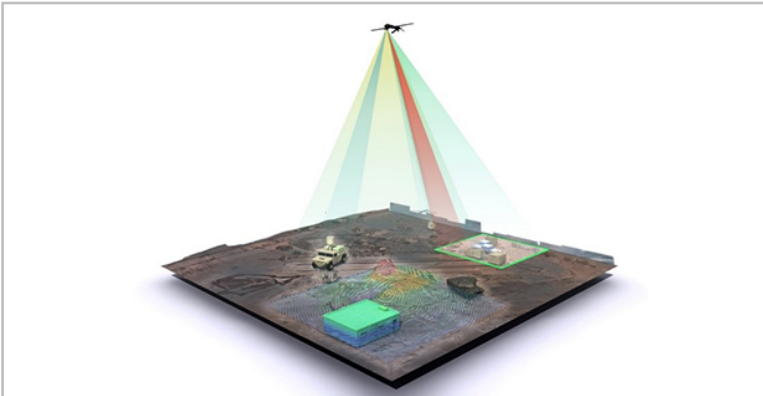
Opportunities to work cutting edge, leap-ahead technology

Cultivate

Culture of Innovation

Enhance

Professional experiences



Reconfigurable Imaging Program

A single sensor platform that can reconfigure by way of software so as to operate in many different sensor modes.



Aerial Dragnet Program

Persistent, wide-area surveillance of all unmanned aerial systems operating below 1,000 feet in an urban environment.

Competition for Talent



- Need to continue to **attract** the **best** and **brightest** to national security service
- Direct **competition** for talent



- **Eliminate** barriers to service
- **Increase** recognition of unique and relevant technical work **and** innovative thinking
- **Leverage** all sources of talent

U.S. DoD R&E Enterprise Pursuing Sustained Technical Advantage



U.S. DoD Research and Engineering Enterprise
<http://www.acq.osd.mil/chieftechologist/>

U.S. Defense Innovation Marketplace
<http://www.defenseinnovationmarketplace.mil>

Twitter: @DoDIInnovation