16th Annual Science and Engineering Technology Conference

National Defense Industrial Association

Al Shaffer
Principal Deputy Assistant Secretary of Defense for Research and Engineering
March 24, 2015
Key Elements of Defense Strategic Guidance

• The military will be *smaller and leaner*, but it will be agile, flexible, ready and technologically advanced.

• Rebalance our global posture and presence to emphasize the Asia-Pacific region.

• Build partnerships and *strengthen key alliances and partnerships* elsewhere in the world.

• Ensure that we can quickly confront and defeat aggression from any adversary – *anytime, anywhere*.

• Protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed.
Technological Superiority

“For decades, U.S. global power projection has relied on the ships, planes, submarines, bases, aircraft carriers, satellites, networks, and other advanced capabilities that comprise our military’s unrivaled technological edge. But today that superiority is being challenged in unprecedented ways.

Advanced military technologies, from rockets and drones to chemical and biological capabilities, have found their way into the arsenals of both non-state actors as well as previously less capable militaries.

And other nations – among them Russia, China, Iran, and North Korea – have been pursuing long-term, comprehensive military modernization programs to close the technology gap that has long existed between them and the United States.”
“A return to sequestration in Fiscal Year 2016 would affect all aspects of the department, but not all equally.

More than one-third of the Fiscal Year 2016 cuts would come have to come from Operations and Maintenance accounts, with unavoidable reductions in readiness and our ability to shape world events in America’s interest.

Let me put this more plainly: allowing sequestration to return would deprive our troops of what they need to accomplish their missions.

Approximately half of the cuts would have to come from the department’s modernization accounts, undermining our efforts to secure technological superiority for U.S. forces in future conflicts.

Because there are bills that DoD absolutely must pay – such as the salaries of our troops – many capabilities being developed to counter known threats from highly capable adversaries would be delayed or cancelled, deepening our nation’s vulnerabilities at a time when the world is growing more dangerous, not less.”

“Sequestration would put a hold on critical programs like our Aerospace Innovation Initiative, the Next Generation Adaptive Engine, the Ground-Based Interceptor missile defense kill vehicle redesign, and several space control efforts.”
Challenges
Rise of the Commons

- Modern Electronic Warfare
- Ballistic and Cruise Missile Defense
- Precision Navigation and Timing (PNT) / Communications / Intelligence Surveillance and Reconnaissance (ISR)
- Modern Integrated Air Defense
- Cyber
- Weapons of Mass Destruction (WMD)
Technology Offset

• Historical Term – Focus on “Asymmetric” Approach
  o Late 50’s - Davey Crockett
  o Air Land Battle – 1980
    – Precision, Navigation and Timing
    – Stealth
    – Precision Munitions
    – Night Vision
  – What is next?
Technology Offset

- Deputy Secretary of Defense Work Proposes *Using Technology to Effect Capability Erosion*


- We must use *technology, research and engineering* to build capabilities that will offset smaller, leaner force structure, faced with a tougher fight.

Emerging Themes: Autonomy, Range, Quantity at Cost
Industry Engagement (DII)

- **Defense Innovation Initiative (DII):** Identify and *invest in innovative ways* to sustain and advance our national security into the 21st century.

- **People:** Integrate leadership development with emerging opportunities and re-think how we develop managers and leaders.

- **Wargaming:** Reinvigorate wargaming to test alternative ways of achieving strategic objectives, and help us think more clearly about the future security environment.

- **New Operational Concepts:** Explore how to employ resources to greater strategic effect and deal with emerging threats in more innovative ways.

- **Business Practices:** Find ways to be more efficient and effective through external benchmarking and focused internal reviews.
Industry Engagement (LRRDPP)

- **Long-Range Research and Development Program Plan (LRRDPP):** Study and prioritize *new or unconventional technology* that could provide significant, national security advantages.

  - Reach out to the best and brightest minds inside and outside the DoD
  - Help us think through the technologically-enabled systems and architectures that we will want to have available post-2025.

- **Share your Ideas** (Submission portal and more information on the Defense Innovation Marketplace)

Better Buying Power (BBP) Continuous Improvement Process

• USD(AT&L) Frank Kendall

• 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: Continues and builds upon prior elements – and takes the focus to our Products
  – Innovation
  – Technical Excellence
  – Speed to Market

http://bbp.dau.mil/
Defense R&E Strategy

1. **Mitigate** current and anticipated threat capabilities
   - Cyber
   - Counter Space
   - Missile Defense

2. **Affordably** enable new or extended capabilities in existing military systems
   - Systems Engineering
   - Modeling and Simulation
   - Capability Prototyping
   - Developmental Test & Evaluation
   - Interoperability
   - Power & Energy

3. Create **technology surprise** through science and engineering
   - Autonomy
   - Human Systems
   - Quantum Systems

---

**Technology Needs**

- Cyber / Electronic Warfare
- Engineering / M & S
- Capability Prototyping
- Protection & Sustainment
- Advanced Machine Intelligence
- Anti-Access/Area Denial (A2/AD)
DoD’s Major Prototyping Activities
Mitigating Current and Future Threats

• Space and Missile Command (SMDC) Nanosatellite Program (SNaP)

• Kestral Eye

• High Energy Laser-Mobile Demonstrator (HEL-MD)

• Electromagnetic Rail Gun

• Automated Navigation and Guidance Experiment for Local Space (ANGELS)

• Laser Weapon System (LAWS)
DoD’s Major Prototyping Activities
Affordability of Current and Future Systems

• Steel Tiger

• Accelerated Nuclear DNA Equipment (ANDE)

• Stiletto

• Multi-Mission Radar

• Engineered Resilient Systems (ERS)
Engineered Resilient Systems

Tradespace Tools & Analytics

- ERS Cloud
- 10,000X Productivity Improvement In AoA
- HPCMP & S&T Resources

Integrated Capability and Workflow

- Decision Support
- Big Data Analytics and Visualization
- Open Architecture
- Knowledge Management
- Data Retention

Requirements Generation - Analysis of Alternatives - Virtual Prototyping & Evaluation

- Fully Explore & Identify KPPs
- Rapidly Distill Alternatives
- Reduces alternatives from thousands to tens or less

- RAPID PROTOTYPING & RESPONSE
- Virtually Warfight
DoD’s Major Prototyping Activities
Affordability of Current and Future Systems

• Adaptive Versatile Engine Technology (ADVENT)

• Adaptive Engine Technology Demonstration (AETD) Program in Fiscal Year 2013

• Adaptive Engine Transition Program (AETP) and will begin with an award to two contractors in Fiscal Year 2016
DoD’s Major Prototyping Activities
Create Technology Surprise

• **Aerospace Innovation Initiative (AII):**
  • All X-Plane
    • DARPA / Air Force / Navy Program to develop and demonstrate technologies.
    • Develop and fly two X-plane prototypes that demonstrate advanced technologies for future aircraft.
    • Will not be EMD prototypes or have residual operational capabilities.
    • A successful development and demonstration X-plane program will inform future aircraft system acquisitions.
  
• **Adaptive Engine Transition Program (AETP)**

• **Autonomy Research Projects Initiative (ARPI)**

• **High-speed Strike Weapon Program** will conduct air-launched and boost-glide weapon demonstrations in the 2018-2020 timeframe.
  • Enable a responsive strike capability on time-critical, heavily defended targets and achieves high survivability through altitude, speed and stealth.
DoD’s Major Prototyping Activities
Successful DoD S&T Transitions

- WaveRider
- Persistent Ground Surveillance System (PGSS)
- Nexus 7 (N7)
- Vehicle and Dismount Exploitation Radar (VADER)
- Automatic Ground Collision Avoidance System (AGCAS)
- Battlefield Air Targeting Man-Aided Knowledge “BATMAN”
- Small Diameter Bomb (SDB)
Impact of R&D Investments? Saved lives on the Battlefield

This chart shows the severity of injury and fatality rate in Iraq and Afghanistan from 2005 to 2013

- Long term advances and delivery from the medical S&T community have contributed to decreasing the fatality rate by half.

- Long term investment in military medical S&T saved countless lives.
• Operational Framework of the DoD S&T Joint Planning and Coordination process (Updated January 2014)
  • Executes the DoD R&E Strategies
  • Portfolio Management infrastructure to enable:
    • Information sharing
    • Alignment of effort against capability gaps
    • Coordination of priorities and investments
    • Exploit synergies and develop new opportunities
    • Support for scientists and engineers across the DoD R&E Enterprise
  • Communities of Interest (COI)
    • 17 cross-domain technical areas, each with their own Steering Group Lead and multiple technical ‘challenge areas’ or sub-groups, staffed with Subject Matter Experts (SMEs)
    • Specific cross-cutting technology areas where there is substantial investment across multiple Components

**Mission:** Leverage *global* commercial and non-commercial research and development (R&D) to ensure superior and affordable development in areas critical to defense, including but not limited to:

- 17 *cross-domain* technical areas, each with a Steering Group Lead and multiple technical ‘challenge areas’ staffed with Subject Matter Experts (SMEs); *Each with an International focus*
- Specific cross-cutting technology areas where there is substantial investment *across multiple Components*

DoD-Industry Engagement
The Marketplace: Your DoD S&T/R&D Resource

Defense Innovation Marketplace website is **the communication resource** between DoD S&T/R&D and Industry/Academia, hosting:

- DoD R&E Strategic Guidance
- Long-Range Research and Development Program Plan
- Technology Integration Meetings (TIMs)
- Independent Research & Development (IR&D) Secure Portal

**Are YOU using the Marketplace and the IR&D portal?**

NDIA S&T Conf - 03/24/2015
COI Industry Engagement Strategy

• **Virtual Technology Interchanges** hosted on the Marketplace

  • Air Force (AFRL) has hosted, since 2013, six Virtual Technology Interchanges using the Marketplace to discuss industry IR&D efforts in Aeronautics, Autonomy, C4ISR, Human Systems (joint effort with the HS COI), Nuclear and Space.

    • Specific technology challenges are outlined and posted to the Marketplace

    • Industry is invited to provide their potential IR&D solutions through the Secure Portal

    • Submissions are reviewed by DoD (COI) subject matter experts.

    • Select projects/companies are then invited to attend a more detailed face-to-face (or Virtual) meeting.

  • Due to the efficiency of these Technology Interchanges

    • Face-to-face dialogues on the technology needs and potentially viable solutions are improved

    • New relationships and partnering opportunities have developed

COIs will be identifying their priority technology challenges and using Virtual Technology Interchanges to work them with industry
ASD(R&E)

DoD Research and Engineering Enterprise:
http://www.acq.osd.mil/chieftechnologist/

Defence Innovation Marketplace

Twitter: @DoDInnovation