



16th Annual Science and Engineering Technology Conference

National Defense Industrial Association

Al Shaffer

**Principal Deputy Assistant Secretary of Defense
for Research and Engineering**

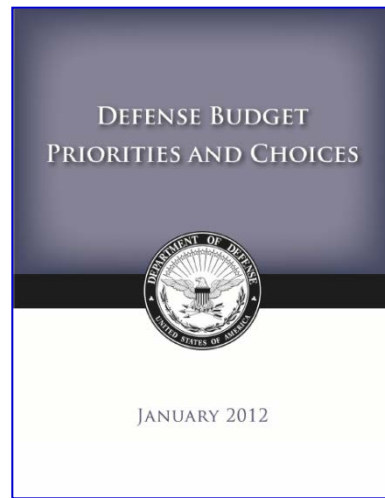
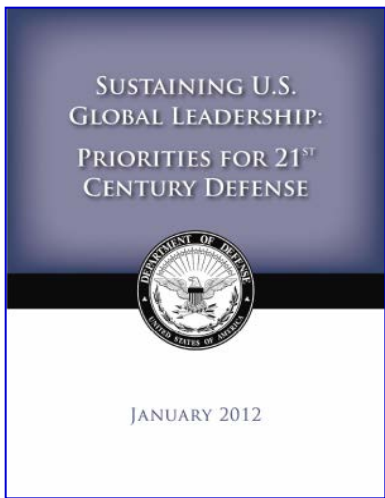
March 24, 2015



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



Secretary Carter

Submitted Statement

Senate Armed Services Committee

FY2016 Budget Request

3 March 2015

*“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.”



Impact of Sequestration



Secretary Carter

Submitted Statement
Senate Armed Services Committee
FY2016 Budget Request
3 March 2015

“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 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.***”

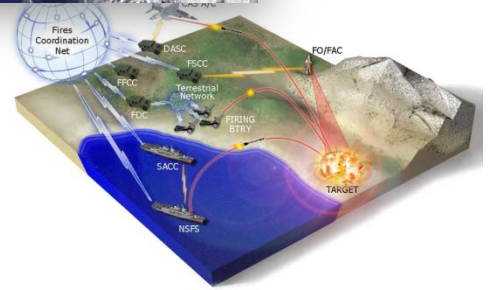
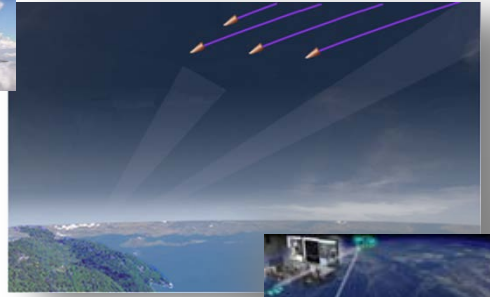
“Sequestration would put a hold on critical programs like our Aerospace Innovation Initiative, the Next Generation Adaptive Engine, the Ground-Based Interceptor missile defense kill vehicle redesign, and several space control efforts.”



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
 - Late 50’s - Davey Crockett
 - Air Land Battle – 1980
 - Precision, Navigation and Timing
 - Stealth
 - Precision Munitions
 - Night Vision
 - What is next?

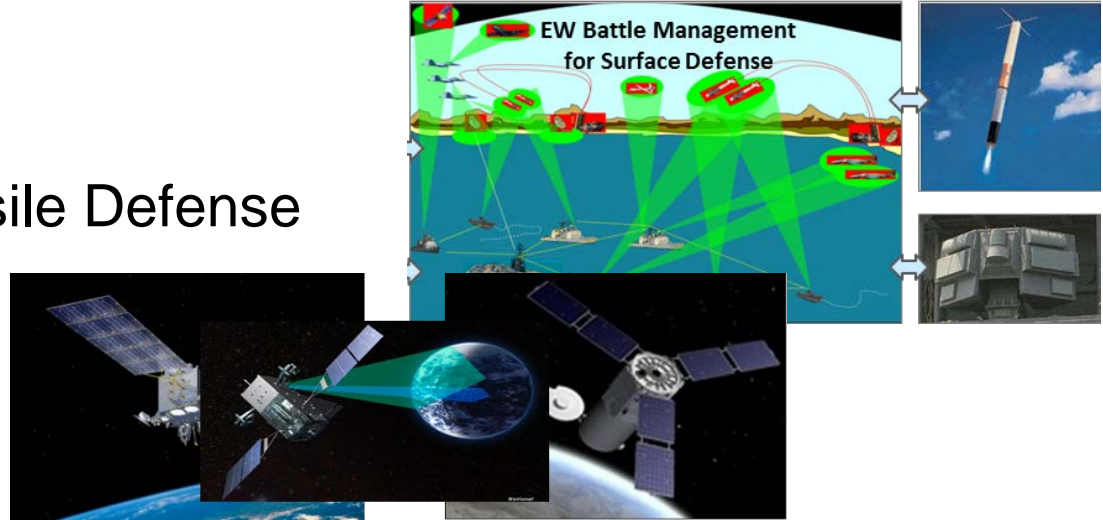




Technology Offset

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

- Current “Challenge” – Electronic Warfare / Missile Defense / Cyber / Space / Integrated Air Defense System (IADS)



- 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)

DEFENSE INNOVATION MARKETPLACE

HOME RESOURCES FAQs NEWS & EVENTS ABOUT CONTACT US

The Long-Range Research & Development Program Plan (LRRDPP): Developing a New Technology Offset Strategy

The last technology offset strategy and the subsequent creation of new capabilities for the Department, was preceded by a long-range R&D plan. This prior plan, developed in the 1970s, was considered a successful effort in identifying game-changing capabilities, such as networked precision strike, stealth and surveillance, and helped us focus our science and technology (S&T) resources on enabling those opportunities and delivering those capabilities. Since that time, others countries and groups have sought to replicate our capabilities and identified ways to potentially diminish U.S. and our allies' competitive advantages.

LRRDPP is a new effort to gather information from a broad group of people in order to study and prioritize new or unconventional applications of technology in ways that would provide significant, advantage to future national security capabilities. We anticipate using input to help in the internal analysis and prioritization of future DoD research and development investments.

Today we see significant changes in the global technology landscape that compel a strategic evaluation of the Department's research and development investment strategy. This current long-range R&D study seeks to identify opportunities for enduring innovation and opportunities to sustain the future our nation's military capabilities in an era of increasing globalization, rapidly evolving technology, and tightening budgets. Many, if not most, of the technologies that we have today are no longer the exclusive domain of the Department of Defense. To put together our updated long-range R&D plan, we would like to leverage ideas from across commercial industry, academia, not-for-profits and the general public.

The objective of the Department's effort is to identify high-payoff enabling technology opportunities that could offer opportunities to shape the trajectory of future competition for technical superiority in the 2025-2030 timeframe.

What systems, capabilities and architectures could the Department field post-2025 that will ensure U.S. dominance and shape the future of military technical competition? Share your ideas here

Share your Ideas: Long-Range Research & Development Program Plan Request for Information

It is the Department's goal to reach out to the best and brightest minds from industry, academia, labs (government and corporate), FFRDCs/engineering centers/product centers, think tanks, small business and the general public - to help us think through the technologically-enabled systems and architectures that we will want to have available post-2025. If your organization has technologies, concepts, or ongoing efforts that are applicable to this goal and you would like to share these ideas with our government team, please submit your ideas through our [Submission Site](#).

Note: This link is only for unclassified submissions. If you have a classified submission, please contact Lt Col Cropsey @ luka.c.cropsey.mil@gmail.com.

Share your ideas

Submit your ideas for LRRDPP Here

LRRDPP Request For Information

LRRDPP RFI on FedBizOps

www.DefenseInnovationMarketplace.mil/LRRDPP.html



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**

The screenshot shows the 'Better Buying Power' website for the Department of Defense. The header includes the DoD logo and navigation links: Home, About, Initiatives, Library, Military Services, Resources, and Contact. A main banner features a photo of a Navy destroyer with the headline 'BBP Initiatives Successfully Employed in Acquisition of Navy Destroyer'. Below the banner are five key focus areas: Ensuring Affordability, Innovative Strategy Saves \$288M, Tapping Small Business Innovation, Economical HawkEye Production Rates, and Focus on Requirements Yields Benefits. The main content area includes a 'What Is Better Buying Power?' section, a search bar for 'BBP Focus Areas', and an 'Items of Interest' sidebar with a recent article titled 'DoD Instruction 5000.02'.

<http://bbp.dau.mil/>



Defense R&E Strategy



1. Mitigate current and anticipated threat capabilities

- Cyber
- Counter Space
- Missile Defense
- Electronic Warfare
- Counter-WMD

2. Affordably enable new or extended capabilities in existing military systems

- Systems Engineering
- Capability Prototyping
- Interoperability
- Modeling and Simulation
- Developmental Test & Evaluation
- Power & Energy

3. Create technology surprise through science and engineering

- Autonomy
- Human Systems
- Quantum Systems
- Data Analytics
- Hypersonics
- Basic Sciences

Technology to offset Manpower

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)
- Automated Navigation and Guidance Experiment for Local Space (ANGELS)
- Kestral Eye
- Laser Weapon System (LAWS)



- High Energy Laser-Mobile Demonstrator (HEL-MD)
- Electromagnetic Rail Gun





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)





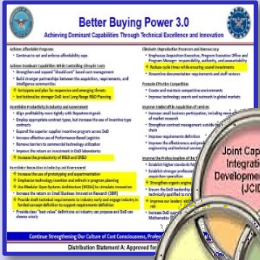
DoD's Major Prototyping Activities

Affordability of Current and Future Systems



Engineered Resilient Systems

Tradespace Tools & Analytics

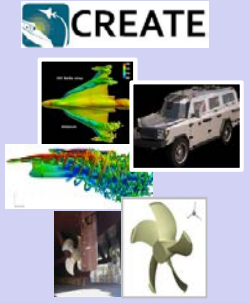
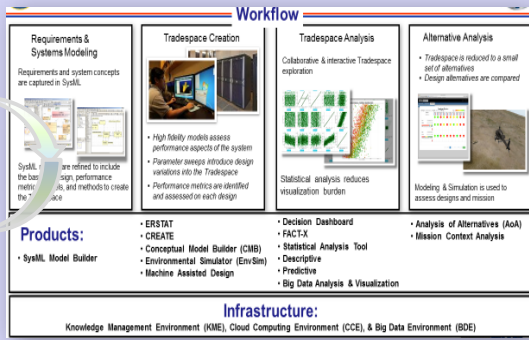


ARCHITECTURE
TRADE ANALYSIS
ADVANCED MODELING
3D REPRESENTATION
MISSION CONTEXT
...ilities
other

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

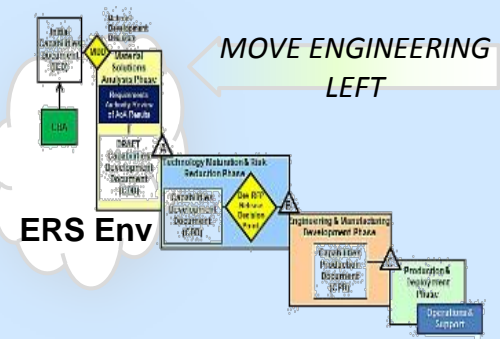
Knowledge Management

Data Retention

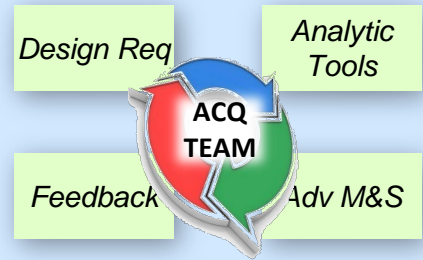
Requirements Generation

Analysis of Alternatives

Virtual Prototyping & Evaluation



Reduces alternatives from thousands to tens or less



RAPID PROTOTYPING & RESPONSE

Fully Explore & Identify KPPs

Rapidly Distill Alternatives

Virtually Warfight



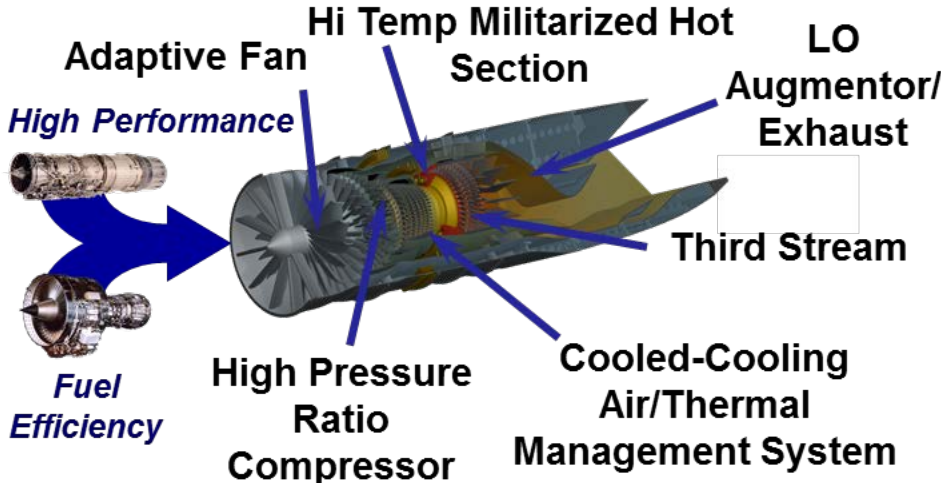
DoD's Major Prototyping Activities

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 (All):**

- 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



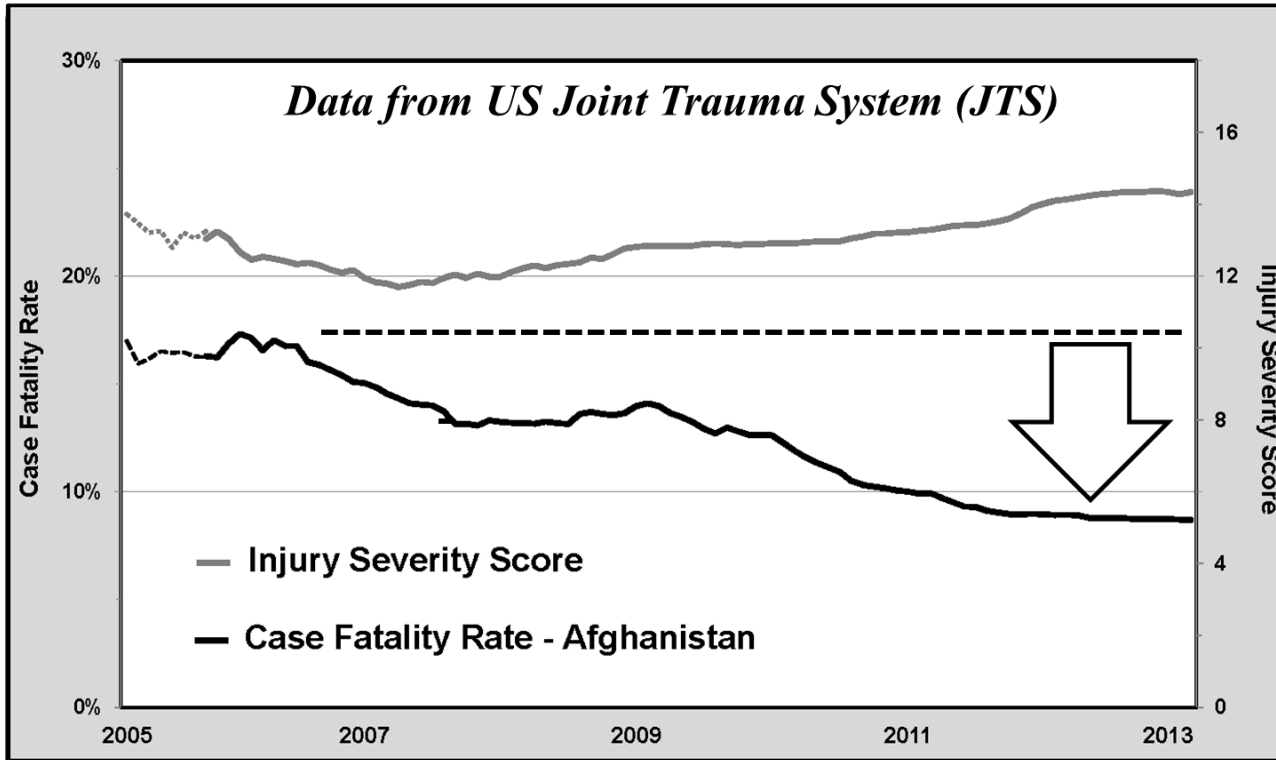
- **WaveRider**
- **Persistent Ground Surveillance System (PGSS)**
- **Nexus 7 (N7)**
- **Vehicle and Dismount Exploitation Radar (VADER)**
- **Automatic Ground Collision Avoidance System (AGCAS)**
- **Battlefield Air Targeting Man-Aided Knowledge "BATMAN"**
- **Small Diameter Bomb (SDB)**





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



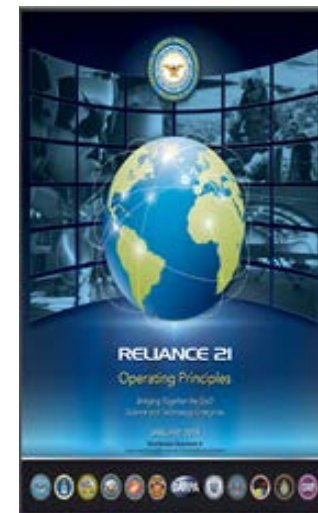
- Long term advances and delivery from the medical S&T community have contributed to decreasing the fatality rate by half.
- Long term investment in military medical S&T saved countless lives.



DoD Research & Engineering (R&E) Reliance 21: Operating Principles



- **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**



Available at www.defenseinnovationmarketplace.mil/resources/2014-Reliance21OperatingPrinciples.pdf

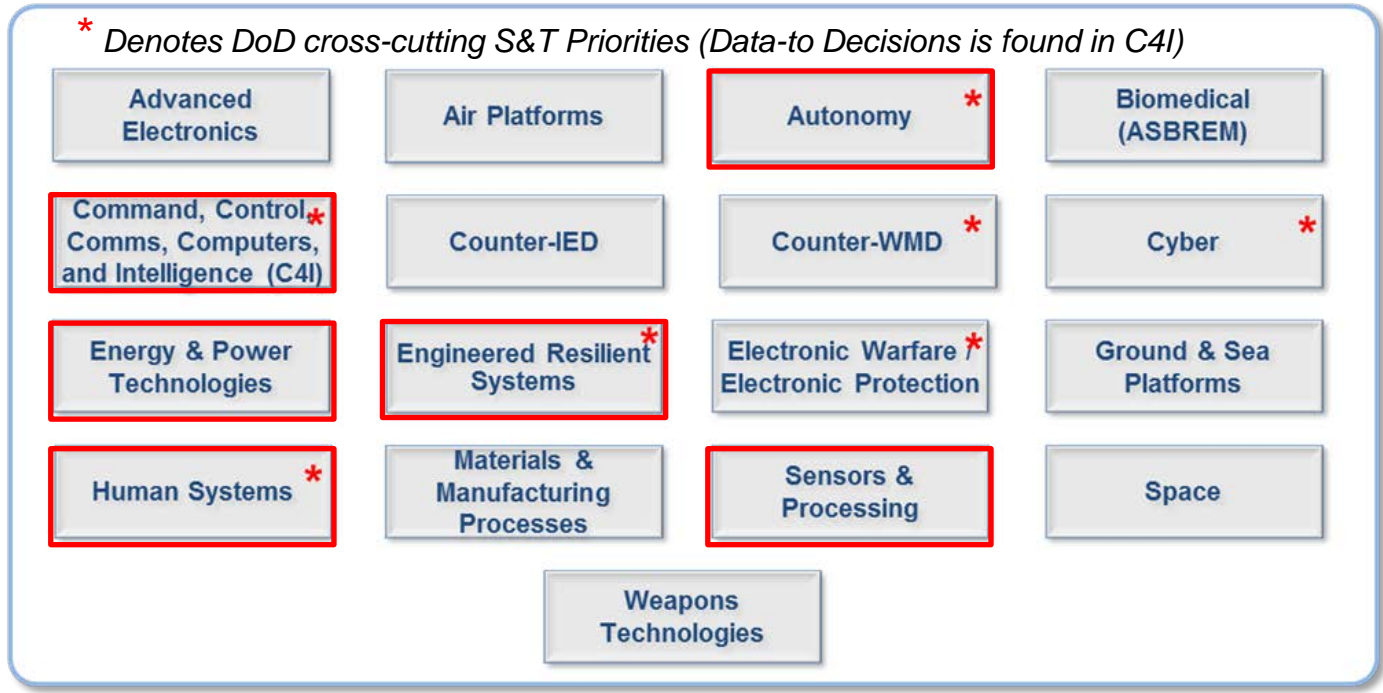


DoD Engagement Strategy

Reliance 21 - Communities of Interest



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:



* Presenting at NDIA S&T Conf 24 – 26 March

- 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**

Available at www.DefenseInnovationMarketplace.mil/resources/2014-Reliance21OperatingPrinciples.pdf



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)**
 - *Human Systems COI Virtual Technology Interchange – June 2015*

The screenshot shows the homepage of the Defense Innovation Marketplace. At the top, it says "DEFENSE INNOVATION MARKETPLACE" with a row of logos for various DoD agencies and DARPA. Below that is a navigation bar with links for HOME, RESOURCES, FAQs, NEWS & EVENTS, ABOUT, and CONTACT US. The main content area is titled "CONNECTING INDUSTRY & DoD" and includes a featured item "ARL Technical Implementation Plan 2015-19". There are also sections for "NEW IN THE MARKETPLACE" with sub-sections for Strategic Documents, Doing Business with DoD, and News & Events. On the right side, there are several "OSD INITIATIVES" and "VIRTUAL TECHNOLOGY INTERCHANGES" buttons, including "Long-Range R&D Program Plan", "Better Buying Power 3.0", "Dynamic Spectrum Industry Day", "Air Force Technology Focus Areas", and "Weapons Tech COI and IR&D Interchange". At the bottom of the screenshot, the URL "www.DefenseInnovationMarketplace.mil" is displayed in a green box.

- **Independent Research & Development (IR&D) Secure Portal**

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



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/>

Defense Innovation Marketplace
www.DefenseInnovationMarketplace.mil

Twitter: @DoDIInnovation