PACOM S&T Conference

5 March 2013

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Assistant Secretary of Defense for Research and Engineering (Acting)
**Report Documentation Page**

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**Standard Form 298 (Rev. 8-98)**
Prescribed by ANSI Std Z39-18
“Gentleman, we are out of money. Now we must think!”

Winston Churchill to Parliament during World War II
“Our current security challenges are more formidable and complex than those we faced in downturns following Korea, Vietnam, and the Cold War. There is no foreseeable “peace dividend” on our horizon.”

GEN DEMPSEY, CJCS
Testimony to SASC, 12 Feb 2013
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 Asia-Pacific and the Middle East.

• Build innovative 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.
Defense S&T Drivers

In time of budget uncertainty, need to reevaluate the purpose of Defense S&T:

- Mitigate emergent threats, e.g.
  - Electronic Warfare and Digital radio frequency memory (DRFM)
  - Missile defense
  - Cyber

- Build / engineer affordability / interoperability in the acquisition chain
  - Multi-service platforms pass data/info
  - Extend life and capabilities of existing systems

- Create technology surprise, e.g.
  - Quantum information systems
  - Synthetic biology, etc
Priorities for 21\textsuperscript{st} Century Defense

Primary Missions of the U.S. Armed Forces

- Defend the Homeland and Provide Support to Civil Authorities
- Counter Terrorism and Irregular Warfare
- Conduct Stability and Counterinsurgency Operations
- Provide a Stabilizing Presence
- Deter and Defeat Aggression
- Project Power Despite Anti-Access / Area Denial Challenges
- Counter Weapons of Mass Destruction
- Operate Effectively in Cyberspace and Space
- Conduct Humanitarian, Disaster, Relief and Other Operations
- Maintain a Safe, Secure and Effective Nuclear Deterrent

S&T Focus Areas

- Complex Threats
  - Electronic Warfare / Electronic Protection
  - Cyber Science and Technology
  - Counter Weapons of Mass Destruction
- Force Multipliers
  - Engineered Resilient Systems
  - Data-to-Decisions
  - Human Systems
  - Autonomy

- Counter AA/AD capabilities
- Tailored and adaptive capabilities
- Low-cost, Small-footprint operations
- Developing and integrating partnership capabilities

Missions in the Commons
A New Reality: Global Dimensions Affect DoD S&T

- Pace of Technology
- Black Swan Syndrome
- Rise of the Commons
- Technology Commercialization
- Expanding Global Knowledge Base
- Economic and S&T Mega-Trends
- Information Agility
- Mass Collaboration

Cloud Computing

Skype
Facebook
Wikipedia
Second Life
MySpace
YouTube
Twitter
Flickr
Digg
Wii-Fi
Nokia
Black Swan Syndrome

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The Pace of Technology

**Technology Adoption Timeline (1900-2005)**

<table>
<thead>
<tr>
<th>Period</th>
<th>1750-1900</th>
<th>1900-50</th>
<th>1950-75</th>
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<tr>
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<td>Railways</td>
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<td>Mobile phones</td>
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<td>Personal computers</td>
<td>Source: World Bank</td>
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**Excerpt from The Economist, Feb. 9, 2008**

*It took 23 years to go from modeling germanium semiconductor properties to a commercial product.*

*The carbon nanotube was discovered in 1991; recognized as an excellent source of field-emitting electrons in 1995, and commercialized in 2000.*

*The Pace of Technology Development and Market Availability is Exceeding the Pace of Acquisition.*
Military Operations Increasingly Depend on Being Able to Operate in Places “No One Owns” – *The Commons*
Expanding Global Knowledge Base

The Research Talent Base is Growing and Shifting at an Accelerating Rate

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Apple and AT&T released the iPhone on 29 June in an exclusive agreement. Hotz spent ~500 hours working on his “summer project” and the hack was available in July.

Today’s adversaries are light and agile, and rapidly react and innovate in response to US actions.

This is the New Asymmetry—Victory Goes to the Agile and Innovative
Mass Collaboration

Ad-hoc Groups Can Quickly Solve (or Create) Massively-Complex Problems
The Span of DoD R&E

Near Term
Specific potential adversary system performance

Mid Term
Strategic force development plans

Far Term
Understanding investment in research coupled with assessment of potential adversary capabilities

Prepare for an Uncertain Future
High Priority S&T areas for DoD

- Metamaterials and Plasmonics
- Quantum Information Science
- Cognitive Neuroscience
- Nanoscience and Nanoengineering
- Synthetic Biology
- Understanding Human and Social Behavior

Trends in basic research are identified and judged through a variety of interactions, including:

- Publications, university site visits, conference attendance
- Future Directions Workshops (identifying emerging areas for investment and International Centers of Excellence for collaborative opportunities)
- Engage expert panels (JASONs, National Academy of Sciences, etc…)

Understanding and Creating the Cutting Edge
Anti-Access/ Area Denial
Current A2/AD Priorities

- Electronic Attack / Electronic Protection
- Cyber Operations
- Space / Counter Space
- Undersea Operations
- Counter Missile / Missile Defense
- Counter Integrated Air Defense Systems
DoD S&T Budget Focus

Enablers/Commons

- Space Programs (PNT, Comms, ISR)
- Cyber
- EW/EMS
- Undersea
- Offensive
- C2
- PSC / COI

OSD/Joint Focus

Service Focus

Air Force

Navy

Enabling Future Acquisition
- Developmental Prototyping

Army / Marine Corps
DoD S&T Complex Threats

Electronic Warfare & Protection
- RF/Mixed Signal Component Technologies
- EO/IR Component Technologies
- Underlying technology enablers

Cyber Science and Technology
- Assuring Effective Missions
- Resilient Infrastructure Trust
- Cyber Experimentation & Measurement
- Agile Operations

Counter Weapons of Mass Destruction

New concepts and technology for remote identification of nuclear, chemical, and biological material, and to assist in mitigation, containment, and attribution of the materials
- Broad Area Search
- Persistent Monitoring
- Tagging and Tracking
Cyber PSC – Problem Statement

S&T Gaps
- Resilient Infrastructure
- Agile Operations
- Assuring Effective Missions
- Trust
- Cyber Experimentation and Measurement
Electronic Warfare Vision
Electromagnetic Spectrum Dominance

The Goal of Electronic Warfare is to Advantage U.S. and Coalition Force Operations by “Shaping” the Electromagnetic Spectrum (EMS)

S&T Gaps

• RF/Mixed Signal Component Technologies
  – Agile, high dynamic range receiver electronics
  – Agile, wideband transmitter electronics
  – Affordable/modular agile beam antennas

• EO/IR Component Technologies
  – Next generation multispectral IR Focal Plane Arrays (FPAs)
  – Multispectral, high power lasers
  – Multispectral optics & optical phase control

• Underlying technology enablers
  – Nitride semiconductor family (GaN/InN/AlN)
  – Ultra-precision clocks/oscillators (nsec → psec → fsec)

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Defense Innovation Marketplace

Website devoted to making it easier for you to find out about DoD’s S&T and Program Investments

Links to Relevant DoD Information
• S&T Planning Documents
• Key Briefs from Department Leaders
• Doing Business with DoD, e.g.
  • Broad Agency Announcements
  • Industry Day Announcements
  • Rapid Innovation Fund Information
• Links to Army, AF, Navy Labs

defenseinnovationmarketplace.mil

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Connecting Industry with Government Customers

The Defense Innovation Marketplace is a centralized online resource to better connect industry with government customers to invigorate innovation.

For Industry, the Marketplace is the place to learn about Department of Defense investment priorities and capability needs, and comply with the new Defense Federal Acquisition Supplement (DFARS) rule.

For Government, the Marketplace will provide new search tools to assess and then leverage industry technology projects for current and future programs.

NEW IN THE MARKETPLACE

<table>
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<th>S&amp;T Strategic Documents</th>
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<th>News &amp; Events</th>
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<tr>
<td>Active Denial Technology (ADT)</td>
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<td>Joint Non-Lethal Weapons Program Overview</td>
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<td>Navy Information</td>
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<td>More...</td>
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Resources
Useful DoD and Service information for business and program planning here

Industry
Market Your Innovation to DoD Customers here

Government
Find Details about Industry’s Innovation Projects here

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Summary

• DoD S&T aligned to meet priorities for a 21st Century security environment

• DoD Strategic Framework….. lays the foundation for S&T commitments – 7 Priority S&T Areas

• Federal Deficit Reduction will impact; S&T remains steady priority

• Asia-Pacific rebalance is the foundation of our R&E strategy
Backup Slides