Affording Defense Capability: An SE-Centric Take on Science and Technology Priorities

Kristen Baldwin
Principal Deputy, Office of the Deputy Assistant Secretary of Defense for Systems Engineering
Integrated S&T Enterprise

Missions

- National Defense Strategy
- Quadrennial Defense Review
- Space Posture Review
- Nuclear Posture Review

Objective Architectures

Critical Capabilities

Enabling Technologies

Operational Challenge

JUONs, UONs, COCOM IPL

Laboratory Program

Basic Research Program

STEM Program

Industry IR&D

FFRDCs

UARCs

ASRR
2011/10/05 Page-2

Distribution Statement A – Cleared for public release by OSR, distribution unlimited.
1. Accelerate delivery of technical capabilities to win the current fight.

2. Prepare for an uncertain future.

3. Reduce the cost, acquisition time and risk of our major defense acquisition programs.

4. Develop world class science, technology, engineering, and mathematics capabilities for the DoD and the Nation.

Fast Track Studies
- Electronic Warfare
- Computer Science
- Cyber Operations
- Energy & Water
- Rapid Capability Tool Kit

Task Forces
- Helo Survivability
- Base Protection
- Tag, Track, Locate
- C-IED SIG Support
- QDR Missions Architectures

Threat sensors mounted to fuselage exterior
Helicopter Alert & Threat Termination-Acoustic (HALTT-A)
MRAP-ATV
Stiletto
PGSS
Quadrennial Defense Review
Mission Set

1. Defend the United States and Support Civil Authorities at Home
2. Succeed in Counterinsurgency, Stability, and Counterterrorist Operations
3. Build the Security Capacity of Partner States
4. Deter and Defeat Aggression in Anti-Access Environments
5. Prevent Proliferation and Counter Weapons of Mass Destruction
6. Operate Effectively in Cyberspace.

http://www.defense.gov/DefenseReviews/
Architecture – Technology Trade Space

Architectures Drive Technologies
Technologies Inform Architectures
DoD S&T Focus Areas

SECDEF Guidance

Complex Threats

Electronic Warfare / Electronic Protection

Cyber Science and Technology

Counter Weapons of Mass Destruction

Force Multipliers

Data-to-Decisions

Human Systems

Autonomy

Engineered Resilient Systems

19 April 2011
Electronic Warfare / Electronic Protection

New capabilities to dominate the electromagnetic spectrum

Affordable Laser IRCM Survivability System (ALISS)

Behavioral Learning for Adaptive Electronic Warfare (BLADE)
Cyber: Architecture for S&T Investments

Cyberspace is the new domain of warfare

Need for active defenses

Ensure the safety of critical infrastructure

Collective defense

Keep the technological advantage

Resiliency

Agility

Assuring Effective Missions

Foundations of Trust

Enforce United States National Security & Economic Prosperity

Foundational DoD S&T Thrusts
Countering Weapons of Mass Destruction

• Advanced sensors
• Rapid response capabilities
• Advanced defeat mechanisms
• Investments span all aspects of this challenge with emphasis shifting from imagery to motion and text analytics

• Unstructured data analytics is the most challenging and critical component
Human Systems

<table>
<thead>
<tr>
<th>Personnel &amp; Training</th>
<th>Strategic Decision Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Realistic, immersive training</td>
<td>• Battle management</td>
</tr>
<tr>
<td>• Adaptive, tailored instruction</td>
<td>• Autonomous system control</td>
</tr>
<tr>
<td>• Train partner state forces</td>
<td></td>
</tr>
</tbody>
</table>

Distribution Statement A – Cleared for public release by OSR, distribution unlimited.
Autonomy

- Mobility
- Scalability
- Manipulation
- Perception
- Human Interaction
- Learning & Intelligence
Engineered Resilient Systems
Complex Systems Design

Trustworthy Systems Design

Conceptual Engineering

Technical Thrusts

Trustability: design patterns, analytic tools

Tying design, physical and computational testing

Virtual worlds projecting alternative futures

Model-based tools: Analysis and simulation

Tradespace exploration

Platform-based analysis and architecting

Model Based Engineering

Platform Based Engineering
Some Final Thoughts

• **How will we get there?**

• **Systems Engineering Research can contribute to many of the cross cutting DoD S&T priorities**
  – We are placing priority for the SERC on Engineered Resilient Systems
  – Today’s panel will kick this off!
And, while you’re at it…

First Degrees in Natural Sciences and Engineering by Country

Give us the workforce we need to execute in the 21st Century!