

DoD S&T Enterprise

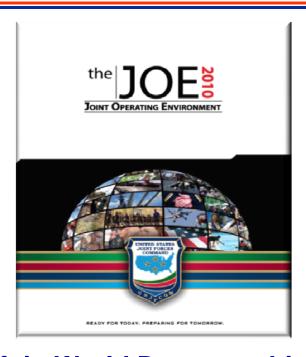
9 August 2011

The Honorable Zachary J. Lemnios Assistant Secretary of Defense for Research and Engineering

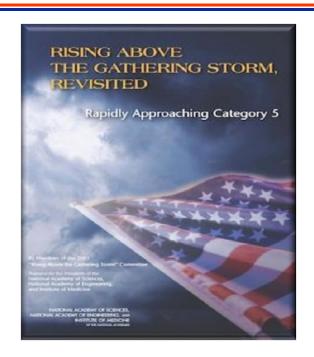


Global Shifts → Global Challenges





Shift in World Demographics
Technology Globalization
Shifting Global Economics
Limited World Energy Resources
Challenges to Existing State Structures
WMD proliferation



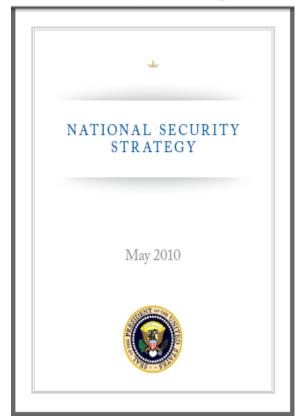
Innovation & Competitiveness
Knowledge Capital
Human Capital
Creative "Ecosystem"



S&T Investment Drivers

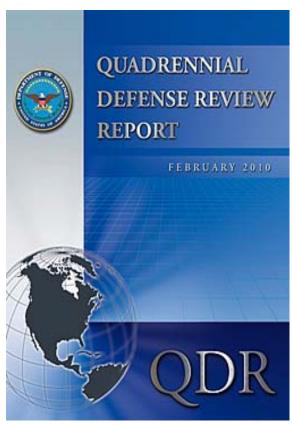


President's National Security Strategy



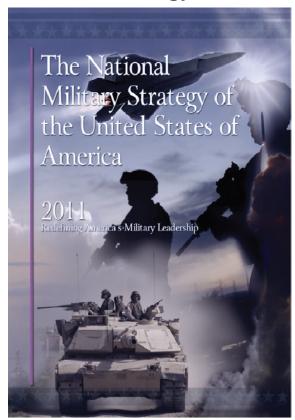
May 2010

SECDEF's Quadrennial Defense Review



February 2010

CJCS' National Military Strategy

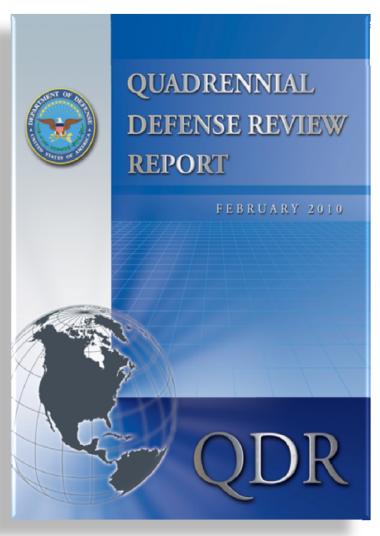


February 2011



QDR Missions Require New Capabilities





- 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.



DoD S&T Focus Areas



SECDEF Guidance



SECRETARY OF DEFENSE 1000 DEFENSE PENTAGON WASHINGTON, DC 20301-1000

APR 19 2011

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARY OF DEFENSE FOR ACQUISITION,
TECHNOLOGY AND LOGISTICS
ASSISTANT SECRETARY OF DEFENSE FOR RESEARCH
AND ENGINEERING
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Science and Technology (S&T) Priorities for Fiscal Years 2013-17 Planning

The Department's S&T leadership, led by the Assistant Secretary of Defense for Research and Engineering, in close coordination with leadership from the Under Secretary of Defense for Policy, the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense, the Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy, and the Joint Staff, has identified seven strategic investment priorities. These S&T priorities derive from a comprehensive analysis of recommendations resulting from the Quadrennial Defense Review mission architecture studies directed in the FY12-16 Defense Planning Programming Guidance.

The priority S&T investment areas in the FY13-17 Program Objective Memorandum are:

- Data to Decisions science and applications to reduce the cycle time and manpower requirements for analysis and use of large data sets.
- (2) Engineered Resilient Systems engineering concepts, science, and design tools to protect against malicious compromise of weapon systems and to develop agile manufacturing for trusted and assured defense systems.
- (3) Cyber Science and Technology science and technology for efficient, effective cyber capabilities across the spectrum of joint operations.
- (4) Electronic Warfare / Electronic Protection new concepts and technology to protect systems and extend capabilities across the electro-magnetic spectrum.
- (5) Counter Weapons of Mass Destruction (WMD) advances in DoD's ability to locate, secure, monitor, tag, track, interdict, eliminate and attribute WMD weapons and materials.
- (6) Autonomy science and technology to achieve autonomous systems that reliably and safely accomplish complex tasks, in all environments.
- (7) Human Systems science and technology to enhance human-machine interfaces to increase productivity and effectiveness across a broad range of missions.





19 April 2011

Complex Threats

Electronic Warfare / Electronic Protection

Cyber Science and Technology

Counter Weapons of Mass Destruction

Force Multipliers

Autonomy

Engineered Resilient Systems

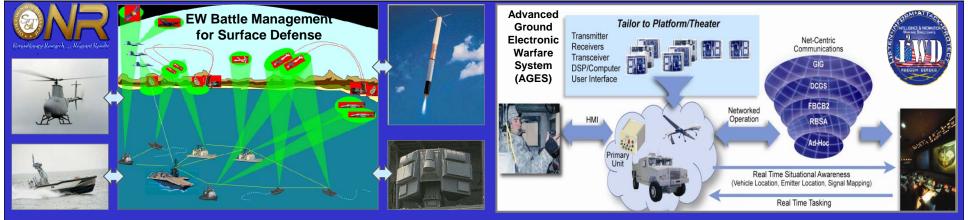
Data-to-Decisions

Human Systems



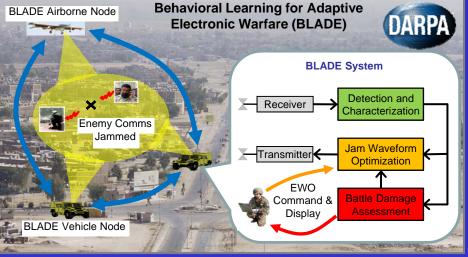
Electronic Warfare / Electronic Protection





New capabilities to dominate the electromagnetic spectrum

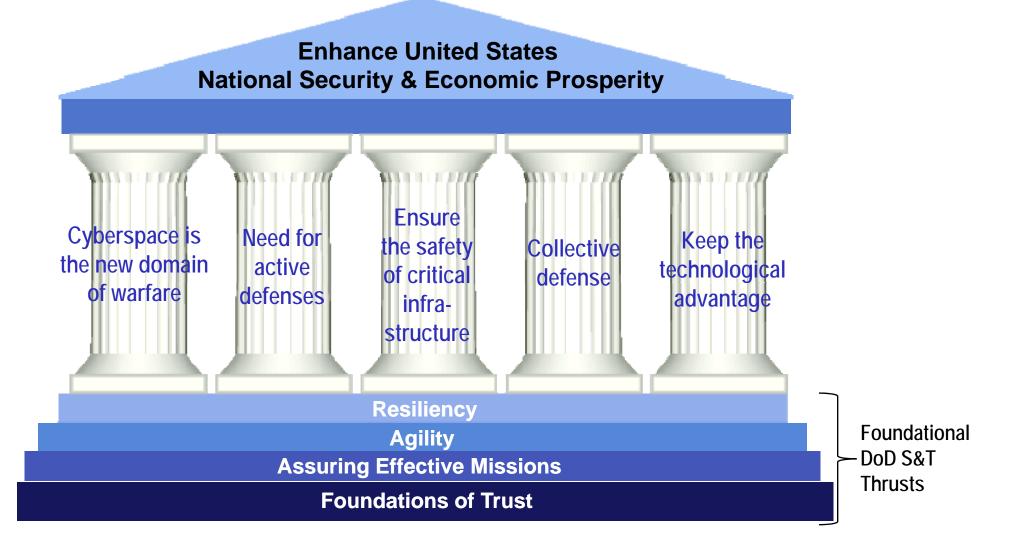






Cyber: Architecture for S&T Investments







Countering Weapons of Mass Destruction











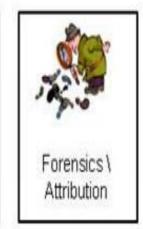




- Advanced sensors
- Rapid response capabilities
- Advanced defeat mechanisms







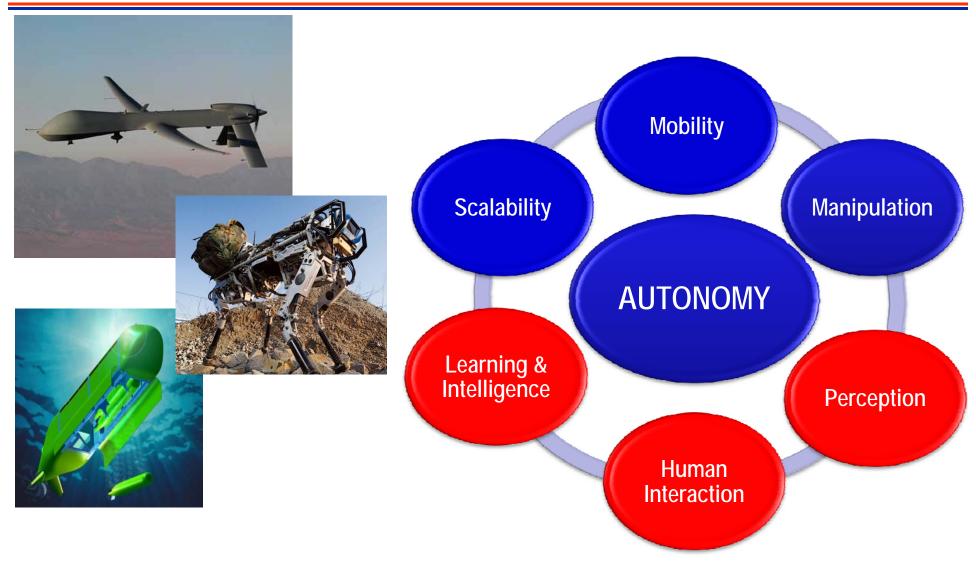






Autonomy







Engineered Resilient SystemsComplex Systems Design



Trustworthy Systems Design

Conceptual Engineering

Trustability: design patterns, analytic tools

Tying design, physical and computational testing

Technical Thrusts

Virtual worlds projecting alternative futures

Model-based tools:
Analysis and simulation

Tradespace exploration

Platform-based analysis and architecting

Model Based Engineering

Platform Based Engineering









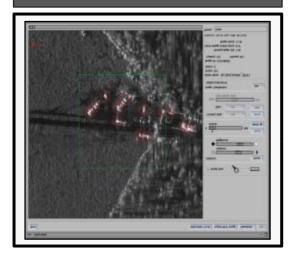
Data-to-Decisions



Data Management Layer



Analytics Layer



User Interaction Layer



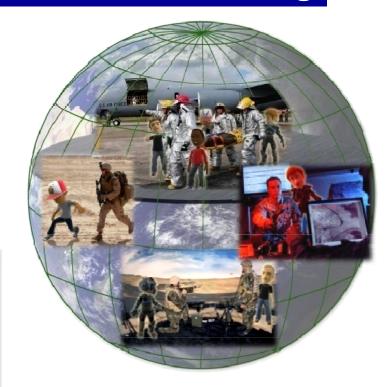
- Investments span all aspects of this challenge with emphasis shifting from imagery to motion and text analytics
- Unstructured data analytics is the most challenging and critical component



Human Systems



Personnel & Training



- Realistic, immersive training
- Adaptive, tailored instruction
- Train partner state forces

Strategic Decision Support



- Battle management
- Autonomous system control





New Frontiers



High Interest Basic Science Areas



Synthetic Biology



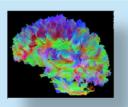
Modeling of Human Behavior



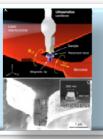
Engineered Materials



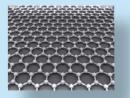
Cognitive Neuroscience



Quantum Systems



Nano Science and Engineering





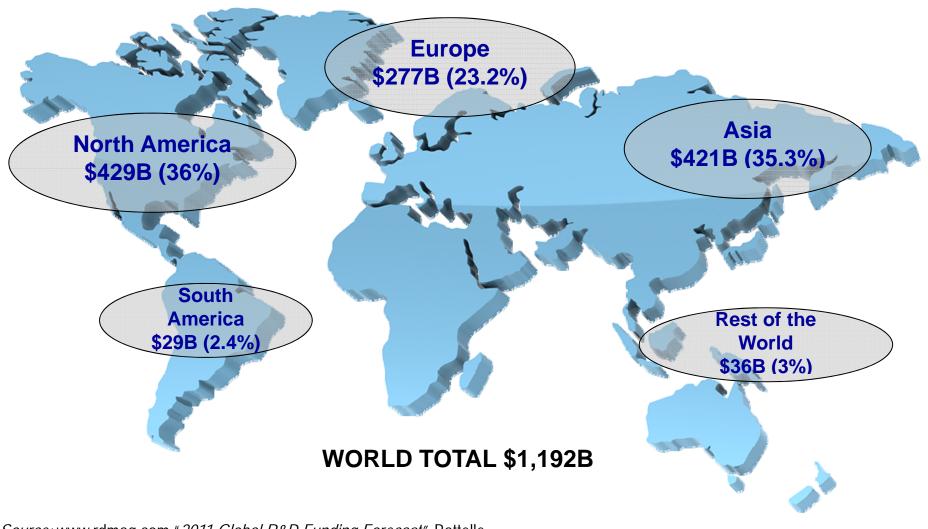


Key Challenge: Ensuring DoD's S&T Talent Edge



R&D Investments: 2011 Increasing Global Competition for S&T Talent

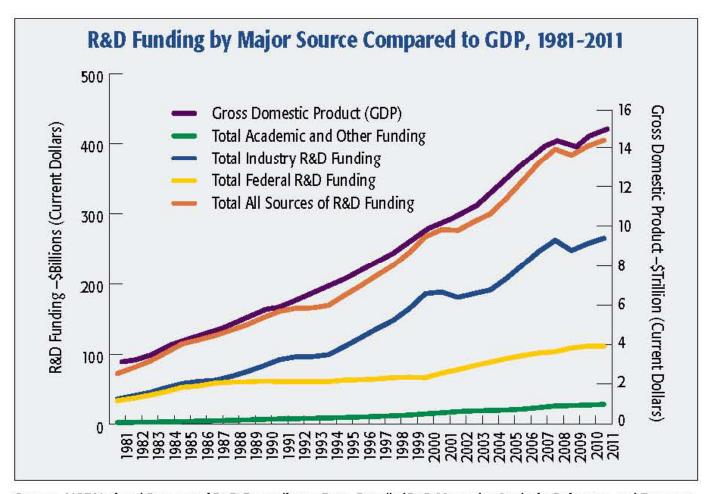






R&D Funding by Source





Source: NSF National Patterns of R&D Expenditures Data, Battelle/R&D Magazine Analysis, Estimates, and Forecasts

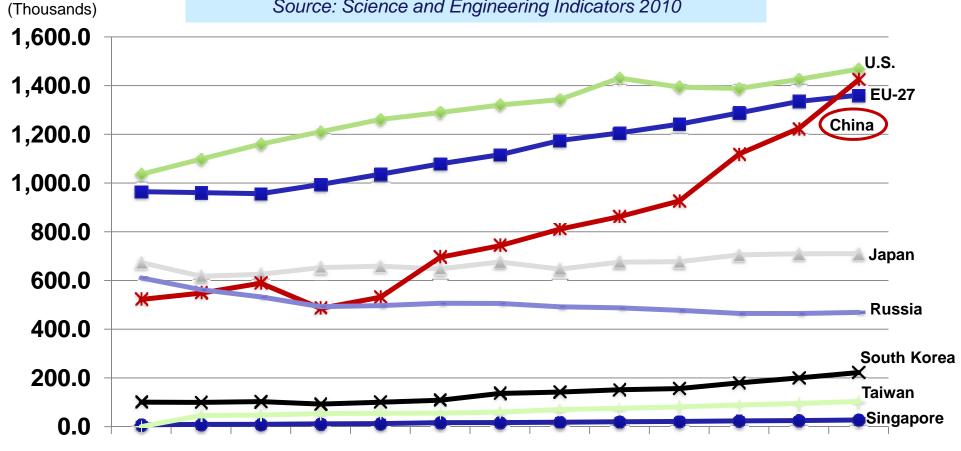


Global R&D: **Increasing Competition**



Estimated number of researchers in selected regions/countries/economies: 1995-2007

Source: Science and Engineering Indicators 2010

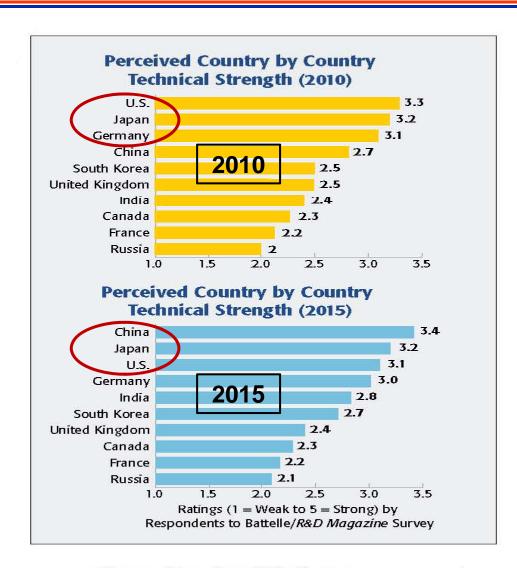


1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007



Battelle's 2011 Global R&D Funding Forecast





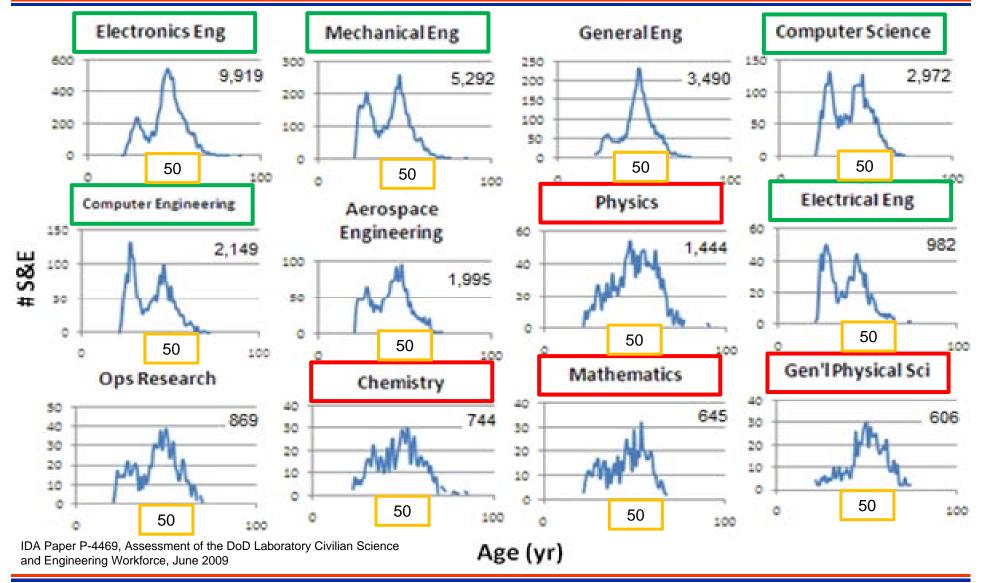
Perceived Countryby-Country Technical Strength

Given existing trends, R&D leaders believe that by 2015, China's technical strength will be greater than that of the US.



DoD's Aging Workforce







DoD Science, Technology, Engineering & Math Strategy



PRE-K & ELEMENTARY	JUNIOR HIGH	HIGH SCHOOL	BACHELORS	MASTERS	DOCTORAL	FACULTY
K-12 INFORMAL EDUCATION						
	TO THE		ASSURE			
			SE CAPS	STONE		
				SMART		
			HBCU / MSI PROGRAM			
				BASIC RESEARCH		
					NDSEG	
130 STEM Initiatives Over 1,700,000 K-12 students				NSSEFF		
	000 K-12 stude ergraduate and					PECASE
studentsApproximately 23,000 teachers and 300 faculty			Programs			



Integrated S&T Enterprise



