Transitioning S&T Programs

Defense Systems Acquisition Management Course
July 21, 2005

Mr. Bob Baker
Deputy Director, Plans and Programs
Office of Director, Defense Research and Engineering
A Focus on Revolutionary Advances

Stealth

Adaptive Optics and Lasers

GPS

Night Vision

Phased Array Radar
Outline

• The Need to Focus on Technology Transition Issues
• Capabilities Based Acquisition
• Focus of the DoD S&T Program
• Technology Transition Thrusts and Opportunities
  – DoD Best Practices
U.S. and Worldwide Research Base Since WWII

- U.S. Gov. – DoD
- U.S. Commercial
- E.U. and Japan
- Total

Source: Report of the Defense Science Board Task Force on the Technology Capabilities of Non-DoD Providers; June 2000; Data provided by the Organization for Economic Cooperation and Development & National Science Foundation
The Globalization of S&T

“In 2001, India graduated almost a million more students from college than the United States did. China graduates twice as many students with bachelor's degrees as the U.S., and they have six times as many graduates majoring in engineering. In the international competition to have the biggest and best supply of knowledge workers, America is falling behind.”

--"The World is Flat", Friedman, 2005

China had 15 companies on Forbes Global 500 list in 2004, up by 4 from the 2003 rankings.

India had only 1 company on the Global 500 in 2003. In 2004, there are 4 Indian companies.

IBM Global Services India unveiled its global delivery centre in Hyderabad on June 14, 2005, the fifth IBM center in India.

"The last 25 years in technology have just been "the warm-up act." Now we are going into the main event, and by the main event, I mean an era in which technology will truly transform every aspect of business, of government, of society, of life."

Carly Fiorina, Hewlett-Packard CEO
2004

China’s Gross Domestic Product is now 2nd in the world to the U.S.

For the first time ever, all members of China’s Politburo Standing Committee, the highest tier within the Communist Party, are card-carrying engineers.
Change in the Global Workforce

-Engineering PhD’s-

[S&E (Produced in US) vs S&E (US Cit) graph]
### Percentage of 24-year-olds with a Science or Engineering Degree

<table>
<thead>
<tr>
<th>Country</th>
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<td>Finland</td>
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<tr>
<td>United States</td>
<td>5.7%</td>
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**Source:** Money Magazine, Oct 2004, pg 124
“Some 220,000 students earned engineering bachelor’s degrees in China last year, and another 100,000 earned engineering PhDs……China now graduates more engineers than the United States, Japan and Germany combined.”

*IEEE Spectrum, June 2005

*Source: NSF, September 2003
The Pace of Technology Development

“Moore’s Law”  Computing doubles every 18 months

“Fiber Law”  Communication capacity doubles every 9 months

“Storage Law”  Storage doubles every 12 months

Defense Acquisition Pace

F-22  Milestone I: Oct 86  IOC: Dec 05*
Comanche  Milestone I: Jun 89  IOC: Sep 09

* Computers at IOC are 512 X faster, hold 65,000 X bits of information than they did at MS I

Technology growth is non-linear… Acquisition path has been linear
The Need to Transition Technology Early

Acquisition Community is Focused on Cost Reduction Throughout Life Cycle

Approximately 10% of LCC Spent in Life Cycle Cost (LCC) Determination

Approximately 90% of LCC Determined in System Development & Demonstration

S&T: Technology Opportunities & User Needs
The Requirement for Tech Transfer

- **15 USC 3710(a)**
  
  “(1) It is the continuing responsibility of the Federal Government to ensure the full use of the results of the Nation’s Federal investment in research and development.”

- **10 USC 2514. Encouragement of technology transfer**
  
  “(a) The Secretary of Defense shall encourage. . .the transfer of technology between laboratories and research centers of the DoD and other Federal agencies, State and local governments, colleges and universities, and private persons in cases that are likely to result in accomplishing the objectives set forth in section 2510(a) of this title. "

  “(b) The Secretary shall examine and implement methods. . .that are consistent with national security objectives and will enable Department of Defense personnel to promote technology transfer.”
The R&E Portal

- Provide **single-point access** to:
  - All current R&E electronic information
  - New E-gov database
  - R&E Points of Contact
  - News Service
  - DDR&E general information
  - Links to useful sites
  - ...and more....

- Be able to **intelligently search** all data

- Have **Single sign-on capability** (one password, multi-level security)

- Customer base: DoD R&E community (civil service, military, approved contractors)
The Challenge of Technology Transition

6.1 Basic Research
6.2 Applied Research
6.3 Adv Tech Dev
6.4 Adv Comp Devel & Prototypes
6.5 Engr/Manuf Development
6.6 Engr/Manuf Development
6.7 Op System Dev

“Perceptions” of the S&T Community
• S&T’s job is complete at the tech development stage
• Implementation of the technology is the customer’s (problem) responsibility
• The role of S&T is “tech push” — If it’s good technology — they will come!
• Development cycle for S&T is too long for most Acquisition and Warfighter customers
• Focus only on the technology and not on the business rationale for implementation

Key Impediments
• Budget: Lack of Transition Funds
• Transition Process Lacks Definition & Visibility
• Culture: Difference Goals & Timelines between S&T and Acquisition Managers
• Lack of Incentives (Performance shortfall is only driver)
Outline

• The Need to Focus on Technology Transition Issues
• Capabilities Based Acquisition
• Focus of the DoD S&T Program
• Technology Transition Thrusts and Opportunities
  – DoD Best Practices
A central objective of the Quadrennial Defense Review was to shift the basis of defense planning from a “threat-based” model that has dominated thinking in the past, to a “capabilities-based” model for the future. This capabilities-based model focuses more on how adversaries might fight, rather than specifically whom the adversary might be or where a war might occur. It recognizes that it is not enough to plan for large conventional wars in distant theaters. Instead the United States must identify the capabilities required to deter and defeat adversaries who will rely on surprise, deception, and asymmetric warfare to achieve their objectives.”
Acquisition Decision Support Systems In Transformation

Joint Capabilities Integration & Development System (JCIDS)
VCJCS/Service Chief Oversight

Defense Acquisition System
Milestone Decision Authority (MDA) Oversight

Planning, Programming, Budgeting & Execution Process (PPBE)
DEPSECDEF Oversight

CJCS 3170.01C 24 June 03
DoD 5000 Series 12 May 03 Revision

MID 913 PPBS to PPBE 22 May 03
Changes to Defense Acquisition Regulation

• DoDD 5000.1, The Defense Acquisition System
  – Rapid & Effective Transition From S&T to Products
  – Emphasis on Cost & Affordability in Program Development

• DoDD 5000.2, Operation of the Defense Acq. System
  – Identify S&T Solutions in Pre-Systems Acquisition
  – Reduce Technology Risks Before the Acquisition Process
  – Use Mechanisms with User & Acq. Customer to Ensure Transition
    > ATDs, ACTDs, Service & Joint Experiments

• DoD 5000.2-R, Procedures for Acquisition Programs
  – Establish Technology Readiness Levels (TRLs) for Critical Technologies

Why? “To create an acquisition policy environment that fosters efficiency, flexibility, creativity, and innovation”

Cancelled by DepSecDef Oct 2002
Additional DEPSECDEF Guidance
30 Oct 2002

• DepSecDef Issued Interim Guidance (~40 Pages):
  • Reaffirmed the Importance of Technology Transition
  • Reaffirmed Evolutionary Acquisition
  • Reaffirmed Technology Development as a Continual Process
  • Directed Continuation of Technology Readiness Assessments and Independent Technology Assessments (Milestones B/C)

DEPSECDF Intent: Streamline Acquisition, with increased flexibility for technology insertion
Evolutionary Acquisition and Spiral Development

Every Spiral Should Enhance Capability
Requirements Generation Shortfalls

Previous process:
• Did not develop requirements in the context of how the Joint Force would fight. Requirements tended to be more Service focused.
• Lacked overarching construct for objective analysis.
• Duplication existed between Services, particularly in the development of minor systems.
• Most system developments aimed for the 100% solution.  
  - Lead to lengthy fielding times.
• Lacked prioritization of Joint Warfighting demands.
• Capability gaps not identified and addressed.
Changes to Requirements Process

- Warfighter “owns” the” Requirements” Process
- Moving to Top-Down “Joint Capabilities Integration”
- Key Documents:
  - Joint Integrating Architecture (JIA) (Pre MS-A)
  - Initial Capabilities Document (ICD) (Pre MS-A)
  - Capability Development Document (CDD) (MS-B)
  - Capability Production Document (CPD) (MS-C)
  - Capstone Requirement Document (CRD)
New Process

**Old**
- Integrated by Combat. Cdrs.
- Systems
- Requirements
- Bottom up, stovepiped

**New**
- Strategic Policy Guidance
- Joint Operating Concepts
- Joint Functional Concepts
- Integrated Architectures
- Service Operating Concepts/Capabilities
- Joint Capabilities

**Systems Driven**

**Capabilities Driven**
Outline

• The Need to Focus on Technology Transition Issues
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• **Focus of the DoD S&T Program**
• Technology Transition Thrusts and Opportunities
  - DoD Best Practices
DDR&E Priorities for CY 2005

- Support Global War on Terrorism
- Support Transformation
  - Comprehensive S&T Review and Integrated DoD S&T Investment
  - National Aerospace Initiative, Energy and Power Technologies, Surveillance and Knowledge Systems
- Enhance Technology Transition
- Enhance National Security S&E Workforce
- Expand Outreach to Combatant Commands & Intelligence Community
Changing Security Environment - Four Challenges -

Irregular
- Unconventional methods adopted by non-state and state actors to counter stronger state opponents.
- (e.g., terrorism, insurgency, civil war, and emerging concepts)

Catastrophic
- Acquisition, possession, and use of WMD or methods producing WMD-like effects against vulnerable, high-profile targets by terrorists and rogue states.
- (e.g., homeland missile attack, proliferation from a state to a non-state actor, devastating WMD attack on ally)

Traditional
- Military capabilities and military forces in long-established, well-known forms of military competition and conflict.
- (e.g., conventional air, sea, land forces, and nuclear forces of established nuclear powers)

Disruptive
- International competitors developing and possessing breakthrough technological capabilities intended to supplant U.S. advantages in particular operational domains.
- (e.g., sensors, information, bio or cyber war, ultra miniaturization, space, directed-energy, etc)

Uncertainty is the defining characteristic of today’s strategic environment
Shift to “Transformational Technologies”
-Investment Priority Changes from PBR05 to PBR06-

Irregular
- IED Mitigation Technology
- Non-Lethal Weapons
- Chem Bio Defense

Catastrophic
- High Energy Laser / Directed Energy (Ballistic Missile Def.)
- Detection / Protection against WMD (CBRNE)
- Network Defense

Disruptive
- Hypersonic Flight & Weapons
- Fuel Cells / Energy and Power
- Nanotechnology
- Net Centric Warfare
- Autonomous Systems
- Assured Affordable Space Access with Distributed Satellites

Likelihood
- Lower
- Higher

Vulnerability
- Lower
- Higher
FY06 RDT&E Budget Request

FY06 RDT&E request = $69.36B (Budget Activities 1-7)

(BA6 + BA7 = $24.93B)

Science and Technology
(BA1 + BA2 + BA3 = $10.52B)

15% of RDT&E

Development
(BA4 + BA5 = $33.89B)

15% of RDT&E

Science and Technology
(BA1 + BA2 + BA3 = $10.52B)

15% of RDT&E

FY06 RDT&E Management Support ($3.77B)

BA7 Operational Systems Development ($21.16B)

BA6 RDT&E Management Support ($3.77B)

BA5 System Development & Demonstration ($19.75B)

BA4 Advanced Component Development & Prototypes ($14.14B)

BA3 Advanced Technology Development ($5.06B)

BA2 Applied Research ($4.14B)

BA1 Basic Research ($1.32B)
FY06-11 Cumulative Total = $231B
Approximately 23% of total Investment consumed by Top 10 Programs
FY06 DoD S&T Budget Request

Total FY06 S&T request = $10.52B
Technology Investment Compared to Other DoD Categories

The DoD Doesn’t “Fix” Today’s Problems by Reducing S&T
FY06 DoD S&T Budget Facts

• DoD FY06 S&T Request is $10.522B — roughly equivalent to PBR05 of $10.550B (in then year dollars)
  – Adjusted for inflation (2.0%), down about $240M from PBR05
  – Services account for S&T 52.2% of total DoD S&T request
  – FY05 DoD S&T appropriation was $13.057B

• S&T is 2.51% of the total Defense Budget Request (compared to 2.62% in FY05)
FY06 S&T Budget Highlights

• New Initiatives
  – **NDEP** (PE 0601120D8Z) – +$10M to build US citizen science, math and engineering workforce; +$160M over FYDP
  – **TRANSCOM S&T Funding** (PE 0603713S) – +$10M for quick-turn projects to enhance distribution and transportation systems; +$25M in FY06-07
  – **JCTDs** (PEs 0603648D8Z, 0604648D8Z, 0605648D8Z, 0902198D8Z) – Restructured ACTD process and realigned funding to enhance technology transition; +$40M in FY06, +$240M over FYDP
  – **Defense Acquisition Challenge** (PE 0604051D8Z) – Realigned to new PE under BA 5; $29M in FY06
• Increased funding for:
  ▪ Quick Reaction Special Projects, Rapid Reaction/New Solutions for GWOT (+$50M)
  ▪ Chem Bio defense (+$166M in BAs 1-3)
  ▪ Hypersonics (+$35M to Navy and Air Force in BA 3)
  ▪ Joint Experimentation (+23M)

• Moved J-UCAS from DARPA to Air Force to enhance transition opportunities
  ▪ $78M remains in Advanced Technology Development
S&T Strategy and Plans

Defense Science and Technology Strategy and Plans

- **Defense R&E Strategy** (Being Updated)
- **Basic Research Plan (6.1) - BRP** - (Biennial)
- **Defense Technology Area Plan (6.2, 6.3) - DTAP** - (Biennial)
- **Joint Warfighting Science and Technology Plan - JWSTP** (*Annual)
- **Defense Technology Objectives (DTO) Volume that supports JWSTP and DTAP** (Annual)
Basic Research Plan (BRP)

BRP-- A strategic plan to link longer term research to broad, revolutionary warfighter capabilities

• Basic Research Areas
  – Physics
  – Chemistry
  – Mathematics and Computer Science
  – Electronics
  – Materials Science
  – Mechanics
  – Terrestrial and Ocean Sciences
  – Atmospheric and Space Sciences
  – Biological Sciences
  – Cognitive and Neural Science

A Strategic plan guiding new technology development built around Basic Research Areas
Defense Technology Area Plan (DTAP)

- DTAP -- A detailed plan focusing DoD science on militarily significant technologies in specific functional areas

Example: DTO AP.08 Fighter/Attack Propulsion

An agreement between the S&T Community and Acquisition Customers
Defense Technology Area Plan

- Twelve technology focus areas in February 2005 edition:
  - Air Platforms
  - Chemical-Biological Defense
  - Nuclear Technology
  - Information Systems
  - Materials & Processes
  - Weapons
  - BioMedical
  - Battlespace Environments
  - Sensors, Electronics and Electronic Warfare
  - Space Platforms
  - Human Systems
  - Ground & Sea Vehicles

- Provides a horizontal perspective across Service and Defense Agency efforts, thereby charting total DoD investment for a given technology area.
FY06 Defense Technology Areas

- Air Platforms
- Biomedical
- Chemical/Biological Defense
- Ground and Sea Vehicles
- Human Systems
- Information Systems Technology
- Materials/Processes
- Nuclear Technology
- Battlespace Environments
- Sensors, Electronics, & Electronic Warfare
- Space Platforms
- Weapons

$ in Thousands

PBR 06
PBR 05
Joint Warfighting S&T Plan (JWSTP)

JWSTP-- Focus to blend emerging technology into warfighter needs

An agreement between Joint Warfighters and S&T Community

Required annually by Congress on 1 March

“a plan for ensuring that the science and technology program of the Department of Defense supports the development of future joint warfighting capabilities identified as priority requirements”
DDR&E implemented a new process for FY2005

Joint Capability Integration And Development System (JCIDS)

- Battlespace Awareness
- Command and Control
- Force Application
- Protection
- Focused Logistics
- Net Centric Ops
- Joint Training
- Force Management

...8 Joint Functional Concepts, Each Representing Both Near and Far Term Capability Needs

...7* Chapters in JWSTP, Each Aligned With Joint Functional Concepts / FCBs

*Force Mgmt Chapter in progress
Feb. 2005 JWSTP DTO Funding

Joint Functional Concepts

- Joint Training
- Net-Centric
- Focused Logistics
- Protection
- Force Application
- Command & Control
- Battlespace Awareness

Total FY06 DTO Investment: $666.7M

FY06 Funding ($ in millions)
Research and Engineering Goals

• Published in Feb 2005, the goals define higher priority items in three broad areas:
  – Process goals
  – Technical capability goals
  – Enabling technology goals

• Goals to advance near-term capability while maintaining a steady flow of technology options for the future force

• Basis for Comprehensive S&T Review
  – Two year cycle that is consistent with PPBE process
  – Odd years review consists of Investment Strategy Review and Assessment conducted by ODUSD(S&T)
  – Even years review consists of Technology Area Review and Assessments conducted by TARA teams
Research and Engineering Goals

-Process Goals-

- Focus on Transitioning Military Relevant Technology
- Support the Education of More Scientists and Engineers in Technical Disciplines Critical to the DoD
- Sustain an Investment in University Research
- Increase Emphasis on Near-term (under 2 years) Technologies and Far-term (>15 years) Technologies
- Archive and Reuse Information from the Global R&E Community (R&E Portal)
- Support Investment in Irregular, Catastrophic, and Disruptive Technology Development
- Improve Affordability Through Systems Engineering, DT&E, Process and Manufacturing Technology Enhancements
Research and Engineering Goals

- Technology Capability Goals -

• Cross Cutting Initiatives
  – National Aerospace Initiative
  – Energy and power technologies
  – Surveillance and knowledge systems

• Protection
  – Detect, identify, track and mitigate WMD
  – Extend the safe zones around bases and critical infrastructure with range of lethality
  – Provide effective cruise and ballistic missile defense

• Situation Awareness
  – Provide robust, reliable, survivable, and secure multi-level networks
  – Increase capability to find, fix, track and identify friendly and enemy forces

• Strike
  – Support fielding of alternative strike weapons (high speed)

• Force Sustainment
  – Reduce logistics or manpower demands
  – Enable rapid force projection and deployment

• Other
  – Reduce time and cost for space launch
  – Enhance realism, effectiveness, and accessibility of training
Research and Engineering Goals
-Enabling Technology Goals-

- Nanotechnology
- Biotechnology
- Unmanned and Autonomous Systems
- Quantum Communications/Computing Technology
- Networked Systems
- Advanced Materials
- Intellectual Capital (Workforce)
- DoD R&E Infrastructure
- Modeling, Simulation, Computation, and Software for Complex Systems
National Aerospace Initiative

**Hypersonics**
- Suborbital Vehicles
- Strategic Strike
- Fast Transport
- Time Critical Targets

**Access To Space**
- 2 Stage-to-Orbit
  - 1st Stage Air Breathing
  - 2nd Stage Rocket
  - Single Stage-to-Orbit

**Space Technology**
- Microsats
- Multifunctional Sats.
Energy and Power Technologies

POWER GENERATION
- Fuel Cells & Fuel Reforming
- Novel Power

ENERGY STORAGE
- Batteries
- Capacitors

POWER MANAGEMENT & CONTROL
- Switching & Conditioning
- Power Transmission & Distribution
- Thermal Management

New Operational Capabilities
- Electric Warship
- More Electric Aircraft
- Space Based Radar
- Electric/Hybrid Combat Vehicle
- Electric/Hybrid Weapons
- High Power Microwave

Power Needs
FY02
FY12
Surveillance & Knowledge Systems

• Network Coverage / Information Assurance
• Common Operating Picture/ Interoperability
• Sensors and Unmanned vehicles (Robotics, UAVs, etc.)
• Information / Knowledge Management Systems
• Cyber Warfare
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Best Practices: Services’ Response

All Services are moving their acquisition processes

FROM

S&T

TO

Acq

Right
• Technology
• People
• Time

Operational Requirements (Warfighter)
Army Transition Plans

Develop directive from senior stakeholders requiring:
• Transition plans synchronized/supported in S&T & PM budgets
• Achievement of key Technology Readiness Levels as an exit criteria
• Use of affordability as an exit criteria
Army ATD Management Plans
Accelerating Transition

- Coordinated and Documented partnership between Warfighting Customer, Technology Developer and Acquisition Buyer
- Proposed by Technologists and Tacticians
- Approved by GO/SES
  - HQ TRADOC Combat Developer
  - HQDA Chief Scientist
  - HQDA, G8 Force Development
  - PEO/PM

Commitments to Transition needed Technology as Fast as Possible
Navy FNC IPT Approach

• Industry Board of Directors Model

• Principal Members:
  – **Chair** -- Requirements community -- Office of Chief of Naval Operations (OPNAV)/Marine Corp Combat Development Center (MCCDC)/Fleet/Force rep.
  – **Transition Lead** -- Acquisition community -- Systems Command (SYSCOM)/Program Executive Officer (PEO) rep.
  – **Execution Manager/Technical Working Group Leader** -- S&T community rep.
  – **Executive Secretary** -- S&T Resource Sponsor Rep.
12 Future Naval Capabilities (FNCs)

- Time Critical Strike
- Organic Mine Countermeasures (MCM)
- Autonomous Operations
- Littoral Anti-Submarine Warfare (ASW)
- Electric Warship and Combat Vehicle
- Littoral Combat/Power Projection

- Total Ownership Cost
- Missile Defense
- Capable Manpower
- Warfighter Protection
- Fleet Force Protection
- Knowledge Superiority and Assurance
Tech transition process should be a 3-legged stool
- AFRL, Product Centers, and Users

Recurring participation at senior levels is mandatory
- MAJCOM/CVs, Product Center/CCs, and AFRL/CC

Funding commitments for both S&T and transition program development are the key to technology transition

Process Focuses on Advanced Technology Demonstration (ATD) Programs

Developing an Air Force Instruction to standardize procedure
Air Force ATC

**Basic Research**
- 6.1

**Applied Research**
- 6.2

**Adv. Technology Development**
- 6.3

**Demonstration & Validation**
- 6.4

**Engr. & Mfg Development**
- 6.5

**Lab (++)**
- Identifies ATD Candidates
- Budgets for Technology
- Develops Transition Strategies

**Product Center (+++)**
- Interprets Requirements
- Builds the Transition Program
- Integrates Technology into Systems

**MAJCOM (+++)**
- Defines Requirements
- Budgets for Development & Production Funds

**ATD Categories**

**Category 1:**
- Warfighter Supports & POMs for Transition

**Category 2A:**
- Warfighter Committed To Work in POM Cycle

**Category 2B:**
- Warfighter Supports But Is Unable to POM for Transition At This Time

**Category 3:**
- Warfighter Does Not Support

- 28 Probes
- 2 Bats
- 9 Moths
- 21 Mice

- 28 Probes
- 2 Bats
- 9 Moths
- 21 Mice
ACTD Projects Positioned between S&T & Acquisition

Filling the Gap between S&T and Acquisition for the CoCom Customer

Advanced Concept Technology Demonstration

“Try before you buy”

S&T

ACTD Is a Transition Program

Acquisition & Logistics

“The 80% Solution”

71% of all ACTDs transition at least one product into a warfighting capability

Transition programs are not acquisition programs, and should not be science projects
Joint Capability Technology Demonstration (JCTD)

- Improves ACTD process/replaces ACTDs over next 3 years (Oversight--not Program Management)
- Designed to speed transformational, joint and coalition capabilities
- Works with combatant commands to identify solutions emerging/validated needs
- Partners with services/agencies to push technology solutions
- Final demonstration phase reached in two years for most JCTDs
- Majority of JCTD start up and transition costs centrally funded in DDR&E/AS&C

**Transformational**

The SPARTAN ACTD demonstrates a multi-mission unmanned surface vessel (USV) capability that will can transform the way our forces provide ship/harbor security.

**Joint**

U.S. Army, Navy, and Air Force are working with UK on the Network Centric Collaborative Targeting ACTD to horizontally integrate intelligence, surveillance, and reconnaissance platforms for target identification and geolocation.

**Coalition**

Pakistani troops deploying for Tsunami relief effort with help from Coalition Theater Logistics ACTD

“We are encouraged by recent actions taken by DOD to initiate a Joint Capabilities Technology Demonstration business process as it is intended to meet joint and coalition forces needs we have outlined.” GAO--Michael Sullivan, Director Acquisition & Source Mgt, HASC sub-committee on Tactical Air and Land Forces Subcommittee, 9 March 2005.
Quick Reaction Special Projects (QRSP)

• Technology Transition Initiative – For DoD S&T Community
  - Establishes a Technology Transition Council
  - Jump starts selected components/subsystems into systems
  - Bridges the “Valley of Death”

• Quick Reaction Fund
  - Provides flexibility to respond to emergent DoD needs within budget cycle
  - Takes advantage of technology breakthroughs in rapidly evolving technologies
  - Completion of projects within a 6-12 month period

• Rapid Reaction Fund
  - Develops, procures, tests, and fields critical force protection needs in Iraq
  - Enhances force protection to counter Improved Explosive Devices (IEDs)
## QRSP Funding Profile (PE 0603826D8Z)

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<th>FY 05</th>
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<th>FY 08</th>
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Example of Quick Reaction Efforts - Thermobaric Weapons

Rapid Technology Transition

- A “Quick Reaction” type development, enabled by base S&T program and ACTD Framework
- Chronology: Program Approved 21 Sept
  - Small Quantity Lab Testing – Oct 01
  - Full Up Static Test – Nov 17
  - Flight Tested - Dec 14
- Funding: Approximately $6M

Theory ➔ Weapon

3 months
Independent Research & Development (IR&D)

**DoD/Industry Interaction**

**DoD**
- Provide information on DoD's R&D activities & plans, mission needs, & operational requirements
- Review IR&D activities and provide feedback to contractors
- Review IR&D database to identify IR&D of interest

**Industry**
- Plan, fund, and conduct IR&D
- Provide technical information about IR&D
- Provide IR&D project descriptions

**Example: Army After Next**

- Program efforts in areas of battery technology, hybrid electric vehicle programs, and energy storage technologies
- Estimate savings: $50M
**Objective:** Improve Affordability of DoD Systems by Investing in New & Improved Manufacturing Processes & Equipment Across The Weapon System Life Cycle

**Program Attributes**
- Improve Cycle Time & Process Capabilities
- Demonstrate Key Information Technologies
- Adopt Best Commercial Practices for Military Applications

**Example: Optics Manufacturing**
- Optics Processing Was Labor Intensive
  - Artisan Based
- Industry Was Moving “Off Shore”
  - Processing uses CNC Machines
  - U.S. has become a world leader
  - 5x grinding + 4x better surface = 4x faster polishing
More Changes on the Way

- QRD 2005 looking at changes to the Acquisition process
- DEPSECDEF Memorandum dated June 7, 2005
  - Growing concern within Congress and DoD
  - Programs continue to increase in cost and schedule
  - Authorizes an assessment to consider every aspect of the Acquisition process
  - Output is to be a recommended structure and process with clear alignment of responsibility, authority, and accountability
  - Simplicity is desirable

Example: Increase the trade space between cost, schedule, and performance. What would the warfighter say if the PM said, “I’ll deliver 80% of the requested performance, in half the time, and for 70% of the cost?”
Bottom Line: Warfighter Confidence

Right Materiel, Right Place, Right Time, at the Right Cost - All The Time
Technology Readiness Levels (TRLs)

Background

- Inclusion in DoD 5000-Series Acquisition Documents
- Defense S&T Advisory Group Recommended Establishment of a TRL IPT
  - Develop a framework and guidelines for consistent implementation

Consensus: Proper Use of TRLs Provides Effective Acquisition Assessment Tool
Measuring Technology Maturity
Technology Readiness Levels

- **TRL 9**: Actual system “flight proven” through successful mission operations
- **TRL 8**: Actual system completed and “flight qualified” through test and demonstration
- **TRL 7**: System prototype demonstration in a operational environment
- **TRL 6**: System/subsystem model or prototype demonstration in a relevant environment
- **TRL 5**: Component and/or breadboard validation in relevant environment
- **TRL 4**: Component and/or breadboard validation in laboratory environment
- **TRL 3**: Analytical and experimental critical function and/or characteristic proof-of-concept
- **TRL 2**: Technology concept and/or application formulated
- **TRL 1**: Basic principles observed and reported

As Defined in 5000.2-R