Transitioning
S&T Programs

Defense Systems Acquisition Management Course
March 6, 2003

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Plans and Programs
If a great technology is developed in the lab but no one uses it, does it make a difference ....
Overview

• Why Focus on Transition Issues?
• DoD Best Practices
  – Army
  – Navy
  – AF
  – DoD-Wide
• Technology Readiness Levels
• Technology Transition Thrusts and Opportunities
• Industry Role
• Summary
U.S. and Worldwide Research Base Since WWII

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
Speeding Technology Transition
“The Challenge”

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

“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
Why Transition in S&T?

Acquisition Community is Focused on Cost Reduction Throughout Life Cycle

- Approximately 10% of LCC Spent
- Approximately 90% of LCC Determined

Life Cycle Cost (LCC) Determination

Cumulative Percent

A: Pre-Systems Acquisition  B: Concept & Technology Development  C: System Development & Demonstration

- Production & Deployment
- Operations & Support

S&T: Technology Opportunities & User Needs
The Challenge: Technology Pace

“Moore’s Law”  Computing doubles every 18 months

“Fiber Law”  Communication capacity doubles every 9 months

“Disk Law”  Storage doubles every 12 months

Defense Acquisition Pace

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Milestone I:</th>
<th>IOC:</th>
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<td>F-22</td>
<td>Oct 86</td>
<td>Dec 05*</td>
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<td>Jun 98</td>
<td>Sep 09</td>
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* 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
The 5000 Model

- Process entry at Milestones A, B, or C (or within phases)
- “Entrance criteria” met before entering phase

Relationship to Requirements Process

- All validated by Requirements Authority
- Increment 2
- Increment 3
Evolutionary Acquisition and Spiral Development

Every Spiral Should Enhance Capability
Best Practices

All Services are moving their acquisition processes

FROM S&T TO Acq

Right
• Technology
• People
• Time

Operational Requirements (Warfighter)
Critical Mass

But we need this...

Programs below critical mass were never ready for transition
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
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.
Air Force
Applied Technology Council (ATC)

- 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


Category 1: Warfighter Supports & POMs for Transition
Category 2A: Warfighter Committed To Work in POM Cycle
Category 3: Warfighter Does Not Support

Lab (++)  Product Center (+++)  MAJCOM (+++)
- Identifies ATD Candidates
- Budgets for Technology
- Develops Transition Strategies
- Interprets Requirements
- Builds the Transition Program
- Integrates Technology into Systems
- Defines Requirements
- Budgets for Development & Production Funds

ATD Categories

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

28
21
9
2

ATC
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 Metrics

<table>
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<tr>
<th>FY01</th>
<th>FY02</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
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<tr>
<td>Recoil Mitigation Demo</td>
<td>ETC Propellant Demo</td>
<td>Seeker/G&amp;C High-g Demo</td>
<td>Propulsion Demo</td>
<td>Multi-Mode WHD</td>
<td>Recoil Mitigation Demo</td>
<td>Seeker/ G&amp;C Multi-Mode WHD</td>
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<tr>
<td><strong>METRICS:</strong> Cannon • 50% reduced recoil force w/Fire-out-of-battery modified M35 cannon w/ETC ignition</td>
<td><strong>METRICS:</strong> Sub Scale firings of Gen II. Model to validate launch velocity. Full Scale Firing With Adv JA2. Validate integration</td>
<td><strong>METRIC:</strong> MP-ERM: • 18k g’s air gun test • Cargo: 20k g’s air gun test</td>
<td><strong>METRICS:</strong> Fire Full Scale Case Telescoped Ammo, Demo M829A2 + 20% performance</td>
<td><strong>METRICS:</strong> L/D=1 (vs 1.7) • EFP • 25% increase in armor penetration</td>
<td><strong>METRICS:</strong> &lt;80K lbs hardstand firing of KE slugs</td>
<td><strong>METRICS:</strong> • P_acq/Enc via Integ Projectile Guide to Hit gun launch to 10km</td>
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<tr>
<td>FY01</td>
<td>FY02</td>
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<tr>
<td>Cannon</td>
<td>ETC</td>
<td>Seeker/G&amp;C</td>
<td>Propulsion</td>
<td>Multi-Mode</td>
<td>Recoil</td>
<td>Seeker/</td>
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**Multi-Role Armament & Ammunition**
Army - Providing Rigor In Technology Transition Management

GAO [http://searchpdf.adobe.com/proxies/2/16/11/77.html]


Technology Readiness -- Best Practices

- Technology Readiness Levels (Maturity)
  - 1 - Requirements
  - 2 - Risk
  - 3 - Technology Readiness Levels (Maturity)
  - 4 - Product Requirements
  - 5 - GAO Recommended Transition Point
  - 6 - Technology Transition

- GAO Recommended Transition Point
  - 7 - Prototype demo (operational env.)
  - 6 - Prototype demo (relevant env. outside lab)
  - 5 - Breadboard validation (relevant env. outside lab)
  - 4 - Breadboard validation (laboratory environment)
  - 3 - Characteristic proof of concept

- Technology Readiness Levels synchronized with FCS Schedule
  - TRL 5 Components/ Subsystems by PDR (FY03)
  - TRL 6 Components/ Subsystems by CDR (FY04)
  - TRL 6 System of System Demonstration by end FY05

Army S&T IS using TRLs
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

As Defined in 5000.2-R
Dimensions to Technology Transition

- Rate of Technology Change is Increasing
- Capabilities-based Planning Changes Requirements/Needs Process
- Acquisition Excellence and Spiral Insertion Provides New Transition Model
- Availability of Commercial Technology Increasing; Need to use to Maximum Extent
- Try Before Buy
- Fail Small, Fast, Early

Multiple Dimensions Mean Multiple Solutions Needed
Transition Thrusts

**SYSTEM / COMPONENT DEVELOPMENT**
- Quick Reaction Projects (less than 12 months)
- Advanced Concept Technology Demonstration (1-5 years)

**SYSTEM ACQUISITION**
- Warfighter Rapid Acquisition Fund
- Spiral Acquisition

**CONCEPT EXPLORATION**
- Joint Experimentation
- Modeling & Simulation

**COMMERCIAL EXPLOITATION**
- Building Partnerships
- Venture Capital Fund
SPEED OF TECHNOLOGY CHANGE

QRSP was established in FY 03 at $25.4M

FY 2003 Congressional language directed 3 elements to accelerate technology transition

• **Defense Acquisition Challenge Program**
  Provides opportunities for inserting innovative and cost-saving technology into acquisition programs
  Funds used only for review and evaluation of proposals, *not* implementation

• **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

• **Technology Transition Initiative**
Objective
Speed Rapid Technology Development

Technology Maturity

Quick Reaction Fund
Technology Transition Initiative
Defense Acquisition Challenge

Idea/Technology Opportunity
Transition To Planned/Fielded System
Improve Subsystem → Program of Record

Three Complementary Projects to Develop Technology at Different Maturity Levels
QUICK REACTION FUND
PROGRAM DESCRIPTION

• Initiate high priority or high leverage technology efforts during the execution year

• Provide opportunity to execute within technology cycle in rapidly maturing technology

• Provide flexibility to respond to emergent DoD issues and address surprises and needs in real time
  – Technology matures in less than a year in some areas
  – Responds to technology opportunities in major acquisition programs

• Address cycle time discontinuity between DoD-programming and execution for rapidly evolving civil sectors
Examples of Quick Reaction Efforts

**Thermobaric Hellfire Enhanced Capability**

Chemistry to the Field in one year - Increased Blast Lethality in Multi-Room Structures
- Rapid Reaction to War Fighter Need; start Jan 02
- Form/Fit/Function Drop-In Warhead Section
- Unique Enhanced Explosive Formulation (metal augmented charge)
- Retains Effectiveness in Remaining Hellfire Blast-Frag Target Set
- Available for possible global war on terrorism

**Low-Cost Imaging Rocket (LOGIR)**

Making 2.75” Rocket Smart – Fire and Forget
- Rapid reaction to integrate precision guidance with developing weapon; start May 02
- Improve ability to kill moving and fixed targets
- Reduce warfighter exposure while increasing success
- Increase lethality while reducing collateral damage
- First flight Jan 03; Complete System ~4QFY03
Examples 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
Technology Transition Initiative
Program Description

• Addresses the gap between the time a technology is demonstrated and the time it gets fielded
• Established by section 242 of the FY 2003 Defense Authorization Act
• Establishes a Technology Transition Manager
• Establishes a Technology Transition Council to provide advice and assistance to the Technology Transition Manager.
  – Science and Technology Executives from each military department and each Defense Agency
  – Acquisition Executives from each military department
  – Members of the Joint Requirements Oversight Council
Technology Transition Initiative Summary

- Promising technological improvements can languish for years waiting for acquisition and operational funding. Technology Transition Initiative (TTI) is the first step toward addressing these challenges.

- TTI provides “seed” funding to accelerate transition of new technology into operational capability.

- Projects will be implemented by a Military Department or Defense Agency.

- OSD to contribute at least 50% of cost from the Technology Transition Initiative Fund
Defense Acquisition Challenge Program
Program Description

• Authorized by Title 10, USC, Sec 2395b, the Defense Acquisition Challenge Program (DACP) provides increased opportunities for the introduction of innovative and cost-saving technologies into DoD acquisition programs.
Defense Acquisition Challenge Program Schedule

• **FY 2003/2004 Program Process/Schedule**
  – Release of Broad Area Announcement – 15 March
  – Receipt of draft vendor proposals – 1 April
  – Receipt of final vendor proposals – 2 June
  – OSD level Review Panel – 3-5 June
  – Funding of selected FY 2003 DACP projects – 1 August

• **FY 2005/2007 Program Process/Schedule**
  – Biannual solicitation, appraisal, selection and execution process continued
Defense Acquisition Challenge

- Pilot Process

BAA Released
(Target is 15 Mar 03)

Unsolicited Proposals
(no timeline)

Summary Proposals
Submitted via website

Submitter Notified

Admin Review

No

Yes

Submitter Notified

Will refer submitters to other programs as applicable

Review Panel
Subject Matter Experts

No

Yes

Proposal Worthy

Submitter Notified

PEO/PM/Prime/
OSD REVIEW
Against Challenge criteria
(3-5 June)

Final Proposals
Submitted via website
(Due 2 June)

OSD Prioritization & Selection

No

Yes

Submitter Notified

Feedback w/PM/PEO/Prime Guidance & concurrence w/test & transition plans/strategies, cost

Submitter notified
Teamed with target program

Submitter & PM Notified
Challenge Project Started
(approx 1 Aug)

No

Yes

OSD Notified

Report Annually to Congress
Defense Acquisition Challenge Program
Summary

• This program will provide companies, not already part of the recognized defense industrial base, an opportunity to introduce their innovative technologies into the defense acquisition program.
DoD Technology Transition Programs

Initial Product/Process Capability → Product/Process Development → Product/Process Insertion → Product/Process Improvement & Sustainment

Dual Use Science & Technology (DUS&T)

Small Business Innovative Research - SBIR

Manufacturing Technology - ManTech

Title III / Defense Production Act

Independent Research & Development *

Additional Info: www.dtic.mil/ott

* Leveraged Industry Funding
Dual Use Science & Technology (DUS&T)

**Objective** - Partner with Industry to Jointly Fund the Development of Dual Use Technologies Needed to Maintain DoD’s Technological Superiority on the Battlefield & by Industry to Remain Competitive in the Marketplace

**Basic Tenets:**
- Cost sharing between the Military Services & Industry (Traditional and Non-Traditional)
- Use of “Other Transactions” in lieu of standard contracting to attract commercial firms
- Formation of partnerships with industry to develop dual use technologies

**Example:** Active Brake System for the HMMWV & Commercial Trucks

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

Example: Optics Manufacturing

1990
- Optics Processing Was Labor Intensive
  - Artisan Based
- Industry Was Moving “Off Shore”

2000
- Processing uses CNC Machines
- U.S. has become a world leader
- 5x grinding + 4x better surface = 4x faster polishing
Defense Production Act / Title III

Purpose: Create, expand, modernize, and maintain domestic production capacity for essential items and industrial resources needed for national defense

Incentives to Industry:
- DoD shares cost of capital investments
- Process improvements
- Material qualification
- Purchase commitments

Example: Gallium Arsenide Wafers

- Wafer prices reduced by 40%
- U.S. producers global market share increased from 25% to 60%
- Systems using GaAs - Cheaper, more reliable, and more capable
Small Business Innovation Research (SBIR)

- Stimulates Technological Innovation
- Increases Small Business Participation in Federally Funded R&D
- Encourages Commercialization of Technology

**FY00 Funding**
- Federal Agencies: $1.1B
- DoD: $564M
- DUSD(S&T): $26M
  - Cognitive Readiness
  - Advanced Distributed Learning
  - Smart Sensor Web
  - Biomedical Programs

**Program Phases**
- **Phase I:** Six months/$100,000 (feasibility study)
- **Phase II:** Two years/$750,000 (prototype development)
- **Phase III:** Commercialize for military & private sector markets

**Example: Acoustic Mouthpiece Using Terfenol-D**
- Low Voltage Transducer Embedded Inside a SCUBA Diver's Mouthpiece
- Allows Diver to Hear Through Dental Sound Conduction
- Capability Will Be Available for Special Forces Divers Without Full Face Masks
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
Bottom Line: Warfighter Confidence

Right Materiel, Right Place, Right Time, at the Right Cost - All The Time