Impact of Technology on Future Defense

F. L. Fernandez

Outline

- **Describe DARPA and its technology investments**
  - **Major focus areas**
  - **Budget details**
  - **DARPA process**
- **Suggest a major change in overall science and technology investment and management paradigm**

Chain of Command

SECRETARY OF DEFENSE

UNDER SECRETARY OF DEFENSE (ACQUISITION, TECHNOLOGY & LOGISTICS)

DIRECTOR, DEFENSE RESEARCH & ENGINEERING

DIRECTOR, DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

DARPA Mission

Change Leader for the Department of Defense

- **Solve National-level problems**
- **Enable Operational Dominance**
- **High-Risk, High-Payoff Technology Development and Exploitation**

DARPA's Role

DARPA		SERVICE R&D
Bottom-up, opportunity, event-driven	★	Top-down, requirement, schedule-driven
Great process flexibility	★	Highly formalized processes
Integrated research	★	6.1 - 6.5 research separated
Radical change	★	Reliable, sustainable gains
Central DoD agency for R&D	★	Support Service mission
Planned product obsolescence	★	Planned product improvement
FY01 funding ($2.0B) is 22% of all S&T funding	★	FY01 funding ($5.2B) is 57% of all S&T funding

The DoD requires both radical innovation and requirements-based R&D

Some Current Focus Areas

		FY 2001
National-Level Problems	**292.0**	**14%**
• Protection from Biological Attack		9%
• Protection from Information Attack		5%
Operational Dominance	**819.9**	**41%**
• Affordable, Precision Moving Target Kill		7%
– Offensive and defensive		
• Dynamic Command & Control		11%
– Mobile Networks		
– Near-Real-Time Planning, Replanning		
• Future Warfare Concepts		23%
– Hard and Deeply Buried Target Classification		
– Combined Manned, Unmanned Operations		
▪ UCAV (AF, N); FCS (Army)		

Some Current Focus Areas
Continued

		FY 2001
High-Risk, High Payoff Technology Exploitation	**784.7**	**39%**
• Information Systems		12%
• Electronic Systems		10%
• MEMS		3%
• Materials Technology		10%
• Beyond Silicon CMOS/Biology Integration		4%
Other	**117.9**	**6%**

Budget Details

- **National-level and high-risk technologies work represents 53% of DARPA's budget for FY01**
- **DARPA's work on national-level problems and high-risk technologies constitutes critical fractions of DoD's total S&T expenditures:**

  For example:

  - **Chemical/Biological Defense 53%**
  - **Information Systems /Technology 43%**
  - **Sensors and Electronics 39%**
  - **Materials/Processes 30%**
- **41% of DARPA's budget is directly devoted to military operations**

Focus Area Identification

Three strategic areas have been identified:

- **National-Level Problems**
- **Operational Dominance**
- **Technology Exploitation**

Based on technical input, DARPA Management determines the focus areas that DARPA should address.

Sources of expertise include:

Operational Dominance	National-Level Problems	Technology Exploitation
CINC Recommendations	Defense Planning Guidance	Defense Science Board
Individual Svc Leadership	Defense Science Board	JASONs
Defense Science Board	Security Agencies	Univ. Research Results
Defense Planning Guidance		Nat'l Acad of Sciences
		Office of S & T Policy

Program Selection

- DARPA's primary mission is to effect Revolutionary Change
- Applications or extensions of existing technology are rarely if ever approved for DARPA funding
- There is no set funding level or percentage for any focus area
- DARPA programming is bottom-up
- DARPA Management evaluates:
  - Program goals and objectives
  - Program structure and content
  - Whether a program concept represents a Revolutionary versus Evolutionary change

Fundamental Changes

- **Proliferation of previously controlled technologies**
  - **Probable deployment of missile defense capability**
- **Global emergence of new, threatening technologies**
  - **DoD S&T must catch-up to rest of world**
  - **DoD S&T must interface with existing civilian infrastructure**
- **Global availability of technology for command & control infrastructure**
  - **DoD S&T must react to unanticipated developments**

Many of the technologies that can deal with these changes are not controlled by DoD nor can DoD manage the pace of development

Current Science & Technology Process

- **DoD S&T investment and management is focused inward**
  - **Policy and planning primarily oriented towards internally subsidized investments**
  - **Presumes knowledge and control of all critical technologies**
    - **Sub-critically funded**
  - **Budget constraints often result in "PowerPoint S&T programs"**
    - **Limited intellectual gene pool**

Fragmented, stove-piped S&T investment and management paradigm wastes already scarce resources

A Proposed S&T Investment Strategy

- **DoD cannot expect to**
  - **Completely control where, when and how future defense critical technologies will emerge**
  - **Have ample warning of the application of emerging technologies to national security threats**
- **DoD must**
  - **Understand global technologies**
  - **Move faster than our enemies to exploit opportunities and counter threats**
- **DoD S&T must**
  - **Advance military-unique technology to maintain excellence**
  - **Provide global understanding and rapidly react to unanticipated change**

DoD S&T is at the intersection of military-unique and other global technology changes, with investment resources to provide access to these changes

DoD needs a Chief Technology Officer!

- **Exceptional grasp of global technology**
- **Has direction authority over all DoD S&T resources**
- **Is Secretary's focal point for technologies needed to enable force transformation**
- **Is major interface with JCS on technical matters**
- **Is major DoD interface with other Federal, state and local agencies**
- **Advises Secretary of emerging technologies and policies, plans and programs to use S&T resources to leverage these technologies**

DoD CTO will elevate importance of S&T and attract top-notch people to public service

Summary

- **Major changes in national security environment will be driven by globally available technology**

- **These require a major change in the DoD S&T investment and management model**
  - **Focus on both requirements and technology opportunity**
  - **Elevate role of technology in DoD**

- **DARPA can help lead this change**