Army Science and Technology

NDIA
9th Annual Science & Engineering Technology Conference

15 Apr 2008

Dr. Thomas H. Killion
Deputy Assistant Secretary
for Research and Technology/
Chief Scientist
Outline

• Army Science and Technology (S&T) Strategy and Funding
• Future Force Technologies
• Future Combat Systems
  – Spinouts to the Current Force
• S&T Insertions to Current Operations
• Basic Research Thrusts
I've been asked to give a presentation at the trade show.

I'd like you to put that together for me, Alice.

What's your topic?

Technology. They didn't say if I'm for it or against it.

I'll leave some wiggle room.
Science & Technology for a Campaign Quality
Army with Joint & Expeditionary Capabilities

**Current Force**
- ~100 lb. load
- Limited network
- > 70 tons
- < 10 mph

**Future Force**
- < 40 lb. load
- Fully networked
- < 30 tons
- > 40 mph

**Enabling the Future Force**
Science and Technology—develop and mature technology to enable transformational capabilities for the Future Force while seeking opportunities to accelerate technology directly into the Current Force

**Enhancing the Current Force**
Elements of Army S&T Strategy

- Ensure investments are aligned with Army missions and capability needs
- Maintain balanced & responsive portfolio across
  - Elements of investment (6.1/6.2/6.3)
  - Disciplines and technology areas
  - Performers (intramural/extramural)
  - Capability pull and technology push
- Sustain critical infrastructure—people and physical—responsive to Army needs
  - Communicate S&T vision and approach to senior decision makers, key stakeholders, partners and customers
  - Establish and refine processes and metrics to promote innovation, efficiency & effectiveness, and facilitate transition
**FY09 Funding—Research to Systems**

3 Different Types of S&T Investments

<table>
<thead>
<tr>
<th>S&amp;T</th>
<th>Development (RDT&amp;E)</th>
<th>Acquisition (Procurement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.8B</td>
<td>$8.7B</td>
<td>$24.6B</td>
</tr>
</tbody>
</table>

### 6.1: Basic Research
- $379M (21% of S&T)

- **Nanoscience**
  - Atomic Structures—Integrated Circuit
  - Understanding to solve Army-unique problems
  - Knowledge for an uncertain future

### 6.2: Applied Research
- $724M (39% of S&T)

- Integrated Textile Conductors
- Embedded Input Device
- Power Transmitting Textiles
- Embedded Circuits
- Applications research for specific military problems
- Components, subsystems, models, new concepts

### 6.3: Advanced Technology Development
- $739M (40% of S&T)

- Precision Air Drop—50 meters
- Demonstrate technical feasibility at system and subsystem level
- Assess military utility
- Path for technology spirals to acquisition—rapid insertion of new technology

67% Universities/Industry

35% Industry

60% Industry

<table>
<thead>
<tr>
<th>Far Term</th>
<th>Mid Term</th>
<th>Near Term</th>
</tr>
</thead>
</table>

High Technology Army
Technology Area Investments to Satisfy Gaps—New Capabilities

FY09 $1.8B

**Force Protection**
$370M

**ISR** $149M

**C4** $144M

**Lethality** $161M

**Medical** $140M

**Soldier** $135M

**Logistics** $92M

**Rotorcraft** $72M

**Unmanned Vehicle** $54M

**Classified** $62M

**Mil Eng & Environment** $47M

**Advanced Simulation** $37M

**Basic Research** $379M

---

**6th Gap Analysis**

1. Protect Force in Counterinsurgency Operations
2. Networked Enabled Battle Command
3. Logistics and Medical in Counterinsurgency Operations (COIN) and non-contiguous battlespace
4. Soldier Protection in Counterinsurgency Environment
5. Tactical Communications
6. Joint Interoperability, Coalition, and Interagency Operations
7. Train the Force How and As it Fights
8. Timeliness of Analysis and Information Dissemination
9. Ability to Conduct Joint Urban Operations
10. Information Operations

---

**Future Force Capability Gap Areas**

1. Modular, Scalable and Tailorable Battle Command and Control
2. Strategic Force Projection / Intra-theater Operational Maneuver and Sustainment
3. Dynamic, Uninterrupted Communications Network
4. Capability for Lethal / Non-Lethal Overmatch
5. Modular, Tailorable Forces
6. Enhanced Collection, Exploitation and Dissemination
7. Enhanced Soldier Protection
8. Sustainment of Modular Forces
9. Enhanced Platform / Group Protection
10. Ability to Train the Force How and As it Fights
Future Force Technologies

**Force Protection**
- Structural Armor
- KE Active Protection System
- High Energy Laser
- Integrated Rotorcraft Protection

**C4/ISR**
- Knowledge Fusion
- Flexible Displays
- Tactical Network & Communications Antennas
- Directional Antennas

**Advanced Antennas**

**Tactical Mobile Networks**
- WNW/SRW TRI - BAND
- 2-PORT LOW PROFILE
- WNW HIGH GAIN
- BODY WEARABLE PLATFORM
- ANTENNA REDUCTION
- IMPROVED MANEUVER TACTICS & WIDEBAND COMMUNICATIONS
- IMPROVED LINK CONNECTIVITY
- REDUCED VISUAL SIGNATURES

**Unmanned Systems**
- Unmanned Ground Vehicles
- Unmanned Air Vehicles
- Unmanned System/Human Interface Technology

**Unmanned Ground Vehicle Technologies**

*Army component—Joint High Power Solid State Laser Program*
Future Force Technologies

Lethality
- Scalable Effects
  - EM Gun
- Warhead
  - Small Arms Technology
  - Urban Assault Munitions
  - Non Line of Sight - Launch System (NLOS-LS)
- Smaller, Lighter, Cheaper Munitions

Soldier Systems
- Combat Rations
- Soldier Mobility and Advanced Load Carriage
- System Flame Test
- Current LiCFx Half-Size BA-5590 Battery
- New Armor Coverage

Logistics
- Power & Energy
  - Hybrid Electric Drive
- Sustainment
- Fuel Cell Development
- Advanced Hybrid Engines
- Segmental Band track

Deployability
- Deployability
  - Precision Air Drop 30k lbs
Future Combat Systems—Spinouts to the Current Force

**Manned Ground Vehicles (MGV)**
- Infantry Carrier Vehicle (ICV)
- Mounted Combat System (MCS)
- Command and Control Vehicle (C2V)
- Non-Line of Sight Mortar (NLOS-M)
- Non-Line of Sight Cannon (NLOS-C)
- Medical Vehicle Treatment (MV-T)
- Medical Vehicle Evacuation (MV-E)
- FCS Recovery and Maintenance Vehicle (FRMV)

**Unmanned Ground Systems (UGS)**
- Reconnaissance And Surveillance Vehicle (RSV)
- Unattended Ground Sectors
- Unmanned Ground Vehicles (UGV)
  - Multifunction Utility/Logistics and Equipment Countermine and Transport
  - MULE-C
  - MULE-T
  - Armed Robotic Vehicle – Assault (Light) (ARV-A-L)

**Unmanned Aerial Systems (UAS)**
- Class I UAV
- Class IV UAV
- T-UGS
- U-UGS
- Non-Line of Sight Launch System (NLOS-LS)

**Mounted Combat System (MCS)**
- Advanced Lightweight Armor
- Engine

**Unmanned Combat System**
- DARPA
- FCS 1.1

**Unmanned UAS**
- DARPA

**Unmanned Ground Vehicle**
- Small UGV (SUGV)

**19 Jan 07**

**High Technology Army**

**Army S&T**
Technology Insertions for Current Operations

Benefiting from Past Investments

Adapting/Accelerating On-going S&T Programs

Leveraging Scientist & Engineer Expertise

Interceptor Body Armor

PackBot Sensors

Blue Force Tracking

Guided MLRS

Mobile Remote Access & Information Diagnostics

Every Soldier A Sensor Simulation

Mine Detecting Ground Penetration Radar (GPR)

USMC Dragon Fire II with Lightweight Counter Mortar Radar (LCMR)

Enhanced Rocket, Mortar & Sniper Detection

RG-31 Engineer Vehicle Add-on Armor Kit

HMMWV Expedient Armor

Hellfire Launch On Predator
Accomplishments—2007

Future Force Warrior (FFW)

Mounted Combat Systems & Abrams Ammunition System Technologies

C4ISR—On The Move Experiment

Add On Armor & EW Subsystems

Buffalo

MRAP

HMMWV

Battlemind Training
Basic Research Thrusts

Discover, develop and exploit robotic devices and systems with highly sophisticated sense, response and processing systems approaching that of biological systems to dramatically enhance Soldier survivability.

Research in human-engineered and biologically-evolved networks to improve performance, increase reliability and enhance network-centric mission effectiveness.

Research to understand biological construction of novel materials, structures and processes to develop biologically-derived materials, sensing systems, information processing and power and energy.

Research in understanding the functional brain to improve training techniques, human-machine interface design, the nature of traumatic brain injuries, and to more fully understand the decision-making process.

Generate advances in quantum sciences that will enable revolutionary approaches to information processing, cryptography, information assurance, and communication.

Discover and create new materials with properties that will revolutionize military technology and make Soldiers less vulnerable to the enemy and environmental threats.

Revolutionize military training and mission rehearsal through the development of technology and art for simulation experiences and the development of virtual human technology.
Predicting the Future

It's tough to make predictions, especially about the future. Some famous technology predictions include:

- “Heavier-than-air flying machines are impossible.”
  – Lord Kelvin, 1895
- “Airplanes are ...of no military value.”
  – Marshal Ferdinand Foch, 1911
- "Who ... wants to hear actors talk ?”
  – H. M. Warner, 1927
- "... (T)here is world market for maybe five computers.”
  – T. Watson, IBM Chairman, 1943
- "640k (RAM) ought to be enough for anybody.”
  – Bill Gates, 1981
Army S&T...

Engine of Transformation