Army and Independent Research and Development

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Empowering Soldiers through High Technology

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Introduction

• Army Science and Technology (S&T) Priorities
• The Next Generation of Revolutionary Technologies
• Independent Research and Development (IR&D)
Strategic innovation and accelerate/mature technology to enable Future Force capabilities while exploiting opportunities to rapidly transition technology to the Current Force.

**Current Force**
- Modular Protective Systems
- Add on Armor for Tactical Vehicles
- Micro Air Vehicle
- 120mm Mid-Range Munition

**Future Force**
- Immersive Training
- Virus-based Self-Assembling Electrodes—Advanced Batteries
- Wearable Flexible Displays

**Enabling the Future Force**
- Mounted Combat System (MCS)
- Armor Kit

**Enhancing the Current Force**
- Immersive Training
Technology Area Investments to Achieve Warfighter S&T Outcomes

FY09 $1.8B

Force Protection $370M

ISR $149M

C4 $144M

Lethality $161M

Medical $140M

Soldier $135M

Logistics $92M

Unmanned Vehicle $54M

Rotorcraft $72M

Military Eng & Environment $47M

Advanced Simulation $37M

Basic Research $379M

Shaping the FY09/10 Portfolio

List of 37 Tier One Warfighter S&T Outcomes (1 of 2)

- Battle Command Network*
- Counter IED and Mine*
- Power & Energy*
- Human Dimension*
- Training*

“Big 5” Warfighter S&T Outcomes

10 Comprehensive Warfighter Outcomes—includes “Big 5”

- Battle Command Network
- Counter IED and Mine
- Power and Energy
- Human Dimension
- Training
- Force Protection
- Battlespace Awareness
- Force Application
- Logistics
- Unmanned Systems Operations

Includes all Army Tier I Outcomes—aligned with S&T portfolio

- Prognostics & Diagnostics
- Alternative Energy Sources
- Force Health Protection Initiative
- Increase control of unmanned systems
- Future Force Multi modal Human Computer Interface
- Increase Future Force Soldier Cognitive Functions While Under Stress
- Language and cultural awareness
- Dismounted soldier virtual training environment
- Adaptive training system

Enhancing the Current Force

Enabling the Future Force

High Technology Army

Includes all Army Tier I Outcomes—aligned with S&T portfolio
Big-Five Warfighter Outcomes that Guide S&T Investment

**Battle Command Network**
- Beyond-line-of-sight
- Optimized for mobile operations
- Increase access to the individual Soldier

**Counter IED and Mine**
- Detect, identify and neutralize CBRNE obstacles
- Safe standoff distance
- Maintains maneuver force momentum while protecting Soldiers and platforms

- Enhanced agility to operate worldwide, reducing weight and volume
- Sufficient pulsed power enabling advanced lethality options
- Increased continuous power and fuel economy
- Dismounted Soldiers to possess twice available power, at half the tactical weight

**Power & Energy**
- Enhance & restore cognitive and physical performance
- Soldiers incorporated into highly trained and competent small units
- Access on potential vs. high school performance
- Mitigate the increase in physiological and psychological stress
- Improving mental, moral and physical capacity and performance

**Human Dimension**
- Live, virtual, constructive and mixed venues
- Impart more skills, faster, at lower cost, with greater retention than currently achievable
- Use non-traditional home station training techniques; train prior to employment
- Enhance and account for individual proficiencies and learning rates (outcome based)
Army S&T Priorities

- Battle Command Network
- Counter IED and Mine
- Power and Energy
- Human Dimension
- Training
- Force Protection
- Battlespace Awareness
- Force Application
- Logistics
- Unmanned Systems Operations

S&T portfolio aligned with Warfighter needs
The Next Generation of Revolutionary Technologies

Decade of the 1970's

- **Structural Imaging**: 1971 – First Practical X-ray Computed Tomography Image
- **Micro-processors**: 1971 – First 4-Bit Micro-Processor in Production
- **Artificial Intelligence**: 1970 – Shakey the robot
- **Super-computing**: Schematic of Early ARPANET
- **ARPANET**: 1975 – Cray I Supercomputer

Today for 2020 and beyond…

- **Functional Brain Imaging & Beyond**: Network Science
- **Robotics**: Immersive Environments
- **Quantum Computing**: Bio-technology
- **Nano-technology**: Genetic Engineering
- **Arcade Games**: Super-computing
- **ARPANET**: Functional Brain Imaging & Beyond
- **Schematic of Early ARPANET**: 1975 – Cray I Supercomputer

1975 – Cray I Supercomputer
Complexity Demands Disruptive Technology

Ground Combat Vehicle Evolution

- **M47 Patton**
  - FM Radio
  - Direct View Optics
  - Engine Gauges
  - Ballistic Periscopes

- **M1A2 Abrams**
  - Secure data/voice radio
  - Thermal Viewer
  - FBCB2 Digital Battle Command
  - Digital Fire Control
  - 1 Color/3 Monochromatic Displays

Helicopter Evolution

- **AH-1 G Cobra**
  - FM Radio
  - Direct View Optics
  - 2.75 inch rockets and 7.62mm machine gun

- **AH-64 Apache Longbow**
  - Secure data/voice radio
  - Integrated pilot night vision system
  - Digital fire control linking gunners view & weapons systems
  - Longbow MMW radar
  - Hellfire missiles and 30mm cannon
  - Survivable rotors—up to 23mm AA

Soldier as System Evolution

- **Late 1960s Soldier**
  - FM radio
  - Early I2 devices
  - Binoculars
  - M-16 with daylightscope

- **Future Force Warrior (FFW)**
  - Integrated body armor & equipment carriage suite
  - Helmet mounted thermal imaging
  - Radio digitally linked to unit communications network displaying individual locations
  - Laser aided weapon precision fire control
  - Embedded training
Revolutionary Technologies

Nanotechnology/ Biotechnology

Bio-Inspired Energy-Dispersive Materials

Virus-based Self-Assembling Electrodes

Nanofluidics

Autonomous Systems

Network Science

Nano flyer

Micro Autonomous Systems Technology CTA
Revolutionary Technologies

Neuroscience

Quantum Information Science

Immersive Technology
Army S&T Enterprise—Research, Development & Engineering Centers & Labs
Partnering—leveraging other Services, Agencies, Academia, Industry & International

**Other Services**
- Air Force
- Navy/USMC

**Academia**
- Georgia Tech
- MIT
- Penn State
- USC
- U Md
- UC System
- Delaware
- Michigan
- Arizona State

**Agencies**
- DARPA
- DTRA
- DoE labs
- DHS
- NIH
- NASA

**Industry**
- Primarily technology development to create options for PMs
- Small Business Innovation Research—solutions from non-traditional sources
- Army Venture Capital Initiative—dismounted Soldier power

**International**
- The Technical Cooperation Program (US, UK, CA, AUS, NZ)
- NATO Research & Technology Organization
- Bilateral Agreements (UK, CA, IS, FR, GE…)

**Other Services**
- PTSD treatment

**Industry**
- Versatile, Affordable, Advanced Turbine Engine

**International**
- NLOS-LS

**Other Services**
- Co-investment with UK to advance state-of-the-art in network science

**Academia**
- Delaware
- Michigan
- Arizona State

**Industry**
- DARPA
- Micro Air Vehicle

**International**
- Transparent Armor—Technology Assessment & Transfer, Inc.

**Other Services**
- Army Venture Capital Initiative—dismounted Soldier power
Upcoming Events/Opportunities

• TRADOC Information Information Exchange Program
• AMRDEC
• CERDEC Technology Interchange Meetings
• TARDEC
  – http://tardec.army.mil/events.asp
• ARDEC
• AUSA (Winter/Spring)
• Army Science Conference
For More Information

• **Links to pertinent websites**
  – **RDECOM**
  – **US Army Corps of Engineers**
  – **US Army Medical Research and Materiel Command**

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