2008 Maneuver Support Science and Technology Conference

Maximizing Research Results

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Dr. David D. Skatrud
Director, Army Research Office
Deputy Director, Basic Science, Army Research Laboratory

Outline

- The Army Research Laboratory
  - Vision/Mission
  - Structure
- Maximizing Research Results
  - Personnel
  - Technical Infrastructure
  - Business Processes
  - Research Programs and Initiatives

RDECOM

U.S. Army Research Laboratory

Mission

Provide innovative science, technology, and analyses to enable full spectrum operations.

Vision

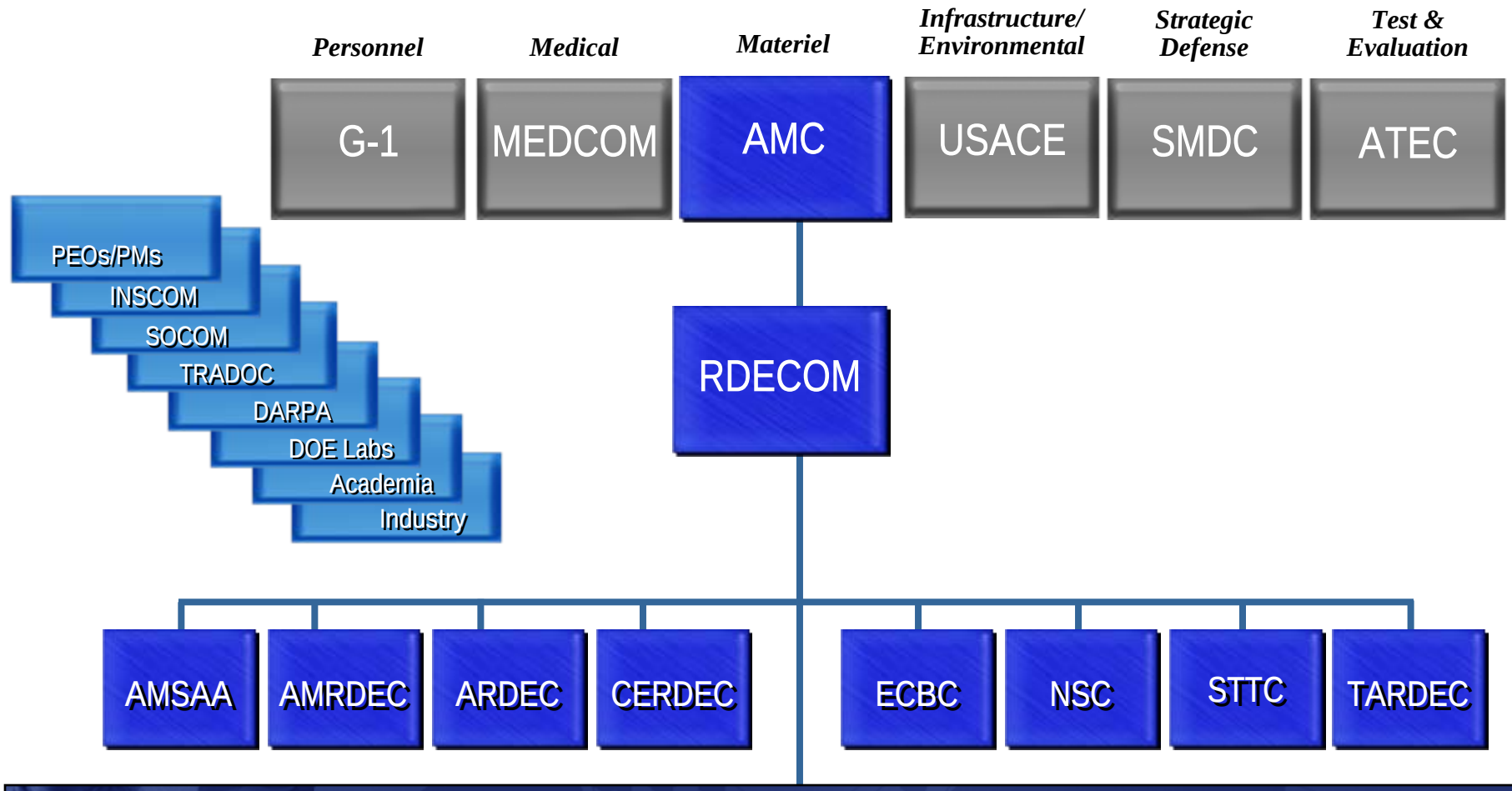
America's Laboratory for the Army: Many Minds, Many Capabilities, Single Focus on the Soldier

Acknowledged Scientific, Technical and Analytical Excellence

Recognized bridge between the Nation's Scientific and Technical Communities and the Army

Leader in providing innovative solutions for the current and future Army

Army RDT&E Performing Organizations



ARL provides underpinning Science, Technology, and Analysis to the Army

U.S. Army Research Laboratory

Associate Director for Plans & Programs
Dr. Cary Chabalowski

Associate Director for Science & Technology
Dr. Volker Weiss

Associate Director for Laboratory Operations
Ms. Teresa Kines

Director
Mr. John Miller

Deputy Director for Basic Science & Director ARO
Dr. David Skatrud

Military Deputy
COL Bobby Smith

Sergeant Major
Steve Hornbach

Vehicle Technology
Dr. Mark Nixon

Human Research & Engineering
Dr. Paul Deitz (A)

Survivability/ Lethality Analysis
Dr. Paul Tanenbaum

Computational & Information Sciences
Dr. John Gowens

Sensors & Electron Devices
Dr. John Pellegrino

Weapons & Materials Research
Ms. Jill Smith

Army Research Office

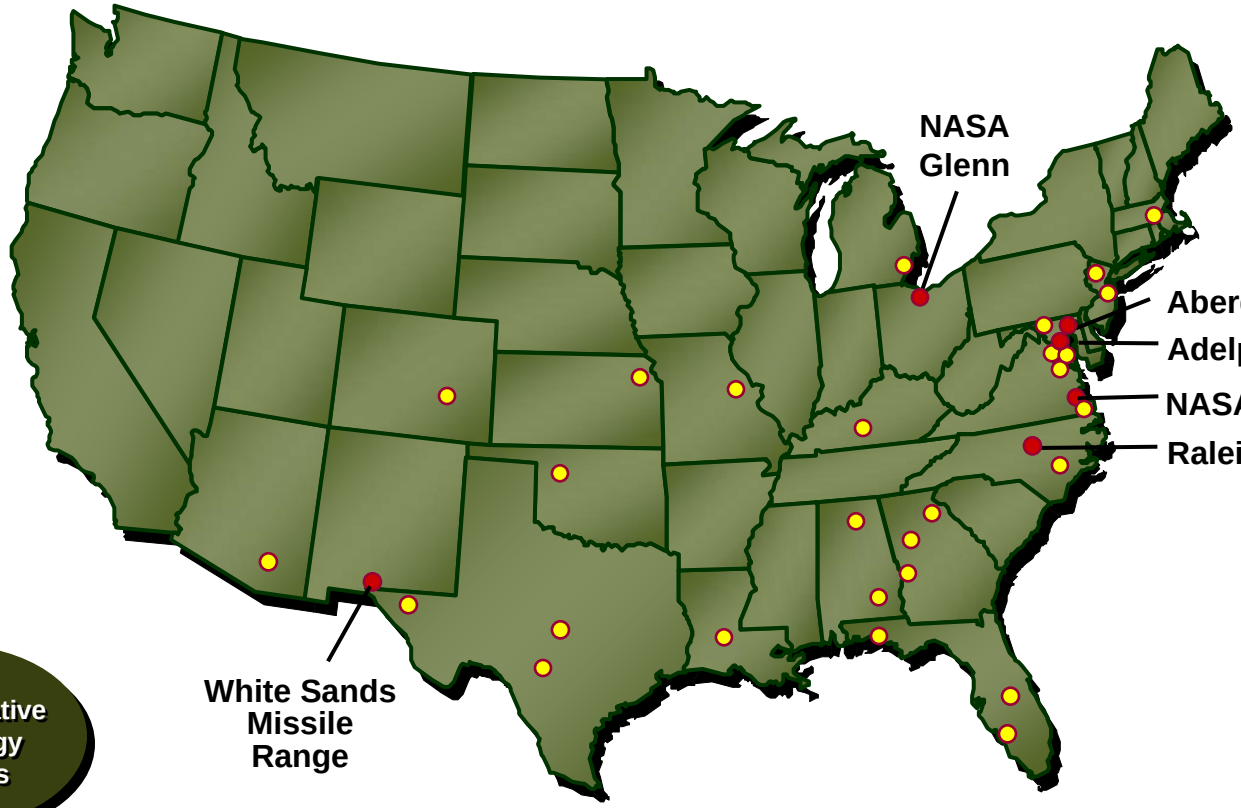
Mathematical & Information Sciences
Dr. Randy Zachery (A)

Physical Sciences
Dr. David Mann

Engineering Sciences
Dr. Tom Doligalski (A)

RDECOM

U.S. Army Research Laboratory



5 Collaborative Technology Alliances

International Technology Alliance

19 DEA/IEA
3 PA/MOU
7 TTCP
6 NATO
5 ESEP

55 Phase I SBIR
14 Phase II SBIR
11 Phase II+ SBIR
48 CRADAs
45 TSAs

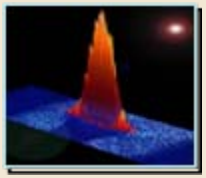
1229
Single Inv Grants
63 MURI
3 UARCs
4 COEs
5 BCEs

297
Academic Partners
In 50 States + DC

1895 Civilians
39 Military

Direct Contact w/ thousands of Private Sector S&Es

ARL's Research Continuum



New State of Matter for Superconducting Magnetism

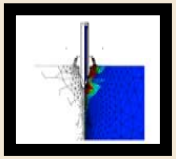
Tilt Rotor

Hot Stage Micrograph

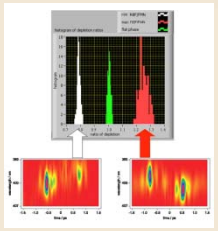
DEMN – Insensitive Munitions

Ballistic Survivability

IED Countermeasures



Multiscale Computation for Impact Dynamics

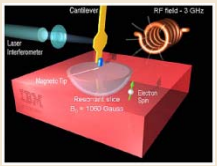


Laser Pulse Control For CBD Detection

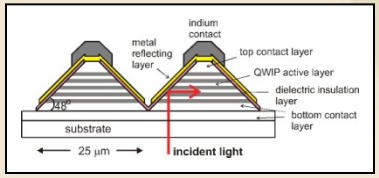
ANS Robotics LADAR

EM Armor

Persistent Surveillance



Single Electron Spin MRFM



C-QWIP FPAs

Flexible Displays

Advanced RF

Language Translation

Basic Science **Evolving Technologies** **Current Ops**

Technology Maturity

ARL Major Laboratory Programs

Survivability
- Kinetic Energy Active Protection
- Materials and Manufacturing Science for Survivability
- Vehicle Protection
- Individual Warfighter Protection

Lethality
- Energetic Materials & Propulsion
- Projectiles & Multi-function Warheads
- Materials and Manufacturing Science for Lethality
- Electromagnetic Gun
- Affordable Precision Munitions

Human Dimension
- Advanced Decision Architectures
- Soldier Performance
- Human Robotic Interaction
- Human Systems Integration

Survivability/Lethality Analysis
- Methodologies
- Future Combat Systems
- Combat Systems
- Air/Missile Defense
- C4ISR

Extramural Basic Research
- Chemistry
- Physics
- Life Sciences
- Nanoscience
- Environmental Sciences
- Materials Sciences
- Mechanical Sciences
- Mathematics
- Computing and Information Science
- Electronics

Battle Command
- Battlespace Information Processing
- Tactical Communications & Networks
- Battlefield Weather for C2 & ISR
- Advanced Computing and Computational Sciences

Sensing
- Advanced Electro-Optical Technologies
- Advanced RF Technologies
- Autonomous Sensing
- Flexible Displays
- Electronic Materials/Devices
- Micro Autonomous Technologies

Power and Energy
- Directed Energy
- Hybrid Electric Vehicle, Platform, & Pulse Power
- Micro, Soldier, and Portable Power

Mobility
- Near Autonomous Unmanned Systems
- Vehicle Propulsion
- Platform Mechanics

ARL Technologies for Current Operations

Survivability

- Rhino II Counter IED
- Interim Fragmentation Kits 5 and 6 (HMMWV)
- IED Countermeasures Equipment (ICE)
- Transparent Armor Gun Shield
- Reactive Armor for Stryker/Abrams
- Bar Armor for Stryker/M113/Buffalo
- Spall Liners and Flame Suppression Packs for Lt Wt Tactical Vehicles
- Underbody Protection

Lethality

- Small Arms Projectile Studies
- Green Ammunition
- 30/105/120mm Ammunition Failure analysis
- Small Caliber Weapons Lubrication Study
- IED Threat Exploitation
- Excaliber/Modular Artillery Charge
- Guided Multiple Launch Rocket System Lethality

Survivability & Lethality Analysis

- Abrams Ballistic Vulnerability Assessment
- Crew Survivability Analysis
- Outer Tactical Vest Analysis

Human Dimension

- Cultural Awareness Tools for Soldiers and Commanders (Globe Smart)
- MANPRINT Analysis
- Combat Arms Earplug Evaluation
- Advanced Combat Helmet Study

Battle Command

- Forward Area Language Converter
- Network Basic Language Translation Services (NetBLTs)
- White House Communications Support
- Palletized Airborne C2 Systems
- Vehicle Communications for Other Government Agencies

Sensing

- Airborne Video Surveillance System (Constant Hawk)
- Infrasonic Arrays for Acoustic Surveillance
- Ground and Airborne Acoustic Mortar/Rocket Detection (UTAMS)
- Persistent Threat Detection System
- Intrusion Detection System (OmniSense)
- Sniper Detection System
- AH64 IR Suppression Kit

Power and Energy

- Blow Torch/Dragon Counter IED

Mobility

- FIDO Unmanned Air System
- Small Robotic Surveillance System (PACBOT)
- CH47 High Altitude Control Load Analysis

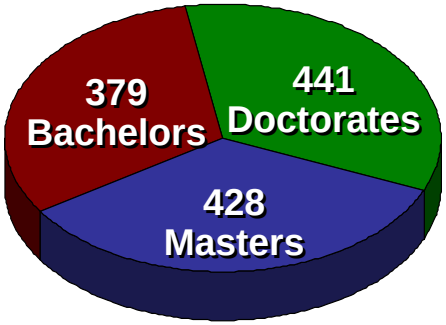
Extramural Basic Research

- FIDO Chemical Detection
- Agentase Chemical Sensor
- Chem/Bio Decontamination (FAST ACT)
- RCIED Exploitation Systems for Forensic Analysis
- Phenomenology for Improved Jamming into JCREW

RDECOM

Civilian Personnel Profile

1248 S&E Workforce



1480 Technical Staff

277	Electrical/Electronics Engineers
200	Physicists/Physical Scientists
171	Mechanical Engineers
90	General/Industrial Engineers
43	Aerospace Engineers
72	Materials Engrs./Metallurgists
61	Engineering Psychologists
77	Chemical Engineers/Chemists
6	Biologists
52	Operations Research Analysts
126	Computer Scientists/Engineer
35	Mathematicians/Statisticians
20	Meteorologists
5	Ceramic Engineers
13	Other E&S
232	E&S Technicians

As of 9/30/2007

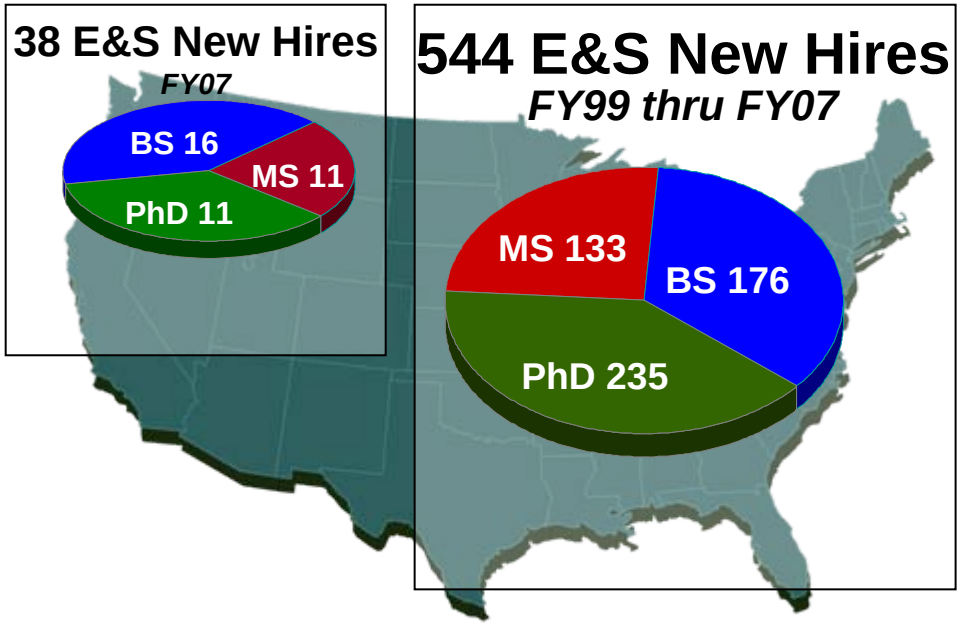
Quality – a diverse, highly skilled ARL Team

- Recruit and retain top scientists, engineers, analysts, administrative personnel, and experienced Soldiers
- Generate a critical mass of expertise within ARL and with strategic collaborative partners for application in key S&T areas

Personnel – Refresh Intellectual Capital

New Hires PhDs Awarded by:

Alabama A&M Univ
Arizona State Univ (5)
Auborn Univ (2)
Banaras Hindu Univ
Bhadrak College, India
Boston College (2)
Boston University
Brigham Young University
Brown Univ
CA Univ of PA
Canada College
Carnegie Mellon Univ
Case Western Reserve Univ
Catholic Univ
Chalmers Univ of Tech
ChangChung Inst
Chicago Univ
Clemson Univ (2)
Cornell Univ (2)
Duke Univ (4)
Drexel Univ (2)
East Carolina Univ
Emory Univ
Florida State Univ
George Mason Univ
G. Washington Univ (4)
Georgetown Univ (4)
Georgia Tech (4)
Harvard University
Inst of Tech – Virginia
Iowa State Univ
Johns Hopkins Univ (3)
Lehigh Univ
Marquette Univ
MIT (2)
Michigan State Univ (2)
Mississippi State Univ (2)
New Mexico State Univ (5)
North Carolina A&T
North Carolina State Univ (7)
Northwestern Univ (4)
Ohio State Univ (3)
Oklahoma State Univ
Oregon State Univ
Polytechnic Univ of NY
Penn State Univ (4)
Purdue Univ (2)
Rensselaer Polytech (3)
Rice Univ
Russian Academy of Sciences
Rutgers Univ (4)
St. Bonaven University
Stanford Univ (3)
Stevens Inst of Tech
State Univ of NY – Syracuse
State Univ of NY – Albany
State Univ of NY – Buffalo (3)
Texas Tech Univ (2)
Texas A&M (2)
Tulane Univ
Univ of Arizona (2)
Univ of Buffalo (2)
Univ of Cincinnati
Univ of CA – Berkley (3)
Univ of CA – LA (5)
Univ of Central Florida
Univ of Connecticut (2)
Univ of Dayton
Univ of Delaware (14)
Univ of Georgia
Univ of Illinois (4)
Univ of Florida (2)
Univ of Houston (2)
Univ of Illinois (6)
Univ of Massachusetts
Univ of MD -- CP (11)
Univ of MD -- BC
Univ of Michigan (2)
Univ of Minnesota (6)
Univ of Moscow
Univ of New Mexico (2)
Univ of New Orleans
Univ of North Carolina (4)
Univ of Pennsylvania (3)
Univ of Rhode Island
Univ of S. California (2)
Univ of South Carolina
Univ of S. Miss.
Univ of S.W. Louisiana
Univ of Tennessee (2)
Univ of Texas – Austin (4)
Univ of Texas – El Paso (2)
Univ of Tulsa
Univ of Utah
Univ of Virginia (4)
Univ of Washington
Univ of Wisconsin
Vanderbilt Univ (2)
Virginia Commonwealth Univ
Virginia Polytech Univ (9)
Washington Univ of St Louis
Wayne State Univ (2)
Univ of Science and Tech – Beijing



University Basic Research Partnerships

SI
The ARL Single Investigator (SI) Program entails grants with one or two faculty and graduate students and / or postdocs.
- ~$110K/yr for 3 yr periods
- Continually open BAA Solicitation
- ~120 new grants / year
- All States, >240 Universities

MURI
The Multidisciplinary University Research Initiative (MURI) Program supports university teams whose research efforts intersect more than one traditional science and engineering discipline.
- ~$1.25M per year
- 3 year period
- 10 new initiatives annually
- Annual BAA Solicitation

CTA
The Collaborative Technology Alliances (CTAs) are partnerships established between consortia of academic and industrial concerns working collaboratively with ARL in an alliance.
- $5 – 8M range
- 8 – 10 years in duration
- Consortia of academic and industrial concerns
- Potential New Areas: Robotics, Cognition and Neuroergonomics, and Network Science

COE
Centers of Excellence (COEs) are comprised of University-lead, focused initiatives and competitive contracts.
- 3 centers
- $1 - 2M per year
- 3-5 years in duration
- No new centers planned at this time

HBCU/MI ARO Core Grants
This program supports STEM initiatives at HBCU/MIs through building infrastructure, instrumentation, scholarships, fellowships, and technical assistance programs.
- Topics from ARO BAA
- ~$110K/yr for 3 year periods

BCE
The Battlefield Capability Enhancement (BCE) Centers of Excellence are Historically Black College executed basic research programs with topics that focus on TRADOC-defined Warfighter Outcomes (previously Technology Gaps).
- Limited to HBCUs
- New competition in FY09
- ~$400K per year

SBIR / STTR
The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs were established by Congress to provide small businesses and research institutions with opportunities to participate in government-sponsored research and development.
- Small Business Research
- Phase I and Phase II efforts
- **www.armysbir.com** for more information

UARC
University Affiliated Research Centers (UARCs) are large centers associated with the U.S. Army
- 4 centers
- 5 year efforts
- ~$5 – 10M per year
- No new UARCs anticipated

DEPSCoR
The Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) program is designed to expand research opportunities in states that have traditionally received the least federal funding for university research.
- For states receiving least amt of federal funds
- 3 year support
- Annual BAA Solicitation

STIR
The objectives of the Short Term Innovative Research (STIR) program are to provide rapid, short-term investigations to assess the merit of innovative concepts in basic research.
- $50K Limit
- Short-term, proof-of-principle research
- Part of SI Continual BAA Solicitation

Partnerships

Co-op Agreements, OTAs, TSAs, Contracts, Grants, CRADAs

Centers Of Excellence

High Performance Computing
- *Stanford University*
- *New Mexico State University*
- *Morgan State University*
- *University of Texas, El Paso*
- *High Performance Tech, Inc*
- *NASA - Ames*

Flexible Displays
- *Arizona State University*

Materials
- *University of Delaware*
- *Johns Hopkins University*
- *Rutgers University*
- *Drexel University*
- *Virginia Tech*

University Affiliated Research Centers

Biotechnology

Biologically-derived:
- Sensors
- Electronics
- Information Processing

Soldier Survivability
- Protection
- Performance Enhancement
- Injury Intervention and Cure

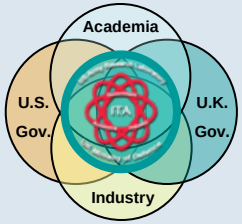
Electromechanics & Hypervelocity Physics
- EM Launch
- Pulsed-power
- Electric Armaments

Immersive Environments
- Full Sensory Immersion
- 3-D Mobility
- Compelling Interactive Stories

Battlefield Capability Enhancement Centers

- Human Centric C2 & Decision Making — North Carolina A&T State University
- Intelligent Sensor Fusion — Tennessee State University
- Environmentally Stable Flexible Displays — North Carolina A&T State University
- Flexible Extremities Protection: — Tuskegee University
- Digital Battlefield Communication:

International Technology Alliance



Collaborative Technology Alliances

- Advanced Sensors
- Robotics
- Power & Energy
- Comms & Networks
- Advanced Decision Architectures
- Micro Autonomous Systems & Technology

ARL Strategic Plan - Infrastructure

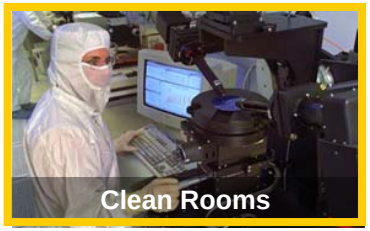
Exploit national and international research infrastructure

- Leverage the technical infrastructure of our extended research community
- Ensure ARL's facilities and equipment are capable of generating state-of-the-art, superior and relevant solutions

RDECOM

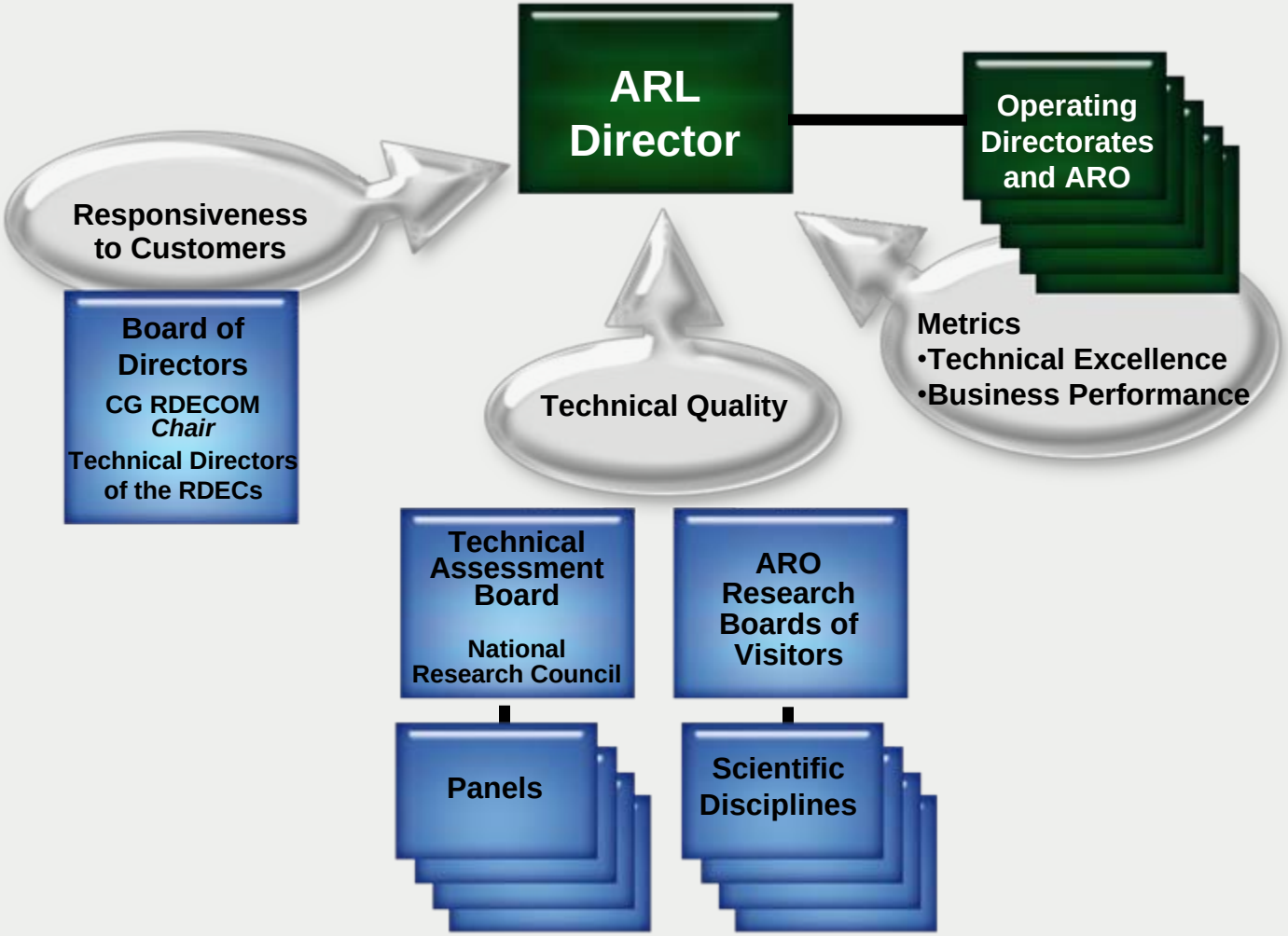
World Class Research Facilities

ARL



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

ARL Performance Evaluation



ARL Planning Process

The "Big Picture"

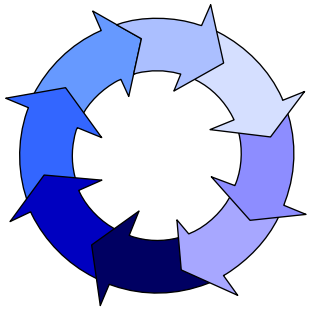
DoD / Army Vision and Guidance

Strategic Plan
- Mission
- Vision
- Strategic Goals

Resources the "Big Picture"

Tells our stakeholders how well we did

Annual Report
- Accomplishments vs. Goals
- Success Highlights



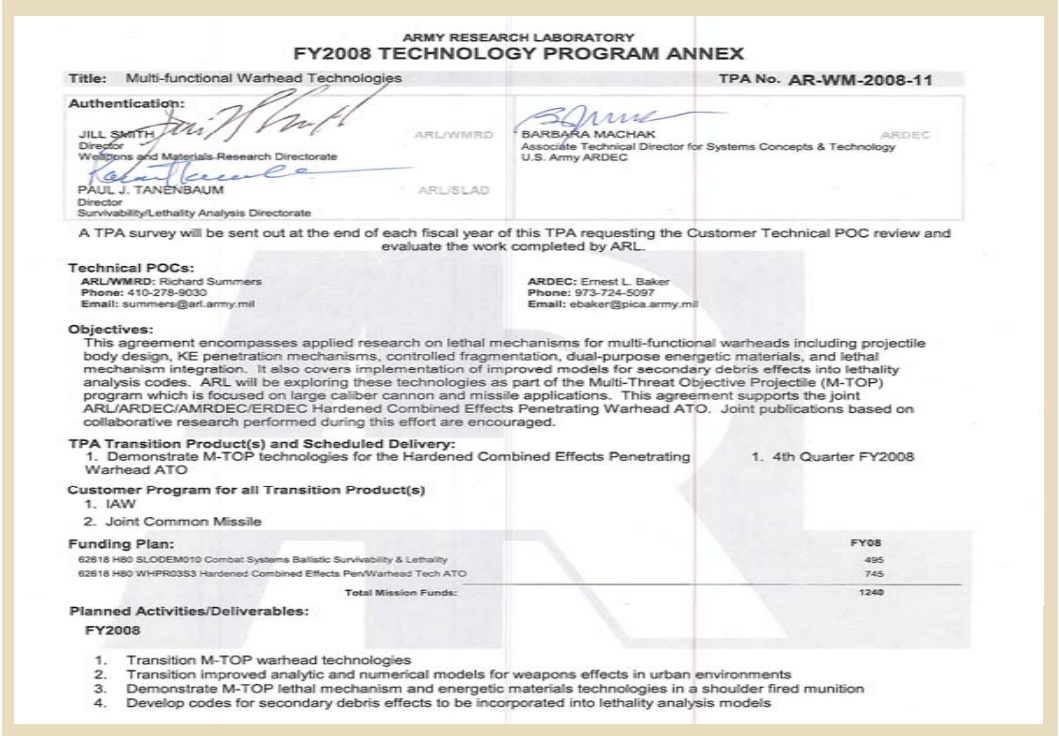
Long-Range Plan
- Objectives
- Resources
- POM Submission

Annual Performance Plan
- Annual Objectives
- Metrics
- Resources

Tells our stakeholders what we plan to accomplish

Technology Program Annex (TPA)

- TPAs document the specific research, technology development, and analysis that ARL will perform for its primary customers, the RDECOM RDECs
- TPAs include a detailed description, deliverables, schedules and costs
- 50% of ARL Mission funds are directed via TPAs
- ARL is expanding TPAs to include other Stakeholders (e.g., INSCOM)
- More emphasis to be placed on specific transitions of technology – pull – not just push



ARMY RESEARCH LABORATORY

FY2008 TECHNOLOGY PROGRAM ANNEX

Title: Multi-functional Warhead Technologies — **TPA No.** AR-WM-2008-11

Authentication:

JILL SMITH, Director, Weapons and Materials Research Directorate — ARL/WMRD

BARBARA MACHAK, Associate Technical Director for Systems Concepts & Technology, U.S. Army ARDEC — ARDEC

PAUL J. TANENBAUM, Director, Survivability/Lethality Analysis Directorate — ARL/SLAD

A TPA survey will be sent out at the end of each fiscal year of this TPA requesting the Customer Technical POC review and evaluate the work completed by ARL.

Technical POCs:

ARL/WMRD: Richard Summers
Phone: 410-278-9030
Email: summers@arl.army.mil

ARDEC: Ernest L. Baker
Phone: 973-724-5097
Email: ebaker@pica.army.mil

Objectives:

This agreement encompasses applied research on lethal mechanisms for multi-functional warheads including projectile body design, KE penetration mechanisms, controlled fragmentation, dual-purpose energetic materials, and lethal mechanism integration. It also covers implementation of improved models for secondary debris effects into lethality analysis codes. ARL will be exploring these technologies as part of the Multi-Threat Objective Projectile (M-TOP) program which is focused on large caliber cannon and missile applications. This agreement supports the joint ARL/ARDEC/AMRDEC/ERDEC Hardened Combined Effects Penetrating Warhead ATO. Joint publications based on collaborative research performed during this effort are encouraged.

TPA Transition Product(s) and Scheduled Delivery:

1. Demonstrate M-TOP technologies for the Hardened Combined Effects Penetrating Warhead ATO — 1. 4th Quarter FY2008

Customer Program for all Transition Product(s)

1. IAW
2. Joint Common Missile

Funding Plan:

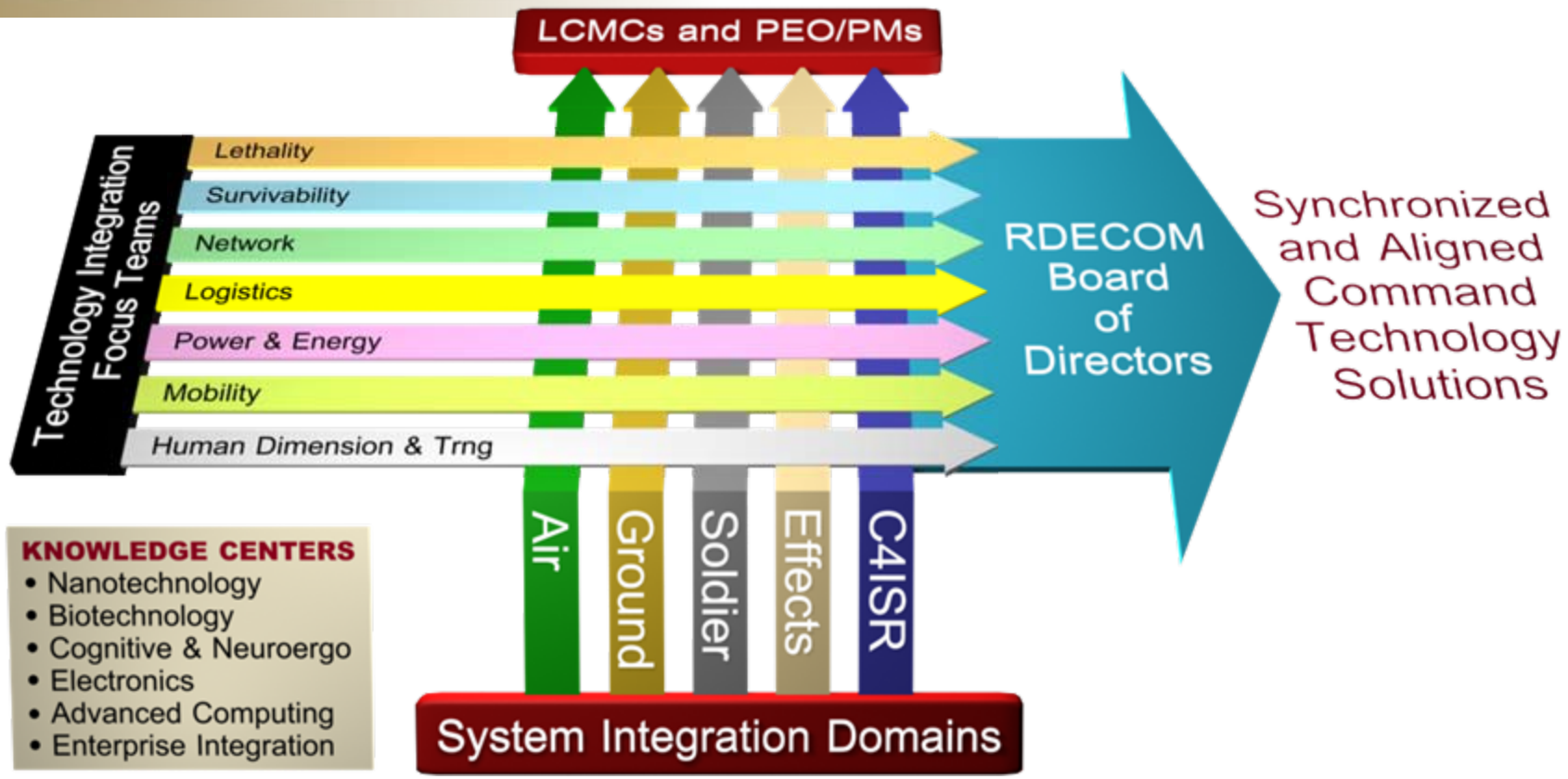
	FY08
62618 H80 SLODEM010 Combat Systems Ballistic Survivability & Lethality	495
62618 H80 WHPR03S3 Hardened Combined Effects Pen/Warhead Tech ATO	745
Total Mission Funds:	1240

Planned Activities/Deliverables:

FY2008

1. Transition M-TOP warhead technologies
2. Transition improved analytic and numerical models for weapons effects in urban environments
3. Demonstrate M-TOP lethal mechanism and energetic materials technologies in a shoulder fired munition
4. Develop codes for secondary debris effects to be incorporated into lethality analysis models

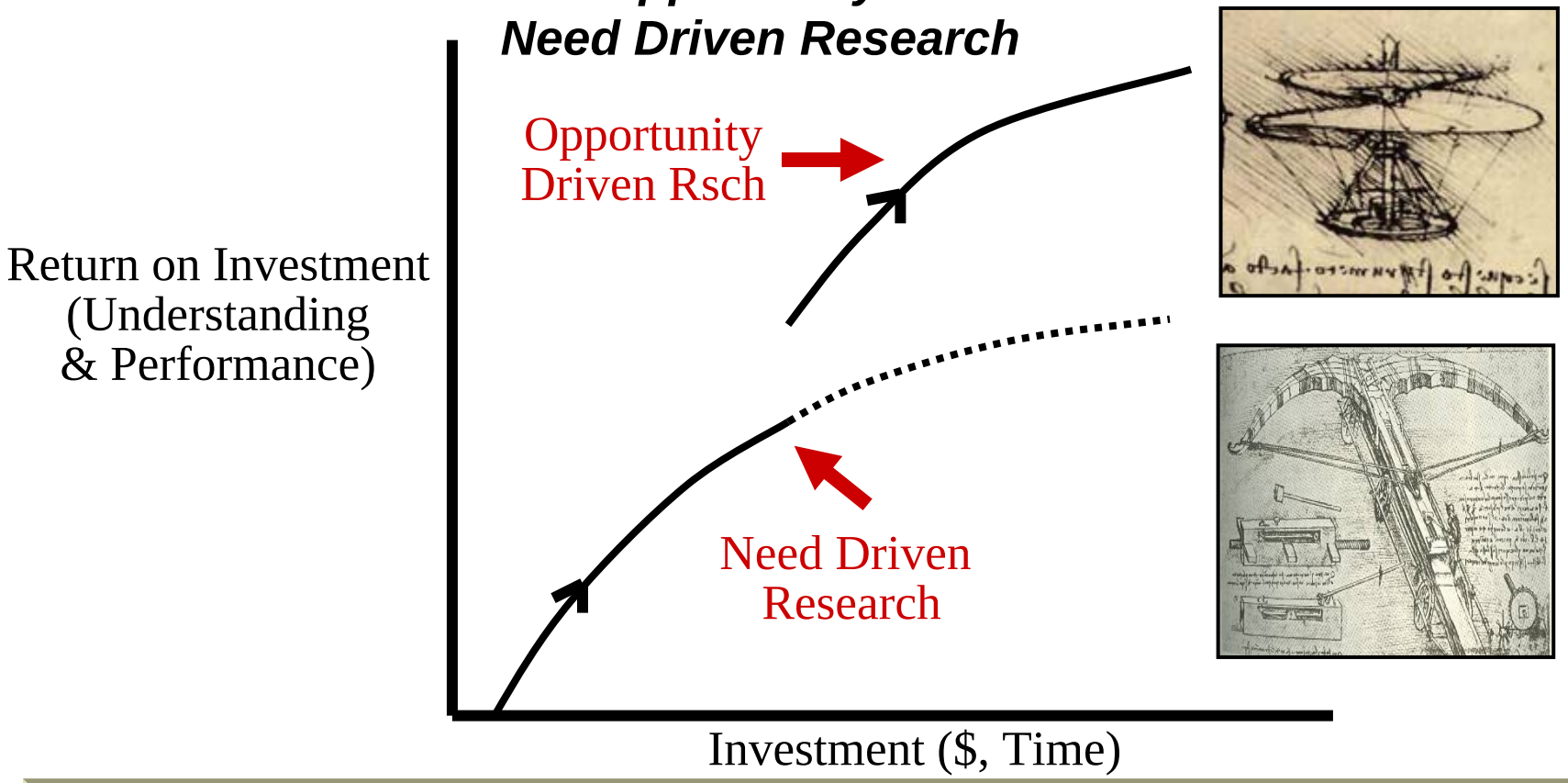
Technology Integration



- **System Integration Domains ensure integrated capabilities for common systems.**
- **Technology Focus Teams ensure 6.1-6.3 S&T portfolio is optimized across all domains.**
- **Knowledge Centers provide coordination and serve as technology advocate to Focus Area leads on emerging technologies.**
- **Board of Directors provide RDECOM S&T strategic guidance, establish command priorities and adjudicate inter-RDEC/Lab issues.**

Balanced Research Portfolio

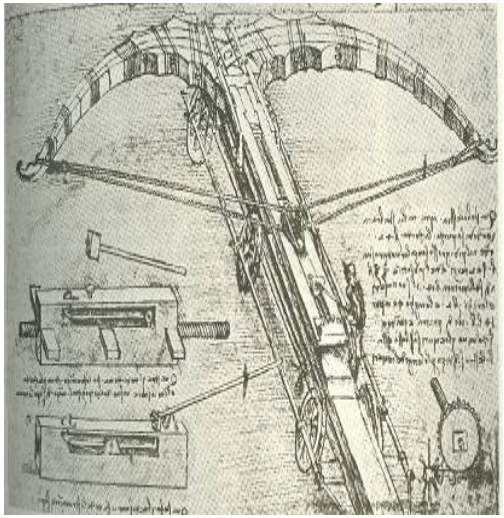
Must Address Both Opportunity Driven Research and Need Driven Research

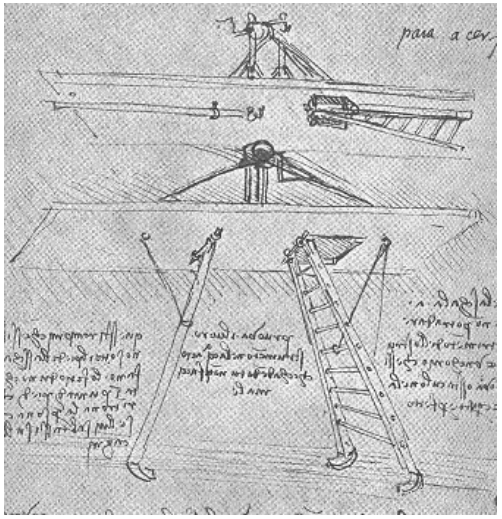


- **Need Driven Research – emphasis on improving specific capabilities or overcoming identified technology barriers**
- **Opportunity Driven Research - emphasis on developing and exploiting scientific breakthroughs to produce revolutionary new capabilities**

Research Pathways

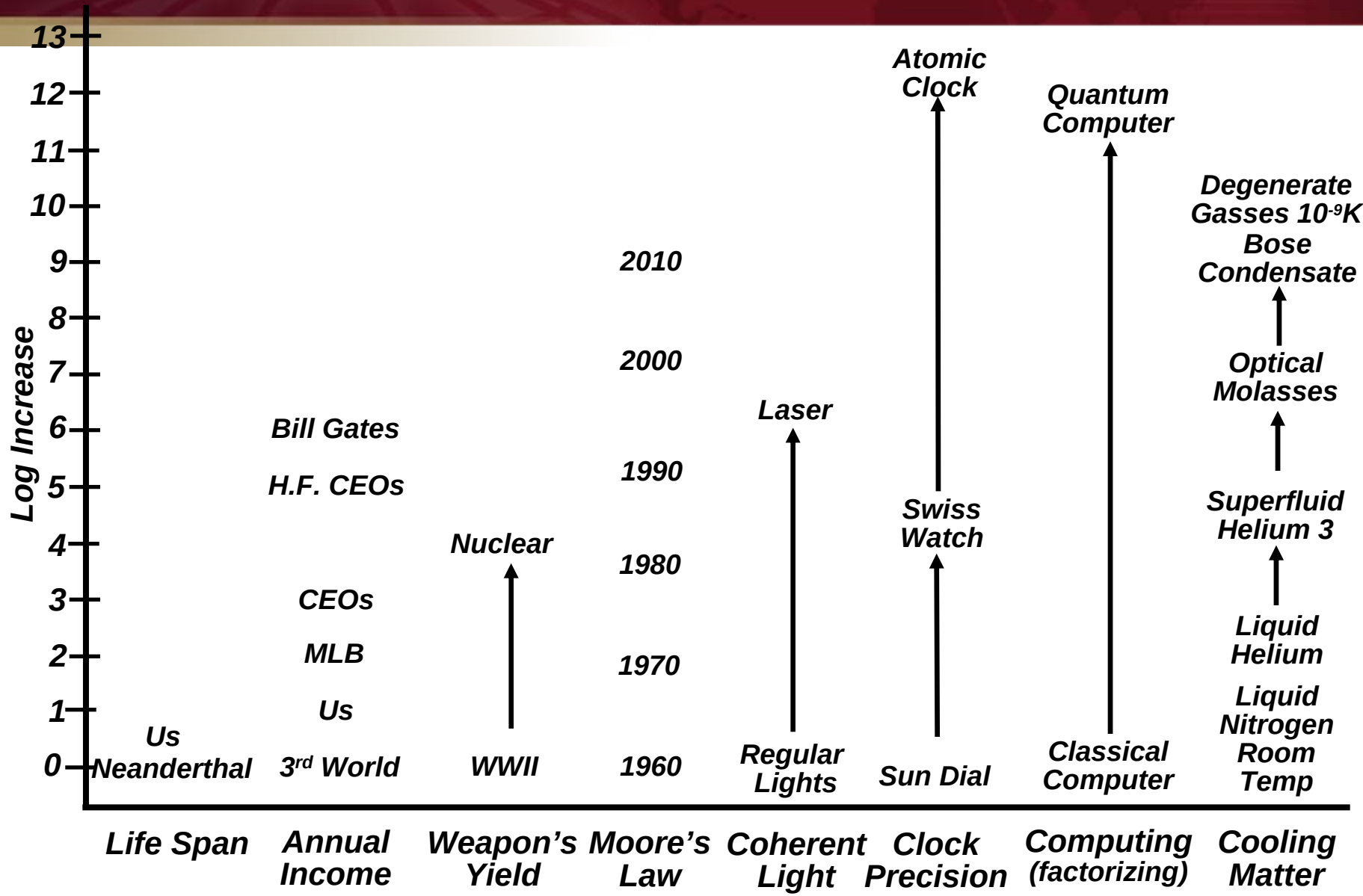
- **Extrapolation of Existing Technologies *(needs driven)***
  - Incremental, Continued Improvement in Existing Technologies
  - Often Driven or Enabled by **Commercial** Market
    - CPU on a chip
    - Inexpensive GPS
  - May be a “Disruptive Technology” (e.g. personal vs. mini computers)
- **Revolutionary New Applications from Scientific Breakthroughs *(opportunity driven)***
  - Utilizes Two Somewhat Distinct Mechanisms
    - Fundamentally new approaches to solving old problems
    - Fundamentally new capabilities
  - Examples from Past
    - Navigation - Satellites and atom clocks for GPS
    - Range Finders and Target Designators - Lasers
  - Potential Examples for Future
    - Atom Optics for Jam-Proof Navigation
    - Quantum Informatics for Computation, Secure Communication, Imaging
    - Nano-energetics for propellants and explosives
    - Micro-active flow control





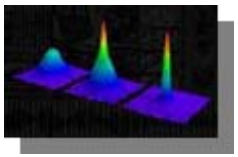
RDECOM

Examples of Revolutionary Changes



Research ROI

Fast Fourier Transform
All Digital Data Analysis Systems
Research Funding - $50K
Market - >>$B / DoD 5%

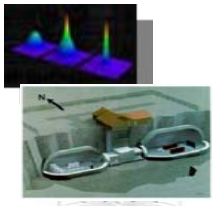


Reactive Polymers
(FIDO)
Research Funding - $5M
Market - $100M / DoD 80%

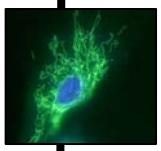
"Nomadics FIDO Explosives Detector"

Control of Oxidative Phosphorylation
Research Funding - $3M
Market - $100M / DoD 70%

Atom Optics Interferometer
Precision Sensing
Research Funding - $12M
Market - $90M / DoD 90%



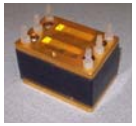
Cooperative Control
Intelligent Control for Multiple UAVs
Research Funding - $6M
Market - >$100M / DoD 50%



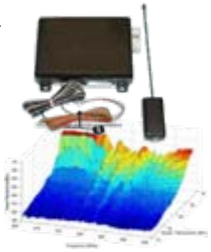
Self-healing Structural Composites
Fiber-Reinforced Composites
Research Funding - $6M
Market - $1B / DoD 20%

≤1985	2001	2002	2007	**2008**	2010	2012	2015	**2020**

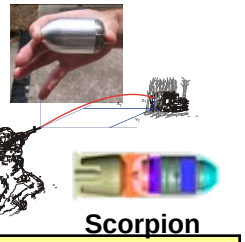
IC Design
CAD/CAM, …
Research Funding - $2M
Market - >$7B / DoD 10%



20W Fuel Cell Stack
Research Funding $5M
Market - >$20M / DoD 80%

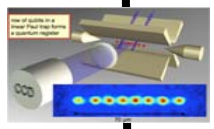


Defeat IEDs
Spectrogram signature of RF device
Research Funding - $2.4M
Market - $30M / DoD 100%



Scorpion

Active Flow Control
Airfoil Download Reduction *Research Funding - $500K*
Market - >$500M / DoD 50%



Quantum Computing
Adv Computations
Info Assurance
Research Funding - $17M
Market - >$B / DoD 20%

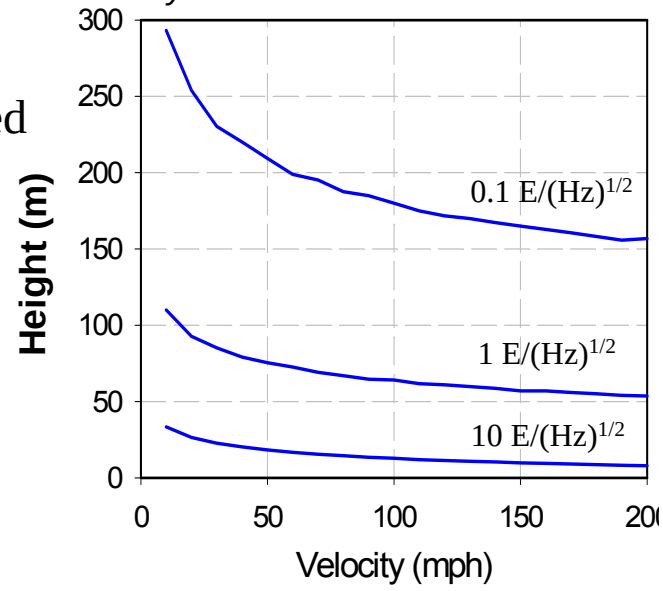
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Example of a Revolutionary Research Topic
Cold Atom Optics

Applications

- Gravity gradiometer for tunnel & bunker detection
  - x10 sensitivity improvement (0.1 E/(Hz)$^{1/2}$) demonstrated
  - Excellent long-term stability
  - Intrinsic immunity to vibrations
  - ***Sensitivity for detection of 5 meter tunnels by aircraft 500 feet above ground***
  - Or a 50 ton tank at 100 meters (5 mph)
  - Sensitivity improvement of 100 million is possible
- High precision inertial navigation
  - **Atom gyros a million times better than optic gyros**
  - **Passive, jam-proof replacement for GPS**
- Improved clocks for enhanced GPS and radar
- Direct-write nano-lithography
- As with the optical laser, many unanticipated revolutionary applications

Detection height as a function of aircraft velocity for a 5m x 5m x 100m tunnel



RDECOM

Strategic Initiatives

- Neuroscience
- Micro-electronics and Nanoscience
- Bioscience
- Network and Information Science
- Atonomous Systems Technologies (Robotics)
- Advanced Computing
- Power and Energy
- System of Systems Analysis
- Information Assurance

RDECOM

Biosciences

Sensors and Electronics

A. Belcher

Cytomx/ARL/UCSB

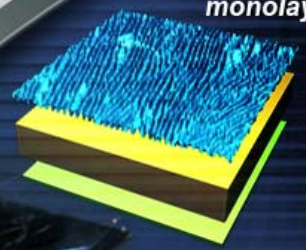
Molecular Recognition Elements

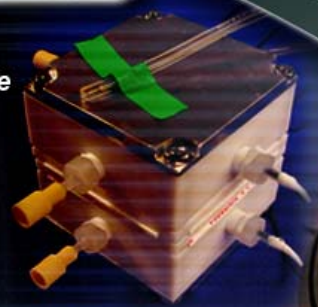
Materials

Sacrifical Bonds for Energy Absorption

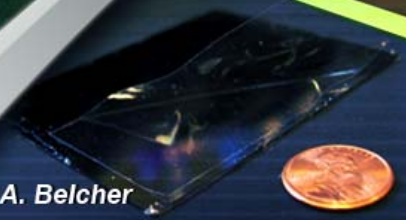
ICB

Self Assembled virus/cobalt oxide monolayer





Microbial Fuel Cells

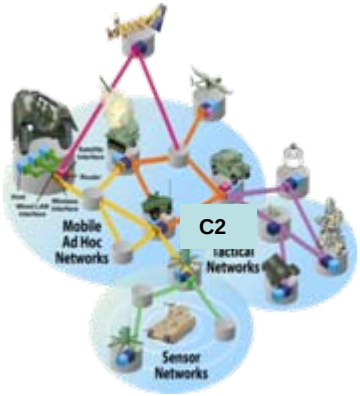


A. Belcher

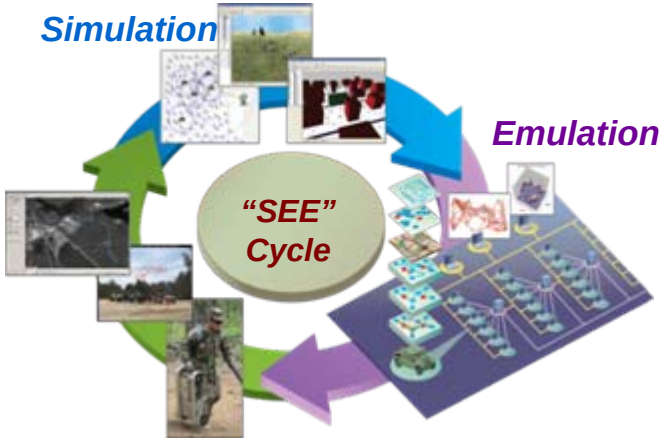
Power & Energy

Network Science

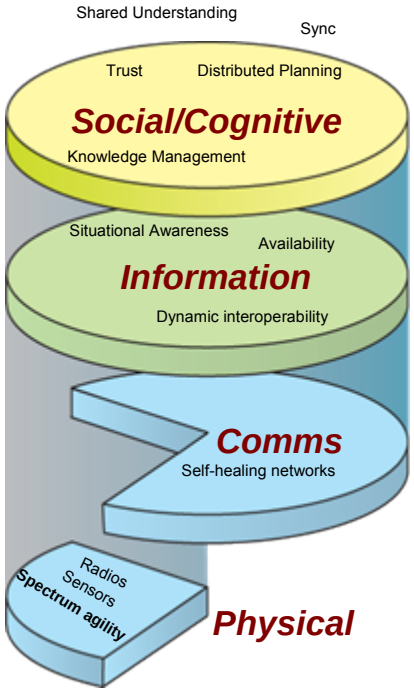
Mobile Ad Hoc C4ISR Networks



HPC-Enabled Large-Scale High Fidelity M&S

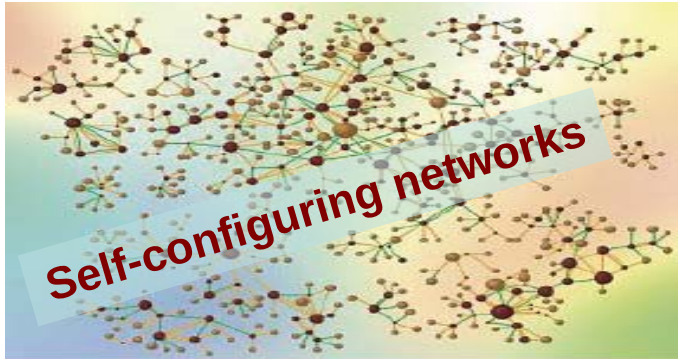


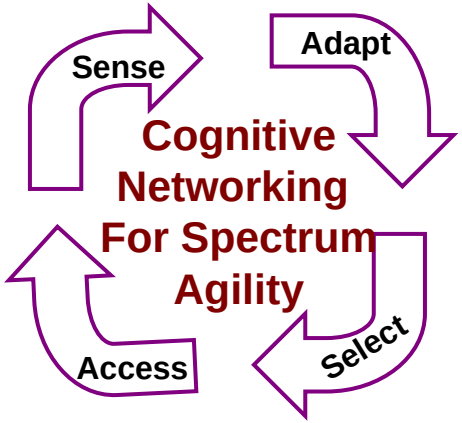
Joint Design of Networks



Robust Network Design Tools

Human Dimensions of Networking





Deliver the right information at the right time to the Warfighter

RDECOM

Autonomous System Technologies

ARL

Large-Scale Robotics Technologies supporting Maneuver Forces

Autonomous Mobility and Dexterous Manipulation for Man-Portable Systems

Micro-Autonomous System Technologies breeding a new class of Soldier assets

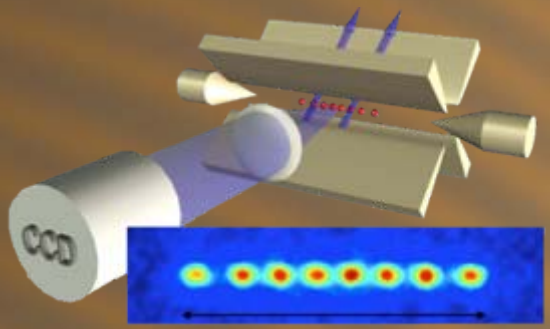
Providing the Soldier with superior situational awareness

Advanced Computing

PC's

Massively Parallel Computing
PetaFLOP Computer

Emerging Quantum
Computing Technologies



PS3

HPC

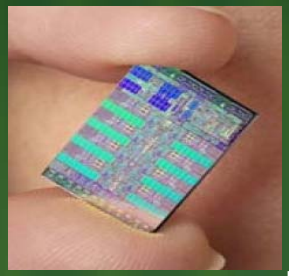
Scalable
Algorithms

Unique and Smart Algorithms

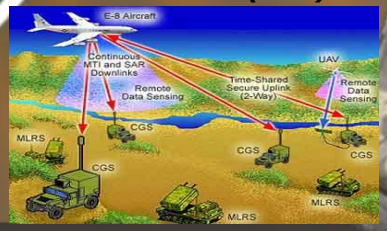
Commodity Computing
Gaming Industry GPUs

Multi-core
(1 TerFlop)

PetaFLOP (10^{15})



Microelectronics
Software

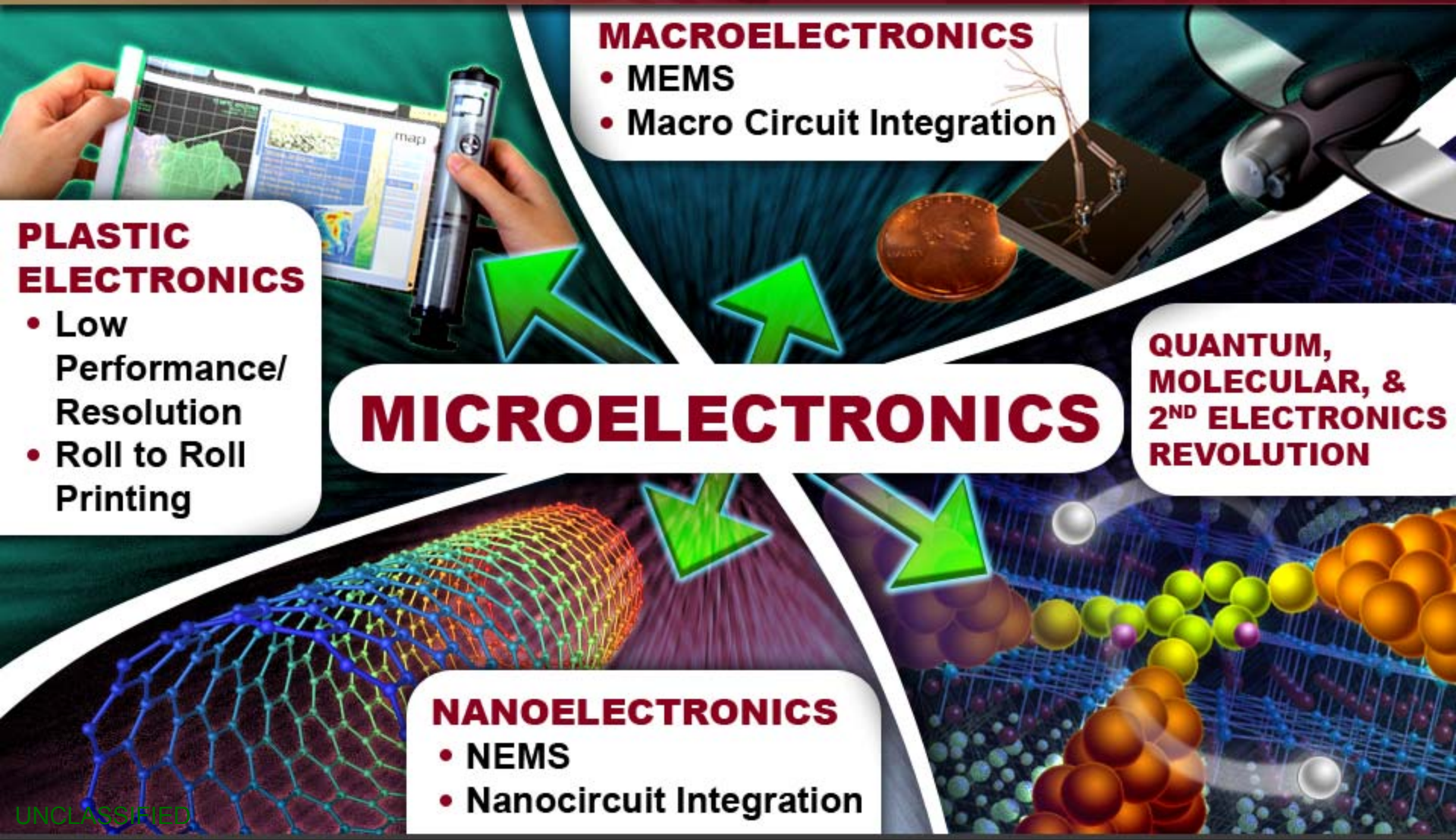


The power of supercomputing in the hands of the Warfighter

RDECOM

Electronics at the Crossroads Beyond Moore's Law

ARL



Unbreakable Comms - Neural Implants - Radars for Hard Targets
Deep Tunnel & Bunker Detection - "Printed" Sensors & Tags

Technical Programs
New Initiatives

Robotics/Autonomous Systems
- Perception
- Intelligence
- Human-Robot Interaction
- Dexterous Manipulation & Robust Mobility

Neuroergonomics
- Soldier-System Perceptual and Motor Integration
- Complex Decision Making
- Individualized Cognitive Assessments *In Operational Environments*

Network Science Center
- Network Theory/Modeling
- Information Fusion
- Information Assurance
- Human Performance and Adversary Understanding

Vehicle and Soldier Protection
- Ultralightweight and multifunctional materials
- Novel and hybrid defeat mechanisms
- Multi-scale physics-based modeling and simulation tools

RDECOM

America's Laboratory for the Army

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.