Natick Soldier Systems Center

U.S. ARMY RDECOM®

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Prepare the Force…Secure the Future

Rhode Island Defense/Textile Day
University of Rhode Island

5 DEC 11

BG John J. McGuiness
U.S. Army Research, Development and Engineering Command
Deputy Commanding General

U.S. Army Natick Soldier Systems Center
Commanding General

Agenda

- Research Development and Engineering Command (RDECOM)
- Natick Soldier Systems Center (NSSC)
- Doing Business with the Army

RDECOM Vision/Mission

Vision: The Army's primary source for integrated Research, Development and Engineering capabilities

Focus on the Warfighter

Mission: Empower, unburden and protect the Warfighter to provide the Army with the decisive edge

The World We Live In

What has not changed?
We Still Live in a World of Persistent Conflict


Environment

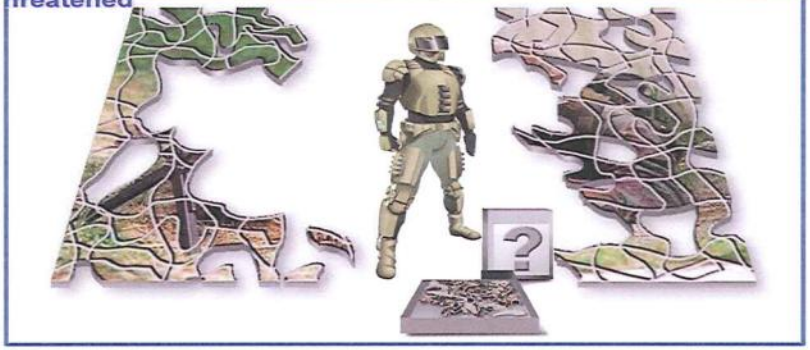

Closed States Threatened


WMD/E Attacks


Failed States


Dissatisfied Populations

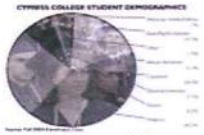

Globalization




Resource Wars


Humanitarian Crises


Resources


Demographics


Urbanization


Terrorist Recruitment

Proliferation


Criminal Environments

Soldiers will continue to be required to function in diverse missions and roles…we need an immediate understanding of how we must prepare, train equip and sustain

RDECOM Structure

CG RDECOM

U.S. ARMY RDECOM

Charter Established
23 August 2002

CSM

EDCG RDECOM
(Acting)

DCG RDECOM
&
Senior Commander NSSC

- RFEC Atlantic
- RFEC Pacific
- RFEC Americas

AMRDEC · ARDEC · ARL · AMSAA · CERDEC · ECBC · NSRDEC · TARDEC

Mission: Empower, unburden and protect the Warfighter to provide the Army with the decisive edge

RDECOM Technology Areas

Air & Missile RDEC (AMRDEC)

- Engines & Drive Trains for Aviation
- Platform Design & Structures
- National Rotorcraft Technology Center
- Rotors and Vehicle Management
- Unmanned & Optionally Manned Systems
- Aircraft and Occupant Survivability
- Airworthiness Approval and Direction
- Mission Critical Computer Resources
- Active Protection
- Air Defense
- Mission Critical Computer Resources

Natick Soldier RDEC (NSRDEC)

- Clothing & Protective Equipment
- Airdrop / Aerial Delivery
- Expeditionary Basing
- Joint Service Combat Feeding
- Soldier/SCU Technology Maturation & Demo
- Human Systems Integration Sciences

Armaments RDEC (ARDEC)

- Grenades and Demolitions
- Warheads
- Fire Control Systems
- Fuze. Energetics
- Small / Medium Caliber Weapons and Ammo
- Large Caliber Weapons and Ammo
- Aeroballistics, Shot Detection, High-g
- Munitions
- Explosive Ordnance

Tank-Automotive RDEC (TARDEC)

- Ground Vehicle
- Survivability
- Active Protection Systems
- Vehicle Electronics and Architectures
- Mobility
- Sustainment Engineering
- Water Purification
- Power & Energy
- Robotics
- Military Adaptation of Commercial Technology
- National Automotive Center

Army Research Lab (ARL)

- Information Sciences
- Human Sciences
- Materials and Manufacturing Sciences
- Ballistics and Aeromechanic Sciences
- Extramural Basic Research

Edgewood Chemical & Biological Center (ECBC)

- Aerosol Physics
- Chem & Bio Agent Spectr/Algorithm Devel
- Chemistry & Bioscience of CB Warfare
- Emerging Threats Science/Technology
- Filtration Sciences
- Inhalation Toxicology
- OPCW Laboratory
- Smoke and Obscurants Advanced Technology
- CB Concept Through Sustainment Solutions
- Life Cycle CB Materiel Acquisition
- Full Service CB Testing
- CB Agent Handling and Surety
- Chemical Munitions Field Operations
- Single Small Scale Facility

Communications-Electronics RDEC (CERDEC)

- C2 Enabling Technology
- Electronic Warfare Technology
- Aircraft Survivability
- Radar
- IR
- Counter IED
- Power
- Antennas
- Network Enterprise Management
- Cyber warfare
- Intelligence & Surveillance
- Displays
- Tactical Biometrics
- C4ISR Systems Integration
- Wireless Transport / Mobile Networking

Demonstrating Army Technology Advances

Technology Enabled Capability Demonstrations (TECDs)

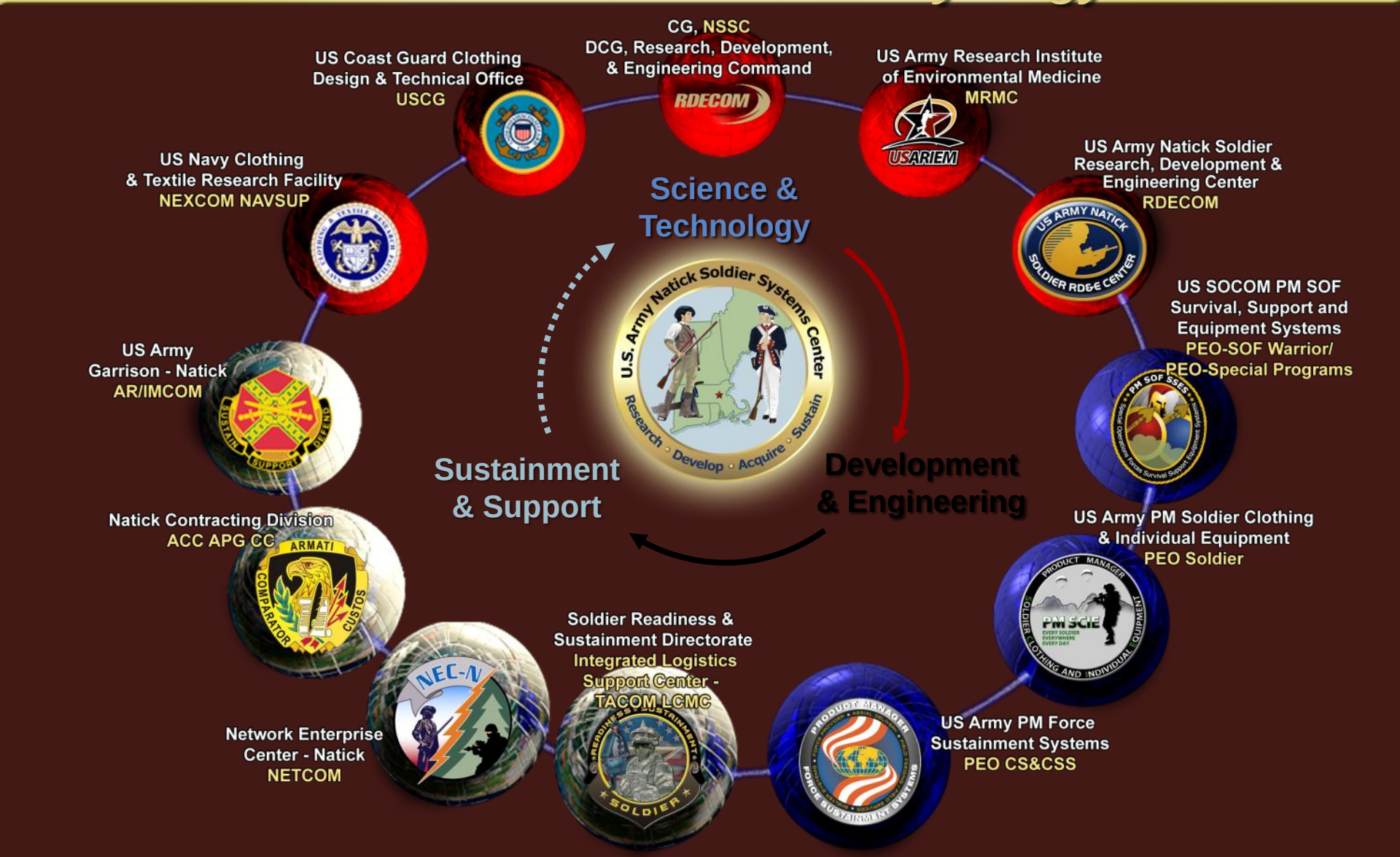
- Starting in FY 14
- Short-term (2-3 year) programs that demonstrate and deliver a capability thru S&T.
- 10 programs across the Army S&T community

- **Force Protection – Soldier & Small Unit**
- **Overburdened – Physical Burden**
- **Sustainability/Logistics - Basing**
- Force Protection - Basing
- Force Protection - Occupant-Centric Platform
- Surprise/Tactical Intelligence - Mission Command
- Surprise/Tactical Intelligence – Actionable Intelligence
- Human – Medical Assessment/Brain in Combat
- Human – Individual Training to Tactical Tasks
- Sustainability/Logistics – Transport, Distribute, & Dispose

Natick Soldier Systems Center

UNCLASSIFIED

Natick Soldier Systems Center
Collaboration and Synergy



Natick Soldier Systems Center
Collaboration and Synergy

US ARMY NATICK SOLDIER SYSTEMS CENTER • Protecting America's Heroes

Who We Support

ARMY

MARINES

NAVY

AIR FORCE

SOF

COAST GUARD

Defense

- Joint Program Executive Office for Chemical/Biological Defense
- Defense Logistics Agency
- Defense Advanced Research Projects Agency

Other Government Agencies

- Office of the Surgeon General
- National Aeronautics & Space Administration
- Food and Drug Administration
- United States Department of Agriculture
- United States Forestry Service
- Bureau of Engraving and Printing
- United States Postal Service
- Army Veterans Program
- Department of Justice
- Department of Homeland Security

Current Operations Support

Quick Reaction Cell (QRC)

- NSRDEC component of RDECOM's Current Operations supporting elements
- Immediate responses to Capability Shortfall Requests from deployed Operating Forces (primarily OEF)
- Rapid prototyping and equipping to demonstrate technologies with deployed units
- Improve Soldier Tactical Capabilities (Survivability, Sustainability, Mobility, Combat Effectiveness, and Quality of Life)

Modular Ballistic Protection System – Stand Alone Variant

In response to need in Regional Command – East (RC-E) for hastily erectable ballistic protection for Indirect Fire positions

High Stress Collapsible Water Bag and Containerized, Unitized Bulk Equipment (CUBE)

In response to need in Regional Command – East (RC – E) for alternatives to resupply troops in OEF with fuel and water

Ironman High Capacity Ammunition Carrying System

In response to Soldier field crafted solution in Regional Command – East (RC-E) to carry and feed 7.62 linked ammunition from the gunner's back

Well Exploration Kits

In response to need in Regional Command – South (RC – S) for mountaineering kits to be used to investigate suspected well caches

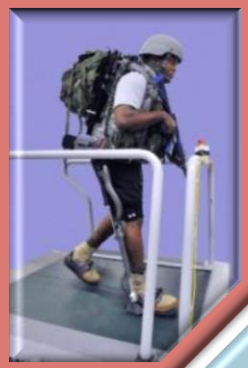
Sacramental Wine Packaging

In response to need in Regional Command – East (RC – E) for Chaplaincy to transport religious wine to FOBs and COPs

NSSC Labs and Test Facilities

Center for Military Biomechanics Research

Allows for 3D analysis of movement, measurement of external forces on the body, monitoring of muscle activity, assessment of O_2 consumption, and real-time mapping of pressure patterns



3D Laser Scanning Lab

Whole body & head/face laser scanning system that enables measurements for current and next generation armor and helmet systems

Doriot Climatic Chambers

Tests the limits of human performance under extreme conditions. Primarily used for human research – where a dedicated group of soldiers perform as human research volunteers.

Cognitive Performance Lab

Virtual Reality & Mobile Cognitive Assessment Platform Capabilities

Thermal Test Facility

Includes a propane fire cell, flame & thermal lab, laser lab, and CO_2 laser

NSSC Labs and Test Facilities

USARIEM Maher Memorial Altitude Laboratory

Pikes Peak, Colorado

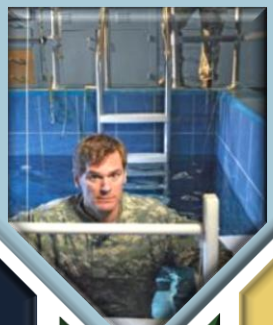
Located on the summit of Pike's Peak this field laboratory is ideal for altitude studies involving multiple volunteers (up to 16) and longer exposure times.

Hypobaric (Altitude) Chambers

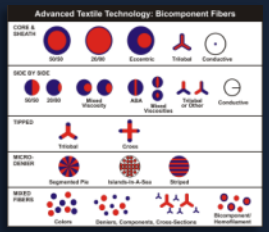
Simulates global atmospheric conditions by reducing ambient barometric pressure in combination with precise manipulation and control of temperature and relative humidity.

Water Immersion Laboratory

Test human performance while exercising in water with temperatures controlled between 5°C to 50°C.



Fiber CoE



One of a kind bi/tri-component fiber extrusion capability that enables the exploration of lightweight and reactive/responsive multi-functional fibers.

Polymer Film CoE

Enables R&D of new plastics and nanocomposites formulations at lab scale production level

Base Camp Integration Lab

- Based at Fort Devens - Team Effort (Active and Reserve)
- Two 150 man Force Provider Expeditionary Base Camps
- Test and Improve Current Component Systems
- Develop New Technologies for Future Use – Power & Water
- Great Potential to Expand

Nanofibers

High Performance Fiber Facility
Mono/Bi-/Tri-Component Fiber Extruder

Research-scale Bi/tri-component Fiber Extruder:

Capacity – 1 to 6 pounds/hour

¾ Inch Diameter Single Screw

Temperature Limit – 350° C

Three Melt Pumps are Thermally Isolated

Nitrogen Ports for Oxygen Sensitive Polymers

Draw Speed: 500-2500 meters/min.

Cost - $580K

High Performance Fiber Facility

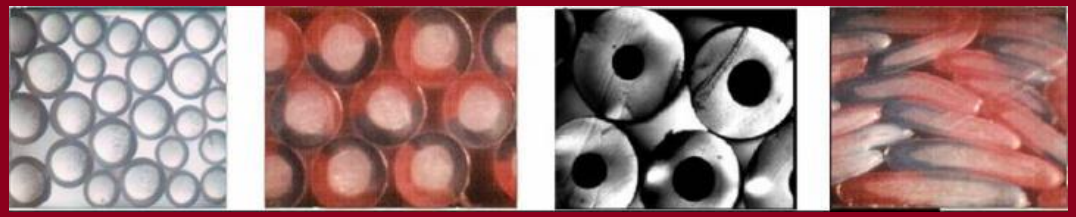
Partnering Opportunity

- **Optical Fibers**
  Optical Sensing and Communication
- **Electronic Fibers**
  Molten Metal Core/Polymer Sheath Fibers for E-Textile Applications
- **High Strength Fibers**
  Islands-in-the-Sea Nanofibers for Soft Armor or High Strength/Impact Composites
- **Flame Retardant Fibers**
  New Polymers or Nanoparticle Additives for Improved FR
- **Reactive Fibers**
  Tri-Component Fibers for Smart Insulation

BICOMPONENT ISLANDS-IN-THE-SEA (INS) FIBERS

Applications: Production of melt processed nanofibers or optical segregation (Nanofibers for ballistic soft armor/composites, and internal reflection fibers)

BI/TRI-COMPONENT SHEATH/CORE FIBER



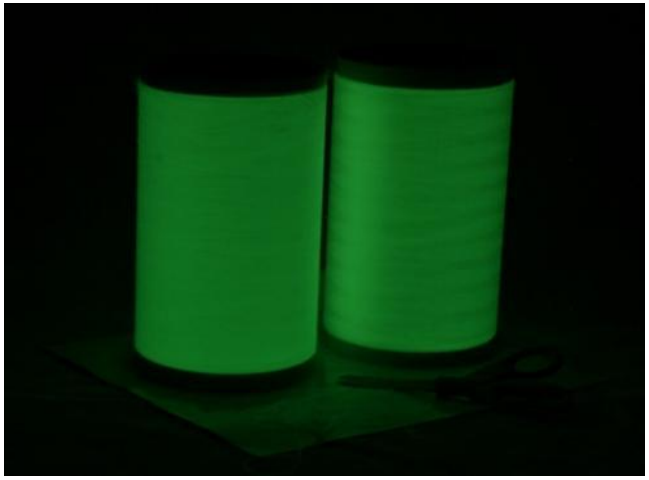
Applications: Concentration of reactive components at the surface of the fiber or putting a conductive material in the core, surrounded by an insulating material (CB decontamination, antimicrobials, sensors, electronic textiles)

High Performance Fiber Facility

Example Partnering Effort

Potential Applications

- **First Responders**
- **Construction Workers**
- **Recreational Sports**



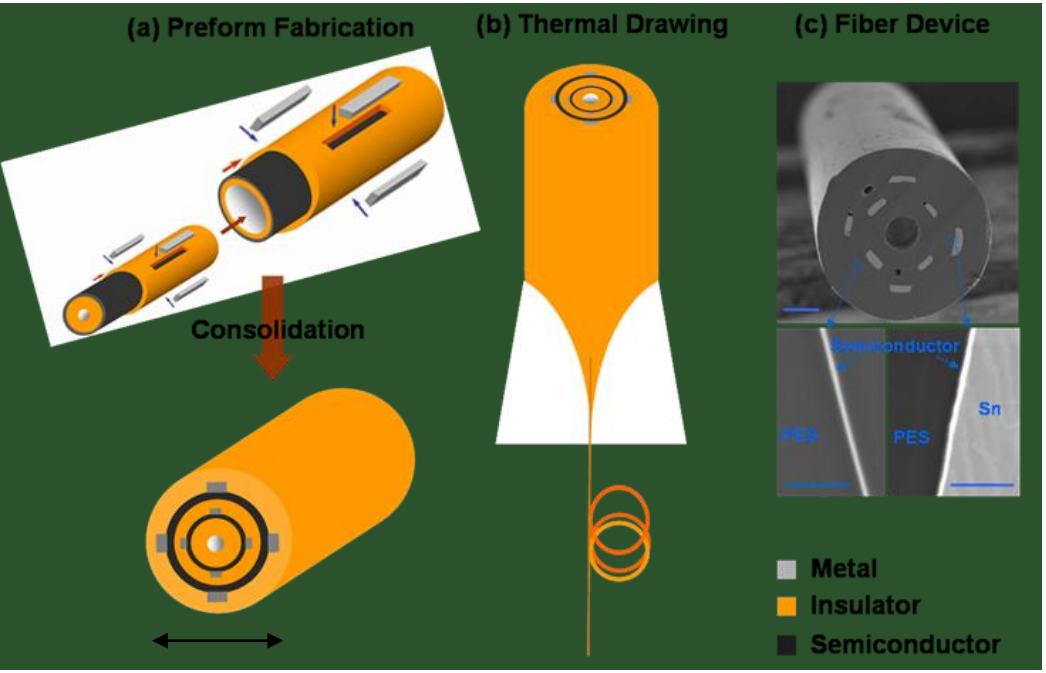
- **Capable of achieving high loading levels in the sheath of the fiber**
- **Reduced overall additive usage**
- **Increased Performance by utilizing unique fiber construction**

PERFORMANCE INDICATOR™

High Performance Fiber Facility
Example Partnering Effort

Towards novel optoelectronic fiber-devices and fabrics:

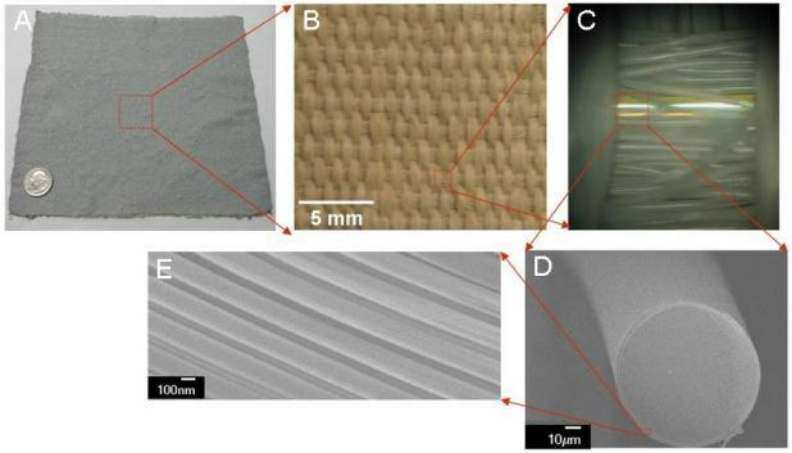
Full-body sensing – new paradigm fibers & fabrics that can see, feel, hear…



~ 3 cm

*With **20nm** feature sizes possible*

Multi-component fiber was woven into a standard fabric (A,B,C)



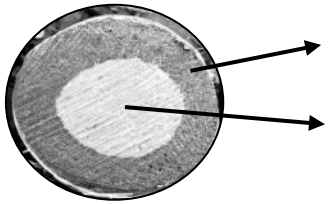
Magnified view of multi-component fiber (D,E)

High Performance Fiber Facility
Example Partnering Effort

DoD SBIR Contract
High Loading Metal Core in the Polymer Sheath

EY TECHNOLOGIES
Engineered yarns. Smart solutions.

Contractual Effort



10000 yards+ of continuously conducting fiber produced

Textile Production

Military Application

Commercial Application

Medical **Sports**

Smart Bandages

Adaptive Clothing

How Do You Get in the Game

Working with the Army

Partnering / Contracting

Partnering

- **CRADA (Cooperative Research & Development Agreement)**

  One or more federal partner(s) working collaboratively with one or more non- federal partner(s).

- **TSA (Testing Services Agreement)**

  Fee-for-service commercial test and evaluation activities for private industry, academic institutions, and individuals. Not a collaboration.

- **PLA (Patent License Agreement)**

  PLAs license commercial companies to commercially exploit patented government-developed technology.

- **EPA (Education Partnership Agreement)**

  Flexible agreement for the transfer of material, technology, and expertise, to elementary and secondary schools, colleges, universities

Contracting

- **SBIR (Small Business Innovative Research)**

  Phase I $100K over 6 months; Phase II - $1M over 2 years.

- **BAA (Broad Agency Announcement)**

  The type of research solicited under a BAA attempts to increase knowledge in science and/or to advance the state of the art as compared to practical application of knowledge.

- **Standard Contract**

  Funding issued against specific statement of need.

- **Grant**

  Funding issued without defined outcome.

- **Cooperative Agreement**

  Funding issued against a specific need when Gov't participation in the work is expected.

Innovation Access Network

- Success Story
  - One member recently began working with an Innovator from the rapidly growing Innovator community. According to the member, the organization they are working with “would have never been found if not for their involvement in IAN.”

- https://www.innovationaccess.org/

Contacts for Partnering at NSSC

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Partnering at RDECOM Centers/Labs

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Tim Ryan
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US Army Tank and Automotive Research, Development and Engineering Center (TARDEC)
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US Army Edgewood Chemical Biological Center
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Natick Soldier Systems Center
Natick MA

Over 50 Years Protecting Those Who Serve

- We are the science behind the Soldier, Marine, Sailor, Airman and Coast Guardsman.
- Our location provides unique access to New England's world-renowned Universities, Hospitals & Industries.
- We play a crucial role in World-wide Operations and Homeland Defense
- We play a key role in Army Transformation for the 21st century
- Working together, we're greater than the sum of our parts

NSSC is Home to the Soldier of the Future








Conclusions

EMPOWER UNBURDEN PROTECT

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