Natick Soldier Research, Development and Engineering Center
Army Research Opportunities Overview for JAPBI

Mr. Michael Codega
Chief – Systems, Engineering & Integration Division
Warfighter Directorate
michael.j.codega.civ@mail.mil

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Natick Soldier RD&E Center

The Soldier's RDEC - Ensuring Dominance through Superior Scientific & Engineering Expertise.

Providing the Army with Innovative Science & Technology Solutions to Optimize Soldier/Team Performance and Improve Combat Readiness.
Natick Soldier Systems Center

78 Acres
459,000 Sq. Ft. of Lab Space

NSSC Partners
Research & Technology Collaborators

Only Active Army Installation in New England, the Birthplace of the Army

Product/Project Managers Development Partners
Mission Areas

- Joint Service Combat Feeding
- Expeditionary Basing/Collective Protection
- Aerial Delivery
- Warfighter Protection, Survivability, and Optimization
- Soldier and Squad Performance Optimization

- Physical
- Technology
- Cognitive
- Human Systems
- Integration
- Mission
- Organization
- Social/Organizational

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Technology Readiness Levels

- Used to identify the maturity of a technology, component or system
- Drives types of funds that can be spent on research and acquisition
- Software-, Engineering-, and Manufacturing Readiness Levels similar

<table>
<thead>
<tr>
<th>TRL</th>
<th>Definition</th>
<th>Description</th>
<th>BA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic principles observed and reported.</td>
<td>Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology’s basic properties.</td>
<td>6.1</td>
</tr>
<tr>
<td>2</td>
<td>Technology concept and/or application formulated.</td>
<td>Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.</td>
<td>6.2</td>
</tr>
<tr>
<td>3</td>
<td>Analytical and experimental critical function and/or characteristic proof of concept.</td>
<td>Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.</td>
<td>6.3</td>
</tr>
<tr>
<td>4</td>
<td>Component and/or breadboard validation in laboratory environment.</td>
<td>Basic technological components are integrated to establish that they will work together. This is relatively “low fidelity” compared to the eventual system. Examples include integration of “ad hoc” hardware in the laboratory.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Component and/or breadboard validation in relevant environment.</td>
<td>Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include “high fidelity” laboratory integration of components.</td>
<td>6.4</td>
</tr>
<tr>
<td>6</td>
<td>System/subsystem model or prototype demonstration in a relevant environment.</td>
<td>Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology’s demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.</td>
<td>6.5</td>
</tr>
<tr>
<td>7</td>
<td>System prototype demonstration in an operational environment.</td>
<td>Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Actual system completed and qualified through test and demonstration.</td>
<td>Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Actual system proven through successful mission operations.</td>
<td>Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.</td>
<td></td>
</tr>
</tbody>
</table>

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### Technology Transfer Mechanisms

**Flexibility through *non-funded* federal partnering agreements**

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cooperative Research and Development Agreements (CRADAs)</strong></td>
<td>• One or more federal laboratories working with one or more non-federal partner(s) toward a common R&amp;D objective.</td>
</tr>
<tr>
<td><strong>Testing Service Agreements (TSA)</strong></td>
<td>• Straight fee-for-service testing, not a collaborative effort. • Customer owns all test data, Gov’t release is prohibited</td>
</tr>
<tr>
<td><strong>Patent License Agreements (PLAs)</strong></td>
<td>• Non-exclusive, partially exclusive, or exclusive.</td>
</tr>
<tr>
<td><strong>Educational Partnership Agreement (EPA)</strong></td>
<td>• For the purpose of encouraging and enhancing study in scientific disciplines at all levels of education.</td>
</tr>
</tbody>
</table>
Cooperative Research and Development Agreements (CRADA)

Presumes alignment of government and commercial/academic technical objectives

- Federal partners can provide personnel, services, facilities, equipment, *but no $$$’s to non-federal partners.*
- Non-federal partners can provide personnel, services, facilities, equipment, and $$$’s.
- Each party retains ownership of solely invented IP and joint inventions will be jointly owned.
- Federal government retains a non-exclusive license to all IP arising under the CRADA, for use by or on behalf of the government.
- Government agrees to negotiate a royalty bearing exclusive license to government owned IP arising under the CRADA.
Unique federal laboratory facilities/capabilities are available to the private sector for testing purposes

- A Testing Service Agreement (TSA) is a simple two party agreement that can be turned around in a few days.
- Cost to the purchaser is equal to the laboratory's cost to provide the service.
- The purchaser retains sole ownership of the test results and the government is prohibited from disclosing data to third parties.
- The government does not derive any rights in or to the purchaser’s Intellectual Property.
- The government is prohibited from directly competing with private testing service companies.
Under a Cooperative Agreement, a principle purpose is to transfer a thing of value to the recipient to carry out a public purpose of support or stimulation authorized by law of the U.S. instead of acquiring property or services for the direct benefit or use of the U.S. government.

Cooperative Agreement (CA)

- Public Benefit
- Substantial involvement is expected between the agency and the recipient
- Funding Agreement
- Rigid Patent Rights
Opportunities for Funded Contracts

BAA and Unsolicited Proposals must comply with the FAR but still provide the offeror with more flexibility than a typical contract solicitation.

**Broad Agency Announcement (BAA)**
- The BAA is an open solicitation for proposals.
- It is funded to fulfill requirements for scientific study and experimentation.
- The BAA does not focus on specific systems or hardware.
- The solicitation is divided into topic groups that are of interest to the sponsoring lab and identifies a POC for that area.

**Unsolicited Proposals (UP)**
- Innovative and unique;
- Independently originated and developed by the offeror;
- Prepared without Government endorsement or involvement;
- Include sufficient detail to permit a proper evaluation;
- Not be an advance proposal for a known agency requirement;
- Not address a previously published agency requirement.

BAAs and UPs are always subject to availability of appropriate agency research funds (usually 6.3) in a fiscal year.
C. Warfighter Systems Technologies
1. Ballistic Protection for Individuals
2. Integrated Protective Headborne Equipment and Injury Diagnostic/Assessment Tools
3. Modular Personal Protection Equipment (MPPE) and Injury Diagnostic Assessment Tools
4. Chemical/Biological Protection for Individuals
5. Flame and Thermal Protection for the Individual Soldier
6. Biotechnology
7. Countersurveillance
8. Body Worn Interactive Materials
10. Biomechanics
11. Materials Nanotechnology
12. Anthropometry
14. Warrior Performance
15. Soldier Power Sources, Power & Data Distribution and Management
16. Future Warrior Technology Integration
17. Technology Assessment and Simulation Tools
18. Ecological Approach to Warfighter Survivability; Perception-Action-Cognition
19. Tactical Medical Equipment and Systems
20. Integrated Sound, Light and Blast Management for the Ears and Eyes
21. Soldier Centric Information Portrayal & Management Technologies

Additional Information and POCs for each area are listed in the BAA
For more information on how you can work with the NSRDEC, contact
Office of Research and Technology Applications
508-233-4184 or 508-233-4488
usarmy.natick.rdecom-nsrdec.mbx.nati-amsrd-nsc-ad-b@mail.mil

Office of the Small Business Advocate
508-233-4367

Small Business Innovation Research
508-233-5372

Learn about the NSRDEC Broad Agency Announcement (BAA)

DOWNLOAD THE BAA

Learn how to do business with the NSRDEC team

DOWNLOAD THE GUIDEBOOK

Federal Business Opportunities (FedBizOps or FBO)
- http://www.fbo.gov
- Search W911QY-R-15-0016

Testing Facilities and Equipment
U.S. Army Program Manager Soldier Protection and Individual Equipment (PM SPIE)

Top S&T Challenges

Dr. James Q. Zheng
Director/Chief Scientist, Technical Management
PM Soldier Protection & Individual Equipment
Program Executive Office – Soldier, US Army
### Top 10 S&T Challenges - PPE

<table>
<thead>
<tr>
<th>Rank by Importance</th>
<th>Rank by Difficulty</th>
<th>Programs</th>
<th>Note/Sub-program description</th>
<th>Lead Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>Test Methodology Development - ballistic, blunt impact</td>
<td>Ballistic/Blunt impact trauma to head/torso, injury based</td>
<td>USAMRMC/ARL/NSRDEC</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Blast Testing Methodology</td>
<td>Standardization, relative/absolute measurements, correlation between shock tube and free field</td>
<td>ARL/ATC/NSRDEC/USAMRMC</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>New Ceramic Material Development</td>
<td>B60, etc. (focus on hardness)</td>
<td>ARL</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>New Fiber and Composite Material Development</td>
<td>Co-polymer PPO, Aramid, etc. (focus on tensile strength)</td>
<td>ARL</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>Improvement of Current Ceramic Materials</td>
<td>B4C, SiC, graded grain size ceramic composite, hybridization, etc.</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Improvement of Current Fiber and Composite Materials</td>
<td>Aramid, HMWPE, fibers, unidirectional composites (resin), and tape</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>Modeling &amp; Simulation</td>
<td>Predictive property-performance (fabrics, fiber-composite, ceramic based armors), human performance</td>
<td>ARL/ISN</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Soft Armor Configuration/Integration/Architecture</td>
<td>Optimization for performance and weight (focus on defeat mechanism)</td>
<td>NSRDEC/ARL</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Helmet Processing, Effect on Performance</td>
<td>Pressure Distribution on complicated shapes (P-T-t optimization)</td>
<td>NSRDEC/ARL</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Fundamental Understanding</td>
<td>Theoretical Strength of Fibers (break what), stress wave propagation (ballistic, blast, blunt), etc.</td>
<td>ARL/ARO/ISN</td>
</tr>
</tbody>
</table>

**Importance**: 1 = Most Important - 10 Least  
**Difficulty**: 10 = Most Challenging - 1 Least

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# Top 10 S&T Challenges - OCIE

<table>
<thead>
<tr>
<th>Rank by Importance</th>
<th>Rank by difficulty</th>
<th>Programs</th>
<th>Note/Sub-program description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>Test Methodology Development/standardization</td>
<td>Develop, validate and standardize testing methods (FR, vector, signature, antimicrobial, etc.)</td>
<td>NSRDEC/ARL</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>Multi-functional fiber/textile</td>
<td>FR, vector, antimicrobial, water repellency, moisture wicking, durable, signature management</td>
<td>ARL/ARO/MIT/ISN</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>FR Test &amp; Req. Analysis</td>
<td>Pyroman repeatability, mid scale test, correlation to free field, requirements analysis</td>
<td>NSRDEC</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>Personnel Airdrop</td>
<td>Modeling/Simulation, instrumentation e.g. black box, improvement in general</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>Signature Management</td>
<td>Materials/methods for Soldier concealment e.g. visible, thermal, SWIR</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>New Material Development</td>
<td>FR materials, light weight, low cost fabrics, bio-inspired</td>
<td>NSRDEC</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>Vector Protection</td>
<td>Permethrin alternative, requirements analysis</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>Advanced textile/fabrics manufacturing technology</td>
<td>3D, seamless, knitting, non-woven, etc.</td>
<td>ARL/NSRDEC</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>System Integration</td>
<td>Optimization for reduced weight, bulk, number of items in a system e.g. EPS.</td>
<td>NSRDEC</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Smart Textiles</td>
<td>Regulating temperature, color change, threat detection, physiological monitoring, etc.</td>
<td>ARL/ARO/MIT/ISN</td>
</tr>
</tbody>
</table>

**Importance:** 1 = Most Important - 10 Least

**Difficulty:** 10 = Most Challenging - 1 Least

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SPIE Broad Agency Announcement (BAA)

https://www.fbo.gov/index?s=opportunity&mode=form&id=55f00a906200b53bbb75378150456aac&tab=core&cview=0

OR

Go to FedBizOpps and put in Solicitation Number:
W91CRB-16-R-0005

OR

Contact Technical Management Directorate, SPIE, PEO Soldier:
Ms. Virginia Halls, virginia.a.halls.civ@mail.mil, 703-806-5176 (PPE)
Ms. Suzanne Horner, suzanne.e.horner.civ@mail.mil, 703-806-5181 (OCIE)

Please note that SPIE BAA only funds 6.4 projects – Testing, evaluating and developing component and/or subcomponent prototypes of SPIE managed items (protection & clothing and individual equipment)

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Yesterday, Today and Tomorrow

US Army Natick Soldier Research, Development & Engineering Center

The Science Behind the Soldier

Yesterday, Today and Tomorrow