U.S. ARMY NATICK SOLDIER RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

BROAD AGENCY ANNOUNCEMENT (BAA) FOR BASIC AND APPLIED RESEARCH

Solicitation Number W911QY-13-R-0032

Effective from 1 March 2013 - 31 March 2015

"THE LEADER IN EMPOWERING THE WORLD'S MOST CAPABLE SOLDIERS"

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SECTION I -- INTRODUCTION

The mission of the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC) is to "Maximize the Warfighter's Survivability, Sustainability, Mobility, Combat Effectiveness and Field Quality of Life by Treating the Warfighter as a System".

Our focus is to deliver world class research, development, systems engineering, and services with a unique human-centric focus by:

- cultivating a highly motivated, expert, and agile workforce;
- exceeding customer and stakeholder expectations;
- delivering what we promise at an unprecedented pace and honoring our commitments;
- fostering long term strategic partnerships and collaborations with key customers, other Government agencies, industry, and academia.

By treating the Soldier as a system, we strive to EMPOWER, UNBURDEN, and PROTECT the Soldier to be comparable to other decisive weapon systems. The Soldier operates primarily within a small unit. Therefore, we focus on both the individual and his/her tactical environment including his/her unit.

Our goal is to provide the American Warfighter the best equipment for the best price through research, development and engineering in the areas of:

- Combat Feeding Equipment and Systems;
- Combat Ration Research and Development (R&D);
- Warfighter Systems Technologies;
- Shelters and Life Support technologies for Contingency Basing;
- Airdrop - Advanced Personnel and Cargo Airdrop Systems;
- Textile Technologies;
- Modeling and Simulation;
- Neuroepidemiology;
- Warfighter Advanced Technologies.
- Technology Enabled Capability Demonstrations

We are deeply committed to making all our service members the best clothed, equipped, sheltered, and fed in the world.

This Broad Agency Announcement (BAA) is intended to fulfill requirements for scientific study and experimentation directed toward advancing state-of-the-art technologies and/or increasing knowledge and understanding as a means of eliminating current technology barriers. This BAA DOES NOT focus on specific systems or hardware solutions. This BAA identifies NSRDEC research/exploratory development areas of interest and provides prospective offerors information on the preparation of proposals along with proposal evaluation factors. The Government may award purchase orders, contracts, grants, cooperative agreements, or other transactions against this BAA.

Please note that, typically, research resulting from work executed under this BAA leads to an additional requirement for services being provided by the applicable contractor in support of operational experiments to evaluate the measures of merit and performance enhancement capability to the Warfighters. However, it is not possible at the time of release of this announcement, or at the time of contract award, to accurately anticipate if these services will be required nor is it possible to anticipate the level of effort required. In addition, the technology explored under this BAA typically has application across the various branches of the Department of Defense (DoD). In order to satisfy the unique needs of these different branches and to ensure a proper job is done in the evaluation of the applicable technology, contract modifications which add new Contract Line Item Numbers (CLINs) and/or expand on current CLINs for services providing flexibility in technology assessment (with technology transition as the ultimate goal) may be executed. In the event that this is required, it shall be considered to be within the scope of this BAA and the resulting contract, and, therefore, will have met the requirements of the Federal Acquisition Regulation (FAR), DoD FAR Supplement (DFARS), and the Competition in Contracting Act. The benefit of this flexibility to the Government and ultimately the taxpayer is a significant increase in the R&D return on investment. The flexibility to have multiple users (branches of the military) in the technology evaluation cycle is absolutely critical and allows systems and technologies to be developed in a manner that has broader DoD market applications. These can then be modularly reconfigured to meet goals and objectives for all DoD services.

SECTION II – CONCEPT PAPERS AND PROPOSALS

WHO MAY SUBMIT

The NSRDEC will consider concept papers and proposals based on this BAA from the following organizations and firms interested in conducting scientific research:

- degree-granting colleges and universities,
- nonprofit research institutes,
- foreign organizations, and
- commercial firms (including Large Businesses, Small Businesses, Historically Underutilized Business Zone small businesses, Small Disadvantaged Businesses, Veteran-Owned and Service-Disabled Veteran-Owned Small Businesses, and Women-Owned Small Businesses).

Proposals from government facilities and organizations WILL NOT be considered under this program announcement. Offerors are cautioned that only a duly appointed Contracting Officer acting within the scope and limits of his/her authority may obligate the Government to the expenditure of funds.

Small Businesses (SB), Small Disadvantaged Businesses (SDB), Women-Owned Small Businesses (WOSB), Historically Underutilized Business Zone (HUBZone) small businesses, Service-Disabled Veteran-Owned Small Businesses (SDVOSB), Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs): Although no portion of this BAA has been set aside for SBs, SDBs, SDVOSBs, HUBZones, HBCUs, or MIs, their participation is highly encouraged. For any topic areas (see Section VI) where sufficient quality proposals are received that demonstrate that a set-aside would be appropriate, NSRDEC will consider doing so and modifying this BAA accordingly. Therefore, all above named business types are encouraged to submit proposals under any topic that they feel they are highly qualified to perform.

The applicable North American Industry Classification System (NAICS) code for the majority of work submitted under this BAA will be either 541711 (Research and Development in Biotechnology); 541712 (Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)) or 541720 (Research and Development in the Social Sciences and Humanities). NAICS 541711 and 541712 have a small business size standard of 500 employees while 541720 has a size standard of $7,000,000 in annual receipts.

To be eligible for award, a prospective recipient must be able to demonstrate sufficient financial and technical resources and must meet certain minimum standards pertaining to financial resources, ability to comply with the performance schedule, prior record of performance, integrity, organization, experience, operational controls, technical skills, facilities and equipment. (See FAR 9.405)

WHEN TO SUBMIT

This BAA shall remain in effect until 31 March 2015 unless superseded, extended or canceled. Concept papers will be accepted until the close of business on 28 February 2015. Proposals

may be submitted at any time after the concept paper has been approved and until the BAA closing date of 31 March 2015. Awards against this BAA may be made until 30 June 2015.

The Offeror agrees that if its offer is accepted by the Government, it shall, as specified in the proposal and within ninety (90) calendar days from the date of the proposal, agree to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), and within the time specified in the proposal schedule. At times, the Government may contact an Offeror after the ninety (90) day period about a proposal it would like to bring to award. This will occur when a shortage of funds exists during the initial ninety (90) day period. If this does occur, the Offeror reserves the right to accept or decline the offer and may also submit a revised proposal with any necessary price/schedule changes, though the technical merit must remain the same.

WHERE TO SUBMIT

Concept papers, proposals and inquires shall be submitted to the electronic or physical mail address indicated under each scientific and technical area of interest cited in Section VI herein. Electronic mail submissions may provide a standard electronic signature or a written signature on the cover page of the submission. Facsimile submission is normally not an authorized means for the delivery of such documents. The contractor MUST receive prior approval from the applicable point of contact (POC) for facsimile submissions.

BAA PROCESS

In an effort to minimize proposal preparation costs, this BAA will utilize a two-step process. Step one will be the offeror's submission of a concept paper. This step will preclude unwarranted effort on the part of an offeror whose proposed technology/capability or product is not of interest to the Government. Those offerors whose concept papers are found to be consistent with the intent of the BAA and which are of interest to the Government will be invited to submit a proposal (step two).

Communication with the technical points of contact (POCs) identified in Section V "Scientific and Technical Areas of Interest" (as well as the POCs listed for Safety and MANPRINT) is essential in tailoring responses to the specific needs of NSRDEC. This preliminary communication is especially important because once the formal proposal is accepted by the technical POC and submitted to the NSRDEC's Contracting Office, no further communication between the proposed contractor and the Government technical POC is allowed.

Requests for or offers of conference or symposium support, consultant services, engineering and/or marketing services, and/or training support will not be considered under this announcement. **Only concepts for research/exploratory development will be considered.**

Offerors should not submit a proposal until selected Government personnel have reviewed the concept paper and the contractor has been invited to submit a formal proposal by Government personnel.

a. Concept Paper Submission: If the Offeror has a novel research approach within an area of

interest covered by this BAA, the Offeror should prepare a BAA concept paper. Concept papers should be submitted electronically to the technical POC listed in each area of interest in Section VI. Concept papers may not exceed 5 single-sided 8 ½ x 11 inch typed pages (including charts, graphs, photographs, etc.) and shall include the following:

(1) A brief technical explanation of the proposed effort that addresses the major research thrust, the research goals and deliverables, a proposed approach to achieve these goals and deliverables, and military relevancy.

(2) A brief "management" description outlining key personnel and experience.

(3) Any past performance the contractor has with similar research efforts.

(4) An estimated cost/price and performance schedule for the work.

Concept papers will be evaluated by the Government within ninety (90) days of receipt.

Once an Offeror has been invited to submit a formal proposal by the specified technical POC, the following process MUST be adhered to by the Offeror.

b. Proposal Submission: Informal exchanges should be held with the technical POC listed under each topical area noted in Section VI herein on any proposed research **BEFORE** the submission of a formal proposal since the BAA is written in such broad terms to cover a wide variety of technical areas.

The Offeror's technical, management, cost/price, past performance, subcontracting (if applicable), and company certification sections of the proposal shall be submitted in severable sections as set forth below. The proposal package must be valid for at least 90 days from the date of submission. All information pertaining to each section shall be confined to the appropriate part. The sections shall be as brief as possible, consistent with complete submission. Pages should not exceed 8-1/2 inches in width and 11 inches in length; however, fold-out pages depicting such items as sketches, etc., may be used. The proposal will be evaluated in accordance with the process described in Section IV herein. The offeror's proposal package must include the NSRDEC BAA Proposal Cover Sheet which can be found on the following link:
http://www3.natick.army.mil/nsrdecbaa.html

PART I - Technical Section - automated and/or one (1) original
PART II - Management Section - automated and/or one (1) original
PART III - Cost/Price Section - automated and/or one (1) original
PART IV - Past Performance Section - automated and/or one (1) original
PART V - Subcontracting (if applicable) - automated and/or one (1) original PART VI - Contractor Representations and Certifications - automated and/or one (1) original

(1) **Part I - Technical Section:**
The Offeror is responsible for including sufficient details, without reference to

cost/price, to permit a complete and accurate evaluation of the proposal from a strictly technical standpoint. The following information shall be included:

(a) A summary of the objective/purpose of proposed research - what scientific "problem" you intend to resolve, advance the state-of-the-art with respect to, or increase the understanding of.

(b) Identification of product(s) or process (es) which you anticipate will result from this effort. Product(s) may simply be technical data, reports on the feasibility of novel concepts, product samples, etc. Also, address any MANPRINT and/or safety requirements or state that no such requirements exist. For specific details and guidance on MANPRINT and safety requirements see Section V herein.

(c) Identification of any potential military and/or civilian applications of the product(s) which may be developed if the work performed under the proposed BAA contract is continued following completion of the proposed contract.

(d) An assessment of the probability for project success.

(e) An explanation of the planned approach, techniques, and/or processes to be used in this effort.

(f) Rationale for the proposed methodology. What, if any, innovative ideas/ techniques will be tried? Identify the technical risks in completing this project and the approach taken to overcome these risks.

(g) Any planned interactions with NSRDEC (to include a request for a post award conference if the contractor so desires) required during the performance of proposed contract.

(h) Any planned collaborative arrangements with other parties (including subcontractors and/or consultants) for the effort. Identify the responsibilities and contributions of these parties in completing the intended deliverables. If the Offeror is an academic institution, provide details of planned interactions with industry (if applicable) and letters from the industries in which they commit themselves to support the effort.

(i) A detailed list and description of all deliverables including data the Offeror proposes to provide to the Government, the schedule for delivery, and acceptance criteria. Proposals must include a severable, self-standing, detailed list and description of all deliverables without any proprietary

restrictions which can be used to make award.

(j) A schedule containing milestones for the performance of the proposed effort.

(k) A Statement of Work (SOW) and a Work Breakdown Structure (WBS) that clearly details the scope and objectives of the effort, the technical approach, and the performance goals. The SOW and WBS will be used in the development of any final award, so the proposal must include a stand-alone SOW and a stand-alone WBS without any proprietary restrictions. The WBS must include a detailed listing of the technical tasks/subtasks in hierarchical fashion for the tasks required to accomplish the effort. Each task in the SOW shall describe the work to be carried out, the end result of the task, the time allocated, the organization performing the task, the predecessor tasks, the performance goals of the task, and the resources (labor, materials, and services) required. The resources shall be costed to provide a baseline budgeted cost for the applicable task. The SOW shall be at a level sufficient to define the nature of the work to be carried out, measure progress, and demonstrate the relationship of the tasks to one another.

(l) Detailed Risk Mitigation Plan: Discuss in detail the technical, cost and schedule risks involved with the project and how each risk will be mitigated by the Offeror.

(2) **Part II - Management Section:**

The management section of the proposal shall include the following for the Offeror and any collaborators identified in Part I:

(a) Resumes (or some portion of such) of technical personnel detailing education, experience, and technical expertise proposed for this effort and the percentage of time expected to be devoted to this project.

Note: Resumes should reflect and emphasize the qualifications and experience as related to the execution of the proposed tasks.

(b) Organization of the Offeror's firm.

(c) Facilities and equipment available for the proposed effort.

(d) Project management systems and controls to be utilized by the Offeror. Include tools, systems and procedures that will be used during execution of the proposed tasks. (i .e. task tracking, management tools, etc.)

(3) **Part III - Cost/Price Section:**

The cost proposal must consist of two parts. Part 1 is a detailed cost breakdown for which the Offeror shall utilize the Cost Proposal Spreadsheet; there are no exceptions. The Cost Proposal Spreadsheet can be found by following this link: http://www3.natick.army.mil/nsrdecbaa.html. Click on the "proposal spreadsheet" link and save a copy of the spreadsheet. Instructions for completion have been embedded in the spreadsheet. Any proposed options that are identified in the Technical Proposal but that are not fully priced out in the Cost Proposal Spreadsheet will not be included in any resulting contract or other transaction. Any proposed options **MUST** be separately priced and separate spreadsheets should be provided for the base period and each option period.

Part 2 further breaks down the information in Part 1 as it pertains to each task or subtask. It must include a detailed cost breakdown by task/subtask using the same task numbers as in the Statement of Work. The Offeror must also provide Part 2 for any proposed options.

Part 1 of the cost proposal must include a detailed breakdown of all costs by cost category for each proposed contract year as listed below and include a summary explaining how each element is applied in the cost proposal.

Direct Labor: Individual labor category or person, with associated labor hours and **UNBURDENED direct labor rates.**

Indirect Costs: Fringe Benefits, Overhead, General and Administrative (G&A), Cost of Money (COM), etc. – must show based amount and rate.

If applicable and available, provide a copy of the Forward Pricing Rate Agreement (FPRA) or Defense Contract Audit Agency (DCAA) approved or recommended rates. Indentify if there are any outstanding Cost Accounting Standards (CAS) violations.

Travel: Separate by destinations and include number of trips, durations in number of days, number of travelers, per diem (travel costs, hotel and meals in accordance with the Federal Travel Regulations and FAR Part 31), airfare, and car rental. If additional miscellaneous expense is included, list description and estimated amount, etc. Fee will not be applied to travel costs.

Subcontracts: Subcontractors must each submit a cost proposal that is as detailed as the Offeror's cost proposal. The subcontractor's cost proposal can be provided with the Offeror's cost proposal or will be requested at a later date. The subcontractor's cost proposal must contain a cover sheet that identifies the company with complete company name, mailing address, and telephone number. Include the Contractor and Government Entity (CAGE) code. The prime offeror

must submit a copy of its subcontracting agreement. Contractor shall provide their price reasonableness documentation for all subcontracts.

Consultants: Provide consultant agreements or other documents which verify the proposed loaded daily/hourly rate and labor category.

Materials: Material amounts must be specifically itemized with actual or estimated costs. Indicate the pricing method (e.g. competition, engineering estimate, market survey, etc.). Include supporting documentation (i.e. vendor quotes, catalog price lists, and/or past invoices for similar purchases).

Other Direct Costs: Provide any Other Direct Costs (ODCs), particularly any proposed equipment or facilities. Equipment and facilities generally must be furnished by the Offeror. Justification must be provided when Government funding for such items is sought.

Fee/Profit: Provide the proposed fee/profit. Include fee percentage and rationale to support the proposed fee or profit. Fee will not be applied to travel costs

Spend Plan: Provide a time-phased spend plan which includes all costs proposed, (i.e. labor, travel, materials, ODCs, etc.). The Offeror's format is acceptable.

Basis of Estimate: Provide a Basis of Estimate (BOE) for all proposed labor. The BOE must provide the rationale for the proposed labor category(ies) and proposed labor hours for each labor category. The Offeror's format is acceptable.

(4) **Part IV - Past Performance Section**:

(a) Information should be submitted for all proposed first-tier subcontractors with whom the Offeror is teaming, as well as for the Offeror itself.

(b) The Offeror should submit past performance information on any contracts (as a prime or subcontractor) it worked on during the previous three (3) years which are relevant to the efforts required by this solicitation. In addition, any and all contracts terminated in whole or part during the previous five (5) years, including those currently in the process of such termination, are considered relevant and the Offeror shall provide past performance information for those contracts. The following information should be included:

- Role as prime or subcontractor
- If from past Government contract, the contracting activity name; address; and the contracting officer's name, telephone/facsimile numbers and email address
- Contract type
- Awarded cost/price
- Final, or projected final, cost/price

- Original delivery schedule
- Final, or projected final, delivery schedule

(c) For each of the contracts described in the past performance section of the Offeror's proposal, a description of the objectives achieved, detailing how the effort is similar to the requirements of this solicitation, shall be included. For any contracts that did not/do not meet the original requirements with regard to original cost/price, schedule, or technical performance, the Offeror should provide a brief explanation of the reason(s) for such shortcomings and any demonstrated corrective actions taken to avoid recurrence. For any terminated contracts, the Offeror shall indicate the termination type and reasons.

(5) **Part V - Subcontracting Plans (if applicable)**:

(a) Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. 631(a)), it is the policy of the Government to enable Small Business, Small Disadvantaged Business, Women-Owned Small Business, Historically Underutilized Business Zone small business, Veteran-Owned Small Business, and Service-Disabled Veteran-Owned Small Business concerns to be considered fairly as subcontractors to contractors performing work or rendering services as prime contractors or subcontractors under Government contracts and to ensure that prime contractors and subcontractors carry out this policy. Offerors, other than small businesses, seeking an award of greater than $650,000 who submit a contract proposal with subcontractors, are required to submit a subcontracting plan IAW FAR 19.702(a)(1) and (2) and should do so with their proposal. The plan format is outlined in FAR 19.704.

As submitted under this BAA, subcontracting plans will be reviewed for adherence to regulations cited in FAR Part 19 and its supplements and not necessarily for evaluation as a specific evaluation criterion. However, an Offeror's refusal to submit a subcontracting plan is grounds for the Government to not negotiate award of that Offeror's BAA proposal.

A sample small business subcontracting plan template is provided at http://www3.natick.army.mil under the Broad Agency Announcement webpage.

(b) Statement of Commitment to Small Business – All offerors shall provide a statement on the extent of their commitment to providing meaningful subcontracting opportunities for Small Businesses, Small Disadvantaged Businesses, Women-Owned Small Businesses, Historically Underutilized Business Zone small businesses, Veteran-Owned Small Businesses, Service-Disabled Veteran-Owned Small Businesses, and other concerns subject to socioeconomic considerations through its awards.

(6) **Part VI - Contractor Representations and Certifications:**

Offeror's are encouraged to complete the annual representations and certificates electronically in the System for Award Management (SAM) https://www.sam.gov/portal/public/SAM and should note in part VI of their proposal what their Dun and Bradstreet Data Universal Numbering System (DUNS) number is and the fact that they are in SAM. Please note that if an Offeror does regular business with DoD, or intends to start, the NSRDEC strongly recommends it complete the electronic certifications in SAM to ease their business practices with the Government.

Note: The applicable North American Industry Classification System (NAICS) code for the majority of work submitted under this BAA will be either 541711 (Research and Development in Biotechnology); 541712 Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)'or 541720 Research and Development in the Social Sciences Humanities. NAICS 541711 and 541712 have a small business size standard of 500 employees while NAICs 541720 has a size standard of $7,000,000 in annual receipts. DFARS Representations and Certifications and Certifications for Grants and Agreements are provided at http://www3.natick.army.mil/nsrdecbaa under the Broad Agency Announcement webpage.

THIS ANNOUNCMENT IS NOT FOR THE ACQUISITION OF TECHNICAL, ENGINEERING AND OTHER TYPES OF SUPPORT SERVICES.

SECTION III – ADDITIONAL INFORMATION ABOUT PROPOSAL SUBMISSIONS

1. **CONTRACTOR MANPOWER REPORTING**

All contracts awarded under this BAA will include the following clause:

ACCOUNTING FOR CONTRACT SERVICES REQUIREMENT (Jun 2010)

The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor shall report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. Detailed instructions can be found on the Contractor Manpower Reporting Application (CMRA) website in the CMRA "Contractor User Guide" or "Subcontractor User Guide". The contractor must create an account upon entering the site and is required to completely fill in the required information at the CMRA website: https://cmra.army.mil.

The required information includes:

(a) Unit Identification Code (UIC) of the Army Requiring Activity that would be performing the mission if not for the contractor: _____ *(Enter the Army Requiring Activity's UIC here).*

(b) Command of the Requiring Activity that would be performing the mission if not for the contractor: _____ *(Enter Command of the Requiring Activity here).*

(c) Contracting Officer (KO) and contact information: _____ *(Enter KO's name, phone number, and email address).*

(d) Contracting Officer's Representative (COR) and contact information: _____ *(Enter COR's name, phone number, and email address).*

(e) Federal Service Code (FSC) reflecting services provided by contractor (and separate FSC for each subcontractor if different). If there are multiple FSCs for an Order number, enter a separate data record for each FSC.

(f) Location where contractor and subcontractor(s) perform the service, including the city, state, Zip code, and country. When service is performed at an overseas location, state only the city and country. If there are multiple locations for an Order number, enter a separate data record for each location. (*Note: If there are many location records that need to be entered, the Bulk Loader function is available which allows the transfer of information from a contractor's system to the secure web site. The Bulk Loader Template and Bulk Loader Instructions may be downloaded from the web site.)*

(g) Contractor Type (prime or subcontractor).

(h) Direct labor hours (including subcontractors) for each FSC.

(i) Direct labor dollars paid this reporting period (including subcontractors) for each FSC.

(j) Weapons system support indication: _____ *(Enter yes or no)*.

If subcontractors are used in the performance of this contract, several factors must be considered. The contractor shall include, and require inclusion of, this clause in all subcontracts at any tier under the contract in which services are being procured. The contractor shall also enter its data in a timely manner as subcontractors can not input any information into the CMRA system until the Prime Contractor has entered its data. The Prime Contractor has overall responsibility for ensuring subcontractors enter their respective data. Subcontractors are only responsible for entering Location Data.

The reporting period will be the period of performance not to exceed 12 months ending 30 September of each Government fiscal year and must be reported by 31 October of each calendar year.

2. **EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT REPORTING (APPLIES ONLY TO CONTRACTS)**

Section 2(d) of the Federal Funding Accountability and Transparency Act of 2006 (Pub.L. No. 109-282), as amended by section 6202 of the Government Funding Transparency Act of 2008 (Pub. L. 110-252), requires the Contractor to report information on subcontract awards. The law requires all reported information be made public; therefore, the Contractor is responsible for notifying its subcontractors that the required information will be made public.

Unless otherwise directed by the Contracting Officer, by the end of the month following the month of award of a first-tier subcontract with a value of $25,000 or more (and any modifications to these subcontracts that change previously reported data) the Contractor shall report the following information at https://www.fsrs.gov/ for each first-tier subcontract:

(a) Unique identifier (DUNS Number) for the subcontractor receiving the award and for the subcontractor's parent company, if the subcontractor has one.

(b) Name of the subcontractor.

(c) Amount of the subcontract award.

(d) Date of the subcontract award.

(e) A description of the products or services (including construction) being provided under the subcontract including the overall purpose and expected outcomes or results of the subcontract.

(f) Subcontract number (the subcontract number assigned by the Contractor).

(g) Subcontractor's physical address including street address, city, state, and country. Also include the nine-digit ZIP code and congressional district.

(h) Subcontractor's primary performance location including street address, city, state, and country. Also include the nine-digit ZIP code and congressional district.

(i) The prime contract number (and order number if applicable).

(j) Awarding agency name and code.

(k) Funding agency name and code.

(l) Government contracting office code.

(m) Treasury Account Symbol (TAS) as reported in FPDS.

(n) The applicable North American Industry Classification System (NAICS) code.

By the end of the month following the month of a contract award, and annually thereafter, the Contractor shall report the names and total compensation of each of the five most highly compensated executives for the Contractor's preceding completed fiscal year at https://www.fsrs.gov/ if :

(a) In the Contractor's preceding fiscal year, the Contractor received:

(i) 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants) and cooperative agreements; and

(ii) $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants) and cooperative agreements; and

(b) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomp.htm.).

Unless otherwise directed by the Contracting Officer, by the end of the month following the month of a first-tier subcontract with a value of $25,000 or more, and annually thereafter, the

Contractor shall report the names and total compensation of each of the five most highly compensated executives for each first-tier subcontractor for the subcontractor's preceding completed fiscal year at https://www.fsrs.gov/ if:

(a) In the subcontractor's preceding fiscal year, the subcontractor received:

(i) 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements; and

(ii) $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements; and

(b) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomp.htm.).

If the Contractor in the previous tax year had gross income from all sources under $300,000, the Contractor is exempt from the requirement to report subcontractor awards. Likewise, if a subcontractor in the previous tax year had gross income from all sources under $300,000, the Contractor does not need to report awards to that subcontractor.

3. GOVERNMENT FURNISHED PROPERTY (GFP)

Government Furnished Property, as defined in FAR Part 45, may be available for contractor use during the performance of a given contract awarded against this BAA.

The offeror should clearly request in its proposal what, if anything, it desires as GFP for the given project. It is recommended that a section in the technical or management proposal be set aside to summarize the GFP requirements.

The offeror may request for incorporation in the contract a GFP delivery schedule NOT based specifically on the date of contract award.

Any property furnished to and accepted by the Government under a resultant contract and subsequently returned to the contractor for any reason shall be regarded as Government Furnished Property.

Any facilities, including rooms, desks, etc., to be provided to a contractor by the Government for the performance of any portion of a contract, is considered to be GFP, and if needed should be specifically requested for the applicable time frames in the offeror's proposal.

4. **TYPE OF CONTRACT**

The Research, Development and Engineering Command (RDECOM), Natick Contracting Division has the authority to award procurement contracts, cooperative agreements, and grants, and reserves the right to use the type of instrument most appropriate for the effort proposed. Offerors should familiarize themselves with these instruments and the applicable regulations before submitting a proposal. Following are brief descriptions of the possible award instruments. Offerors shall provide rationale to support their suggested award instrument.

(i) Procurement Contract - A legal instrument which, consistent with 31 U.S.C. 6303, reflects a relationship between the Federal Government and a State, a local government, or other recipient when the principal purpose of the instrument is to acquire property or services for the direct benefit or use of the Federal Government.

The contract type may vary according to the degree and timing of the responsibility assumed by the contractor for the cost of performance and the amount and nature of the profit incentive offered to the contractor for achieving or exceeding specific standards and goals. See FAR Subpart 16.101(a). Offerors shall identify the type(s) of contract (FAR Part 16) they feel is (are) best suited to the proposed effort. **The offeror shall note that, in accordance with** FAR Subpart 16.301-3**, in order to receive a COST type contract, its accounting system must be adequate for determining costs on a Government contract. This is determined by the Defense Contract Audit Agency (DCAA) office assigned to the offeror's business location and may take thirty (30) to forty (40) days for completion.** An Offeror's suggestion regarding suitable contract type does not obligate the Government to employ the suggested contract type. The selection of the contract type is subject to negotiation.

(ii) Grant - A legal instrument that, consistent with 31 U.S.C. 6304, is used to enter into a relationship:

a. The principal purpose of which is to transfer a thing of value to the recipient to carry out a public purpose of support or stimulation authorized by a law of the United States, rather than to acquire property or services for the DOD's direct benefit or use.

b. In which substantial involvement is not expected between the DOD and the recipient when carrying out the activity contemplated by the grant.

c. In which no fee or profit is allowed.

(iii) Cooperative Agreement - A legal instrument which, consistent with 31 U.S.C. 6305, is used to enter into the same kind of relationship as a grant (see definition "grant"), except that substantial involvement is expected between the DOD and the recipient when carrying out the activity contemplated by the cooperative agreement. The term does not include "cooperative research and development agreements" as defined in 15 U.S.C. 3710a. No fee or profit is allowed.

Grants and cooperative agreements are governed by the following regulations:

a. OMB Circular A-21, "Cost Principles for Educational Institutions"

b. OMB Circular A-87, "Cost Principles for State, Local and Indian Tribal Governments"

c. OMB Circular A-102, "Grants and Cooperative Agreements with State and Local Governments"

d. OMB Circular A-110, "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations"

e. OMB Circular A-122, "Cost Principles for Non-Profit Organizations"

f. OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations"

g. DOD Grant and Agreement Regulations (DODGARs), DOD 3210.6-R http://www.dtic.mil/whs/directives/corres/html/321006r.html

Copies of OMB regulations may be obtained from:

Executive Office of the President
Publications Service
New Executive Office Building
725 17th Street, N.W., Room 2200
Washington, DC 20503

Telephone: (202) 395-7332
FAX Requests: (202) 395-9068
http://www.whitehouse.gov/OMB/

a. http://www.whitehouse.gov/omb/circulars_a021_2004

NOTE: In accordance with DoD Directive 3210.6, http://www.dtic.mil/whs/directives/corres/html/321006r.html, the DODGARs may include rules that apply to other non-procurement instruments, when specifically required in order to implement a statute, Executive Order, or Government-wide rule that applies to other non-procurement instruments, as well as to grants and cooperative agreements.

(iv) Other Transaction for Research - A legal instrument, consistent with 10 U.S.C. 2371, which may be used when the use of a contract, grant, or cooperative agreement is not feasible or appropriate for basic, applied, and advanced research projects. The research covered under "an other" transaction shall not be duplicative of research being conducted under an existing DOD program. To the maximum extent practicable, other transactions shall provide for a 50/50 cost share between the Government and the Offeror. An Offeror's cost share may take the form of cash, independent research and development (IR&D), foregone intellectual property rights, equipment, or access to unique facilities. Due to the extent of cost share, and the fact that "an other" transaction does not qualify as a "funding agreement" as defined at 37 CFR 401.2(a), the

intellectual property provisions of "an other" transaction can be negotiated to provide expanded protection to an offeror's intellectual property. No fee or profit is allowed on other transactions.

5. PREPARATION COSTS

It must be clearly understood that the receipt and review of concept papers and proposals as described in this BAA by the Government is entirely for the purpose of technical evaluation and in no way constitutes an agreement to enter into contractual or other relationships. It must be further understood that the submission of such documents is voluntary and must be done solely at the offeror's expense. The Government will in no way be held liable for, nor reimburse, an offeror for any expenses (direct or indirect) incurred in the process of formulating or submitting such documents.

6. AVAILABILITY OF FUNDS

It must be clearly understood that as of the date of release of this BAA there are no funds committed for any project. Until such time as funds are released to the Contracting Officer, no contract can, or will, be made for an otherwise acceptable proposal.

7. FAR INFORMATION/REFERENCES

All FAR information/references plus other related acquisition information may be found on the Internet at either of the following addresses:

https://www.acquisition.gov.far

http://farsite.hill.af.mil/

8. SYSTEM FOR AWARD MANAGEMENT REGISTRATOIN (SAM)

By submission of an offer, the Offeror acknowledges the requirement that prospective awardees **MUST** be registered in the System for Award Management (SAM) database prior to submitting an invoice and through final payment of any contract resulting from this BAA Solicitation. Offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation. To remain registered in the SAM database after the initial registration, the Offeror is required to review and update on an annual basis from the date of initial registration (or subsequent updates) its information in the SAM database to ensure it is current, accurate and complete.

9. INVOICING AND PAYMENTS

All payments by the Government under contracts awarded from this BAA shall be made by electronic funds transfer (EFT) or the Government VISA purchase card. If not paid by VISA, then invoices shall be submitted electronically in accordance with DFARS 252.232-7003, which will be included in any resulting contract from this BAA. The automated method being used at NSRDEC is the Wide Area Workflow (WAWF) system found at https://wawf.eb.mil.

Contractors are encouraged to view this website and familiarize themselves with the invoicing process. More specific instructions on WAWF will be provided in any BAA award document.

10. REPORTING

The following are samples of data deliverables that are typically required under a research effort:

Monthly Progress Reports;
Test Results, data, and analyses;
Presentation materials;
Final Technical Report;
Safety Assessment Report

The following minimum data deliverables will be required under traditional procurement contracts awarded to those Offerors whose full proposals are selected for award:

Monthly Progress Report: These reports must describe the previous calendar month's activity, technical progress achieved against goals, difficulties encountered, recovery plans (if needed), explicit plans for the next calendar month, and financial expenditures (including expenditures during the past calendar month period plus cumulative expenditures and projected expenditures for the coming calendar month.)

Final Technical Report: For a final report, each selected Offeror must provide a final technical report of work performed during the period of performance delivered no later than the prescribed time. The final report must be a cumulative, stand-alone document that describes the work of the entire research effort. It must include any technical data gathered. The final technical report must include a summary of all performance goals versus performance achieved during the program (either measured or otherwise substantiated). The final technical report must discuss all variances from the performance goals including reasons or theories for variances. If applicable, provide a discussion of how the Offeror might meet any unmet performance goals under a future effort. This final technical report must also include "lessons learned" from the effort as well as recommendations for future research, development, or testing that would lead to success in meeting the performance goals. The final report must provide a comprehensive and detailed account of all funds expended.

11. RESTRICTED DATA ON PROPOSALS

As stated in FAR 52.215-1(c) "Instructions to Offerors - Competitive Acquisition", the following guidance is provided for contractors desiring to restrict any information in their concept papers or proposals:

Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall –

(1) Mark the title page with the following legend:

"This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed -- in whole or in part -- for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of – or in connection with -- the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [*insert numbers or other identification of sheets*];" and

(2) Mark each sheet of data it wishes to restrict with the following legend:

"Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal."

12. **INTELLECTUAL PROPERTY**

a. Noncommercial Items (Technical Data and Computer Software)

Offerors responding to this BAA requesting a procurement contract, grant, or cooperative agreement to be issued under the FAR/DFARS shall identify all noncommercial technical data and noncommercial computer software that they plan to deliver under any proposed award instrument in which the Government will acquire less than unlimited rights, and to assert specific restrictions on those deliverables on a list. Offerors shall follow the format for the list under DFARS 252.227-7017 for this stated purpose. In the event that Offerors do not submit the list, the Government will assume that it automatically has "unlimited rights" to all noncommercial technical data and noncommercial computer software delivered under any award instrument, unless it is substantiated that development of the noncommercial technical data and noncommercial computer software occurred with private or mixed funding. If private or mixed funding is anticipated in the development of noncommercial technical data and noncommercial computer software delivered under any award instrument, then Offerors should identify the data and software in question as subject to Limited Rights or Government Purpose Rights respectively. In accordance with DFARS 252.227-7013 "Rights in Technical Data-Noncommercial Items", and DFARS 252.227-7014 "Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation", the Government will automatically assume that any such Government Purpose Rights restriction is limited to a period of five (5) years in accordance with the applicable DFARS clauses, after which time the Government will acquire "unlimited rights" unless the parties agree otherwise. Offerors are admonished that the Government will use the list during the source selection evaluation process to evaluate the impact of any identified restrictions and may request additional information from the Offeror, as may be necessary, to evaluate the Offeror's assertions. Once an Offeror's assertions are confirmed and a contract is to be awarded, a

clause confirming the scope of these identified restrictions may be prepared for incorporation into the contract. If no restrictions are intended, then the Offeror should state "NONE" on the list.

A sample list for complying with this request is as follows:

NONCOMMERCIAL			
Technical Data or Computer Software to be Furnished with Restrictions	Basis for Assertions	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(LIST)	(LIST)	(LIST)

b. Commercial Items (Technical Data and Computer Software)

Offerors responding to this BAA requesting a procurement contract grant, or cooperative agreement to be issued under the FAR/DFARS, shall identify all commercial technical data, and commercial computer software that may be embedded in any noncommercial deliverable technical data and/or computer software contemplated under the research effort on the list. The Government may use the list during the source selection evaluation process to evaluate the impact of any identified commercial data/software restrictions, and may request additional information from the Offeror, as may be necessary, to evaluate the Offeror's assertions. If no deliverable commercial technical data/software is intended, then the Offeror should state "NONE" on the list.

A sample list for complying with this request is as follows:

COMMERCIAL	
Technical Data or Computer Software to be Furnished with Restrictions	Basis for Assertions
(LIST)	(LIST)

c. All Proposers – Patents

Offerors responding to this BAA shall include documentation proving ownership or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) that will be utilized under the proposal being submitted. If a patent application, provisional or non-provisional, has been filed for an invention that the proposal utilizes, but the application has not yet been made publicly available, you may provide only the serial number, inventor name(s), assignee names (if any), filing date, and a summary of the invention title, together with either: 1) a

representation that you own the invention, or 2) proof of possession of appropriate licensing rights in the invention.

d. All Offerors – Intellectual Property Representations

Offerors shall provide a good faith representation that they either own or possess appropriate licensing rights to all other intellectual property (IP) that will be utilized under the proposal being submitted. Additionally Offerors shall provide a short summary for each such IP in which an Offeror asserts the Government will be restricted that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research.

13. PROTECTION OF HUMAN SUBJECTS

Proposals selected for funding are required to comply with provisions of the Common rule (32 CFR 219) on the protection of human subjects in research and the Department of Defense Directive 3216.2. All proposals that involve the use of human subjects are required to include documentation of their ability to follow Federal guidelines for the protection of human subjects. This includes, but is not limited to, protocol approval mechanisms, approved Institutional Review Boards, and Federal Wide Assurances. These requirements are based on the expected human use issues sometime during the entire length of the proposed effort.

NOTE: All contracts with organizations conducting human research will include the following clause:

CONTRACT CLAUSE FOR USE OF HUMAN SUBJECTS

"Research at funded institutions using human subjects may not begin until the U.S. Army Surgeon General's Human Subjects Research Review Board (HSRRB) approves the protocol. Written approval to begin research or subcontract for the use of human subjects under the applicable protocol proposed for this award will be issued from the US Army Medical Research and Materiel Command, HSRRB, under separate letter to the funded institution and the Principal Investigator. A copy of this approval will be provided to the US Army Natick Soldier Research Development & Engineering Center for the official file. Non-compliance with any provision of this clause may result in withholding of funds and/or the termination of the award."

END CLAUSE

The following procedures will be employed to insure compliance with the above contract clause:

The checklist, which can be found at http://www3.natick.army.mil/ssbaa.html, will be prepared by the contractor following review by their local Institutional Review Board (IRB).

The contractor will submit the checklist together with the protocol, the scientific review of the protocol (may be included as part of local IRB review), and the results of the local IRB review to the U.S. Army Surgeon General's Human Subjects Research Review Board (HSRRB) at the email address hsrrb@amedd.army.mil or by mail to:

U.S. Army Medical Research and Materiel Command
Commanding General
ATTN: MCMR-ZB-P
504 Scott Street
Fort Detrick, MD 21702-5012

After review and approval by the HSRRB, the contractor must provide a copy of the completed checklist together with a copy of the HSRRB approval letter to Jane Simpson, Coordinator for Quality Assurance and Compliance, NSRDEC.

14. **ANIMAL USE**

DoD Instruction 3216.01 http://www.dtic.mil/whs/directives/corres/ins1.html dated September 13, 2010, provides policy and requirements for the use of animals in DoD-funded research. The DoD definition of animal is any live or dead nonhuman vertebrate. All proposals that involve the use of animals must address DoD compliance with Instruction 3216.01.

Provisions include rules on animal acquisition, transport, care, handling, and use in 9 CFR parts 1-4, Department of Agriculture rules implementing the Laboratory Animal Welfare Act of 1966 (7 U.S.C. 2131-2156), and guidelines in the National Academy of Sciences (NAS) "Guide for the Care and Use of Laboratory Animals" (1996) including the Public Health Service Policy and Government Principles Regarding the Care and Use of Animals in Appendix D to the Guide.

15. **MILITARY RECRUITING**

This is to notify potential offerors that each grant or cooperative agreement awarded under this announcement to an institution of higher education must include the following term and condition:

"As a condition for receipt of funds available to the Department of Defense (DoD) under this award, the recipient agrees that it is not an institution of higher education (as defined in 32 CFR part 216) that has a policy of denying, and that it is not an institution of higher education that effectively prevents, the Secretary of Defense from obtaining for military recruiting purposes: (A) entry to campuses or access to students on campuses or (B) access to directory information pertaining to students. If the recipient is determined, using the procedures in 32 CFR part 216, to be such an institution of higher education during the period of performance of this agreement, and therefore to be in breach of this clause, the Government will cease all payments of DoD funds under this agreement and all other DoD grants and cooperative agreements to the recipient,

and it may suspend or terminate such grants and agreements unilaterally for material failure to comply with the terms and conditions of award."

If your institution has been identified under the procedures established by the Secretary of Defense to implement Section 558, then: (1) no funds available to DoD may be provided to your institution through any grant, including any existing grant, (2) as a matter of policy, this restriction also applies to any cooperative agreement, and (3) your institution is not eligible to receive a grant or cooperative agreement in response to this solicitation.

This is to notify potential offerors that each contract awarded under this announcement to an institution of higher education shall include the following clause: Defense Federal Acquisition Regulation Supplement (DFARS) clause 252.209-7005, Military Recruiting on Campus.

16. INTERNATIONAL TRAFFIC IN ARMS REGULATION (ITAR)

The offerors and their subcontractors shall comply with the ITAR, 22 CFR Parts 120 through 130. Information regarding ITAR is available at http://pmddtc.state.gov/regulations_laws/itar_official.html. If a question exists regarding ITAR, please contact Mr. Stephen Brackett at Stephen.bracket.civ@mail.mil. Information pertaining to the Export Administration Regulation (EAR) is available at http://www.bis.doc.gov/policiesandregulations/index.htm.

17. ORGANIZATION CONFLICTS OF INTEREST

All Offerors and proposed subcontractors must affirm whether they are providing scientific, engineering, and technical assistance (SETA) or similar support to any NSRDEC technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the Offeror supports and identify the prime contract numbers. Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure shall include a description of the action the Offeror has taken or proposes to take to avoid, neutralize, or mitigate such conflict. In accordance with FAR 9.503 and without prior approval, a contractor cannot simultaneously be a SETA and a research and development performer. Proposals that fail to fully disclose potential conflicts of interests will be rejected without technical evaluation and withdrawn from further consideration for award. If a prospective Offeror believes that any conflict of interest exists or may exist (whether organizational or otherwise), the offeror should promptly raise the issue with NSRDEC by sending his/her contact information and a summary of the potential conflict by e-mail to the Administrative Point of Contact identified in each topic under Section VI, before expending time and effort in preparing a proposal and mitigation plan. If, in the sole opinion of the Contracting Officer after full consideration of the circumstances, any conflict situation cannot be effectively avoided, the proposal may be rejected without technical evaluation and withdrawn from further consideration for award under this BAA.

SECTION IV – EVALUATION PROCESS

1. EVALUATION APPROACH FOR CONCEPT PAPERS

Concept papers will be evaluated by technical/scientific personnel who are knowledgeable within the particular topical area/specific interest area to determine if the paper presented is consistent with the intent of the BAA and of interest to the Government. Concept papers will be evaluated on the scientific/technical merit, the management approach, the importance to agency programs, and the proposed cost/price. Based on these evaluation criteria, the highest rated concept papers will show considerable potential to develop into highly qualified proposals that could likely lead to an award. Concept papers will be evaluated within ninety (90) days of receipt.

2. EVALUATION APPROACH FOR PROPOSALS

Proposals submitted in response to this solicitation will be given a scientific/peer review evaluation by NSRDEC technical personnel in accordance with the evaluation criteria below. Each proposal will be evaluated based on the merit and relevance of the specific proposal as it relates to NSRDEC program requirements/needs, rather than against other proposals. Once a proposal has been submitted by the technical POC to the contracting office, the Offeror is to HAVE NO FURTHER CONTACT with the technical POC until the time a contract award exists. Inquiries regarding status of the evaluation may be addressed to the administrative POC indicated under each scientific and technical area.

Offerors whose proposals are considered not to have sufficient merit, which are not relevant to an Army need, or which are in areas where funds are not expected to be available will be notified as soon as possible after completion of evaluation that their proposal will not be further considered for a contract award.

For those proposals that are acceptable, notification will be made within ninety (90) days after receipt of proposal. The offeror will also be notified as to if and when funding is expected to be available for the project. The offeror is cautioned that the availability of funds as of the date of such notice is no guarantee that funds will be available at any given later date.

3. BASIS FOR AWARD

Offers will be selected based upon the outcome of proposal evaluation in accordance with the evaluation criteria cited below plus the availability and source of funds. Not all highly rated proposals will result in a contract award. The Government may elect not to award a contract for every highly rated proposal for each topical area/specific interest area. The Government may award more than one contract in a given topical area/specific interest area or the Government may not award a contract at all in a given topical area/specific interest area.

4. FACTORS AND SUBFACTORS TO BE EVALUATED

Evaluation will be broken down into four (4) factors: technical, management, cost/price, and past performance. The technical factor is the most important followed by management, cost/price, and finally, past performance. The technical factor has at least two (2) and up to three (3) sub-factors and cost/price has two (2) sub-factors, each of equal importance.

Technical sub-factors A and B are of equal importance and technical sub-factor C is also equal when it is an applicable sub-factor.

Technical personnel will assign an adjectival and risk rating for the technical and cost/price factor and sub-factors, as well as the management factor of each proposal. Past performance areas will receive only a performance risk rating. A copy of the evaluation form is provided for informational purposes as an attachment to the BAA.

5. EVALUATION CRITERIA

a. **FACTOR I -Technical:** Each sub-factor in this factor will be evaluated and receive an individual rating. This factor will receive an overall rating based on the ratings of all the technical sub-factors combined.

(1) Sub-factor A: Technical Merit: The proposal will be evaluated on the relevance of the proposed effort in response to the topical area/specific interest area and the overall technical feasibility of the technology, capability, the product and/or the technology proposed.

(2) Sub-factor B: Technology Advancement/Warfighting Capability: The proposal will be evaluated on the potential to increase the combat effectiveness of the Army and the potential for exploiting a capability not likely to be executed elsewhere.

(3) Sub-factor C: Safety and MANPRINT Requirements (when applicable): The proposal will be evaluated to assure that it has properly addressed safety/ MANPRINT requirements (see section V herein) by including the following information:

(a) The offeror's understanding of safety/MANPRINT and how it applies to the proposed work.

(b) The methods/techniques the Offeror will use to ensure that safety/MANPRINT will be incorporated into the program so as to ensure that the items/products delivered to the Government are safe and effective for use by personnel

(c) The qualification/knowledge of the individual responsible for the offeror's safety/MANPRINT requirements.

b. **FACTOR II - Management:** The proposal will be evaluated on the quality of the personnel, equipment, facilities, project management systems, controls (i.e., the overall organization), and the milestone schedule being proposed. The overall management plan will be evaluated.

c. **FACTOR III - Cost/Price:** Each sub-factor in this factor will be evaluated and receive an individual rating. This factor will receive an overall rating based on the ratings of both cost/price sub-factors combined.

(1) Sub-factor A: Cost/Price Benefit: The proposals will be evaluated to determine the overall benefit to the Government. Considerations will include industry

contribution and fiscal feasibility. Fiscal feasibility includes the ability to accomplish the proposed project within Government fiscal constraints; the requirement for the use of other Government contractors to assist in the execution of proposed effort; and the use of Government furnished equipment, information, facilities, and other assets. The proposals will be evaluated to determine the extent to which the overall cost/price to the Government is reasonable.

(2) Sub-factor B: Cost/Price Realism: The proposals will be evaluated for cost realism to assess the likelihood that the technical and management approaches can be accomplished at the cost/price proposed.

d. **FACTOR IV - Past Performance:** The Offeror's and first tier subcontractor's past performance with Government and industry in the specific interest area or similar and/or related areas will be evaluated to assess the relative risks associated with the Offeror's likelihood of success in meeting the requirements stated in this BAA. Specific areas of past experience and performance examined will include demonstrated technical and schedule performance, cost control, general responsiveness to contract requirements, customer satisfaction, and customer focus. Emphasis will be on recent, relevant experience (see past performance area under section II of this BAA).

6. RATING METHOD

a. Under the technical portion in the MANPRINT/safety evaluation only, the following method shall be used: the offer will be given a pass/marginal/fail in the evaluation areas cited; however, should a fail or marginal be given, the Government may be able to work with the offeror in order to assure MANPRINT/safety requirements are correctly addressed

b. Adjectival Ratings: The adjectival ratings that will be utilized for evaluating individual technical, management, and cost/price factors and sub-factors are defined as follows:

(1) Excellent: Evaluation of the factor/sub-factor indicates the Offeror's proposal meets or exceeds all stated criteria by demonstrating a firm grasp of the requirements and translating the requirements into a well defined and preferred approach. Innovative approaches that push the state of the art are present. The proposal exhibits strengths and does not contain any weaknesses or deficiencies.

(2) Very Good: Evaluation of the factor/sub-factor indicates the Offeror's proposal meets or exceeds all stated criteria by demonstrating an understanding of the requirements and translating the requirements into a well defined and feasible approach. Innovative approaches that are, at a minimum, state of the art are present. The proposal exhibits some strengths and might contain one or more weaknesses but does not contain any deficiencies.

(3) Acceptable: Evaluation of the factor/sub-factor indicates the Offeror's proposal meets all stated criteria by demonstrating an understanding of the requirements and translating the requirements into a feasible approach. Limited innovation beyond the norm is present. The proposal may exhibit some strengths and might contain some weaknesses but does not contain any deficiencies.

(4) Marginal: Evaluation of the factor/sub-factor indicates the Offeror's proposal meets the majority of the stated criteria but either demonstrates a limited understanding of the requirements or translates the requirements into an approach which may not be feasible. The proposal may exhibit some strengths and might contain several weaknesses but does not contain any deficiencies.

(5) Unacceptable: Evaluation of the factor/sub-factor indicates the Offeror's proposal does not meet the stated criteria or contains one or more deficiencies which indicate a lack of understanding of the requirements. The stated criteria can only be met with major changes to the proposal.

c. Risk Assessment:

(1) The proposal risk assessment ratings for technical, management, and cost/price factors and sub-factors are defined as follows:

(a) High: Likely to cause serious disruption of contract effort or increase in cost/price of performance even with special contractor emphasis and Government monitoring.

(b) Moderate: Has some potential to cause minor disruption of contract effort or increase in cost/price of performance. Normal Government monitoring will probably be able to overcome most difficulties.

(c) Low: Has very little potential to cause disruption of contract effort or increase in cost/price of performance. Minimal Government monitoring will probably be able to overcome difficulties.

(2) The performance risk assessment ratings for past performance are defined as follows:

(a) High: Based on the Offeror's performance record, substantial doubt exists that the offeror will successfully perform the required effort.

(b) Moderate: Based on the Offeror's performance record, some doubt exists that the Offeror will successfully perform the required effort.

(c) Low: Based on the Offeror's performance record, little doubt exists that the

Offeror will successfully perform the required effort.

(d) Unknown: No performance record identifiable. This is essentially a neutral rating, which will neither directly benefit nor negatively impact the offeror.

d. Definitions:

(1) Strength: An aspect of a proposal that appreciably decreases the risk of unsuccessful contract performance or that represents a significant benefit to the Government.

(2) Weakness: A flaw in the proposal that increases the risk of unsuccessful contract performance. A "significant weakness" in the proposal is a flaw that appreciably increases the risk of unsuccessful contract performance.

(3) Deficiency: A material failure of a proposal to meet a Government requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level.

SECTION V –SAFETY AND MANPRINT REQUIREMENTS

In addition to the technical portion of your proposal, there are specific requirements for Safety and MANPRINT (MANpower and PeRsonnel INTegration)/Human Systems Integration (HSI) that are governed by regulation which must be included, ***if applicable***, in any acceptable proposal. Contractors who develop an item, equipment or system for use by U.S. Army personnel shall include the following system safety/health hazards and MANPRINT requirements:

1. SYSTEM SAFETY/HEALTH HAZARD

Contractors who propose development of early technology or prototype materiel shall ensure an aspect of their effort is to identify potential mishap risks and that those risks are eliminated or controlled to an acceptable level. The objective of this effort is to preclude injury, illness, death to the user or maintainer, or damage to the materiel developed. To ensure this objective the contractor should describe its planned actions, may be required to conduct specific hazard analyzes, and should provide a safety assessment that:

a) identifies safety design standards (statutory, regulatory, industry consensus, etc.) utilized in the design;

b) identifies safety features, controls, devices, etc., incorporated into the materiel design;

c) includes Material Safety Data Sheets for potentially hazardous materials used in the manufacture or operation of the materiel;

d) residual risks associated with the use of the materiel; and

e) specific safety recommendations or precautions required to ensure the safety of personnel and property.

Acceptable levels of residual risk, and combined hazard severity-probability (Risk Assessment Code), are provided below for the convenience of potential offerors. These "excerpts" were taken from MIL-STD-882D, Standard Practice for System Safety, which, if desired, may be seen in full text at the following web site: http://www.geia.org/sstc/G48/882d.pdf.

a. Risk Assessment: Decisions regarding resolution of identified hazards shall be based upon assessment of the residual risk involved. To aid the achievement of the objectives of system safety, hazards shall be characterized as to hazard severity categories and hazard probability levels, whenever possible. A risk assessment procedure considering only hazard severity will generally suffice during the early design phase to minimize risk. When hazards are not eliminated during the early design phase, a risk assessment procedure based upon hazard probability hazard, hazard severity, as well as risk impact shall be used to establish priorities for corrective action of identified hazards or formal acceptance of residual risks.

Table 1 Risk Assessment Codes (RACs)

			PROBABILITY				
			Frequent A	Probable B	Occasional C	Remote D	Improbabl E
SEVERITY	Catastrophic	I	IA	IB	IC	ID	IE
	Critical	II	IIA	IIB	IIC	IID	IIE
	Marginal	III	IIIA	IIIB	IIIC	IIID	IIIE
	Negligible	IV	IVA	IVB	IVC	IVD	IVE

Table 2 Risk Levels Indicated by RACs

HAZARD RAC	RISK LEVEL
IA-ID, IIA-IIC, IIIA	**HIGH** – Unacceptable
IE, IID, IIIB-IIIC, IVA	**MEDIUM** – Unacceptable
IIE, IIID-IIIE, IVB-IVE	**LOW** - Acceptable upon review & approval of System Safety PM/Project Officer & Supporting Engineer

b. Hazard Severity: Hazard severity categories are defined to provide a qualitative measure of the worst credible mishap resulting from personnel error; environmental conditions; design inadequacies; procedural deficiencies; or system, subsystem, or component failure or malfunction.

Table 3 Hazard Severity Definitions

DESCRIPTION	CATEGORY	DEFINITION
Catastrophic	I	Death or system loss
Critical	II	Severe injury, severe occupational illness, or major system damage
Marginal	III	Minor injury, minor occupational illness, or minor system damage
Negligible	IV	Less than minor injury, occupational illness or minor system damage

c. Hazard Probability: The probability that a hazard will be created during the planned life expectancy of the system can be described in potential occurrences per unit of time, events, population, items, or activity. Assigning a quantitative hazard probability to a potential design or procedural hazard is generally not possible early in the design process. A qualitative hazard probability may be derived from research, analysis, and evaluation of historical safety data from similar systems. Supporting rationale for assigning a hazard probability shall be

documented in hazard analysis reports. An example of a qualitative hazard probability ranking is:

Table 4 Hazard Probability Definitions

DESCRIPTION*	LEVEL	SPECIFIED INDIVIDUAL ITEM	FLEET OR INVENTORY**
Frequent	A	Likely to occur frequently	Continuously experienced
Probable	B	Will occur several times in the life of an item	Will occur frequently
Occasional	C	Likely to occur sometime in the life of an item	Will occur several times
Remote	D	Unlikely, but possible to occur in the life on an item	Unlikely, but can be reasonably expected to occur
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced	Unlikely to occur, but possible

*Definitions of the descriptive words may have to be modified based upon quantity involved.
** The size of the fleet or inventory should be defined.

2. MANPRINT

MANPRINT is a comprehensive management and technical process designed to improve total system (user, hardware and software) performance through continuous integration of manpower, personnel, training, human factors, system safety, health hazards, and soldier survivability considerations throughout the materiel design, development, and acquisition process. MANPRINT concerns which must be addressed during the performance of tasks are focused primarily on optimizing user/maintainer performance while minimizing error and simplifying maintenance tasks without introducing any new safety risks or health hazards. To ensure that this objective is met, if applicable, all developmental efforts shall include MANPRINT/Human Factors Engineering analyses which identify and evaluate operability and maintainability deficiencies.

Early discussions with appropriate POCs will identify whether or not MANPRINT requirements apply to a particular effort. Typically, MANPRINT applies to the design, development, and acquisition of all items, equipment, or systems intended for personnel use or that will require personnel interaction for the proper use, maintenance, repair, etc. These items include, but are not limited to, typical soldier products under the purview of NSRDEC such as: personal protective clothing/equipment, food and food service equipment, tents/shelters and airdrop equipment. For efforts focused on research, MANPRINT considerations particularly those associated with safety and health hazards shall apply when the product of a research effort will be utilized in the development of items, equipment, or systems. Specifically, contractors shall consider the potential safety and health hazard implications that the products of their research

efforts will have when/if those products are integrated into items. When MANPRINT is required, it shall be addressed in the contractor's proposal under the technical section and will be evaluated under the technical section as outlined in Section IV of this BAA.

For efforts requiring MANPRINT considerations, the contractor shall provide documentation that should include as appropriate to the proposal (but is not limited to) an explanation which describes how each MANPRINT domain was (or will be) taken into consideration when designing/developing the item. Include a discussion relating to the trade-offs that were made, if any, and the rationale associated with those trade-offs and/or how trade-offs associated with the MANPRINT domains will be addressed and handled. Specifically, the contractor shall address each domain regarding the proper use/operation, maintenance, inspection and repair of their product, as follows:

(1) Manpower/Personnel & Training: Address the numbers of personnel, their skill qualifications and training (either in the form of formal training, embedded training, training materials, etc.) that is or will be required.

(2) Human Factors Engineering:

(a) Describe how sound Human Factors Engineering principles and practices were (or will be) applied to the design and development of the product.

(b) The contractor shall utilize the data for design-critical human body dimensions as contained in the 1988 Anthropometric Survey of U.S. Army Personnel: Methods and Summary Statistics. Address what design-critical human body dimensions were (or will be) taken into consideration when designing the product (e.g., for proper fit of items or acceptable reach/accessibility, etc.).

(c) When deemed appropriate, provide the following Human Factors Engineering analysis or the intention to provide this information:

An explanation which documents and describes human performance errors and/or difficulties which may be encountered during operation, maintenance, and repair of the item, equipment, or system. For each error, include the estimated frequency of occurrence, the cause of the error/difficulty in terms of the conditions which may have contributed to it, the consequence of the error/difficulty on system operation, and a brief explanation of the reason for the error/difficulty by the user.

An explanation which describes how human performance may impact system goals by including a narrative explanation of how human error associated with operations and the length of time required to perform operations may affect system reliability and effectiveness.

A description of potential incompatibilities among human performance

capabilities and equipment to document both the aspects of performance which may be adversely affected and the associated equipment configurations/characteristics. The contractor shall identify the controls or displays that may be needed but are not present on the equipment. Recommended solutions to these incompatibilities shall also be included and stated in terms of redesign, alteration of tasks, and/or training.

(d) Provide any instructions necessary for proper use/operation/maintenance/repair of the equipment or a discussion of what instructions will be developed or will be necessary. The instructions shall include the proper method of interface with any other standard item that will typically be used/worn with their product.

(3) System Safety and Health Hazards: see section V, paragraph 1

(4) Soldier Survivability: Soldier Survivability pertains to the characteristics of a system that can reduce fratricide, detectability and probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue. Describe any impacts the product has on Soldier Survivability and/or how Soldier Survivability issues were (or will be) considered in the design/development of the product.

All contractor questions/concerns about proposal requirements for system safety engineering and MANPRINT requirements may be discussed with the following appropriate POCs:

Safety: Mr. Dan Gregory, TEL: 508-233-4883, daniel.r.gregory.civ@mail.mil

MANPRINT: Ms. Rose Guerra, TEL: 508-233-4070, rosemarie.guerra.civ@mail.mil

SECTION VI – SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

A. COMBAT FEEDING EQUIPMENT AND SYSTEMS

1. Combat Food Service Equipment for Individual and Group Feeding.

Ideas, concepts, and technologies applicable to sustaining troops on the battlefield are needed for four general mission areas: consolidated large groups (550 troops), companies (150 troops), squads/small combat units (~12 troops), and individual Warfighters. Responsive proposals are directed towards minimizing the expenditure of energy, manpower, and other resources and materiel, and yet provide maximum flexibility and effectiveness in responding to the total food service requirements of troops operating under all battlefield threats, in all climatic and terrain conditions, and at all levels of commitment. Generally, the requirements are for systems that can be rapidly deployed/employed; are easily transported; offer quick response times; are highly efficient (i.e., require least manpower, fuel, water, etc.); support all types of rations and menus; and can be readily adapted to any battlefield scenario. As such, equipment must be compact, lightweight, versatile (e.g., modular, multi-functional, multi-fuel capability, etc.), energy efficient, reliable, and easily operated and maintained. In addition, effective field sanitation and waste handling/disposal concepts are needed.

Field feeding equipment and systems can be classified according to the following specific interest areas:

(A) Individual
- (1) Ration and beverage heating
- (2) Ration and beverage chilling

(B) Group
- (1) Heat and Serve
- (2) Storage of perishable fresh and frozen foods
- (3) Preparation of meals
- (4) Transportation, distribution, and service
- (5) Waste management, reduction, recycling, and conversion
- (6) Sanitation
- (7) Refrigeration

Scientific and Technical Areas of Interest:

A comparison of current and emerging capabilities versus known and projected requirements of the Military Services indicates an interest in the following technical areas:

a. Diesel/JP8 combustion technologies including vaporization, atomization, and gasification (catalytic or otherwise) that are efficient, clean, reliable, and maintainable.

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b. Exothermic and endothermic chemical technologies and thermoelectric technologies for heating and chilling rations/beverages that are safe, efficient, compact and/or reusable.

c. Heat transfer technologies that will safely utilize all forms of generated/cogenerated energy (e.g. chemical, electrical, fuel combustion, etc.) for cooking, heating, and cooling rations and water.

d. Refrigeration technologies, or other methods for safely storing perishable foods, that operate with minimum expenditure of energy and limited weight/space demands for all modes of transport, storage, and distribution of perishable subsistence in the field.

e. Equipment technologies for safely thawing cases and pallets of frozen foods.

f. Field amiable methods and equipment to improve the sensitivity and selectivity for detection and identification of microbiological or chemical contamination in foods.

g. Material technologies for new structural and insulative materials appropriate for food service equipment that provide improved durability, strength, energy efficiency, and cost.

h. Equipment and systems technologies to reduce, recycle, and/or extract energy out of food service waste in an efficient, safe waste handling, and disposal in an environmentally acceptable manner.

i. Food equipment sanitation technology that reduces the logistics of cleaning and sanitizing cookware by reducing water, reducing fuel required to heat water, treating and recycling the water, novel disinfectants and sanitizers, or other forms and processes for waterless sanitation.

j. Methods and equipment for the decontamination of fresh fruits and vegetables in a field feeding environment.

k. Equipment technologies to ensure the sanitary protection of food and beverages during assembly, preparation, service, and distribution in the field, and systems concepts for efficient and effective cleaning and sanitation of field feeding equipment.

l. Novel power supplies for efficiently and effectively producing/storing and/or providing electric power to operate field feeding equipment including consideration of such factors as size, weight, cost, reliability, safety, maintainability, useful life, and environment factors.

m. Equipment technologies, novel methods, and devices for heating food and chilling water on aircraft and in vehicles.

n. Equipment technologies that offer improvements in baking, roasting, steaming, boiling, simmering, and grilling.

o. Equipment and technologies to reduce cooking, cleaning, and maintenance labor in Navy ship galleys and sculleries.

p. Automated Information Systems, Radio Frequency Identification, and sensors for food service equipment and systems to include wireless systems that support more efficient and effective food service operations.

q. Equipment technologies integrated with the food service equipment or systems to automatically reduce the power consumption for electric food service equipment items and/or automatically manage the available electric power more efficiently to increase cooking throughput without increasing the weight, volume, manpower, and cost.

r. Equipment and technologies and systems that reduce labor by automatically tracking and storing subsistence items aboard Navy ships.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Mr. Paul Dellarocca, Paul.j.Dellarocca.civ@mail.mil, TEL (508) 233-4394

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
ATTN: RDNS-CR (Mr. Mark Daley)
Kansas Street
Natick, MA 01760-5018
TEL: 508-233-4163, mark.a.daley8.civ@mail.mil

2. Unit/Organization Equipment.

Unit/organizational and field service support equipment are required to sustain and increase the efficiency, survivability, and operational capability of the soldier in the battlefield while meeting individual needs. Equipment required to perform a variety of field functions must be efficient, reliable, compact, lightweight, easily operated/maintained, and logistically supportable. This equipment must also be rugged enough to withstand field transport, set-up under high stress conditions, repeated set-up and tear down, and drastically varying field conditions and climates. Future battlefield requirements dictate the need for more mobile, NBC survivable and

multi-functional equipment in addition to the need to reduce the logistical burden of supplying water, fuel, and electrical power to the field.

Specific interest areas include:

- Mobile Laundry Systems
- Space Heaters for Tentage and Shelters
- Water Heaters for Laundry, Showers, and General Purpose Hot Water (including non-powered immersion type heaters)
- Field Clothing and Textile Repair Equipment
- Field Sanitation and Hygiene Equipment
- Non-Powered Field Lighting
- Mortuary Affairs Equipment
- Latrines and Incinerators for Human Waste Collection and Disposal in the Field
- Lightweight portable shower systems
- Field furniture
- Portable Field Waste Water Treatment/Recycling Systems
- Co/tri-generation technologies

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future combat service support requirements dictates interest in the following major areas of scientific knowledge and technological capabilities:

a. Advanced technology to allow the exploratory development of diesel/jet fuel-fired clothes dryers, microwave clothes dryers, and water heaters suitable for field use.

b. Advanced combustion technology to allow the exploratory development of clean-burning, efficient, and safe multi-fuel fired non-powered heaters for the field. This includes both space heaters and immersion heaters for water. ("Non-powered" means that no external electrical power is required for operation.)

c. Advanced water treatment technologies to allow the safe re-use or disposal of waste water from field showers, laundries, and latrines.

d. Technology to produce low-cost, high efficiency, lightweight equipment for heating, ventilating, uniform heated/cooled air distribution, and conditioning for tentage applications (including collective protection).

e. Novel and exploratory concepts to effectively and reliably identify, process, preserve, and safely transport (including air transport) human remains including NBC contaminated human remains from the battlefield.

f. Novel and exploratory concepts to provide non-powered field lighting using liquid fuels such as diesel and jet fuel.

g. Advanced small capacity multi-fuel combustion, heat transfer, and material technologies to allow development of lightweight highly portable general purpose hot water heaters for field use.

h. Advanced laundry technologies for reducing the use of detergents and water over existing systems.

i. Advanced technology for the development of lightweight, modular, deployable field latrines and advanced methods of treatment and disposal for human waste from latrines in the field.

j. Advanced technology for developing a lightweight, portable incinerator that will provide a safe, economical, and environmentally sound means of disposing of waste products (including human wastes) generated during military operations.

k. Advanced technology to allow development of compact, portable, lightweight shower units for use by soldiers on initial entry into theaters of operation.

l. Novel means of power generation (thermoelectric, thermophotovoltaics, solar, fuel cells, renewable energy etc) to allow field service equipment such as heaters, showers and laundries, to be self-powered for operation in remote/isolated locations w/o need of tactical generators.

m. Novel concepts in field furniture that will reduce the logistics burden, be easily deployable and lightweight, be rugged, and enhance utility/effectiveness in the field.

n. Novel waterless or low water cleansing technologies for field showers and personal hygiene.

o. Advanced technologies to permit the development of innovative equipment identified in the functional areas above to better the quality of life for the soldier in the field.

Communication with the Technical POC prior to submission of a formal proposal is essential. All concept papers should be submitted to the Technical POC below.

Technical POC: Mr. Joseph Mackoul, TEL: 508-233-5592, joseph.a.mackoul.civ@mail.mill

All proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
PM-Force Sustainment Systems
ATTN: SFAE-CSS-FP-F (Cheryl Miller)
Kansas Street
Natick, MA 01760-5057
TEL: 508-233-6246, cheryl.a.miller106,civ@mail.mil

B. COMBAT RATION RESEARCH AND DEVELOPMENT

Shelf-stable prepared combat rations are essential for enabling the individual Warfighter to perform assigned missions and to survive battlefield threats. The requirements for compactness, storage stability, protection, modularity, enhanced nutrition, Warfighter acceptance, convenience, and producibility have become even more stringent in anticipation of supporting highly mobile, widely dispersed Warfighters in climatic extremes.

Combat ration functionality goals can be divided into the following specific interest areas:

- Storage stability with maximum quality and nutrient retention
- Production and distribution efficiency
- Consumption/acceptance enhancement
- Human performance optimization/enhancement
- Improved, enhanced and more effective protective packaging systems
- Collection and consolidation of quality assurance and environmental data
- Food protection from incidental or intentional contamination
- Novel, non-thermal/thermal food processing methods and technologies
- Environmentally preferable “green” food processing methods and sustainable high barrier food packaging materials.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements indicates the need to

explore key emerging areas of scientific knowledge and technological capabilities. These Scientific and Technical (S&T) Areas of Interest are in direct support of several operational/capability requirements serving the needs of the Armed Services in the near, mid, and longer range timeframe and on the future battlefield (Future Force). The S&T Areas of Interest also support the following major thrusts: enhanced performance; energy and nutrient intake; nutrient stability; improved consumption rates; and reduced ration weight and volume, source material, and waste. In addition, each S&T area is linked to Defense Strategic Goals, Force Transformation, the Joint Operational Concepts, and the Services visionary documents to provide the total spectrum of joint service support to sustain the Warfighter on the battlefield through technological advantage thereby ensuring focused logistics, improved responsiveness, deployability, agility, versatility, survivability, and improved combat readiness and effectiveness. The spectrum of likely operations describes a need for land forces in joint, combined, and multinational formations for a variety of missions extending from humanitarian assistance and disaster relief to peacekeeping and peacemaking to major theater wars.

Advanced, multi-functional, effective and efficient protective packaging systems are crucial to the preservation of Army material in any climatic and/or hazardous environment. Material requirements for protective packaging systems relate to both food and food service equipment. In order for the individual Warfighter to perform the assigned mission and/or survive battlefield threats, mission essential items must arrive at the right time at the right place and provide the expected functionality and utility. Technological advances in high barrier polymer films and coatings, active and intelligent packaging are needed to meet the increasingly stringent and sometimes conflicting requirements of compactness, sustainability, storage stability, recyclability, protection, modularity, durability, convenience, degradability, and producibility. Packaging functionality includes (as applicable) protection from the following events: temperature extremes, insect/rodent infestations, moisture permeation, oxygen permeation, light penetration, microbial penetration, tampering events, loss of integrity, and transportation hazards (including rough handling and air drop). Advanced systems for tracking and monitoring quality of ration unit loads are required for flexible logistic systems for the future battlefield.

The key areas of science and technology include:

a. Scientific information and advanced processing technologies are needed to ensure that nutrients required for optimum performance under stress are provided and are physiologically available for utilization.

b. Improved technology is needed to produce a greater variety of ready-to-eat, lightweight, low-volume, nutrient/calorie-rich ration components that would be acceptable, cost effective and producible by the ration industry.

c. Innovative food processing technologies and systems are needed to provide for cost

effective, high volume production of shelf stable, fresh-like wet or intermediate moisture foods with maximum retention of quality factors and nutrition.

d. Scientific information is needed about the influence of food constituents and processing (traditional and novel advanced methods) on the physical structure, chemical reactivity, nutrient preservation, package integrity, and microbiological safety of ration components to ensure their stability under extreme storage conditions (with special interest in dairy products, eggs and other high-protein foods).

e. Scientific information and innovative technologies/methodologies are needed about maximizing quality/nutrient retention and extending shelf-life/storage stability of fresh fruits and vegetables as well as cost effective logistical support mechanisms or implementation strategies suggested for viable technologies.

f. Programming and data base development is needed for exploiting a ration item optimization model to guide the selection of ration components or off-the-shelf items intended for diverse missions based on energy requirements, nutritional content, battlefield operational conditions, personal preferences, weight, volume, and cost of items or components.

g. Scientific information is needed on the basis for and extent to which specific food constituents incorporated into the food: 1) delay fatigue, 2) extend physical strength and endurance, 3) hasten recovery from injury, 4) heighten alertness or enhance cognitive abilities, 5) increase feelings of satiety of Warfighters engaged in physically or mentally demanding tasks, or 6) promote Warfighter health protection and fitness, prevent injury and illness, conserve the mental and physical well-being of Warfighters, and maintain personal readiness.

h. Scientific concepts and data are required for increasing the speed and sensitivity of detection technologies (sensors) for food safety determination to include novel approaches in preparation of samples from complex food matrices, high throughput screening capabilities, improved transducer technologies and capture efficiencies. In addition field portable objective and quantitative technologies are required for determination/estimation of ration quality status or presence of food borne pathogens.

i. Scientific information is needed for the development and implementation of strategies

for the application of novel pathogen reduction technologies for fresh fruits and vegetables and for food preparation and eating surfaces.

j .Scientific information is needed for the development and elaboration of food safety risk analysis decision making tools such as in comprehensive food processing and environmental risk assessments as well as predictive models of pathogen behavior in specific food matrices.

k. Packaging technology based on non-foil, high barrier polymeric material is needed to ensure protection against oxygen, moisture vapor, microbial, and insect penetration to maintain integrity throughout the military logistics system, and to provide rations with a minimum three year shelf life.

l. Active/smart packaging materials/films/coatings and in-packaging adjuvants are needed that possess inherent properties for scavenging or eliminating moisture, oxygen, off odors (e.g. aldehydes), carbon dioxide, and/or ethylene (as appropriate) as well as repelling insects and rodents. Technology is also needed for packaging materials/systems containing anti-microbial or biocidal agents, physiological inhibitors for fresh produce and other methodologies to control or modify the atmosphere within a package for extension of shelf life.

m. Technology is needed to develop advanced materials/films/coatings for flexible, semi-rigid, and rigid polymeric containers that provide physical and chemical protection comparable to traditional aluminum foil-based high barrier polymeric materials. Determine compatibility of non-foil high barrier polymeric material for both thermoprocessing and novel thermal/nonthermal processing (e.g. microwave or high pressure processing).

n. Technology is needed to develop simple and cost effective tamper-indicating features for application to primary packaging, secondary ration packaging, and unit loads to enhance the safety and security of the subsistence supply chain.

o. Technology is needed to develop a model that will predict the barrier performance of film structures incorporating multiple high barrier technologies, while taking into account environmental variables such as temperature and relative humidity, packaging configuration, headspace composition, interaction between product and package, and process-induced stresses in packaging materials.

p. Technology is needed to advance packaging to reduce weight and volume and to make it more sustainable, recoverable, recyclable, compostable, biobased, degradable, and capable of being decontaminated.

q. Technology is needed to develop innovative, high-performance, manufacturable, compostable, and recyclable fiberboard materials for incorporation into ration secondary packaging systems to enhance ration container and unit load performance during long-term storage and rough handling conditions. Multi-functional coatings and/or additives may also enhance the utility of secondary packaging. Enhanced systems must adequately protect military rations and must ensure sufficient burst strength and compression/stacking strength properties.

r. Low cost, intelligent packaging technologies including enhanced bar code labels, printed electronic sensor devices/labels with displays, sensor enabled RFID tags, and smart indicators for reconstitution water fill lines and food serving target temperatures are needed to enhance primary, secondary, and/or pallet-level ration packaging systems to improve strategic handling, product storage/rotation/inspection, assembly, mobility, deployability, transportability, security, logistics and distribution supply chain tracking and retrieval, and to ensure reliable operation of components in all scenarios.

s. Technology is needed to automate and centralize manufacturing (traceability) and inspection data and to provide real-time asset visibility and tracking of environmental storage/history data to accurately predict the remaining shelf life of operational rations, and to facilitate improved process efficiency and management of the ration supply chain throughout the lifecycle.

t. Technology is needed to develop cost effective convenience and portable packaging features/designs, including easy-to-open, eat-on-the-move, and reclosable, functional packages for dispensing both conventional and unconventional solid and reconstituted liquid ration components.

u. Technology is needed to develop flexible, semi-rigid and/or rigid high barrier materials that are: compatible with Horizontal/Form/Fill/Seal machinery; capable of withstanding classical thermoprocessing, microwave or high pressure sterilization, as well as aseptic packaging; and capable of providing products with a three year

shelf life.

v. Technology is needed to develop and produce lighter weight, shelf-stable, highly appealing, and nutritious individual and group operational ration systems having a smaller footprint or modular sub-systems that require little or no preparation and are adaptable for Joint Service applications in global deployments and all operations ashore and afloat. Nutritious and novel sustainment systems must support the future Modular Force and Joint Operational Environment under all battlefield threats and climatic conditions enabling an agile and adaptive military response for 'prompt' and 'sustained' operations.

w. Technology is needed to develop green food processing technologies that conserve energy and reduce harmful emissions to support field utilization and industrial food manufacturing.

x. Advanced technologies, innovation, and concepts to devise novel systems, capabilities, and/or methodologies to enhance distribution-based combat ration sustainment to deliver the right rations, to the right place, at the right time, over extended distances supporting global deployments. Logistics and sustainment delivery concepts must optimize operational efficiency and cost effectiveness, ensure Warfighter acceptability and nutrition, and achieve strategic responsiveness for highly mobile, rapidly deployed forces involved in extended operations requiring Class 1 resupply. Innovative sustainment concepts should emphasize speed, precision, accuracy, visibility, and reduce or eliminate traditional supply chain management problems including product identification and location, stock rotation and management issues, product spoilage losses, and menu fatigue.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Mr. Andy Senecal, andre.g.senecal.civ@mail.mil, (508) 233-4507

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
ATTN: RDNS-CF (Mr. Mark Daley)
Kansas Street Natick MA 01760-5018
TEL: 508-233-4163, mark.a.daley8.civ@mail.mil

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

C. WARFIGHTER SYSTEMS TECHNOLOGIES

1. Ballistic Protection for Individuals.

Ballistic protection for the Warfighter involves protection of the body (head/neck, torso, extremities) against a variety of projectiles that differ widely in shape, size, and impacting velocity. New materials and systems are required to meet these broad ballistic threats and to lighten the load carried by the Warfighter.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New polymers that can provide increased tensile properties, increased ballistic protection, and lighter weight.

b. Highly ordered polymers (e.g. liquid crystals) for High Performance (HP) fibers.

c. Improvements to existing HP fibers (e.g. surface modification, processing, and composition variations).

A need also exists for:

d. Novel concepts to identify the best technical approach to provide protection to the individual Soldier against multiple ballistic threats. Such concepts should identify ballistic defeat mechanisms for fragmentation and handgun threats. Upon identification and understanding of defeat mechanisms, further efforts should establish the feasibility of systematically combining those mechanisms into lightweight, flexible, minimum bulk structures of 1 lb per square foot or less providing a high level of protection against the identified threats.

e. Unique and novel textile and composite structures which optimize the ballistic protection of currently available materials for soft body armor and helmet applications.

f. Studies of blast effects to include overpressure and behind armor effects on the individual and materials/systems to mitigate effects.

g. Novel concepts to identify the best technical approach to provide ballistic protection to the individual Soldier against multiple ballistic threats. Such concepts should identify ballistic defeat mechanisms for current ballistic threats including small arms threats and flechettes. The small arms threats range from 5.45mm to 7.62mm ball and armor piercing (AP) with limited interest in 12.7 mm AP. Upon identification of defeat mechanisms, further efforts should establish the feasibility of systematically combining those mechanisms into lightweight, minimum bulk structures using unique and novel textile and/or composite systems.

h. Additional concepts may include transparent armor, smart materials for armor and other functionalities, and nanotechnology approaches to new materials.

NOTE: Some of the technical approaches for topics within this solicitation may be subject to export control restrictions under existing export control laws and/or required to be conducted as classified projects as outlined in the National Industrial Security Program Operating Manual (NISPOM) and its supplements. Contractors who would like to submit proposals pertaining to such technologies are encouraged to contact their local Defense Investigative Service (DIS) Industrial Security representative or the Technical POC listed in the solicitation for guidance.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Janet Ward, TEL: 508-233-5462, janet.e.ward2.civ@mail.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development & Engineering Center
ATTN: RDNS-WS (Ms. Gail Bernheart)
Kansas Street
Natick, MA 01760-5020
TEL: 508-233-4706, gail.d.bernheart.civ@mail.mil

2. Integrated Protective Headborne Equipment and Injury Diagnostic/Assessment Tools.

Head borne protection for the individual combatant involves protection of the head (to include the eyes, neck and throat) against fragmentation munitions, handgun projectiles, blunt trauma

impact, and behind armor effects including injuries caused by kinetic energy and blast waves.

New materials, designs including modeling and simulation design tools, survivability models, treatments and diagnosis technologies are required to meet this broad range of threats while also providing in-depth consideration of the appropriate ergonomics, comfort, hearing, mission requirements, thermal/vapor management and other cognitive functions necessary for the combatant to fully execute his/her operational duties without extensive physical or mental impairments.

New diagnostic and assessment tools/methods that medically evaluate the combatant are needed in order to more fully characterize specific warrior populations at risk and requiring further clinical intervention. In order to support this requirement, new diagnostic and assessment methods and tools for Post-Traumatic Stress Disorder (PTSD) and Traumatic Brain Injury (TBI) are required. In addition, research data needs to be collected in a systematic manner for the various services, compiled, and analyzed in order to develop a baseline for a requirements document. The injury data is a key element in developing treatment and diagnosis tools and new protection/survivability models so that troops maybe better protected in future engagements and injuries treated at the front lines.

Marine Corps personnel as well as both Navy Active and Reserve personnel are deploying in unprecedented numbers to the CENTCOM AOR as Individual Augmentee personnel in support of Army missions. This large movement of Navy personnel to extreme environments in a nontraditional combat role presents unique medical readiness requirements.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New and improved polymers for fiber reinforced plastics and resins which can provide increased ballistic protection and lighter weight.

b. New fibers and materials for energy absorption and moisture vapor permeability/cooling management.

c. Transparent materials for enhanced eye protection without reductions in visibility.

d. Improved lightweight integrated communications devices.

e. Engineering designs which incorporate enhancements to combat helmets including area of coverage, field of view, modular attachment points, speech recognition, and

compatibility with existing equipment and improved hearing capabilities.

f. Modeling and simulation tools for material/armor system designs.

g. Modeling and simulation survivability design tools including bio-mechanics and injury prevention/diagnosis models.

A need also exists for:

h. Novel modular designs and integration concepts to identify the best technical approach to provide head protection to the individual combatant against multiple ballistic and non-ballistic threats. Such concepts should identify ballistic protection capabilities for each component and area of the head to be protected. Upon identification of critical design elements further efforts should establish the feasibility of systematically combining those modular components into a lightweight head-borne system of approximately 3.5 pounds providing a high level of protection against the identified threats and a high level of user comfort.

i. Unique and novel design approaches which utilize the currently fielded equipment and developmental items as a base platform for incorporating modular components for improved ballistic/blast protection and which would offer the user the ability to tailor the level of protection to the current threat by adding or removing modular integrated components (i.e. face shield, eye protection, neck protection).

j. Unique and novel design approaches for protective assemblies which provide maximum area of coverage and ballistic resistance capabilities. These systems could weigh as much as 6 – 8 pounds and encompass the entire head. This type of approach will require attachment designs and bio-mechanic studies to determine the best means for carrying the system weight on the shoulders or other parts of the body and be capable of allowing the user to tailor the level of protection to the anticipated threat by adding or removing modular integrated components.

k. Ergonomic and human factor studies to identify key parameters for user acceptability. The identified design(s) include studies, laboratory data, and human evaluations for heat stress retention, stability, ability to fire weapon systems, maneuverability, and general form, fit, and function of proposed design.

l. Modeling and simulation design and material evaluation tools which provide engineers and medical personnel the appropriate human interface information necessary to mitigate injuries from a variety of threats encountered on the modern battlefield.

m. Characterization and surveillance of, and mitigation of, Post-Traumatic Stress Disorder

(PTSD) and Traumatic Brain Injury (TBI), primarily within military personnel. Within the surveillance domain, information on the type and prevalence of behavioral health problems and brain injury-related issues will be used to identify resource needs and potential mitigation strategies for prevention programs. The prevalence of deployment-related psychological symptoms in troops-in-transition who are returning to civilian life needs to be determined, and their health care utilization patterns need to be described. The extent to which PTSD and TBI data among military personnel are accurate and up to date will need to be determined. Medical data from theater will be required to characterize the pre-clinical deployment-related variables that co-vary with subsequent development of PTSD and TBI. Specific to TBI, neuropsychological baseline screening and follow-up assessment methods are needed to enhance the safety and performance of Warfighters. New diagnostic and assessment methods for PTSD and TBI are needed in order to more fully characterize specific populations at risk and requiring further clinical intervention.

n. There is a need to match evidence-based services to the needs of deployed personnel and to allow the Navy Surgeon General and the Medical Officer of the Marine Corps to provide accurate psychological health information. Specifically, there is a critical need for surveillance to determine the prevalence of psychological health problems and TBI in expeditionary Sailors and Marines, particularly in high-risk populations such as infantry. The portfolio of programs proposed will document the prevalence of health problems and TBI in high-risk naval populations, and the magnitude of resources needed by these populations.

o. Other topics pertaining to psychological health relevant to TBI are: develop a core body of knowledge in compassion fatigue; evaluate the need for telemedicine; educate professional on those affected by disease or addiction; develop a course on how to use pharmacotherapy treatment and non-pharmacological intervention; standardize a Neurocognitive & Combat Stress Toolbox; develop a portable head-neck CT scan for use in patient transport; study ocular signs of TBI; develop the Navy Reserve's Psychological Health strategic plan; develop critical skills related to individual and family emotional regulation, problem solving, communication, and accessing support; develop assessment and treatment program for the families of Wounded Warriors; develop an outreach program for Marines; provide mental health case managers and oversight for each Wounded Warrior Battalion; train support staff at USMC HQ; enhance knowledge and skills on non-mental health caregivers to recognize combat related symptoms; train mental health providers on the techniques and interventions necessary to decrease combat operational stress; provide on-site training for OSCAR team members prior to deployment; investigate negative expectations about disclosing combat experiences; develop website for self-management intervention employing empirically derived cognitive-behavioral therapy; develop pre-deployment training for psychological first-aid; etc.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

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Technical POC: Mr. David Krasnecky, TEL: 508-233-5189, david.krasnecky1.civ@mail.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
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ATTN: RDNS-BOR-P (Ms. Ann Dickhut)
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3. Modular Personal Protection Equipment (MPPE) and Injury Diagnostic/Assessment Tools.

Personnel protection for the individual combatant involves protection of the torso (to include the extremities, arms, groin, and legs) against fragmentation munitions, blast effects, small arms and handgun projectiles. New materials, designs, and technologies are required to meet this broad range of threats while also providing the appropriate ergonomics, comfort, weight, and cooling necessary for the individual to be capable of wearing the body armor for extended periods of time. Torso/extremity protection for the individual combatant involves protection against fragmentation munitions, handgun projectiles, blunt trauma impact, and behind armor effects including injuries caused by kinetic energy and blast waves. New materials, designs including modeling and simulation design tools, survivability models, treatments, and diagnosis technologies are required to meet this broad range of threats while also providing in-depth consideration of the appropriate ergonomics, comfort, maneuverability, mission requirements, thermal/vapor management and other cognitive functions necessary for the combatant to fully execute his/her operational duties without extensive physical impairments. The goal of this task is to develop a modular personnel protective system and modeling tools which can be tailored to defeat specific threats including fragmentation/blast munitions, handgun, and small arms projectiles. The modular system will have the capability to achieve various levels of personnel protection to meet specific threats and missions and to provide protection to specific and critical areas of the Soldier. The modular system will be designed to protect areas of the body not currently protected by the Improved Outer Tactical Vest (IOTV) and Enhanced Small Arms

Protective Plates (ESAPI). The primary challenge becomes one of designing an efficient and synergistic system that offers various level of protection while being operationally effective and meets form, fit, and heat stress reduction requirements so that sustainability is increased.

New diagnostic and assessment tools/methods that medically evaluate the effectiveness of armor and the individual combatant are needed in order to more fully characterize specific warrior threats and populations at risk requiring further clinical intervention. In order to support this requirement, new diagnostic and assessment methods and tools for behind armor and penetrating wounds are required. In addition, research data needs to be collected in a systematic manner for the various services, compiled and analyzed in order to develop a baseline for a requirements document. The injury data is a key element in developing treatment and diagnosis tools and new protection/survivability models so that troops may be better protected in future engagements and injuries treated at the front lines.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New and improved polymers for fiber reinforced plastics and resins which can provide increased ballistic protection and lighter weight.

b. New fibers and materials for energy absorption and moisture vapor permeability/cooling management.

c. Improved ceramic materials and designs capable of providing weight reductions, improved frangibility, and body conforming shapes.

d. Improved lightweight integrated and flexible extremity protection.

e. Engineering designs which incorporate enhancements to personnel protection including area of coverage (soft and hard armors), modular attachment points, flexibility, compatibility with existing equipment, and tailorability to increasing threat levels.

A need also exists for:

f. Novel modular designs and integration concepts to identify the best technical approach to provide body/extremity protection to the individual combatant against multiple ballistic and non-ballistic threats. Such concepts should identify ballistic

protection capabilities for each component and area of the body to be protected. Upon identification of critical design elements, further efforts should establish the feasibility of systematically combining those modular components into a lightweight personnel protection system of approximately 15 pounds providing a high level of protection against the identified threats and a high level of user comfort.

g. Unique and novel design approaches which utilize the currently fielded Interceptor Body Armor as a base platform for incorporating modular components for improved ballistic/blast protection and would offer the user the ability to tailor the level of protection to the current threat by adding or removing modular integrated components (i.e. hard plates, soft panels, neck protection and extremity protection).

h. Unique and novel design approaches for protective assemblies which provide maximum area of coverage and ballistic and blast resistance capabilities. These systems could weigh as much as 12 - 20 pounds and encompass most of the body. This type of approach will require attachment designs and bio-mechanic studies to determine the best means for carrying the system weight on the shoulders or other parts of the body and be capable of allowing the user to tailor the level of protection to the anticipated threat by adding or removing modular integrated components.

i. Ergonomic and human factor studies to identify key parameters for user acceptability. The identified design (s) include studies, laboratory data, and human evaluations for heat stress retention, stability, ability to fire weapon systems, maneuverability, and general form, fit and function of the proposed design.

j. Modeling and simulation design and material evaluation tools which provide engineers and medical personnel the appropriate human interface information necessary to mitigate injuries from a variety of threats encountered on the modern battlefield.

k. There is a need for research programs with specific goals and end-points for health related issues relevant to military personnel and veterans. These research programs are generally concerned with topics relating but not limited to healthcare delivery, detection, diagnosis, treatment and control or eradication of specified chronic diseases, conditions, or syndromes, or to other initiatives relevant to health needs.

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Industrial Security representative or the Technical POC listed in the solicitation for guidance. Communication with the Technical POC prior to submission of a formal proposal is essential.

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All concept papers, proposals and administrative inquiries should be submitted to:

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4. Chemical/Biological Protection for Individuals.

The protection of the Warfighter from exposure to hazardous chemicals, such as chemical warfare agents, is essential to mission accomplishment on today's battlefield and that of the future. This protection is currently accomplished through the use of an activated carbon system, the use of semi-permeable material systems, and the use of impermeable barrier materials. The activated carbon system is used in protective overgarments and affords protection by adsorbing hazardous chemicals. The impermeable barrier materials consist of rubber, coated, and multilayer laminate fabrics found in gloves, boots and special purpose (e.g. depot storage/ demolition/explosive ordnance disposal ensembles), which afford protection by acting as a physical barrier to chemicals.

Future needs for chemical protective uniforms require that they protect against multiple threats including toxic aerosols and biological agents, be decontaminable and reusable. These uniforms must also be comfortable in all climates and not impair the mobility or performance of the Warfighter. The materials for these uniforms should be lightweight; have improved protection for resistance to liquid, vapor, and aerosol CB agent penetration; lessen the propensity for heat stress, have increased durability and shelf life; and be reusable through the use of reactive and biocidal materials that will detoxify the chemical warfare (CW) agents without adverse reaction with the skin. There is a need for the development of methods for measuring adsorption of agents and agent surrogates within protective materials (particularly liquid challenge/liquid penetration) and for determining the reaction products (quantitative and qualitative) that originate from detoxification chemistry taking place in catalytic and reactive materials.

A need exists to alleviate the effects of extreme environmental loads through the use of microclimate conditioning. In particular, there is a need to mitigate the effects of heat stress induced by personal protective clothing. Microclimate Cooling Systems (MCS) are effective in removing excess stored body heat, resulting in reduced body core temperature rise and reduced skin temperature. Operationally, MCS can significantly increase users' mission duration,

improve mental acuity, reduce hydration needs, and enhance thermal comfort. However, the size, weight, and power consumption of these systems have precluded their use for many users. Thus, there is a need to minimize these parameters to improve the acceptance of MCS for the military and First Responder communities.

At the cold end of the environmental spectrum, there is a need to enhance insulation and provide auxiliary personal heating to augment cold weather clothing or supplant layers of bulky cold weather clothing to prevent cold injuries, enhance mobility, and reduce interference with critical equipment and controls. In particular, technology approaches that provide heating to improve finger tactility and dexterity are needed.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities:

a. Novel materials and concepts that could provide protection against highly toxic compounds, including toxic industrial chemicals (TIC) and military offensive chemical agents (blister, nerve, etc.) in gross contamination amounts for extended periods (greater than four hours), and biological agents. We are also interested in related exploratory development proposals such that feasibility can be established for the development of improved CB agent/TIC protective and biological agent protective suits, garments, gloves and socks. Proposals which emphasize lighter weight, improved protection, improved decontamination (through the use of self-decontaminating or biocidal materials or materials that can be regenerated in the field), improved durability and launderability, reduced heat stress, and other human factor concerns are of particular interest. Intelligent textiles and polymers are of interest. These may include materials with controllable, variable permeability. For gloves, novel technologies that improve tactility, durability, and moisture vapor transport are desired.

b. Swatch and system test methodologies for evaluating the effectiveness of emerging CB material technologies to provide protection against hazardous chemicals.

c. Low cost service life indicators that can be worn or stored inside a chemical protective garment package to visibly display or provide some reading as to the degree of protection remaining in the garment are of interest as are applications of novel polymers and smart materials.

d. Reduce/minimize the need for live agent testing to verify the chemical protection of current carbon based sorptive systems.

e. Advanced material technologies such as elastomeric, polymeric, semi-permeable, or selectively permeable membrane technology that allows selective permeation of moisture while preventing penetration of chemical and biological warfare agents in the forms of liquid, vapor, and aerosol.

f. Garment design and novel closure systems for CB protective clothing systems. We are interested in ensemble designs that enhance protection and reduce thermal burden. We are also interested in elastic/stretchable polymeric materials such as thermoplastic elastomers for development of closure systems that provide and maintain chemical/biological agent protection in normal and in stretched states.

g. Mechanisms and garment treatments that capture and possibly react with aerosolized (<5micron) threat particles. Key to this work would be to demonstrate that such treatments could remain effective during the normal use and service life of the protective garment.

h. Improved and multi-functional outer shell materials for CB protective garments. We are interested in materials with novel surface modification to either their fibers or the fabric, resulting in a comfortable; durable; air permeable; water, solvent, and oil repellent (i.e. omniphobic or superhydrophobic and superoleophobic) material for the life of the garment.

i. Development of self-healing polymers for CB protective clothing applications.

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Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

All concept papers, proposals and administrative inquiries *other than for Micro Climate Cooling Systems* should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
ATTN: RDNS-WS (Ms. Gail Bernheart)
Kansas Street
Natick, MA 01760-5020
TEL: 508-233-4706, gail.d.bernheart.civ@mail.mil

All concept papers, proposals and administrative inquiries *for Micro Climate Cooling Systems* should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
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5. Flame and Thermal Protection for the Individual Soldier.

Flame and thermal protection for the Warfighter involves protection of the body, face, and hands against a variety of flame and thermal threats and hazards including those attributed to improvised explosive devices that occur in combat (rural and urban warfare), operations other than war, and standard operational duties. New, low cost, effective materials are needed to protect against these threats and hazards to reduce burn injuries. Likewise, there is a need to develop new test methods and evaluation criteria for assessing burn injuries which simulate and correlate to real life scenarios.

NOTE: Any materials/technologies applied directly to exposed skin may need to undergo Food and Drug Administration (FDA) approval and toxicity clearance testing.

Scientific and Technical Areas of Interest: The following scientific knowledge and/or technological capabilities are of interest to provide improved materials for the protection of Warfighters in clothing and individual equipment items.

a. New, low cost fibers for clothing applications (woven, nonwoven, knit, and batting fabric structures) which provide flame and thermal resistance without melt drip characteristics.

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b. Improvements to existing fibers (e.g. incorporate novel flame retardant chemicals, flame suppressors or char formers into conventional low cost fibers), fiber variants.

c. Novel concepts and approaches to integrate multiple protection capabilities into materials and clothing systems. Such concepts should integrate flame and thermal protection with other protective capabilities such as environmental protection, signature management, comfort, and electrostatic dissipation without significantly increasing weight.

d. Novel development of flame resistant treatments, coatings, and films that are moisture vapor permeable, lightweight, and chemically compatible with a wide variety of substrate materials.

e. Test methodology and supporting instrumentation to characterize and evaluate the melt burn potential of thermoplastic fiber-based fabric in layered configurations at either the bench scale or full instrumented manikin system level.

f. Novel commercial, environmentally friendly flame retardant chemical treatments and processes for synthetic and natural fibers.

g. Scientific information on the effect of material type and location within the clothing system configuration on burn injury.

h. Studies on the thermal or combined thermal and blast effects on the individual and clothing system configuration.

i. Technology to reliably simulate and record the high thermal or combined high thermal and blast effects within a laboratory environment at the bench scale or full scale clothing system level.

j. Scientific information/innovative technologies leading to the development of highly durable, instrumented fire manikins and reliable and accurate thermal sensors.

k. Scientific information and studies on models and prediction methods for burn injury effects or the combined burn/blast injury effects.

l. Novel concepts to provide flame and thermal or combined thermal and blast protection through active mechanisms such as smart materials that sense and respond or other active systems that respond to an external or internal stimulus.

m. FDA approved and non-toxic materials applied to exposed skin which reduce the thermal burn injuries / provide flame and thermal protection.

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Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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6. Biotechnology.

Biological processes and systems have evolved efficient responses to pressures in the environment. The science of biotechnology identifies those processes and systems which can be manipulated for enhancement of current technologies or development of new ones. The needs of the Warfighter in the field -- enhanced protection from chemical and biological agents, lightweight clothing and gear, real-time detection and identification of enemy agents, and energy creation and storage can be served by research in this growing field.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus Warfighter needs leads to interest in the following major areas of scientific knowledge and technological capabilities:

a. Novel biologically-based biocides for the generation of antimicrobial materials with non-leaching killing action.

b. Experimentation and theoretical research into the structural interactions and mode of action of peptides at interfaces.

c. Development and enhancement of sensor technologies for detection of chemicals and biological materials.

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d. Environmentally benign processes (i.e. low temperature and pressure, aqueous, pH 7) for production of materials.

e. Novel approaches to stabilizing enzymes and natural dyes for long-term use in a broad range of environments.

f. Real-time generation of biofuels from renewable resources.

g. Novel, environmentally-friendly FR materials from renewable biological sources.

h. Development of improved antimicrobial and antisporal test methods

i. Novel approaches in the use of prebiotic and/or probiotic additives to military rations to enhance the subsistence of the Warfighter.

j. Controlling polymicrobial environments as a strategy for defeating harmful organisms while promoting the growth of beneficial organisms.

k. Understanding self-assembly of structural proteins for fiber/nanofiber formation.

l. Biofermentation for production of recombitant proteins, enzymes, peptides, etc. of interest.

m. Biofermentation to understand novel function of gut microbiota.

Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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7. Countersurveillance.

Survivability is fundamental to the conduct of warfare. The countersurveillance mission is to enhance the survivability of the Warfighter on the battlefield by providing textiles for uniforms, individual equipment to include carried equipment such as weapons, and paints/textiles for exposed skin that reduce detectability by various sensors. These sensor threats include the eye, near infrared image intensifiers, short-wave infrared devices, thermal imagers, radar and multi-spectral sensors. Signature suppression with textile and skin camouflage materials usually takes the form of dyes/pigments, additives and coatings although novel and innovative solutions are encouraged. Thermal countermeasures must not degrade existing countermeasures for visual and near infrared (NIR) protection. They should be passive, hypo-allergenic and not increase the bulk or heat stress over levels currently imposed by existing clothing systems.

Scientific and Technical Areas of Interest:

Analysis of user requirements and current capabilities indicates the need for:

a. Near and far term research proposals related to novel concepts and materials that:

(1) Defeat the threat of short-wave infrared devices.

(2) Defeat the threat of thermal sensor detection.

(3) Defeat the threat of radar detection.

(4) Defeat multispectral threat sensors.

(5) Provide novel camouflage solutions to current and future sensor threats by exploring the applicability of a wide variety of technical approaches without compromising visual and NIR performance.

(6) Provide NIR protection and maintain shade after laundering and exposure to various environmental conditions.

(7) Provide protection to exposed hands and facial areas to defeat multispectral sensor detection.

(8) Provide protection by concealment of weapons and other carried equipment to defeat multispectral sensor detection.

(9) Provide materials capable of temporarily adjusting visual/near-infrared camouflage in the field for uniforms and personnel protective equipment (PPE) for enhanced concealment in unique sites of conflict.

(10) Provide new manufacturing technologies for the scale-up of printing and fabrication of textile uniforms and equipment to facilitate a quick turnover of unique camouflaged final products to the soldiers.

b. Exploratory development proposals related to the above areas under which the feasibility of such proposals may be demonstrated.

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Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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8. Body Worn Interactive Materials.

Electronic subsystems, devices, and sensors are being miniaturized for personal use. Novel materials, technologies, and manufacturing methods are needed to integrate these electronics into textiles, protective clothing, or combat field equipment. There is an interest in the development of textile-based conductive materials and integration of these materials and electronics into textile clothing and individual equipment to provide multiple performance enhancements. Desired materials and products shall be safe to wear, lightweight, flexible, launderable, resistant to corrosion and water contamination, and durable to wear and tear. In addition, novel materials providing sense and respond, or actuation capabilities, power generation, or radio frequency tagging are of interest.

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Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New fiber forming polymers that provide conductive, radiative, or optical performance. Conductivities of conductive fibers should approach that of metals for power/data transmission applications.

b. Responsive fibers and fabrics that can sense and respond to a particular stimulus.

c. Novel manufacturing processes to integrate electro-optic fibers, yarns, films, and materials into fabrics. These processes should be capable of large-scale production of the materials.

d. Techniques to integrate or mount battery powered wireless or wired sensors or other miniature electronic devices into or onto fabrics or other individual equipment.

e. Development of ergonomic connector technologies to attach/detach electronics and sensors to/from network.

f. Methods to translate standard cabling such as USB 2.0, Firewire (IEEE 1394), and coaxial cables into flat, lightweight, flexible, wearable textile-based conductors.

g. Integration methods of textile-based body-worn antennas into protective clothing and equipment.

h. Novel wearable power generation technologies to provide minute battery charging capabilities or to provide for direct power of low consumption miniature electronic devices.

i. Lightweight Electromagnetic Interference/Radio Frequency (EMI/RF) shielding capabilities for wearable electronic components and conductive networks.

j. Radio Frequency tagging for technical applications such as local positioning within a building and for inconspicuous data storage and collection.

l. Development of ergonomic computer input devices for handware of other clothing items.

Communication with a Technical POC prior to submission of a formal proposal is essential.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Technical POCs:

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9. Body-Worn Systems, Hand Held Devices, and Smart-Lightweight Electronic Components/Modules for Soldier Protection, Knowledge Management and Cognitive Improvement.

The advanced tactical helmet and body-worn electronic systems, components and smart sensors for future individual and small combat unit Warfighter systems will integrate communications for next generation Soldiers, NBC protection, tactile/visual/audible information displays, micro display integration, weapon sighting/fire control functions, and directed energy weapons (DEW) protection on the Warfighter. These will maximize the Warfighters survivability and situational understanding on the battlefield. Advanced technology for the Soldier is needed for the integration of miniature lightweight, durable, reliable, low-power displays, sensors, optics, remote threat detectors, and personal area network systems. This includes wireless and wearable smart electronic components/modules/materials that might be integrated into textiles or on the Soldier for disseminating power and data in a manner which the small combat unit can process.

Scientific and Technical Areas of Interest:

Future technology integration efforts focused on needs of Soldiers that increase force effectiveness by optimizing and integrating capabilities while improving the Soldier's situational awareness and survivability have revealed the following areas of interest:

a. Research proposals related to advancing the human integration and current technology for lightweight, integrated wearable systems; Soldier integrated displays and body-worn systems that enhance the Soldier survivability and situational awareness on the battlefield. Special interest areas include unique human systems integration of data and power systems, miniaturization, increased durability and reliability, and components having low power as well as new power solutions that meet Soldier-portable system requirements for survivability and situational understanding. Specific examples of body-

worn system capabilities include: data devices, integrated electronic modules, inter-connections in fabrics, wearable battery technologies, combat identification, tactical engagement simulation capability, system voice control, State-of-the-Art unique interfaces, haptics, neuro-physiological, and physiological/medical sensors and data management, Soldier integration of individual/team weapon system sensors and controls.

b. Research proposals for various lightweight, low power, body-mounted displays; threat detecting sensors; indirect weapon sighting systems; communication and information management capabilities and devices to enhance performance and protect Warfighters' biosensors against the varied threats expected in the intense battlefield environment of the future (e.g., chemical/biological toxins, unexploded ordnance, RF, seismic, acoustic); and smart electronic modules that think, sense and communicate to the Warfighter; interfaces that allow Warfighters to manipulate miniature robotics and robotically controlled sensors to enhance visualization and situational and cognitive awareness.

c. Research proposals for low weight, low power, high efficiency man portable/wearable systems and components (e.g., antennae, power and/or data bus, sensors, displays) that can be integrated into textiles and other protective structures.

d. Research proposals that integrate Soldier portable IR and daylight readable display technologies using minimal energy output levels with deicing and defogging capability, meeting performance requirements across all environments.

e. Research proposals for body-worn components, sensors and systems, and system components using innovative display and sensor technologies capable of innovative human integration. Critical areas of interest include some or all of the following display attributes:

- Displayed Information
- Reduced bulk and weight
- Integration of multifunctional displays, modules, and sensors
- Increased bandwidth, resolution color displays and sensors
- Reduced power requirements
- Electronic components that may be integrated into textiles
- Components that think, sense and communicate to the Warfighter
- Cognition enhancement capabilities

- E-Textile technologies that conduct energy
- Energy harvesting technologies
- Integrated Data and Power technologies that support Soldier SA and other devices

Communication with the Technical POC prior to submission of a formal proposal is essential.

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10. Biomechanics.

Biomechanical tools, data, and knowledge products are currently being developed to guide the design of boots, individual body armor, and load carriage gear that reduce injuries, delay fatigue and enhance dismounted Warfighter agility, mobility, and operationally relevant performance. There is a need for detailed information on the forces acting on the Soldiers' musculoskeletal system as well as how their gait, range of motion, rates of movement, energy expenditure, stamina, and ability to detect and react to threats are affected by their load and its distribution on the body, the terrain and grade of the environment, and obstacles presented by the environment.

Scientific and Technical Areas of Interest:

A review of the existing data and models has revealed the following areas of continuing scientific and technical interest:

a. Anatomy/Imaging: Development of innovative and fundamental metrics to quantify and assess the relation of joint morphologies of the loaded lumbar spine or lower limb during dynamic Soldier-specific tasks with biomechanical profiles associated with reduced performance and increased injury risk of the dismounted Warfighter.

b. Fatigue: Determining explicit biomechanical tools and measures to assess and predict declines in physical performance across a range of Soldier relevant tasks, scenarios,

and environments. Integration of biomechanically based predictive physical fatigue algorithms into real-time monitoring of systems of Warfighter physical performance.

c. Determination of biomechanical measures of fatigue to predict performance failure of critical Warfighter task outcomes.

d. Head/Neck, Helmet: Investigation of the effects of acute and chronic head-borne weight and moment of inertia on Warfighter performance, fatigue and the incidence of injuries. Determination of physical and mass property boundaries of head-borne mass for the dismounted and mounted Soldier based on performance, fatigue and injury.

e. Biomechanics in the field: Validated, reliable, and accurate methods for acquisition and analysis of marker-less kinematic (and kinetic) data during Soldier-specific tasks performed in a variety of environments that are suitable for integration into real-time monitoring of Warfighter performance injury risk. Technological capability must be able to integrate seamlessly with wide variety of Warfighter clothing and individual equipment worn and carried on the body.

f. Modeling: Development of modeling and virtual prototyping tools of whole-body human locomotion and Soldier-specific maneuvers that inform on optimizing Soldier performance and equipment improvement design guidance to enhance performance for the dismounted Warfighter.

g. Novel Pressure/Force Measure: Capability that advances the current state of technology to measure the pressure and/or force applied to the shoulders/upper back/lower back region of Soldiers while fully encumbered with military equipment.

h. Obstacle Course and Agility: Tools and measures that tie lab-based scientific measures to Warfighter relevant obstacle course performance as well as establishment of valid and reliable tools and measures sensitive to Soldier-borne equipment effects.

i. Soldier Load: Determination of the biomechanical effects of varied mass, volume, and location of loads on the range of Warfighter performance and Warfighter tasks; development of prototypical devices that facilitate enhancing the understanding of load (re-) distribution on the body; and research that addresses optimizing load distribution and its benefit on marksmanship, agility maneuvers, climbing, sprinting, other military relevant environs.

j. Soldier Performance Augmentation: Fundamental research that advances knowledge on scientific issues surrounding efficacy of prototypical devices designed to augment Soldier performance.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Dr. Jeffrey M. Schiffman, TEL: 508-233-4967,
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All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Natick Soldier Systems Center
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11. Materials Nanotechnology.

Nanotechnology, the understanding and manipulation of matter at the nanometer scale, offers opportunities to create materials with new or significantly improved properties relative to known materials. In some cases, properties are observed in materials with controlled nanometer-scale structures that have not been realized in more conventional material structures. Examples include the use of nanostructures to improve energy-harvesting efficiency in photovoltaic and thermoelectric materials/devices, enormous enhancement of Raman sensing by plasmonic nanoparticles for chemical/explosives detection, and nano-enabled smart materials.

There are numerous reports of small amounts of nanoparticle additives (such as montmorillonite clays or carbon nanotubes) giving rise to mechanical or electrical properties in polymer composites that typically require much higher loadings of conventional additives to achieve. Nano-clay-filled polymers are known to exhibit extraordinary diffusion properties.

Periodic structures with nano-scale features are known to interact strongly with electromagnetic radiation having wavelengths on the order of the feature size. These effects can be used to create new types of resonant structures for enhanced optical performance for instance, the photonic crystal behavior exhibited by materials with controlled structural features on the nanometer scale. Plasmonic field enhancement from nanostructures and/or nanoparticles has enabled the exquisitely sensitive Surfact-Enhanced Raman Spectroscopy response and improved absorption and “photon management” in both inorganic and organic solar cells. Nanoscale periodic structures are also used to create non-conventional optical that can be tuned to operate in specific wavelength regions.

Scientific and Technical Areas of Interest:

There is a need for research and development of materials incorporating nanometer-size

architectures, and demonstrating enhanced or novel properties relative to existing materials in the area of physical properties, including mechanical properties, thermal properties, diffusion barrier properties, plasmonics, nanoelectronics, electromagnetic and optical properties, novel or enhanced chemical functionality, and unanticipated combinations of properties. Composites of polymers with nanometer-scale reinforcements of various forms may offer enhanced mechanical properties allowing equipment to be fabricated with less weight and bulk than current designs and possibly at lower cost. The creation of composites comprised of plasmonic nanoparticles and 'smart materials' (i.e. materials that respond to an external stimulus) is an area where there has been limited research. The coupling of those two fields to produce smart materials that respond to changing plasmonic fields of metallic nanoparticles is an area of research that could result in materials that could find use in optical switching, photovoltaic, and filtration applications. The creation of interpenetrating networks of various compositions with domain sizes on the nanometer scale may offer access to unprecedented material properties. Fiber or textiles with controlled nanometer-scale architectures may have application to the development of high strength, high durability or multifunctional textiles.

Plasmonic, semiconducting, and even dielectric nanoparticles and nanostructures ("metamaterials") exhibit novel optoelectronic and optical properties such as enhanced quantum yields, hot carrier effects, ultrafast rectification, photonic upconversion, nonlinear absorption, etc. These novel effects can be exploited to unburden the Soldier by enabling more battery recharging in the field and less use of disposable batteries with their associated logistical train. Novel optoelectronic effects will also empower new, highly sensitive detection of explosives and chemical threats. Purely optical effects arising from nanomaterials may be used for Soldier vision protection and advanced imaging in a variety of scenarios. To harvest a useful amount of energy, metamaterials must be scalable to and fabricatable over large areas, probably in flexible, lightweight formats to allow simple packaging and transport.

Particular areas of application for the materials of interest include personnel armor, clothing, airdrop systems, shelters and load carriage systems, packaging materials, textile-integrated electronic systems, chemical and biological reactive materials, permselective materials, tactical optics, and vision systems.

In addition to the discovery and development of new materials, research efforts may be needed to understand the nano-scale origins of bulk properties observed in nanocomposite or nano-structured materials that could aid in the design optimization of material structures for particular applications.

New techniques that will enable the creation of periodic and a-periodic structures with decreased feature size are of interest and the ability to control the geometry of nano-scale elements and their periodic configuration is also of interest.

Research to develop economically viable processes for the creation of nano-structured materials on a commercial scale may be of interest.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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12. Anthropometry.

The NSRDEC has traditionally maintained an extensive anthropometric database on U.S. Army and other military personnel. Anthropometric data are used to facilitate the design and sizing of personal protective clothing and equipment systems. These data are also required for the design and layout of general-purpose workstations and combat vehicle crew stations. Virtually all military system development requires access to accurate body size data at some point in the design process. U.S. Army anthropometric data are also used by military contractors, other government agencies, and industry. The U.S. Army is currently executing a major anthropometric survey of its personnel to collect current body size information for use in the applications defined above.

Scientific and Technical Areas of Interest:

a. Develop software tools for extracting traditional anthropometric data and other human engineering related measurements of the human body such as volume, surface area, and curvatures from 3D whole body, head/face, and foot images. These tools may include applications for measurement of the human body as well as for summarization of body size and shape using 3D anthropometric data. These tools shall be implemented on 3D human body surface images and integrated with hardware and software systems currently in use by US Army anthropologists and human engineers.

b. Develop and/or integrate human body modeling software into an analytical computer

based system that allows clothing and equipment designers to visualize, compare and evaluate the effects of single and multi-layer clothing/equipment systems on the physical performance of human users. The resulting tolls will be used by anthropologists and human engineers to assess the impact of clothing/equipment systems (body armor, helmets, NBC, and thermal protective clothing) on key performance parameters such as mobility, movement, and overall area of coverage of the human body.

c. Obtain clothed and encumbered anthropometric measurement data on a representative set of US Army personnel in order to identify the dimensional changes in body size that occur as single and multi-layer clothing and equipment systems worn by Warfighters. At a minimum, identify and quantify the body size changes that occur under current and next generation clothing and equipment systems that impact Warfighter body size for typical Infantry, Aviation and Ground Vehicle Warfighters. Data collection procedures may include a combination of traditional anthropometric tolls and/or 3D whole body and body segment scanning of study participants depending upon the specific nature of the clothing and equipment systems being investigated. Close coordination between the government and offeror on such matters as the final dimension list, body landmarking requirements, quality control implementation, and data cleaning t shall be required throughout the duration of this data collection effort.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Mr. Steven Paquette, TEL: 508-233-5430, steven.p.paquette.civ@mail.mil

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13. Advanced Protection and Integration Technologies and Systems.

As protective and structural technologies get more advanced, opportunities emerge to integrate multiple functions into fewer layers and components. As the Army transforms over the next decade to a lighter, more agile, and lethal force, the Warfighters set of protective clothing and individual equipment must also transform. The Army is seeking a revolutionary approach to system design and integration using emerging technologies and technology trends. New and emerging technologies and design concepts must be explored to provide the warrior with combat

overmatch through significant advances in survivability, mobility, and cognitive/physical warrior performance. An advanced integrated combat uniform system will emerge as the foundational centerpiece for the human interface, load bearing, protection, and electronics hardware linkages for the future warrior systems. System weight and bulk reduction are key goals of this effort. Significant mission benefits to the soldier include: longer mission time (endurance) in hot/cold and/or chemical/biological environments; improved warrior performance, both physical and cognitive in all mission environments; reduced heat stress casualties; reduced water intake requirements; enhanced cold weather protection; and enhanced mobility due to reduced bulk and protrusion of electronic devices and interfaces.

Scientific and Technical Areas of Interest:

a. Research proposals to develop combat uniform and modular, integrated system design concepts and breadboard prototypes to include integration of multiple technologies into fewer textile-based structures and/or system components. Examples include, but are not limited to, integration of ballistic/blast protection and load bearing functions; integration of chemical/biological agent protection with environmental protection and signature management; integration of novel closure and interfaces for advanced protection and electronic networking capabilities; integration of power/data bus, sensors and connectors into textiles and other protective structures. Design concepts and prototypes may address any and all portions of the body, e.g., torso, upper and lower extremities, neck, face, head. Research is needed to address the needs of the full suite of Soldier as System variants such as the Core, Ground, Mounted, and Aviator. Unique and novel design approaches for protective systems should be scalable and tailorable to meet multiple mission and threat scenarios.

b. Research proposals to advance the level(s) of protection or decrease the weight associated with protective clothing and equipment.

c. Research proposals for novel design approaches and technologies to provide enhanced passive physiological management, active ventilation, and/or heating and cooling concepts suited for dismounted Warfighter applications.

d. Research proposals to develop and implement measures, assessment tools and devices, and analysis of cognitive and physical Warfighter performance, especially as it relates to the soldier's body worn system and components. Specifically, development of standardized test methods and devices that measure key performance parameters and user acceptability of protective systems is needed. Test methods and standards that need to be developed include, but are not limited to, blast effects, blunt force trauma, armor material and system flexibility, mobility restriction due to worn equipment and surrounding / operational environment, load carriage capacity and balance, standard and emergency doff functionality, material aging, camouflage effectiveness, system modularity and integration.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Communication with the Technical POC prior to submission of a formal proposal is essential.

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14. Warrior Performance.

Warrior Performance is the degree to which a Warfighter's skills and abilities are implemented for a particular task or set of tasks. It is specific to the military operational environment. There are on-going efforts to generate data in the area of human factors as it relates to Warrior Performance; however, most of these efforts relate to the physical aspects of performance. Though significant work is being done through these efforts, more work remains in order to gain a complete picture of the relationship of the warrior to his/her environment. Concentration on the cognitive aspects of individual warrior performance is lagging. Significant work still remains to be done in this area as well. The objective of this area of study is to generate methodologies as well as relevant data that can be applied directly to the development of emerging warrior systems with equal emphasis on physical and cognitive performance and can be utilized by emerging behavioral models for the same purpose. The warrior performance target audience includes male and female: Dismounted Infantry, Mounted Infantry, Engineers, SOF, Medics, Army Aircrew and Military Police.

Scientific and Technical Areas of Interest:

Development and validation of quantitative measures and criteria as well as methodologies for evaluating these areas is a key element of any proposed effort.

a. Research to determine the performance of individuals and small units with respect to their Situation Awareness. Influencing factors for investigation should include, but not be limited to, maturity, skill, experience, motivation, risk acceptance, training, and

learned versus inherent propensity for situation awareness. Studies may also include the impact of mission (e.g., complexity, type, intensity), mission environment (e.g., MOUT, Jungle) training proficiency, and unit dispersion on the SA of individuals and small units. Studies on the impact of different technology types on situation awareness, and situation awareness and the 'small unit dynamic' are also of interest.

b. Studies on the effect of fatigue on warriors to include, but not be limited to, the influence of mission on physical and cognitive fatigue, quantification of the physical/cognitive relationship of fatigue, quantification of different types of fatigue (e.g., muscle, cognitive, systemic) and their impact on warrior performance, determining mitigating factors of fatigue related to training, and determining whether levels/degrees of fatigue be can predicted based on personal characteristics.

c. Research to determine differences in warrior performance due to varying missions (e.g., attack, raid, SASO) and mission environments (e.g., Desert, Arctic). This research should highlight the impact on physical and cognitive warrior performance.

d. Taxonomy – Develop taxonomy of measures and associated criteria of physical and cognitive warrior performance.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Caroline Mahoney, 508-233-5302, caroline.r.mahoney.civ@mail.mil

All concept papers, proposals and administrative inquiries should be submitted to:

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15. Soldier-borne Power Sources

In the future, dismounted Warfighter capabilities will continually be modernized with advanced sensors, networking and processing technologies, all of which require power. While many of these new capabilities will possess advanced low power electronics and power management features, the need for innovative power source solutions for the Warfighter and small combat unit will remain an essential aspect of the Army's Soldier modernization program. Emerging operational concepts dictate the need for technology to support extended missions without the benefit of re-supply for 72 hours or longer.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Scientific and Technical Areas of Interest: Power source solutions that can demonstrate through objective analysis substantial reductions in life cycle cost and logistics burden are of primary interest to the Army. Technologies and concepts that provide improvements in energy density, ergonomics, "ease of use", and safety to facilitate human factors and Soldier-centric integration are of interest.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Mr. Kailash Shukla, TEL: 508- 233-5313, Kailash.c.shukla.civ@mail.mil

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Kansas Street Natick, MA 01760-5056

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16. Future Warrior Technology Integration.

As the Army transforms to a lighter, more agile, and lethal force, a revolutionary approach to system design and integration is needed, consisting of open system architectures to provide lightweight, system-engineered, integrated modular protective combat ensembles employing plug and play components. New technologies and design concepts must be explored to provide the warrior with combat overmatch through revolutionary advances in survivability, mobility, networked communications, collaborative situational awareness, power sources, and networked lethality/fire control while enabling extended combat missions with reduced loss in physical capabilities from fatigue, stress, and hardship.

Scientific and Technical Areas of Interest:

a. Proposals are needed to integrate, mature, and demonstrate innovative ballistic and blast protection solutions to provide increased protection against evolving bullet, fragmentation, and blast threats through an architecture that integrates weight reduction, anthropometry, modularity, and tactical gear packaging to increase mobility and reduce stress. Examples include: develop multiple impact

survivability concepts for torso and improved protection for head, face, and extremity; mature and integrate advanced fiber, polymer, ceramics, nano and/or composite material technologies for ballistic and blast protection.

b. Proposals are needed to integrate and demonstrate innovative integrated solutions in the areas of: tactical concealment and multispectral signature reduction; and protection against flame, lasers, chemical, biological, and toxic industrial chemicals and materials. Technology options include selectively permeable membranes, flame resistant fibers, fabrics and treatments, and nanotechnology based materials.

c. Proposals are needed to integrate and demonstrate novel design approaches and technologies to provide body worn enhanced passive, active, and hybrid thermal management (optimized for weight and power reduction). Examples include: body worn ventilation and filtration systems; incorporating active microclimate cooling with Body armor and Chemical-Biological protective suits; incorporating active ventilation with headgear protection; and semi-permeable and moisture wicking membranes/fabrics for improved temperature and moisture management.

d. Proposals are needed to mature, integrate, and demonstrate Soldier mobility and load carriage solutions to include exoskeleton, lower extremity load carriage devices and advanced materials for load carriage applications that reduce system size, weight and metabolic energy costs and enhance mobility while optimizing soldier fighting and sustainment loads.

e. Proposals are needed to mature and integrate Warfighter and Small Combat Unit (SCU) networking technologies with Soldier information awareness systems and emerging tactical networks. The goal is to maintain compatibility and interoperability of unique platoon, squad, and Warfighter information requirements with company and higher Command and Control (C2), and Situational Awareness (SA) infrastructures. Technology solutions include reliable jam- proof wireless technologies and advanced cabling and connectors to include e-textiles and micro/nano connectors to enhance personal area networking between head, body, and weapon systems.

f. Proposals are needed to integrate, mature, and demonstrate innovative Warfighter power and energy solutions to Soldier System. The goal is to provide higher power and energy density sources for ground and mounted Warfighters. Examples include: direct and reformed methanol fuel cell, conformal low-profile rechargeable battery, enhanced zinc-air battery, and platoon/squad level generator/charger.

g. Proposals are needed to mature, evaluate, and integrate Small Combat Unit (SCU) lethality concepts and technologies to include small unit cooperative engagement

for more accurate firing solutions, common net-centric SOSCOE compliant Fire Control and body-worn gunfire detection solutions.

Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs: Mr. David Krasnecky, TEL: 508-233-5189, david.krasnecky1.civ@mail.mil
Mr. David Audet (for Soldier mobility and load carriages technologies),
TEL: 508-233-6438, david.j.audet2.civ@mail.mil
Alternate POC: Mr. Kailash Shukla, TEL: 508-233-5313, kailash.c.shukla.civ@mail.mil

All concept papers, proposals and administrative inquiries should be submitted to:

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17. Anti-Terrorist Mobility Reduction Technologies.

Currently, there exists a need to limit the ability of enemy troops and terrorists to maneuver within the confines of secured buildings, check point areas, and military installations. The objective of the Anti-Terrorist Mobility Reduction Technologies is to develop chemically-based coatings that act to modify the properties of military-relevant terrain, including concrete and asphalt, at low mass coverage. These coatings will be readily dispersible, reversible to restore the original properties, and readily removed from the terrain.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. Chemical coatings that modify military terrain surfaces.

b. Lightweight and easy to deploy.

c. Ability to cover a wide surface area and variety of floor and road materials.

d. Capability to withstand a variety of environmental conditions.

A need also exists for:

e. Novel modular designs and integration concepts to identify the best technical approach to provide mobility reduction technologies to the individual combatant against terrorist threats. Such concepts should identify the mobility reduction capabilities offered for each component and area of the body/vehicle to be affected.

f. Unique and novel design approaches which utilize currently fielded equipment as a base platform for incorporating improved mobility reduction technologies and would offer the user the ability to tailor the level of mobility to the current threat by adding or removing material(s).

g. Unique and novel design materials for anti-terrorism which provide maximum areas of roadway/floor coverage and resistance to environmental conditions and traction improvement additives (sand, dirt, debris and etc).

h. Ergonomic and human factor studies to identify key parameters for user acceptability. The identified design(s) include studies, laboratory data and human evaluations for stability, ability to fire weapon systems, maneuverability, and general mobility.

NOTE: Some of the technical approaches for topics within this solicitation may be subject to export control restrictions under existing export control laws, and/or required to be classified projects as outlined in the National Industrial Security Program Operating Manual (NISPOM) and its supplements. Contractors who would like to submit proposals pertaining to such technologies are encouraged to contact their local Defense Investigative Service (DIS) Industrial Security representative or the Technical POC listed in the solicitation for guidance.

Communication with the Technical POC prior to submission of a formal proposal is essential. Technical POC: Mr. Andrew Mawn, TEL: 508-233-4262, Andrew.j.mawn.civ@mail.mil

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18. Technology Assessment and Simulation Tools.

As the Army transforms to a lighter, more agile and lethal force, a revolutionary approach to system integration, assessment and simulation of Warfighter systems architectures encompassing survivability, mobility, networked communications, collaborative situational awareness, power sources, and networked lethality/fire control is needed.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Scientific and Technical Areas of Interest:

The following technical areas warrant research and development efforts.

a. Proposals are needed to develop engineering assessment and simulation tools for the NSRDEC-Future Warrior Technology Integration (FWTI) system integration and simulation lab. The lab objectives are to develop effective tools to expedite the integration and the assessment of dismounted soldier component technology prior to field experimentation.

b. Proposals are needed to expand the current simulation capability into the realm of performance metrics associated with dismounted use of component technologies. The expected simulation capabilities performance metrics include:

- Development of simulation and architecture capabilities, Information Portrayal Efficacy, Cognitive Loading, Squad Situational Awareness during planning, movement, execution, and reconsolidation.

- Displays, reporting efficacy, unstructured communications, voice, white boarding, structured communications, squad computer input devices, and lethality component performance: accuracy and latency.

- Small, combat unit net centric performance for information dissemination and portrayal, asset control, sensor data dissemination, and sensor data consumption including unmanned aerial vehicle (UAV), unmanned ground sensor (UGS), unmanned ground vehicle (UGV), Chem/Bio, soldier worn gunfire detection (SWGD), Mission hours/Kg, and Mobility.

Communication with the Technical POC prior to the submission of concept papers or formal proposals is required.

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

19. Ecological Approach to Warfighter Survivability; Perception-Action-Cognition.

The degree to which physically coupled load, coupled environmental information, and cognitive requirements interact in regulating of emergent properties of Warfighter performance is unknown. Consequences on perception-action (P-A) coupling are suggested to have significant impact on Warfighter survival and performance, given the extreme loads, cognitive tasks, and environmental constraints of combat and training. This new thrust area within NSRDEC offers the potential for significant progress in understanding the impact of load, equipment, cognition, and environment on Warfighter survival and performance using Ecological Task Analysis. Research is required at the Applied and Basic levels in order to ascertain and link operational performance metrics, coordinative and intentional dynamics, and underlying system dynamics to survivability and performance in combat. The 'Enterprise for the Ecological Study of Warfighter Load' seeks to integrate various aspects of Ecological theory and Dynamic Systems approaches to understand the nested dynamics involved in specific operational tasks (dynamic marksmanship, threat identification during locomotion, situational awareness, etc). Impacts of physically coupled load on information pick up and intentional task dynamics under fatigue/stress conditions are an unexamined but necessary area of research into Survivability. The Enterprise seeks to build a collaborative group within Government and Academia who support "best practices" data collection and analysis approaches in order to best serve the Warfighters needs while expanding the applicability of the ecological approach to understanding the "Human Dimension'.

Scientific and Technical Areas of Interest:

The following are some of the fundamental questions necessary in understanding the overall consequences of Warfighter load, necessary subordinate relations to task performance, and the modeling necessary to further our understanding. While marksmanship is initially of primary interest due to the potential consequences of load on P-A/ survivability; there certainly exist other equally relevant areas of investigation using the ecological approach in understanding the problems of technology overload. Thus, the list below should not be considered exclusive.

Applied Research Questions:

1. What are the consequences of Warfighter load on Perception-Action coupling necessary for Survival in combat?

    a. How does load affect establishment of marksmanship postures and the necessary postural affordances for perception of the environment?

    b. How does load affect the coordination dynamics during dynamic marksmanship in different "work-spaces" within the environment?

    c. What are the consequences of segmental loading on the speed-accuracy trade-off during marksmanship; what are the basic metrics that provide insights into local

and global dynamics?

d. Can Hybrid Oscillator Models be developed for Fitts Law Tasks using Speed and Load Parameterization for Marksmanship tasks?

2. What fundamental impacts does segmental loading have on the perceptual capabilities of the Human System during movement through the environment?

a. How does segmental loading and speed affect the ability to successfully identify and discriminate (e.g. Friend v Foe) targets in the environment during straight-line locomotion?

b. How does segmental loading and speed affect the ability to successfully identify and discriminate (e.g. Friend v Foe) targets in the environment during different locomotive styles (e.g. straight line, side to side, around obstacles, over rough terrain, etc)?

3. What are the effects of terrain complexity and load on visual perception/Dynamic Visual Acuity (DVA)?

a. How does load and speed parameterization affect DVA during locomotion when terrain becomes increasingly complex?

b. How do Warfighters navigate differential terrain under different loads, speeds, and terrestrial complexity in the short range (e.g. 5-20m), mid-range (20-50m), and long-range (50+m) in order to achieve maximal efficiency of movement?

4. How does Perceptual Encapsulation of the Warfighter affect information pick-up and action under load (e.g. reduced field of view, aural localization)?

a. How do area of protection trade-offs (e.g. greater visual & aural encapsulation) affect threat pick-up, and to what degree is the aural-visual contribution to information pick-up modified?

b. To what degree do 'enhanced' perceptual technology systems (e.g. night vision, expanded aural awareness, etc) disrupt natural information pick-up and the ability to localize sources of information in the environment?

c. How does the addition of head-mounted load relate to the ability to localize environmental information; what are the changing visual-aural dynamics with increased encapsulation from the local environment?

5. What are the consequences of integrating relevant cognitive tasks into the perception-

action cycle necessary for survival for the above tasks?

a. Aural Communication with/without Simple Repeated Response?

b. Aural Direction with/without Complex Response?

c. Retention of Key information for prospective performance at different time scales during dynamic tasks.

d. How do coordination dynamics and performance change when these tasks are integrated into the intrinsic dynamics of marksmanship and threat identification during locomotion.

6. How can Survivability be modeled empirically based on the interaction of Mobility, Lethality, and Situational Awareness (Perception) for the above tasks under load?

a. Can n-dimensional subordinate sub-space models be developed for Mobility, Lethality, and Situational Awareness that interact with a Superordinate Survivability Model for use in decision making, Analysis of Alternatives for load configuration and design metrics?

7. How does one design advanced equipment to carry the Ballistic and Fire Load required by the Warfighter in such a way that is complies with both empirical scientific findings and insights (relevant for *tactical* engagement) AND the realities of Operations across the spectrum of mission profiles (operational realities)?

a. Are there advanced designers and products that can provide the tactical requirements for Warfighter and integrate recent scientific findings regarding Shoot and Move dynamics?

b. Is there a way to modularize the equipment such that load distribution may be managed in such a way as to allow different mission profiles to be supported without substantial changes in configuration (e.g. a specific building block approach of increased load carriage requirements within operational realities)?

c. Is there a way to modify current load carriage distribution and design to "meet in the middle" with operational requirements by suggesting changes to Tactics, Techniques, and Procedures (TTPs) that provide:

1) Similar or increased performance at the level of the Task (e.g. speed accuracy);

2). Quantitative improvement in the dynamics that underlie that task performance (e.g. improved segmental coordination, postural control,

and postural-focal
coupling in dynamic marksmanship tasks).

3) . Integrated changes in TTPs testable, acceptable, and modifiable (flexible) to the Warfighter when new concepts in load carriage and distribution are instantiated by Scientific/Industry teaming?

** **NOTE**: question 7 requires submitters to have substantial understanding of the history of load carriage and designs for tactical missions across the broad spectrum, Industrial capability for manufacturing advanced concepts designs, and significant tactical insight to understand and trade the Operational – Scientific perspective in such a way that optimizes Warfighter success in the execution of actions on the objective. The intent of question 7 is to provide a basis for answering these questions as well as the development of advanced concepts that are testable in the larger program entailed in this BAA Section.

Basic Research Areas:

1. Fundamental haptic response to Load parameterization: effects on motor abundance, stability, and adaptability. Biotensegrity models and dynamic touch as a means to understand the dynamics of segmental load.

2. Dynamic visual acuity (DVA) and precision performance under load.

3. Aural-visual localization under increased perceptual encapsulation and load.

4. Consequences of load on behavioral action modes; Biospectroscopic analysis of load parameterization in field conditions. Long time-scale impacts on affordances under load and reflections of route choice and task accomplishment in combat.

5. Marksmanship synergies under load: task space analysis and the constraints on the Degrees of Freedom. Postural-focal coupling in complex movement and systems-level dynamics.

6. Development and utilization of advanced techniques in non-linear analysis, fractal/dimensional analysis, and Human Dimension metrics. Multi-scale dynamics that underlie performance in visual-manual precision task interaction.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

All concept papers, proposals and administrative inquires should be submitted to:

U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
ATTN: RDNS-WS (Ms. Gail Bernheart)
Kansas Street Natick, MA 01760-5020
TEL: 508-233-4706, gail.d.bernheart.civ@mail.mil

20. Tactical Medical Equipment and Systems.

Tactical medical equipment and systems for the Warfighter include items required to rescue, recover, sustain, treat, and transport wounded personnel on the battlefield. This includes components for use by individual Warfighters or combat medics within individual first aid kits, medic kits, casualty evacuation, and other related systems. New materials and systems are required to advance the medical capabilities currently available, thereby reducing the amount of preventable battlefield deaths and reducing the effects resulting from injury.

Scientific and Technical Areas of Interest

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology and advanced capabilities are needed for:

a. Hemostatic materials and systems used for hemorrhage control resulting from a multitude of threats including but not limited to small caliber gun shots, large caliber gun shots, and improvised explosive devices (IEDs).

b. Novel concepts and innovative designs for rapid blood test kits which provide a quick positive or negative response to a variety of pathogens including Human Immunodeficiency Virus 1 and 2, Hepatitis C Virus, Hepatitis B Virus, HTLV-I/II, Malaria, Syphilis, West Nile Virus, and Chagas Disease.

c. Novel and innovative design concepts for miniaturizing and ruggedizing vital signs monitors to provide protection from damage during handling and operations.

d. Novel concepts for non-hazardous oxygen generators for use in short term casualty care situations which provide controllable flow rate, are rechargeable, and are lightweight.

e. Advanced training aids which provide simulated real life wound patterns on the human body for use during operational training. Such aids should provide a variety of different injuries in different areas of the body similar to what is being experienced on

the battlefield today.

f. Advanced hand held devices which provide the combat medic with enhanced tools for recording, transferring, transmitting, and collating patient information related to injuries and treatment. Devices should interact with medical monitoring and treatment devices (i.e. Tempus IC Pro, physiological status monitors, etc), record patient data (i.e. vital signs), and provide video and audio recording capabilities. Device should be designed with an open architecture to allow for additional capabilities and applications to be added as needed to achieve greater functionality.

g. Advanced tactical hand held ultrasound capabilities which provide quick and accurate diagnostic capabilities.

h. Advanced field blood testing diagnostic capabilities to include pathogen testing and blood matching required to complete blood transfusions.

i. Novel fluid resuscitation therapy protocols and products that are shelf stable, and safe for pre-hospital/austere environments.

j. Light weight fluid warming equipment suitable for point of injury care.

k. Novel concepts and designs for hypothermia prevention.

l. Novel approaches to modernizing, miniaturizing and improving medical tools, kits and materials.

m. Novel/miniature translator devices specifically developed and designed to assist in-field medical treatment and applications.

n. Novel concepts for high altitude medicine prevention and treatment.

o. Improved concepts for field burn treatment/stabilization capabilities.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

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21. Integrated Sound, Light and Blast Management for the Ears and Eyes

The goal of this effort is to protect vital senses and preserve physical and neurological performance essential to deployment readiness and mission effectiveness with primary focus on the eyes and ears.

Scientific and Technical Areas of Interest:

Manage Sound, light and pressure wave effects on the Soldier in military environments

A need exists for:

a. Technologies that build on the success of currently fielded eye protection by introducing an integrated hearing protection approach that protects the ears while allowing for sound localization and short-range audible communication.

b. Dosimeter technology for eventual integration into the system to monitor noise/blast exposure and serve as an indicator as to when threshold limits are being approached or have been reached.

c. Technologies that enhance hearing while simultaneously protecting the ears from damage.

d. Other new/novel concepts for sound, light, and pressure wave management.

A need also exists for:

Modeling and testing methodologies for characterizing and conducting trade-off studies of various technological concepts/approaches and/or prototypes to include, but not limited to:

a. Protection against sound.

b. Protection against blast effects on eyes, ears, brain, and/or protective system

itself.

c. Concept and/or prototype performance as compared to currently fielded systems and/or to no protection at all.

d. Concepts and/or prototypes designed for exposure monitoring and/or alerts.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Ms. Michelle Markey, TEL: 508-233-5471, michelle.l.markey.civ@mail.mil

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22. Soldier Centric Information Portrayal & Management Technologies.

As the Army migrates to a networked force, handheld mobile computing platforms are being disseminated down to the Small Unit operating at the tactical edge. Currently, tactical battlefield information portrayal techniques are not optimized for dismounted mission effectiveness and often burden the Soldier cognitively. Providing emerging sensor and mission command information down to the Small Unit level is a unique human systems integration challenge and requires considering the impact on the human dimension and cognitive load. Novel information portrayal and management technologies are needed for the Soldier and Small Unit to improve their situational awareness, mission effectiveness, and cognitive performance on the battlefield.

Scientific and Technical Areas of Interest:

The following technical areas warrant research and development efforts.

a. Developing novel information portrayal and management technologies for the Soldier and Small Unit to improve their situational awareness, mission effectiveness, and cognitive performance on the battlefield.

b. Developing hands free, low cognitive workload user interfaces concepts and technologies; augmented reality graphical user interfaces, displays, and supporting technologies; information portrayal of Intelligence, Surveillance,

and Reconnaissance (ISR) technologies; and modular device architectures for Soldier- worn electronic devices.

c. Applying human-computer interaction, human factors, and cognitive research to improve information portrayal and management algorithms to cognitively unburden the Soldier.

Communication with the Technical POC prior to submission of concept paper or formal proposal is required.

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Alternate POC: Mr. Dennis Magnifico, (508)-233-6944, Dennis.s.magnifico.civ@mail.mil

All concept papers, proposals and administrative inquiries should be submitted to:

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Natick Soldier Research, Development and Engineering Center
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D. SHELTERS AND LIFE SUPPORT TECHNOLOGIES FOR CONTINGENCY BASING

The objective is to enhance the protection and capability provided to Warfighters and Warfighter systems that use soft, rigid wall, and hybrid shelters and life support equipment in expeditionary base camps including integrated base defense. Threats include combat and the environment, and capabilities include mobility, transportability, durability, and producibility. Research and development enhancements are grouped into eight primary thrusts areas. These are: 1) Ballistic Protection and Integrated Base Defense; 2) Chemical/Biological Protection; 3) Electromagnetic Interference/Electromagnetic Pulse Protection; 4) Environmental Protection and Energy Efficiency; 5) Detection Avoidance; 6) Deployment/Durability; 7) Functional Integration of Multiple Technologies; and 8) Life Support/Habitability Technologies.

Scientific and Technical Areas of Interest:

The following examples (though not inclusive) represent areas of science and technology that are relevant to the objectives of the Shelters and Basing/Life Support Technologies and may be of interest to the Army.

1) Ballistic Protection and Integrated Base Defense

a. Lightweight rigid shelter panels and/or structures effective against ballistic threats utilizing ceramic/epoxy/fiberglass composite panels with the capability of localized/variable protection applying protection only where critically needed and to the level needed.

b. High strength, lightweight, flexible, and affordable ballistic resistant fibers, fabrics, or fabric composites for tentage (flexible, thin, abrasion resistant).

c. Concepts and systems capable of providing active and passive force protection systems that decrease both deployment time and manpower requirements and are interoperable with situational awareness technologies.

d. Non-mass concepts for perimeter protection such as active vehicle disablement and counter IED's.

e. Modeling software that will assist in guiding technical solutions based on deployability, capability, and human factors.

2) Chemical/Biological Protection

a. Technologies related to collective protection shelters including barrier and reactive materials, hermetic structural closures, and entry/exit systems.

b. Gasket materials which have similar mechanical and environmental performance characteristics as the current silicone gaskets but provide increased protection against chemical/biological threats without a significant cost increase

3) Electromagnetic Interference/Electromagnetic Pulse (EMI/EMP) Protection

a. High permeability and high conductivity structural composites that provide EMI/EMP shielding.

b. EMI/EMP gasket with improved mechanical properties and performance in field environment. The gasket should not be subject to compression set and should require minimal to no cleaning.

4) Environmental Protection and Energy Efficiency

a. Insulative, shielding, rigid shelter panel technologies that minimize the acoustic and thermal signatures associated with on-board power generators.

b. Superinsulative panels for rigid wall shelters.

c. Low bulk and low cube insulative liners for tentage that may utilize active methods of membrane dispersion to produce dead air space and high insulation.

d. Functional treatments of tentage fabrics that produce reduced effects from solar loading, the capability to accept camouflage printing, and the capability to accept insecticides, etc.

e. Renewable energy generation/storage systems and conservation technologies applicable to expeditionary base camps.

5) Detection Avoidance

a. Lightweight, low-cost, rigid and flexible shelter treatments that reduce visual, IR and radar signatures.

6) Deployment/Durability

a. Flame retardant fibers and fabrics that maintain mechanical strength, wear, and weather resistance for materials used for tentage applications.

b. Bonding techniques that guarantee long-lasting shielding continuity and integrity at seams and cutouts of rigid wall shelters.

c. Novel stitching and joining techniques for leak-free seams in tents through the possible use of durable, composite threads which can permanently expand with application of a stimulus (e.g. heat) to eliminate the possibility of tent seam leakage due to needle holes, as well as increase seam strength.

d. Net-shape manufacturing processes for fabric structures utilizing tubular materials with integral end close-outs that form the final shape of a fabric structure without seams except for doors and windows.

e. Technologies related to the maturation of inflatable structures that carry high loads, are reliable and are affordable. Related topics include the development of rapid airbeam inflation systems and technologies for long term deployment of airbeam structures, such as alternative inflation substances and rigidifying.

f. Self-erecting tents and rigid shelters utilizing novel technologies such as shape memory materials and phase change materials.

g. Technologies that improve shelter soil/structural interfaces in world-wide environments to include soil stabilization and improved anchoring techniques.

h. Soft wall shelters that can become rigid with application of external stimulus, using reversible rigidizing polymers.

i. Lightweight, high strength, low-cost, rigid panels for expandable rigid wall shelters.

j. Highly expandable rigid wall structures with expansion ratio of 12 or higher.

k. Improved expandable rigid shelter design for expandable shelters which reduce the number of personnel needed, and/or reduce the amount of time required to set up and tear down.

7) Functional Integration of Multiple Technologies

a. Integration of multiple shelter technologies (ballistic/detection avoidance/EMI/EMP/CB) to demonstrate a highly-protected "operate-on-the-move" command post.

b. Integration of multiple shelter technologies to demonstrate a shelter complex that provides multiple survivability capability integral with the system's components along with rapid deployment through low weight, high expansion, and airbeam support.

c. Integration of multiple information and automation technologies to enhance the utility of rigid shelters.

8) Life Support/Habitability Technologies

a. Self-sufficient base camp technologies to enhance sustainability, reduce manpower and logistics burden, increase habitability, and facilitate intuitive operation of base camp functions with regard to energy, water, and waste.

b. Water reclamation and water generation capability demonstrated to reduce water resupply.

c. Waste remediation systems with a demonstrated capability to safely reduce solid waste disposal.

d. Waste to energy systems with a demonstrated capability to convert waste volume into energy.

e. Modeling and simulation tools for contingency basing sustainment system design.

f. Integrated hygiene and laundry system designs that are space and power efficient, maximize water reuse, and are self-cleaning to provide a healthy and habitable environment for the Warfighter.

g. Scientific parameters for balancing Warfighter living conditions with physical/cognitive performance and logistical demands.

9) Miscellaneous

a. The development of alternative applications for new inflatable, pressurized composite structures technology such as breakwaters, fendering systems, rapid port enhancement, water/fuel containers, munitions barricades, and high pressure hoses.

b. Modeling of nonlinear fabric structures, fabric/yarn mechanics, constitutive relation, wind structure interactive modeling, and failure criteria.

c. Applications of electrotextiles to rigid and soft-walled shelters.

d. New technologies that will benefit shelter electrical systems such as high efficiency lighting, power management, and field photovoltaic systems.

NOTE: Some of the technical approaches for topics within this solicitation may be subject to export control restrictions under existing export control laws, and/or required to be conducted as classified projects as outlined in the National Industrial Security Program Operating Manual (NISPOM) and its supplements. Contractors who would like to submit proposals pertaining to such technologies are encouraged to contact their local Defense Investigative Service (DIS) Industrial Security representative or have the Technical POC listed in the solicitation for guidance.

Communication with a Technical POC prior to submission of a formal proposal is essential.

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

E. AIRDROP – ADVANCED PERSONNEL AND CARGO AIRDRIP SYSTEMS

Airborne force projection and aerial delivery methods are critical operational capabilities of the military's strategic shift toward a CONUS-based force. Increasing mission responsibilities now include humanitarian missions and all types of aerial delivery applications from a wider range of air vehicles. Airdrop science and technology is focused on: 1) increasing aircraft (manned and unmanned, fixed wing and rotary wing)/airborne force survivability in a threat environment by expanding the aerial delivery operational envelope; 2) improving airdrop accuracy through the introduction of standoff (of various levels) precision guided aerial delivery platforms, ADVANCED High Altitude Low Opening (HALO) capabilities and low level airdrop systems; 3) reducing personnel injuries/casualties by improving system functional reliability while reducing ground impact velocity, oscillation, and exposure time to threats; 4) reducing the cost and time required for parachute development and production by new manufacturing techniques and using novel new parachute designs developed by computational analytical methods to reduce manufacturing and testing requirements; and 5) technologies to improve Helicopter (manned and unmanned) Helicopter Sling Load (HSL) and External Air Transport (EAT) capabilities..

Scientific and Technical Areas of Interest:

An assessment of current personnel and cargo airdrop capabilities and ongoing research and development efforts versus future requirements has led to the following areas of interest:

a. Cargo airdrop technologies should focus on precision aerial delivery for all cargo weights (1-60K lbs) and varying ranges of off-set distances, including higher altitudes and/or high glide and extended off-set powered systems. Affordable high altitude precision delivery systems and, where applicable, low cost guidance, navigation and control (GN&C) systems to include sensors, avionics, and software. In addition, technologies for compatible mission planning systems at various levels of integration with delivery platforms and aircraft to support all types of airdrops from all types of aircraft, manned and/or unmanned. Complimentary weather sensors and forecasting technologies for integration and/or use with mission planning or precision aerial delivery systems.

b. Concepts and development of extraction systems for light(10K lb) through heavy (60Klb) payloads from a range of transport aircraft and a range of aircraft and aircraft velocities/altitudes (through range of aircraft flight envelopes)

c. Lighter weight and lower cost airdrop components than currently used for cargo and/or personnel airdrop systems. New rapid rigging/derigging and reduced velocity landing technologies for heavy drop platforms are desired to speed the preparation phase and recovery phase of airdrops.

d. New personnel parachute systems are needed to provide accurate delivery as well as low velocity landings coupled with ground wind attenuation to minimize body injuries. High glide and high off-set distance decelerator designs along with high tech communication,

video/audio, and global positioning systems are needed for steerable personnel parachute systems. In-flight communication systems for high altitude deployed paratroopers and HALO/HAHO (High Altitude High Opening) navigation aid systems for SOF units. In addition, lightweight oxygen systems for increased duration for high altitude deployed paratroopers.

e. Technologies, concepts, and techniques to minimize the signature and risk of mission compromise of personnel and/or cargo airdrop systems to include any/all of the following types of detections: visual (day and night), radio frequency (RF) emissions, acoustic (aerodynamic noise), thermal (infrared), and Radar return signatures.

f. Technologies to support "combination drops" in which cargo is dropped with jumpers to follow. This mission involves deconfliction, digital communication between jumpers and aerial guidance units, full situational awareness, and the ability of jumpers to command drop zone changes for their cargo.

g. Next generation environmental protection for HALO/HAHO parachutists. These systems will allow free fall jumpers to perform insertion operations from greater offsets which require remaining aloft for extended lengths of time in a harsh environment.

h. Advanced personnel and cargo exfiltration technologies such as powered flight to maximize offset for airborne insertion and allow for exfiltration of personnel and cargo.

i. Advanced construction methods and/or auto-packing methods for low cost manufacturing of all types of aerial delivery systems.

j. New/Novel low cost materials for aerial delivery systems.

k. Environmentally friendly materials for one-time use aerial delivery systems. Dual use materials which may be used for shelter or fuel after aerial delivery mission.

l. Development of interactive/electronic textiles (fabrics, cordage, and webbing) for parachutes to monitor and improve aerial delivery system performance and/or textile structural health monitoring such as canopy fabric structural behavior during inflation, variable glide ratio capabilities, textile structural integrity monitor/indicator, textile tension/stress/strain sensing capabilities, and environmental-adjustable materials.

m. Development of materials that have a more user and environmentally friendly disposal method than materials currently used in low-cost, one-time use cargo parachute. Current material is a woven polypropylene geotextile and is disposed of through burning. The most desirable technologies would allow the users to completely abandon the parachutes on the drop zone where they land with the confidence that within days or weeks the material will have fully or partially degraded to eliminate its physical footprint. Materials

that have the ability to partially or fully degrade through various trigger mechanisms (such as thermal, mechanical, photochemical, biological, chemical, or electrical) in a time period that could range from a few seconds to a few days are ideal. Degradation could be initiated by natural means (such as ambient light or heat) or via a man-made trigger (application of water or voltage).

n. Modeling and experimental investigation of all the stages of parachute systems to include inflation and steady descent for modified round canopies, cross canopies, single-skin and ram-air parafoils, and new parachute designs.

o. Modeling and experimental research on the biomechanics of paratroopers during parachute deployment and landings, body protective devices to minimize body injuries, and avoidance measures for towed jumpers.

p. Advanced sensors, instrumentation and measurement methods to measure and investigate parachute aerodynamics and structural dynamics during opening, descent, and landing phase including aerial delivery system spatial position, motion and geometry; fabric strain; opening force; air velocity; air pressure; and overall flow field.

q. Advanced technologies for precise delivery of robots and unattended ground sensors.

r. New Helicopter Sling Load (HSL) and External Air Transportation (EAT) concepts that will reduce the ground personnel for hook-up, increase flight stability ranges for HSL items, increase flight envelope while not modifying the current airframes

s. Other aerial delivery applications with DoD and/or other US Government applications to include aerial delivery from VTOL and UAS air vehicle systems.

Communication with a Technical POC prior to submission of a formal proposal is essential.

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Request all concept papers and proposals submitted be copy furnished to:

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F. TEXTILE TECHNOLOGIES

1. Multi-Functional Materials.

Individual Warfighter protection against battlefield threats such as ballistics, enemy detection, chemical and biological agents, and IEDs is essential to the continued effectiveness of the fighting force. At the same time, protective materials (clothing/armor, etc.) must also be effective and ensure survival under extremes of environmental (temperature and humidity) conditions without significant sacrifices in Warfighter comfort. Current textile technologies require multiple components to be added to the Warfighter uniform in order to meet these threats. Development of novel multifunctional materials would have significant impact on Warfighter load, increasing sustainability in the field. In addition to threat survivability, there is a strong interest in the new and growing field of "wearables." The wearables field is of interest insofar as it relates to the integration of electronic capabilities into textile materials, combat clothing and combat field equipment worn by Warfighters. The following is a summary list of textile technologies of interest to the Natick Soldier Research, Development and Engineering Center:

a. Novel polymer synthesis that produces materials with unique chemical/physical/mechanical property characteristics.

b. Surface modification to existing materials that enhances existing properties and/or provides a multi-functional platform.

c. High-strength fibers, i.e., fibers from liquid crystal polymers.

d. Yarn and fabric manufacturing, fabric preparation and finishing processes to provide enhanced protection and various functionalities, i.e. antimicrobial, insect repellant, moisture management technologies, etc.

e. Photochemistry and photophysics of dyes and dyed textiles.

f. Methods for sorbing/reacting chemical warfare agents in lightweight, low heat stress textile systems.

g. New scale-up technologies for creating conventional and novel fibers and fabrics.

h. New coatings and fiber materials that exhibit enhanced fire retardant properties.

i. New technologies for the characterization of textile systems properties (e.g. electrostatic; electromagnetic; durability; and flame, thermal and ballistic resistance).

j. Consideration of comfort and physiological implications of protective clothing.

k. Modeling the chemical/physical/mechanical properties of new materials and/or surface modifications to existing materials, and the effects of these materials on Warfighter comfort (e.g. air and water permeation, flexibility, wear and tear).

l. Novel textiles and textile finishing technologies, methods or processes to include mechanical, chemical (liquid, coating, spraying, dipping, vapor deposition, etc), lamination, and heat processes, that provide novel or enhanced performance or multifunctional behavior in areas that include but are not limited to, moisture management, thermal management, flame and thermal protection, chemical and biological protection, water resistance/repellence, durability to wear and environmental exposure, reactive behaviors, impact protection, electrostatic properties, and microorganism protection.

m. New and novel textile materials with unique, new or enhanced characteristics (3D fabrics, stretch-wovens, stretch nonwovens, integrated “wearable’s”, etc.).

n. Intelligent materials, smart textiles, or integrated textiles that can sense and respond to various environmental stimuli (electrical, magnetic, chemical, thermal, other) and may exhibit passive, active, or adaptable behavior to provide unique, new, or enhanced characteristics.

o. Exploration of the effects of combining functionalities into a single material on their efficacy.

p. New manufacturing technologies for the scale-up of printing and fabrication of textile uniforms to facilitate a quick turnover of final products to Soldiers.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:

Dr. Shaun Filocamo, TEL: 508-233-5095, shaun.f.filocamo.civ@mail.mil

Ms. Melynda Perry (for item d. Yarn and Fabric Manufacturing), TEL: 508-233-4355, melynda.perry.civ@mail.mil

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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

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2. *High Performance Multi-component Fibers*.

Bi/tri-component fibers can be defined as "individual fibers composed of two/three polymers of different chemical and/or physical properties extruded from the same spinneret with various cross sectional geometries." Bi/tri-component fiber cross sectional geometries which include side-by-side, sheath/core, islands in the sea and segmented pie morphologies can be utilized to develop lighter, reactive/responsive fabrics that will make the wearer safer, more comfortable, and higher performing. Bi/tri-component fibers can also be used in applications besides clothing including soft shelters, parachutes, vehicles, and numerous other textile applications. Most commercial bi/tri-component fibers are used in commodity applications such as carpeting, automobile interior fabrics, and filters. There has been very little work done in high performance or multi-functional fibers where specialty polymers (conducting, transparent, high strength, etc.) are co-extruded with metals, nanoparticles, optically active materials, etc. to make novel fibers and textiles with combinations of physical, chemical, optical, and/or electronic properties never seen before. NSRDEC has acquired a bi- as well as bi/tri-component fiber extruder for processing thermoplastic materials that will be available for novel fiber research and development projects.

Scientific and Technical Areas of Interest:

There is a need for research and development of novel fibers to create woven and nonwoven textiles for Warfighter and first responder protection and sustainment. Specifically, novel optical, high strength, electronic, flame resistant, and reactive (chemical, biological) fibers are of interest. Novel optical fiber research and development could involve efforts related to the creation of fibers for friend vs. foe identification, optical communication systems, and optical sensing. High strength fiber R&D should relate to the creation of melt processable fibers for soft and rigid armor; transparent fiber reinforced composites for transparent armor; or structural composites for load carriage, shelters, or other Soldier System applications. Investigation of nanofibers produced through islands-in-the-sea technology for high strength, impact resistant composites is of interest. Electronic fibers for use in, for example, electrotextiles should be melt processable, conducting, shielded, and durable. There is specific interest in developing a flame resistant elastomeric fiber that can be woven into an undergarment and wicks away moisture. Reactive fibers could change chemically or physically to perform certain functions. An example of a physical change would be a fiber that coils or stretches in response to temperature changes.

Chemically or biologically reactive fibers could sense and/or decontaminate chemical or biological hazards. It is conceivable to make fibers that combine several of the desired characteristics. For instance, a transparent fiber with the appropriate additives could sense and react to a chemical or physical change by sending an electronic message to the heads up display of the user, advising the user of a hazardous situation. In addition to the fabrication of new bi/tricomponent fibers, research efforts are needed to explore more fundamental issues such as delamination of the different polymers that could be used in the fiber, the use of compatibilizing additives and polymers, the dispersion of additives in the various polymers of the fiber, and the use of "migrating" additives to modify desired areas of the fiber. In addition, there is interest in devising new cross-sectional geometries that will enable or improve the performance of bi/tri-component fibers for specific applications.

Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POCs:

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Natick Soldier Research, Development and Engineering Center
ATTN: RDNS-WS (Ms. Gail Bernheart)
Kansas Street Natick, MA 01760-5020
TEL: 508-233-4706, gail.d.bernheart.civ@mail.mil

G. MODELING AND SIMULATION

Individual Ground Soldier and Tactical Small Unit Operational Effectiveness and Survivability.

The Modeling and Analysis Team (MAT) is tasked with supporting decision makers by employing a variety of analytic tools and techniques to perform critical analyses needed throughout the acquisition cycle (simulation-based acquisition). Our main focus is on assessing the contribution of new materiel, equipment, and capabilities to operational effectiveness and survivability of the Tactical Small Unit (TSU).

One of our objectives is to enable the development and application of an adaptive toolkit to support the conduct of rapid and repetitive analysis pertaining to the TSU. The MAT has developed a quantitative tool that will allow decision makers to tailor a Ground Soldier System that is operationally optimized across various missions, environments, and enemy threats. The

tool supports the integrated analytic simulation of individual Ground Soldiers and Ground Soldier small units to assess their potential survival and performance when equipped with current or proposed individual combatant clothing and equipment ensembles.

Although there are alternative approaches (e.g., field experimentation, laboratory tests) to assess operational effectiveness, they cannot provide the quantitative power, utility, ease of use, affordability, and consideration of conditions that can be simulated with this modeling tool. These conditions include TSU mission objectives, terrain, weather, lighting levels, threats, physiological factors, opposing force responses, situational awareness, and other elements. Consequently, constructive simulation is necessary and complements these other live and virtual methods to provide Army decision makers with a comprehensive assessment capability that has been used to show the relative benefit of one proposed capability versus another.

We also continue to work to develop and implement other elements of the analytic infrastructure. These include, but are not limited to: characterization of equipment, methodology and algorithm development, collection and dissemination of data, implementation of operational use cases in the simulation, identification of essential elements of analysis and metrics, and linkage of models and simulations.

Scientific and Technical Areas of Interest:

The development and application of a toolkit to conduct rapid and repetitive analysis pertaining to the TSU leads to the following areas of continuing scientific and technical interest:

a. Research, develop, and implement elements of a shared analytic infrastructure that facilitate the analysis of issues in the depth and breadth critically important to NSRDEC, e.g. Soldier load, personnel protection, integrated base defense, force application, and Warfighter situational awareness. Elements include:

    Decomposition and building operational use cases to provide needed context to Warfighter centric analysis.

    Hardware system characterization to provide a shared understanding of the linkage between equipment, impacts on Warfighter performance and tactics, techniques and procedures.

    Application of metrics that focus analysis and support quantitative assessments.

    Development of a ground Soldier-centric data model that supports analysis and sharing of data across communities and can drive test methods and experimental design.

Compilation, synthesis, and analysis of empirical data collected during simulation runs.

Identification of experimentation and test plans and protocols to leverage best practices and support consistency across experiments.

Identification of needed instrumentation to accomplish analytic requirement.

Tools that support collaboration and meeting shared objectives across Warfighter and Soldier Technology analysis communities.

b. Conduct research or use extant data and knowledge to develop and implement methodologies and algorithms pertaining to TSU operations in a range of areas. Given the breadth of factors that can have a significant impact on TSU operations, only a partial listing is provided. The list includes: effects of clothing, equipment and encumbrance on Ground Soldier task performance; heat stress; cause and assessment of injuries and their impact on task performance and survivability; target detection, recognition, and identification; sensors, information transfer, communications, information technologies, network systems and their effects on situational awareness and decision making; and behavior representation.

c. Research how Ground Soldiers move, shoot, communicate, sense and perceive, and decide during operations by collecting data or by compiling, synthesizing, or analyzing empirical data collected during field experiments and training exercises.

d. Enhance NSRDEC analytic tools to support data exchange and linkage with other U. S. Army and NATO analytic models, simulations, and war games such as COMBAT XXI, OneSAF, and CAEn based upon analytic needs.

e. Develop tools and capabilities that allow simulation of the full spectrum of missions ranging from Stability and Support Operations (SASO) to combat.

f. Generate and enhance terrain databases that support the analysis of TSU operational effectiveness and survivability within IWARS or linked with other models such as Combat XXI or OneSAF.

g. Extend the Infantry Warrior Simulation for human-in-the-loop operation to allow for the research and assessment of Ground Soldier cognition, behavioral representation and the value of information.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC: Mr. Thomas Gilroy, TEL: 508-233-5855, Thomas.d.gilroy.civ@mail.mil

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

All concept papers, proposals and administrative inquiries should be submitted to:

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H. WARFIGHTER ADVANCED TECHNOLOGIES

1. Soldier Intelligence, Surveillance, and Reconnaissance (ISR).

An advanced technology development effort is underway to mature and integrate technologies that address capability gaps associated with Soldier ISR; primarily the need to reduce Soldier load and increase individual and squad situational awareness and understanding.

The primary thrust of this activity is the development and demonstration of a remotely operated, cargo-pocket sized soldier sensor system and downstream enabling technologies that support both indoor and outdoor intelligence, surveillance, and reconnaissance missions. The remotely operated soldier sensor should have the capability to:

- Continuously view objects or person(s) of interest.
- Respond to spontaneous dynamic events such as wind gusts (outdoor operation).
- Avoid collision with fixed background objects (indoor operation).

All design approaches will be considered to include fixed wing, rotary wing, bio-inspired, and hybrid designs. However, preference will be given to approaches that provide the robustness and reliability required for military applications. No formal size, weight, and power limits are described to allow respondents trade-space. The over-arching goals for the effort are that the platform and sensor portion of the system be able to fit within a cargo pocket and the control and display portion be no larger than a tablet computing device. Ideally, the control and display portion of the system will easily integrate into the soldier ensemble and data transmission will be in DoD standard formats for video and metadata such as H.264.

Scientific and Technical Areas of Interest:

As with all ISR systems, the value of the tool is not the platform itself, but the increased situational awareness the platform enables by creating an environment in which the platform's

sensor(s) are able to continuously collect information on and precisely locate objects of interest. As a result, maturation and demonstration of the following enabling technologies are required:

a. Advanced payloads of the appropriate size and power consumption for a sensor system that can support both day and night imaging, video, and other means of intelligence collection while being compatible with a platform that fits within a Warfighter's cargo pocket.

b. Guidance, navigation, and control systems that can support navigation in environments where GPS is not available along with the capability to operate the platform semi-autonomously and avoid collisions.

c. Lightweight and low power data links that reduce bandwidth consumption and enable secure digital transmission of sensor data and operator/system generated command and control (C2) inputs.

d. Software capabilities that provide stable imagery and allow the user a method to select differing viewpoints for objects of interest.

e. Applications that provide the capability to generate precise (Category III or better) military grid reference system (MGRS) coordinates for both fixed and moving objects observed within the sensor's video stream.

The aerodynamic design of the platform should allow the sensor to be highly maneuverable, yet the complexity of operating the design need not be exposed to the user. Creative approaches for a simple user interface that enables complex tasks to be accomplished are encouraged. The goal of this effort is to provide value to the Warfighter through increased situational awareness and understanding, not increase the Warfighter's cognitive burden. Typically, ISR missions are performed in parallel with other combat duties. As such, a user cannot be 100% dedicated to operating the sensor system.

In concert with the technology development activities envisioned above, there is additional interest in the tools to train effectively, maintain proficiency, and evolve tactics, techniques, and procedures for this class of Cargo Pocket ISR system.

Technology candidates must exhibit a Technical Readiness Level (TRL) of 4-7. Proposals will be entertained for both an overall system design as well as individual sub-systems.

The development timeframe for this effort is October 2012 through September 2013.

Communication with the Technical Points of Contacts (POCs) prior to submission of a formal proposal or concept paper is essential.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Technical POCs:

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All concept papers should be submitted to:

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2. Information Operations

Information Operations to include Computer Network Operations and Electronic Warfare has had a dramatic impact on the battlefield in recent years, permitting commanders and Warfighters to leverage technology as a means to improve awareness and decision making during operations planning and execution. This area of the battle space is largely technology driven and tied directly to the commercial communications industry. Changes in commercial industry standards and technologies require constant vigilance on behalf of the Government for development of advanced Information Operations equipment and software.

Efforts are underway to leverage software development and hardware integration to address any emerging threat in the following areas:

- Computer Network Operations
- Electronic Warfare

Scientific and Technical Areas of Interest:

Concept papers and proposals are requested in the following areas and are not necessarily limited to the specific area of interest indicated:

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

a. Computer Network Operations as defined by the Department of Defense.

b. Electronic Warfare in a Tactical Application.

c. Electronic Warfare as defined by the Department of Defense.

d. Targeting within Information Operations.

e. Integration into UAV and other Aerial Platforms.

f. Use in Ground Platforms.

g. Use as Handheld/Man packable Form, Fit and Function.

h. Testing of the above mentioned technologies.

Additionally, technology candidates must exhibit the following:

a. Technical Readiness level 1-7.

Communication with the Technical POC prior to the submission of a formal proposal is essential.

Technical POC:

LTC Charlotte Rhee, charlotte.r.rhee.mil@mil.mil

All concept papers should be submitted on CD-ROM to:
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All proposals and administrative inquiries should be submitted to:
U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
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SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

I. TECHNOLOGY ENABLED CAPABILITY DEMONSTRATIONS (TECDs)

1. TECD 1b: Force Protection – Soldier and Small Unit

Technology enabled Capability Demonstrations are science and technology development efforts designed to address some of the Army's highest priority capability gaps. TECD 1b is chartered to investigate applied research (6.2) and advanced technology (6.3) development efforts in Soldier and Small Unit Force Protection. The development program has taken a holistic view that encompasses all environments the Soldier operates in as well as the full spectrum of threats the Soldier faces. This includes technologies that allow for the Soldier and Small Unit to be better protected by means of increased situational awareness and understanding. The program is divided into four technology thrust areas each with its own unique goals and technical areas of interest: A) Human Performance, B) Ballistics & Blast, C) Environmental Protection, and D) Squad Protection. Research and development efforts undertaken during the course of the TECD can take a variety of different routes; however, the end goal of the program is to have each technology development effort result in one of three outcomes:

- Develop a new capability or augment an existing capability that transitions to a Program of Record (PoR);
- Develop a novel or improved test method to evaluate existing or emerging capabilities;
- Develop and demonstrate a new capability that informs a requirement.

A. Human Performance:

Human Performance is rarely considered in the design approach to personal protective equipment (PPE) and when it is considered, it is often viewed as an afterthought. As such, current PPE requirements are focused on protection and not Soldier performance and overall mission outcome for the squad. A trade analysis between mobility, lethality, and protection would aid the situation; however, the necessary metrics are not defined. Moreover, there is a need to assess real-time Soldier physiological status which would enable small unit leaders to identify potential injuries and casualties before they occur.

As a result of the **Human Performance** problem statement described above, it would be beneficial to develop novel methods and approaches for the following:

- Validated metrics and test methods for evaluating human performance as a function of PPE and encumbrance.

- Models for Soldier Mobility/Lethality/Survivability trade-space analysis.

- A lightweight, reliable, and network-enabled physiological status monitor that can identify injuries and predict decline in Soldier performance.

More specifically, studies and models that address the following **Human Performance** topics would be of interest:

- The human systems performance envelope on how PPE and Body Armor Protection Levels (BAPLs) affect Soldier mobility and lethality.

- Measureable mobility and agility tasks that are traceable to operational relevance and their relationship to the Soldier's ability to shoot & communicate.

- How fatigue (sleep, cognitive, and physical) impacts Soldier mobility and lethality as differentiated with and without the use of PPE, BAPL, etc.

- When varying BAPLs do and do not impact mobility/agility, shooting performance, vigilance, etc.

- The impact of varying BAPL on ability to carry rucksack-borne and other body-borne loads (i.e., the interaction of PPE and BAPL with other loading elements).

- How to construct representations and define metrics that allow tradeoff analysis of mobility/lethality/survivability.

B. Ballistics & Blast:

The problems faced by the Soldier and squad with respect to Ballistic & Blast are wide and diverse and have been further decomposed into the following topics for simplicity: Lightweight Modular /Tailorable/Scalable Personal Protective Equipment, Improved Eye Protection, Blast Test Methods for the Head, Active Hearing Protection, Threat Based Munitions and Behind Armor Blunt Trauma (BABT).

B1) Lightweight Modular/Tailorable/Scalable Personal Protective Equipment:

Today's Interceptor Family of Body Armor (IBA) is highly effective against ballistic threats, but introduces significant mobility challenges due to weight and encumbrance. The need to maintain or increase Soldier survivability while increasing Soldier mobility and lethality must be explored. Also, current tactical body armor does not deteriorate with age alone; however, one of the most frequently asked questions is, "How long does body armor last?" Unfortunately, no definitive answer can be given to this question. The need to determine armor service life as a function of use must be explored.

Current tactical body armor utilizes nylon woven fabrics for use in outer carriers. These carriers have been shown to have limited service life when used regularly and are susceptible to high

abrasive wear, tearing, and colorfastness. The need for a more durable and lightweight alternative must be explored. Furthermore, tactical body armor protection levels (BAPLs) have been benchmarked off legacy armor systems. In order to maximize Solder performance and survivability the need to conduct an analysis using operationally relevant threats must be explored.

B2) Improved Eye Protection:

Current protective eyewear issued to Soldiers comprises a clear lens and a tinted lens which both offer fragmentation protection. However, the lenses must be swapped out when changes in lighting conditions occur. The need for a rapid transitions lens with fragmentation protection is sought. Also, fogging of eyewear is still one of the leading issues stated by users of ballistics protective eyewear on field surveys. If the eyewear fogs the user is unable to see the enemy, determine threats, or determine his/her location in relation to inanimate objects (significant issue for drivers of vehicles). Users frequently remove their eyewear when fogging occurs, thus negating the protective capabilities of ballistics protective eyewear. In addition current anti-fog coatings are prone to scratching and are not resistant to chemical exposure such as DEET found in face paint, reducing the service life of the eyewear. Improved anti-fog coatings for ballistics fragmentation protective eyewear are required to reduce or eliminate the need for a user to remove the eyewear and to improve durability.

The eyewear requirement is to provide ballistic protective eyewear to users who require a prescription. This requirement is being met by placing the prescription insert as an add-on behind the primary shield. This method of providing prescriptions to the user causes several logistics issues and potential optical issues. The more lenses placed in front of the users eyes the greater chance there is for the optics to become out of tolerance which can cause eye strain, headaches, dizziness, and blurriness of vision impacting the user's ability to perform their mission. The need exists to implement the prescription directly into the primary shield eliminating the cost for extra components and increasing user comfort.

B3) Blast Test Methods for the Head:

Mild Traumatic Brain Injury (mTBI) can occur from the primary, secondary, and tertiary effects of blast events. The primary threat is based on the overpressure generated from the explosion. This overpressure can vary in magnitude, duration, and load profile. Currently, an injury mechanism responsible for TBI from primary effects is not fully understood, but a significant number of investigations are being conducted in an attempt to determine the injury mechanism. The need to characterize protective equipment as it relates to mTBI is sought. Moreover, there is insufficient dose-response ocular injury data and modeling to support the development of blast overpressure guidelines for field effective blast protective eyewear.

B4) Active Hearing Protection:

Current hearing protection consists of circumaural (around the ear) or inner aural (in the ear) active and passive hearing protection that does not currently fit the user well, allow the user to determine localized sound direction, or understand verbal or radio communications to the extent that the user would have normally when wearing no hearing protection. Due to these issues Soldiers are choosing to wear no hearing protection for increased situational awareness and ease of communication rather than taking the risk of missing an auditory queue indicating a threat or command. There is a need to provide hearing protection that is easy to use and reusable, provides auditory situational awareness, and mitigates impulse noise exposure during combat.

B5) Threat Based Munitions:

Current tactical body armor performance is measured using fragment simulants that were defined by the Army in the 1970's based on threats of that era. The need to conduct a fragmentary threat analysis is warranted by the change in threat faced today by our Soldiers.

B6) Behind Armor Blunt Trauma (BABT):

Since the 1970s, the means of assessing the potential for BABT has been to test an armor sample on a bed of Roma Plastilina modeling clay and measure the depth of the cavity or dent produced by a non-penetrating impact. This measure has many names including backface signature (BFS), backface deformation (BFD), and transient deformation (TD). Over the years, there have been interest and research efforts to replace this test method; but to date, none has proved as reliable and cost effective as this method, and none has produced a better correlation to injury potential.

The commonly accepted limit for BFD on torso armors is 44mm. This maximum BFD was established in the 1970s by correlation of a series of experiments on clay to impacts and injury on surrogates. Further, clay is also used as a medium for testing within helmets, where an injury-based criterion for BFD has never been developed. The need to better link impact to injury is sought since medical research, current understanding of injury mechanisms, quantifying risk, and developing criteria associated with BABT is considered largely incomplete.

As a result of the **Ballistic & Blast** problems mentioned above in the various topic areas, novel means are sought for development of the following:

B1) Lightweight Modular/Tailorable/Scalable Personal Protective Equipment:

- A system that incorporates integrated load redistribution technology into the armor system and is a fully expandable system (modular, scalable, and tailorable) while utilizing state of the art, lighter weight armor materials; reducing the logistical footprint of the system, and minimizing lifecycle costs. In addition, this system will offer a 20% total weight reduction over the current IBA baseline.

- Develop a novel durability test method that correlates to an operational including the development of an armor rating system for conditioning (ex. Classification according to its appearance: “New,” “Good,” “Fair,”, “Poor”, and “unserviceable”).

- Identify new fabric technology(ies) for high durability tactical carriers.

- Deliver a detailed analysis of areas of coverage with recommended protection levels as it relates to operational threats (modeling & simulation to optimize area of coverage for entire Soldier).

B2) Improved Eye Protection:

- Protective eyewear that can transition from light to dark and vice-versa in less than 3 seconds. 18% luminous transmittance at dark state and 89% luminous transmittance at light state.

- Improved anti-fog coatings that are able to meet the current chemical and abrasion requirements.

- All in one lens with prescription capability able to meet military combat eye protection requirements GL-PD-10-12 dated April 16, 2010. Must meet prescription requirements and be able to accommodate +11 to -11 diopter prescriptions.

B3) Blast Test Methods for the Head:

- A test methodology for evaluating helmets under blast loading is necessary to define protection standards for primary blast-induced mTBI.

- Develop an eye injury criterion, blast test method for eye trauma, and computer models to assess eye injuries and protection.

B4) Active Hearing Protection:

- The development of a low cost active hearing protection system designed with an open architecture to allow interoperability with Army common radios and provide options for both two-way communication and hearing protection to ensure maximum Soldier communication capability and auditory 360 degree situational awareness. An option to connect to two radios simultaneously should be included in any proposed concept.

B5) Threat Based Munitions:

- The development of a threat matrix with the distribution of varying fragments to support keeping or changing the current simulants used in the evaluation of armor systems.

B6) Behind Armor Blunt Trauma (BABT):

- Develop a novel test method for assessing BABT for the torso and head that is more reliable and cost effective than the current method.

- Develop the injury probability curve for various locations on the torso and head which leads to new BABT requirements based on the region of the body that the armor covers.

C. Environmental Protection:

Soldiers face a variety of problems related to being adequately protected in their operating environments. They require protection from and concealment in a gamut of battlefield conditions. Traditionally this is accomplished through the use of camouflage which seeks to minimize the probability of detection by the use of patterns and colors. Soldiers must also be prepared to deploy to any climate and place with the appropriate camouflage and concealment. Changing camouflage patterns for issued uniforms and gear can be a costly and lengthy process.

In terms of the diversity of operating environments, Soldiers require protection against wet, cold, and extreme climates. This often means carrying multiple layered systems to achieve comfort in a range of temperatures. Soldiers on extended patrols are required to sleep in austere conditions; and quality sleep is required for resilience. On the opposite end of the environmental spectrum, Soldiers require the capability to conduct operations without impairment from heat stress or strain. Soldiers can consume up to 12-15 liters of water per day and can routinely engage in 7-10 day foot patrols (Operation Enduring Freedom). Dehydrated Soldiers become a health/medical risk to themselves and their units when judgment and physical performance are reduced. Soldiers require the ability to remain hydrated in any operational environment.

Besides environmental extremes, Soldiers require the ability to reside and conduct operations without the threat of harm from indigenous insects as well as be able to conduct operations for extended periods without traditional shower systems while maintaining an acceptable level of personal hygiene. Furthermore, Soldiers operating in Mission Oriented Protective Posture (MOPP) Level IV require a high level of protection that results in multiple pieces of cumbersome, heavy, and often flammable personal protective equipment (PPE) that induces a high level of thermal burden.

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As a result of the **Environmental Protection** problems mentioned above, novel means are sought for the following:

- Providing concealment against visual and electronic detection.
- Providing small quantities (+/- 500) of theater specific camouflage within 60-90 days for initial operations or short duration missions.
- Providing insulating and protective clothing layers that are adjustable or self regulating to the environment.
- Sleep systems capable of protecting Soldiers in cold, wet, or insect infested areas at minimum weight and bulk.
- Cooling Soldiers in hot environments.
- Integrating and improving Soldier hydration.
- Protecting Soldiers from insects.
- Maintaining personal hygiene without the use of water and/or showers.
- Protecting Soldiers from Chemical, Biological, Radiation, & Nuclear (CBRN) threats at the current protection level while reducing all types of burden.

D. Squad Protection:

Soldiers almost always function as part of a larger unit. In the context of dismounted operations, the smallest functional unit is the squad. Viewing the squad as a functional unit versus the individuals that compose it, the expeditionary squad requires increased protection and improved means of hazard identification through squad organic capabilities that can provide increased situational awareness and understanding or conversely deny the adversary situational awareness and understanding. As such, squads require the ability to obscure their movement from friendlies, enemies, and non-combatants while also maintaining situational awareness of other soldiers. Squads also require the ability to identify and mark locations as well as obscure their movements without being exposed to hazardous substances or chemicals.

In addition, the squad lacks sufficient situational awareness and understanding of the surrounding environment to identify threats and minimize the chance of tactical surprise. The expeditionary squad lacks the ability to perform required combat duties in concert with the reconnaissance of potential threats. Furthermore squads require the ability to identify trip and command wires across the spectrum of lighting conditions (day/night/twilight) as well as

improved explosive detection capabilities that incorporate the ability to detect non-metallic explosive devices or device components.

Prior to target engagement in the urban environment squads require the ability to discriminate among friendlies, enemies, and non-combatants. Squads also require the means to remotely emplace sensors for non-line-of-sight locations, deny the adversary access from key and decisive terrain as well as friendly emplaced positions and detect the location of the adversary when fired on.

As a result of the **Squad Protection** problems mentioned above, novel means and devices ***organic to the squad*** are sought for the following:

- Providing spectrally selective obscurants.
- Solutions to maximize obscurant and smoke performance while minimizing toxicity.
- Concepts for a squad organic micro unmanned system and accompanying display that minimizes operator burden.
- Algorithms and hardware for guidance, navigation, and control for micro unmanned systems (UAS) that allow the system to have the intelligence required to conduct a semi-autonomous mission without operator input.
- Methods of fusing electro-optical and infra-red imagery with the capability to display visual cues indicating trip and command wires with minimum false positives.
- Approaches to hand-held detectors that can detect non-metallic explosive devices.
- Small arms deployable sensors that have the capability to report visual, acoustic, and position information that allows for discrimination between friend and foe.
- Mortar launched sensor capability that can report visual, acoustic and position information that allows for target discrimination between friend and foe.
- Approaches to area-denial sensors and/or radars that allow for increased stand-off between friendly locations and adversary positions.
- Approaches to gunfire detection that limit false positives and allow for the shot location information presented to and distributed amongst the Squad with a simple and easy to understand interface.

Technology candidates must exhibit a Technical Readiness Level (TRL) of 4-6. Proposals will be entertained for both individual and integrated capability sets.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

The development timeframe for this effort is October 2012 through September 2016 Communication with the Technical Points of Contacts (POCs) prior to submission of a formal proposal or concept paper is essential.

Technical POCs:

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U.S. Army Natick Soldier Systems Center
Natick Soldier Research, Development and Engineering Center
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2. TECD 4a: Sustainability/Logistics – Basing

TECD 4a is chartered to formulate an S&T program to increase self-sufficiency, reduce supply demands, and reduce waste at Combat Outposts (COPs 150-500 PAX)/Patrol Bases (PBs 50-150 PAX) to small Forward Operating Bases (FOBs 500-1000 PAX) and improve the ability to sustain the Small Unit for the duration of the mission at lower cost and lower risk to suppliers without adversely impacting primary mission Soldier availability (troop to task ratio).

The Army needs improved capability to enable sustainment independence/"self-sufficiency" and to reduce sustainment demands at contingency bases. It is too costly, too unpredictable, and too labor intensive for a Small Unit to carry all required consumables (fuel & water) to last for weeks or months at a COP/PB to small FOB (up to 1000 PAX). As a result, contingency bases are highly dependent on resupply/backhaul, which can be unpredictable and is costly in terms of soldiers at risk in convoys, reduced mission availability, etc.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

Near term objectives for TECD 4a are to: reduce need for fuel resupply by 25%, reduce need for water resupply by 75% and decrease waste generation by 50% while maintaining quality of life. There are multiple technology thrust areas and enabling technologies across the three TECD focus areas of fuel demand reduction, water demand reduction, and waste reduction. Research and development efforts undertaken during the course of TECD 4a can take a variety of different routes; however, the end goal of the program is to have each technology development effort result in one of the following outcomes:

- Develop a new capability or augment an existing capability that transitions to a Program of Record (PoR).
- Develop a novel or improved test method to evaluate existing or emerging capabilities.
- Develop and demonstrate a new capability that supports Warfighter (TRADOC) requirements.
- Support trade-off assessments, assessment reports and concept developments.
- Produce material in low quantities including material samples and prototype systems.

Technology candidates must exhibit a Technical Readiness Level (TRL) of 5 or 6. Proposals will be entertained for any of the three focus areas addressing fuel demand reduction, water demand reduction, and/or waste reduction.

TECD 4a is planning operationally relevant technology demonstrations in 2015 and 2017. A final demonstration may be held in 2018.

The BAA includes the following technical areas: Combat Food Service Equipment for Individual and Group Feeding, Unit/Organizational Equipment, and Shelters and Life Support Technologies for Contingency Basing. Proposals that support TECD 4a within these specific technical areas should be submitted directly to the respective technical area POCs.

The process to submit a formal proposal or concept paper to the Technical Points of Contacts (POCs) for these areas is referenced in Section II above.

Detailed descriptions for the above referenced technical areas are located in:

- Section VI, A. Combat Feeding Equipment and Systems (pp. 44-49) and;
- Section VI, D. Shelters and Life Support Technologies for Contingency Basing (pp. 97-101).

It is essential to communicate with the Technical POCs indicated in the BAA prior to the submission of a formal proposal or concept paper.

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

TECD 4a POCs Claudia Quigley, 508-233-5243, Claudia.j.quigley.civ@mail.mil or Paul Carpenter, 508-233-4043, paul.d.carpenter16.civ@mail.mil can also provide technical support in preparing proposals if needed.

SECTION VII - PROPOSAL FORMS

Print Form

Natick Soldier Research Development and Engineering Center BAA Proposal Cover Page

1. For Consideration By:

- ☐ Combat Feeding Equipment and Systems
- ☐ Combat Ration Research and Development
- ☐ Warrior Systems Technologies
- ☐ Tentage, Fabric Structures and Rigid Wall Shelters
- ☐ Airdrop-Advanced Personnel and cargo Airdrop Systems
- ☐ Textile Technologies
- ☐ Modeling and Simulation
- ☐ Neuroepidemiology
- ☐ National Protection Center
- ☐ Robotics and Advanced Technology

2. Check the appropriate Box(es) if this proposal includes any of the items below

- ☐ Human Subjects
- ☐ Vertebrate Animals
- ☐ National Environment Policy Act
- ☐ Disclosure of Lobbying Activities (If proposing for a Grant)
- ☐ Historical Places
- ☐ GFE (Government Furnished Equipment)
- ☐ GFP (Government Furnished Property)
- ☐ Biosafety Level (BL) 1-4 Facility
- ☐ Genetically Engineered Organisms
- ☐ Ozone Depleting Substances

3. Check the Type of Award Document Proposed:

- ☐ *Contract*
  - ☐ Cost Reimbursement
  - ☐ Cost + Fixed Fee
  - ☐ Fixed Firm Price
  - ☐ Other
- ☐ *Grant*
- ☐ *Cooperative Agreement*
- ☐ *Other* *Please Specify:* _____

4. BAA Number:

5. Proposal Title:

6. Topic Area by Number and Title:

7. Total Funds Requested:

8. Offeror Submitting Proposal: ***(Include DUNS # and Cage Code)***

9. Type of Business: (Please select the appropriate entry)

- ☐ Large Business
- ☐ Small Disadvantaged Business
- ☐ Other Small Business
- ☐ Historically Black Colleges and Universities
- ☐ Minority Institutions
- ☐ Other

10. Primary Investigator/Technical Point of Contact:
Salutation:
Last Name:
First Name:
Street Address:
City, State:
Zip Code:
Telephone:
Fax (if available):
e-mail (if available):

11. Offeror Administrative Point of Contact:
Salutation:
Last Name:
First Name:
Street Address:
City, State:
Zip Code:
Telephone:
Fax (if available):
e-mail (if available):

12. Date Proposal Prepared: _____

13. Date Proposal Expires: _____

14. Signature of Authorized Representative for Offeror:

_____

Print Form

Natick Soldier Research, Development and Engineering Center Offeror BAA Proposal Checklist

IMPORTANT: This form must immediately follow the cover page in the submitted proposal.
All Applicable Items shall be checked off prior to submission.
Failure to submit a complete proposal may result in rejection of the proposal.

Part I - Technical Section:

- ☐ b) Project Objective/Purpose
- ☐ c) Anticipated Resulting Product(s) or Process(es)
- ☐ d) Future Military/Civilian Applications
- ☐ e) Assessment of Project Success
- ☐ f) Project Approach/Methodology/Techniques/Processes
- ☐ g) Rationale for Methodology *(including risk)*
- ☐ h) Planned NSRDEC Interaction
- ☐ i) Planned Collaborative Agreements
- ☐ j) List of Deliverables
- ☐ k) Project Schedule *(including milestones)*

Part II - Management Section:

- ☐ a) Technical Personnel Biographies: *(To include Resume/experience/education/expertise/% of time)*
  - ☐ PI
  - ☐ Collaborator(s) ☐ N/A
  - ☐ Other Personnel ☐ N/A
- ☐ b) Description of Offeror's Organizational Structure
- ☐ c) Description of Facilities and Equipment
- ☐ d) Project Management Systems Description

Other:

- ☐ Proposal Cover Sheet
- ☐ CCR Registration Complete

Part III - Cost/Price Section:

- ☐ b) Detailed Cost breakdown *(excel compatible format)*
  - ☐ Total Program Cost by Major Cost Items
  - ☐ Total Program Cost by Program Task *(For each year)*
  - ☐ Itemization of Major Subcontracts
  - ☐ Itemization of Equipment Purchases
  - ☐ itemization of Information Technology Purchases
  - ☐ Summary of Funding Requirements by Month
  - ☐ Budget Explanation Page (see BAA Part III, section b)
- ☐ c) Proposed Costs Conform to the Identified Principles/ Procedures (see BAA Part III, section c)
- ☐ d) Detailed Supporting Cost and Pricing Information
  - ☐ Description of Methods Used to Estimate Costs
  - ☐ Supporting Documentation
  - ☐ COST OR PRICING DATA **(see BAA part III, section d)**

    *NOTE: As Defined in **FAR Subpart 15.4** "COST OR PRICING DATA Shall be required if the offeror is seeking a procurement contract award of $650,000 or greater"*

Part IV - Past Performance Section:

- ☐ Offeror
- ☐ Proposed First-tier Subcontractors

Part V - Subcontracting Plan *(Shall be included if other than Small Business and seeking an award of greater than $550,000) See BAA Part V*

- ☐ Included ☐ Not Applicable

Part VI - Contractor Representations and Certifications: *(Check the appropriate entry)*

- ☐ DFAR Representations and Certifications Included
- ☐ Certifications for Grants and Agreements Included
- ☐ Online Certifications and Representations Application (ORCA)