ONR BAA Announcement # 07-013

BROAD AGENCY ANNOUNCEMENT (BAA)

Capable Manpower Future Naval Warfighting Capability

Human Systems Integration

INTRODUCTION:

This publication constitutes a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2), the Department of Defense Grants and Agreements Regulations (DoDGARS) 22.315(a), or DoD's Other Transaction Guide for Prototypes. A formal Request for Proposals (RFP), solicitation, and/or additional information regarding this announcement will not be issued.

The Office of Naval Research (ONR) will not issue paper copies of this announcement. The ONR reserves the right to select for award all, some, or none of the proposals in response to this announcement. The ONR reserves the right to fund all, some, or none of the proposals received under this BAA. ONR provides no funding for direct reimbursement of proposal development costs. Technical and cost proposals (or any other material) submitted in response to this BAA will not be returned. It is the policy of ONR to treat all proposals as sensitive competitive information and to disclose their contents only for the purposes of evaluation.

I. GENERAL INFORMATION

1. Agency Name

Office of Naval Research

2. Research Opportunity Title

Human Systems Integration

3. Program Name

Capable Manpower Future Naval Warfighting Capability

4. Research Opportunity Number

BAA 07-013

5. Response Date

Full Proposals: 30 March 2007

6. Research Opportunity Description

The Capable Manpower (CM) Future Naval Warfighter Capability (FNWC) program office at the Office of Naval Research, is inviting full proposals. These proposals should suggest innovative science and technology developments to overcome the capability gaps described later in this announcement.

The Capable Manpower Future Naval Warfighter Capability program (CM) is a set of capability-development projects focused on the human performance aspects of the Navy and Marine Corps. CM supports work to further human-systems integration, particularly in the areas of human factors engineering, manpower and personnel, and training.
In this announcement, the Navy and Marine Corps are seeking the development of innovative technology-based products to enable transformation in their Human Capital programs, targeted at human systems integration (HSI), that enable SYSCOM program managers to optimize total system performance, minimize total ownership costs, and ensure that systems are built to accommodate the characteristics of the user population that will operate, maintain, and support systems, for the warfighting pillars of Sea Strike, Sea Shield, Sea Basing, and FORCEnet. A description of these Sea Power 21 pillars can be found at: http://www.navy.mil/navydata/cno/proceedings.html.

Reduced manning and increased mission requirements will demand greater competencies of Naval warfighters than ever before, and also greater synchrony among individual competencies, in teams and in interaction with complex systems. New approaches to performance support and system design are necessary to ensure that future combatants and related sea-service components are adequately staffed and have optimal readiness. The Capable Manpower Future Naval Warfighter Capability program is dedicated to development and focused transition of ***products*** to the Navy / Marine Corps. Products are new technologies, methodologies, processes, systems, and/or devices, together with evidence of their cost/effectiveness, based on research and development. The goal is to deliver these products to Navy / Marine Corps customers, to improve system design, utilization, training, and performance of Sailors and Marines, enabling significant Manpower, Personnel, Training, and Human Systems cost savings and improved warfighting readiness.

An Executive Integrated Product Team (EIPT) comprised of Navy and Marine Corps flag and general officers and senior executives for Manpower/Personnel, Education and Training, Human-Systems Integration, and Science and Technology oversees the CM program. The CM FNWC office at the Office of Naval Research (ONR) oversees CM program execution.

6.1 Capability Gaps:

Proposals are desired to develop technology-based ***products*** to address one or more of the following capability gaps.

6.1.1: Capability Gap 1. "Next Generation Autonomous Systems"

Challenge:
Technological advances in unmanned systems have afforded military commanders alternative methods to execute complex missions in challenging environments. Although unmanned platforms appear similar to manned platforms, the war-fighting community must confront a new set of challenges to ensure unmanned systems are fully integrated into the Naval war-fighting force structure. Before the full potential of autonomous

systems can be realized, however, standards and regulations for unmanned operations must be established. Specifically, the separation of operator and vehicle imposes a number of barriers to optimum human performance, including loss of sensory cues valuable for control, delays in control and communications loops, and difficulty in scanning the environment surrounding the vehicle. In addition, a single operator may control multiple vehicles simultaneously, a task likely to impose unique and heavy cognitive workload demands.

Enabling Capability Gap: Develop and demonstrate the automation and human interface technologies to support collaborative decision-making in which multiple unmanned system operators manage groups of unmanned vehicles (unmanned aerial vehicles (UAV), unmanned surface vehicles (USV), and unmanned underwater vehicles (UUV)) with optimal manning. Operators may be in a single watch team or part of distributed operations combat environments with limited communications. The unmanned vehicles may support the same mission tasks or have shared use in which multiple users are using the same unmanned vehicle assets to support different mission tasks.

Gap Specifics: At the Science and Technology (S&T) level the following questions need to be addressed:

Interface Standards

- Through what forms of control interface should operators manipulate unmanned vehicles?
- What are the implications of sensory cues being unavailable to operators of unmanned systems (e.g., noise, tactile)?
- What compromises should be adopted between spatial resolution, temporal resolution, time delay, and field-of-view in the display of visual imagery for flight control and/or conflict detection?
- Can augmented reality displays or synthetic vision systems successfully compensate for the degraded visual imagery provided by onboard sensors?
- Can multi-modal display technology be used to compensate for the dearth of sensory information available to an unmanned operator?
- To what extent can displays and controls be standardized across unmanned systems?
- What are the implications for system safety based on operator judgment when the operator no longer has a “shared fate” with the vehicle?
- What are the interaction effects among cognitive combat demands and unmanned systems and how can they be measured, assessed, and diagnosed to mitigate any negative effects?

Collaborative Situation Awareness Tools:

- Under what circumstances are various modes of autonomous control--fully automated, partially automated, manual--appropriate?
- Should automated control be re-configurable? For example, should the operator be able to alternate between levels of control when he/she deems appropriate?

- How and when should the unmanned operator override the automated control system?
- What are the consequences of degraded reliability of automated autonomous functions for performance of the automated task and of concurrent tasks?

Collaborative Decision-Making Tools

- How should decision performance be augmented and team-shared situation awareness, collaboration, and information management be enhanced?
- How should distributed interaction among team members be supported in complex, distributed operational combat environments?
- How should decision making among members of watch station and between watch stations on different ships be supported, including asset allocation, team planning and re-planning, and de-confliction despite limited communications?
- What is the best method to perform threat, environmental and acoustic validation and verification in uncertain environments?

UAV Mission and Crew Requirements Modeling

- What are the missions (traceable to Joint Mission Essential Task Lists (JMETLs)/Naval Mission Essential Task Lists (NMETLs)) and crew size relevant implications of UAV design choices?
- What design/performance trades should be made during the development of UAV CONOPS?
- How should design/performance trades between pilot and payload operator tasking in UAVs be made?

Desired Outcomes: The research and development investment will result in the following products:

Outcome 1: Develop common command and control capabilities to allow a high degree of independence and increasing levels of autonomy.

Outcome 2: Develop interface and decision support tools to enable a single operator to simultaneously manage multiple homogeneous or heterogeneous unmanned vehicles from a single control station or to enable a small group of operators to manage a much larger number of vehicles.

Outcome 3: In support of reduced manning initiatives, develop metrics for assessing cognitive workload for both single and multiple unmanned vehicle operator interfaces.

Outcome 4: Develop a broader knowledge domain of individual and team information processing and decision making in complex and operational environments when using unmanned systems.

Product Goals: Recommend crew interface solutions to optimize unmanned operator performance for various single or multi vehicle missions by levels of automation. Innovative design solutions will compensate for the lack of certain types of sensory cues

that may inhibit operator and/or commander situational awareness. These interface solutions will enable the operator to become aware of and react to various types of anomalous events. This will also dictate how training should be structured to account for the lack of sensory cues and the specific flight interface being used. Recommendations may directly support U.S. Navy Littoral Combat Ship operator interface design and U.S. Navy and Marine Corps unmanned aerial vehicle ground control station and/or hand held interface consoles.

6.1.2: Capability Gap 2: "Displaying Information with Uncertainty"

Challenge: There is a need to improve undersea warfare ability to efficiently and effectively detect, recognize, and identify noisy targets in ambiguous and uncertain dynamic environments. Visual displays need to be redesigned to improve crew situation awareness, reduce workload, and improve performance by incorporating fundamental human factors and usability principles. Although the submarine platform is of primary interest, there is a need across other ship types (e.g., DDGs, CGs, FFGs), other military (e.g., decision support systems), government (e.g., air traffic controller displays), and commercial systems (e.g., automobile moving map navigation displays) to develop "best practices" visual display standards that adhere to human factors usability principles. The significant challenge is to create human vision models and policies that will establish optimal common displays and presentation to convey data to users with different information needs. Display standards must account for both basic perceptual properties (e.g., interaction of spatial, temporal, and luminance) and higher order cognitive processing of information (e.g., extracting naturalistic targets from a cluttered environment). In addition, there is a need to develop validated, common display elements in conjunction with Open Architecture initiatives to optimize the human-machine interface, support affordability, promote interoperability, increase war-fighting capability, and enable cross-discipline use.

Enabling Capability Gap: There is currently no agreed upon display standard across organizations and manufacturers regarding what is the most efficient method to achieve optimal human detection, recognition, and identification performance of symbols and text displayed on electronic monitors. Quantitative metrics are needed to measure the interaction effects of spatial (e.g., color, luminance, size) and temporal (e.g., motion) attributes of symbols and text on human performance. Moreover, when information is displayed with uncertainty: what is the best way to display information with uncertainty so that the operator can quickly understand the information?

Gap Specifics: At the Science and Technology (S&T) level the following questions need to be addressed:

<u>Displayed Information</u>

- What is the best way to display information with uncertainty? How should information be displayed to maximize removal of ambiguity?
- What are the effects of human visual performance when symbol size, contrast, color, and motion are displayed on electronic displays? Research is needed to

develop a predictive visual performance model to assess the interaction of displayed content by electronic monitor characteristics.

- What are the interactions between monitor characteristics and displayed information on visual detection, recognition, and identification?
- What are the data visualization techniques that use both processing technology and human perceptual capabilities to allow the operator to rapidly detect targets (either from transient signals or indications of a close-in target) and react effectively under time constraint? Research is needed to identify those perceptual elements that are important to this visualization and to incorporate the results in a revised skills development, training and operating program.
- Are existing human vision models satisfactory in predicting operator detection, recognition, and identification of noisy targets in ambiguous and uncertain dynamic environments?
- What are the masking effects of texture overlays on the readability of symbols and text?

Displaying Information with Uncertainty

- How can the submarine efficiently and effectively process all contact information in order to maneuver in enough time to maintain all contacts outside a given distance?
- What is the best way to display information coupled with a degree of uncertainty so that the operator can quickly transition from information, to knowledge, to recommended action?
- What technologies are required to assist operators in identifying relevant trends and patterns?
- What are the graphical interface design principles to ensure the display is intuitive for the operator; allows the operator to easily detect, recognize, and identify potential risks; and affords the operator appropriate feedback to filter signal from noise?

Data Visualization Approaches

- What are the data visualization approaches and the processing and presentation of "information" to improve (increase accuracy, reduce risk) operators' decision-making process?
- What are the critical characteristics of human visual perception, cognition, and decision making to support rapid and accurate human decision-making performance based on information received from visual displays?
- What information systems, interface designs, intelligent systems and other tools to enable autonomy are required for human performance to be maintained at an acceptable level over the design reference missions?
- What characteristics of equipment, tool and computer displays; instructions, procedures, labels and warnings; and human-computer interaction designs will maintain critical sensory and cognitive capabilities?

Desired Outcomes: The research and development investment will result in the following products:

Outcome 1: Identification of spatial and temporal features of symbols and text that are problematic when presented on electronic displays

Outcome 2: A suitable human target detection, recognition, and identification visual model that predicts operator performance in homogenous and heterogeneous environments.

Outcome 3: Guidelines, strategies, and technologies for understanding how different representations or display formats may affect operators' understanding of the uncertainty and the impact on decision making. Recommended visualization techniques shall be made available to display designers to ensure users are made aware of the locations and degree of uncertainties in their data so as to make more informed analyses and decisions.

Product Goals: A best practices document that provides guidance on how to display information with uncertainty. This document will contain standards on how best to display symbols and text on electronic displays, provide guidance on the effects of texture overlay on the readability of symbols and text, and provide guidance on appropriate design features of graphical user interfaces. Human visual performance models will quantify how different representations or display formats may influence operators' understanding of the uncertainty and the impact on decision making.

6.1.3: Capability Gap 3: "Commanding Officer (and crew) Decision Making"

Challenge: A submarine commanding officer and crew must rapidly encode spatially disparate information into a shared situational awareness model. The commanding officer's accurate mental model of the tactical situation will ensure sound and timely decisions during rapidly changing maritime environments. Building a good situational awareness of the tactical situation can be challenging when the available information is intermitent or ambiguous. As knowledge about the situation increases, the commanding officer's ability to make an appropriate decision also increases. Normally, knowledge and information are positively correlated; however, there is a limit to the amount of information that can be processed at any given time. This limit, commonly referred to as information overload, is task dependent and varies between individuals. Information overload may prohibit the observer from processing any more information, and cause the commander to take more time to reach the same decision he could have reached with less information. Therefore it is not the quantity of information that matters; it is the right information made available to the commanding officer and crew at the correct time.

Enabling Capability Gap: There is a need to better understand the principal attributes of superior submarine commanding officer and crew decision making processes. This is due to the increased complexity of information available to the operator coupled with the need to reduce manning and/or manage the workload requirements onboard the submarine. Human systems integration science and technology must account for

hardware and software improvements coupled with the operator's ability to manage workload requirements. By understanding good tactical decision making processes, science and technology investments can develop integrated displays, crew selection and training, and alternative decision aids to achieve improved submarine commanding officer and crew decision making.

Gap Specifics: At the Science and Technology (S&T) level the following questions need to be addressed:

Information Flow:

- What are the training, preparation and information transfer solutions needed to overcome improper command decisions (Commanding Officer, Officer of the Deck, etc.) that have historically resulted in collisions and/or adverse effects on Operational Availability and mission accomplishment?
- What is the best solution to deliver the right information to the right people at the right time so they can make the right decisions? The problem is that not all information is equal, accessible, or even of constant importance.
- How to design systems which present relevant information from sensor or historical data, which do so quickly and intuitively and which require fewer technicians?
- How to deliver people, process, and equipment in a way to improve our systems so they present a clear picture of reality to the decision makers in an actionable format at the time they need it?
- What decision making processes automate the collection of information and enable analysis required to distill trends which will enable continuity and learning at both the tactical and strategic levels?
- What human systems integration strategies should be recommended that the submarine fleet adopt to account for the growth of new sensor and environmental data?

Decision Aids:

- How to integrate different sources of information into a common display that provides the commanding officer a seamlessly simple process to understand the surrounding environment? Today's submarine is equipped with numerous sources of spatially disparate information that prevents the commanding officer from establishing good situational awareness of the submarine's internal and external environment. Commanding officers are increasingly less connected to the system and are forced to spend substantial cognitive effort processing and integrating data which steals precious time needed for strategic planning and operational analysis. A new integrated data fused system may replace several dozen people jammed into a full control room to assist the single decision maker – the approach officer.
- What are the decision support software and displays required to aid the commanding officer in quickly reconfiguring systems or implementing damage control actions that would preserve warfare capability and maintain ship survivability?

- Can decision support tools allow submarines to be connected to the larger battle-force with emphasis on reducing latency of command?
- How to deliver an efficient search, retrieval, and "new posting" mechanism for the Navy's Distance Support program and the Submarine Force's Technical Data Knowledge Management program? These programs access information from off hull and dynamically update information stores such as tech manuals. What is the best solution to ensure the right person has the information at the right time?
- What is the best method to perform threat, environmental and acoustic validation and verification in uncertain environments?

Desired Outcomes: The research and development investment will result in the following products:

Outcome 1: Improved commanding officer (and crew) decision making and mariner skills.

Outcome 2: An integrated data fused system that provides the commanding officer a good tactical situational awareness. This data fused system replaces the several dozen crew members who currently support the single decision maker.

Outcome 3: Selection and training methods to improve the submarine war-fighter decision making abilities from every level of the crew.

Outcome 4: Decision aids to improve submarine tactical decision making.

Product Goals: Being able to deliver the right information to the right people at the right time so they can make accurate and timely decisions with the least amount of manpower and hardware support.

6.1.4: Capability Gap 4. "Achieve Optimal Manning"

Challenge: A vital Navy goal is the optimal crewing of the present and future fleet of ships and aircraft enabling a significant reduction in total ownership costs through reductions in personnel numbers in the Navy. Manpower accounts for the largest percentage of costs across the lifecycle of a ship, aircraft, or system. These costs must be reduced if the Navy is to have the balanced resources to meet the warfighting challenges of the 21st Century.

A key enabler in meeting this goal is application of a true systems approach to ship/aircraft/systems design and procurement; one that seamlessly integrates human factors along with more traditional engineering factors into the process.

Enabling Capability Gap: While the necessity for human systems integration is understood, its routine application in the design and procurement process is not uniformly accomplished, resulting in this enabler not meeting the Navy's needs. There are both

cultural and technical reasons for this capability gap. The cultural issues are being addressed at senior leadership levels via policies and instructions.

The technical issues such as shortcomings in requisite tools and models require research to understand these shortcomings and to develop the fixes and replacements. There are a myriad of systems integration tools and processes available to the acquisition and design communities, however most are considered inadequate to successfully manipulate design decisions. Further, there is a need to develop valid and reliable behavioral science performance models that can aid design decisions in the structured engineering processes that historically have been concerned with non-behavioral factors such as weight, size, operational performance, and cost.

Gap Specifics: At the Science and Technology (S&T) level the following questions need to be addressed:

Tool Assessment and Metrics:

- What is the quantitative and qualitative operational definition of an integrated "whole ship" system? What metrics quantify system manning requirements for an integrated "whole ship" system?
- Do the current plethora of strategies, tools, databases, and technologies that describe, measure, and model human performance satisfy acquisition design decision standards?
- Based upon results from a trade-off analysis, what modifications are required for human systems integration tools and processes to meet acquisition design expectations?
- What are the quantitative and qualitative metrics required by the acquisition community to use human systems integration tools and processes in the design process?
- Given that platform design manning decisions are multi-dimensional, what are the appropriate metrics and criterion values to accept or reject a manning design decision?
- How may performance support technologies within the tactical system's architecture alleviate instructor manning burdens created at training schoolhouses?

Tool Validation:

- Are the human systems integration tools and processes selected in the analysis valid and reliable?
- How effective were the human systems integration tools and processes in assisting the acquisition community design process?
- Are the human systems integration tools and processes robust across different platforms?
- Do tradeoff manning and training costs with material system factors in a computer simulation lead to lower total ownership (e.g., manning and training) costs?

Desired Outcomes: The research and development investment will result in the following products:

Outcome 1: Achieve required mission capabilities at lowest lifecycle cost.

Outcome 2: Assuming no reduction in warfighting capability, achieve quantitative modeling manning software that enables the following objectives:

- 10% reduction in manning onboard existing submarines.
- 50% reduction in manning for future submarines.
- 75 total crew for LCS
- 125 total crew for DDG 1000
- 900 total crew for CVN-21

Outcome 3: Achieve technological solutions to support reduced manning on watch bills as well as reduced collateral and incidental duties (e.g., stores loads, weapons loads, and other "all-hands evolutions"). These hardware and software solutions shall improve an operator's ability to manage workload requirements and decision making effectiveness.

Product Goals: A robust standardized set of human systems integrated specific modeling and simulation tools to assess the interaction between operators' performance by system design by manning levels. These advanced design methodologies and tools should support rapid, spiral, human-centered design processes.

6.2. Transition Requirement

The CM program is dedicated to development and focused transition of ***products*** to fleet or shore commands, to Programs of Record, and/or to engineering-development or acquisition programs at naval systems commands / Program Executive Offices. To help ensure this transition, a Technology Transition Agreement (TTA) will normally be required for each major product developed in an effort funded under this program. An exception to this requirement would be a product whose value would be recognized widely throughout the Navy / Marine Corps. Each TTA will be a formal memorandum of agreement among the product developer, the Office of Naval Research, and the transitioning command or program office and will contain: (1) a description of the product(s) to be transitioned if the research and development is successful, (2) a description of the exit criteria the product(s) must meet in order to transition, and (3) a statement of commitment by the receiving command or program office, should exit criteria be met, to fund further development or implementation, together with the transition funding profile, the Program Element and/or Budget Activity which will fund that transition. For efforts of less than three years duration, the TTA(s) will normally be required at project initiation. For longer projects, the TTA(s) will normally be completed no later than three years before intended transition.

7. Point(s) of Contact –

Questions of a technical nature shall be directed to the cognizant Technical Point of Contact, as specified below:

Dr. William K. Krebs
Office of Naval Research
Capable Manpower Human Systems Integration Program Officer
Naval Warrior Applications Division, Code 342
875 North Randolph Street, Rm. 1037
Arlington, VA 22203-1995

Telephone: (703) 696-2575
Fax: (703) 696-1212
Email: krebsw@onr.navy.mil

Questions of a business nature shall be directed to the cognizant Contract Specialist, as specified below:

Wade Wargo
Office of Naval Research
Contract and Grant Awards Management Division, Code 254
875 North Randolph Street, Rm W1254
Arlington, VA 22203-1995

Telephone: (703) 696-0719
Fax: (703) 696-3365
Email: wargow@onr.navy.mil

8. Instrument Type(s) -

It is anticipated that primarily contracts will result from this announcement. However, ONR will consider awarding grants, cooperative agreements, or other transaction agreements to appropriate parties, should the situation warrant use of a non-contractual instrument.

9. Other Information -

CFDA No.: 12.300

10. Catalog of Federal Domestic Assistance (CFDA) Titles -
CFDA Title: DoD Basic and Applied Scientific Research

II. AWARD INFORMATION

Proposals from either a single performer or integrated, teamed efforts that address Applied Research (Budget Category 6.2) and Advanced Technology Development

(Budget Category 6.3) solutions are desired in the cost and period of performance range set forth below.

- Yearly Funding: $150,000/year to a maximum award of $2,000,000/year. However, lower and higher cost proposals may be considered. Most awards will be less than $2,000,000/year.
- Period of Performance: The period of performance for projects may be from one to five years, with an estimated start date of 01 October 2007, subject to date of final award and availability of funds each fiscal year.

ONR anticipates that approximately $4,500,000 per year will be available to fund work proposed under this BAA. Proposals for less than the maximum dollar award are generally preferred, and it is possible that few or no awards may be made near or above the maximum funding level. Only an exceptionally important, highly-integrated effort with great transition potential would qualify for an award near or above the maximum level.

The Office of Naval Research is seeking participants for this program that are capable of supporting the goals described in this announcement. Offerors have the opportunity to be creative in the selection of the technical and management processes and approaches to address the technology thrust areas.

ONR and other DOD agencies have funded related technology development under numerous programs. If offerors are enhancing work performed under other ONR or DoD projects, they must clearly identify the point of departure and what existing work will be brought forward and what new work will be performed under this BAA.

III. ELIGIBILITY INFORMATION

All responsible sources may submit a proposal, which shall be considered by the Government.

Historically Black Colleges and Universities (HBCU) and Minority Institutions (MI) are encouraged to submit proposals and join others in submitting proposals. However, no portion of this BAA will be set aside for HBCU and MI participation due to the impracticality of reserving discrete or severable areas of Manpower, Personnel, Training and Education (MPTE) and Human Systems Integration (HSI) technologies for exclusive competition among these entities.

Independent organizations and teams are encouraged to submit proposals in any or all capability-gap areas. In either case, offerors must be willing to cooperate and exchange software, data and other information in an integrated program with other contractors, as well as with system integrators, selected by ONR.

Industry-Academia-Government Partnering

ONR highly encourages partnering among industry, academia, and/or Government with a view toward speeding the incorporation of new science and technology into fielded systems. Government partners may include naval laboratories/centers or fleet/force commands. Proposals that use industry-academic-Government partnering which enhances the development of novel S & T advances will be given favorable consideration. Funding for any Government partners will not be provided through any awards from this announcement, but rather will be transferred directly to that Government entity.

Teaming Arrangements

ONR encourages partner or teaming arrangements but only one entity should be designated the technical and business Point of Contact for a team/partnership. That entity will be the prime contractor that is responsible for proposal submission, communications, and subsequent negotiations (if any).

IV. APPLICATION AND SUBMISSION INFORMATION

1. Application and Submission Process

The due date for receipt of Full Proposals is 4 p.m. (EDT) on 30 March 2007. It is anticipated that final selections will be made approximately 45 days after full proposal submission. As soon as the final proposal evaluation process is completed, the proposer will be notified via email of its selection or non-selection for an award. Proposals exceeding their page limit may not be evaluated.

2. Content and Format of Full Proposals

Proposals submitted in response to this BAA are expected to be unclassified. While classified work may be proposed, only unclassified proposals are permitted. The proposal submissions will be protected from unauthorized disclosure in accordance with FAR 15.207, applicable law, and DOD/DON regulations. Offerors are expected to appropriately mark each page of their submission that contains proprietary information. Only pages that contain proprietary information should be so marked; do not mark all pages with a "boilerplate" statement. The Proposal shall include a severable, self-standing Statement of Work which contains only unclassified information and does not include any proprietary restrictions.

IMPORTANT NOTE: Titles given to the proposals should be descriptive of the work they cover and not be merely a copy of the title of this announcement. Titles must not be marked as proprietary.

Full Proposal Format – Volume 1 - Technical and Volume 2 - Cost Proposal

- Paper Size – 8.5 x 11 inch paper, except for a maximum of two foldout pages not exceeding 11 x 17 inch paper.
- Margins – 1" inch
- Spacing – single or double-spaced
- Font – Times New Roman, 12 point
- Number of Pages – Volume 1 is limited to no more than 38 pages. Each foldout page up to the maximum of two will be counted as one page within the page count. There is no page limitation for Volume 2. Limitations within sections of the proposal are indicated in the individual descriptions shown below. The cover page, table of contents, and resumes are excluded from the page limitations. Full Proposals exceeding the page limit may not be evaluated.
- Copies – one (1) original, one (1) copy, and one (1) electronic copy on CD-ROM or DVD (in Microsoft® Word or Excel 97 compatible or .PDF format). If a grant is sought, the full proposal may be submitted electronically at http://www.grants.gov/ as delineated below.

Full Proposal Content

Volume 1: Technical Proposal

Volume 1 of the Full Proposal shall include the following sections, each starting on a new page. Page limitations on sections within this volume apply, if specified below.

- **Cover Page:** (Not included in page limitations.) This should include the words "Technical Proposal" and the following:

  1) BAA number;
  2) Title of Proposal;
  3) Identity of prime Offeror and complete list of subcontractors, if applicable;
  4) Principal Investigator (PI) contact (name, address, phone/fax, electronic mail address);
  5) Technical contact (name, address, phone/fax, electronic mail address);
  6) Administrative/business contact (name, address, phone/fax, electronic mail address); and,
  7) Duration of effort

- **Table of Contents:** (Not included in page limitations.)

- **Executive Summary:** (2 pages) Identify the capability gap(s) to which the proposal is addressed and summarize the technology products you are proposing to develop and the expected improvements to Navy / Marine Corps capability.

- **Concept of Operation for the Navy:** (2 pages) A summary of the way in which the proposal's product(s) would support the Navy / Marine Corps in an operational context. Include quantitative specifications for how the products will improve operational performance.

- **Plan for Transition of Products to Operation or Acquisition:** (2 pages) For each of the proposal's products, describe the intended transition plan including: the Navy or Marine Corps operational or system command(s) or program executive office which is planned to execute the Technology Transition Agreement (TTA) to implement or further develop the product; and the name of the transition program of record (if applicable). This section should provide an estimate and description of additional (post S&T) costs for engineering development and/or acquisition which would be required to effect product implementation or utilization.

- **Technical Approach:** (9 pages): A detailed description of the approach planned.

- **Statement of Work:** (6 pages) A Statement of Work (SOW) clearly detailing the scope and objectives of the effort and the technical approach. It is anticipated that the proposed SOW will be incorporated as an attachment to the resultant award instrument. To this end, such proposals must include a severable self-standing SOW without any proprietary restrictions, which can be attached to the contract or agreement award. Include a detailed listing of the technical tasks/subtasks organized by year.

- **Project Schedule and Milestones:** (1 page) A summary of the schedule of events and milestones. Please note that periods of performance will begin on or after 01 October 2007.

- **Deliverables and Exit Criteria:** (4 pages) A detailed description of the results targeted and products to be delivered, including quantifiable exit criteria products must meet in order to be accepted by transitioning organizations.

  Assertion of Data Rights and/or Rights in Computer Software: (Not included in page limitations.) Include here a summary of any proprietary rights to pre-existing results, prototypes, software, or systems supporting and/or necessary for the use of the research, results, and/or prototype. Any data rights asserted in other parts of the proposal that would impact the rights in this section must be cross-referenced. If there are proprietary rights, the Recipient must explain how these affect its ability to deliver research results and final data. Additionally, Recipient must explain how the program goals are achievable in light of these proprietary limitations. If there are no claims of proprietary rights in pre-existing data, this section shall consist of a statement to that effect. The rules governing these assertions are prescribed in

Defense Acquisition Regulation Supplement (DFARS) clauses 252.227-7013, -7014 and -7017. These clauses may be accessed at the following web address: http://farsite.hill.af.mil/VFDFARA.HTM. The Government may challenge assertions that are provided in improper format or that do not properly acknowledge earlier federal funding of related research by the Offeror.

- **Operational Utility:** (2 pages) A detailed plan for assessing the operational utility of the key products of this effort during a Fleet or Marine operational exercise, including proposed metrics.

- **Qualifications**: (5 pages) A discussion of previous accomplishments and work in this, or closely related, areas, and the qualifications of the investigators. Key personnel resumes shall be attached to the proposal and will not count toward the page limitations.

- **Management Approach:** (5 pages) A discussion of the overall approach to the management of this effort, including brief discussions of the total organization; use of personnel; project/function/subcontractor relationships; government research interfaces; and planning, scheduling and control practices. Identify which personnel and subcontractors (if any) will be involved. Include a description of the facilities that are required for the proposed effort with a description of any Government Furnished Equipment/Hardware/Software/Information required, by version and/or configuration.

VOLUME 2: Cost Proposal

The Cost Proposal shall consist of a cover page and two parts. Part 1 will provide a detailed cost breakdown of all costs by cost category by calendar or fiscal year and Part 2 will provide a cost breakdown by task/sub-task using the same task numbers in the Statement of Work. Options must be separately priced.

Although not required and provided for informational purposes only, detailed instructions, entitled "Instructions for Preparing Cost Proposals for Contracts and Agreements", including a sample template for preparing costs proposals for contracts and agreements, may be found at ONR's website listed under the 'Acquisition Department – Contracts & Grants - Submitting a Proposal' link at: http://www.onr.navy.mil/02/how_to.asp

Cover Page: The use of the SF 1411 is optional. The words "Cost Proposal" should appear on the cover page in addition to the following information:

- BAA number
- Title of Proposal
- Identity of prime Offeror and complete list of subcontractors, if applicable

- Technical contact (name, address, phone/fax, electronic mail address)
- Administrative/business contact (name, address, phone/fax, electronic mail address) and
- Duration of effort (differentiate basic effort and options)
- Summary statement of proposed costs

Part 1: Detailed breakdown of all costs by cost category by calendar or fiscal year:

- **Direct Labor** – Individual labor category or person, with associated labor hours and unburdened direct labor rates;
- **Indirect Costs** – Fringe Benefits, Overhead, G&A, COM, etc. (Must show base amount and rate);
- **Proposed Contractor-Acquired Equipment** – such as computer hardware for proposed research projects should be specifically itemized with costs or estimated costs. An explanation of any estimating factors, including their derivation and application, shall be provided. Where possible, indicate purchasing method (competition, price comparison, market review, etc…);
- **Travel** – Number of trips, destination, duration, etc.;
- **Subcontract** – A cost proposal as detailed as the Offeror's cost proposal will be required to be submitted by the subcontractor. The subcontractor's or subrecipient's cost proposal can be provided in a sealed envelope with the Offeror's cost proposal or will be obtained from the subcontractor prior to award;
- **Consultant** – Provide consultant agreement or other document which verifies the proposed loaded daily/hourly rate;
- **Materials** - should be specifically itemized with costs or estimated costs. An explanation of any estimating factors, including their derivation and application, shall be provided. Include a brief description of the Offeror's procurement method to be used (Competition, engineering estimate, market survey, etc.);
- **Other Directs Costs** - particularly any proposed items of equipment or facilities. Equipment and facilities generally must be furnished by the contractor/recipient. (Justifications must be provided when Government funding for such items is sought). Include a brief description of the Offeror's procurement method to be used (Competition, engineering estimate, market survey, etc.);
- **Grant Specific Costs** – Costs not normally associated with contracts, such as Graduate Assistant tuition, laboratory fees, report and publication costs and;
- **Fee/Profit including fee percentage** – (contract proposals only)

Part 2: Cost breakdown by task/sub-task corresponding to the same task breakdown in the proposed Statement of Work. When options are contemplated, options must be separately identified and priced by task/subtask.

3. Significant Dates and Times

Anticipated Schedule of Events		
Event	Date (MM/DD/YEAR)	Time (Local Time)
Full Proposals Due Date	30 March 2007	1600
Notification of Selection*	45 days after proposal Due Date	N/A
Contract Awards *	15 September 2007	N/A
Period of Performance begins*	01 October 2007	N/A

* These dates and times are estimates as of the date of this announcement.

4. Submission of Late Proposals

Any proposal, modification, or revision, that is received at the designated Government office after the exact time specified for receipt of proposals is "late" and will not be considered unless it is received before award is made, the contracting officer determines that accepting the late proposal would not unduly delay the acquisition and

(a) If it was transmitted through an electronic commerce method authorized by the announcement, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(b) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of proposals and was under the Government's control prior to the time set for receipt of proposals; or

(c) It was the only proposal received.

However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

Acceptable evidence to establish the time or receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the Government office designated for receipt of proposals by the exact time specified in the announcement, and urgent Government requirements preclude amendment of the announcement closing date, the time specified for receipt of proposals will be deemed to be extend to the same time of day specified in the announcement on the first work day on which normal Government processes resume.

The contracting officer must promptly notify any Offeror if its proposal, modifications, or revision was received late and must inform the Offeror whether its proposal will be considered.

5. Submission of Grant Proposals to Grants.gov

Grant proposals may be submitted through Grants.gov or by hard copy as specified in paragraph 6 below. Regardless of whether Grants.gov is used or "hardcopy" submission, the Offeror must use the Grants.gov forms from the application package template associated with the BAA on the Grants.gov website. To be considered for award, applicants must include the ONR Department Code in Block 4 entitled 'Federal Identifier' of the Standard Form (SF) 424 R&R. **Please be sure to enter the Department Code that best relates to your proposal in Block 4 (Federal Identifier) of the SF 424 R&R to ensure that it is properly routed to the correct Program Office. Only one Department Code may be selected.** Please choose at the sub-Department level wherever possible (i.e., for parent ONR Code 30, you should select at the 301, 302 or 303 level if possible). A list of the Department Codes can be found at http://www.onr.navy.mil/ on the right side of the screen. For those Applicants who fail to provide a Department Code identifier will receive notification that their proposal submission has been rejected.

For electronic submission, there are several one-time actions that must be completed in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). See www.grants.gov, specifically www.grants.gov/GetStarted.

Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/applicants/register_your_organization.jsp which will provide guidance through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called 'MPIN' are important steps in the CCR registration process. Applicants who are not registered with CCR and Grants.gov should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible. Additionally, in order to download the application package, applicants will need to install PureEdgeViewer. This small, free program will allow applicants to access, complete, and submit applications electronically and securely. For a free version of the software, visit the following website: www.grants.gov/DownloadViewer. Any questions that may arise relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

Detailed instructions entitled "Grants.Gov Electronic Application and Submission Information" on how to submit a Grant proposal through Grants.gov may be found at the ONR website listed under the 'Acquisition Department – Contracts & Grants Submitting a Proposal' link at: http://www.onr.navy.mil/02/how_to.asp

6. Address for the Submission of Full Proposals for Contracts, Grants, and Agreements-

Capable Manpower Submission Coordinator
Naval Warrior Applications Division
Office of Naval Research
Code ONR 342CM, Rm. 1037
875 North Randolph Street
Arlington, VA 22203-1995

NOTE 1: PROPOSALS SENT BY FAX OR EMAIL WILL NOT BE CONSIDERED.

NOTE 2: Due to changes in security procedures since 11 September 2001, the time required for hard-copy written materials to be received at the Office of Naval Research through the U.S. Postal Service has increased. Thus it is recommended that any hard-copy proposal be mailed several additional days before the deadline established in the solicitation so that it will not be received late and thus ineligible for award consideration.

V. EVALUATION INFORMATION

1. Evaluation Criteria –

Full Proposals will be selected through a technical/scientific/transition/cost decision process with non-cost considerations being significantly more important than cost. Even though cost is of less importance than all the non-cost factors combined, it will not be ignored. The degree of its importance will increase with the degree of equality of the proposals in relation to the other factors on which selection is to be based, or when the cost is so significantly high as to diminish the value of the technical superiority to the Government. Criteria A-D are listed in descending order of priority. Any sub-criteria listed under a particular criterion are of equal importance to each other.

A. Overall scientific / technical merit, quality, and feasibility of the proposal.

(1) The degree of innovation or originality
(2) The soundness of technical concept
(3) The Offeror's awareness of the state of the art and understanding of the scope of the problem and the technical effort needed to address it

B. Naval relevance, transition potential and anticipated contributions of the proposed technology to human systems integration in naval operations.

(1) Likelihood that the proposed work will result in transitionable product(s) which address one or more of the capability gaps described in this announcement.
(2) Potential to enhance the overall management or performance of military personnel, which includes selection, training and education, distribution, assignment, and the design of human-system interfaces, and the integration of humans in naval systems.
(3) Perceived need and benefit of the proposed research and understanding of the Fleet capability or warfare area to which transition would occur

C. Offeror's capabilities, related experience, and past performance, including the qualifications, capabilities and experience of the proposed principal personnel

(1) The quality of technical personnel proposed including qualifications, capabilities and experience of the proposed Principal Technical Investigator, Project Manager, and other key personnel critical in achieving the proposed objectives
(2) The Offeror's experience in relevant efforts with similar resources, including experience in transitioning products to operations or acquisition.
(3) The ability to manage the proposed effort, and adequacy of Offeror's facilities to conduct proposed development.

D. The reasonableness and realism of the proposed cost

(1) Total cost relative to benefit
(2) Reasonableness and realism of cost levels for facilities and staffing

Socio-Economic Merits - For proposed awards made as contracts, the socio-economic merits of each proposal will be evaluated based on the extent of the Offeror's commitment in providing meaningful subcontracting opportunities (to the maximum extent practicable) for small businesses, HUBZone small businesses, small disadvantaged businesses, woman-owned small businesses, veteran-owned small businesses, service disabled veteran small businesses, historically black colleges and universities, and minority institutions.

Industry-Government Partnering – ONR highly encourages partnering among industry and Government with a view toward speeding the incorporation of new science and technology into fielded systems. Proposals that utilize industry-Government partnering which enhances the development of novel S&T advances will be given favorable consideration.

Industry-Academia Partnering – ONR highly encourages partnering among industry and academia with a view toward speeding the incorporation of new science and technology

into fielded systems. Proposals that utilize industry-academic partnering which enhances the development of novel S&T advances will be given favorable consideration.

Options - The Government will evaluate options for award purposes by adding the total cost for all options to the total cost for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

2. Evaluation Panel -

Potential Offerors should understand that government technical experts drawn from the Office of Naval Research and other naval, defense, and federal activities/agencies will participate in the evaluation of the Full Proposals. The Government may use selected support personnel to assist in providing both technical expertise and administrative support regarding any ensuing proposals from this announcement. These support contractors will be bound by appropriate non-disclosure agreements to protect proprietary and source-selection information.

VI. AWARD ADMINISTRATION INFORMATION

- The North American Industry Classification System (NAICS) code – The North American Industry Classification System (NAICS) code for this announcement is 541710 with a small business size standard of 500 employees.

- CCR - Successful Offerors not already registered in the Central Contractor Registry (CCR) will be required to register in CCR prior to award of any grant, contract, cooperative agreement, or other transaction agreement. Information on CCR registration is available at http://www.onr.navy.mil/02/ccr.htm.

- Certifications – Proposals for contracts and assistance agreements should be accompanied by a completed certification package which can be accessed on the ONR Home Page at Contracts & Grants located at http://www.onr.navy.mil/02/rep_cert.asp.

  For contracts, in accordance with FAR 4.1201, prospective contractors shall complete electronic annual representations and certifications at http://orca.bpn.gov. The Online Representations and Certifications Application (ORCA) must be supplemented by DFARS and contract specific representations and certifications found at http://www.onr.navy.mil/02/rep_cert.asp.

  For grant proposals and proposals for cooperative agreements or other transaction agreements (other than for prototypes), the certification package is entitled, "Certifications for Grants and Agreements."

- Subcontracting Plans - Successful contract proposals that exceed $550,000, submitted by all but small business concerns, will be required to submit a Small Business Subcontracting Plan in accordance with FAR 52.219-9, prior to award.

- Models – Model grant, cooperative agreement, other transaction agreement, and contract documents may be found on the ONR website at http://www.onr.navy.mil/02/model_awards.asp.

2. Deliverables -

The following is a sample of reporting deliverables that could be required under a research effort. The following deliverables, primarily in contractor format, are anticipated as necessary. However, specific deliverables should be proposed by each Offeror and finalized with the contracting agent:

- Detailed Technical Data
- Monthly Technical and Financial Progress Reports
- Presentation Material(s)
- Annual Progress Report
- Other Documentation or Reports as required, including reports on results of experimentation or demonstrations of products.
- Final Report

Specific data deliverables should be proposed by each offeror and finalized during negotiations. For any contracts awarded from this solicitation in which the developed products for the relevant capability gaps are for software, prototypes, and/or other hardware deliverables, these items will be included as not-separately-priced deliverables in the contract. Any software deliverables must provide the Government with source code for all modules in which government funds were used in the development.

VII. OTHER INFORMATION

1. Government Property/Government Furnished Equipment (GFE) and Facilities

Each proposer must provide a very specific description of any equipment/hardware that it needs to acquire to perform the work. This description should indicate whether or not each particular piece of equipment/hardware will be included as part of a deliverable item under the resulting award. Also, this description should identify the component, nomenclature, and configuration of the equipment/hardware that it proposes to purchase for this effort. The purchase on a direct reimbursement basis of special test equipment or other equipment that is not included in a deliverable item will be evaluated for allowability on a case-by-case basis. Maximum use of Government integration, test, and experiment facilities is encouraged in each of the Offeror's proposals.

Government research facilities and operational military units are available and should be considered as potential government- furnished equipment/facilities. These facilities and resources are of high value and some are in constant demand by multiple programs. It is unlikely that all facilities would be used for any one specific program. The use of these

facilities and resources will be negotiated as the program unfolds. Offerors should explain as part of their proposals which of these facilities they recommend are critical for the project's success.

2. Security Classification

In order to facilitate intra-program collaboration and technology transfer, the Government will attempt to enable technology developers to work at the unclassified level to the maximum extent possible. If access to classified material will be required at any point during performance, the Offeror must clearly identify such need prominently in its proposal.

3. Project Meetings & Reviews

Program status reviews may also be held to provide a forum for reviews of the latest results from experiments and any other incremental progress towards the major demonstrations. These meetings will be held at various sites throughout the country. For costing purposes, offerors should assume that 40% of these meetings will be at or near ONR, Arlington VA and 60% at other contractor or government facilities. Interim meetings are likely, but these will be accomplished via video telephone conferences, telephone conferences, or via web-based collaboration tools.

4. Use of Animals and Human Subjects in Research

If animals are to be utilized in the research effort proposed, the Offeror must complete a DOD Animal Use Protocol with supporting documentation (copies of AAALAC accreditation and/or NIH OLAW Animal Welfare Assurance approval letter, IACUC approval, research literature database searches, and the two most recent USDA inspection reports) prior to award. Similarly, for any proposal for research involving human subjects the Offeror must submit prior to award: documentation of approval from an Institutional Review Board (IRB); IRB-approved informed consent form; IRB-approved research protocol; an executive summary of planned research (one-half to one page in length); proof of completed human research training (e.g., training certificate, institutional verification of training, etc.); an application for a DoD Navy Addendum to the Offeror's DHHS-issued Federalwide Assurance (FWA) or the Offeror's DoD Navy Addendum number. The forms for assurance applications can be found at http://www.onr.navy.mil/sci_tech/34/343/ . If the research is determined by the IRB to be greater than minimal risk, the Offeror also must provide the name and contact information for the independent medical monitor. [Note: for research involving human subjects that is greater than minimal risk, administrative procedures to protect human subjects from medical expenses (not otherwise provided or reimbursed) that are the direct result of participation in a research project must be addressed. Documentation describing those procedures may be requested. For additional information on this topic please email 343_contact@onr.navy.mil.] For assistance with submission of animal and human subject research related documentation, contact the ONR Animal/Human Use Administrator at (703) 696-4046.

5. Department of Defense High Performance Computing Program

The DoD High Performance Computing Program (HPCMP) furnishes the DoD S & T and DT & E communities with use-access to very powerful high performance computing systems. Awardees of ONR contracts, grants, and assistance instruments may be eligible to use HPCMP assets in support of their funded activities if ONR Program Officer's approval is obtained and if security/screening requirements are favorably completed. Additional information and an application may be found at http://www.hpcmo.hpc.mil/.

6. Interactive Courseware or Training Materials:

For products developed under an award pursuant to this announcement, in accordance with DOD Instruction 1322.20 and OPNAV Instruction 1500, the government will obtain, to the extent authorized by the Federal Acquisition Regulations (FAR), unlimited rights or Government-purpose license rights to the training programs, courseware, associated presentation programs necessary to develop, interpret, and execute the courseware, documentation, and associated training materials for all ICW programs developed for or by the DON. These rights shall include the royalty-free rights to use, duplicate, and disclose data for Government purposes and to permit others to do so for Government purposes. The Government shall not agree to pay royalties, recurring license or run-time fees, use tax, or similar additional payments for courseware, associated presentation programs necessary to interpret and execute the courseware, documentation, or associated training materials for ICW programs developed for or by the Department of the Navy (DON).

7. Submission of Questions

Any questions regarding this solicitation must be provided to the Science and Technology Point of Contact and/or Business Point of Contact listed in this solicitation. Questions must be submitted by 4:00 p.m. EST on 23 March 2007. Questions submitted after this date and time may not be answered and the due date for submission of proposals will not be extended.