

UNITED STATES ARMY RESEARCH OFFICE
INSTITUTE FOR SOLDIER NANOTECHNOLOGIES
PROGRAM ANNOUNCEMENT/SOLICITATION

Table of Contents

1. Executive Summary	2
2. Introduction	3
3. Research Program Volume	5
3.1. Background	5
3.2. Research Program	6
3.3. Outreach Plan	9
4. Program Management Volume	11
4.1. Management Plan	11
4.2. Technology Transition Management Plan	13
5. University Commitment and Costs Volume	14
5.1. Dedicated Facilities and Infrastructure	14
5.2. Total Costs	15
5.3. Co-Investment Plan	16
5.4. Subcontracting Plan	16
6. Proposal Preparation and Submission	16
6.1. Proposal Format Information	16
6.2. Marking of Proposals	18
6.3. Proposal Submission Information	19
6.4. Late Submissions, Modifications and Withdrawals of Proposals	19
7. Evaluation and Award	20
7.1. Research Program Volume	22
7.2. Program Management Volume	23
7.3. University Commitment and Costs Volume	26

Institute for Soldier Nanotechnologies

1. Executive Summary

Purpose:

The Army has developed a plan for transformation into an Objective Force that is more responsive, deployable, agile, versatile, lethal, survivable and sustainable than today's forces. Since the individual soldier will be at the center of the objective force and will require systems revolutionary in their capabilities, the Army's science and technology program in the emerging nanoscience arena is being extended to address this need. Thus, in response to the Army Vision, the Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology) has asked the Army Research Office (ARO) to create a University Affiliated Research Center (UARC) entitled the "Institute for Soldier Nanotechnologies", or ISN. The purpose of this research center of excellence is to develop unclassified nanometer-scale science and technology solutions for the soldier. A single university will host this center, which will emphasize revolutionary materials research toward advanced soldier protection and survivability capabilities. This center will work in close collaboration with industry, the Army's Natick Soldier Center (NSC), the Army Research Laboratory (ARL) and the other Army Research Development and Engineering Centers (RDECs) in pursuit of its goals.

Funding:

This Program Announcement is issued subject to the availability of funds. Offerors are reminded that this request is subject to Presidential, Congressional and Departmental approval. The anticipated basic research effort is to be funded with FY-02 through FY-06 6.1 RDT&E funds in the amount of \$50,000,000.

It is anticipated that additional FY-02 through FY06 6.2 RDT&E funds, up to \$20,000,000, may also be provided, in the form of subsequent UARC subcontracts, for accelerated transition of research concepts into producible technologies by industrial partners participating in research at the ISN.

Period of Performance:

The period of performance will be five years and the estimated total cost is \$50,000,000 with provisions for subsequent additional UARC subcontracting efforts by industrial partners for as much as \$20,000,000. Award is projected for third quarter FY-02. It is possible that a highly successful organization could continue for additional years.

Profit or Fee:

In accordance with DOD Guidance on University Affiliated Research Centers, agreements awarded as a result of this Program Announcement will be restricted to universities and other, university affiliated, non-profit organizations.

Proposal Submission:

Section 6 of this Program Announcement provides information on Proposal Preparation and Submission. Note that there are page limitations and other requirements detailed in Section 6. Proposals must be received by the ARO by **2:00 PM Eastern time on 15 November 2001** at the following addresses:

For USPS:

Draft Solicitation

U.S. Army Materiel Command Acquisition Center
Research Triangle Park Division
ATTN: AMSSB-ACR (Patsy Ashe)
P.O. Box 12211
Research Triangle Park, NC 27709-2211

For FedEx, UPS etc.:

U.S. Army Materiel Command Acquisition Center
Research Triangle Park Division
ATTN: AMSSB-ACR (Patsy Ashe)
4300 S. Miami Blvd.
Durham, NC 27703

Proposals received after the deadline will be handled in accordance with the provisions detailed in Section 6. Facsimile transmissions or electronic media transmissions are not permitted.

Evaluation and Award:

Evaluation and Award in connection with this Program Announcement will be performed in accordance with Section 7 of this Program Announcement.

Amendments:

Amendments to this Program Announcement will be released via the Internet on the ARO web-site (<http://www.aro.army.mil/soldiernano/index.htm>). Offerors are encouraged to monitor the ARO web-site to ensure they have any and all amendments to the Program Announcement prior to submitting an offer.

Contact Information:

Interested parties are encouraged to submit comments or questions via electronic mail to the e-mail address listed below. Comments or questions submitted should be concise and to the point, eliminating any unnecessary verbiage. In addition, the relevant part and paragraph of the Program Announcement should be referenced. Answers will be posted on the Q&A section of the ARO web-site:

<http://www.aro.army.mil/soldiernano/Q&A.htm>

The e-mail address is: QA@arl.aro.army.mil

Acquisition Schedule:

The following is an estimated schedule for the events leading to award under this Announcement:

EVENT	ESTIMATED DATE
Program Announcement Issued	01 Sep 2001
Proposals Due	15 Nov 2001
Negotiations Conducted	10 Dec 2001 - 30 May 2002
Award	01 Jun 2002

2. Introduction

The Army has established the goal of transforming itself into an Objective Force that is more responsive, deployable, agile, versatile, lethal, survivable and sustainable than the current legacy or pending interim force. The individual soldier will continue to be at the center of the Objective Force, but new technology will be needed to provide

revolutionary new capabilities. Recent advances in the field of nanoscience suggest that it may be possible to provide the soldier with radically new capabilities and full-spectrum threat protection without incurring significant weight or volume penalties. However, such soldier systems will only be realized by directing new resources to the Army's science and technology program in the emerging field of nanoscience. Thus, in response to the Army Vision, the Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology) has asked the Army Research Office (ARO) to create a University Affiliated Research Center (UARC), the "Institute for Soldier Nanotechnologies", or ISN.

Therefore, the Army Research Office announces its intention to create a research center of excellence to identify and develop unclassified nanometer-scale science and technology, which will enhance the combat survivability of future soldiers. A single university will host this center, which will emphasize revolutionary materials research toward development of advanced soldier protection concepts. This approach will integrate a wide range of functionalities, including multithreat protection against ballistics, sensory attack, chemical and biological agents; climate control (cooling, heating, and insulating), possible chameleon-like garments; biomedical monitoring; and load management. The objective is to enable a revolutionary advance in soldier survivability through the development of novel materials for integration into the Objective Force Warrior system. To be effective, the research solutions will have to be compatible with a variety of complicating factors, including soldier mission requirements, limited energy resources, communications needs, and rugged insensitivity or adaptive responsivity to extremes of temperature, humidity, storage, damage, and soilage.

The single university host will be selected through a limited competition with the intention of creating a unique national asset conducting revolutionary materials research. The Army will invest \$10M annually for this University Affiliated Research Center (UARC) to concentrate on innovative materials research for the soldier. It is anticipated that the single university host will provide a dedicated facility for this UARC and, along with its industrial partners, will commit significant infrastructure, resources, and personnel to complement the government's investment.

The Army also requires that the UARC create cooperative partnerships with industry. This will ensure that the technical innovations emerging from the research will transition into militarily relevant applications and result in producible technologies. Partnerships will be manifested in several ways. Because of the potential for developing spin-off commercial products, it is anticipated that industry will place personnel at the UARC in order to participate in the research. Industrial partners will bear the costs of their on-site personnel and may also co-invest in the development or operation of the UARC itself. In addition, the Army will supply applied research funding, in the form of subsequent subcontracts to the UARC, to sponsor specific efforts by the industrial partners to accelerate the transition of novel concepts into products.

The primary goal of the UARC is to create an expansive array of innovations in nanoscience and nanotechnology for a variety of survivability-related applications that will be harvested by the industrial partner(s) for future Army use. The interrelationship between university innovation and industrial integration is expected to evolve over the lifetime of the UARC, driven by opportunities opened by university innovation and by

needs responding to evolving Army requirements. The UARC will be expected to garner industrial participation aggressively before and after the UARC contract is awarded. The management of the UARC must provide a flexible means for managing the industrial participation and adapting to change while maintaining focus on the core goals of the Institute. A criterion for selection will be a comprehensive and compelling plan for creating innovation and managing technology transition from lab to applications.

The structure of this announcement is as follows. The proposals shall be submitted in three volumes by each offeror, and the announcement lists the requirements for each volume. The first volume specifies the technical aspects of the work to be performed, identifying how research innovation will be accomplished. Both research concentration areas must be addressed, and an integration and outreach plan for the UARC must be specified. The second volume outlines how the UARC will be managed internally and within the larger university context. The technology transition plan contained in this volume must indicate how the UARC will coordinate and collaborate with the ongoing Army research activities and how it will attract and interact with industrial partners to accomplish technology transition. The final volume specifies the budget and the university and industrial commitment to the UARC. Among the required elements are descriptions of the dedicated facility and infrastructure provided to host this UARC as well as any in-kind cost sharing or co-investment proposed by the university and its current or potential industrial partners.

3. Research Program Volume

3.1. Background

The Secretary of Defense has identified four overriding defense strategy objectives for the military: 1) to assure friends and allies; 2) to dissuade future adversaries; 3) to deter threats and counter coercion; and 4) to defeat adversaries if deterrence fails. The military is currently modernizing itself to face these objectives in a post cold-war world. Most of the efforts are focused on increasing command and control, lethality, mobility, survivability, and sustainability of systems in the field.

For the Army, the particular focus has been on rapid deployability. The Cold War called for a heavy guardian force to be pre-positioned in the anticipated theater and equipped to dominate the battlefield with high tactical mobility, survivability and lethality overmatch. Recent military engagements, however, have demonstrated the need for significant changes in this force. Global threats persist, but they are now in the form of a light/medium tactical force capable of rapidly escalating capabilities in their local region of influence. In response, the Army has defined a transformation vision for creating the Objective Force, a strategically mobile force capable of handling the full spectrum of future operations from stability and support operations through major theater war.

Despite a significant emphasis on vehicles and systems, the main tasks necessary to achieve the Secretary of Defense's defense strategy objectives remain with the individual soldier. Investment is now required to address the individual soldiers' effectiveness in peacekeeping, low-intensity operations, combat, and MOUT (military operations in urban terrain). Progress needs to be made towards enhancing the individual dismounted soldiers' survivability in the battlespace, sensory and communications abilities in the battlespace, target acquisition capabilities, mobility and maneuverability,

or ability to withstand an entire spectrum of stress factors. This project is intended to address soldier survivability in particular by the formation of an institute that will serve as a source for future materials related innovation as a part of the Army's overall technology strategy for applying nanotechnology to the soldier's ensemble in order to enhance soldier protection.

3.2. Research Program

3.2.1. Statement of Objectives

The main objective of this project is the establishment of an Institute for Soldier Nanotechnologies (ISN). The Institute will be chartered to conduct unclassified basic research into the creation and utilization of materials, devices, and systems through the control of matter on the nanometer-length scale and the ability to engineer matter at the level of atoms, molecules, and supramolecular structures. The Institute will also research techniques for generating larger structures with fundamentally new molecular organizations exhibiting novel physical, chemical, and biological properties and phenomena. The aim of the research is to learn to exploit these properties and efficiently manufacture and employ these structures to the benefit of the individual soldier.

The main objective of the ISN is to serve as the Army's focal point for basic research into nanotechnology for application to the future soldier. In addition, the Institute will be expected to serve as an Army corps of technical expertise, providing nanotechnology related basic research and technical support to Army intra- and extramural applied research and development projects for advanced and enabling technologies required by the soldier and soldier support systems. The core capabilities of the ISN will be centered on the nanotechnologies required by the soldier and soldier support systems, with an emphasis on soldier survivability. The Institute will perform cooperative research with industry, the Army Research Laboratory (ARL), the Army's Natick Soldier Center (NSC) and the Army's other Research, Development and Engineering Centers (RDECs). The Institute will work closely with ARL, NSC, the other Army RDECs, and with industry to transition new technologies from the laboratory to new products for the soldier and spin-off commercial applications. To fill this role, a large centralized research facility is envisioned which will house world-class scientists and research infrastructure. While the initial contract will be for five (5) years, it is possible that a highly successful organization could continue for additional years.

3.2.2. Statement of Work

In researching advanced and enabling technologies to help soldiers be as effective as they can be, the ISN should look at the individual soldier as an integrated platform system. Viewing the soldier as a system, individual research objectives should focus on enhancing the soldiers protection against the full spectrum of threats - ballistic, chem/bio, and electromagnetic. By creating a wide variety of new nanometer-scale technologies the ISN should create a wealth of opportunities to improve soldier survivability in diverse environments and conditions, preparing the soldier for the unique threats of the coming century. A list of required research topical areas is presented below. These have been assembled based on the findings of several workshops on the topic of nanotechnology as applied to soldier systems, including the ARO Workshop entitled "Nanoscience for the Soldier", the Proceedings from which may be found at

<http://www.aro.army.mil/nanosoldier/>. This should serve as a possible starting point for planning the Institute. In addition, background on current and emerging Soldier System requirements is available on the NSC website at <http://www.natick.army.mil/>. The offeror is encouraged, however, to identify additional research objectives and technology transition plans based on their own conclusions and the perceived strengths of their own facilities and personnel. Also, the offeror is required to maintain adequate flexibility so as to allow the research program to develop and evolve over time after the Institute is established.

The research requirements have been divided into two broad categories: Soldier Protection and Materials Development and Processing. The offerors may, at their discretion, structure the technical proposals as either a single, large research program or as a collection of separate, though interrelated, research tasks. It should be noted, however, that the intent of this program is to fund a multidisciplinary institute with a single focus and purpose. **A collection of loosely related tasks by individuals or small groups that do not show significant integration, coordination, and synergy will not be considered responsive.**

3.2.2.1. Soldier Protection

The offeror must specify a research plan that creates a variety of nanotechnological solutions to provide research to increase the survivability of the soldier. In the battlespace, this may start with lightweight protection of the soldier from a variety of threats that may be present, such as simple cut, puncture, and tearing, flame/fire protection, and directed energy/laser protection. Lightweight ballistic protection is of concern including the threats from fragments and flechettes to small arms. Protection should also include sight and hearing protection from such threats as laser dazzling and flash blinding and protection from the high levels of shock and noise typical of the battlespace. The development of barrier or selectively permeable materials for adaptive environmental control including chemical and biological threat protection is of major interest.

Enhanced survivability in the battlespace can also be accomplished by concealment. For this reason, research leading to the development of adaptive camouflage (chameleon-like) and the ability to modify the soldier's signature across the EM spectrum is of considerable interest. Also of interest would be research that could lead to the development of interactive textiles or clothing that may include active fibers or other active sensors to detect local threats or to have IFF (identification friend/foe) capabilities.

The protection of the soldier outside of the battlespace is also of concern. This includes protection from weather and terrain. The individual's ability to carry loads over long distances or traverse vertical obstacles; to hear, communicate, and interpret battlespace conditions; and the requirements for nutrition etc. are responsible for much of the logistical footprint associated with the soldier. Because of this logistical footprint, and the need to meet the logistical demands in the field, the weight of the soldiers' equipment becomes a serious survivability problem. Basic research that could spur the development of passive or active heating and/or cooling systems to regulate body temperature and reduce the total load carried by the soldier would be valuable. Research might also address the development of autonomous systems to detect and treat wounds or trauma. This could include the collection and integration of physiological data based on

a wide array of nanosensor structures interfaced with the soldier. Finally the technology of self-cleaning and/or self-repairing clothing would help protect the soldier from field damage, insects, and disease is of interest.

3.2.2.2. Materials Development and Processing

The offeror must specify a research plan that creates a variety of means to fabricate, analyze, and process nanometer-scale materials. The ability to create the new systems proposed for enhanced protection of the soldier is limited by the availability of materials with the properties that will enable the development of these systems. When materials with the necessary properties to create a specific system do exist, there remains the question of availability and affordability of such materials. The ability to produce single subsystems on a laboratory scale is of no particular interest to the Army unless the capability to produce large quantities in a reasonable time frame exists. For that reason, the development and processing of macroscopic quantities of nanosystems will be a topic of critical importance for the Institute and will be a primary focus of research into new protective systems as described above. The Institute will focus on the discovery of revolutionary materials, systems-of-materials, and enabling processing strategies. This is an area in which industry partnering is expected to be particularly relevant, with industry researchers participating in the basic research program (under industry sponsorship) and industry performing applied research to demonstrate producibility (under Army sponsorship).

The expected fabrication and processing tasks may include such activities as the synthesis, production, and handling of nanoscale building blocks, directed- or self-assembly of nanostructures, physical and biological templating, the development of multifunctional hierarchical order, and the scale-up of nanofabrication manufacturing techniques. All such work should lead to affordable and durable multi-functional soldier uniform and equiptage applications.

It is expected that predictive phenomenological materials modeling will be developed across multiple length (atomic to soldier) and time (picosecond to decade) scales. Such fundamental tools for modeling will provide a means for relating nanoscale properties and architectures to macro scale performance. It is expected that these models can in turn be developed into design tools that will allow novel materials to be contemplated, analyzed, and optimized prior to their fabrication and characterization.

As important as the fabrication and modeling tasks are the expected materials characterization tasks. A variety of characterization tools and techniques are expected to be developed and exploited, including analysis of nanoscale composition and structure, heterogeneities, surfaces and interfaces, and the measurement of physical properties and phenomena at the nanoscale. In addition, high throughput screening techniques appropriate for combinatorial development methods may be of interest. Of particular importance is the characterization of nanoscale dynamics and interactions and, through this, the determination of mechanical response and strain rate behavior of nanoscale structures.

Finally, it is expected that the synthesis, modeling, and characterization tasks will not operate in isolation but will progress synergistically toward the design, fabrication, and analysis of novel nanoscale materials technology. Because this combined effort undergirds the activities of the entire Institute, the Research Plan must explicitly address

how these tasks will be integrated into a state-of-the-art nanomaterials foundry, particularly in partnership with industry.

3.3. Outreach Plan

A significant Outreach effort is expected to accompany the Research Program. The Outreach Plan should outline the primary means by which the research developed by the Institute will be transferred to benefit the Army, either directly or through the Institute's industrial partners. The Outreach Plan should emphasize the types of scientific and technical exchange anticipated. By contrast, the Technology Transition Management Plan, developed in the Program Management Volume of the proposal, will specify the mechanism by which technology transition will be managed by the Institute. There are several technical objectives of the transfer of science and technology. A key objective of the Outreach Plan will be to bring together those generating the research with those likely to be able to exploit it, before the research is committed or even formulated. There are a number of directions by which a promising innovation may be exploited.

3.3.1. Outreach to the Army

The first and most important aspect of the Outreach Plan will be the Institute's interaction with the Army and with industry. The Institute will be expected to coordinate on a frequent and regular basis with the Army's scientists and engineers that work to support the soldier. Of primary importance is the interface with the Army Research Laboratory (ARL) and the Natick Soldier Center (NSC). Information about these laboratories and their current activities may be found at <http://www.arl.army.mil/>, <http://www.natick.army.mil/>, and <http://www.sbcom.army.mil/>. For example, the establishment of a personnel exchange program would allow researchers from Army laboratories to work at the ISN facilities. The Outreach Plan should specify the various means by which research activities and results are communicated to and coordinated with the Army.

3.3.2. Outreach to other Sponsored Research Activities

The Institute is also expected to interact cooperatively with all relevant Army-, DoD-, and other Federally-sponsored university and industrial research programs that bear on the mission of the Institute. The offeror will be expected to become familiar with other, related research activities sponsored by the DoD (Multidisciplinary University Research Initiatives, Collaborative Technology Alliances, etc.) and other government agencies (NSF, NASA, DoE, DARPA, etc.). The offeror must become technically cognizant of the progress of these activities, and the potential impact of these activities, on the Research Plan. An aggressive Outreach Plan must identify these other activities, specify the types of coordination to be undertaken, outline a strategy for assessing research results from other centers, and incorporate them into the Institute when appropriate. Indeed, it is envisioned that the Institute will serve as a hub to help assess and coordinate all extramural soldier-related nanotechnological research on behalf of the Army and will synergistically and cooperatively leverage these investments.

3.3.3. Industrial Partners

The Army requires that the UARC create cooperative partnerships with industry. This will ensure that the technical innovations emerging from the research will transition into militarily relevant applications and result in producible technologies. Partnerships

will be manifested in several ways. Because of the potential for developing spin-off commercial products, it is anticipated that industry will place personnel at the UARC in order to participate in the research. Industrial partners will bear the costs of their on-site personnel and may also co-invest in the development or operation of the UARC itself. In addition, the Army will supply applied research funding, in the form of subsequent subcontracts to the UARC, to sponsor specific efforts by the industrial partners to accelerate the transition of novel concepts into products.

Clearly, the Institute must work directly with its industrial partners in transitioning technology for potential large-scale manufacture. An outline of how such a technology transfer component might be integrated into the technical aspects of the program should be provided. The goal is to join with the Army, other government customers, and the industrial partners to bring technology from the Research Program to a point where producibility can be demonstrated. The Outreach Plan must specify the types of interactions planned between the Institute and its industrial partners to ensure that developed nanotechnologies are manufacturable, practical, and affordable. In addition, the Outreach Plan should indicate the anticipated role of entrepreneurial activities that will be spawned in support of the Institute's mission.

Because of the potential for product development, it is expected that the industry partners will place some of their personnel at the Institute so that they may participate in the fundamental research program. In addition, to facilitate the technology transfer objectives of this Institute, it is the Army's intent to secure additional 6.2 funding of up to \$20,000,000 to help support industrial involvement (see Section 5). The Outreach Plan must aggressively address the efforts the UARC will take to seek out transition opportunities with industry, both existing and entrepreneurial, and how they will transfer the technology to the industrial partners.

3.3.4. Outreach to Expand Base of Customers and Partners

An ancillary objective is for the Institute to increase its base of government customers and industrial partners. The Institute is expected to serve as a vehicle to respond to the Army or other government customers who have requirements for the expertise and/or results emerging from the Research Program. Because the outreach of the Institute will not be restricted to the Army, the Outreach Plan should outline activities to identify research needs and opportunities, and encourage research investment, of other government agencies and industrial partners.

3.3.5. Education and Relevance

To accomplish some of the outreach objectives, it is anticipated that the offeror will propose such activities as seminars, symposia, workshops, special studies, and short courses. These should be specifically targeted at educating and training engineers and scientists from both the Army and industry on the latest developments and technological implications of the ongoing research. The Outreach Plan should clearly specify all such anticipated activities.

A critical role that the ISN will play is to grow the U.S. talent base in nanotechnology. Although foreign national graduate students and researchers are welcomed and expected to play an important role in the research, the ISN is strongly encouraged to recruit outstanding graduate students and post doctoral researchers who are U.S. citizens, perhaps through the creation of a Fellowship program. The Outreach Plan

should specify the plans by which potential U.S. citizen researchers are recruited to the ISN and how any ISN Fellowship program for U.S. citizens will be operated.

4. Program Management Volume

4.1. Management Plan

The contractor is required to develop a five-year management plan to ensure that essential nanoscale related technology capabilities of particular importance to the Army are fostered, developed, and maintained. The plan shall include provisions for approving and modifying the research program to achieve the mission requirements of the Army. This plan is to include management of the Institute's research and technology transfer programs as well as cost controls and the development of a cost share program as industrial involvement develops. This plan shall incorporate a strategy for the inclusion of industry within the Institute and the management of research and development efforts including commercialization of the technology. The objective for this plan is to present an agenda that is scientifically sound and accountable, and ensures that the essential nanotechnologies of particular importance to the Army are developed. This plan will incorporate interchanges on a regular schedule with the ARO program manager. This plan will incorporate interchanges with Army research personnel on a continuous basis by means of research collaborations with Army staff. A majority of the research projects selected by the Institute should have vigorous and active technical collaborations with Army scientists and engineers. The plan will incorporate a means of providing periodic reporting to, and review by, higher level Army management officials. This approach is intended to accelerate the incorporation of new technologies arising from Institute research into new Army systems development.

The Management Plan will include the following elements:

4.1.1. Internal UARC Organizational Structure and Plan

The Management Plan will indicate the internal organizational structure through which the Institute will be managed. The roles of the director, key administrators, and research team leaders will be identified. The personnel organizational structure must be identified, including the anticipated total number and distribution of research and administrative personnel. Only those students, researchers, faculty, administrators, adjunct faculty, affiliates, consultants, and advisors associated with the host university may receive funding from the UARC. A plan to attract, appraise, and retain researchers over the duration of the Institute should be presented. A financial management plan must also be specified which indicates how monetary resources will be redistributed among researchers, administrators, and subcontractors in response to changing research results and opportunities.

The Management Plan will indicate how the Institute will report within the University system. Prior UARCs have reported directly to the Provost of the University as a separate entity within the University. The University's vision of how the Institute will be created, manned, managed, and supported must be clearly specified. The role of the Institute in the University's strategic plan and long-range vision should be identified. In addition, the Institute will become a highly visible activity within the University community, attracting significant governmental and industrial interactions. As such, the University should indicate the role it will play in supporting the Institute's activities to

coordinate with industrial sources in order to promote the total effort toward attaining the Army mission. The University must also show how it will connect with and leverage innovative research efforts involving parties external to the University, perhaps including small and small disadvantaged business.

4.1.2. UARC Research Management Plan

The Management Plan will specify how the Institute, in coordination with the Army, will choose which research projects to pursue. It is anticipated that each research project will be reviewed and renewed annually. Individual Action Plans (IAP) should be drawn up at the start of projects to reflect protocols that will guide the tasks. Progress in relation to these action plans and corresponding time lines are to be reported and evaluated at regular project performance reviews. The Management Plan should indicate how research and development tasks will be defined from within the various technical disciplines in cooperation with selected representatives of the at-large scientific community, industry, and the Army.

The Management Plan must indicate how the quality of the research will be maintained. The means by which research projects and personnel are added to or subtracted from the Institute's portfolio should be clearly identified. A plan for annual external program reviews and periodic internal performance appraisals must be specified. The external program reviews will allow the Army to assess the progress and relevance of the research program and will be attended by the ARO program manager, chief Army collaborators with the Institute, other government officials, and representatives of each industrial partner. The management plan must outline the nature and scope of its approach for the external program review.

The internal reviews may take place through an internal oversight committee or other means as deemed appropriate by the University. In order to allow the university to garner outside expertise to assist in the construction, development, and maturation of the UARC, the university will be allowed to subcontract up to 10% of its funding for various consultants and advisors, including personnel from other universities or other not-for-profit organizations. Consultants may be used to assist the university in developing new capabilities, not currently available on campus, required by the UARC. All work by consultants must be designed to develop or improve the UARC infrastructure on-campus, making the UARC more self-sufficient and responsive to Army need.

Advisors may be used to help the UARC management assess the creativity, innovation, and responsiveness of the UARC. All work by advisors must be designed to help provide "honest broker" feedback, perhaps through the various performance review mechanisms, and should help the UARC improve its scientific and technological stature within the context of the larger scientific, governmental, and industrial communities.

It is important to note that there is no requirement for the university to hire such consultants or advisors, and a university will not be penalized for not hiring consultants or advisors. Conversely, a university will be penalized if it depends too strongly on such consultants or advisors, and a proposal will be considered non-responsive if more than 10% of the UARC budget is designated for such subcontractors. All subcontracted activities and partnerships will be dynamic in nature and subject to the reviews and controls in the management plan.

4.2. Technology Transition Management Plan

Offerors must submit a Technology Transition Plan as part of their Management Proposal. It is anticipated that the planned \$50 million provided to the UARC in 6.1 RDT&E funds will result in a panoply of innovations in nanoscience and nanotechnology for soldier survivability. Promising innovations will need to be developed further with the industrial partners using anticipated 6.2 RDT&E funds for producibility demonstration. Additionally, it will be essential to exchange scientific and technical information between the UARC and all relevant university, industrial, and governmental research activities, especially Army-funded ones, that will arise over the life of the UARC. All such transitions will necessarily raise issues of proprietary rights in technical data, computer software, and intellectual property. The following represents the basic requirements of the Technology Transition Plan, which will be incorporated into any resulting contract as the guide for any technology transition efforts engaged in by the UARC with the Army, industry, academia, and government entities.

4.2.1. Interface with the Army

The objective of any interface with the Army is to ensure the relevance of the research and to transition innovations derived from UARC research. The Technology Transition Management Plan must aggressively address the efforts the UARC will take to seek out transition opportunities with the Army and how it will transfer the technology to the Army. It is expected that the Institute will develop a Technology Transition Management Plan by which research plans are developed and personnel directly coordinate with the Army. To provide the Institute technical guidance and assistance in assessing the Army relevance of proposed research, the Army anticipates designating technical advisors from relevant Army Labs and Centers. The plan will specify the administrative and personnel commitment to enable a thriving technology transition between the Army and the UARC.

4.2.2. Interface with Other University and Government Research Centers

It is essential that the UARC research program interact with other Army or DoD research efforts located at universities or government laboratories. This includes ARO-sponsored single investigators, the DoD Multidisciplinary University Research Initiative (see: http://www.onr.navy.mil/sci_tech/special/onrpgadh.htm), and the Army Research Laboratory's Collaborative Technology Alliances (see: <http://www.arl.army.mil/alliances/index.html>). The plan must provide a general approach for interacting with projects that are performing research in areas similar to or related to the UARC research plan. It must specify how it will both import and export technology breakthroughs between itself and the other research centers.

4.2.3. Interface with Industry

The immediate objective of any interface with industry is to transition innovations derived from UARC research to industrial concerns with the capability to provide demonstrations of producibility. The ultimate objective is to incorporate these innovations into products to be used by future soldier system programs. To facilitate the technology transfer objectives of this Institute, it is the Army's intent to secure additional 6.2 funding of up to \$20,000,000 to help support industrial involvement (see Section 5). Provisions in the Technology Transition Plan should be made for the availability of these

augmenting funds; however, there are no assurances that these funds will be made available, and the Institute should be prepared to operate without them.

The offeror will detail industrial partners and the nature of the interaction, whether in place or proposed. The offeror will be considered non-responsive for failure to do so clearly in the proposal.

4.2.4. Intellectual Property Issues

Questions regarding intellectual property rights in technical data, computer software, copyrights, and patents, and the protection of those rights, will necessarily arise in pursuing the Technology Transition Plan. The Plan must therefore address how the UARC proposes to handle such issues with the various entities with which it interfaces: industry, academia and government. Since the particularities of any technological transfer or collaboration is not yet known, it is sufficient to explain what issues would be considered and the mechanism for resolving disputes and protecting sensitive information.

(Note: This Institute is intended to work only on basic research topics, which are not, by definition, subject to National Security concerns. It is likely, however, that certain interactions with the Army and/or industry will lead to applied research and development projects that will involve the generation and handling of data that will need to be classified in the interests of national security. It is neither expected nor required that the university undertake classified research projects as part of this institute. When necessary, the Army will identify potentially sensitive projects and may require that adequate staffing with U.S. nationals is provided. Such investigations, using appropriate personnel, may be conducted at an affiliated Army or industrial research facility under the joint direction of ISN staff. In such cases, intellectual property issues will have to be considered in light of their impact on national security.)

5. University Commitment and Costs Volume

The proposed action is to conduct a competition limited to universities for the award of a cost reimbursement contract under which a separate institute will be established to conduct research in nanoscience for the soldier. The institute will establish and maintain linkages with the Army and industrial partners. It is expected that the resulting research center will be designated as a Department of Defense University Affiliated Research Center (UARC). The anticipated basic research effort is to be funded with FY-02 through FY-06 6.1 RDT&E funds in the amount of \$50,000,000. Award is projected for third quarter FY-02. The period of performance will be five years and the estimated cost is \$50,000,000 with provisions for adding additional funded efforts.

It is anticipated that additional FY-02 through FY06 6.2 RDT&E funds, up to \$20,000,000, may also be provided under this agreement to support accelerated transition of the resulting technology through the Institute's industrial partners.

5.1. Dedicated Facilities and Infrastructure

The University Commitment must include the provision of an appropriate dedicated facility for use by the Institute. A signed statement of this commitment must be obtained from the appropriate State, institutional, and/or university officials. The proposal shall be considered non-responsive if such a commitment is not clearly delineated in the University Commitment and Cost Volume. A description of the facility

must be included and must be of sufficient detail to judge the appropriateness of the facility to house the Institute. This facility shall be in addition to any other cost sharing or co-investment plans that are proposed. All other university commitments to provide infrastructure for the UARC should also be detailed in the proposal.

5.2. Total Costs

The financial portion of the proposal should contain cost estimates sufficiently detailed for meaningful evaluation of the proposals, including cost details for proposed subawards. The total basic research costs will be evaluated for cost realism and reasonableness within funding constraints.

For budget purposes, use an award start date of 01 June 2002 and total program duration of five years. The budget must include annual breakdowns along with a total program budget. The budget must include the total cost of the project, as well as a breakdown of the amount(s) by source(s) of funding (e.g., funds requested from the DoD agency and non-federal funds to be provided). The offerors may, at their discretion, structure the cost proposals as either one large institute or as a management task combined with a collection of discrete research tasks. The choice must, however, be consistent with the structure of the Research Program Volume. If the budget is presented as a collection of tasks, a summary containing total costs of the program must be provided. Elements of the budget(s) should include:

1. Time being charged to the project, for whom (principal investigator, graduate students, etc.), and the commensurate salaries and benefits. Allowable charges for graduate research assistants include salary/stipend, appropriate research costs, and any tuition costs that are normally charged to research awards. Allowable charges for undergraduate students include salary and research training costs, but not tuition.
2. Estimate of material and operating costs.
3. Costs of equipment, based on most recent quotations and broken down in sufficient detail for evaluation (equipment costs should be budgeted primarily during the first three years).
4. Travel costs and time, and the relevance to stated research program objectives.
5. Staff rotation costs, which includes the costs associated with implementing university visiting professor sabbatical. This should also specify costs to host visiting scientists at the ISN, including costs to host other scientists (office, phone/fax, computer etc.) beyond what their source organization will provide (salary, travel, per diem etc.).
6. Publication and report costs.
7. Subaward costs and type (the portion of work to be subawarded and rationale), including any consultant and advisor fees (indicating daily or hourly rate) and travel expenses; include a description of the nature of and need for any consultant's or advisor's participation with strong justification. Note that the subaward of funds among all performers must be described carefully in both the text and the cost section. Application of indirect cost (facilities and administration) to subawards shall be governed by A-21 cost principles.
8. Communications costs not included in overhead.
9. Other direct costs.
10. Indirect costs (facilities and administration).
11. Total costs for each period and a total for the program.

The Government may make adjustments to the cost of the total proposed effort as deemed necessary to reflect what the government judges the effort should cost. These adjustments shall consider the technical approach proposed. These adjustments may include upward or downward adjustments to proposed labor hours, labor rates, quantity of materials and price of materials.

5.3. Co-Investment Plan

A clear identification and explanation of any proposed co-investment or cost-sharing arrangement, to include the amount or ratio of cost share, when such cost share will be provided, and evidence of a commitment from the offeror to provide such a cost share. A signed statement of commitment regarding the cost sharing or co-investment funds described above should be obtained from the appropriate State, institutional, and/or private sector officials.

It may be convenient to construct a table showing the cost sharing or co-investment committed to this proposal in the following categories: State, institutional, industrial, and private sector. The amount and nature of the planned expenditure share could then be displayed for each source of funding (e.g., State appropriation, equipment and faculty release time for research, etc.).

5.4. Subcontracting Plan

Offerors shall submit with their proposal any Subcontracting Plan, if necessary, for the hiring of consultants and advisors. If a Subcontracting Plan is required, it may be necessary to include provisions for Small, Small Disadvantaged, and Women-Owned Small Business Concerns. The plan shall conform to FAR 19.704 and DFARS Subpart 226.70. The proposed plan and goals will be negotiated with all offerors determined to be within the competitive range. At the time of award, the plan will be incorporated into and made a material part of the contract. Offerors who qualify as a Small, Small Disadvantaged, or Women-Owned Small Business under the terms of this solicitation may disregard this provision.

Offerors will be required to submit any Subcontracting Plan that must be approved prior to award of the contract. Further, compliance with that plan will be monitored during performance.

6. Proposal Preparation and Submission

6.1. Proposal Format Information

The entire proposal shall be provided in three separate volumes, each bound separately in a manner suitable to facilitate handling and distribution. Each volume should be concise, utilizing one side of each page with no foldout pages. Specific page limitations are described below. Each proposal must be typed or printed (with type that is not smaller than 12 point on standard 8 1/2" X 11" paper with one (1) inch margins, 6 lines per inch). In addition, each of these volumes shall contain a table of contents that is included within the page limitations and recommended formats set forth below.

6.1.1. Research Program Volume

The pages included in the Research Program Volume shall be numbered. Offerors are advised that the Research Program Volume of the proposal shall not exceed 40 pages

(including figures), plus a one-page vita per investigator. Offerors are cautioned that pages in excess of the 40-page limitation, and pages in excess of the 1 page limitation for the vitae, will not be included in the evaluation. Inclusion of research manuscripts and reprints is strongly discouraged and will be counted against the 40-page limit.

The layout of the Research Program Volume is recommended as follows:

- A. Table of Contents
- B. Executive Summary
- C. Research Plan
 1. Soldier Protection
 2. Materials Development and Processing
- D. Outreach Plan
 1. Outreach to the Army
 2. Outreach to other Sponsored Research Activities
 3. Industrial Partners
 4. Outreach to Expand Base of Customers and Partners
 5. Education and Relevance
- E. Brief (1 page) vitae for each investigator

6.1.2. Program Management Volume

The pages included in the Program Management Volume shall be numbered. Offerors are advised that the Program Management Volume of the proposal shall not exceed 40 pages (including figures), plus a one-page vita per for the Institute Director and each of the senior management staff. Offerors are cautioned that pages in excess of the 40-page limitation, and pages in excess of the 1 page limitation for the vitae, will not be included in the evaluation. The 40-page maximum does not include the Security Compliance Plan (if necessary).

The layout of the Program Management Volume is recommended as follows:

- A. Table of Contents
- B. Executive Summary
- C. Program Management Plan
 1. Internal UARC Organizational Structure and Plan
 2. UARC Research Management Plan
- D. Technology Transition Management Plan
 1. Interface with the Army
 2. Interface with other University and Government Research Centers
 3. Interface with Industry
 4. Intellectual Property Issues

6.1.3. University Commitment and Cost Volume

There are no page limits to the information provided for the University Commitment and Cost Volume. For the Research Program, the proposed amounts shall not exceed the funding ceilings identified in this Program Announcement.

The layout of the University Commitment and Cost Volume is recommended as follows:

- A. Table of Contents
- B. Executive Summary
- C. Dedicated Facilities and Infrastructure

- D. Total Cost
- E. Co-Investment Plan
- F. Subcontracting Plan

6.2. Marking of Proposals

The proposal submitted in response to this solicitation may contain technical and other data that the offeror does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation. Information contained in unsuccessful proposals will remain the property of the offeror except for that evidenced in the Proposal Cover Page and Project Summary. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information which constitutes a trade secret, proprietary commercial or financial information, confidential personal information, or data affecting the national security, is provided by a offeror in a proposal, it will be treated in confidence, to the extent permitted by law, provided that the following legend appears and is completed on the front of the proposal:

For any purpose other than to evaluate the proposal, this data shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if an award is made to the 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 agreement. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in page(s) _____ of this proposal.

Any other legend may be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration and without assuming any liability for inadvertent disclosure. The Government will limit dissemination of properly marked information to within official channels.

In addition, the pages indicated as restricted must be marked with the following legend:

Use or disclosure of the proposal data on lines specifically identified by asterisk (*) are subject to the restriction on the front page of this proposal.

The Government assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose.

In the event properly marked data contained in a proposal in response to this solicitation is requested pursuant to the Freedom of Information Act, 5 USC 552, the offeror will be advised of such request and prior to such release of information will be requested to expeditiously submit to ARO a detailed listing of all information in the proposal which the offeror believes to be exempt from disclosure under the Act. Such action and cooperation on the part of the offeror will ensure that any information released by ARO pursuant to the Act is properly determined.

6.3. Proposal Submission Information

Proposals must be submitted according to the instructions contained herein. **Proposals in connection with this Program Announcement are due by 2:00pm ET on 15 November 2001.**

The proposal must be submitted directly to the following address:

For USPS

U.S. Army Materiel Command Acquisition Center
 Research Triangle Park Division
 ATTN: AMSSB-ACR (Patsy Ashe)
 P.O. Box 12211
 Research Triangle Park, NC 27709-2211

For FedEx, UPS etc.

U.S. Army Materiel Command Acquisition Center
 Research Triangle Park Division
 ATTN: AMSSB-ACR (Patsy Ashe)
 4300 S. Miami Blvd.
 Durham, NC 27703

Each proposal shall consist of the following:

PROPOSAL ITEM/VOLUME	NUMBER OF COPIES
Proposal Cover Sheet (ARO Form 51) with Authorized Signature(s)	Original and 1 copy
Research Program Summary (A brief, 1-2 page abstract that summarizes the content of the Research Program of the proposal.)	Original and <u>10</u> copies
Research Program Volume (to include Biographical Sketches)	Original and <u>10</u> copies
Program Management Volume(to include Biographical Sketches)	Original and <u>10</u> copies
University Commitment and Cost Volume	Original and <u>10</u> copies

NOTE: There will be NO electronic submission of proposals in connection with this Program Announcement.

6.4. Late Submissions, Modifications and Withdrawals of Proposals

- (a) Any proposal received at the U.S. Army Research Office after the exact time specified for receipt will not be considered unless it is received before award is made and it:
 1. Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 15th of the month must have been mailed by the 10th);

Draft Solicitation

2. Was sent by mail and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation;

3. Was sent by U.S. Postal Service Express Mail Next Day Service-Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and U.S. Federal holidays; or

4. Is the only proposal received.

(b) Any modification of a proposal or quotation is subject to the same conditions as in subparagraphs (a)(1), (2), and (3) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late proposal or modification sent either by U.S. Postal Service registered or certified mail is the U.S. Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the proposal, quotation, or modification shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. Postal Service on the date of mailing. Therefore, offerors or quoters should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the proposal wrapper or other documentary evidence of receipt maintained by the installation.

(e) The only acceptable evidence to establish the date of mailing of a late offer, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision. Therefore, offerors should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, 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.

(g) Proposals may be withdrawn by written notice or telegram (including mailgram) received at any time before award. Proposals may be withdrawn in person by an offeror or an authorized representative, if the representative's identity is made known and the representative signs a receipt for the proposal before award.

7. Evaluation and Award

All information necessary for the review and evaluation of a proposal must be contained in the Technical, the Management, and the University Commitment and Cost Volumes. No other material will be provided to the evaluators.

An initial review of the proposals will be conducted to ensure compliance with the requirements of this Program Announcement (PA). Failure to comply with the requirements of the PA may result in a proposal receiving no further consideration for award.

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A formal Source Selection Evaluation Board (SSEB) will review the proposals. The SSEB, consisting of qualified groups of government scientists, managers, and cost specialists, will conduct a detailed review of each proposal and provide an analysis to a Source Selection Advisory Council (SSAC). The SSAC will review and validate the findings and advise the Source Selection Authority (SSA). The SSA will make final selection.

The Army, at its discretion, may visit proposed sites during the evaluation phase to verify information contained in the proposals. Any site visits will be coordinated with the offerors at the appropriate time.

The Army Research Office (ARO) will evaluate proposals received in response to this announcement using formal source selection procedures. The award will be based on an integrated assessment of each offeror's ability to satisfy this announcement's requirements. The Government anticipates discussions with offerors will be conducted; however, the Government reserves the right to make an award without discussions. A competitive range may be established for any discussions. If discussions are held, offerors in the competitive range will be invited to submit Final Proposal Revisions, which will be evaluated using the same evaluation procedures as were used with the initial proposals. The Government intends to make an award to an offeror, conforming to this announcement, that offers the best value to the Government, cost and other factors considered. An award may be made to other than the offeror who offers the lowest cost proposal or to other than the best technical proposal. An award will not be made if, in the opinion of the SSEB, the SSAC, and/or the SSA, none of the proposals are of net benefit to the Army. In such a case, the program may be re-competed at a later time. Finally, this solicitation, and any subsequent award, is subject to the availability of funds.

Proposals submitted in response to this Program Announcement will be evaluated in the following areas and with the associated weights:

1. Research Program Volume
 - ◆ Research Plan (40%)
 - ◆ Outreach Plan (20%)
2. Program Management Volume
 - ◆ Management Plan (20%)
 - ◆ Technology Transition Management Plan (10%)
3. University Commitment and Cost (10%)

In addition, each proposal will be initially screened to ensure that it meets the four minimal requirements:

1. The proposal is responsive to the solicitation in all categories.
2. The proposal specifies its industrial partners and their commitments.
3. The proposal identifies and describes a dedicated facility to house the UARC.
4. The proposal does not subcontract in excess of 10% of the budget.

*** under construction ***

