



Broad Agency Announcement
Chip-Scale Combinatorial Atomic Navigator
(C-SCAN)
Microsystems Technology Office (MTO)
DARPA-BAA-12-44
April 16, 2012

Table of Contents:

Part I: Overview Information.....3

Part II: Full Text of Announcement

 Sec. I: FUNDING OPPORTUNITY DESCRIPTION.....5

 Sec. II: AWARD INFORMATION.....14

 Sec. III: ELIGIBILITY INFORMATION.....15

 A. Eligible Applicants

 B. Procurement Integrity, Standards of Conduct, Ethical Considerations,
 and Organizational Conflicts of Interest

 C. Cost Sharing/Matching

 D. Other Eligibility Criteria

 Sec. IV. APPLICATION AND SUBMISSION INFORMATION.....16

 A. Address to Request Application Package

 B. Content and Form of Application
 Submission

 C. Proposal Abstract and Full Proposal Submission Information

 Sec. V. APPLICATION REVIEW INFORMATION.....28

 A. Evaluation Criteria

 B. Review and Selection Process

 Sec. VI. AWARD ADMINISTRATION INFORMATION.....31

 A. Selection Notices

 B. Administrative and National Policy Requirements

 C. Reporting

 D. Electronic Systems

 Sec. VII. AGENCY CONTACTS.....39

 Sec. VIII. OTHER INFORMATION.....39

 A. Intellectual Property Procurement Contract Proposers

 B. Non-Procurement Contract Proposers – Noncommercial and
 Commercial Items (Technical Data and Computer Software)

 C. All Proposers – Patents

 D. All Proposers – Intellectual Property Representations

 E. Other Transactions

NOTE: PROPOSERS ARE CAUTIONED THAT EVALUATION RATING MAY BE LOWERED AND/OR PROPOSALS REJECTED IF ALL PROPOSAL PREPARATION AND/OR SUBMITTAL INSTRUCTIONS LISTED HEREIN ARE NOT FOLLOWED.

THOSE INTENDING TO SUBMIT A PROPOSAL FOR AN ASSISTANCE INSTRUMENT (GRANT OR COOPERATIVE AGREEMENT) ARE STRONGLY ENCOURAGED TO READ THE INSTRUCTIONS PROVIDED AT SECTION IV(B)(4) REGARDING THE TIME REQUIRED TO RECEIVE VALIDATION OF SUBMISSIONS MADE THROUGH GRANTS.GOV. PROPOSALS THAT ARE VALIDATED AFTER THE PROPOSAL DUE DATE/TIME WILL BE CONSIDERED LATE AND, AS SUCH, WILL NOT BE CONSIDERED DURING THE INITIAL ROUND OF REVIEWS.

Part I: Overview Information

- **Federal Agency Name** – Defense Advanced Research Projects Agency (DARPA), Microsystems Technology Office (MTO)
- **Funding Opportunity Title** – Chip-Scale Combinatorial Atomic Navigator (C-SCAN)
- **Announcement Type** –Initial Broad Agency Announcement
- **Funding Opportunity Number** – DARPA-BAA-12-44
- **Catalog of Federal Domestic Assistance Numbers (CFDA)** – 12.910 Research and Technology Development
- **Dates**
 - Posting Date- April 16, 2012
 - Proposal Abstract Due Date- May 16, 2012
 - Proposal Due Date- July 10, 2012
- **Concise description of the funding opportunity:** DARPA is soliciting innovative research proposals in the area of co-integration of inertial sensors with dissimilar physics of operation in a single micro-scale Inertial Measurement Unit (IMU). In this context, the program seeks to address challenges associated with the long-term drift, dynamic range, and start-up time of chip-scale components for positioning, targeting, navigation, and guidance tasks. Specific interest is in the development of a Chip-Scale Combinatorial Atomic Navigator (C-SCAN) that combines inertial sensors with dissimilar, but complementary, physics of operation into a single microsystem. The main objectives of the C-SCAN program are to (1) explore the miniaturization and co-fabrication of atomic sensors with high-performance solid-state inertial sensors, and (2) develop combinatorial algorithms and architectures that seamlessly co-integrate components with dissimilar physics in a single ensemble. The deliverable of this program is a miniature IMU that co-integrates atomic and solid-state inertial sensors in a single microsystem with a volume of no more than 20 cubic centimeters (20 cc) and power consumption of no more than 1 Watt (1 W). The performance of C-SCAN is expected to be above and beyond what is currently available, combining a high resolution of motion detection (10^{-4} deg/hour for rotation and 10^{-6} g for linear acceleration), exceptional long-term bias and scale-factor stability (1 ppm with respect to the full-scale of operation), and start-up time performance orders of magnitude better than available today (less than 10 seconds from a cold start).
- **Anticipated individual awards** – Multiple awards are anticipated.
- **Types of instruments that may be awarded** -- Procurement contract, grant, cooperative agreement or other transaction.
- **Agency contact**
 - Dr. Andrei Shkel, Program Manager
DARPA/MTO
The BAA Coordinator for this effort can be reached by electronic mail:
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Part II: Full Text of Announcement

I. FUNDING OPPORTUNITY DESCRIPTION

The Defense Advanced Research Projects Agency often selects its research efforts through the Broad Agency Announcement (BAA) process. The BAA will appear first on the FedBizOpps website, <http://www.fbo.gov/>, and Grants.gov website at <http://www.grants.gov/>. The following information is for those wishing to respond to this BAA.

DARPA is soliciting innovative research proposals in the area of co-integration of inertial sensors with dissimilar physics of operation in a single microscale Inertial Measurement Unit (IMU). In this context, the program seeks to address challenges associated with the long-term drift, dynamic range, and start-up time of chip-scale components for positioning, targeting, navigation, and guidance tasks. Of specific interest is the development of a Chip-Scale Combinatorial Atomic Navigator (C-SCAN) that combines inertial sensors with dissimilar, but complementary, physics of operation into a single microsystem. The main objectives of the C-SCAN program are to (1) explore the miniaturization and co-fabrication of atomic sensors with high-performance solid-state inertial sensors, and (2) develop combinatorial algorithms and architectures that seamlessly co-integrate components with dissimilar physics in a single ensemble. It is anticipated that the program will lead to a new breed of inertial microsystems, with a wider range of operating conditions and greater immunity to the environment, reduced start-up time, increased sensitivity, and improved bias and scale factor stability.

The deliverable of this program is a miniature Inertial Measurement Unit (IMU) that co-integrates atomic and solid-state inertial sensors in a single microsystem, with a volume of no more than 20 cubic centimeters (20 cc) and power consumption of no more than 1 Watt (1 W). The IMU is envisioned to be an ensemble of sensors augmented by signal-processing algorithms that exploit the benefits of dissimilar physical modalities through innovative combinatorial architectures – hence the acronym Chip-Scale Combinatorial Atomic Navigator (C-SCAN). The performance of C-SCAN is expected to be above and beyond what is currently available, combining a high resolution of motion detection (10^{-4} deg/hour for rotation and 10^{-6} g for linear acceleration), exceptional long-term bias and scale-factor stability (1 ppm with respect to the full-scale of operation), and start-up time performance orders of magnitude better than available today (less than 10 seconds from a cold start). To meet these objectives, the C-SCAN program is expected to develop a complete IMU comprised of combinatorial gyroscopes and accelerometers with the following characteristics: 10^{-4} deg/hour and 10^{-6} g bias stability, $5 \cdot 10^{-4}$ deg/ $\sqrt{\text{hour}}$ Angle Random Walk (ARW) and $5 \cdot 10^{-4}$ m/sec/ $\sqrt{\text{hour}}$ Velocity Random Walk (VRW), 1 ppm bias and scale-factor drift characteristics of 40 Hz (or $\sim 15,000$ deg/sec) and 1,000 g range of operation, respectively. The C-SCAN module will have three axes of rotation, as well as three axes of acceleration sensitivity. The misalignment between the axes of sensitivity in C-SCAN is not to exceed 10^{-4} radians when operating in a harsh military environment. The operational environments of interest are: (1) in-operation exposure to temperatures

varying from -55°C to +85°C, (2) in-operation exposure to mechanical vibrations from 5 Hz to 5 kHz with an average amplitude 5 g, and (3) device survivability and subsequent normal operation after exposure to (a) 15,000 g shock exerted in less than 1 sec, (b) a peak acceleration amplitude on the level of 20 g through the frequency range for random vibrations from 5 Hz to 5 kHz, and (c) a 100°C temperature difference thermal shock with transfer time not exceeding 10 seconds.

This solicitation is an integral part of DARPA's micro-PNT (microtechnology for Positioning, Navigation, and Timing) portfolio of programs. The overarching objective of the micro-PNT portfolio is to develop technologies for self-contained chip-scale inertial navigation and precision guidance that could effectively eliminate the dependence on GPS or any other external signals and enable uncompromised navigation and guidance capabilities for advanced munitions, mid- and long-range missiles, and various military platforms under a wide range of operating conditions. The micro-PNT program currently includes a number of important specific efforts that focus on development of precision timing devices, inertial sensors, and microsystems. This solicitation leverages the results of these efforts and expands the scope of the micro-PNT program.

Reliance on the satellite-based Global Positioning System (GPS) for precision PNT information is critical to the conduct of many types of military operations and the performance of a wide range of military weapon systems. When GPS is inaccessible, whether as a result of some type of component or overall system malfunction or as a consequence of deliberate enemy action, critical information with respect to the object's position (latitude/longitude, altitude), bearing/direction, altitude, speed, and timing can only be gathered through self-contained on-board instruments, including gyroscopes for orientation, accelerometers for position, and oscillators for time. The goal of the DARPA micro-PNT portfolio of programs is to develop micro-technology for self-contained, chip-scale inertial navigation and precision guidance that would effectively eliminate the dependence on GPS while enabling uncompromised navigation and guidance capabilities for advanced munitions, various military platforms, under a wide range of operation conditions.

Current state-of-the-art microscale inertial instruments can provide the required level of precision for missions of only 30 seconds or less in duration. The micro-PNT program is developing chip-scale, small SWaP+C (Size, Weight and Power, plus Cost) inertial sensors for a variety of operational scenarios, missions ranging from minutes to hours, and for reliable operation under environmental conditions varying from moderate to severe. The ongoing work includes development of a broad range of chip-scale precision timing devices and inertial sensors, including chip-scale atomic clocks, chip-scale primary atomic clocks, solid-state oscillators, silicon accelerometers, vibratory rate gyroscopes, rate integrating gyroscopes, electrostatically levitated spinning mass gyroscopes, and micro nuclear magnetic resonance gyroscopes.

While recent results in the micro-PNT program have shown considerable progress toward development of small-scale inertial instruments approaching navigation-grade performance, the overall challenge remains – how to **simultaneously meet all** the

stringent PNT requirements imposed by DoD missions in a small SWaP+C package. Specific requirements include – but are not limited to – accuracy, resolution, scale-factor and bias stability (both in-run and long-term), extended dynamic range, fast warm-up time, and short integration time. These challenges are significant, and it is unlikely that all the requirements can be achieved in a single type of device. To cite a few examples: (1) vibratory gyroscopes can achieve the required level of bandwidth and frequency of measurements, but they have limited resolution and poor long-term stability; (2) atomic sensors exhibit excellent resolution and potential for long-term bias stability, but they show limited bandwidth and generally do not allow high-frequency measurements; (3) the warm-up and integration times for different type of clocks and inertial sensors also vary broadly, from seconds for mechanical vibratory devices to tens of minutes for atomic devices.

The “time-to-act” of an IMU device is the time required to go through its warm-up period and reach its optimal readout characteristics with respect to accuracy, precision, and stability. Many modern tactical military operational scenarios require fast – practically instantaneous – “time-to-act.” For example, the expected turn-on time of the Hellfire air-to-surface missile is on the order of 5 seconds, whereas the typical mission duration is on the order of one minute with an average closing speed on target of over 1,000 km/hour. By comparison, the Small Diameter Bomb (SDB) has a desirable “time-to-act” on the order of seconds, with a standoff range of 40-60 miles and mission duration of tens of minutes. Overall, more than 98% of the current missiles in the U.S. arsenal have mission durations of less than 20 minutes, and the majority of platforms have an expected “time-to-act” on the order of 10 seconds. Today, almost all of these missions are critically dependent on GPS for achieving the required level of delivery accuracy. A preferable solution, however, is to completely eliminate the dependence on GPS or any other external signals during the mission, and rely solely on self-contained solutions such as inertial navigation, which is immune to jamming, spoofing, and other intentional or unintentional modification of information regarding position, orientation, and time. Achieving 20 minutes of free inertial guidance is a major technological challenge faced by small SWaP+C inertial instruments. Solving this problem is of great strategic importance.

Several recent developments in micro-technology, inertial instruments, and atomic devices may present an opportunity for solving the problem of extended inertial guidance and navigation, potentially offering a new breed of chip-scale navigators exhibiting favorable characteristics when combined in a single hybrid micro-system ensemble. Several examples, approaches, and sensing modalities of interest for C-SCAN are discussed below. These examples of current activities can be used for inspiration, but they should not be interpreted as constraints or requirements for technical solutions proposed in response to this BAA.

Combinatorial chip-scale clock. The architecture developed within the DARPA Chip-Scale Atomic Clocks (CSAC) effort utilizes a combination of a mechanical resonator and an atomic cell connected in a feedback Phase-Locked Loop (PLL) configuration to provide both fast response time and long-term clock stability in a single microsystem. For

short integration times, on the order of a second, the performance of CSAC is defined by the solid-state resonator, while for long integration times, the performance of the clock is defined by the atomic transition of the Rb or Cs vapor. Essentially, the architecture allows the long-term stability of atomic transitions to discipline a less precise local mechanical oscillator.

Cold-atom technology on the micro-scale. Integrated Micro Primary Atomic Clock Technology (IMPACT) architectures offer a possibility for miniaturized stable clocks, by exploiting cold-atom physics, creation of magneto optical traps and octupole ion traps, and efficient combination of atomic transitions and optical whispering gallery mode resonators on the micro-scale, all in a volume of about 10 cm³. An intriguing possibility would be to extend this technology to chip-scale cold-atom inertial sensors – accelerometers, gyroscopes, and ultimately a complete atomic navigator.

Chip-scale NMR gyroscopes. The Navigation-Grade Integrated Micro Gyroscope (NGIMG) effort has demonstrated the potential for Nuclear Magnetic Resonance (NMR) gyroscopes on the microscale. The performance of such devices is approaching navigation-grade sensitivity and exhibits considerable promise for exceptional long-term stability. If the device operation is linked to energy-transition phenomena, a stable atomic reference based on NMR for the entire IMU system becomes possible.

IMU based on cold-atom interferometry. Reports in the scientific literature present early developments of cold-atom interferometers configured to measure all six degrees of motion (x, y, z, roll, pitch, and yaw), thereby opening an opportunity for a complete cold-atom Inertial Measurement Unit (IMU) in a single device. Although these results are preliminary and based on limited laboratory experiments, the approaches are worth considering as they may create an opportunity for new types of inertial instruments with high sensitivity and exceptional long-term stability. A broad variety of concepts utilizing interference of matter waves (deBroglie wavelength), electro-magnetic waves (optical wavelength), and a Bose-Einstein condensate (BEC) are being explored.

It should be recognized that current versions of atomic inertial sensors suffer from several drawbacks, such as extremely long warm-up time (tens of minutes), long integration time to reach an optimal reading (thousands of seconds), and instrumentation that is very complex, bulky, and power hungry. In contrast, solid-state inertial sensors are very compact (tens of cubic millimeters), with short warm-up times (seconds), fast integration times (seconds), and low power consumption (milli-Watts). In addition, solid-state sensors can be instrumented with exceptional responsiveness, large bandwidth, and a broad dynamic range of operation. However, the major drawback of solid-state inertial sensors is the loss of long-term bias and scale-factor stability.

The C-SCAN program aims to overcome challenges associated with the loss of stability in inertial sensors over time, while enabling high-accuracy measurements of position and orientation for both fast and slow motion, and optimal readings from sensors in seconds. If successful, the technological solutions achieved in the program will eliminate the current level of dependence on GPS or other external signals for most missile platforms

in the current U.S. arsenal. A powerful option is to develop a Chip-Scale Combinatorial Atomic Navigator (C-SCAN) that combines inertial sensors with dissimilar, but complementary, physics of operation into a single microsystem. Successful technological solutions are expected to lead to several orders of magnitude improvement in accuracy, bias, and scale-factor stability reaching, and potentially exceeding, the performance of state-of-the-art conventional-size instruments at a fraction of the cost, size, and power consumption. This endeavor will clearly require revolutionary ideas and technological advances in the areas of micro-fabrication, physics of operation, architectural designs, algorithms, and signal-processing solutions.

The proposed research should investigate innovative approaches that enable revolutionary advances in the science, devices, and systems relevant to achieving the C-SCAN program goals. Specifically excluded from the program is research that aims at evolutionary improvements to the existing state of practice.

DARPA seeks innovative proposals in the following **Areas of Interest**:

Technical Area One: Miniaturization of atomic inertial references

The objective of work in this technical area is to demonstrate the feasibility of implementing an ultra-stable, atomic inertial reference for orientation and position on the microscale. To date, most efforts directed toward the development of atomic inertial sensors (gyroscopes and accelerometers) have focused on increasing the measurement sensitivity of angle, angular velocity, and acceleration. Even though the sensitivity of measurement remains an important consideration, the primary focus of this technical area is to achieve a long-term bias and scale-factor stability, possibly utilizing stable atomic structures and/or stable atomic transitions between energy levels as a foundation.

The intended applications require extremely fast “time-to-act” – i.e., the time required for a sensor to complete its warm-up routine and reach its optimal readout characteristics. The “time-to-act” in applications of interest is not to exceed 10 seconds. To compare, in current implementations of atomic devices the “time-to-act” is several orders of magnitude longer, typically on the order of 20 minutes for warm-up and 15-17 minutes of integration time for achieving an optimal reading. These characteristics are not acceptable for the C-SCAN vision. Successful implementation of C-SCAN will likely require the development of new phenomenology, exploitation of under-utilized physics, and realization of new engineering solutions. The goal is to achieve a short “time-to-act” while also providing a precision inertial reference.

Technical Area One final goals:

1. Experimentally demonstrate a 6-DOF all-atomic inertial reference supporting the final goal of the program with respect to the size (20 cc), power consumption (<1 Watt), and performance level (10^{-4} deg/hour for rotation, 10^{-6} g for acceleration, and 1 ppm bias and scale-factor stability for gyroscopes and accelerometers).

2. Experimentally demonstrate the performance level in the operational environments of interest:
 - a. during operation, exposure to temperatures varying from -55°C to +85°C;
 - b. during operation, exposure to mechanical vibrations from 5 Hz to 5 kHz and with an average amplitude 5 g;
 - c. device survivability and normal subsequent operation after a 15,000 g shock exerted in less than 1 sec, a peak acceleration amplitude on the level of 20 g through the frequency range for random vibrations from 5 Hz to 5 kHz, and a 100°C temperature difference thermal shock with transfer time not exceeding 10 seconds.
3. Demonstrate the “time-to-act” of 10 sec – the time required for the all-atomic inertial reference to complete its warm-up routine from cold start and to reach its optimal readout characteristics.
4. Develop and demonstrate a batch manufacturing process for the all-atomic inertial reference supporting low-cost manufacturing of C-SCAN.

The proposed effort should identify measurable quantitative milestones throughout its full duration. These milestones must define a credible trajectory toward achieving the final goals outlined above. It is expected that the proposed efforts will be structured to achieve substantial progress early in the program, such as in the first year. At least two (2) all-atomic inertial reference prototypes, each interfaced with front-end electronics, and at least one (1) set of universal control electronics boards will be delivered after the second and third year of the project for independent government evaluation.

Technical Area Two: Combinatorial algorithms and architectures.

This technical area will explore combinatorial algorithms and architectures allowing seamless co-integration of inertial sensors with dissimilar, but complementary, physics. The architecture of the ensemble should allow both fast response to inertial stimuli (rotation and/or acceleration) and long-term stability. Even though algorithms for fusion of information involving optimal estimators are a natural and generally acceptable approach, this solicitation strongly encourages innovative architectures requiring minimal computation (as done, for example, in CSAC, where a solid-state resonator and signals from atomic transitions are coupled by a Phase-Locked Loop).

The extreme miniaturization of C-SCAN presents unprecedented design challenges in Mechanical, Electro-Magnetic, and Thermal (MEMaT) domains. Packing components closer together triggers undesirable mechanical energy coupling, increased density of parasitic electro-magnetic fields, and an increased potential for undesirable thermal gradients. If not appropriately designed, the MEMaT couplings reduce sensitivity and stability of individual sensors, shift parameters of control electronics, and subsequently degrade the performance of the C-SCAN. Innovative designs and architectures that are closely supported by MEMaT modeling are required for implementation of C-SCAN.

Within this technical area, DARPA has an interest in the development of algorithms and architectures that are able to compensate for deficiencies in microscale inertial sensors.

The combinatoric approach is intended to provide complementary benefits of components in the C-SCAN ensemble. The combined system is expected to exhibit superior performance compared to any of the single components with respect to bandwidth, resolution, noise characteristics, long-term stability, and “time-to-act.”

Technical Area Two final goals:

1. Develop a combinatorial architecture for C-SCAN. Quantitatively demonstrate that the architecture simultaneously meets ALL of the required characteristics for C-SCAN: 10 sec “time-to-act,” 1 ppm bias and scale-factor drift characteristics, 10^{-4} deg/hour angular rate bias stability, 10^{-6} g accelerometer bias stability, $5 \cdot 10^{-4}$ deg/ $\sqrt{\text{hour}}$ Angle Random Walk (ARW), $5 \cdot 10^{-4}$ m/sec/ $\sqrt{\text{hour}}$ Velocity Random Walk (VRW), 40 Hz (or $\sim 15,000$ deg/sec), and 1,000 g range of operation.
2. Develop a comprehensive MEMaT model of C-SCAN. The model shall support critical design decisions, ensuring that the fluctuation in misalignment between inertial sensors in C-SCAN is less than 100 micro-radians, and the scale factor and cross-couplings of C-SCAN components are lower than 10^{-4} (100 ppm or 0.01 percent).
3. Develop a reduced-order dynamic model of C-SCAN that captures MEMaT transients and couplings within the system. The reduced-order model should represent the operation of inertial sensors in the form of ordinary differential equations and exploit insights gained from the comprehensive electro-mechanical, electro-magnetic, and thermo-mechanical models. The model should be practical and sufficiently accurate to support a system-level development of thermal control loops, magnetic field stabilization loops, synchronization loops, and drive/sense control loops. Completeness of the model should be sufficient for the development of control loops, ensuring the C-SCAN is capable of performing on the level defined by the final goals of the program over the temperature range of -55°C to $+85^{\circ}\text{C}$ and a vibration frequency range of 5 Hz to 5 kHz for average amplitude 5 g.

The proposed effort should identify measurable quantitative milestones throughout its full duration. These milestones must define a credible trajectory toward achieving the final goals outlined above. It is expected that the proposed efforts will be structured to achieve substantial progress early in the program, such as in the first year. The developed modeling software should be made available at the end of each year for independent government evaluation.

Technical Area Three: Integration and Demonstration of C-SCAN microsystem

This technical area represents the culmination of activities in and results from Technical Areas One and Two. In Technical Area Three, C-SCAN will be integrated in a single microsystem combining devices with dissimilar physics. The integration challenges explored in Technical Area Three are new and difficult. They include implementation of chip-scale, multi-degree of freedom atomic inertial references and solid-state inertial sensors. The structure of C-SCAN has to be sufficiently rugged and appropriate for

operation in harsh military environments. The ultimate integrated solution should achieve a practical compromise between complexity and contemplated benefits, resulting in a low-cost IMU exhibiting unprecedented performance. Work conducted in Technical Area Three is intended to deliver an integrated, ultra-miniaturized C-SCAN. Performance of the integrated microsystem – C-SCAN and the corresponding algorithmic support – will be evaluated with respect to its suitability for operation in harsh military environments.

Technical Area Three final goals:

1. Demonstration of C-SCAN operation in a physical package not exceeding 20 cubic centimeters (20 cc) in volume. The physical package should include an ensemble of three reference atomic gyroscopes, three reference atomic accelerometers, and a complementary set of solid-state inertial sensors (i.e., at least 12 sensors in total, including 6 gyroscopes and 6 accelerometers) that, working in unison, provide precise position and orientation information. The physical package should provide adequate sealing/environmental isolation of sensors and include the vibration isolation system. If ovenization of components is considered, the oven/heating elements should be included in the total volume of the physical package and power budget. The physical package should provide all necessary interconnects for interfacing inertial sensors to the signal-conditioning and control electronics. The stated size of the physical package does not include the signal-conditioning and control electronics.
2. Demonstrate C-SCAN with the following performance characteristics:
 - a. Resolution of motion detection of 10^{-4} deg/hour for rotation and 10^{-6} g for linear acceleration along all six degrees of freedom;
 - b. Scale-factor and bias stability of 1 ppm (with respect to the full-scale of operation) for all six degrees of freedom. Performance demonstrations should be conducted with temperatures varying from -55°C to $+85^{\circ}\text{C}$ per Mil-Std-810 testing protocols;
 - c. 10 seconds “time-to-act” for the entire C-SCAN. This is the time required for the all-atomic inertial reference and solid-state sensors to complete their warm-up routine from cold start and to reach their optimal readout characteristics under the specified operating conditions and power consumption constraints;
 - d. Angle Random Walk (ARW) of at least $5 \cdot 10^{-4}$ deg/ $\sqrt{\text{hour}}$ for all three degrees of freedom for rotational motion of C-SCAN;
 - e. Velocity Random Walk (VRW) of at least $5 \cdot 10^{-4}$ m/sec/ $\sqrt{\text{hour}}$ for all three degrees of freedom for translational motion of C-SCAN;
 - f. 40 Hz (or $\sim 15,000$ deg/sec) range of operation along all three degrees of freedom of rotational motion;
 - g. 1,000 g range of operation along all three degrees of freedom of translational motion.
3. Demonstration of the C-SCAN power consumption of less than 1 W for operation at temperatures ranging from -55°C to $+85^{\circ}\text{C}$. The power budget includes the operation of atomic and solid-state inertial sensors, front-end electronics, and thermal-stability control.

4. Demonstration of the misalignment between axes of sensitivity in C-SCAN not to exceed 10^{-4} radians, such that the scale factor and cross-couplings of C-SCAN components are lower than 10^{-4} (100 ppm or 0.01 percent), while operating in a realistic military environment. The operational environment of interest is
 - a. during operation, exposure to temperatures varying from -55°C to $+85^{\circ}\text{C}$;
 - b. during operation, exposure to mechanical vibrations from 5 Hz to 5 kHz, with an average amplitude 5 g;
 - c. device survivability and normal subsequent operation after a 15,000 g shock exerted in less than 1 sec, a peak acceleration amplitude on the level of 20 g through the frequency range for random vibrations from 5 Hz to 5 kHz, and a 100°C temperature difference thermal shock with transfer time not exceeding 10 seconds.

The proposed effort should identify measurable quantitative milestones throughout its full proposed period of performance. These milestones must define a credible trajectory toward achieving the final program goals outlined above. It is expected that the proposed efforts will be structured to achieve substantial progress early in the program, such as in the first year. At least two (2) prototypes suitable for comprehensive environmental and functional testing will be delivered at the end of the second and third year of the project for independent government evaluation.

Guidelines for Program Phases and Milestones

The C-SCAN program is expected to have a duration of three years. Proposed efforts may define three distinct maturation phases. Proposed efforts should identify measurable quantitative milestones throughout its full duration. These milestones must define a credible trajectory towards achieving the final goals in each of the technical areas being addressed as outlined above. Preference will be given to proposed efforts that are structured to achieve substantial progress early in the program, such as in the first year.

For each technical area being addressed, submitted proposals should include: (1) a detailed plan for completion of all milestone-oriented tests within any proposed phases, (2) a detailed budget for each individually priced technical area and proposed phase by Federal Government Fiscal Year, and (3) a set of proposed internal milestones for measuring progress.

A successful proposal will thoroughly discuss all details for meeting the C-SCAN program milestones set forth for all proposed phases for each of the three technical areas described in this BAA. Proposers are encouraged to submit an integrated proposal in all technical areas, however innovative proposals in fewer technical areas will be considered.

Performance will be continually evaluated based on the likelihood that progress will lead to achievement of the final goals of each technical area. Should it be determined that substantial progress is unlikely, DARPA does not guarantee continued funding.

II. AWARD INFORMATION

Multiple awards are anticipated. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation, and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if it is later determined to be necessary. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work at the end of one or more of the phases.

Awards under this BAA will be made to proposers on the basis of the evaluation criteria listed below (see section labeled "Application Review Information"), and program balance to provide overall value to the Government. Proposals identified for negotiation may result in a procurement contract, grant, cooperative agreement, or other transaction depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. Such additional information may include but is not limited to Representations and Certifications. The Government reserves the right to remove proposers from award consideration should the parties fail to reach agreement on award terms, conditions and cost/price within a reasonable time or the proposer fails to timely provide requested additional information.

As of the date of publication of this BAA, DARPA expects that program goals for this BAA may be met by proposers intending to perform 'fundamental research,' i.e., basic or applied research performed on campus in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization the results of which ordinarily are restricted for proprietary or national security reasons. Notwithstanding this statement of expectation, DARPA is not prohibited from considering and selecting research proposals that, while perhaps not qualifying as 'fundamental research' under the foregoing definition, still meet the BAA criteria for submissions. If proposals are selected for award that offer other than a fundamental research solution, then DARPA will either work with the proposer to modify the proposed statement of work to bring the research back into line with fundamental research or else the proposer will agree to restrictions in order to receive an award. See Section VI.B.4 for further information on fundamental, non-fundamental and restricted research. In all cases, the DARPA contracting officer shall have sole discretion to select award instrument type and to negotiate all instrument provisions with selectees.

III. ELIGIBILITY INFORMATION

A. Eligible Applicants

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA. Historically Black Colleges and Universities (HBCUs), Small Businesses, Small Disadvantaged Businesses and Minority Institutions (MIs) are encouraged to submit proposals and join others in submitting proposals; however, no portion of this announcement will be set aside for these organizations' participation due to the impracticality of reserving discrete or severable areas of this research for exclusive competition among these entities.

Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to this BAA in any capacity unless they address the following conditions. FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector AND must also provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to government solicitations and compete with industry, and compliance with the associated FFRDC sponsor agreement and terms and conditions. This information is required for FFRDCs proposing to be prime or subcontractors. Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority (as well as, where relevant, contractual authority) establishing their ability to propose to Government solicitations. At the present time, DARPA does not consider 15 U.S.C. 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C. 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the Proposer.

B. Procurement Integrity, Standards of Conduct, Ethical Considerations, and Organizational Conflicts of Interest

Current federal employees are prohibited from participating in particular matters involving conflicting financial, employment, and representational interests (18 USC 203, 205, and 208). The DARPA Program Manager for this BAA is Dr. Andrei Shkel. Once the proposals have been received, and prior to the start of proposal evaluations, the Government will assess potential conflicts of interest and will promptly notify the Proposer if any appear to exist. (Please note, the Government assessment does NOT affect, offset, or mitigate the Proposer's own duty to give full notice and planned mitigation for all potential organizational conflicts, as discussed below.)

Without prior approval or a waiver from the DARPA Director, in accordance with FAR 9.503, a Contractor cannot simultaneously provide scientific, engineering, technical

assistance (SETA) or similar support and also be a technical performer. Therefore, all Proposers as well as proposed subcontractors and consultants must affirm whether they (their organizations and individual team members) are providing SETA or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the Proposer, subcontractor, consultant, or individual supports and identify the prime contract number(s). Affirmations shall be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest (FAR 9.5) must be disclosed. The disclosure must include a description of the action the Proposer has taken or proposes to take to avoid, neutralize, or mitigate such conflict. If in the sole opinion of the Government after full consideration of the circumstances, a proposal fails to fully disclose potential conflicts of interest and/or any identified conflict situation cannot be effectively mitigated, the proposal will be rejected without technical evaluation and withdrawn from further consideration for award.

If a prospective Proposer believes that any conflict of interest exists or may exist (whether organizational or otherwise) or has questions on what constitutes a conflict of interest, the Proposer should promptly raise the issue with DARPA by sending his/her contact information and a summary of the potential conflict to the BAA mailbox before time and effort are expended in preparing a proposal and mitigation plan.

C. Cost Sharing/Matching

Cost sharing is not required for this particular program; however, cost sharing will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument (e.g., for any Other Transactions under the authority of 10 U.S.C. § 2371). Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

D. Other Eligibility Criteria (optional)

1. Collaborative Efforts

Collaborative efforts/teaming are encouraged. A teaming website has been established at <http://teaming.sysplan.com/BAA-12-44/> to facilitate the formation of teaming arrangements between interested parties. Specific content, communications, networking, and team formation are the sole responsibility of the proposer. Neither DARPA nor the Department of Defense (DoD) endorses the destination web site or the information and organizations contained therein, nor does DARPA or the DoD exercise any responsibility at the destination. This website is provided consistent with the stated purpose of this BAA.

IV. APPLICATION AND SUBMISSION INFORMATION

A. Address to Request Application Package

This solicitation contains all information required to submit a proposal. No additional forms, kits, or other materials are needed. This notice constitutes the total BAA. No

additional information is available, nor will a formal Request for Proposal (RFP) or additional solicitation regarding this announcement be issued. Requests for same will be disregarded.

B. Content and Form of Application Submission

1. Security and Proprietary Issues

The Government anticipates proposals submitted under this BAA will be unclassified. No classified proposals will be accepted.

Proprietary Data: All proposals containing proprietary data should have the cover page and each page containing proprietary data clearly marked as containing proprietary data. It is the Proposer's responsibility to clearly define to the Government what is considered proprietary data.

It is the policy of DARPA to treat all proposals as competitive information, and to disclose their contents only for the purpose of evaluation. Proposals will not be returned. The original of each proposal received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided the formal request is received at this office within 5 days after unsuccessful notification.

2. Abstract Submission Information

It is STRONGLY ENCOURAGED that a proposal abstract be submitted to determine the acceptability of the proposed concept to the BAA. This procedure is intended to minimize unnecessary effort in proposal preparation and review. The time and date for submission of abstracts is specified in Section 5A below. DARPA will acknowledge receipt of the submission and assign a control number that should be used in all further correspondence regarding the abstract.

Proposal abstracts may only be submitted through T-FIMS (no email, fax or hardcopy submissions are permitted). See <https://baat.darpa.mil> for more information on how to request an account, upload proposals, and use the T-FIMS tool. Because proposers using T-FIMS may encounter heavy traffic on the web server, and T-FIMS requires a registration and certificate installation for all proposers, proposers should not wait until the day the abstract is due to create an account in T-FIMS and submit the abstract.

Upon review, DARPA will provide written feedback on the likelihood of a full proposal being selected and the time and date for submission of a full proposal, which may differ from the originally published date below.

3. Abstract Format

Abstracts are encouraged in advance of full proposals in order to provide potential proposers with a rapid response to minimize unnecessary effort. Proposal abstracts should follow the format as described below. The cover sheet should be clearly marked "PROPOSAL ABSTRACT" and the total length should not exceed 11 pages, excluding the cover page and Attachment 2, PowerPoint summary slides. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. Smaller font may be used for figures, tables and charts. The page limitation for abstracts includes all figures, tables, and charts. No formal transmittal letter or cost proposal summary checklist is required. All abstracts must be written in English.

Section I. Administrative

- A. Cover sheet to include:
- (1) BAA number
 - (2) Technical area proposing to (1 - 3)
 - (3) Lead organization submitting proposal
 - (4) Type of business, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", OR "OTHER NONPROFIT"
 - (5) Contractor's reference number (if any)
 - (6) Other team members (if applicable) and type of business for each
 - (7) Proposal title
 - (8) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available)
 - (9) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available), total funds requested from DARPA, and the amount of cost share (if any)
 - (10) Date proposal was submitted AND
 - (11) Total cost broken out by phase for each technical area applying to

Section II. Summary of Abstract Proposal

- A. {1} A clearly defined organization chart for the program team which includes, as applicable: (1) the programmatic relationship of team member; (2) the unique capabilities of team members; (3) the task of responsibilities of team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year.
- B. {2} Innovative claims for the proposed research. This section is the centerpiece of the proposal and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art alternate approaches.
- C. {3} Technical rationale, technical approach, and constructive plan for accomplishment of technical goals in support of innovative claims and deliverable production.

- D. {2} Deliverables associated with the proposed research and the plans and capability to accomplish technology transition and commercialization. Include in this section all proprietary claims to the results, prototypes, intellectual property, or systems supporting and/or necessary for the use of the research, results, and/or prototype. If there are not proprietary claims, this should be stated. For forms to be completed regarding intellectual property, see Section VIII. There will be no page limit for the listed forms.
- E. {1} Cost, schedule and measurable milestones for the proposed research, including estimates of cost for each task in each year of the effort delineated by the prime and major subcontractors, total cost and company cost share, if applicable. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.)
- F. {2} General discussion of other research in this area.
- G. PowerPoint summary slides that describe the proposed program and effort. Download and use the template provided with the BAA, Attachment 2. Submit the PowerPoint file in addition to your abstract.

DARPA will respond to proposal abstracts with a statement as to whether DARPA is interested in the idea. DARPA will attempt to reply to proposal abstracts via letter within thirty (30) calendar days of receipt. Should a proposer be discouraged from submitting a full proposal, the letter must contain feedback for the proposer regarding the rationale for the decision not to recommend a full proposal be submitted. Proposal abstracts will be reviewed in the order they are received. Regardless of DARPA's response to a proposal abstract, proposers may submit a full proposal. DARPA will review all full proposals submitted using the published evaluation criteria and without regard to any comments resulting from the review of a proposal abstract.

4. Proposal Submission Information

Proposers are required to submit full proposals by the time and date specified in the BAA in order to be considered in the single round of selections. Proposals received after the time and date specified in the BAA will be considered late and as such, will not be evaluated.

The typical proposal should express a consolidated effort in support of one or more related technical concepts or ideas. Disjointed efforts should not be included into a single proposal.

Restrictive notices notwithstanding, proposals may be handled, for administrative purposes only, by a support contractor. This support contractor is prohibited from competition in DARPA technical research and is bound by appropriate nondisclosure requirements. Proposals may not be submitted by fax or e-mail; any so sent will be disregarded.

Proposals not meeting the format described in the BAA may not be reviewed.

For Proposers Requesting an Assistance Instrument

Grant or cooperative agreement proposals may only be submitted to DARPA through Grants.gov (using the APPLY function) or in hard-copy. Grant or cooperative agreement proposals may not be submitted through any other means (including T-FIMS and other comparable systems). If proposers intend to use Grants.gov as their means of submission, then they must submit their entire proposal through Grants.gov; applications cannot be submitted in part to Grants.gov and in part as a hard-copy. Proposers using the Grants.gov APPLY do not submit paper proposals in addition to the Grants.gov APPLY electronic submission.

Proposers must complete the following steps before submitting proposals on Grants.gov (these steps are also detailed at www.grants.gov/applicants/get_registered.jsp):

- Proposers must obtain a DUNS number
- Proposers must register their organization in the Central Contractor Registration (CCR) (<https://www.bpn.gov/CCRSearch/Search.aspx>)
- Proposers must register the Authorized Organization Representative (AOR) in Grants.gov
- Proposers must have the organization's E-BIZ point of contact authorize the AOR to submit applications.

Once Grants.gov has received a proposal submission, Grants.gov will send two email messages to advise proposers as to whether or not their proposals have been validated or rejected by the system; IT MAY TAKE UP TO TWO DAYS TO RECEIVE THESE EMAILS. The first email will confirm receipt of the proposal by the Grants.gov system; this email only confirms receipt, not acceptance, of the proposal. The second will indicate that the application has been successfully validated by the system prior to transmission to the grantor agency or has been rejected due to errors. If the proposal is validated, then the proposer has successfully submitted their proposal. If the proposal is rejected, the proposer will have to resubmit their proposal. Once the proposal is retrieved by DARPA, the proposer will receive a third email from Grants.gov. To avoid missing deadlines, proposers should submit their proposals in advance of the final proposal due date with sufficient time to receive confirmations and correct any errors in the submission process through Grants.gov. For more information on submitting proposals to Grants.gov, visit the Grants.gov submissions page at: http://grants.gov/applicants/apply_for_grants.jsp.

Proposers electing to submit grant or cooperative agreement proposals via grants.gov must complete the SF 424 R&R form (Application for Federal Assistance, Research and Related) and the SF-LLL (if required). Please use the Attachments Form and upload, as two separate documents, Volume I, Technical and Management Proposal and Volume II, the Cost Proposal, as well as any other documents require by the BAA (i.e., subcontract proposals). No other Grants.gov forms are required. Please note that Grants.gov does not accept zipped or encrypted documents uploaded at attachments. Please follow the document made available on grants.gov as part of the solicitation entitled "Instructions

for Using Grants.gov to Apply for a Grant or Agreement from DARPA (Short Form),” dated 20 October 2011, for more information.

Technical support for Grants.gov submissions may be reached at 1-800-518-4726 or support@grants.gov.

Proposers electing to submit grant or cooperative agreement proposals as hard copies must complete the SF 424 R&R form (Application for Federal Assistance, Research and Related) available on the grants.gov website.

If submitting hard-copy, an original and (4) copies of the proposal and (4) electronic copies of the proposal on a CD-ROM shall be submitted to DARPA/MTO, 3701 North Fairfax Drive, Arlington, VA 22203-1714 (Attn: DARPA-BAA-12-44) for proposals received before April 30, 2012. For all proposals to be received on or after April 30, 2012, the original and (4) copies of the proposal and (4) electronic copies of the proposal on a CD-ROM shall be submitted to DARPA/MTO, 675 North Randolph Street, Arlington, VA, 22203-2114 (Attn: DARPA-BAA-12-44).

For Proposers Submitting proposals through T-FIMS

Proposals sent in response to DARPA-BAA-12-44, unless seeking a grant or cooperative agreement, must be submitted through T-FIMS (no email, fax or hardcopy submissions are permitted). See <https://baat.darpa.mil> for more information on how to request an account, upload proposals, and use the T-FIMS tool. Because proposers using T-FIMS may encounter heavy traffic on the web server, and T-FIMS requires a registration and certificate installation for all proposers, proposers should not wait until the day the proposal is due to create an account in T-FIMS and submit the proposal.

For All Proposers

All administrative correspondence and questions on this solicitation, including requests for information on how to submit a proposal abstract or full proposal to this BAA, should be directed to DARPA-BAA-12-44@darpa.mil. DARPA intends to use electronic mail for correspondence regarding DARPA-BAA-12-44. **Proposals and proposal abstracts may not be submitted by fax or e-mail; any so sent will be disregarded.** DARPA encourages use of the Internet for retrieving the BAA and any other related information that may subsequently be provided.

5. Full Proposal Format

All full proposals must be in the format given below. Nonconforming proposals may be rejected without review. Proposals shall consist of two volumes. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. Smaller font may be used for figures, tables and charts. The page limitation for full proposals includes all figures, tables, and charts. Volume I, Technical and Management Proposal, may include an attached bibliography of relevant technical papers or research notes (published and

unpublished) which document the technical ideas and approach upon which the proposal is based. Copies of not more than three (3) relevant papers can be included with the submission. The bibliography and attached papers are not included in the page counts given below. The submission of other supporting materials along with the proposals is strongly discouraged and will not be considered for review. Section II of Volume I, Technical and Management Proposal, shall not exceed 15 pages per Technical Area proposed, excluding Attachment 2, PowerPoint summary slides. Maximum page lengths for each section are shown in braces { } below. All full proposals must be written in English.

a. Volume I, Technical and Management Proposal

Section I. Administrative

- A. Cover sheet to include:
- (1) BAA number
 - (2) Technical area (1-3)
 - (3) Lead Organization submitting proposal
 - (4) Type of business, selected among the following categories: “LARGE BUSINESS”, “SMALL DISADVANTAGED BUSINESS”, “OTHER SMALL BUSINESS”, “HBCU”, “MI”, “OTHER EDUCATIONAL”, OR “OTHER NONPROFIT”
 - (5) Contractor’s reference number (if any)
 - (6) Other team members (if applicable) and type of business for each
 - (7) Proposal title
 - (8) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available)
 - (9) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available), total funds requested from DARPA, and the amount of cost share (if any) AND
 - (10) Date proposal was submitted.
- B. Official transmittal letter.

Section II. Detailed Proposal Information

- A. PowerPoint summary slides that describe the proposed program and effort. Download and use the template provided with the BAA, Attachment 2. Submit the PowerPoint file in addition to Volume I and Volume II of your full proposal.
- B. {max: 2 pages per Technical Area} Statement of Work (SOW) - In plain English, clearly define the technical tasks/subtasks to be performed, their durations, and dependencies among them. The page length for the SOW will be dependent on the amount of the effort. The SOW **must not** include proprietary information. The SOW **must** be developed so that each phase of the program (if multiple phases are proposed) is separately defined. It is recommended that the SOW should be developed so that each major task consistent with progress toward the intermediate

milestones of the proposed program is separately defined. The SOW **must** include, for each phase (if multiple phases are proposed), a table defining the program metrics to be achieved. For each task/subtask, provide:

- A general description of the objective (for each defined task/activity);
- A detailed description of the approach to be taken to accomplish each defined task/activity);
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
- The completion criteria for each task/activity - a product, event or milestone that defines its completion.
- Define all deliverables (reporting, data, reports, software, etc.) to be provided to the Government in support of the proposed research tasks/activities.

- C. {max: 4 pages per Technical Area} Innovative Claims, Technical Rationale and Approach. This section is the centerpiece of the proposal and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art alternate approaches. A concise section outlining the scientific and technical challenges, unique approaches, and potential anticipated technical solutions to the challenges that will be addressed. This section should demonstrate that the proposer has a clear understanding of the state-of-the-art; and should provide sufficient technical details so as to permit complete evaluation of the feasibility of the idea. All program metrics must be associated with demonstrable, quantitative measures of performance and should be summarized in a single table. Proposals should clearly explain the technical approach(es) that will be employed to meet or exceed each program metric and provide ample justification as to why the approach(es) is/are feasible. Additionally, comparison with other ongoing research shall be provided indicating advantages and disadvantages of the proposed effort.
- D. {max: 2 pages per Technical Area} Program Plan & Risk Assessment. Detailed program plan and risk assessment. A narrative explaining the explicit timelines, milestone achievements, and quantitative program metrics (to include proposer defined metrics, if applicable) by which progress toward the goals can be evaluated. The proposed period of performance of the overall program, and each program phase, should be clearly stated for each technical area. The narrative plan should include a specific test plan detailing how all program metrics will be accurately measured. All program metrics must be associated with demonstrable, quantitative measures of performance, and should be summarized in a single table. Proposals should clearly explain the technical approach(es) that will be employed to meet or exceed each program metric and provide ample justification as to why the approach(es) is/are feasible. This section should also identify major technical risk elements specific to the proposed approach, estimate the risk magnitude for each such element, and describe specific plans to mitigate risk. For each technical area being responded to by the proposal, all program milestones

should be described/discussed in detail so reviewers can assess risks associated with meeting them.

- E. {max: 2 pages per Technical Area} Description of the results, products, transferable technology, and expected technology transfer path enhancing the technical and management approach. See also Section VIII “Intellectual Property.”
- F. {max: 1 page per Technical Area } Capabilities. Describe proposer’s previous accomplishments, relevant prior work, the background qualifications and relevant experience of team member organizations (prime and sub(s)) and key individuals to be assigned to the program, and the facilities and equipment to be utilized.
- G. {max: 2 pages per Technical Area} Teaming and Management Plan. A clearly defined organization chart and plan for the program team which includes, as applicable: (1) the programmatic relationship of team member; (2) the unique capabilities of team members; (3) the task of responsibilities of team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year.
- H. {max: 2 pages per Technical Area} Cost, schedules and measurable milestones for the proposed research, including estimates of cost for each technical area and task in each year of the effort delineated by the primes and major subcontractors, total cost, and any company cost share. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each. Additionally, proposals should clearly explain the technical approach(es) that will be employed to meet or exceed each program metric and provide ample justification as to why the approach(es) is/are feasible.

Section III. Additional Information

A brief bibliography of relevant technical papers and research notes (published and unpublished) which document the technical ideas upon which the proposal is based. Copies of not more than three (3) relevant papers can be included in the submission.

b. Volume II, Cost Proposal – {No Page Limit}

Cover sheet to include:

- (1) BAA number;
- (2) Technical area proposing to (1 – 3);
- (3) Lead Organization submitting proposal;
- (4) Type of business, selected among the following categories: “LARGE BUSINESS”, “SMALL DISADVANTAGED BUSINESS”, “OTHER SMALL BUSINESS”, “HBCU”, “MI”, “OTHER EDUCATIONAL”, OR “OTHER NONPROFIT”;
- (5) Contractor’s reference number (if any);
- (6) Other team members (if applicable) and type of business for each;

- (7) Proposal title;
- (8) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available);
- (9) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), and electronic mail (if available);
- (10) Award instrument requested: cost-plus-fixed-fee (CPFF), cost-fee—no fee, cost sharing contract – no fee, or other type of procurement contract (*specify*), grant, cooperative agreement, or other transaction;
- (11) Place(s) and period(s) of performance;
- (12) Total proposed cost separated by basic award and option(s) (if any);
- (13) Name, address, and telephone number of the proposer’s cognizant Defense Contract Management Agency (DCMA) administration office (*if known*);
- (14) Name, address, and telephone number of the proposer’s cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
- (15) Date proposal was prepared;
- (16) DUNS number;
- (17) TIN number; and
- (18) Cage Code;
- (19) Subcontractor Information; and
- (20) Proposal validity period, and
- (21) Any Forward Pricing Rate Agreement, other such approved rate information, or such documentation that may assist in expediting negotiations (if available).

NOTE: The Attachment 1, Approved Proposer Checklist, must be included with the coversheet of the Cost Proposal.

The proposers, to include eligible FFRDCs, cost volume shall provide cost and pricing information, or other than cost or pricing information if the total price is under \$700,000, in sufficient detail to substantiate the program price proposed (e.g., realism and reasonableness). In doing so, the proposer shall provide a summary cost breakdown by technical area and a **detailed cost breakdown by phase (if multiple phases are proposed), technical task/sub-task, and month for each technical area proposed to**. The breakdown shall include, at a minimum, the following major cost item along with associated backup documentation:

- B. Total program cost broken down by major cost items:
 - a. **Direct Labor** – a breakout clearly identifying the individual labor categories with associated labor hours and direct labor rates, as well as a detailed Basis-of-Estimate (BOE) narrative description of the methods used to estimate labor costs;
 - b. **Indirect Costs** – Including Fringe Benefits, Overhead, General and Administrative Expense, Cost of Money, Fee, etc. (must show base amount and rate);

- c. **Travel** – Provide the purpose of the trip, number of trips, number of days per trip, departure and arrival destinations, number of people, etc.;
- d. **Other Direct Costs** – Itemized with costs; Back-up documentation is to be submitted to support proposed costs;
- e. **Material/Equipment & Information Technology** – A priced Bill-of-Material (BOM) clearly identifying, for each item of material, equipment and information technology¹ proposed, the quantity, unit price, the source of the unit price (i.e., vendor quote, engineering estimate, etc.), the type of property (i.e., material, equipment, special test equipment, information technology, etc.), and a cross-reference to the Statement of Work (SOW) task/s that require the item/s. At time of proposal submission, any item that exceeds \$1,000 must be supported with basis-of-estimate (BOE) documentation such as a copy of catalog price lists, vendor quotes or a written engineering estimate (additional documentation may be required during negotiations, if selected). **If seeking a procurement contract and items of Contractor Acquired Property are proposed, exclusive of material, the proposer shall clearly demonstrate that the inclusion of such items as Government Property is in keeping with the requirements of FAR Part 45.102.**
- f. **Consultants** – If consultants are to be used, proposer must provide a copy of the consultant’s proposed SOW as well as a signed consultant agreement or other document which verifies the proposed loaded daily / hourly rate and any other proposed consultant costs (e.g. travel);
- g. **Subcontracts** – Itemization of all subcontracts. Additionally, the prime contractor is responsible for compiling and providing, as part of its proposal submission to the Government, subcontractor proposals prepared at the same level of detail as that required by the prime. Subcontractor proposals include Interdivisional Work Transfer Agreements (ITWA) or similar arrangements. **If seeking a procurement contract, the prime contractor shall provide a cost reasonableness analysis of all proposed subcontractor costs/prices.** Such analysis shall indicate the extent to which the prime contractor has negotiated subcontract costs/prices and whether any such subcontracts are to be placed on a sole-source basis. All proprietary subcontractor proposal documentation which cannot be uploaded to TFIMS or Grants.gov as part of the proposer’s submission, shall be made immediately available to the Government, upon request, under separate cover (i.e., mail, electronic/email, etc.), either by the proposer or by the subcontractor organization – this does not relieve the proposer from the requirement to include, as part of their submission (via TFIMS, Grants.gov or Hardcopy, as applicable), subcontract proposals that do not include proprietary pricing information (rates, factors, etc.);
- h. **Cost Sharing** - The source, nature, and amount of any industry cost-sharing; and
- i. Written justification required per Section VI(B)(4) pertaining to subcontracted effort/s being considered Contracted Fundamental Research.

¹ As defined in FAR Part 2.101.

Proposers are encouraged to provide the aforementioned cost breakdown as an editable MS Excel spreadsheet, inclusive of calculations formulae, with tabs (material, travel, ODC's) provided as necessary. The Government also requests and recommends that the Cost Proposal include MS Excel file(s) that provide traceability between the Bases of Estimate (BOEs) and the proposed costs across all elements and phases. This includes the calculations and adjustments that are utilized to generate the Summary Costs from the source labor hours, labor costs, material costs, etc. input data. It is requested that the costs and Subcontractor proposals be readily traceable to the Prime Cost Proposal in the provided MS Excel file(s); however, this is not a requirement.

Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each. For IT and equipment purchases, include a letter stating why the proposer cannot provide the requested resources from its own funding.

The cost proposal should include identification of pricing assumptions of which may require incorporation into the resulting award instrument (i.e., use of Government Furnished Property/Facilities/Information, access to Government Subject Matter Experts, etc.).

Note 1: "Cost or Pricing Data" as defined in FAR Subpart 15.4 shall be required if the proposer is seeking a procurement contract award of \$700,000 or greater unless; 1) the proposer requests an exception from the requirement to submit cost or pricing data or 2) the proposer is a nonprofit organization (including educational institutions) seeking a cost-reimbursement-no-fee contract². "Cost or pricing data" are not required if the proposer proposes an award instrument other than a procurement contract (e.g., a grant, cooperative agreement, or other transaction.) Those proposing a grant or cooperative agreement may follow/use the application instructions/form templates (i.e., DARPA BAA Form Package) provided as part of the BAA posting to grants.gov; however, the costing details requested above should be provided to the maximum extent possible as this will reduce the time needed to negotiate any resulting award instrument.

PLEASE NOTE, PROPOSERS ARE CAUTIONED THAT EVALUATION RATINGS MAY BE LOWERED AND/OR PROPOSALS REJECTED IF PROPOSAL PREPARATION (PROPOSAL FORMAT, CONTENT, ETC.) AND/OR SUBMITTAL INSTRUCTIONS ARE NOT FOLLOWED.

² Per DFARs 215.403-3(c)(4)(D), when the proposer is a nonprofit organization (including educational institutions) seeking a cost-reimbursement-no-fee contract the proposer must provide information other than cost or pricing data to the extent necessary for the contracting officer to determine price reasonableness and cost realism. Additionally, such proposers are required to submit cost and pricing data from subcontractors that are not nonprofit organizations (including educational institutions) when the subcontractor's proposal exceeds the cost or pricing data threshold at FAR 15.403-4(a)(1).

6. Submission Dates and Times

a. Proposal Abstract Date

Proposal abstracts must be submitted to DARPA by no later than **12:00 p.m. (noon), Eastern Time, May 16, 2012**. Proposal abstracts received after this time and date will not be reviewed.

b. Full Proposal Date

The full proposal must be submitted by no later than **12:00 p.m., Eastern Time, July 10, 2012** in order to be considered during the single round of selections. Proposals received after this deadline will not be reviewed.

DARPA will post a consolidated Question and Answer response to http://www.darpa.mil/Opportunities/Solicitations/MTO_Solicitations.aspx. In order to allow the Government adequate time to provide a response to questions prior to the proposal due date, proposers are encouraged to submit questions no later than June 27th, 2012 to DARPA-BAA-12-44@darpa.mil.

7. Intergovernmental Review (if applicable)

Not Applicable.

8. Funding Restrictions

Not Applicable.

9. Other Submission Requirements

Cost Proposal Summary Checklist (See Attachment 1) must be provided with the cost proposal.

V. APPLICATION REVIEW INFORMATION

A. Evaluation Criteria

Evaluation of proposals will be accomplished through a scientific/technical review of each proposal using the following criteria, in descending order of importance: (a) Overall Scientific and Technical Merit; (b) Potential Contribution and Relevance to the DARPA Mission; (c) Cost Realism; (d) Realism of Proposed Schedule; (e) Proposer's Capabilities and/or Related Experience; and (f) Plans and Capabilities to Accomplish Technology Transition. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement.

The following are descriptions of the evaluation criteria:

(a) Overall Scientific and Technical Merit

The proposed technical approach must be feasible, achievable, complete, and supported by a proposed technical team that has the expertise and experience to accomplish the proposed tasks. The technical merit of the research and the soundness of the plan to perform it will be evaluated. The proposed research must be highly innovative and show promise of meeting the program performance goals. The research must have the potential to make a radical impact on future technology and enable cost-effective design and fabrication at future technology nodes. Task descriptions and associated technical elements must be complete and presented in a logical sequence with all proposed milestones and deliverables clearly defined. The proposal must present a sound case that, in the event of an award, the execution of the technical plan will meet the targeted research objectives. In particular, there must be convincing evidence of the ability of the proposer to meet the program milestones. The proposal must identify major technical risks and present mitigation plans which are clearly defined and feasible.

(b) Potential Contribution and Relevance to the DARPA Mission

The potential contributions of the proposed effort to the national technology base will be evaluated and its relevance to DARPA's particular mission and methods assessed. Specifically, DARPA seeks to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security. DARPA aims to accomplish this by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their ultimate military use.

(c) Cost Realism

The objective of this criterion is to establish that the proposed costs are realistic for the technical and management approach offered, as well as to determine the proposer's practical understanding of the effort. The proposal will be reviewed to determine if the costs proposed are based on realistic assumptions, reflect a sufficient understanding of the technical goals and objectives of the BAA, and are consistent with the proposer's technical approach (to include the proposed Statement of Work). At a minimum, this will involve review, at the prime and subcontract level, of the type and number of labor hours proposed per task as well as the types and kinds of materials, equipment and fabrication costs proposed. It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. For efforts with a likelihood of commercial application, appropriate direct cost sharing may be a positive factor in the evaluation.

(d) Realism of Proposed Schedule

The proposer's abilities to aggressively pursue performance milestones in the timeframe set forth in the BAA and to accurately account for that timeframe will be evaluated, as well as proposer's ability to understand, identify, and mitigate any potential risk in schedule.

(e) Proposer’s Capabilities and/or Related Experience

The proposer's prior experience in similar efforts must clearly demonstrate an ability to deliver, within the proposed budget and schedule, products and results that meet the proposed technical performance goals. The proposed team must possess sufficient experience and expertise to manage the cost and schedule of the effort throughout its execution. The proposer must possess or demonstrate access to all the facilities and leading-edge technology capabilities required to meet the proposed technical performance goals of the BAA. Ongoing or recently completed efforts by the proposer in this research area must be fully described, including identification of other Government sponsors.

(f) Plans and Capability to Accomplish Technology Transition

The capability to establish and identify a practical technology roadmap for transitioning C-SCAN devices and/or technology leading to military and/or commercial applications, including the key elements for improving technological maturity and reliability beyond the immediate project goals will be evaluated. In addition, the evaluation will take into consideration the extent to which the proposed intellectual property (IP) rights will potentially impact the Government’s ability to transition the technology.

B. Review and Selection Process

Evaluation of proposals will be accomplished through a scientific/technical review of each proposal. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA’s intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

Award(s) will be made to proposers whose proposals are determined to be the most advantageous to the Government, all factors considered, including the potential contributions of the proposed work to the overall research program and the availability of funding for the effort. DARPA’s intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

It is the policy of DARPA to ensure impartial, equitable, comprehensive proposal evaluations and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals. Pursuant to FAR 35.016, the primary basis for selecting proposals for acceptance shall be technical, importance to agency programs, and fund availability. In order to provide the desired evaluation, qualified Government personnel will conduct reviews and (if necessary) convene panels of experts in the appropriate areas.

Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. For evaluation purposes, a proposal is the document described in “Proposal Information”, Section IV.B.2. Other supporting or background materials submitted with the proposal will be considered for the reviewer's convenience only and not considered as part of the proposal.

Restrictive notices notwithstanding, proposals may be handled for administrative purposes by support contractors. These support contractors are prohibited from competition in DARPA technical research and are bound by appropriate non-disclosure requirements.

Subject to the restrictions set forth in FAR 37.203(d), input on technical aspects of the proposals may be solicited by DARPA from non-Government consultants /experts who are strictly bound by the appropriate non-disclosure requirements.

It is the policy of DARPA to treat all proposals as competitive information and to disclose their contents only for the purpose of evaluation. No proposals will be returned. After proposals have been evaluated and selections made, the original of each proposal received will be retained at DARPA and all other copies will be destroyed.

VI. AWARD ADMINISTRATION INFORMATION

A. Selection Notices

As soon as the evaluation of a proposal is complete, the proposer will be notified that 1) the proposal has been selected for funding pending contract negotiations, or 2) the proposal has not been selected. These official notifications will be sent via e-mail to the Technical POC identified on the proposal coversheet.

B. Administrative and National Policy Requirements

1. Meeting and Travel Requirements

There will be a program kickoff meeting and all key participants are required to attend. Performers should also anticipate regular program-wide PI Meetings and periodic site visits at the Program Manager's discretion.

2. Human Use

All research involving human subjects, to include use of human biological specimens and human data, selected for funding must comply with the federal regulations for human subject protection. Further, research involving human subjects that is conducted or supported by the DoD must comply with 32 CFR 219, *Protection of Human Subjects* (http://www.access.gpo.gov/nara/cfr/waisidx_07/32cfr219_07.html) and DoD Directive 3216.02, *Protection of Human Subjects and Adherence to Ethical Standards in DoD-Supported Research* (<http://www.dtic.mil/whs/directives/corres/pdf/321602p.pdf>).

Institutions awarded funding for research involving human subjects must provide documentation of a current Assurance of Compliance with Federal regulations for human subject protection, for example a Department of Health and Human Services, Office of

Human Research Protection Federal Wide Assurance (<http://www.hhs.gov/ohrp>). All institutions engaged in human subject research, to include subcontractors, must also have a valid Assurance. In addition, personnel involved in human subjects research must provide documentation of completing appropriate training for the protection of human subjects.

For all proposed research that will involve human subjects in the first year or phase of the project, the institution must provide evidence of or a plan for review by an Institutional Review Board (IRB) upon final proposal submission to DARPA. The IRB conducting the review must be the IRB identified on the institution's Assurance. The protocol, separate from the proposal, must include a detailed description of the research plan, study population, risks and benefits of study participation, recruitment and consent process, data collection, and data analysis. Consult the designated IRB for guidance on writing the protocol. The informed consent document must comply with federal regulations (32 CFR 219.116). A valid Assurance along with evidence of appropriate training all investigators should all accompany the protocol for review by the IRB.

In addition to a local IRB approval, a headquarters-level human subjects regulatory review and approval is required for all research conducted or supported by the DoD. The Army, Navy, or Air Force office responsible for managing the award can provide guidance and information about their component's headquarters-level review process. Note that confirmation of a current Assurance and appropriate human subjects protection training is required before headquarters-level approval can be issued.

The amount of time required to complete the IRB review/approval process may vary depending on the complexity of the research and/or the level of risk to study participants. Ample time should be allotted to complete the approval process. The IRB approval process can last between one to three months, followed by a DoD review that could last between three to six months. No DoD/DARPA funding can be used towards human subjects research until ALL approvals are granted.

3. Animal Use

Any Recipient performing research, experimentation, or testing involving the use of animals shall comply with the rules on animal acquisition, transport, care, handling, and use in: (i) 9 CFR parts 1-4, Department of Agriculture rules that implement the Laboratory Animal Welfare Act of 1966, as amended, (7 U.S.C. 2131-2159); (ii) the guidelines described in National Institutes of Health Publication No. 86-23, "Guide for the Care and Use of Laboratory Animals"; (iii) DoD Directive 3216.01, "Use of Laboratory Animals in DoD Program."

For submissions containing animal use, proposals should briefly describe plans for Institutional Animal Care and Use Committee (IACUC) review and approval. Animal studies in the program will be expected to comply with the PHS Policy on Humane Care and Use of Laboratory Animals, available at <http://grants.nih.gov/grants/olaw/olaw.htm>.

All Recipients must receive approval by a DoD certified veterinarian, in addition to an IACUC approval. No animal studies may be conducted using DoD/DARPA funding until the USAMRMC Animal Care and Use Review Office (ACURO) or other appropriate DoD veterinary office(s) grant approval. As a part of this secondary review process, the Recipient will be required to complete and submit an ACURO Animal Use Appendix, which may be found at:

https://mrmc-www.army.mil/index.cfm?pageid=Research_Protections.acuro&rn=1.

4. Publication Approval

It is the policy of the Department of Defense that the publication of products of fundamental research will remain unrestricted to the maximum extent possible. The definition of Contracted Fundamental Research is:

“Contracted Fundamental Research includes [research performed under] grants and contracts that are (a) funded by budget category 6.1 (Basic Research), whether performed by universities or industry or (b) funded by budget category 6.2 (Applied Research) and performed on-campus at a university. The research shall not be considered fundamental in those rare and exceptional circumstances where the applied research effort presents a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense, and where agreement on restrictions have been recorded in the contract or grant.” Such research is referred to by DARPA as “Restricted Research.”

Pursuant to DoD policy, research performed under grants and contracts that are (a) funded by budget category 6.2 (Applied Research) and NOT performed on-campus at a university or (b) funded by budget category 6.3 (Advanced Research) does not meet the definition of fundamental research. Publication restrictions will be placed on all such research.

It is anticipated that awards for both Fundamental and Non-fundamental Research may be made as a result of this BAA. Appropriate clauses will be included in resultant awards for Non-fundamental Research to prescribe publication requirements and other restrictions, as appropriate. DARPA does not anticipate applying publication restrictions of any kind to Fundamental Research to each individual award that may result from this BAA.

Proposers are advised if they propose grants or cooperative agreements, DARPA may elect to award other award instruments due to the need to apply publication or other restrictions. DARPA will make this election if it determines that the research resulting from the proposed program will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a

requirement for DARPA permission before publishing any information or results on the program and will be considered Restricted Research.

For certain research projects, it may be possible that although the research being performed by the Prime Contractor is Restricted Research, a subcontractor may be conducting Contracted Fundamental Research. In those cases, it is the Prime Contractor's responsibility to explain in their proposal why its subcontractor's effort is Contracted Fundamental Research.

The following same or similar provision will be incorporated into any resultant Restricted Research or Non-Fundamental Research procurement contract or other transaction:

There shall be no dissemination or publication, except within and between the Contractor and any subcontractors, of information developed under this contract or contained in the reports to be furnished pursuant to this contract without prior written approval of DARPA's Public Release Center (DARPA/PRC). All technical reports will be given proper review by appropriate authority to determine which Distribution Statement is to be applied prior to the initial distribution of these reports by the Contractor. With regard to subcontractor proposals for Contracted Fundamental Research, papers resulting from unclassified contracted fundamental research are exempt from prepublication controls and this review requirement, pursuant to DoD Instruction 5230.27 dated October 6, 1987.

When submitting material for written approval for open publication, the Contractor/Awardee must submit a request for public release to the PRC and include the following information: 1) Document Information: document title, document author, short plain-language description of technology discussed in the material (approx. 30 words), number of pages (or minutes of video) and document type (briefing, report, abstract, article, or paper); 2) Event Information: event type (conference, principle investigator meeting, article or paper), event date, desired date for DARPA's approval; 3) DARPA Sponsor: DARPA Program Manager, DARPA office, and contract number; and 4) Contractor/Awardee's Information: POC name, e-mail and phone. Allow four weeks for processing; due dates under four weeks require a justification. Unusual electronic file formats may require additional processing time. Requests can be sent either via e-mail to pre@darpa.mil or via hard copy to 3701 North Fairfax Drive, Arlington VA 22203-1714 until April 30, 2012/675 North Randolph Street, Arlington VA 22203-2114 on or after April 30, 2012, telephone (571) 218-4235. Refer to http://www.darpa.mil/NewsEvents/Public_Release_Center/Public_Release_Center.aspx for information about DARPA's public release process.

5. Export Control

The following clause will be included in all procurement contracts, and may be included in Other Transactions as deemed appropriate:

(a) *Definition.* “Export-controlled items,” as used in this clause, means items subject to the Export Administration Regulations (EAR) (15 CFR Parts 730-774) or the International Traffic in Arms Regulations (ITAR) (22 CFR Parts 120-130). The term includes:

1) “Defense items,” defined in the Arms Export Control Act, 22 U.S.C. 2778(j)(4)(A), as defense articles, defense services, and related technical data, and further defined in the ITAR, 22 CFR Part 120.

2) “Items,” defined in the EAR as “commodities”, “software”, and “technology,” terms that are also defined in the EAR, 15 CFR 772.1.

(b) The Contractor shall comply with all applicable laws and regulations regarding export-controlled items, including, but not limited to, the requirement for contractors to register with the Department of State in accordance with the ITAR. The Contractor shall consult with the Department of State regarding any questions relating to compliance with the ITAR and shall consult with the Department of Commerce regarding any questions relating to compliance with the EAR.

(c) The Contractor's responsibility to comply with all applicable laws and regulations regarding export-controlled items exists independent of, and is not established or limited by, the information provided by this clause.

(d) Nothing in the terms of this contract adds, changes, supersedes, or waives any of the requirements of applicable Federal laws, Executive orders, and regulations,

including but not limited to—

(1) The Export Administration Act of 1979, as amended (50 U.S.C. App. 2401, *et seq.*);

(2) The Arms Export Control Act (22 U.S.C. 2751, *et seq.*);

(3) The International Emergency Economic Powers Act (50 U.S.C. 1701, *et seq.*);

(4) The Export Administration Regulations (15 CFR Parts 730-774);

(5) The International Traffic in Arms Regulations (22 CFR Parts 120-130);

and (6) Executive Order 13222, as extended;

(e) The Contractor shall include the substance of this clause, including this paragraph (e), in all subcontracts.

6. Subcontracting

Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. 637(d)), it is the policy of the Government to enable small business and small disadvantaged business concerns to be considered fairly as subcontractors to contractors performing work or rendering services as prime contractors or subcontractors under Government contracts, and to assure that prime contractors and subcontractors carry out this policy. Each proposer who submits a contract proposal and includes subcontractors is required to submit a subcontracting plan in accordance with FAR 19.702(a) (1) and (2) should do so with their proposal. The plan format is outlined in FAR 19.704.

7. Electronic and Information Technology

All electronic and information technology acquired through this solicitation must satisfy the accessibility requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d) and FAR Subpart 39.2. Each proposer who submits a proposal involving the creation or inclusion of electronic and information technology must ensure that Federal employees with disabilities will have access to and use of information that is comparable to the access and use by Federal employees who are not individuals with disabilities and members of the public with disabilities seeking information or services from DARPA will have access to and use of information and data that is comparable to the access and use of information and data by members of the public who are not individuals with disabilities.

8. Employment Eligibility Verification

As per FAR 22.1802, recipients of FAR-based procurement contracts must enroll as Federal Contractors in E-verify and use E-Verify to verify employment eligibility of all employees assigned to the award. All resultant contracts from this solicitation will include FAR 52.222-54, "Employment Eligibility Verification." This clause will not be included in grants, cooperative agreements, or Other Transactions.

9. Central Contractor Registration (CCR) and Universal Identifier Requirements

Unless the proposer is exempt from this requirement, as per FAR 4.1102 or 2 CFR 25.110 as applicable, all proposers must be registered in the Central Contractor Registration (CCR) and have a valid Data Universal Numbering System (DUNS) number prior to submitting a proposal. Information on CCR registration is available at <http://www.ccr.gov>. All proposers must maintain an active CCR registration with current information at all times during which they have an active Federal award or proposal under consideration by DARPA. All proposers must provide the DUNS number in each proposal they submit.

DARPA cannot make an assistance award to a proposer until the proposer has provided a valid DUNS number and has maintained an active CCR registration with current information.

10. Reporting Executive Compensation and First-Tier Subcontract Awards

The FAR clause 52.204-10, “Reporting Executive Compensation and First-Tier Subcontract Awards,” will be used in all procurement contracts valued at \$25,000 or more. A similar award term will be used in all grants and cooperative agreements.

11. Updates of Information Regarding Responsibility Matters

FAR clause 52.209-9, Updates of Publicly Available Information Regarding Responsibility Matter, will be included in all contracts valued at \$500,000 where the contractor has current active Federal contracts and grants with total value greater than \$10,000,000.

12. Representation by Corporations Regarding Unpaid Delinquent Tax Liability or a Felony Conviction Under Any Federal Law

Each proposer must complete and return the representations in paragraph (b) below with their proposal submission.

(a) In accordance with sections 8124 and 8125 of Division A of the Consolidated Appropriations Act, 2012 (Pub. L. 112-74) none of the funds made available by that Act may be used to enter into a contract with any corporation that –

(1) Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, unless the agency has considered suspension or debarment of the corporation and made a determination that this further action is not necessary to protect the interests of the Government.

(2) Was convicted of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless the agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government.

(b) The Offeror represents that –

(1) It is is not a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability,

(2) It is is not a corporation that was convicted of a felony criminal violated under Federal law within the preceding 24 months.

13. Cost Accounting Standards Notices and Certification (Deviation 2012-00003 (JAN 2012))

As per FAR 52.230-2, amended by Deviation 2012-00003 (JAN 2012), any procurement contract in excess of \$700,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except those contracts which are exempt as specified in 48 CFR 9903.201-1. Any offeror submitting a proposal which, if accepted, will result in a CAS compliant contract, must submit representations and a Disclosure Statement as required by 48 CFR 9903.202 detailed in FAR 52.230-2.

C. Reporting

The number and types of reports will be specified in the award document, but will include as a minimum quarterly financial status reports. The reports shall be prepared and submitted in accordance with the procedures contained in the award document and mutually agreed on before award. Reports and briefing material will also be required as appropriate to document progress in accomplishing program metrics. A Final Report that summarizes the project and tasks will be required at the conclusion of the performance period for the award, notwithstanding the fact that the research may be continued under a follow-on vehicle.

D . Electronic Systems

1. Representations and Certifications

In accordance with FAR 4.1201, prospective proposers shall complete electronic annual representations and certifications at <http://orca.bpn.gov>.

2. Wide Area Work Flow (WAWF)

Unless using another approved electronic invoicing system, performers will be required to submit invoices for payment directly via the Internet/WAWF at <http://wawf.eb.mil>. Registration to WAWF will be required prior to any award under this BAA.

3. i-Edison

The award document for each proposal selected for funding will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (<http://s-edison.info.nih.gov/iEdison>).

VII. AGENCY CONTACTS

Email is the preferred method of communication.

Administrative, technical or contractual questions should be sent via e-mail to DARPA-BAA-12-44@darpa.mil. All requests must include the name, email address, and phone number of a point of contact.

The technical POC for this effort is:

Dr. Andrei Shkel

DARPA-BAA-12-44@darpa.mil

Before April 30, 2012:

DARPA/MTO

ATTN: DARPA-BAA-12-44

3701 North Fairfax Drive

Arlington, VA 22203-1714

On/After April 30, 2012:

DARPA/MTO

ATTN: DARPA-BAA-12-44

675 North Randolph Street

Arlington, VA 22203-2114

VIII. OTHER INFORMATION

A. Intellectual Property Procurement Contract Proposers

1. Noncommercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all noncommercial technical data and noncommercial computer software that it plans to generate, develop, and/or deliver under any proposed award instrument in which the Government will acquire less than unlimited rights, and to assert specific restrictions on those deliverables. Proposers shall follow the format under DFARS 252.227-7017 for this stated purpose. In the event that proposers do not submit the list, the Government will assume that it automatically has “unlimited rights” to all noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, unless it is substantiated that development of the noncommercial technical data and noncommercial computer software occurred with mixed funding. If mixed funding is anticipated in the development of

noncommercial technical data and noncommercial computer software generated, developed, and/or delivered under any award instrument, then proposers should identify the data and software in question, as subject to Government Purpose Rights (GPR). In accordance with DFARS 252.227-7013 Rights in Technical Data - Noncommercial Items, and DFARS 252.227-7014 Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, the Government will automatically assume that any such GPR restriction is limited to a period of five (5) years in accordance with the applicable DFARS clauses, at which time the Government will acquire “unlimited rights” unless the parties agree otherwise. Proposers are admonished that the Government will use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.” It is noted an assertion of “NONE” indicates that the Government has “unlimited rights” to all noncommercial technical data and noncommercial computer software delivered under the award instrument, in accordance with the DFARS provisions cited above. Failure to provide full information may result in a determination that the proposal is not compliant with the BAA – resulting in nonselectability of the proposal.

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

NONCOMMERCIAL				
Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

2. Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a procurement contract to be issued under the FAR/DFARS shall identify all commercial technical data and commercial computer software that may be embedded in any noncommercial deliverables contemplated under the research effort, along with any applicable restrictions on the Government’s use of such commercial technical data and/or commercial computer software. In the event that proposers do not submit the list, the Government will assume that there are no restrictions on the Government’s use of such commercial items. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.” Failure to provide full information may result in a determination that the proposal is not compliant with the BAA – resulting in nonselectability of the proposal.

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

COMMERCIAL				
Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

B. Non-Procurement Contract Proposers – Noncommercial and Commercial Items (Technical Data and Computer Software)

Proposers responding to this BAA requesting a Grant, Cooperative Agreement, Technology Investment Agreement, or Other Transaction for Prototype shall follow the applicable rules and regulations governing these various award instruments, but in all cases should appropriately identify any potential restrictions on the Government’s use of any Intellectual Property contemplated under those award instruments in question. This includes both Noncommercial Items and Commercial Items. Although not required, proposers may use a format similar to that described in Paragraphs 1.a and 1.b above. The Government may use the list during the evaluation process to evaluate the impact of any identified restrictions, and may request additional information from the proposer, as may be necessary, to evaluate the proposer’s assertions. If no restrictions are intended, then the proposer should state “NONE.” Failure to provide full information may result in a determination that the proposal is not compliant with the BAA – resulting in nonselectability of the proposal.

C. All Proposers – Patents

Include documentation proving your ownership of or possession of appropriate licensing rights to all patented inventions (or inventions for which a patent application has been filed) that will be utilized under your proposal for the DARPA program. If a patent application has been filed for an invention that your proposal utilizes, but the application has not yet been made publicly available and contains proprietary information, you may provide only the patent number, inventor name(s), assignee names (if any), filing date, filing date of any related provisional application, and a summary of the patent title, together with either: 1) a representation that you own the invention, or 2) proof of possession of appropriate licensing rights in the invention.

D. All Proposers – Intellectual Property Representations

Provide a good faith representation that you either own or possess appropriate licensing rights to all other intellectual property that will be utilized under your proposal for the DARPA program. Additionally, proposers shall provide a short summary for each item asserted with less than unlimited rights that describes the nature of the restriction and the intended use of the intellectual property in the conduct of the proposed research

E. Other Transactions (OTs)

DARPA is able to obtain its research support through a variety of legal instruments and flexible arrangements, to include use of Other Transaction Agreements (OTAs). OTAs are potentially applicable to a wide variety of DARPA programs. They are likely to be particularly applicable to support dual-use technologies (those with commercial nonmilitary potential as well as potential military applications), consortia or multi-party agreements, and work supported by multiple funding sources. Because OTAs are not traditional procurement contracts, DARPA is not required to include the traditional FAR and DFARS clauses in these agreements, but is free to negotiate provisions that are mutually agreeable to both the Government and the consortium of companies entering into the agreement. Proposals may, but need not, state that an OTA rather than a contract or grant is desired. Furthermore, DARPA does not enter into OTAs when a contract or grant is feasible or appropriate. See FAR 35.003 for Government-wide policy on use of contracts for research and development.

There are two types of commonly used OTAs awarded pursuant to 10 U.S.C. 2371: Other Transactions for Research and Other Transactions for Prototype Projects (a.k.a. “845s”). Of these two types of OTAs, the one most pertinent to this BAA is referred to as a Technology Investment Agreement (TIA) and is issued in accordance with Part 37 of the Department of Defense Grant and Agreement Regulations (DoDGARs) (<http://www.dtic.mil/whs/directives/corres/html/321006r.htm>). TIAs are assistance instruments used to stimulate or support research designed to: (a) reduce barriers to commercial firm’s participation in defense research, to give the Department of Defense (DoD) access to the broadest possible technology and industrial base; (b) promote new relationships among performers in both the defense and commercial sectors of that technology and industrial base; and (c) stimulate performers to develop, use, and disseminate improved practices. As a matter of 43 DoD policy, a TIA may be awarded only when one or more for-profit firms are to be involved either in the (1) performance of the research project; or (2) the commercial application of the research results (e.g. commercial transition partner). Also of importance is the requirement that, to the maximum extent practicable, the non-Federal parties carrying out a research project under a TIA are to provide at least half of the costs of the project – this being a statutory condition for any TIA, or Other Transaction Agreement in general, issued under the authority of 10 U.S.C. 2371. Such instruments can involve a single performer or multiple performers participating as a consortium (which are not required to operate as a separate legal entity) and the Generally Accepted Accounting Principle (GAAP) applies rather than the FAR or DFARS cost principles.

For information on 845 Other Transaction Authority for Prototypes (OTA) agreements, refer to http://www.darpa.mil/cmo/other_trans.html. All proposers requesting an 845 Other Transaction Authority for Prototypes (OTA) agreement must include a detailed list of milestones. Each such milestone must include the following: milestone description, completion criteria, due date, payment/funding schedule (to include, if cost share is proposed, contractor and Government share amounts). It is noted that, at a minimum, such milestones should relate directly to accomplishment of program technical metrics as

defined in the BAA and/or the proposer's proposal. Agreement type, fixed price or expenditure based, will be subject to negotiation by the Agreements Officer; however, it is noted that the Government prefers use of fixed price milestones with a payment/funding schedule to the maximum extent possible. Do not include proprietary data. If the proposer requests award of an 845 OTA agreement as a nontraditional defense contractor, as so defined in the OSD guide entitled "Other Transactions (OT) Guide For Prototype Projects" dated January 2001 (as amended) (<http://www.acq.osd.mil/dpap/Docs/otguide.doc>), information must be included in the cost proposal to support the claim. Additionally, if the proposer plans requests award of an 845 OTA agreement, without the required one-third (1/3) cost share, information must be included in the cost proposal supporting that there is at least one non-traditional defense contractor participating to a significant extent in the proposed prototype project.